RCRA PART B

PERMIT APPLICATION

for

AVCO LYCOMING TEXTRON
Stratford Army Engine Plant
Stratford, CT 06497

October 1985

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METCALF & EDDY

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I. INTRODUCTION

In 1976, the Resource Conservation and Recovery Act (RCRA) was passed into law. This Act regulates hazardous waste management activities and required that the U.S. Environmental Protection Agency (U.S. EPA) issue regulations to implement this hazardous waste management program. The U.S. EPA published a wide-ranging set of hazardous waste regulations on May 19, 1980. One of the requirements of these regulations was that all facilities that store, treat, or dispose of hazardous waste submit Part A of a RCRA permit application by November 19, 1980. This submission allowed these facilities to operate as "interim status" facilities as long as they complied with regulations in 40 CFR Part 265. Facilities could operate under interim status until they were requested or voluntarily submitted Part B of the permit application.

AVCO Lycoming Textron, Stratford Army Engine Plant (herein after referred to as AVCO or AVCO Lycoming) is currently operating four hazardous waste surface impoundments. AVCO submitted Part A of the RCRA permit application to the U.S. EPA on November 13, 1980. The AVCO Part A permit application listed four different types of hazardous waste management processes, which are listed below:

- A storage capacity of 110 55-gallon drums for a total storage capacity of 6050 gallons.
- A storage capacity of 908,940 gallons in four surface impoundments.

- Treatment capacity of 504,000 gallons per day in a tank (Chemical wastewater treatment system).
- A storage capacity of 40 tons in a tank.

The only activity of the four above hazardous waste management activities that needs to be permitted is the storage of hazardous wastes in the surface impoundments. The storage of hazardous wastes in containers and tanks does not need to be permitted because the waste is shipped off-site within 90 days of the time it is placed into the container or tank (40 CFR Part 262.34). In addition, the U.S. EPA suspended the applicability of 40 CFR Parts 122, 264, and 265 to owners and operators of wastewater treatment tanks that receive, store, and treat wastewaters that are hazardous waste or that generate, store or treat a wastewater treatment sludge which is a hazardous waste where such wastewaters are subject to regulation under Sections 402 or 307(b) of the Clean Water Act (40 CFR 265.1(c) (10); FR-November 7, 1980 pp. 76074-76075). Since AVCO's effluent from their chemical wastewater treatment is subject to Section 402 of the Clean Water Act, the chemical wastewater treatment system is not subject to the above-cited RCRA regulations.

RCRA was amended in 1984 and signed into law on November 8, 1984. This action is referred to as "The Hazardous and Solid Waste Amendments of 1984". Section 213 of these amendments states that in the case of land disposal facilities which have been granted interim status under Section 3005 of RCRA before November 8, 1984, interim status shall terminate on

November 8, 1985 unless the facility submits Part B of the permit application before this time and meets other conditions.

As previously mentioned, AVCO is currently operating four surface impoundments. It is planned to close these surface impoundments in the spring of 1986. Because the surface impoundments will not be closed prior to November 8, 1985, AVCO is submitting Part B of the RCRA permit application to U.S. EPA Region I and the Connecticut Department of Environmental Protection (DEP).

The general requirements for a Part B permit application are provided in 40 CFR Part 270.14. 40 CFR Part 270.14 identifies the specific 40 CFR Part 264 technical requirements that are applicable to the permit application as well as other requirements. In addition to these general requirements, there are more specific requirements for surface impoundment operation in 40 CFR Part 270.17.

The AVCO Part B permit application addresses the above regulatory permit requirements. Because AVCO plans on closing the surface impoundments in May 1986, the closure plan should be reviewed with this closing date in mind.

II. FACILITY DESCRIPTION

General

The AVCO facility, which is owned by the U.S. Army and operated by AVCO Lycoming Textron is located in Stratford, Connecticut just south (approximately 1,000 feet) of where the Housatonic River enters the Long Island Sound. The major activities of the facility include the production of tank and aircraft engines. The production of these engines includes the plating of engine and other miscellaneous pieces in zinc, cadmium, chrome, copper, magnesium, nickel, and black oxide baths. Other baths associated with these plating baths include cleaning baths (such as acid and alkaline cleaners) and rinse (water) baths. The spent baths and rinse water are discharged to an equalization lagoon prior to being treated. In addition, wastewater from several other areas of the plant are sent to the equalization lagoon. The plant areas contributing flow to the equalization lagoon are summarized below:

- Main plating area
- Anodizing area
- HAE area
- Tumbling machine effluent
- Wash tub operation
- Wet air scrubbers
- Condensate and cooling water
- Quality assurance lab
- Plasma spray booth area

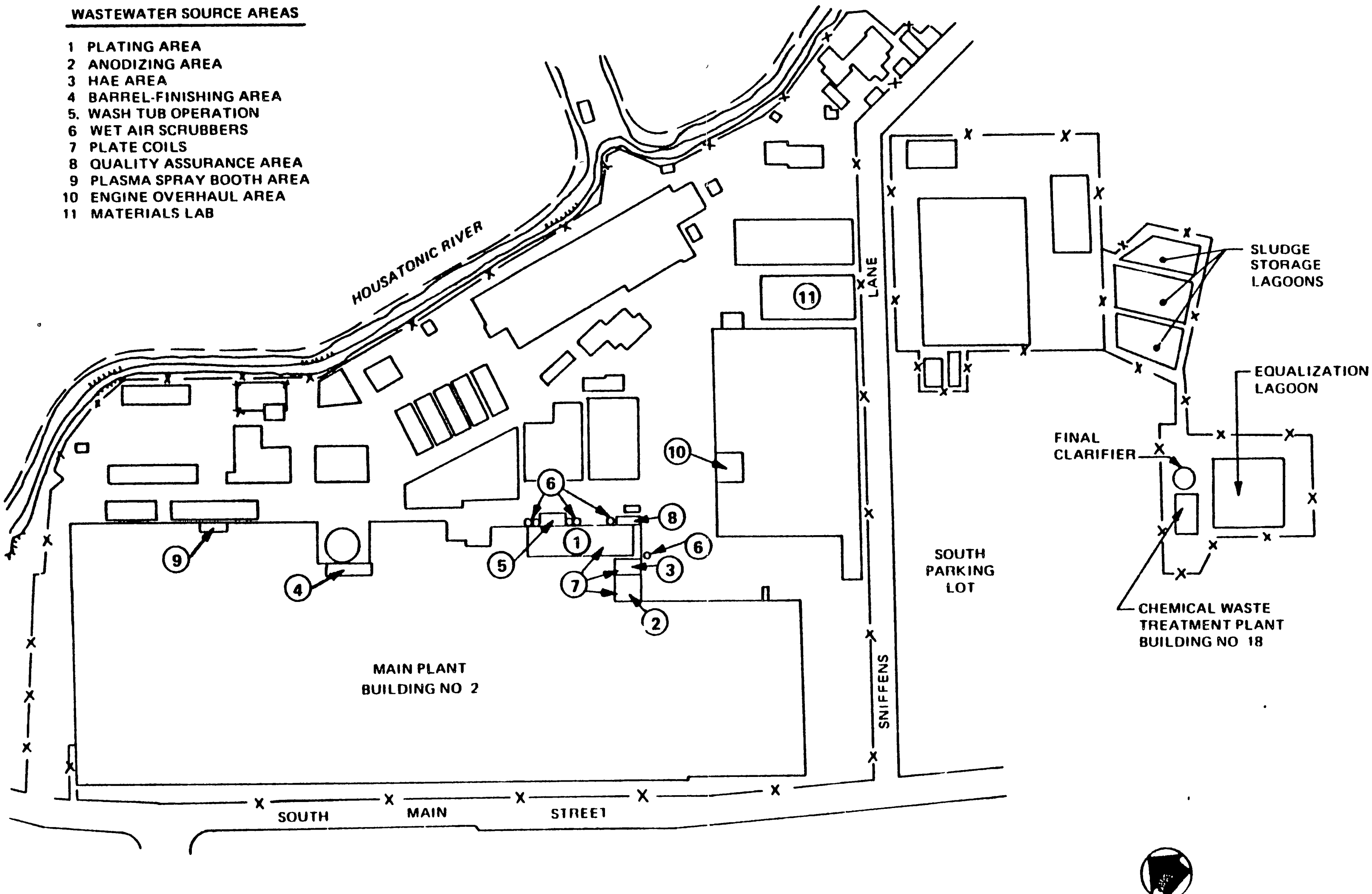
- Engine overhaul area
- Materials lab.

More information on the composition of these wastewater sources is provided in the Waste Analysis Plan (Part V). A map of the AVCO facility is provided in Figure II-1. The location of the wastewater source areas, equalization lagoons and sludge storage lagoons are shown on this figure. Figure II-2 shows and aerial photograph of the area surrounding the AVCO facility.

The wastewater in the equalization lagoon is pumped to a chemical wastewater treatment system. This system first treats the cyanides contained in the wastewater by alkaline chlorination. Next, the chromium in the wastewater is reduced to the trivalent state with sulfuric acid and sodium metabisulfite. After the cyanide and chrome are treated, the free metals are precipitated as metal hydroxides with a lime treatment. The overflow from the treatment system clarifier is discharged to an outfall near the treatment plant in accordance with an NPDES permit under Section 402 of the Clean Water Act. The settled metal hydroxide sludge is pumped to one of three sludge storage lagoons.

The approximate surface areas of the four surface impoundments are presented below:

Surface Impoundment	Surface Area
Equalization Lagoon	25,600 $ft.^2$
Sludge Storage Lagoon (South)	9,140 $ft.^2$
Sludge Storage Lagoon (Middle)	7,920 $ft.^2$
Sludge Storage Lagoon (North)	12,600 $ft.^2$



NOTE FROM CONCEPT ENGINEERING REPORT, SAEP CHEMICAL WASTE TREATMENT AND DISPOSAL, WESTON, 1982

FIG. II-1 AVCO LYCOMING PLANT LAYOUT AND WASTEWATER SOURCE LOCATIONS

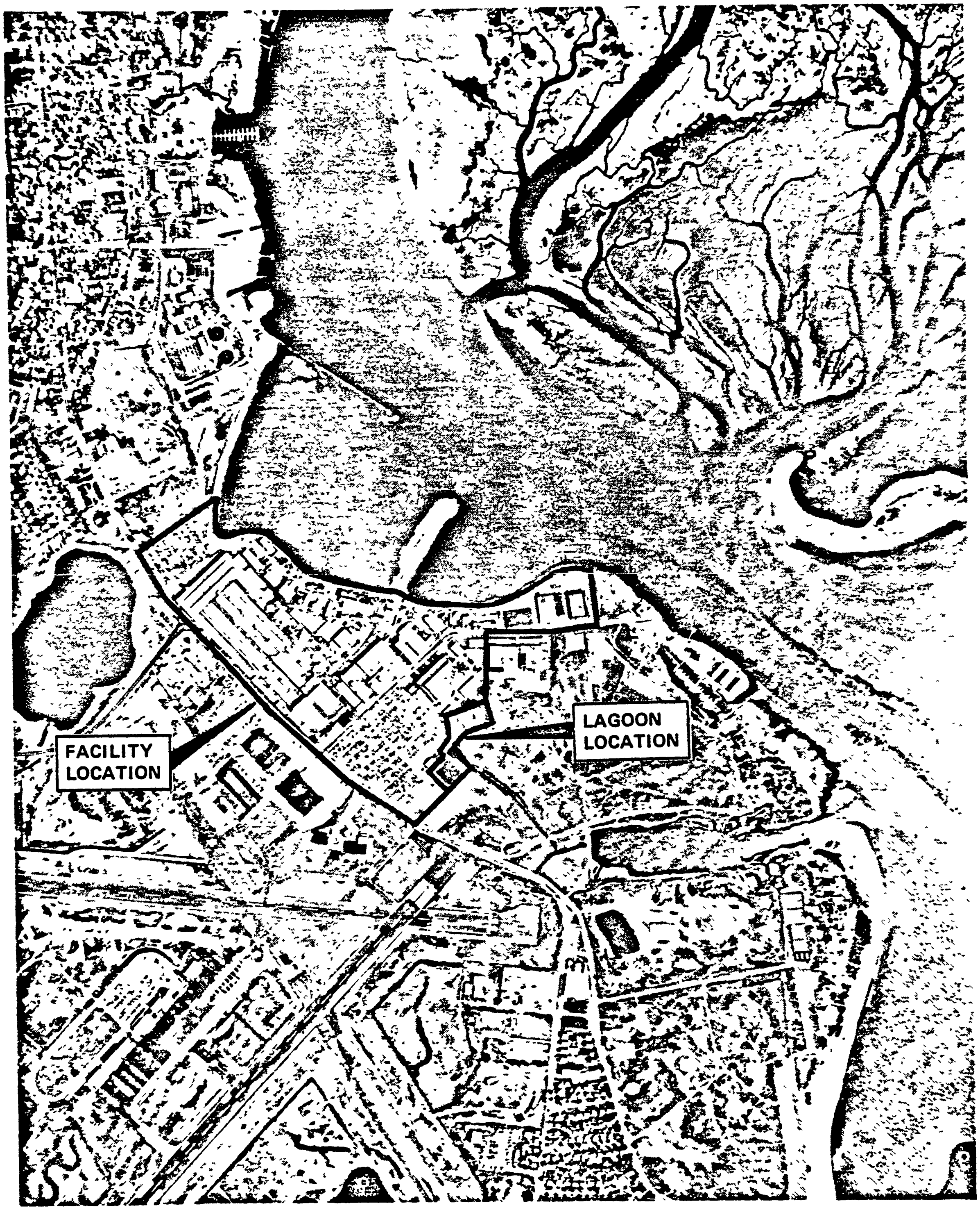


FIG. II-2 AERIAL MAP – AVCO LYCOMING FACILITY

The total area occupied by these impoundments is approximately 1.3 acres.

The equalization lagoon is lined with a bentonite liner whereas the three sludge holding lagoons are unlined. The volume of sludge material in the four lagoons is estimated to be approximately 10,500 cubic yards. This volume has been determined through current lagoon topography and knowledge of the base elevation of the lagoons.

The hazardous waste in the equalization lagoon consists of the following:

- Wastewater treatment sludges from electroplating operations (U.S. EPA Hazardous Waste #F006)
- Spent cyanide plating bath solutions from electroplating operations (U.S. EPA Hazardous Waste #F007)
- Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process (U.S. EPA Hazardous Waste #F009)
- Waste streams that exhibit the EP Toxicity characteristic for cadmium and chromium (U.S. EPA Hazardous Waste #'s D006 and D007, respectively)

The volume of material discharged to the equalization lagoon that has the EPA hazardous waste #'s F007 and F009 is approximately 1,600 gallons per day. The majority of this wastewater is the rinsewater used to clean plating pieces. The amount of wastewater discharged to the equalization lagoon exhibiting the EP Toxicity Characteristic for cadmium and/or chrome is approximately 77,500 gallons per day. Wastewater treatment sludges are accumulated in the equalization lagoon because of the settling of suspended solids from the stored wastewater. The sludge generated in the chemical wastewater treatment system (EPA Hazardous Waste #F006) is discharged to one of the three sludge storage lagoons. The volume of this material discharged to the holding lagoons is approximately 7,700 pounds per day (960 gallons per day).

In the spring of 1986, a new chemical wastewater treatment system will be completed. This new treatment system will include an equalization tank to replace the equalization lagoon and a filter press to dewater the sludge will replace the sludge holding lagoons. Once this new system is on-line, the equalization lagoon and sludge storage lagoons will be closed according to the closure plan.

Hydrogeology

The AVCO Lycoming facility is underlain by glacial stratified drift deposits. The stratigraphy of the deposits beneath the lagoons has been determined by examining the logs of borings that were drilled for this and previous investigations. The following description is based on the boring logs which are currently available (borings B-1 through B-18, Metcalf & Eddy, Inc., 1985 (see Appendix C for the boring logs); borings B-1 through B-15, Haley & Aldrich, 1982). Boring logs for existing observation Wells Nos. 1-7 are not currently available. Borings B-1 to B-18 by M&E were visually classified in the field utilizing the Unified Soil Classification System. Soil lab tests were also performed on selected soil samples. The location of the borings is presented in Figure II-3.

The uppermost 5 to 15 feet of soil generally consists of one or more of the following materials: fine to coarse sand with a trace of silt (SP); silty sand (SM); or fill, which is typically sand and gravel with varying amounts of silt. These uppermost materials are underlain by a variable thickness layer of peat (OL). The organic peat was encountered in seven borings (B-2, B-4, B-5, B-8, B-9, B-10 and B-12). The subsurface soils below the uppermost strata and the peat (where present) consist primarily of fine to coarse sand with varying amounts of gravel and a trace of silt.

Maps prepared by the US Geological Survey (Wilson, et. al., 1974) indicates that bedrock occurs at a depth greater than 120 feet. No known data are available regarding the depth to bedrock at this facility.

The peat zone ranged from a minimum of 5.5 feet to a maximum of 20 feet in thickness in borings B-4 and B-10, respectively. Depth to the top of the peat layer ranged from a minimum of 6 feet to a maximum of 17 feet below existing ground surface in borings B-2 and B-8, respectively. Rock was not encountered in any of these borings.

Previous subsurface investigation work has been performed on this site by other consultants (Haley & Aldrich, Inc./R.F. Weston, B-1 to B-15, November 11, 1982). Similar soils were

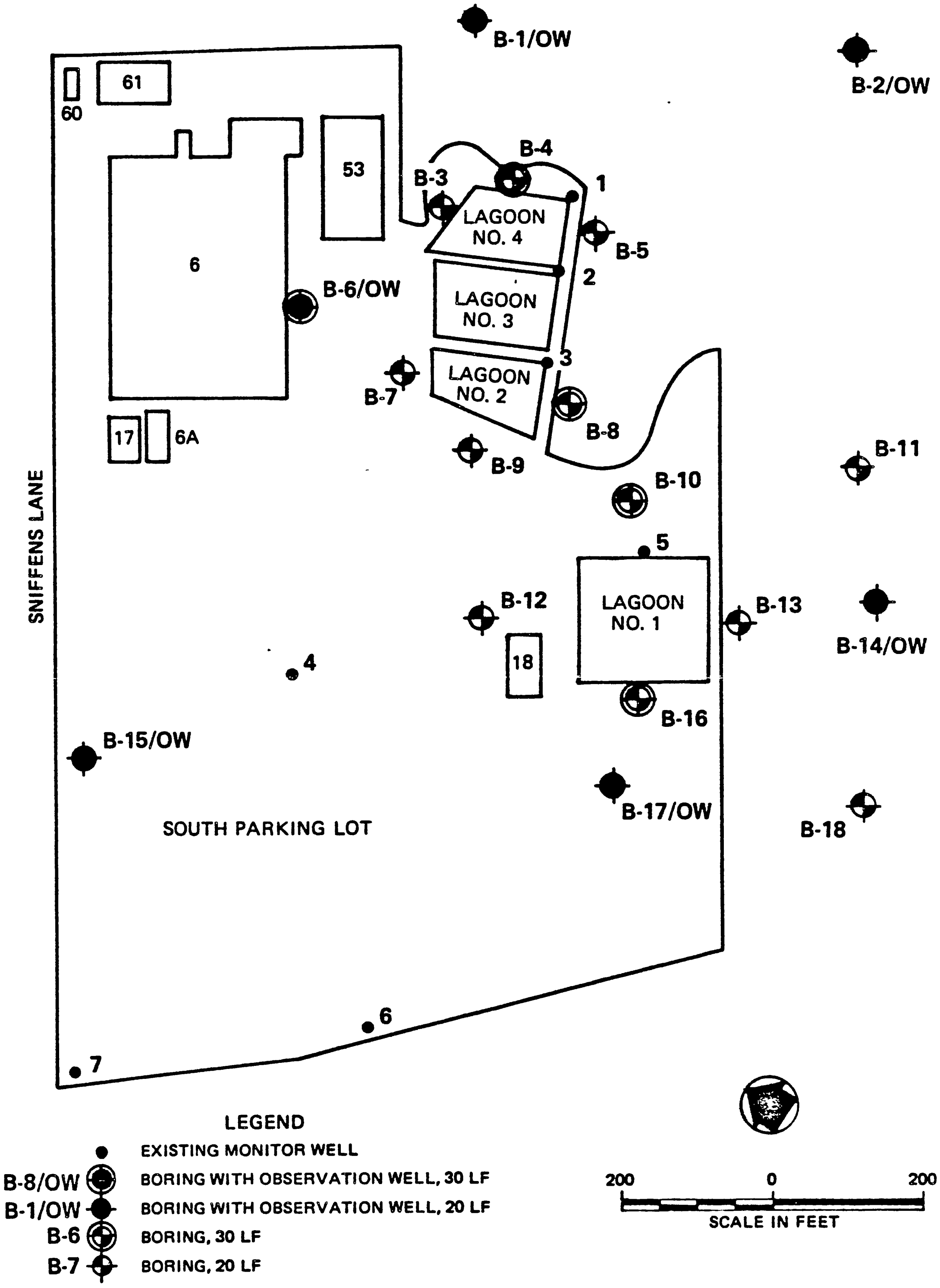


FIG. II-3 LOCATION OF BORINGS AND OBSERVATION WELLS

encountered in their borings. Seven observation wells (OW-1 to OW-7) were also installed and are being monitored in a separate AVCO-Lycoming project.

Borings B-1 to B-15 by Haley & Aldrich/Roy F. Weston ranged in depth from 11.5 feet to 51.5 feet. Boring B-13 was completed to refusal at 25.3 feet. Silty sands and mixtures of sand and coarse-fine gravels and peat were encountered in these borings. Rock was not encountered.

As part of this subsurface investigation program observation wells were installed in six borings (B-1, B-2, B-6, B-14, B-15 and B-17). These wells will supplement the existing observation wells (1 to 7) currently being monitored by Leggette, Brashears and Graham, Inc. for water quality.

The AVCO facility and associated lagoons are located in a relatively flat area near the mouth of the Housatonic River. Ground surface elevations are generally lower than 10 feet (above zero, National Geodetic Vertical Datum). The water table is also fairly flat, and marshy areas with tidal channels exist in the vicinity of the site.

A surface water drainage divide and an inferred groundwater divide exist west of Main Street. Under undeveloped conditions, groundwater in the shallow part of the aquifer in the vicinity of the lagoons would be expected to flow primarily southeastward toward the tidal ditch or eastward to northeastward toward the Housatonic River. A percentage of the groundwater would be expected to flow downward into deeper parts of the aquifer.

The development of the area has probably had some significant effects on the hydrologic system. The large buildings and paved areas with storm drainage systems greatly reduce groundwater recharge and generally cause a lowering of the water table. The excavation of ditches in tidal marshes may lower the water table and may facilitate the infiltration of salt water into the aquifer if the poorly permeable tidal marsh deposits are totally removed. Storm drainage pipes, if placed below the water table with gravel bedding, may also create pathways for groundwater drainage and subsequent lowering of the water table and changes in groundwater flow directions. Another factor which may influence groundwater movement at the site is the possibility of seepage from the equalization lagoon No. 1, which is reported to have a bentonite liner, and from the sludge storage lagoons No. 2, 3 and 4 which are unlined. Previous water level monitoring has indicated the possibility of groundwater mounding around the lagoons.

Examination of the water level data that are available both from recent monitoring of the six installed by Metcalf & Eddy wells and from previous monitoring of the seven existing monitoring suggests the following conclusions:

1. Water levels in existing well No. 5 are elevated according to water level measurements in existing wells No. 1-7 by others, due either to seepage from the equalization lagoon or to tidal effects.
2. Significant variations among the water levels in existing wells No. 1, 2 and 3, are apparently due to seepage from the sludge storage lagoons. These wells are completed in relatively poorly permeable materials. Although boring logs are not currently available for these wells, the logs from nearby recently installed wells indicate that existing wells No. 1, 2, 3 and 5 are screened in peat and silty sand.

Based on water level data obtained from the new observation wells a contour map of the phreatic surface was developed (see Figure XIV-2). The phreatic surface contours indicate high water levels north of Lagoons No. 2, 3 and 4. The phreatic surface grades down slope in the southerly direction.

Lagoons No. 2, 3 and 4 are unlined. Based on this information and the corresponding field data the high water levels may be due to artificial recharge by downward seepage from the three unlined lagoons. Mounding has not been shown on the phreatic surface contour map in the area of lagoon No. 1. Further water level data from existing well No. 5 may contradict this.

Based on the prepared phreatic surface contour map and associated gradients it is estimated that groundwater flow radiates uniformly outward from the area of boring B-6/OW. However, water level data from existing observation well measurements by L,B&G indicate that the groundwater flow may be radially outward from all lagoons. However, a complete set of water level readings from all observation wells is required to substantiate flow direction.

Stevens recorder data obtained from existing well No. 5 indicated that groundwater levels fluctuate with the tidal cycle at this location. Groundwater level data from OW-1, B-6 and B-17 as recorded by Stevens recorder indicated no tidal fluctuation in these observation wells. Due to the uncertainty associated with the data recorded and the short period of record it is recommended that this study be continued to quantify and confirm this information.

Based on the soil strata encountered the following permeabilities have been extrapolated from laboratory data: silty sand (SM) $K = 3 \times 10^{-4}$ CM/SEC; poorly graded sand (SP) $K = 150 \times 10^{-4}$ CM/SEC; low plasticity silt (ML) $K = 1 \times 10^{-4}$ CM/SEC; peat (OL), $K = 0.75 \times 10^{-4}$ CM/SEC.

Soil profiles developed from M&E boring information indicate that the lagoons are underlained by the silty sand (SM) soil zone. As a result, contaminant transport may be restricted to this soil strata. The organic peat zone which is interlayered between this soil and the higher permeability poorly graded sand found at depth may also affect contaminant transport.

The groundwater in the general area of the AVCO facility is classified as Class GB water. The definition of Class GB water is as follows from the Connecticut Water Quality Standards and Classifications:

> Class GB area may be suitable for receiving discharges permitted in Class GAA and Class GA. In addition, these groundwaters may be suitable for receiving certain treated industrial process waters amenable to further treatment by the soils. Such discharges shall not cause degradation of groundwaters that could preclude future use of the groundwater for drinking supplies without treatment or violate adjacent surface water classification.
>
> Class GB groundwaters are those located in areas where historical, industrial, commercial or residential development has or is likely to render the groundwaters unsuitable for drinking water without treatment, however, the intent is to prevent new discharges from causing further degradation.

At the present time, the ground water flow direction has not been definitively determined. The ground water elevation data suggests that there may be some ground water mounding below the equalization lagoon and that the flow direction may be toward the Housatonic River and/or the Marine Basin.

III. LOCATION INFORMATION

General

Information on the location of the facility in regard to seismic activity and floodplain information is required by 40 CFR 270.14(b)(11) and 264.18. The information presented in this section has been developed in compliance with these requirements. This information pertains to the equalization lagoon and the three sludge storage lagoons.

Seismic Considerations

The AVCO Lycoming facility is an existing facility located in Stratford Connecticut, and is not within any of the political jurisdictions listed in Appendix VI of 40 CFR Part 264. As such, none of the requirements of 40 CFR 270.14(b)(11) and 264.18 regarding seismic considerations are pertinent to this facility.

Floodplain Information

The intent of the floodplain regulations is to prevent the release of hazardous wastes from a facility during a flood. A determination must be made as to whether the facility is within the 100-year floodplain. If the facility is within the floodplain additional information must be provided. This information includes the following:

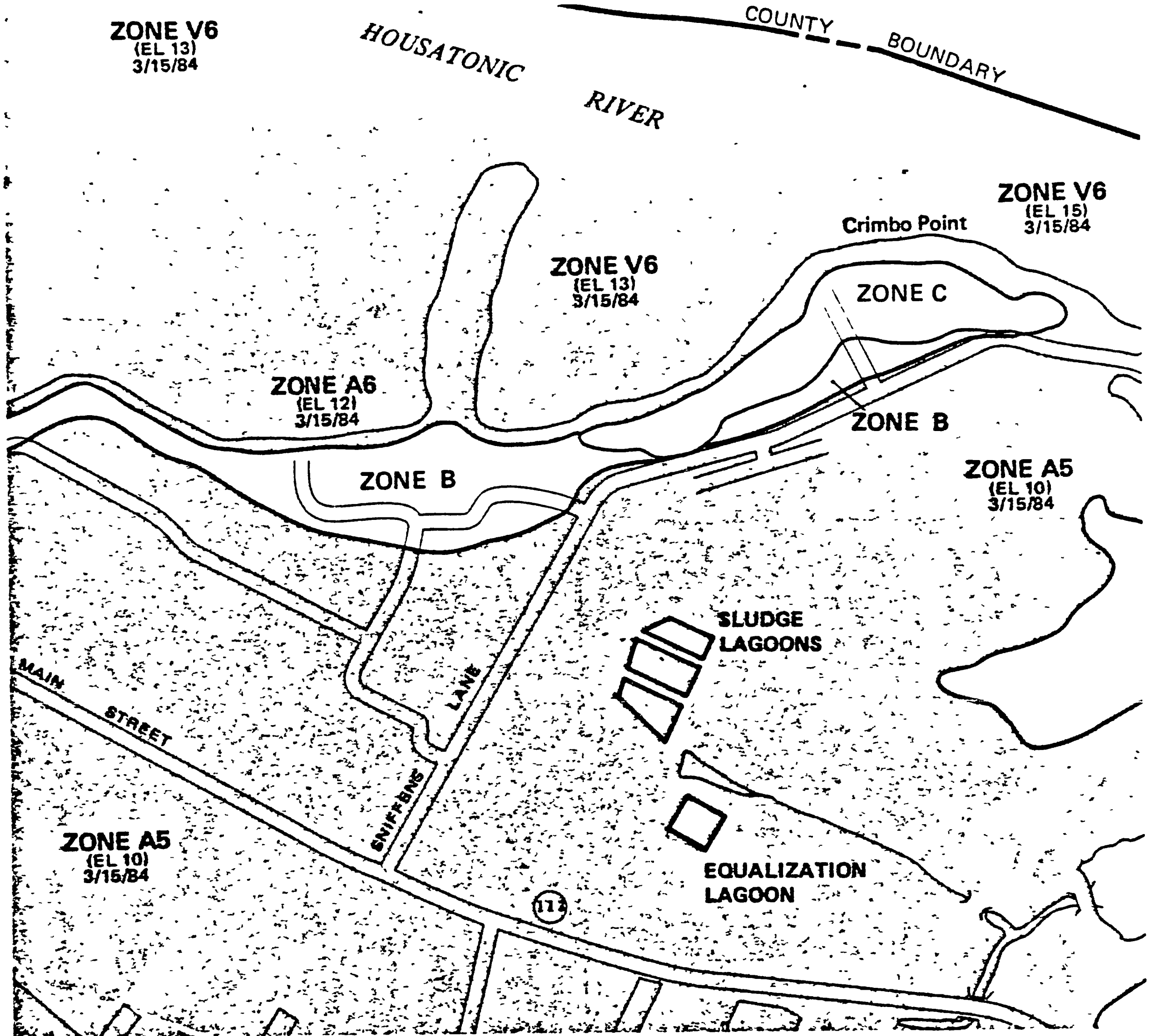
1. Analyses indicating the various forces expected to result at the facility during a 100-year flood.

2. Information on the facility design and flood protection devices and their ability to prevent washout.

3. If applicable, in lieu of (1) and (2) above, a detailed description of procedures to be followed to remove the hazardous waste from the facility before it is flooded.

The regulations stipulated in 40 CFR 264.18 require that any facility located in a 100-year floodplain be designed to prevent washout by a 100-year flood unless: (a) procedures are in effect which will allow the waste to be removed before flood waters reach the facility or (b) it can be demonstrated that no adverse effects on human health or the environment will result if washout occurs.

Floodplain Location. A Flood Insurance Study has been conducted by the Federal Emergency Management Agency (FEMA) for the Town of Stratford, Connecticut. This study region includes the AVCO facility. From this study it is determined that the equalization lagoons and sludge storage lagoons are within the 100-year floodplain. Figure III-1 is a copy of the Flood Insurance Study mapping, with the AVCO facility location identified. The 100-year stillwater flood elevation at the facility is 10 ft., with a maximum wave crest elevation of 13 ft. These elevations are with reference to the National Geodetic Vertical Datum (NGVD) of 1929. The facility is not within an area classified as having wave action velocity.



NOTE. FROM FLOOD INSURANCE STUDY FOR TOWN OF STRATFORD, FAIRFIELD COUNTY, CT. MARCH, 1984.

KEY TO MAP

500-Year Flood Boundary — ZONE B
100-Year Flood Boundary
Zone Designations* With Date of Identification e.g., 12/2/74 — ZONE A1 DATE / ZONE A5 DATE
100-Year Flood Boundary
500-Year Flood Boundary — ZONE B

ZONE	EXPLANATION
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
B	Areas between limits of the 100-year flood and 500-year flood, or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

500 0 500
SCALE IN FEET

FIG. III-1 100-YEAR FLOOD PLAIN DELINEATION WITH AVCO LYCOMING LAGOONS

Flood Protection. The entire AVCO Lycoming facility is protected by a flood protection dike with six pump houses used to pump out interior drainage. The top elevation of this dike is approximately 12 ft. (NGVD 1929 datum). This is above the 100-year stillwater flood elevation of 10 ft. The maximum 100-year wave crest elevation (13 ft.) may overtop the dike, but extensive flooding in the dike interior is not expected since the base flood elevation is below the dike crest and the flood waters will not be sustained at the maximum wave crest elevation. The facility area is not classified as a velocity wave region in the Flood Insurance Study, and wave forces on the dike should not be excessive. The flood protection dike surrounding the AVCO Lycoming facility is expected to prevent flood waters from reaching the lagoons during a 100-year flood.

IV. WASTE CHARACTERISTICS

General

Information on the chemical and physical characteristics of the waste for which the permit application applies must be submitted in accordance with the requirements of 40 CFR 270.14(b)(2) and 264.13(a). The information requirements and regulations require that the data submitted must contain the information needed to properly handle the waste at the facility. The areas of the AVCO Lycoming facility to which these requirements apply are the equalization lagoon and the three sludge storage lagoons. Influent to the equalization lagoon is from various processes at the AVCO facility, including metal plating and finishing operations. The wastewater contained in the equalization lagoon is pumped through a chemical waste treatment plant, and metal hydroxide sludge from this process is pumped to the sludge storage lagoons. More information on the processes generating the waste stream influent to these lagoons is included in Section II, Facility Description, and Section V, Waste Analysis Plan.

Waste Characteristics

The primary waste constituents of concern at the surface impoundments include chromium, other heavy metals, and cyanide. Influent to the equalization lagoon is aqueous while sludge is contained in the sludge holding lagoons. Sampling of these wastes was conducted as part of the preliminary design work for the new chemical waste treatment plant currently under construction.[1] Composite samples were collected at the influent and effluent of the equalization lagoon, and grab samples were collected of the sludge accumulated in the equalization lagoon and the north sludge storage lagoon. These sampling locations are shown in Figure IV-1. Samples were analyzed for solids content, cyanide, and metals. Sludge samples were also analyzed for leaching characteristics via the EP toxicity test. Results of sampling at these locations are presented in Tables IV-1 and IV-2. The EPA hazardous waste identification numbers assigned to the wastes are also given in these tables.

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1. "Concept Engineering Report, Stratford Army Engine Plant, Chemical Waste Treatment and Disposal", Weston, 1982.

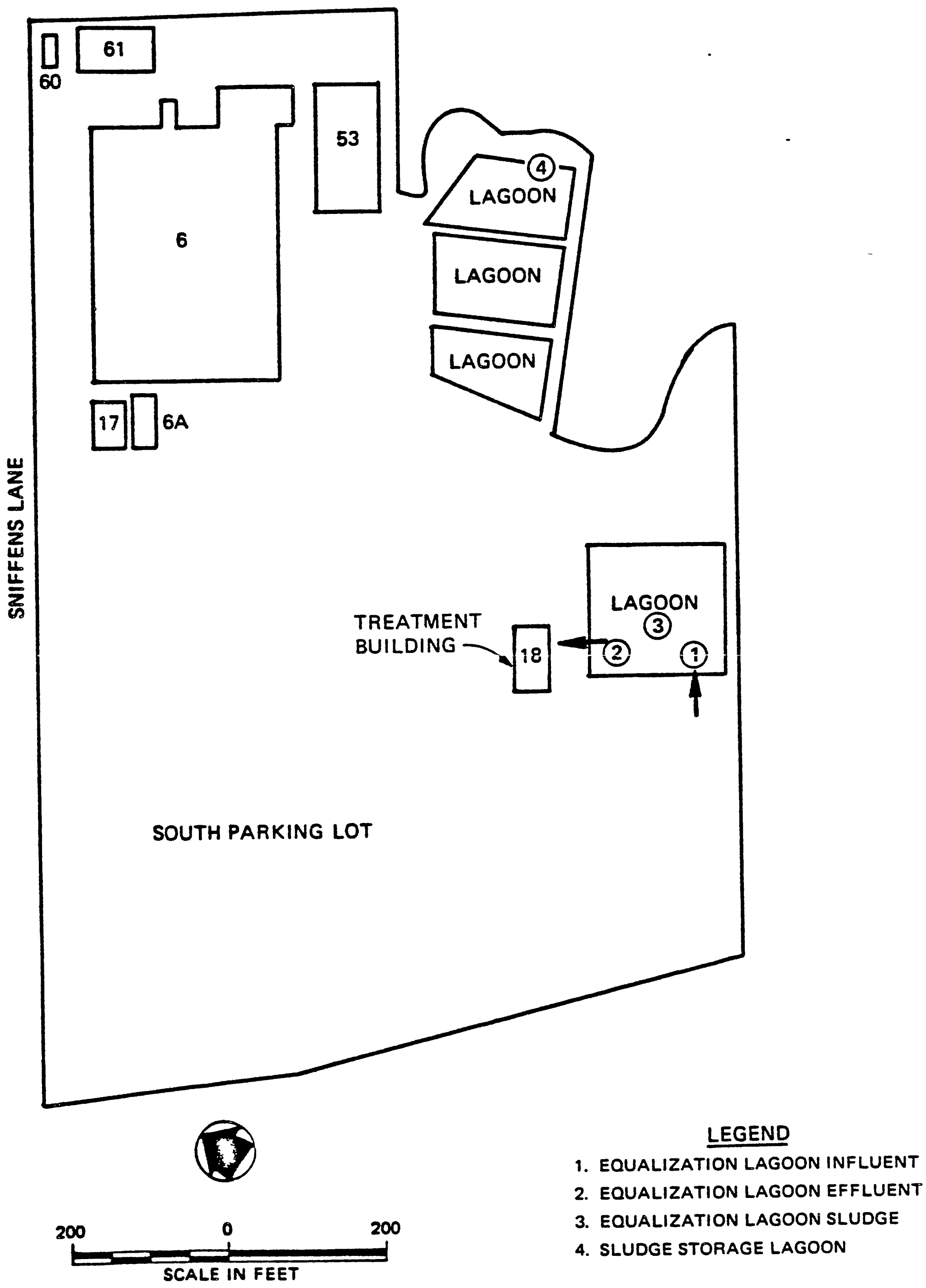


FIG. IV-1 LOCATION OF 1981 LAGOON SAMPLING POINTS

TABLE IV-1. Summary of Aqueous Sampling Results[1]

Parameter	Sample Concentration (mg/l) Equalization Lagoon Influent (EPA Haz. Waste F007, F009)	Equalization Lagoon Effluent (EPA Haz. Waste F007, F009)
Suspended Solids	5.0	2.0
Amenable Cyanide	0.08	0.014
Total Cyanide	0.111	0.031
Cadmium	<0.05	<0.05
Total Chromium	2.1	6.4
Hexavalent Chromium	2.0	6.3
Cobalt	<0.05	<0.05
Manganese	0.04	0.05
Nickel	0.21	0.16
Iron	0.33	0.33
Zinc	0.20	0.12
Copper	0.66	0.13

1. Results from Weston (1982). Samples collected on 5/14/81.

TABLE IV-2. SUMMARY OF SLUDGE SAMPLING RESULTS[1]

Parameter	Sample Concentration[2] Equalization Lagoon Sludge (EPA Haz. Waste F006)	Sludge Storage Lagoon (EPA Haz. Waste F006)
Constituent Analyses		
Total Solids (%)	12.10	27.4
Amenable Cyanide (mg/kg)	120	13
Total Cyanide (mg/kg)	149	108
Cadmium	63.0	18.0
Total Chromium	6580	13920
Hexavalent Chromium	17.4	<4
Cobalt	3.6	6.8
Manganese	300	440
Nickel	460	560
Iron	1480	2560
Zinc	190	172
Copper	1080	1720
EP Toxicity Analysis		
Arsenic	<0.01	<0.01
Barium	0.10	0.13
Cadmium	0.27	0.12
Chromium	6.9	0.13
Lead	<0.05	<0.05
Mercury	<0.001	<0.001
Selenium	0.027	0.018
Silver	0.5	<0.5

1. Results from Weston (1982). Samples collected on 5/14/81.
2. All concentrations in mg/l unless otherwise noted.

V. WASTE ANALYSIS PLAN

General

AVCO Lycoming Textron, Stratford Army Engine Plant (AVCO or AVCO Lycoming) located in Stratford, Connecticut manufacturers tank and aircraft engines along with other products. AVCO's manufacturing process includes the plating of various engine and miscellaneous pieces in zinc, cadmium, chrome, copper, magnesium, nickel, and black oxide baths. Other baths associated with the plating operations include cleaning baths (such as acid and alkaline cleaners) and rinse water baths. The spent baths and rinse water are discharged to an equalization lagoon prior to being treated. In addition to the plating wastes, wastewater from several other areas of the AVCO facility are sent to the equalization lagoon. The composition of the wastewater from these various sources is presented in this Waste Analysis Plan.

From the equalization lagoon, the wastewater is pumped to an chemical wastewater treatment system. The overflow from the treatment system clarifier is discharged to an outfall near the plant in accordance with an NPDES permit. The settled metal hydroxide sludge is pumped to one of three sludge storage lagoons.

In addition, waste products are stored in containers on site for subsequent off-site disposal. Discarded commercial chemicals and other hazardous wastes are stored in 55-gallon drums. These drums are maintained in the hazardous waste staging area prior to being moved to the containerized hazardous waste storage area near the wastewater treatment system.

The hazardous waste stored in tanks and containers at the AVCO Lycoming facility is shipped off-site within 90 days of the time it is placed in the containers or tanks, and therefore does not require RCRA permitting (40 CFR Part 262.34). Thus, the material that is addressed in this Waste Analysis Plan is the waste sent to the equalization lagoon and the three sludge storage lagoons.

AVCO has been asked by the U.S. EPA and the Connecticut Department of Environmental Protection (DEP) to prepare a closure plan with regard to the equalization lagoon and the three sludge storage lagoons. AVCO, with the assistance of the Corps of Engineers, has redesigned their chemical wastewater treatment system so that the lagoons will no longer be used after May 1986. Therefore, closure of the lagoons will begin in May 1986.

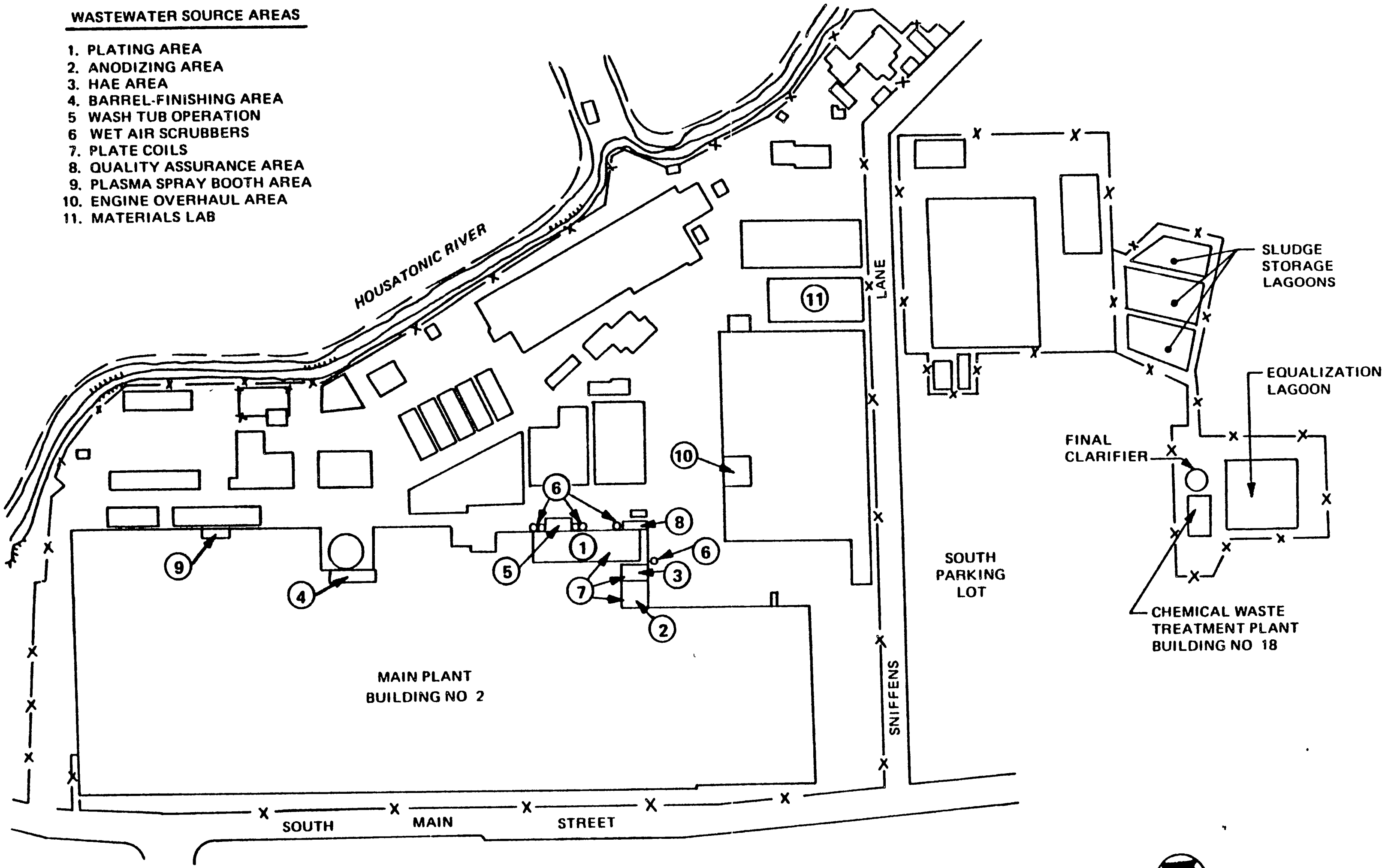
The information and procedures put forth in this Waste Analysis Plan pertain to the operation of the equalization lagoon and three sludge storage lagoons prior to closure. This Plan has been developed in accordance with the requirements of 40 CFR 270.14(b)(3) and 264.13.

Waste Description

Waste Generation Process. Wastewater from several areas of the AVCO Lycoming facility contribute flow to the equalization lagoon. The approximate flows from each of these plant areas, including the main plating area, are presented in Table V-1. The locations of these wastewater sources and the surface impoundments are shown in Figure V-1. These flows are based on information presented in a concept engineering report developed for the AVCO chemical waste treatment plant currently under construction (Weston, 1982).

The flows presented in Table V-1 differentiate between chromium and cyanide wastes, which are the two wastes of principal concern in the treatment process. Although the plating room waste does not contribute a large percent of the total flow to the equalization lagoon, the majority of the metals and cyanides discharged to the treatment system are generated in this area. The cyanide waste from the main plating area represents over 90 percent of the cyanide waste influent to the treatment process.

The composition and volume of the plating baths at the AVCO Lycoming facility are presented in Table V-2. Chemical usage and bath disposal rates are dependent on the ongoing plating operation. The composition of the plating and cleaning baths is altered during plant processes. When the baths no longer function as required due to contamination or other factors that affect bath performance the bath contents are discharged to the equalization lagoon or are treated for reuse. The criteria regarding when each bath must be treated or disposed of vary from bath to bath. The approximate frequency of plating bath disposal is once each month.



NOTE FROM CONCEPT ENGINEERING REPORT, SAEP CHEMICAL WASTE TREATMENT AND DISPOSAL, WESTON, 1982

FIG. V-1 AVCO LYCOMING PLANT LAYOUT AND WASTEWATER SOURCE LOCATIONS

TABLE V-1. SUMMARY OF FLOWS TO EQUALIZATION LAGOON[1]

Wastewater Source	Average Chromium Waste (gpd)	Average Cyanide Waste (gpd)	Average Common Waste (gpd)	Average Total Flow (gpd)
Main Plating Area	1,100	1,500	1,700	4,300
Anodizing Area	18,500	-	13,700	32,200
HAE Area	25,200	-	10,800	36,000
Tumbling Machine Effluent	-	-	4,000	4,000
Wash Tub Operation	-	-	1,800	1,800
Wet Air Scrubbers	27,000	-	-	27,000
Condensate and Cooling Water	-	-	104,000	104,000
Quality Assurance Lab	-	-	100	100
Plasma Spray Booth Area	5,600	-	-	5,600
Engine Overhaul Area	-	-	700	700
Materials Lab	100	100	100	300
Total Flow	77,500	1,600	136,900	216,000
Percent of Total	36	<1	63	

1. From Weston (1982).

TABLE V-2. SUMMARY OF PLATING BATHS AT AVCO LYCOMING STRATFORD FACILITY [1]

Bath Description	Operating Volume (gallons)	Composition
Alkaline Permaganate Descaler	550	Alkaline permanganate salts (1375 lbs) (Turco 4338 or equivalent)
Electrolytic Descaler	360	Descaling cleaner (720 lbs); sodium cyanide (360 lbs)
Alkaline Soak Cleaner	550	Steel cleaner (33 gal.);
Alkaline Derust	525	Turco 4181 (1575 lbs);
Muriatic Acid Pickle(2)	360	ea.Muriatic acid (360 gal.);
Nitric Acid Pickle	180	Nitric acid (40 gal.);
Cathodic Etch	180	Sulfuric acid (63 gal.); hydrofluoric acid (9 gal.)
Nitric Passivate	360	Nitric acid (72 gal.)
Nitric-Hydrofluoric Pickle	550	Nitric acid (165 gal.); hydrofluoric acid (82.5 gal.)
Hydrofluoric Acid Etch(2)	180	Hydrofluoric acid (60 gal.)
Zinc Phosphate	360	Zinc phosphate (270 gal.)
Cadmium Plate	360	Sodium cyanide (405 lbs); cadmium oxide (80 lbs.); brightener (16 lbs) (Rohco Super XL or equivalent)
Chromium Plate (10)	180	Chromic acid (1360 lbs); sulfuric acid (61 oz.)
Copper Plate (2)	360	Copper cyanide (140 lbs); sodium cyanide (180 lbs); potassium hydroxide (60 lbs); Rocheltex (22 gal.)
Manganese Phosphate	100	Manganese phosphate (5.5 gal.); steel wool (1 lb)
Nickel (Wood's Bath) (2)	180	Nickel chloride (360 lbs); muriatic acid (22.5 gal.)
Chromium Strip	360	M & T compound 80 (720 lbs)
Copper Strip (2)	360	Chromic acid (1440 lbs); Sulfuric acid (11.2 gal.)
Nickel Plating - Sulfamate (2)	360	Nickel sulfamate solution (360 gal.)
Black Oxide	360	Black oxide salts (2160 lbs)

1. From "Report for the Abatement and Control of Plating Area Corrosion", Alonzo B. Reed, Inc., May, 1985.

In addition to the plating bath waste, rinse water from the plating processes is sent to the equalization lagoon. Rinse water baths are used throughout the plating operation so that baths are not cross-contaminated and so that the pieces are cleaned properly. Some of the rinse water baths have continuous overflow, while others are dumped periodically. Water from these rinse water baths and from periodic rinsing of the plating bath tanks comprises the bulk of the wastewater flow from the plating room to the equalization lagoon. The spent plating baths and rinse water are sent to the equalization lagoon by draining or pumping the baths to an open channel drainage system in the plating room floor. These channels are below the floor elevation, and are covered by metal grating. The spent bath liquid drains by gravity to a wet well, and is pumped to the equalization lagoon.

The plating baths are sent to the equalization lagoon in a staggered manner, with bath dumping dependent on ongoing plating operations. Due to the large volume of the equalization lagoon (approx. 500,000 gallons), concentrations within the lagoon are expected to remain fairly stable.

The wastewater contained in the equalization lagoon is sent to the on-site chemical waste treatment system. This system treats cyanides by alkaline chlorination and reduces chromium with sulfuric acid and sodium metabisulfate. In addition, it precipitates the metals as metal hydroxides. The chemical waste treatment system includes a final clarifier, where precipitated solids settle out. The sludge from this clarifier is pumped to one of the three sludge storage lagoons. Sludge is stored in these lagoons until such time as the material is shipped off-site for disposal. The exact composition of the sludge is dependent on the waste stream influent to the treatment process, although the sludge should be fairly homogenous due to the large capacity of the equalization lagoon. The cyanide and hexavalent chromium content should be low due to the treatment processes.

Waste Analysis Data. As part of the operation of the chemical waste treatment plant samples are routinely collected from the waste stream following cyanide treatment. These samples are analyzed for chromium content to determine the chemical addition required for treatment. These measurements reflect the chromium concentration present in the equalization lagoon since no chromium reduction has been accomplished up to this point. Recent hexavalent chromium measurements from six daily samples collected in September, 1985 ranged from 6.8 mg/l to 12.6 mg/l, with an average concentration of 9.4 mg/l. These measurements typify the hexavalent chromium concentrations in the equalization lagoon.

Sampling of the equalization lagoon and sludge storage lagoons was conducted as part of a concept engineering report for the new chemical waste treatment plant currently under construction (Weston, 1982). Composite samples were collected at the influent and effluent of the equalization lagoons, and grab samples were collected of the sludge accumulated in the

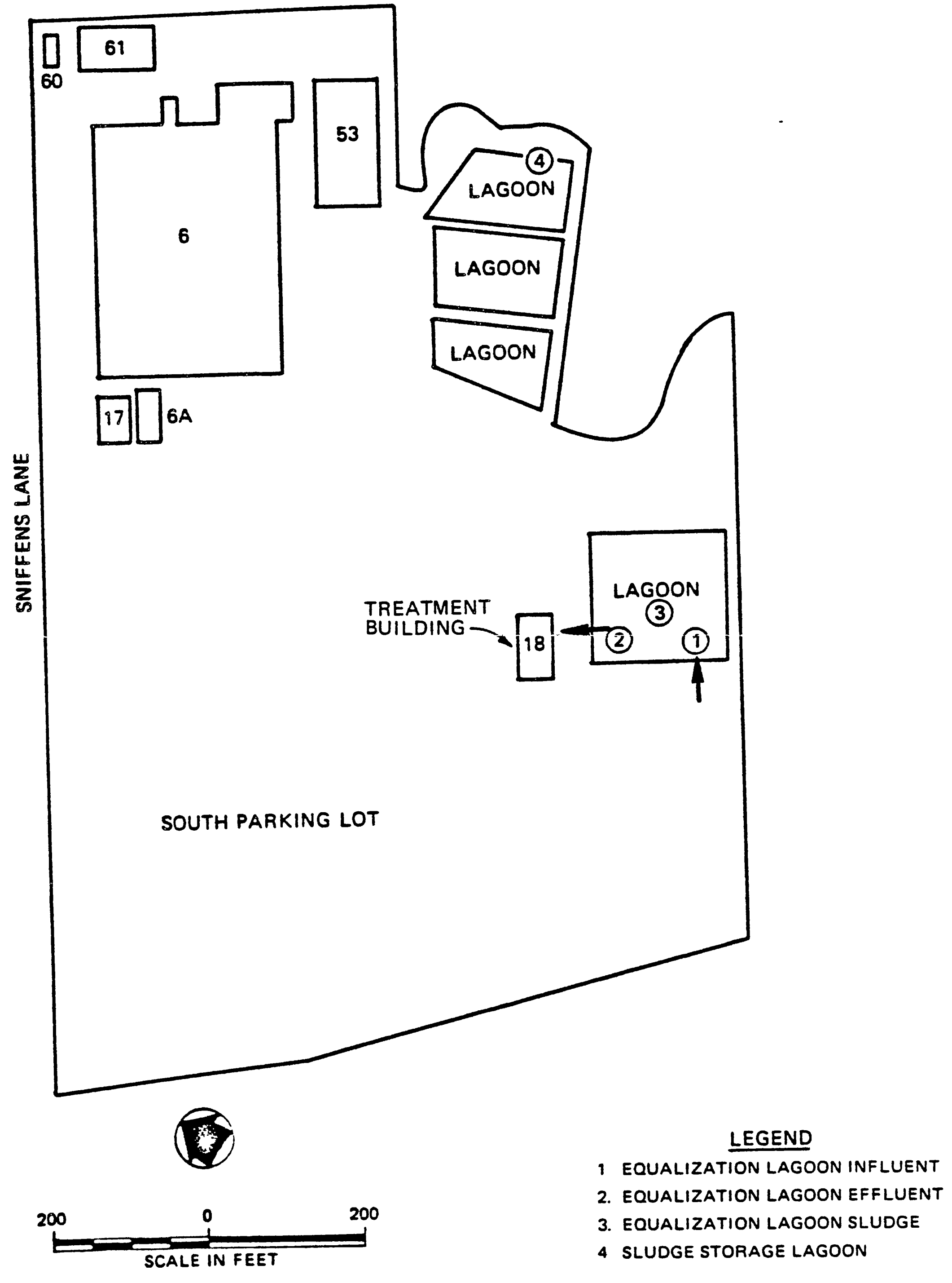


FIG. V-2 LOCATION OF 1981 LAGOON SAMPLING POINTS equalization lagoon and the northern sludge storage lagoon. These sampling locations are shown in Figure V-2. Samples were analyzed for solids content, cyanide, and metals. Sludge samples were also analyzed for leaching characteristics by the EP toxicity test. Results of sampling at these locations are presented in Tables V-3 and V-4.

Sampling Plan

General. Sampling of the wastewater treatment plant flow following cyanide treatment will continue as part of the plants standard operating procedures. Information from this sampling and previous sampling in the lagoons as well as knowledge of the wastewater sources and the composition of the baths used in the plating process (Tables V-1, and V-2) serve to characterize the material that is in the equalization lagoon and sludge storage lagoons. As part of the waste analysis plan, a sampling plan has been developed for future waste characterization sampling. This plan will be implemented in the event that changes in the waste composition occur that are not documented by previous sampling data or sampling conducted as part of the plants routine operations.

Sampling Locations and Schedule. Due to variations in the plant operation and plating bath disposal practices, the waste streams discharged to the equalization lagoon and sludge storage lagoons may not be uniform over time. Sampling in the equalization lagoon and sludge discharge streams should be conducted in a random fashion over a full cycle of the plating

TABLE V-3. SUMMARY OF AQUEOUS SAMPLING RESULTS[1]

Parameter	Sample Concentration	
	Equalization Lagoon Influent	Equalization Lagoon Effluent
Suspended Solids	5.0	2.0
Amenable Cyanide	0.08	0.014
Total Cyanide	0.111	0.031
Cadmium	<0.05	<0.05
Total Chromium	2.1	6.4
Hexavalent Chromium	2.0	6.3
Cobalt	<0.05	<0.05
Manganese	0.04	0.05
Nickel	0.21	0.16
Iron	0.33	0.33
Zinc	0.20	0.12
Copper	0.66	0.13

1. Results from Weston (1982). Samples collected on 5/14/81.

TABLE V-4. SUMMARY OF SLUDGE SAMPLING RESULTS[1]

Parameter[2]	Sample Concentration[2] Equalization Lagoon Sludge	Sample Concentration[2] Sludge Storage Lagoon
Constituent Analyses		
Total Solids (%)	12.10	27.4
Amenable Cyanide (mg/kg)	120	13
Total Cyanide (mg/kg)	149	108
Cadmium	63.0	18.0
Total Chromium	6580	13920
Hexavalent Chromium	17.4	<4
Cobalt	3.6	6.8
Manganese	300	440
Nickel	460	560
Iron	1480	2560
Zinc	190	172
Copper	1080	1720
EP Toxicity Analysis		
Arsenic	<0.01	<0.01
Barium	0.10	0.13
Cadmium	0.27	0.12
Chromium	6.9	0.13
Lead	<0.05	<0.05
Mercury	<0.001	<0.001
Selenium	0.027	0.018
Silver	0.5	<0.5

1. Results from Weston (1982). Samples collected on 5/14/81.
2. All concentrations in mg/l unless otherwise noted.

bath disposal operation (approximately 4 to 6 weeks). This cycle length should be sufficient to include any normal variation in wastewater composition from the other plant sources listed in Table V-1. Each day of the cycle is assumed to have an equal probability of measuring a particular parameter since the plating bath dumping schedule is not fixed and the initial day of sampling will be randomly selected. Variation in wastewater flow composition from other plant sources is also expected to be random. Assuming a 42 day sampling cycle and a total of 5 samples collected, a schedule of sampling at the equalization lagoon and sludge waste stream has been prepared using a table of random units. Sampling is proposed on days 13,15,38,39 and 42 of the sampling program cycle. It is proposed that samples be collected at the sump at Building 63. Wastewater from all plant sources drain to this sump prior to pumping to the equalization lagoon. Access to the sump is obtained by a hatch cover located adjacent to Building 63. The normal water level in the sump is approximately 15 feet below the slab elevation. Sludge samples from the treatment plant clarifier are proposed to be obtained at the influent pipe to the sludge storage lagoons. The sampling location will coincide with the influent pipe of the lagoon to which sludge is being pumped at the time of sampling. Sampling locations are shown in Figure V-3.

The chemical waste treatment plant operates only one shift per day, with influent to the equalization lagoon and sludge storage lagoons only during this period. The equalization lagoon

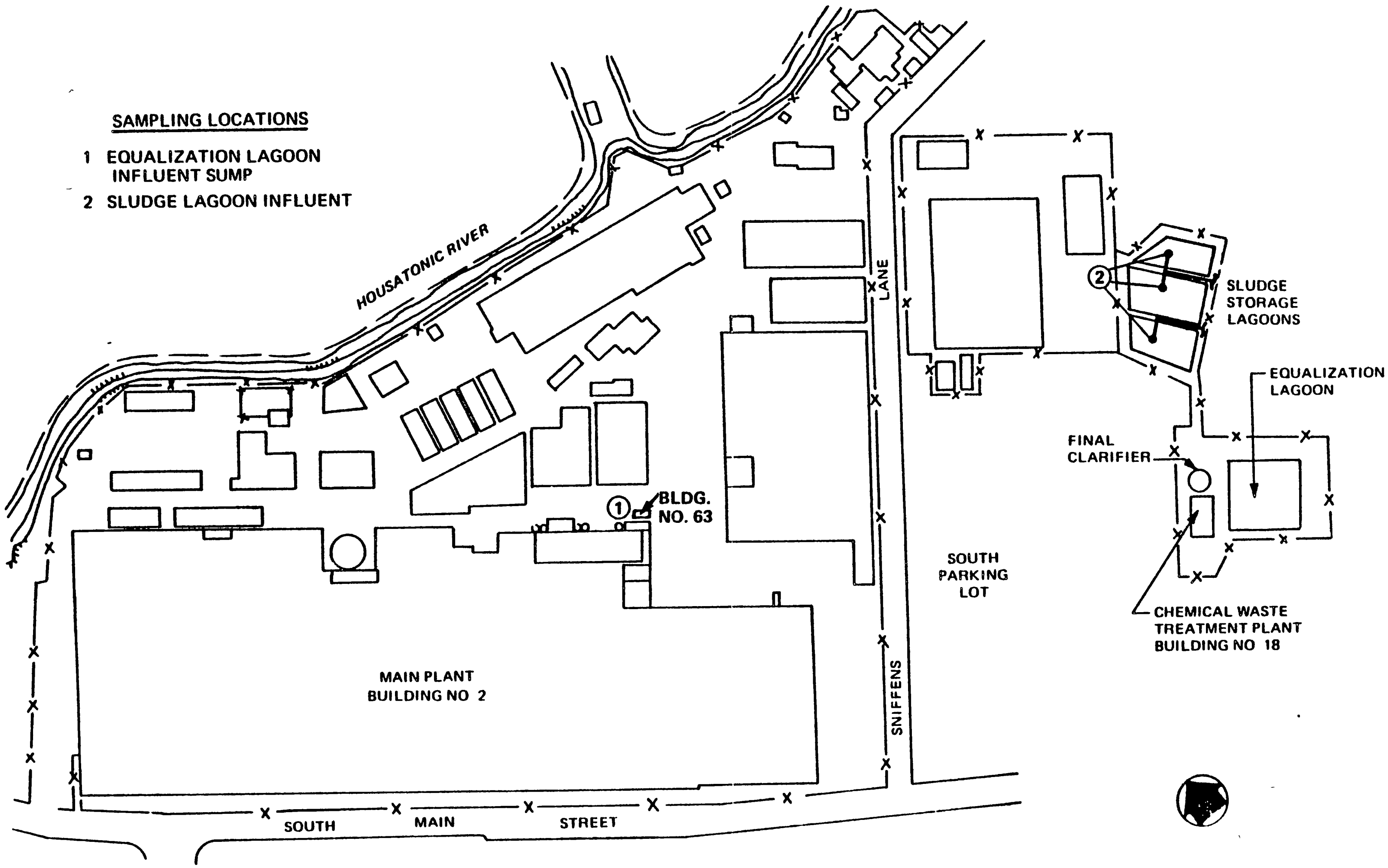


FIG. V-3 SAMPLING PLAN STATIONS

and sludge lagoon influent will be sampled during this shift on each scheduled sampling data.

Waste Analysis Parameters. The parameters selected for analysis at each sampling location are given in Table V-5. These parameters were selected based on knowledge of the wastes generated at the facility and information required for proper operation and environmental protection of the surface impoundments. The E.P. Toxicity Test (40 CFR Part 261, Appendix II) will be used on the sludge samples. The rationale for selecting the waste analysis parameters given in Table V-5 is presented in the following paragraphs.

pH. The pH of the equalization lagoon influent will be measured to help characterize the aqueous waste stream. The pH of the waste stream will determine its compatibility with the bentonite liner. The cyanide and chromium removal processes in the chemical waste treatment plant are pH dependent. In addition to the pH measurements proposed at the wet well, pH is routinely measured at the chemical waste treatment plant.

Chromium and Cyanide. Measurements of hexavalent chromium, total chromium, and cyanide will be obtained in both the influent to the equalization lagoon and the the sludge influent to the sludge lagoons. Cyanide and chromium are known inputs to the chemical waste treatment plant and are of concern in terms of environmental contamination.

Other Heavy Metals. Selected heavy metals will be sampled in the sludge lagoon influent. As part of the treatment process metals are precipitated as metal hydroxides. The metal hydroxides settle out in the clarifier and are pumped to the sludge lagoons. Since heavy metals are of concern in terms of environmental contamination, these parameters will be analyzed in the sludge.

TOC. Total organic carbon samples will be collected in both the equalization lagoon influent and the sludge lagoon influent. These analyses will be conducted as an indicator of the presence of organic pollutants in the waste stream. The chemical waste treatment system is not designed for treatment of organic compounds.

TABLE V-5. WASTE ANALYSIS PARAMETERS

Parameter	Equalization Lagoon Influent	Sludge Storage Lagoon Influent
pH	X	X
Hexavalent Chromium	X	X
Total Chromium	X	
Cyanide	X	X
Other Heavy Metals		
Mercury		X
Copper		X
Zinc		X
Cadmium		X
Nickel		X
Total Organic Carbon (TOC)	X	X
Selected Organics	X	X

<u>Selected Organics</u>. If significant levels of TOC are measured in any samples further testing for organic pollutants will be conducted to determine the compounds and concentrations present. The organic compounds analyzed will be selected based on the suspected source of the organic contamination. Potential analyses include total organic halide (TOX) and volatile organics.

<u>Sampling Methods</u>. A dipper sampler similar to that specified in EPA publication SW-846, "Test Methods for Evaluating Solid Wastes" will be used to obtain samples at the equalization lagoon wet well and at the sludge discharge to the sludge lagoons. Duplicate samples will be collected and analyzed at each location. Sampling at the plating baths and the chemical waste treatment plant will continue as part of the plant's operating procedure.

Analytical Procedures. The analytical procedures to be used as part of the proposed sampling plan are summarized in Table V-6. Chain of custody procedures will be used to trace sample possession from the time of collection. A chain of custody record will be established for each sample from the time of collection to completion of laboratory analysis. The chain of custody record will contain, at a minimum, the following information:

- Name and signature of collector
- Date and time of collection
- Place of collection
- Waste type
- Sample number
- Analyses to be performed
- Times and signatures for each transfer of possession

Procedures for Conducting Proposed Sampling Plan. Data available from previous and ongoing waste sampling and knowledge of the constituents used in the facility operation characterize the material in the equalization lagoon and the sludge storage lagoons. The principal constituents of concern in terms of environmental contamination are cyanide and chromium. The sampling plan outlined herein will be conducted in the event that operations at the facility change such that the waste composition changes and the existing information and present waste sampling procedures are not sufficient to characterize these changes. In addition, this proposed sampling plan will be conducted annually as a supplement to currently ongoing sampling.

TABLE V-6. ANALYTICAL PROCEDURES

Parameter	Method Analytical	Reference
Cadmium	EPA 213.1	2
Chromium - hexavalent	SMEWW 312B	4,2
Chromium - total	EPA 218.1	2
Copper	EPA 220.1	2
Mercury	EPA 245.1	2
Nickel	EPA 249.1	2
Zinc	EPA 289.1	2
Cyanide - amenable	EPA 335.1	2
Cyandie - total	EPA 335.2	2
pH	EPA 150.1	2
TOC	EPA 415.2	2
TOX	SW-846 9020	3,2
Halogenated volatile organics	SW-846 8010 (head space)	3,1
Aromatic volatile organics	SW-846 8020 (head space)	3,1

1. Title 40, Code of Federal Regulations (CFR), 1984 rev. Part 136. Guidelines Establishing Test Procedures for the Analysis of Pollutants.

2. Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020. US Environmental Protection Agency (EPA), Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268, March 1979.

3. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd ed, EPA, Office of Solid Waste and Emergency Response, Washington, DC 20460, July 1982.

4. Standard Methods for the Examination of Water and Wastewater, 15th ed, American Public Health Association, American Water Works Association, Water Pollution Control Federation, Washington, DC 20036, 1979.

REFERENCES

Alonzo B. Reed, Inc., "Report for the Abatement and Control of Plating Area Corrosion", AVCO Lycoming Division, Stratford, CT ABR Project No. 253-101-5, May, 1985.

IPC, Inc., "Hazardous Waste Management Program in Compliance With USEPA Interim Status Operating Permit", report submitted to AVCO Lycoming Division, May, 1981, revised March, 1985.

U.S. EPA, "Test Methods for Evaluating Solid Waste, Physical Chemical Methods", SW-846, 2nd ed., July, 1982.

Weston, Inc., "Concept Engineering Report, Stratford Army Engine Plant Chemical Waste Treatment Plant and Disposal", February, 1982.

VI. SECURITY

General

The security measures presented herein demonstrate compliance with the requirements of 40 CFR 270.14(b)(4) and 264.14. The intention of these security measures is to prevent the unknowing or unauthorized entry of persons or livestock onto the active portion of the facility. The "active portion", as defined in 40 CFR 260.10, refers to the "portion of a facility where treatment, storage, or disposal operations are being or have been conducted after the effective date of (40 CFR) Part 261". The security requirements of 40 CFR 264.14 apply to the equalization lagoon and the sludge holding lagoons at the AVCO Lycoming facility. The hazardous waste staging area and the hazardous waste storage area are not subject to the requirements of 40 CFR 270.14(b)(4) and 264.14 because hazardous waste at these locations is shipped off-site within 90 days of the time the waste is first placed in the tank or container (40 CFR 262.34). Although not required, the security measures of 40 CFR 270.14 and 264.14 are currently adhered to at these locations also. Figure VI-1 shows the location of these areas within the AVCO facility.

Controlled Access

The main portion of the AVCO facility is enclosed by a chain-link fence surrounding the property. Access to the facility is controlled by security guards posted at facility entrances. All visitors and contractors must receive authorization before entering any part of the facility. This controlled entry system in itself

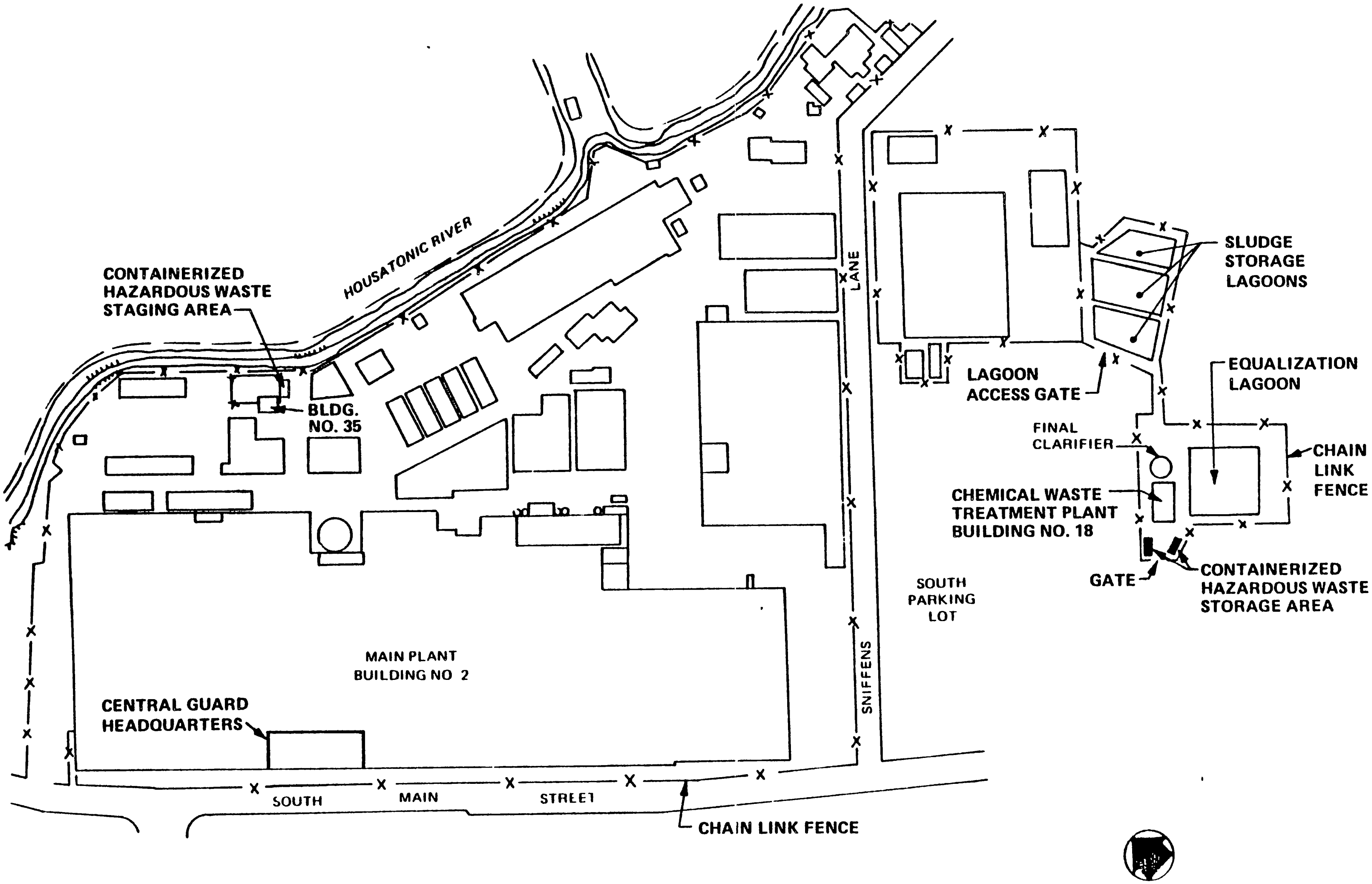


FIG. VI-1 HAZARDOUS WASTE AREAS AND SECURITY MEASURES constitutes compliance with 40 CFR 264.14(b). The hazardous waste staging area is not a separately fenced area, but it is within the main portion of the fenced and guarded facility. Only persons with jobs directly related to the hazardous waste staging area are authorized to enter this area.

The chemical waste treatment plant is outside of the fenced and guarded section of the AVCO facility, but it is completely enclosed by a separate chain link fence, with access controlled by locked gates. The equalization lagoon, sludge storage lagoons, and hazardous waste storage areas are all within the fenced chemical waste treatment plant area. The treatment plant operator maintains keys to the chemical waste treatment plant area and controls access during operating hours. Access is controlled 24 hours a day by the Security Department. Only persons with job duties directly related to the chemical waste treatment plant or hazardous waste storage area are authorized to enter the area. The entrance to the chemical waste treatment plant area will be locked during all hours that the plant is not manned and operating.

Warning Signs

All entrances to the chemical waste treatment plant area are posted with signs lettered "Danger- Unauthorized Personnel Keep Out". The hazardous waste storage area within the chemical waste treatment plant is protected by a masonry barrier surrounding the area. At the entrance to this area a sign is posted with the lettering "Danger - Unauthorized Personnel Keep Out".

Other Security Measures

Master keys for all gate locks for secured areas are kept at the Central Guard Headquarters. During times when the facility is not in operation all secured areas are locked and checked during routine guard patrols. Guard patrol rounds are frequent, and include an inspection of the chemical waste treatment plant area. The AVCO facility is illuminated at night by means of outside lighting. In addition, television monitoring is utilized at the AVCO facilty, with monitors located at the Control Guard Headquarters. Outside monitored areas include the surface impoundments area.

VII. INSPECTION SCHEDULE

General

The inspection plan presented herein complies with the requirements of 40 CFR 270.14(b)(5), 264.15, and 264.226. The areas within the AVCO Lycoming facility that are subject to these requirements are the equalization lagoon and the three sludge storage lagoons. The hazardous waste storage area and hazardous waste staging area do not fall under these permit requirements because the waste in these areas is shipped off-site within 90 days (40 CFR 262.34). Rather, these areas must adhere to the requirements of 40 CFR Part 265, Subpart I in regard to inspections.

The inspection schedule presented herein focuses on procedures to detect inadequacies which may be causing or may lead to a release of hazardous waste constituents and/or a threat to human health. Information obtained from systematic inspections of the facility will help identify problems in time to correct the condition before it causes harm to human health or the environment.

Inspection Procedure

All facets of the surface impoundment structures and related equipment are included in the inspection schedule. The hazardous waste staging and storage areas must be inspected periodically for container leaks, corrosion, or other signs of deterioration. Table VII-1 lists the items to be inspected, the frequency of inspection, and the things to be looked for during inspection. A copy of the

TABLE VII-1. INSPECTION SCHEDULE

Item	Inspection Frequency	Inspection Procedure	Potential Problem Conditions
Lagoon Liquid Levels	Weekly and immediately after storms	Measure water or sludge level elevation at all four lagoons	Freeboard less than 2 ft.; sudden drop in liquid level
Dike Condition	Weekly and immediately after storms	Walk entire perimeter of all four lagoons along top of dike and at base of dike; look for signs of erosion and for wet area or dead vegetation indicative of leakage.	Erosion degrading structural integrity; leaks
Equalization Lagoon Pumping Station	Weekly	Inspect influent sump pump at building No. 63 and discharge pump at influent to the chemical waste treatment plant. Check for deterioration, malfunction or other signs that pumps are not operational or in need of repair.	Pumps not operational or in poor working order.
Hazardous Waste Storage Area	Weekly	Inspect all containers for signs of leakage, corrosion, or other deterioration.	Presence of leaking or potentially leaking containers
Hazardous Waste Staging Area	Weekly	Inspect all containers for signs of leakage, corrosion, or other deterioration	Presence of leaking or potentially leaking containers

TABLE VII-1. (Continued) INSPECTION SCHEDULE

Item	Inspection Frequency	Inspection Procedure	Potential Problem Conditions
Security	Weekly	Walk entire perimeter of fence surrounding chemical waste treatment area; check for breaks in fence, inoperative gates and locks, and missing or illegible warning signs.	Fence system does not prevent unknowing or unauthorized entry.
Emergency Equipment	Weekly	Assure that all emergency equipment identified in the Containgency Plan is present and ready for use.	Equipment missing or not operational

inspection log sheet to be used during inspection is provided in Table VII-2.

Weekly inspection of the lagoons is stipulated, with additional inspection after storms. This additional inspection is due to the increased likelihood of high liquid levels and dike erosion during periods of rainfall. Security of the facililty is inspected weekly to limit the possibility of unknowing or unauthorized entry to the area. Emergency equipment and safety equipment are inspected weekly to assure that they are available and in working condition should they be required. Containers and tanks are inspected weekly to detect leaks, corrosion, or other deterioration.

The primary emergency coordinator (identified in the Contingency Plan, Section IX) is responsible for assuring that the inspection schedule presented here is carried out. Inspection log sheets will be maintained at the facility for a period of at least three years from the date of inspection. Steps will be taken to immediately remedy any deficiencies found during a routine inspection. The response to emergency conditions is presented in Section IX, the Contingency Plan.

The structural integrity of the sludge lagoon dikes appears to be adequate. These dikes are of a relatively low level, and no advanced erosion indicative of structural failure has been observed. The northeast side of the equalization lagoon has signs of erosion on the outside of the dike. All other sides of the equalization lagoon appear to be adequate and have no apparent signs of structural damage.

TABLE VII-2. INSPECTION LOG SHEET

Inspector Name:
Date:
Time:

Item	Date	Measurement	Remarks	Repairs/Remedial Action Date Started	Repairs/Remedial Action Date Completed
Equalization Lagoon					
Liquid level (ft)					
Freeboard (ft)					
Dike condition					
Sludge Storage Lagoons					
Liquid level #1					
Freeboard #1					
Dike condition #1					
Liquid level #2					
Freeboard #2					
Dike condition #2					
Liquid level #3					
Freeboard #3					
Dike condition #3					
Hazardous Waste Storage Area					
Hazardous Waste Staging Area					
Security					
Emergency Equipment					

VIII. PREPAREDNESS AND PREVENTION

General

This section provides a description of the preparedness and prevention measures which have been or will be implemented at the AVCO Lycoming facility in compliance with 40 CFR Part 270.14(b)(6) and Part 264, Subpart C. The purpose of these measures is to minimize the possibility of fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents. The preparedness and prevention measures have been prepared with regard to the operation of the equalization lagoon, three sludge storage lagoons, the hazardous waste staging area and the hazardous waste storage area. The four lagoons are subject to 40 CFR Part 264, as is discussed in the Introduction (Section I) of this Permit Application. The containerized hazardous waste storage and staging areas is subject to 40 CFR Part 265, Subpart C in regard to preparedness and prevention. The provisions of 40 CFR Part 265, Subpart C are very similar to 40 CFR Part 264 Subpart C. Much of the information required by these regulations is presented in other sections of this document. In these cases a brief summary of the information is presented in this section and reference is given to other sections of the permit application where more detailed information can be found.

Facility Design and Operation

The AVCO-Lycoming facility manufactures tank and aircraft engines along with other miscellaneous products. The manufacturing process includes plating of various pieces in zinc, cadmium, chrome, magnesium, copper, nickel, and black oxide baths, as well as the use of cleaning baths and rinse water baths. Periodically these baths no longer serve their intended use and are discharged to an on-site equalization lagoon. The spent baths stored in the equalization lagoon are then pumped to a chemical wastewater treatment system. In addition, wastewater from several other sources at the AVCO facility is discharged to the equalization lagoon. These sources are presented in Section V, the Waste Analysis Plan. The treatment system destroys cyanides, reduces chromium, and precipitates the free metals as metal hydroxides. The precipitated metal hydroxide sludge is pumped to one of the three sludge storage lagoons.

Other hazardous wastes generated at the facility are containerized and are temporarily stored at a hazardous waste staging area and hazardous waste storage area, before being shipped off-site. Additional discussion on the facility description is provided in Section II of this permit application.

The four lagoons are located on the south border of the AVCO Lycoming plant, within the fenced area of the chemical waste treatment plant. This area is isolated from the production section of the plant, where most employees are located, thus reducing the potential for harm to human health. To the northeast of the lagoons is an uninhabited marsh area bordering the Housatonic River. The Inspection Schedule presented in Section VII of this document describes the procedures that will be conducted to assure that the dikes are in good condition, that no leaks are occurring, and that sufficient freeboard is maintained in the lagoons. In addition, observation wells are maintained around the lagoons to determine if contamination from the lagoons is migrating off-site. The lagoons are enclosed by a chain link fence with access controlled by a locked gate. Signs with the legend "Danger-Unauthorized Personnel Keep Out" are posted at the gate.

The containerized hazardous waste storage area is located within the fenced area of the chemical waste treatment plant. The containerized hazardous waste staging area is located at the tank farm area within the fenced area of the main AVCO Lycoming plant. Access to each of these areas is controlled, and only those personnel with related job duties are authorized to be in these areas. The Inspection Schedule presented in Section VII describes the routine procedures to be conducted to monitor for potential leaks, container corrosion, or other potentially hazardous conditions in these areas. Further discussion on security at the facility is presented in Section VI of this permit application. The condition of the security system is routinely checked as part of the Inspection Schedule.

<u>Required Equipment</u>

Section 264.32 of 40 CFR requires the maintenance of the following equipment at the facility:

- An internal communication or alarm system
- An external communication system

- Emergency equipment to control fires, spills, and contamination
- Adequate water supply for fire protection

This equipment is required in the immediate vicinity of each hazardous waste management (HWM) area for use in dealing with emergencies in these areas. A brief discussion of this equipment is provided below. More detailed information on emergency equipment is provided in Section IX, the Contingency Plan.

Internal Communications. There is a private-line telephone at each of the hazardous waste management areas which sends a direct signal to the Guard Headquarters when removed from the receiver. The Guard Headquarters is staffed 24 hours a day. In addition, there is a fire alarm "pull box" at each HWM area which sends a signal directly to Guard Headquarters.

External Communications. External emergency services can be summoned by either contacting the Guard Headquarters via the internal communication system or by contacting these services directly. A normal dial telephone is located at each HWM area that can be used to dial directly outside the plant or for internal communications. Available external emergency services are presented in Section IX, the Contingency Plan.

Emergency Equipment. Emergency equipment located in the chemical waste treatment plant area is accessible for use in emergencies at the hazardous waste storage area and the surface impoundments. In addition, emergency equipment will be kept at the hazardous waste staging area. Equipment maintained at these areas includes:

- a chemical fire extinguisher
- spill absorbant material, shovels, brooms, and cleaned empty drum containers for spill control
- hoses and nozzles for washing down small spills

A more complete listing of emergency equipment is provided in Part IX, the Contingency Plan.

Water Supply for Fire Fighting. The Town of Stratford water supply serves as the primary source of emergency water at the AVCO Lycoming facility. Fire hydrants are located thought the facility. The Town of Stratford Fire Department is available for assistance in fighting fires at the facility. In addition, the AVCO facility maintains internal mobil fire fighting equipment.

Testing and Maintenance of Equipment

Equipment required by 40 CFR 264.32, as discussed in the preceding paragraphs, will be periodically inspected or tested to insure proper operation during an emergency. These inspections, are included in Section VII, Inspection Schedule, of this document. Table VII-1 summarizes the Inspection Schedule and describes the inspection procedures.

Access to Communications or Alarm Systems

A discussion of the internal and external communications systems at the facility was presented previously in this section in response to the requirements of 40 CFR 264.32(a) and (b). These systems are readily accessible to personnel involved in hazardous waste handling operations. The communication equipment located in the chemical waste treatment plant building (Building 18) is readily accessible to the hazardous waste storage area and surface impoundments. Communication equipment will also be located in the hazardous waste staging area. There are normally two employees at Building 18 at all times. When only one person is in the building, this person remains in the office area, near the communication equipment, until the return of the second person. Hazardous materials handling at the hazardous waste storage area and hazardous waste staging area will always be conducted by more than one person.

Aisle Space

Access to the surface impoundments, hazardous waste storage area and hazardous waste staging area will be maintained at all times. Roadways and accessways within the facility accessing these areas are clearly identifiable, and employees are instructed to keep these areas clear at all times.

Arrangements With Local Authorities

A complete listing of the local emergency response teams available and means to contact them is provided in Section IX, the Contingency Plan. Each of these organizations maintains a copy of the Contingency Plan. The Contingency Plan has been reviewed with each organization, and an understanding has been reached as to the role of each organization during an emergency situation.

IX. CONTINGENCY PLAN

X. GENERAL HAZARD PREVENTION

General

A description of procedures, structures or equipment used at the facility to prevent general hazards in several categories is required under 40 CFR 270.14(b)(8). The five specific items stated in these regulations for which general hazard prevention measures must be described are as follows:

- Unloading operations
- Flooding or hazardous waste runoff
- Contamination of water supplies
- Effects of equipment failure and power outage
- Exposure of personnel to hazardous wastes

Each of these five items is discussed in the following paragraphs in regard to the surface impoundments at the AVCO facility. The containerized waste areas at the AVCO facility do not accumulate wastes for more than 90 days, and therefore do not fall under the requirements of 40 CFR Part 270 (40 CFR 262.34(a)).

Unloading Operations

The equalization lagoon and sludge storage lagoons operation does not include loading or unloading of containers at the facility. Periodically (every several years) sludge from the sludge storage lagoons is removed and hauled off-site. Sludge that has accumulated in the equalization lagoon is also periodically removed and transferred to the sludge storage lagoons. Sludge removal operations at the sludge storage lagoons involves pumping/excavation while at the equalization lagoon the bottom solids are removed by a vacuum truck. Standard health and safety protocol is followed during these operations so that spills and accidents are minimized. This includes protective clothing and where necessary, respirators.

Flooding or Hazardous Waste Runoff

As is discussed in Section III of this permit application, Location Information, the surface impoundments are located within the 100-year floodplain. The AVCO Lycoming facility is equipped with a flood protection dike system which is expected to prevent flooding of the surface impoundments during a 100-year flood.

The Inspection Schedule (Section VII) developed for the facility includes routine surveillance of the impoundments to check for signs of leaks or potential leaks. Also, the lagoons are operated so as to maintain a minimum of 2 feet of freeboard between the liquid level and the top of the dike. These measures help to prevent the possibility of hazardous runoff from the facility, either from leaking dikes or overtopping of the impoundment.

Contamination of Water Supplies

There are no public water supplies in the vicinity of the AVCO Lycoming facility. The groundwater in the area of the AVCO facility is classified as GB water by the Connecticut Water Quality Standards and Classifications. This classification is not a drinking water supply classification. In addition, the nearby Housatonic River is not used as a public water supply in the Stratford region.

Effects of Equipment Failure and Power Outage

The equalization lagoon and sludge storage lagoons store waste material without the assistance of mechanical equipment or electricity. In the event of a power outage or equipment failure, little impact is expected at these lagoons. A backup generator is available to provide power to the wastewater treatment facility if the main power supply is cut off. If for some reason the outlet from the equalization lagoon to the chemical waste treatment plant is out of service, influent to the lagoon would be monitored so as to maintain 2 feet of freeboard in the lagoon.

Exposure of Personnel to Hazardous Wastes

Precautions and procedures have been established to prevent exposure of personnel to hazardous wastes during an emergency situation. As is presented in Section IX, the Contingency Plan, protective clothing is maintained at the facility for use by personnel involved in managing an emergency situation. The appropriate personnel have been trained in the use of this protective gear. All personnel not involved in the management of the emergency incident will be evacuated from the area. Evacuation procedures are also discussed in the Contingency Plan. Personnel potentially involved in the Contingency Plan will be trained in its implementation so as to reduce the risk of harmful exposure of these personnel. A Personnel Training Plan will be conducted to accomplish this (Section XIII).

The chemical waste treatment plant area, within which the surface impoundments are located, is a separately fenced area. This area is posted with signs stating "Danger - Unauthorized Personnel Keep Out". These signs can be read at a distance of greater than 50 feet. These security measures help prevent the unknowing entry of unauthorized personnel into the hazardous waste facility. Further discussion of security procedures is presented in Section VI of this Permit Application.

XI. IGNITION/REACTION PRECAUTIONS

General

The regulatory requirements for the prevention of ignition or reaction of wastes are given in 40 CFR 270.14(b)(9) and 264.17. In addition to these general requirements, specific requirements for surface impoundments are provided in 40 CFR 264.229 and 264.230. The information presented herein demonstrates compliance with these requirements.

Waste Characteristics

The waste stream influent to the equalization lagoon has been described in Section V, Waste Analysis Plan. The principal wastes of concern are cyanide and chromium. In addition, a variety of acids and other chemicals from the metal finishing operations are discharged to the equalization lagoon. The vast majority of the waste stream to the equalization lagoon is water from various plant operations, including condensate and cooling water and rinse water. As such, the waste composition in the equalization lagoon is fairly dilute. None of the wastes discharged to the lagoon are ignitable, and because of the dilute nature of the waste stream chances of incompatible wastes reacting are reduced. One potentially dangerous reaction that could occur if more concentrated wastes were to mix is the formation of hydrogen cyanide gas from a combination of cyanide with acid.

Ignition/Reaction Potential

The present volume of the equalization lagoon is approximately 500,000 gallons under normal operating conditions. In comparison to this volume the average discharge of approximately 1,600 gallons per day of wastewater containing cyanide is small. Thus, the cyanide discharge to the lagoon does not rapidly alter the waste composition in the lagoon. It should be noted that the majority of cyanide wastewater is rinse water containing small amounts of cyanide. The possibility of the mixture of incompatible wastes such as acid and cyanide at concentrations high enough to produce a reaction is remote within the equalization lagoon.

The sludge discharged to the sludge storage lagoons is primarily composed of metal hydroxides. The sludge is the end product of the wastewater treatment system, which includes treatment of cyanides by alkaline chlorination. The nature of the sludge is such that it is not ignitable. No other material is added to the sludge lagoons and thus incompatible wastes are not mixed in the lagoons.

XII. TRAFFIC CONTROL

Information on traffic patterns is required in compliance with 40 CFR 270.14(b)(10). The areas within the AVCO Lycoming facility to which this requirement applies are the equalization lagoon and sludge storage lagoon areas. There are no specific regulatory standards in 40 CFR Part 264 with which traffic movement must comply.

The intent of requiring submittal of traffic related information is to insure that movement of hazardous waste and other traffic movement will be conducted in a manner so as to minimize the risk of accidents. Due to the nature of the surface impoundments, there is very little vehicular movement of hazardous wastes at these facilities. Wastewater enters the equalization lagoon in a pipeline, and outflow from the lagoon is directly to the chemical waste treatment process. Sludge from the treatment system final clarifier is pumped to the sludge holding lagoons. None of these routine waste movements involve traffic movement.

The material stored in the sludge storage lagoons is periodically removed and transported off-site. When this occurs trucks are used to transport the material. Access to the lagoon area is obtained via a gate in the chain link fence surrounding the area. The trucks exit the facility via the South Parking Lot to South Main Street. Figure XII-1 shows the location of roadways near the lagoon area. Sniffens Lane is a low use roadway, primarily

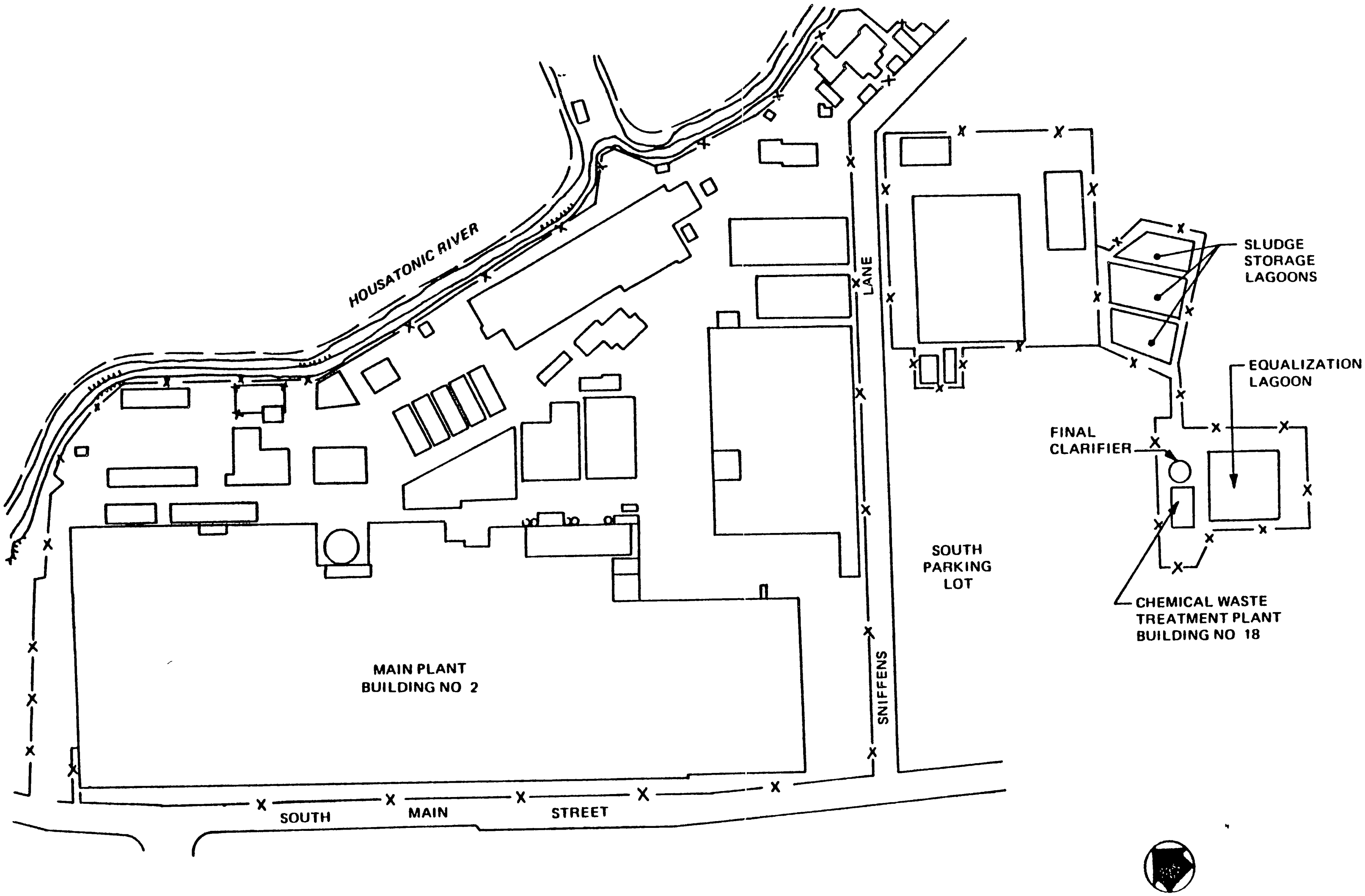


FIG. XII-1 AVCO LYCOMING PLANT LAYOUT

servicing the AVCO Lycoming facility. South Main Street is a more heavily used public roadway. No difficulty has been experienced or is anticipated in regard to traffic movement at the facility.

XIII. PERSONNEL TRAINING OUTLINE

AVCO Lycoming personnel involved with hazardous waste management activities are required to attend a program of classroom instruction that teaches them to perform their duties in a manner that ensures the AVCO Lycoming's compliance with the requirements of 40 CFR Part 264.16.

The major components of this training program include:

- Overview of environmental laws and regulatons, such as those regulating air pollution, water pollution, and solid/hazardous waste management, issued by the U.S. EPA and the Connecticut DEP. The role of the Department of Transportation in regulating hazardous materials will also be discussed;
- Identification and characterization of hazardous wastes generated at the AVCO Lycoming facility. This part of the training will identify the major hazard classes associated with wastes generated at the site. A review of basic chemistry will be provided with regard to these materials, so that facility personnel can properly respond to any emergencies involving these materials;
- Storage, in-house transfer, and off-site shipment of hazardous waste;
- Review of the emergency response equipment and materials and medical equipment available for emergencies; and
- Review of processes generating and storing hazardous waste so that personnel can, where appropriate, stop the generation or flow of hazardous waste during an emergency.

Facility personnel will be provided with a background on environmental laws and regulations so that they understand the necessity for environmental compliance. It will be stressed that these regulations have been developed to protect our environment as well as the safety of AVCO Lycoming personnel. Personnel will also be told of the consequences of not complying with the regulations.

One of the keys to the hazardous waste training program is that all appropriate individuals at the facility should understand the hazardous characteristics of wastes generated at the site. This includes the potential for any of the waste products to react with other site wastes or materials in an adverse manner. The key to this portion of the training will be the knowledge of facility personnel regarding the plant location of waste materials and raw materials, as well as the processes using or generating these materials. This knowledge will aid facility personnel in being able to quickly evaluate the potential hazards involved in a leak or a spill. Facility personnel will be instructed on inspecting container/process conditions to detect any deterioration or structural damage that could cause a future problem.

Personnel involved with hazardous waste management activities will be instructed on which containers must be used for each of the waste types at the facility. Where appropriate, personnel will receive on-the-job training regarding the movement of hazardous waste containers within the facility. Those personnel involved with loading hazardous waste onto trucks for off-site shipment will be taught how to inspect these drums. This is important because the shipper (AVCO Lycoming) of these materials is responsible for any problems involving drums that were leaking or damaged when they were loaded onto a truck (49 CFR Part 173.24).

Facility personnel will also be responsible for knowing the location and use of emergency response equipment and materials and medical equipment available for emergencies. Specific items that appropriate individuals will be responsible for in the training program include:

- Use of the internal communication system to alert the emergency coordinator for events that cannot be handled by the individual who first observes the incident;
- The location and use of respiratory equipment appropriate to the spilled/leaked material;
- The location and use of spill control equipment, such as the absorbents, neutralizing solutions, shovels, drums, and other associated equipment;
- The location and use of medical equipment so that initial medical care can be provided prior to emergency units arriving at the facility.

The training program outlined above will be conducted every six months, although trained personnel will attend only one session a year. The training program will be taught every six months so that new individuals will not work six months without being trained.

Records of all individuals trained in hazardous waste management activities will be maintained at the facility for three years.

The personnel involved in the management of hazardous waste will be classified according to the job titles listed below.

The duties of the individuals assigned to each of the job titles is included in the job descriptions. There is no special skill, educational requirements or qualifications for any of the positions. However, each of the individuals assigned to these positions will be thoroughly familiar with all duties included in the job description, as well as the content of the contingency plan. In addition, individuals involved in the transfer/movement of containers will be physically capable of performing such activities.

Hazardous Waste Manager - The hazardous waste manager, who may also be the emergency coordinator, will be responsible for the coordination and supervision of all personnel involved in hazardous waste management activities. The hazardous waste manager, assisted by outside expertise, will conduct the training of personnel involved in hazardous waste management. The hazardous waste manager will work closely with the managers of engineering, operations, and purchasing so that he is aware of any changes in the chemistry or production processes that could affect the site contingency plan or the type of personnel training required. If there are changes in the chemistry or production process that will require the contingency plan to be amended, the hazardous waste manager will hold a briefing for all personnel involved in hazardous waste management to alert them to the changes and any changes that may result in the implementation of the contingency plan. The hazardous waste manager must be familiar with all facility operations that could generate a hazardous waste. He must have knowledge of the physical, chemical, and biological properties of these waste materials. The hazardous waste manager must be familiar with or have immediate access to someone who is familiar with stoping facility processes. This includes both raw material and waste feed. Specific duties of the hazardous waste manager are included below:

- Preparation of the Annual Report
- Preparation of any necessary Exception Reports
- Preparation of any additional reports as requested by the U.S. EPA or Connecticut DEP.

Safety Coordinator - The safety coordinator will be responsible for the maintenance of all emergency equipment, spill control equipment and materials, and medical equipment. The safety coordinator will also be responsible for instructing hazardous waste personnel on the proper use of the emergency supplies.

The safety coordinator is responsible for knowing the capabilities of the emergency response units such as the Stratford Fire Department and Police Department and the coordination of these units when they come to the site. As with other hazardous waste trained personnel, the safety coordinator is responsible for knowing the evacuation procedues and routes. The safety coordinator must also be familiar with the site material safety data sheets (MSDS's).

Hazardous Waste Administrator - These personnel are responsible for the recordkeeping activities associated with hazardous waste, except for the preparation of the annual report, which is the responsibility of the hazardous waste manager. The specific activities that this individual will be responsible for include the following:

- Number each of the drums that will be used for the storage of hazardous waste;
- Check that drums that will be used to collect hazardous waste are compatible with the waste and meet all U.S. EPA, U.S. DOT, and Connecticut DEP requirements.
- Issue appropriate drums to the hazardous waste handlers;
- Place the proper marking and labels on drums accumulating hazardous waste;
- Maintain an inspecton log with the numbers of all drums and the types of hazardous waste accumulating in the drum, along with the date accumulation began;
- Prepare the hazardous waste manifests; sign the manifests; and obtain the approval of the hazardous waste manager as to the preparation of the manifest;
- Forward the appropriate copy of the manifest to the State of Connecticut and retain the appropriate generator copy in the facility records;
- Maintain a record in the inspection log and on the office calendar of the day that each hazardous waste shipment went out and the date that will mark 30 days from the shipment;
- Contact hazardous waste transporters and/or designated facilities if copies of the manifest have not been returned from the designated facility in 30 days.

Hazardous Waste Handler - These personnel are responsible for activities that generate hazardous waste, such as changing oil in machinery, and transporting hazardous waste within the facility. Their specific duties include the following:

- Obtaining appropriate drums from the hazardous waste administrator for hazardous waste accumulation/storage;
- Emptying, transferring, or pumping hazardous waste from tanks or processes to drums;
- Transporting drums of waste material within the plant facilities;
- Transferring quantities of waste from drum to drum as necessary;
- Assisting in the loading of waste drums on truck for off-site transport;
- Cleaning up spills that do not require the implementaion of the contingency plan;
- Assisting the emergency coordinator during an emergency regarding spill contaminant or fire suppression.

XIV. GROUND WATER MONITORING PROGRAM

General

AVCO Lycoming Textron (AVCO) in Stratford, Connecticut manufactures tank and aircraft engines along with other products. The manufacturing process includes the plating of engine and other pieces in zinc, cadmium, chrome, copper, magnesium, nickel and black oxide baths. Spent plating baths are discharged to an equalization lagoon. Wastewater from several other areas of the facility are also discharged to the equalization lagoon. The wastewater from the equalization lagoon is pumped to a chemical waste treatment plant, and metal hydroxide sludge from this process is pumped to a sludge storage lagoon. There are a total of three sludge storage lagoons at the facility.

In the spring of 1986 a new industrial waste treatment system will be completed. This new treatment system will include an equalization tank to replace the equalization lagoon and a filter press to dewater the sludge will replace the sludge storage lagoons. Once this new system is on line, the four surface impoundments will be closed. Contaminated material at the surface impoundments will be removed according to the Closure Plan (Section XV).

Information regarding protection of ground water is required for the surface impoundments in accordance with 40 CFR 270.14(c). The regulatory requirements for the facility are specified in 40 CFR Part 264 Subpart F. The information presented herein has been developed in compliance with these requirements.

A ground water monitoring program is currently conducted at the AVCO facility to monitor any migration of contaminants from the surface impoundments. This program has been designed to comply with the interim status requirements of 40 CFR Part 265 Subpart F. A summary of the ground water monitoring that has been conducted to date is presented in this section. In addition, a program is presented for continued ground water monitoring prior to and following closure of the surface impoundments. The results of the ground water sampling program to date are presented in Appendix A

Previous Ground Water Monitoring

Ground water monitoring wells have been installed at the AVCO facility at various times. Existing well locations are shown in Figure XIV-1. Wells No. 1 to 5 were installed in November, 1981 by Roy F. Weston, Inc. Sampling of these wells was also conducted by Weston at this time. In March, 1982, Leggette, Brashears, and Graham (LB&G) was retained by AVCO Lycoming to conduct ground water monitoring at the facility. LB&G is still performing this work for AVCO Lycoming. In June 1983, personnel from AVCO Lycoming, LB&G and the Connecticut DEP met to discuss the ground water monitoring program. The DEP changed the parameters to be sampled from those specified in 40 CFR 265.92 to the first 12 parameters listed in Table XIV-1.

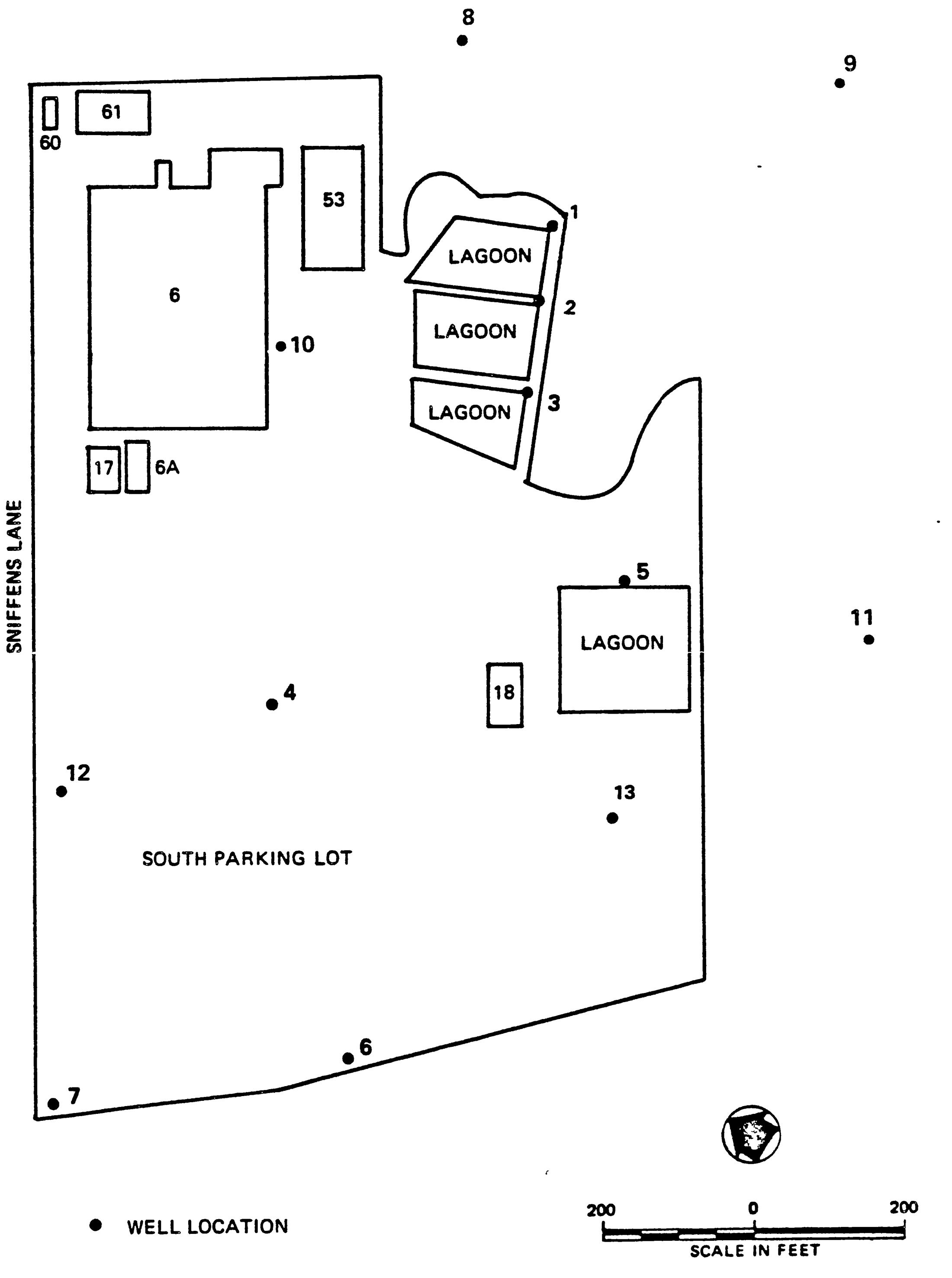


FIG. XIV-1 LOCATION OF EXISTING GROUNDWATER MONITORING WELLS

TABLE XIV-1. GROUND WATER MONITORING PARAMETERS SPECIFIED BY THE CONNECTICUT DEP

Cadmium
Chromium - hexavalent
Chromium - total
Copper
Mercury
Nickel
Zinc
Cyanide - amenable
Cyanide - total
Halogenated volatile organics
Aromatic volatile organics
pH
Specific conductivity
TOC
TOX

In July of 1983, LB&G installed wells 6 and 7 to establish the local ground water flow direction (see Figure XIV-1). LB&G completed two quarterly samplings in August and November 1983 before the DEP added the indicator parameters of specific conductivity, total organic carbon (TOC), and total organic halide (TOX). Because these indicator parameters were not measured in August and November, 1983, it was not possible to make a statistical comparison between first and second-year indicator parameters. Therefore, the DEP recommended that the 1983-1984 program be substituted for the first year of analytical results (1981-1982).

The originally installed wells 1, 2, 3, & 5 are adequate for the determination of contaminant migration off-site, but they are too close to the impoundments to be used to determine the regional ground water flow direction. The addition of the two additional ground water monitoring wells did not provide any added insight into the local ground water flow direction. It appears that there is ground water mounding below the lagoons, making the ground water direction difficult to determine. There is an indication that without the ground water mounding, the local ground water flow is toward the southeast (Marine Basin).

The rate of the ground water flow at the AVCO Lycoming facility, assuming a ground water flow direction toward the Marine Basin, has been estimated in the November 6, 1984 "First Year Report, Ground water Monitoring Program." This rate was determined using Darcy's Law:

$V = \frac{Ki}{n}$; where

V = average linear ground water velocity (feet per day)

K = hydraulic conductivity of the aquifer (feet per day)

n = porosity of the aquifer (dimensionless)

i = hydraulic gradient (dimensionless)

These values were not measured, but instead were estimated given the site hydrogeologic conditions. A value of i was estimated given the average water-level elevation above mean sea level in the wells and the distance to the Marine Basin. The resultant i value is 0.0024. K and n values were estimated at 100 feet per day and 0.3, respectively. These values were estimated assuming the aquifer consists of a relatively uniform sand. The value for V with the above assumptions is 0.8 feet per day. At this rate, the ground water would take approximately 4.3 years to reach the Marine Basin.

In the same first year report, the results of the ground water sampling indicated levels of chromium and cyanide slightly above the Connecticut Public Drinking Water Code (CPDWC) in wells 1-5 and not in 6 or 7 (which are assumed to not be affected by the lagoons). It should be noted with regard to this sampling that the ground water samples were not filtered prior to analysis. The CPDWC, similar to the National Interim Primary Drinking Water Regulations (NIPDWR) standards, refer to dissolved concentrations of constituents (filtered) in sediment-free drinking water. On November 14, 1984, the U.S. Army Environmental Hygiene Agency (USAEHA) observed the ground water sampling procedures. In addition to observing the sampling, the USAEHA took replicate samples and filtered these with a Millipore hazardous waste filtration device with 0.45-micron membrane filters. An unfiltered sample for well 5 showed a chromium concentration of 0.261 milligrams per liter. USAEHA's filtered sample for this same well, contained 0.011 milligrams per liter of chromium. Therefore, as illustrated in this sample, it is not appropriate to compare unfiltered sample values to the NIPDWR or CPDWC standards.

The first year report of November 6, 1984 stated that a more extensive monitoring system is not necessary for the following reasons:

1. The total absence of any existing or potential future ground water users in the area.

2. The relatively low concentrations of contaminants detected near the suspected sources.
3. The close proximity of the site to a discharge area where the concentrations of ground water contaminants would be further diluted.
4. Plans to build a new treatment facility would include the removal and treatment of the contaminated material from the impoundment areas, thus removing the source of contamination.

In September 1985, soil borings were taken and additional monitoring wells were installed by Metcalf and Eddy, Inc. at various locations surrounding the surface impoundments. At this same time, a ground water assessment program was submitted to EPA Region I and the Connecticut DEP. The borings were taken to determine the extent of contamination and the volume of material to be removed as part of the closure plan. The wells were installed to determine the local ground water flow direction and to further define the ground water quality. These well locations are shown in Figure XIV-1 (wells No. 8 to 13). No ground water samples have been collected at these wells to date, but they will be sampled in November 1985 as part of the on-going monitoring program.

Static water level measurements have been obtained at these recently installed wells no. 8 to 13. The ground water elevation contours from measurements obtained at these wells in late September, 1985 are shown in Figure XIV-2. A similar ground water elevation pattern was measured on October 16, 1985. These measurements indicate mounding of the ground water table in the area of the sludge lagoons. The cause of this apparent ground water mounding may be due to water being contributed from the surface impoundments.

It should be noted that the water table measurements obtained are for a given point in time, and do not take into account any tidal fluctuations that may occur. Water level recording instruments were placed at wells No. 1, 5, 10 and 13 for one to four day periods during September, 1985. Measurements obtained indicated no tidal variation in water level at wells no. 1, 10 and 13, but substantial tidal variation at well no. 5. Tidal influence at this well is attributed to its close proximity to the tidal channel adjacent to the equalization lagoon. The available ground water level data is not sufficient to describe the overall ground water flow pattern in the region.

Additional discussion on the ground water flow pattern and hydrogeologic conditions in the area of the surface impoundments is presented in Section II (Facility Description).

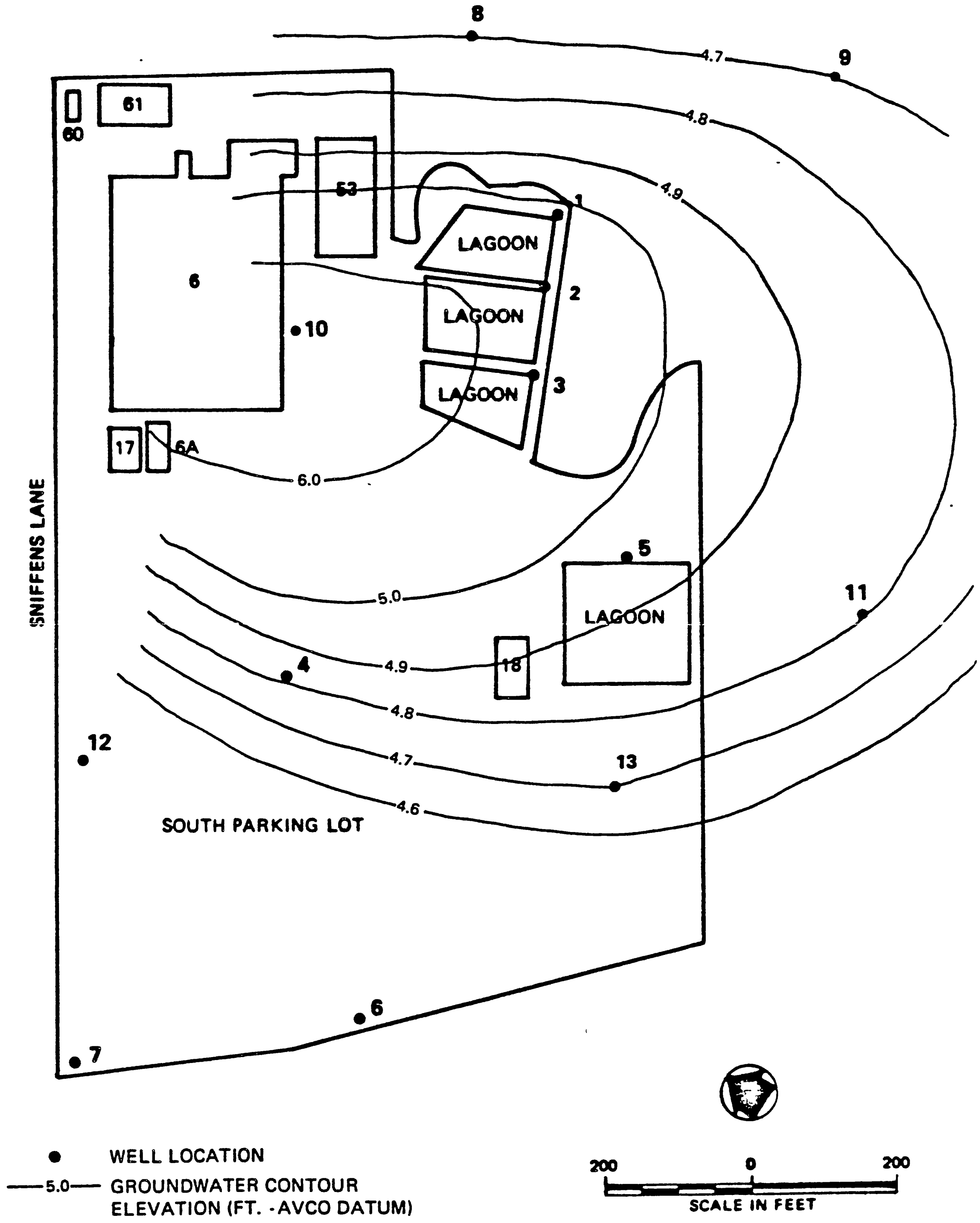


FIG. XIV-2 GROUNDWATER CONTOURS BASED ON SEPTEMBER 1985 MEASUREMENTS

Future Ground Water Monitoring

In compliance with the regulatory requirements of 40 CFR Part 264 Subpart F, ground water monitoring will be continued at the AVCO facility. This monitoring program will be conducted to meet the general ground water monitoring requirements of Section 264.97 and the compliance monitoring program requirements of Section 264.99.

Monitoring Wells. The regulatory requirements of Section 264.97 state that the ground water monitoring system must consist of a sufficient number of wells installed at appropriate locations and depths so as to yield ground water samples from the uppermost aquifer that are sufficient to:

- represent the quality of background water that has not been affected by leakage from any of the surface impoundments.
- represent the quality of ground water passing the point of compliance.

The seven previously sampled wells and the six recently installed wells shown in Figure XIV-1 will all be sampled as part of the proposed monitoring program. Wells number 1 through 5 were located as part of the interim status requirements of 40 CFR Part 265 Subpart F. Wells No. 1, 2, 3 and 5 were installed to represent hydraulically downgradient conditions at the limit of the waste management area. Well No. 4 was installed to represent hydraulically upgradient background conditions. Wells No. 6 and 7 and wells 8 through 13 were installed to obtain information on ground water flow direction and characteristics. The depth of the screen setting for each of these wells is given in Table XIV-2.

Measurements to date have indicated no violation of the CPDWC standards at wells No. 6 and 7, but violation of these standards has been noted on occasion at wells 1 through 5. Well 10 is located hydraulically upgradient of the surface impoundment according to the available static water level measurements. Based on these considerations, well Nos. 6, 7, and 10 are considered to represent background water that has not been affected by leakage from the surface impoundments. It should be noted that during the installation of well 10 hydrocarbons were visually detected in the soils. These hydrocarbons are not attributed to the surface impoundment, but must be considered when using this well to represent background conditions. As previously mentioned, ground water samples will be gathered in November to determine what types of hydrocarbons exist in this location. Wells 8, 9, 11, 12 and 13 will be used to monitor for any migration of contaminants away from the surface impoundments.

Ground water monitoring wells 1, 2, 3 and 5 should qualify as point of compliance wells because they are located so that any off-site migration of hazardous constituents should pass through these wells. The point of compliance is defined in 40 CFR Section 264.96 as the "vertical surface located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the

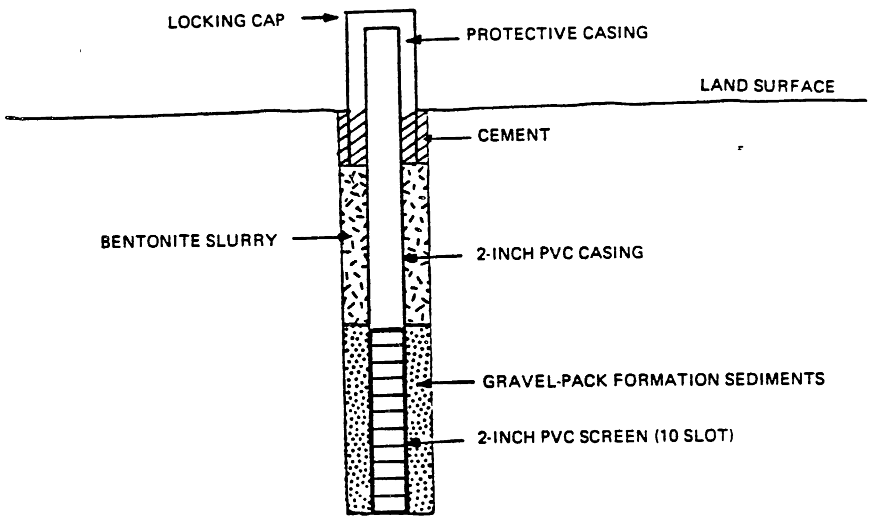
TABLE XIV-2. SUMMARY OF DEPTH OF MONITORING WELLS

Well No.	Well Diameter (in.)	Screen Setting(1) (ft)	Screen Elevation(2) (ft)
1	2.0	15-25	-4 to -14
2	2.0	15-25	-3.8 to -13.8
3	2.0	15-25	-5.1 to -15.1
4	2.0	25-35	-15.3 to -25.3
5	2.0	20-30	-8.7 to -18.7
6	2.0	18.9-28.9	-9.4 to -19.4
7	2.0	20-30	-11 to -21
8	2.0	5-15	5 to -5
9	2.0	5-15	6.3 to -3.7
10	2.0	5-15	5.2 to -4.8
11	2.0	5-15	4.8 to -5.2
12	2.0	5-15	5.6 to -4.4
13	2.0	5-15	4.7 to -5.3

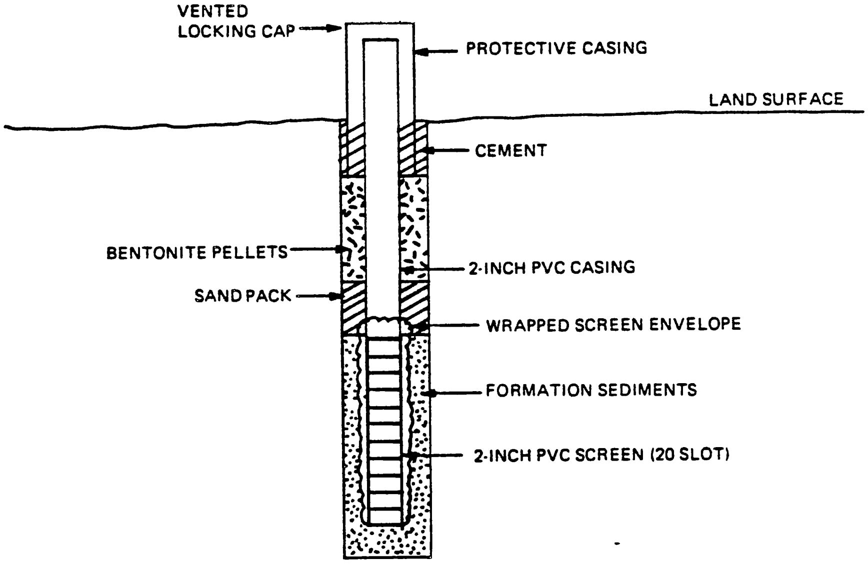
1. Screen setting depth below grade
2. Elevation by AVCO Lycoming datum

regulated units". If it is determined by the EPA Regional Administrator that the point of compliance does not correspond to any of the existing wells, an additional well(s) will be installed.

The monitoring wells have been installed in a manner that maintains the integrity of the monitoring well bore hole and prevents surface water runoff from entering the well. A schematic of the well construction is provided in Figure XIV-3.



WELLS NO. 1 TO 7



WELLS NO. 8 TO 13

FIG. XIV-3 SCHEMATIC OF WELL CONSTRUCTION

It should be noted that well No. 4 was constructed with the top of the casing below grade, and may be subject to surface runoff contamination.

Sampling Plan Measurements. Samples will be collected at each of the monitoring wells on a quarterly basis. The proposed sampling schedule will be an extension of the existing quarterly monitoring program. The sampling schedule will extend until one year beyond closure of the surface impoundments.

All samples will be analyzed for the parameters as specified by the Connecticut DEP. These parameters, the sampling frequency and the analytical procedures to be used during analysis are presented in Table XIV-3. The specific volatile organics to be analyzed are listed in Table XIV-4. In addition, the static ground water level and water temperature at each monitoring well will be measured. The general appearance, color and odor associated with the samples will also be recorded.

Sampling Procedures. A primary consideration of the sampling procedure is to avoid the inclusion of stagnant (standing) water that may have been contaminated from the surface. It is therefore necessary to pump each well before withdrawing samples. Three to four volumes of water will be evacuated from the well before withdrawing samples. Assuming 10 ft. of standing water in a 2 in. diameter well, the standing water inventory would be approximately 1.6 gallons. Thus, a minimum of 5 gallons of water should be pumped from the well before sampling. This evacuation volume will be adjusted

TABLE XIV-3. MONITORING PROGRAM PARAMETERS AND ANALYTICAL PROCEDURES

Parameter	Analytical Method	Reference	Sampling Frequency
Cadmium	EPA 213.1	2	Quarterly
Chromium - hexavalent	SMEWW 312B	4,2	Quarterly
Chromium - total	EPA 218.1	2	Quarterly
Copper	EPA 220.1	2	Quarterly
Mercury	EPA 245.1	2	Quarterly
Nickel	EPA 249.1	2	Quarterly
Zinc	EPA 289.1	2	Quarterly
Cyanide - amenable	EPA 335.1	2	Quarterly
Cyanide - total	EPA 335.2	2	Quarterly
Specific Conductivity	EPA 120.1	2	Quarterly
pH	EPA 150.1	2	Quarterly
Halogenated volatile organics	SW-846 8010 (head space)	3,1	Semi-annually
Aromatic volatile organics	SW-846 8020 (head space)	3,1	Semi-annually
TOC	EPA 415.2	2	Semi-annually
TOX	SW-846 9020	3,2	Semi-annually

1. Title 40, Code of Federal Regulations (CFR), 1984 rev. Part 136. Guidelines Establishing Test Procedures for the Analysis of Pollutants.

2. Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020. US Environmental Protection Agency (EPA), Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268, March 1979.

3. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 2nd ed, EPA, Office of Solid Waste and Emergency Response, Washington, DC 20460, July 1982.

4. Standard Methods for the Examination of Water and Wastewater, 15th ed, American Public Health Association, American Water Works Association, Water Pollution Control Federation, Washington, DC 20036, 1979.

TABLE XIV-4. VOLATILE ORGANICS TO BE ANALYZED

Halogenated Volatile Organics

Benzylchloride
Bis(2-chloroethoxy)methane
Bis(2-chloro-2-methyl) ethylether
Bromodichloromethane
Bromoform
Bromomethane
Carbon tetrachloride
Chloroacetaldehyde
Chloral
Chlorobenzene
Chloroethane
Chloroform
1-chlorohexane
2-chloroethylvinylether
Chloromethane
Chloromethylether
Chlorotoluene
Dibromochloromethane
Dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
Dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethylene
trans-1,2-dichloroethylene
Dichloromethane
1,2-Dichloropropane
1,3-Dichloropropylene
1,1,2,2-Tetrachloroethane
1,1,1,2-Tetrachloroethane
Tetrachloroethylene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
Trichlorofluoromethane
Trichloropropane
Vinyl chloride

Aromatic Volatile Organics

Benzene
Chlorobenzene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Ethylbenzene
Toluene
Xylenes

accordingly depending on the depth of standing water at each location. Evacuated water should be discharged to one of the surface impoundments. The static water level in the well must be measured before the evacuation pumping is started.

Each well will be evacuated using a hand-operated "guzzler pump". Water samples will be taken with a peristaltic pump. After each use the guzzler pump and hoses will be rinsed with methanol and distilled water. The hoses on the peristaltic pump will be replaced after each well is sampled.

All samples will be properly preserved prior to laboratory analysis. Sample containers and preservation techniques are listed in Table XIV-5. A chain of custody record will be established for each sample from the time of collection to completion of laboratory analysis. The chain of custody record will contain, at a minimum, the following information:

- Name and signature of collector
- Date and time of collection
- Place of collection
- Waste type
- Sample number
- Analyses to be performed
- Times and signatures for each transfer of possession

Data Evaluation. Ground water concentrations will be compared with the CPDWC standards and the maximum concentration standards of 40 CFR 264.94 to determine if violations of these standards exist. From the

TABLE XIV-5. SAMPLE CONTAINER TYPES AND PRESERVATION METHODS

Sample	Container Type	Preservation Method
Cadmium, chromium, copper, mercury, nickel, zinc	Plastic or glass	HNO_3 to pH<2
Cyanide	Plastic or glass	Cool, 4°C; NaOH to pH > 12; 0.6g ascorbic acid(1)
Halogenated volatile organics	Glass, teflon lined septum	Cool, 4°C; 0.008% $Na_2S_2O_3$(1)
Aromatic volatile organics	Glass, teflon lined septum	Cool, 4°C; 0.008% $Na_2S_3O_3$(1)
Total organic carbon (TOC)	Plastic or glass	Cool, 4°C; HCl or H_2SO_4 to pH < 2
Total organic halide (TOX)	Glass, teflon lined septum	Protect from light

1. Should only be used in the presence of residual chlorine.

thirteen well monitoring network it will be possible to determine if the surface impoundments have contaminated the groundwater and it should be possible to determine the rate, extent, and concentration of contaminant movement. Static water levels will continue to be measured to evaluate ground water flow patterns.

The ground water monitoring program will be continued for one year following closure of the surface impoundments, which is scheduled for 1986. This follow-up monitoring will be used to determine if any hazardous constituents are still entering the local groundwater.

XV. HAZARDOUS WASTE CLOSURE PLAN

HAZARDOUS WASTE CLOSURE PLAN

for

AVCO LYCOMING TEXTRON
STRATFORD ARMY ENGINE PLANT
Stratford, CT 06497

Revised October 1985

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1. INTRODUCTION

AVCO Lycoming Textron, Stratford Army Engine Plant (AVCO) located in Stratford, Connecticut manufactures tank and aircraft engines along with other miscellaneous products. AVCO's manufacturing process includes the plating of various engine and miscellaneous pieces in zinc, cadmium, chrome, magnesium, copper, nickel, and black oxide baths. Other baths associated with these plating baths include cleaning baths (such as acid and alkaline cleaners) and rinse (water) baths. Periodically the plating baths and cleaners no longer serve their intended purpose and have to be treated for reuse or treated in a chemical wastewater treatment system. The frequency of the dumps of the plating baths and cleaners is dependent on the operating parameters of the baths. The baths can be dumped as often as every week or as little as every six months depending on the bath type and the amount of time the bath has been used. In addition, rinse water from the plating area is continuously discharged to the equalization lagoon. The wastewater from the plating area constitutes only a small portion of the total wastewater flowing to the treatment system. Prior to the wastewater being treated in the treatment system, the wastewater is stored in an equalization lagoon.

The wastewater stored in the equalization lagoon is pumped to the chemical wastewater treatment system. The storage capacity of the equalization lagoon (approximately 500,000 gallons) allows a more uniform influent wastewater to be fed to the chemical wastewater treatment system. The wastewater treatment system destroys cyanides, reduces chromium, and precipitates the metals as metal hydroxides. The treated wastewater is discharged to a tidal estuary under an NPDES permit. The precipitated metal hydroxides are pumped to one of three sludge storage lagoons.

The equalization lagoon and the three sludge storage lagoons are classified as hazardous waste surface impoundments. The location of these lagoons at AVCO is shown in Figure 1. As operators of hazardous waste surface impoundments, AVCO is subject to the Connecticut hazardous waste regulations (Title 25, Chapter 54cc(c)) and will be subject to U.S. EPA hazardous waste regulations (40 CFR Part 264) once the Part B permit application has been approved.

One of the requirements of the hazardous waste regulations is that owners and operators of storage, treatment, and/or disposal facilities must have a written closure plan at the site. The Connecticut citation for these requirements is in Section 25-54cc(c)34(g) and the federal citation is 40 CFR Part 264 Subpart G.

It is the intent of the AVCO facility to comply with all pertinent state and federal hazardous waste regulations in closing the surface impoundments.

The closure method for the AVCO surface impondments was selected after an extensive evaluation of on-site and off-site alternatives. The alternatives that were evaluated are listed below.

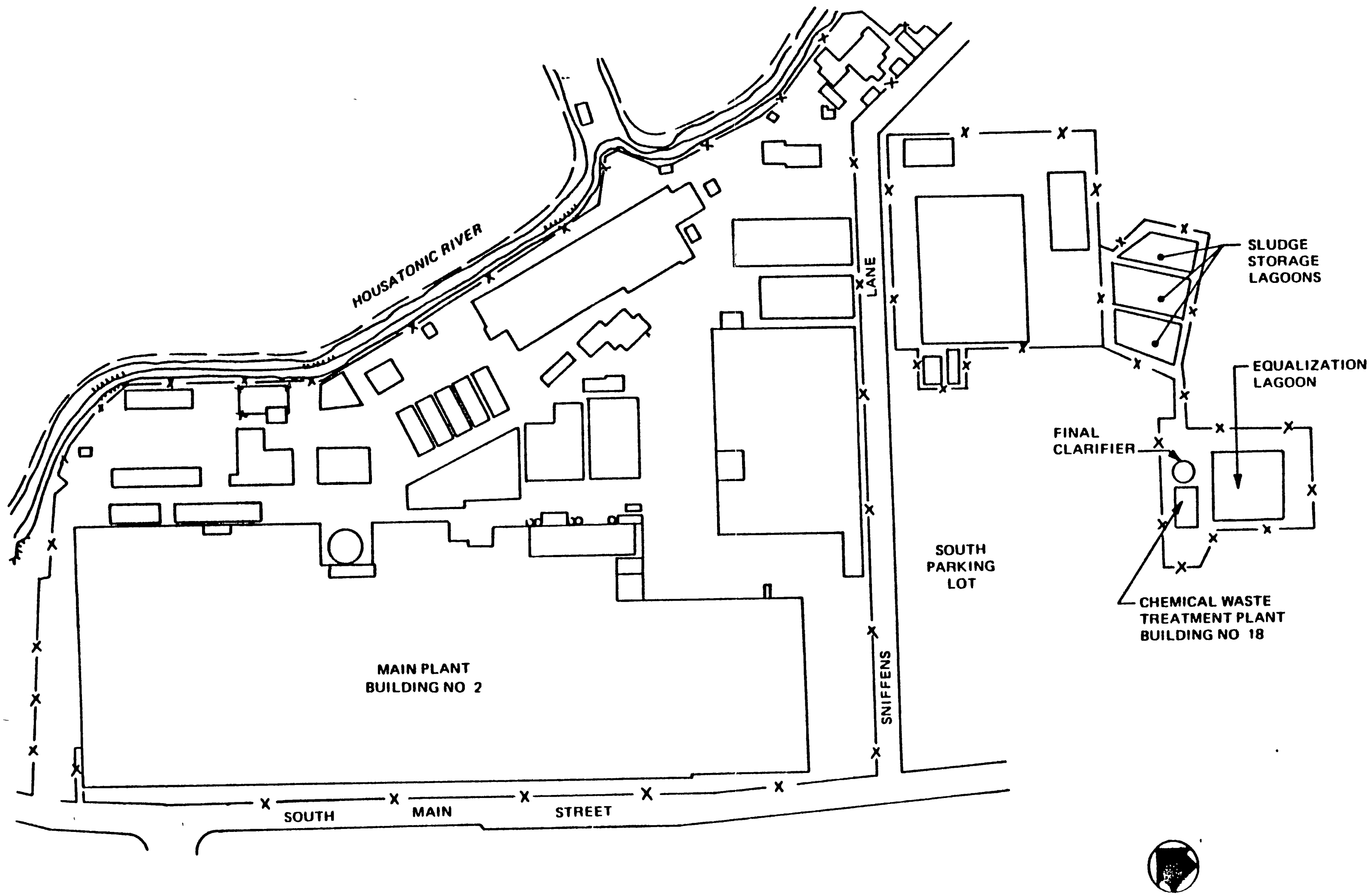

FIG. 1 AVCO LYCOMING PLANT LAYOUT

On-Site Management Alternatives

- Removal of standing liquids and covering the lagoons
- Removal of standing liquids, in-situ treatment, and covering the lagoons (possibly file a delisting petition)
- Removal of standing liquids, removal of contaminated material, dewatering removed material, on-site treatment, such as solidification/fixation, and on-site disposal (possibly file a delisting petition)
- Removal of standing liquids, removal of contaminated material, dewatering removed material, and on-site disposal

Off-Site Management Alternatives

- Removal of standing liquids, removal of the contaminated material, dewatering removed material, on-site treatment, such as solidification/fixation, and off-site disposal (possibly file a delisting petition)
- Removal of standing liquids, removal of the contaminated material, dewatering removed material, off-site treatment, such as solidification/fixation, and off-site disposal
- Removal of standing liquids, removal of the contaminated material, dewatering removed material, and off-site disposal

It should be noted that with regard to the term "contaminated material", this has been defined by the U.S. EPA and the Connecticut DEP as soil that has been leached according to the Extraction Procedure Test (40 CFR Part 261 Appendix II), where the extract contains metals in excess of ten times the National Interim Primary Drinking Water Regulation (NIPDWR) standards.

The closure method selected for the surface impoundments is the off-site management alternative which consists of removing standing liquids, removal of the contaminated material, dewatering the removed material, off-site treatment, such as solidification/fixation, and off-site disposal. Since this alternative will remove all contaminated material from the surface impoundments during closure, post-closure requirements will not be applicable.

The AVCO hazardous waste surface impoundments will be closed in the spring of 1986. It will be possible to close the surface impoundments because a new chemical wastewater treatment system will be built. The new system will include an equalization tank to replace the equalization lagoon and a filter press will be installed to dewater the sludge from the clarifier, replacing the sludge storage lagoons.

II. FACILITY DESCRIPTION

General

The hazardous waste management facilities at AVCO were discussed in Section I. Figure 1 shows the location of the surface impoundments. The surface area of each of the surface impoundments is provided below.

Facility Type	Area
Surface Impoundment (North Storage Lagoon)	12,600 $ft.^2$
Surface Impoundment (Middle Storage Lagoon)	7,920 $ft.^2$
Surface Impoundment (South Storage Lagoon)	9,140 $ft.^2$
Surface Impoundment (Equalization Lagoon)	25,600 $ft.^2$

The total area of the four surface impoundments is 55,260 ft^2 (1.27 acres). It should be noted that the equalization lagoon is lined with a bentonite liner whereas the three sludge storage holding lagoons are not lined.

Hydrogeology

The AVCO Lycoming facility is underlain by glacial stratified drift deposits. The stratigraphy of the deposits beneath the lagoons has been determined by examining the logs of borings that were drilled for this and previous investigations. The following description is based on the boring logs which are currently available (borings B-1 through B-18, Metcalf & Eddy, Inc., 1985 (see Appendix D of the Part B permit application); borings B-1 through B-15, Haley & Aldrich, 1982). Boring logs for existing observations Wells Nos. 1-7 are not currently available. Borings B-1 to B-18 by M&E were visually classified in the field utilizing the Unified Soil Classification System. Soil lab tests were also performed on selected soil samples. The locations of the borings are presented in Figure 2.

The uppermost 5 to 15 feet of soil generally consists of one or more of the following materials: fine to coarse sand with a trace of silt (SP); silty sand (SM); or fill, which is typically sand and gravel with varying amounts of silt. These uppermost materials are underlain by a variable thickness layer of peat (OL). The organic peat was encountered in seven borings (B-2, B-4, B-5, B-8, B-9, B-10 and B-12). The subsurface soils below the uppermost strata and the peat (where present) consist primarily of fine to coarse sand with varying amounts of gravel and a trace of silt.

Maps prepared by the US Geological Survey (Wilson, et. al., 1974) indicate that bedrock occurs at a depth greater than 120 feet. No known data are available regarding the depth of bedrock at this facility.

The peat zone ranged from a minimum of 5.5 feet to a maximum of 20 feet in thickness in borings B-4 and B-10 respectively. Depth to the top of the peat layer ranged from a minimum of 6 feet to a maximum of 17 feet below existing ground surface in borings B-2 and B-8, respectively. Rock was not encountered in any of these borings.

Previous subsurface investigation work has been performed on this site by other consultants (Haley & Aldrich, Inc./R.F. Weston, B-1 to B-15, November 11, 1982). Similar soils were

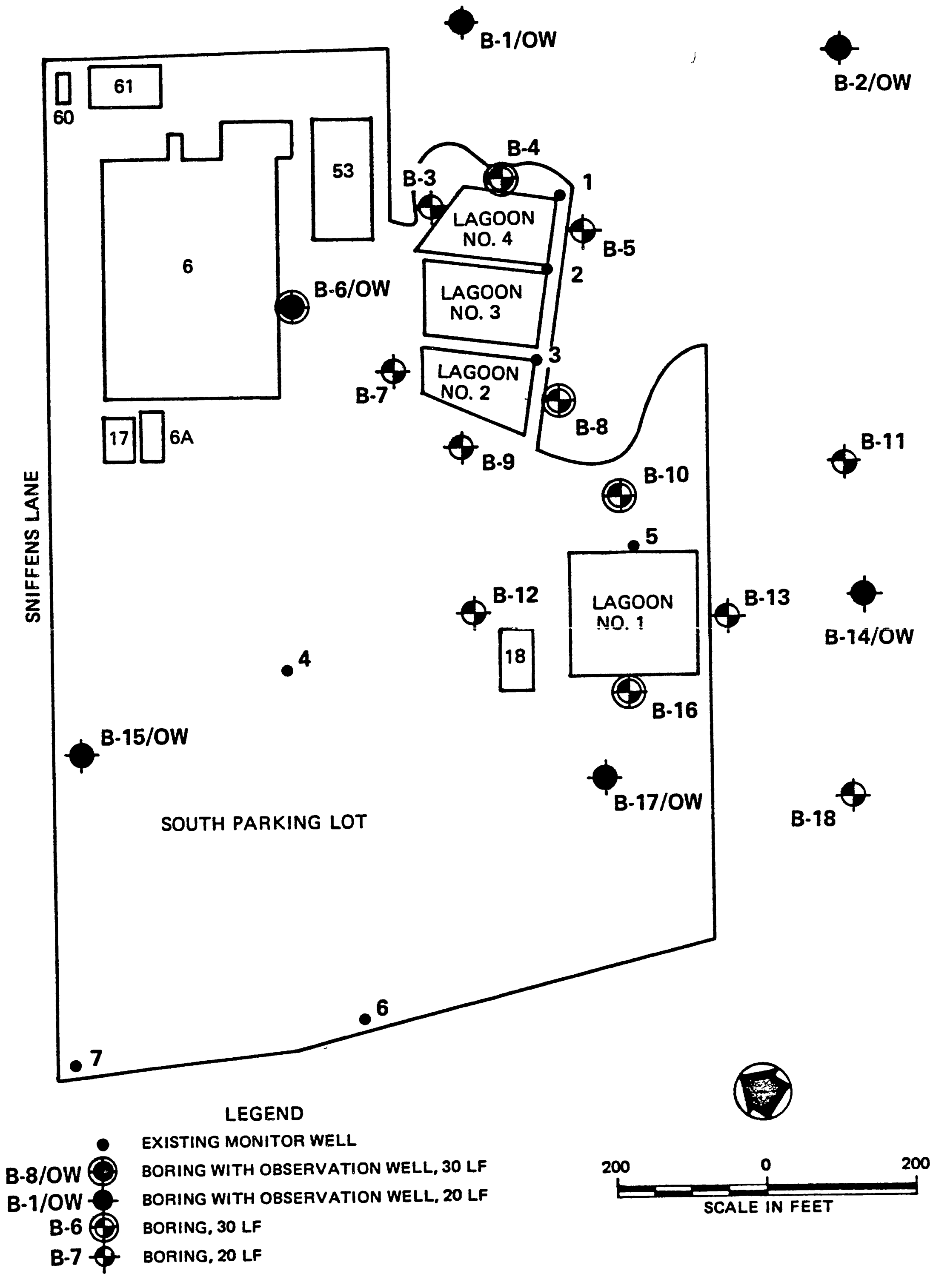

FIG. 2 LOCATION OF BORINGS AND OBSERVATION WELLS

encountered in their borings. Seven (OW-1 to OW-7) observation wells were also installed and are being monitored in a separate AVCO Lycoming project.

Borings B-1 to B-15 by Haley & Aldrich/Roy F. Weston ranged in depth from 11.5 feet to 51.5 feet. Boring B-13 was completed to refusal at 25.3 feet. Silty sands and mixtures of sand and coarse-fine gravels and peak were encountered in these borings. Rock was not encountered.

The AVCO facility and associated lagoons are located in a relatively flat area near the mouth of the Housatonic River. Ground surface elevations are generally lower than 10 feet (above zero, National/Geodetic Vertical Datum). The water table is also fairly flat, and marshy areas with tidal channels exist in the vicinity of the site.

A surface water drainage divide and an inferred groundwater divide exist west of Main Street. Under undeveloped conditions, groundwater in the shallow part of the aquifer in the vicinity of the lagoons would be expected to flow primarily southeastward toward the tidal ditch or eastward to northeastward toward the Housatonic River. A percentage of the groundwater would be expected to flow downward into the deeper parts of the aquifer.

The development of the area has probably had some significant effects on the hydrologic system. The large buildings and paved areas with storm drainage systems greatly reduce groundwater recharge and generally cause a lowering of the water table. The excavation of ditches in tidal marshes may lower the water table and may facilitate the infiltration of salt water into the aquifer if the poorly permeable tidal marsh deposits are totally removed. Storm drainage pipes, if placed below the water table with gravel bedding, may also create pathways for groundwater drainage and subsequent lowering of the water table and changes in groundwater flow directions. Another factor which may influence groundwater movement at the site is the possibility of seepage from the equalization lagoon No. 1, which is reported to have a bentonite liner, and from the sludge storage lagoons No. 2, 3 and 4 which are unlined. Previous water level monitoring has indicated the possibility of groundwater mounding around the lagoons.

Examination of the water level data that are available both from recent monitoring of the six M&E wells and from previous monitoring of the seven existing monitoring suggests the following conclusions:

1. Water levels in existing well No. 5 are elevated according to water level measurements in existing wells No. 1-7 by others, due either to seepage from the equalization lagoon or to tidal effects.

2. Significant variations among the water levels in existing wells No. 1, 2 and 3, are apparently due to seepage from the sludge storage lagoons. These wells are completed in relatively poorly permeable materials. Although boring logs are not currently available for these wells, the logs from nearby M&E wells indicated that existing wells No. 1, 2, 3 and 5 are screened in peat and silty sand.

Based on water level data obtained from the new observation wells a contour map of the phreatic surface was developed. This information is presented in Figure 3. The phreatic surface contours indicate high water levels north of Lagoons No. 2, 3 and

4. The phreatic surface grades down slope in the southerly direction.

Lagoons No. 2, 3 and 4 are unlined. Based on this information and the corresponding field data the high water levels may be due to artificial recharge by downward seepage from the three unlined lagoons. Mounding has not been shown on the phreatic surface contour map in the area of lagoon No. 1. Future water level data from existing well No. 5 may contradict this.

Based on the prepared phreatic surface contour map and associated gradients it is estimated that groundwater flow radiates uniformly outward from the area of boring B-6/OW. However water level data from existing observation well measurements by L,B&G[1] indicate that the groundwater flow may be radially outward from all lagoons. However a complete set of water level readings from all observation wells is required to substantiate flow direction.

Stevens recorder data obtained from existing OW No. 5 indicated that groundwater levels fluctuate with the tidal cycle at this location. Groundwater level data from OW-1, B-6 and B-17 as recorded by Stevens recorder indicated no tidal fluctuation in these observation wells. Due to the uncertainty associated with the data recorded and the short period of record it is recommended that this study be continued to quantify and confirm this information.

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1 L,B&G = Leggette, Brashears & Graham Inc.

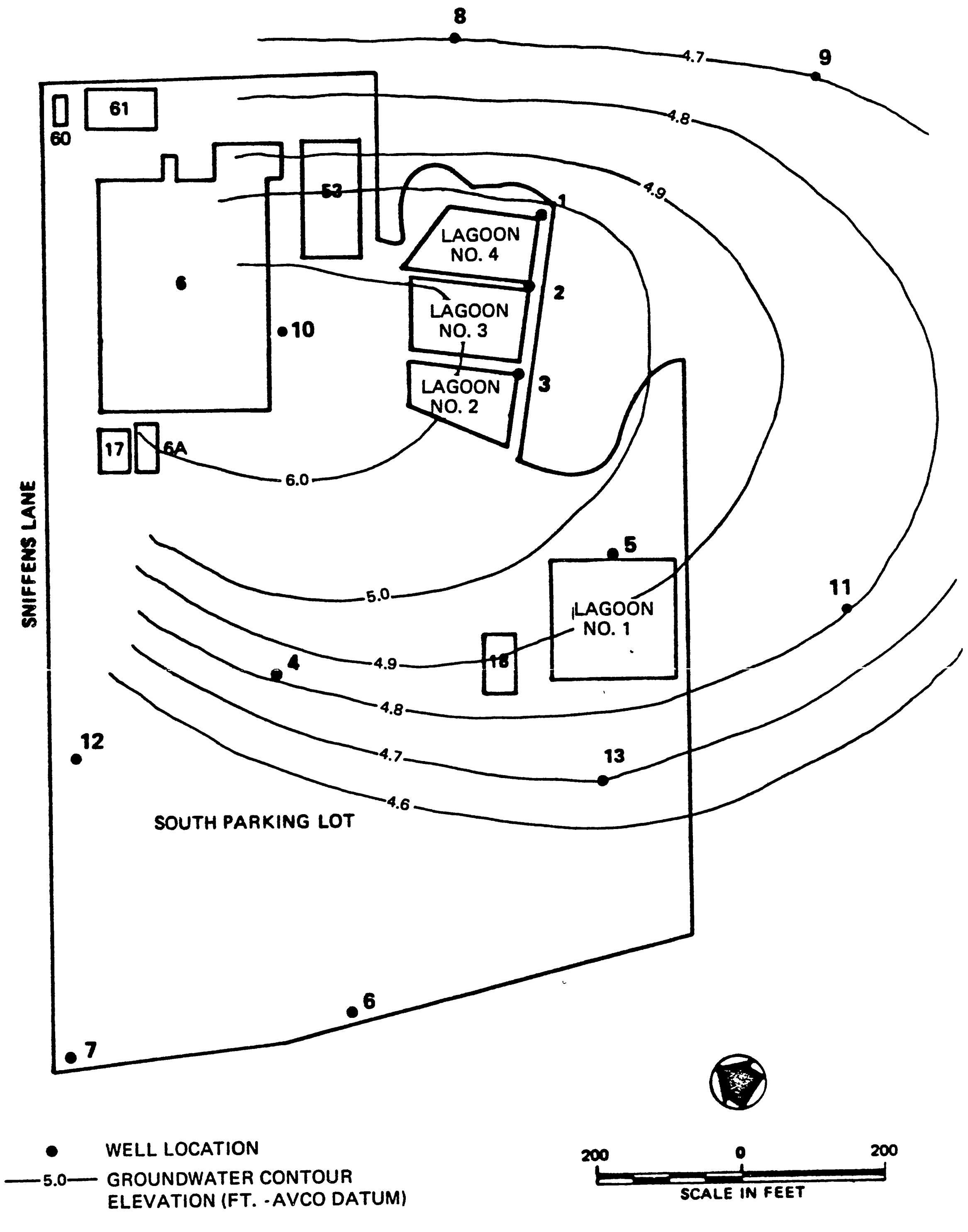


FIG. 3 GROUNDWATER CONTOURS BASED ON SEPTEMBER 1985 MEASUREMENTS

Based on the soil strata encountered the following permeabilities have been extrapolated from laboratory data: silty sand (SM) K = 3 x 10^{-4} CM/SEC; poorly graded sand (SP) K = 150 x 10^{-4} CM/SEC; low plasticity silt (ML) K = 1 x 10^{-4} CM/SEC; peat (OL), K = 0.75 x 10^{-4} CM/SEC.

Soil profiles developed from M&E boring information indicates that the lagoons are underlained by the silty sand (SM) soil zone. As a result, contaminant transport may be resticted to this soil strata as discussed in the following section. The organic peat zone which is interlayered between this soil and the higher permeability poorly graded sand found at depth may also affect contaminant transport.

The groundwater in the general area of the AVCO facility is classified as Class GB water. The definition of Class GB water is as follows from the Connecticut Water Quality Standards and Classifications:

> Class GB area may be suitable for receiving discharges permitted in Class GAA and Class GA. In addition, these groundwaters may be suitable for receiving certain treated industrial process waters amenable to further treatment by the soils. Such discharges shall not cause degradation of groundwaters that could preclude future use of the groundwater for drinking supplies without treatment or violate adjacent surface water classification.
>
> Class GB groundwaters are those located in areas where historical, industrial, commercial or residential development has or is likely to render the groundwaters unsuitable for drinking water without treatment, however, the intent is to prevent new discharges from causing further degradation.

Ground water contours have been prepared for the area around the lagoons and are presented in Figure 3. The ground water contours suggest that there may be ground water mounding below the storage lagoons and that the local groundwater flow direction may be toward the Marine Basin, located 1000 feet east of the facility.

The average amount of precipitation in the Stratford Area as well as the amount of rainfall in 1984 is presented in Table 1. The pan evaporation rate for this part of Connecticut is approximately 29 inches per year. Since evaporation occurs primarily from approximately May through October, there is some potential for solar evaporation at the AVCO facility, during the closure period.

TABLE 1. PRECIPITATION DATA-STRATFORD AREA

Month	Precipitation[1] (inches) 1984	Average
January	1.52	3.25
February	4.72	3.00
March	3.49	3.93
April	4.37	3.74
May	8.14	3.44
June	3.53	2.90
July	6.54	3.46
August	1.23	3.68
September	2.24	3.29
October	2.79	3.33
November	1.86	3.79
December	2.56	3.75
TOTAL	42.99	41.56

1. Bridgeport Airport gauge - 42 years of record

III. FINAL CLOSURE SCHEDULE

A new chemical wastewater treatment system is being installed at the AVCO facility. This system should be completed by May 1986. The new treatment system will have an equalization tank to replace the equalization lagoon and a filter press that will substitute for the sludge storage lagoons. Therefore, after May 1986, the equalization lagoon will no longer be used as the storage basin for the plant's industrial wastewater. In addition, the precipitated metal hydroxide sludge will be pumped to a filter press to be dewatered instead of being pumped to the sludge storage lagoons.

Closure of the equalization lagoon and the three sludge lagoons will begin in May 1986. The U.S. EPA (40 CFR 265.112 (c)) and the Connecticut DEP (Section 25-54cc(c)-34(c)(3)) require that owners or operators of hazardous waste management facilities submit a closure plan to the Regional Administrator and Commissioner, respectively, at least 180 days before the date closure is expected. In addition, the closure plan must be submitted with the Part B permit application in accordance with 40 CFR 270.14(b)13 and approved by the Regional Administrator as part of the permit issuance proceeding under Part 124. The submittal of the closure plan at this time is serving a two-fold purpose; as part of the Part B permit application and to notify the appropriate authorities that the surface impoundments will be closed as of May 1986. Since it is unlikely that the Part B permit application will be approved prior to the closure of the surface impoundments, the closure of the surface impoundments will be performed in accordance with Connecticut DEP regulations.

The schedule of the pertinent closure activities is shown in Table 2. It is realized that the closure plan is subject to the approval of the Connecticut DEP Commissioner. If after 90 days from the time the closure plan is submitted, AVCO has not been notified by the Connecticut DEP of any changes to the closure plan, AVCO will proceed with all closure activities noted in this section.

AVCO has decided to close the hazardous waste surface impoundments as storage units rather than disposal units. The surface impoundments can be closed as storage units because all sludge, liners, soil, and other associated clean-up material that is "contaminated" will be excavated and removed from the site. As previously mentioned, the term "contaminated" refers to material that has been leached according to the Extraction Procedure Test (40 CFR Part 261 Appendix II) and the extract contains metals in excess of ten times the National Interim Primary Drinking Water Regulation (NIPDWR) standards.

As noted in Table 2, once the four surface impoundments cease to receive hazardous waste, the following actions will be performed. All pumpable untreated wastewater in the equalization lagoon will be transferred to the treatment system. After these liquids have been pumped to the treatment system, the contaminated material and liquids in the equalization lagoon and the sludge storage lagoons will be pumped to a filter press for

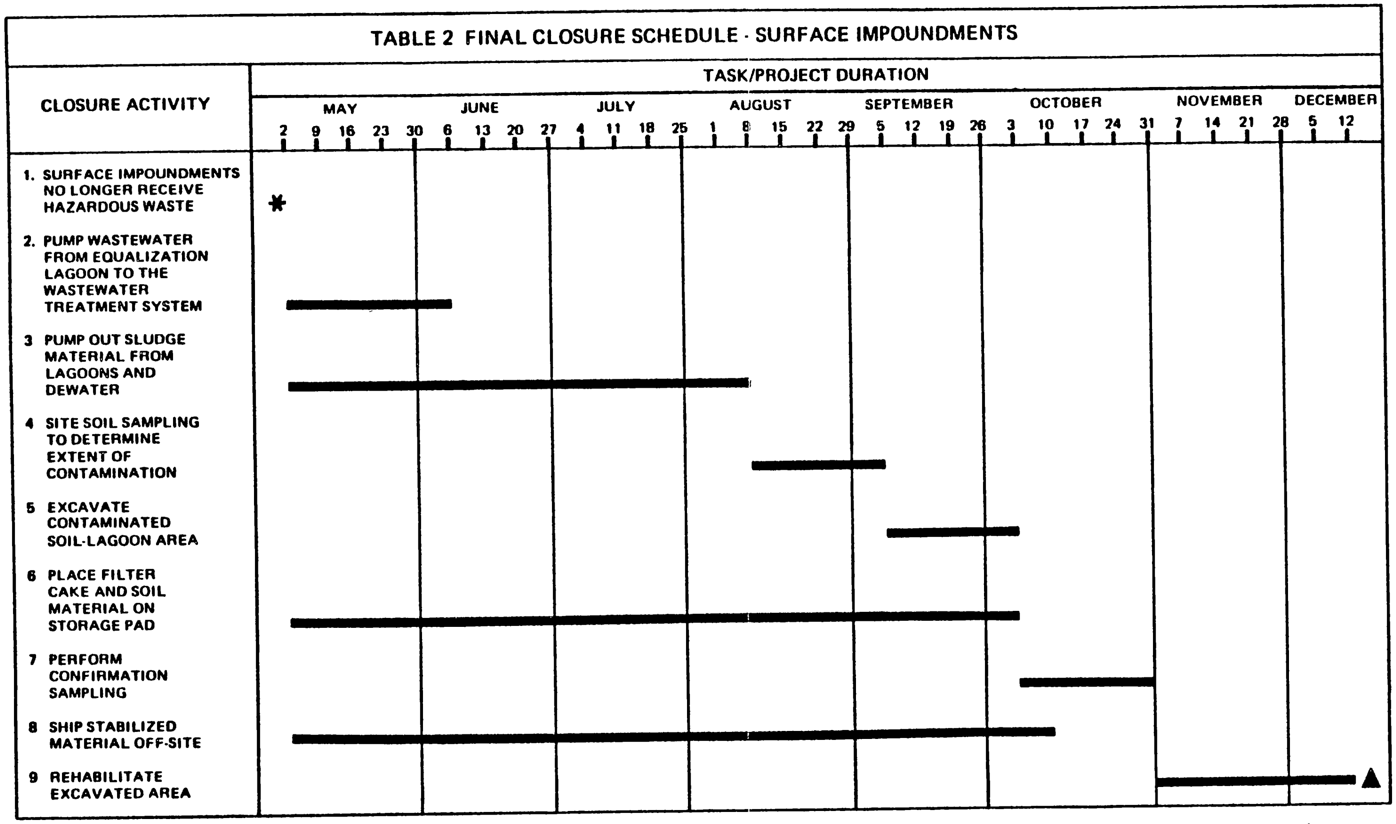


TABLE 2 FINAL CLOSURE SCHEDULE - SURFACE IMPOUNDMENTS

▲ CERTIFICATION OF CLOSURE

dewatering. Material that is not pumpable will be slurried and then pumped to the filter press. The filtrate from the filter press will be discharged to the wastewater treatment system if it contains constituents in excess of the NPDES limits. The filter cake generated from the filter press will be transferred to a storage pad where it will subsequently be loaded for off-site shipment.

A soil sampling program during September 1985 indicates that the soil surrounding the lagoons is not contaminated. The sampling program conducted at this time did not involve sampling in the lagoons themselves. Instead the sampling program was designed to determine the areal extent of contamination as well as the depth of any areal contamination. Additional soil sampling will be performed during the actual closure of the impoundments.

The amount of contaminated material in the lagoons is estimated at 12,000 cubic yards based on a survey performed in October, 1985 and other site information. The exact volume of material that needs to be excavated will not be known until the soil confirmation sampling program conducted during closure reveals that all contaminated material has been removed.

As noted in Table 2, the facility closure activities will take longer than 6 months. This is in part due to the volume of material that must be managed and the fact that all the material will be dewatered prior to off-site shipment. It has been mentioned that the volume of contaminiated material is 12,000 cubic yards or roughly 2,400,000 gallons. If it is assumed that the 12,000 cubic yards of material contains 15% solids and will be dewatered to 40% solids, the final volume of filter cake will be 4500 cubic yards. Contractors who have dewatered metal hydroxides sludges, such as these at AVCO, have found that roughly 125 cubic yards of filter cake can be produced each week for each filter press. It is not felt that more than two filter presses could be used at the facility. Based on the use of two filter presses, this activity would take, as shown in Table 2 in Activities 3 and 5, 18 weeks. The soil confirmation sampling also extends the length of the closure activities.

Because of the volume of contaminated material and the number of activities necessary to assure the proper closure, the closure process will take 7 1/2 months. It is felt that this time frame will allow AVCO to close the surface impoundments in an environmentally sound manner.

After all contaminated material has been removed, the excavated areas will be backfilled and rehabilitated so that the land can be used for other purposes. AVCO and an independently registered professional engineer will certify that closure has been completed according to the closure plan.

The closure activities outlined above will be performed so that closure complies with the closure performance standard in Part 264.111. The closure activities will be further discussed in Section V.

IV. WASTE CHARACTERISTICS

The purpose of the four surface impoundments has been previously discussed. The equalization lagoon has served as a wastewater storage basin and the three sludge storage lagoons have been used to store the precipitated metal hydroxide sludge from the chemical wastewater treatment process.

The wastewater in the equalization lagoon contains the following major constituents:

- zinc
- chromium (trivalent and hexavalent)
- magnesium
- nickel
- copper
- cyanides

The sludge storage lagoons contain hydroxides of the above metals, except chromium, where only trivalent chromium should be present. The hexavalent chrome is reduced to the trivalent form in the treatment system. In addition, the cyanides are destroyed in the treatment system.

V. CLOSURE OF SURFACE IMPOUNDMENTS

A. Volume of Contaminated Material

The sampling program conducted during September of this year provided preliminary information on the volume of contaminated material. Chromium has been the only "EP toxic metal" found in the groundwater monitoring wells. However, cadmium is used in the plating process. Therefore, chromium and cadmium have been analyzed for each of the soil samples according to the Extraction Procedure Test (40 CFR Part 261 Appendix II).

The locations of the soil borings drilled to determine the extent of contamination is shown in Figure 3. The depths that soil samples were taken in each of the borings is presented in Table 3. Neither chromium nor cadmium was detected in any of the extracts from the soil samples.

Based on the results of the sampling program, there does not appear to be any contaminated material beyond the lagoons. The volume of sludge in the three sludge storage lagoons is estimated below. This volume is current as of October 1985.

Table 3. Sample Collection Depths at Boring Locations

Boring Number	Sample Collection Depths (ft.)
B-1	0-2; 6-8; 12-14; 18-20
B-2	0-2; 6-8; 12-14; 18-20
B-3	0-2; 6-8; 12-14; 18-20
B-4	0-2; 3.5-5.5; 7-9; 10.5-12.5 14-16; 21-23; 24.5-26.5;
B-5	0-2; 4.6-6.6; 9.2-11.2; 13.8-15.8; 18.4-20.4; 23-25
B-6	0.8-2; 4.8-6.8; 10.6-11.9; 16-18; 22.2-24.2
B-7	0-2; 3.6-5.6; 7.2-9.2; 10.8-12.8; 14.4-16.4; 18-20
B-8	0-2; 4.1-6.1; 8.2-10.2; 12.3-14.3; 16.4-18.4; 20.5-22.5; 24.6-25.5; 28.7-30.7
B-9	0.4-2.4; 3.6-5.6; 7.2-9.2; 10.8-12.8; 14.4-16.4; 18-20
B-10	0-2; 3.5-5.5; 7-9; 10.5-12.5; 14-16; 17.5-19.5; 21-23; 24.5-26.5; 28-30
B-11	0-2; 6-8; 12-12.5; 18-20
B-12	0-2; 3.5-5.5; 7-9; 10.5-12.5; 14-16; 17.5-19.5; 21-23; 24.5-26.5; 28-30

(Cont.)

Table 3. (Cont.) Sample Collection Depths at Boring Locations

Boring Number	Sample Collection Depths (ft.)
B-13	0-2; 3.6-4.3; 7.2-9.2; 10.8-12.8; 14.4-16.4; 18-20
B-14	0-2, 6-8, 12-12.5; 18.5-20
B-15	0.3-2.3; 6-8; 12-14; 18-20
B-16	0.4-0.6; 3.5-5.5; 7-9; 10.5-12.5; 14-16; 17.5-19.5; 21-22.8; 24.5-26.5; 28-30
B-17	0.4-2.4; 6-8; 12-14; 18-20
B-18	0-2; 6-8; 12-13.3; 18-20

Sludge Holding Lagoon	Contaminant Depth[1]	Lagoon Area	Volume of Comtaminated Material
No. Lagoon	8 ft.	12,600 ft^2	3730 yd.^{3}
Middle Lagoon	6 ft.	7,920 ft.^{2}	1760 yd.^{3}
So. Lagoon	7.5 ft.	9,140 ft.^{2}	2540 yd.^{3}
			8030 yd^3

1. This information is based on a site survey performed between October 2 and Oct. 4 by Metcalf & Eddy and an estimate of the base of the lagoon determined by Roy F. Weston, Inc. during survey work in 1981.

Sludge has also precipitated in the equalization lagoon. It was estimated in 1982 (Weston, 1982) that the volume of sludge in the equalization lagoon was roughly 500,000 gallons. If it is assumed that this volume has not changed significantly, this volume contributes an additional 2500 yd^3 of sludge. The bentonite liner in the equalization lagoon will also be removed once the sludge material is removed from the lagoon. This will contribute an additional 600 yd^3 of material. The total volume of sludge in the four lagoons is therefore approximately 11,000 yd.^{3} The total volume of contaminated material at closure is estimated at 12,000 cubic yards. This value includes additional sludge that will be discharged to the sludge storage lagoons until the facility is closed, as well as a contingency.

B. Removal of Standing Liquids from the Surface Impoundments

The equalization lagoon will cease to receive industrial wastewater once the new chemical wastewater treatment system is operational. This action, which is scheduled for May 1986, will initiate closure of the lagoons. The first task with regard to closure activities is the removal of the wastewater from the equalization lagoon. The wastewater will be pumped to the existing treatment system. This will be a routine exercise since the pumping system is in place.

One option with regard to removing the sludge and contaminated solid material from the lagoons includes; (1) allowing the liquids at the surface of the impoundments to solar-evaporate; (2) lowering the water table below the lagoons through groundwater pumping; and (3) excavating the remaining material. As noted in Table I in Section II, there is the potential for evaporation to occur in the summer months, which is when closure is planned. However, there is no guarantee that the dry removal could proceed uninterrupted. If wet material were excavated, it could be placed on a sloped storage pad to remove free liquids, but this would not significantly reduce the amount of water in the contaminated material. It may be necessary to add a bulking agent to this material to further reduce free liquids. This action would increase the volume of contaminated material which would increase the transportation and disposal costs.

A further comparison of dry excavation methods and wet excavation methods is presented in Subsection D of this section. The result of the discussion in Subsection D is that the wet excavation method appears to be a more appropriate choice for material removal. Therefore, solar evaporation will not be relied on to evaporate surface liquids on the lagoons.

C. Treatment Method for Removed Liquids

Two different wastewaters may have to be treated in the closure of the lagoons; the untreated wastewater from the equalization lagoon and possibly the filtrate generated from the filter press. A filter press will be used to dewater the sludge. The liquids in the equalization lagoon are untreated so that cyanides and heavy metals will be present. These liquids, and if necessary the filtrate, will be pumped to the existing industrial wastewater treatment system so that the cyanides, chrome, and metals are properly treated.

It is important to note that at closure of the lagoons, the equalization lagoon will not be used because of the new treatment system. The wastewater from the AVCO plant will go directly to the equalization tank instead of the equalization lagoon, except for cyanide-containing wastewater, which in the new treatment scheme will be treated prior to reaching the equalization tank. The new treatment system following the equalization tank, unlike the treatment system following the equalization lagoon, does not treat cyanides. Therefore, it is necessary to treat the material from the equalization lagoon in the existing treatment system so that the cyanides are destroyed. The only change that will be made in operating the existing treatment system for this wastewater is that the settled material in the clarifier will be pumped to the new treatment filter press rather than to the sludge storage lagoons.

The sludge that is generated from the treatment of this wastewater will be managed as a hazardous waste.

D. Removal of Contaminated Materal

The removal of the lagoon material was briefly discussed in Subsection B of this section. Some of the disadvantages of dry excavation methods were mentioned in relation to the use of solar-evaporation.

Another potential problem in the "dry" removal of the lagoon material is that the groundwater table is located approximately five feet below the land surface. Groundwater removal or a lowering of the water table may be necessary to remove contaminated material located in the ground water. The problem associated with the location of the groundwater, with regard to dry removal methods, will not present the same problems to the wet removal of the contaminated material. This is because the ground water can actually aid in the wet removal process, by providing a water source to slurry unpumpable material.

An advantage of the wet removal of the contaminated material is that the "slurried" material can be pumped through a filter press. The filter press can increase the percentage of solids in sludges or other materials to 40 or 50 percent. Therefore, if there are 10,000 cubic yards of contaminated material, this could be reduced to a volume of 5,000 cubic yards (assuming the initial material contains 20 percent solids and it is dewatered to 40 percent solids). This volume reduction does not include the addition of lime that may be needed to pretreat the water prior to dewatering. In this example the dewatering process would generate 5,000 gallons of filtrate that could be discharged to the tidal estuary if it does not contain constituents that would violate the NPDES permit. Otherwise, this filtrate would have to be pumped to the wastewater treatment system.

With the above considerations, a wet method will be used to remove the contaminated material from the lagoons. A filter press will be used to dewater the slurried material.

The "wet" removal method to be used will be determined by the percent solids and solids handling characteristics of the material. The contractor who performs this work will have equipment available to handle the potentially varying conditions in the impoundment. Equipment that may be necessary to remove sediments include an air jet or a water jet to suspend (slurry) the waste material. A vacuum tank truck with internal mining capability may be appropriate to pump the slurry from the impoundment. One of the more common techniques is to use a high-speed rotary cutter mounted at the suction of a pump with the entire assembly hung from a floating platform.

All personnel involved in the contaminant removal operation will follow the site health and safety program.

E. Dewatering the Excavated Material

The method of dewatering metal hydroxide sludges that has been most reliable and achieved high solids content in sludges is the "plate and frame" filter press. These filter presses have generated filter cakes with between 35 and 55 percent solids. Plate and frame filter presses have been used to dewater metal hydroxide sludges removed from surface impoundments and have been successful. The contractor will be responsible for guaranteeing a minimum solids content in the sludge.

The contractor selected to perform the closure operations will be responsible for transporting the filter cake from the filter press to the temporary storage pad. In addition, the filtrate will be piped so that it can be discharged to the treatment system or the tidal estuary if it does not exceed the NPDES permit limitations.

As with the removal of the contaminated material, the contractor personnel will comply with all health and safety standards in the dewatering operation.

F. Confirmation Sampling of Excavated Area

All pumpable sludge material will be removed from the four lagoons as discussed in subsection D. Once this material is removed, the soil at the bottom of the lagoons will be sampled to determine if it is contaminated. A minimum of 10 soil samples will be obtained from each of the excavated lagoons. Sampling will include extracting each of the samples according to the E.P. Toxicity Test (40CFR Part 261, Appendix II) and determining if the chromium and cadmium concentration in the extract exceeds 0.5 mg/l and 0.1 mg/l, respectively.

The areas of the lagoon that are determined to be contaminated through the confirmation sampling program will be excavated. The excavation process will be dependent on the "pumpability" of the contaminated material. If the material is not pumpable, excavation will be performed with a clamshell bucket or some other mechanical digging apparatus. This dry excavation method will be used to remove the bentonite liner from the bottom of the equalization lagoon.

The sampling/excavation process will be performed until all contaminated material is removed from the lagoon. In addition to testing for metals, a soil sample will be taken from each of the excavated lagoons and analyzed for volatile organics using methods 8010, 8015 and 8020.

G. Temporary Storage of Contaminated Material

The filter cake generated by the filter press will be placed on a temporary storage pad prior to off-site shipment. This action will be taken for a couple reasons. First, the off-site shipment of the filter cake will proceed smoothly if the trucks that come onto the site can be completely loaded when they first arrive at the site. The trucks that will be used for off-site shipment will have an approximate capacity of 18 cubic yards. Since it is likely that a fleet of trucks will be used, there will need to be a stockpile of filter cake so that these trucks are not standing idle.

Once the filter press is operating, it should be capable of dewatering approximately 150,000 gallons of material a week. It will be necessary to slurry some of the sludge material that is not pumpable. It was previously noted that contractors who have performed similar work have found that approximately 125 yd^3

of filter cake can be produced each week by one filter press. This would be the equivalent to about 7 truck loads of material each week. It will be necessary to operate two filter presses to meet the time schedule. The rate of generation of this volume of filter cake should be similar to the ability of the trucks to transport this material off-site. Therefore, if transportation is initiated one week after dewatering is begun, there should always be roughly 300 yd^3 of stored material.

The storage pad built for the temporary storage of this material should have the capacity of 600 $yd.^3$ This will allow for any problems that may arise in removing and dewatering the site contaminated material. The storage pad will consist of a thick (>30 mils) liner placed on a level, solid surface. A similar liner will be placed over the filter cake at all times except for loading. The stored material will resemble a waste pile. The base liner will be approximately 100 feet by 100 feet and the cover liner will be roughly 125 feet by 125 feet.

H. Off-Site Shipment of Contaminated Material

The off-site shipment of the contaminated material will be a fairly routine exercise. The contractor involved in the removal and dewatering of the lagoon material will be responsible for loading the contaminated material into the trucks. As previously mentioned, the trucks should have an approximate capacity of 18 $yd.^3$ and must be covered during transport. It may be necessary for the contractor to place plywood or some other material over the base liner so that the loading vehicles do not rip the base liner.

It is proposed to send the contaminated material to the Stablex Canada facility in Blainville, Quebec, Canada. The facility is located approximately 20 miles north of Montreal. Because this material is being shipped out of the United States, AVCO will notify the EPA as required by 40 CFR 262.50 (b). This includes notifying the EPA Administrator in writing four weeks before the initial shipment of the waste. The waste will be identified by its EPA hazardous waste identification number and its DOT shipping description, which for the AVCO waste would be:

EPA ID#:	F006
DOT ID#:	NA 9189
Proper Shipping Name:	Hazardous waste, solid, n.o.s.
Hazard Class:	ORM-E

Additional information that will be submitted includes the name and address of the foreign consignee. All of the above information will be submitted to the following:

Office of International Activities (A-106)
U.S. EPA
Washington, D.C. 20460

AVCO will also request that Stablex Canada sign each manifest and return a copy of the signed manifest to AVCO. The transporter of the material will also be asked to submit a copy of the manifest stating the date and place of entry into Canada.

AVCO will comply with other manifest requirements under 262.20 (a) except that:

- The name, address, and EPA identification number of the foreign consignee will be used instead of the designate facility;

- The departure point from the U.S. into Canada will be identified.

AVCO will submit an exception report to the Regional I Administrator and the EPA Administrator, at the previously mentioned address, if either of the following occurs:

1. A copy of the manifest signed by the transporter stating the date and place of departure from the U.S. has not been received by AVCO within 45 days from the date it was accepted by the initial transporter; or
2. A copy of the manifest signed by Stablex Canada has not been received by AVCO within 90 days from the date it was accepted by the initial transporter.

I. Restoration of the Excavated Area

The excavated lagoons will be backfilled so that the backfilled areas can be compacted to have the same support as the surrounding land. The lagoon dike material that has not been removed will be graded to fit the natural contour of the surrounding land.

The contractor will be responsible for bringing the backfill material from off-site because of the limited soil material available on-site.

J. Decontamination of Equipment/Facilities

All equipment and AVCO facilities used during the closure process will be decontaminated prior to the equipment being removed from the site and prior to AVCO facilities being used for another purpose. Typical decontamination procedures should include steam cleaning all equipment/facilities and, if necessary, pumping the cleaning solution to the industrial wastewater treatment system. The criteria used to determine whether this water needs to be treated is if any constituents exceed their NPDES concentration limit.

K. Closure Certification

Upon completion of all closure activities, AVCO and an independent registered professional engineer will separately submit certification to the Administrator of U.S. EPA Region I and the Commissioner of the Connecticut DEP certifying that the facility has been closed in accordance with the specifications in the approved closure plan.

VI. GROUND WATER MONITORING DURING CLOSURE

The ground water monitoring sampling program will continue, as usual, during the closure activities. At this time the ground water monitoring wells are sampled on a quarterly basis. The following consititents/parameters are tested for each quarter:

Copper
Chromium (Total)
Chromium (Hexavalent)
Cadmium
Mercury
Ground Water Elevation
Nickel
Zinc
Cyanide total
Cyanide amenable
pH
Conductivity

In addition to the above constituents/parameters, the following constituents/parameters are tested for on a semi-annual basis:

Temperature
Benzylchloride
Bis (2-chloroethoxy) methane
Bis (2-chloro-2-methyl)ethylether
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon tetrachloride
Chloroacetaldehyde
Chloral
Chlorobenzene
Chloroethane
Chloroform
1-Chlorohexane
2-chloroethylvinylether
Chloromethane
Chloromethylether
Chlorotoluene
Dibromochloromethane
Dibromomethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethylene
trans-1,2-dichloroethylene
Dichloromethane
1,2-Dichloropropane
1,3-Dichloropropylene
1,1,2,2-Tetrachloroethane
1,1,1,2-Tetrachloroethane
Tetrachloroethylene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
Trichlorofluoromethane
Trichloropropane
Vinyl Chloride
TOX
TOC
Benzene
Ethylbenzene
Toluene
Xylene

All constituents/parameters that are tested on a semi-annual basis will be sampled for after closure has been completed. In addition, AVCO will continue the quarterly ground water sampling program for a year after closure of the lagoons.

It should be noted that the ground water monitoring network at AVCO consists of 13 ground water monitoring wells, which are shown in Figure 2. This network of wells provides AVCO with sufficient sampling points to detect any off-site migration of hazardous constituents.

Ground water sampling will be performed according to the Ground Water Sampling Program, which is included in the RCRA Part B application, Section XIV.

VII. CLOSURE COST ESTIMATE

The closure cost estimate for the four surface impoundments is presented in Table 4. The closure cost estimate is based on a volume of 12,000 yd^3 of contaminated material in the four surface impoundments. This volume is based on studies performed in September 1985. An additional volume of 1,500 yd^3 has been added to the previously mentioned 10,500 yd^3 contaminant volume because of potential liner contamination, additional material going to the sludge storage lagoons, and allowance for a contingency. If it is assumed that six inches of the bentonite liner will have to be removed from the equalization lagoon, this will amount to an additional contaminant volume of approximately 600 yd^3. In addition, approximately 40 yd^3 of sludge (after dewatering) is added to the sludge storage lagoons each month.

If should be noted that the cost estimate is a preliminary cost estimate and it will be further defined when contractor bids are received to perform the closure activities. The final cost of the closure will not be known until confirmation sampling determines that no further contamination exists in the lagoons.

TABLE 4 - CLOSURE COST ESTIMATE

The following assumptions have been made concerning closure. The unit costs and construction activities associated with closure are shown below.

Volume of Standing Liquid on the Lagoons at Closure (gallons)	200000
Volume of Contaminated Material (Cubic yards)	12000

Capital Costs

Unit Costs

Haul Distance for Backfill (miles):	5
Haul Cost for Backfill ($/cu.yd.-mile)	0.29
Labor Cost for Soil Sampling ($/hr.):	80
Soil Excavation Sampling (Labor-hr./sample):	2
Soil Sampling-Drilling Cost ($/sample):	60
Soil Sample Cost-Organics (Volatiles) ($/sample):	250
Soil Sample Cost-EP Toxicity ($/sample):	275
Buy and Place Backfill ($/cu.yd.):	4.91
Cost for removing, dewatering, and loading the contaminated material for off-site shipment ($/gallon of processed material)	0.12
Labor Cost for Contruction ($/hr):	46.5
Treatment Cost of Liquids (inc. Sludge Disposal) ($/gallon)	0.015

Capital Cost Estimate

Clearing Site/Site Preparation	$5.000
Soil Confirmation Sampling-EP Toxicity (120)	$56.400
Soil Confirmation Sampling-Organics (Volatiles) (8)	$3.960
Treatment of Standing Liquids	$3.000
Removal, Dewatering, and Loading of Contaminated Material	$288.000
Treatment of Filtrate from Dewatering	$18.000
Backfill Excavated Area	$76.320
SUBTOTAL	$450.680
Eng., Design, Spec's & Insp. @20%:	$90.136
Legal and Administration @3.0%:	$13.520
Contingency @10%	$45.068
TOTAL CAPITAL COSTS(w/o Off-site Mngt)	$599.404

1) Disposal at the Stablex Canada Facility near Montreal, Canada: (A 15% increase in material vol. is incl.)

Treat/Disp. Cost	$95	/cu.yd	$1,311.000
Transportation (@18 cu.yd/Truck Load)	$1,200	/Truck Load	$920.000
TOTAL OFF-SITE COST			$2.231.000
TOTAL CLOSURE COST			$2,630.404

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

NPDES PERMIT

Avco Lycoming - Stratford Army Engine Plant
550 South Main Street
Stratford, CT 06497

Attention: Mr. Peter Bonitatebus, Manager
Engineering

RECEIVED
AUG - 5 1985

Re: DEP/WPC-138-023
Town of Stratford
Housatonic River Watershed

Gentlemen:

This permit is issued in accordance with Subsection e of Section 22a-430 of Chapter 446k, Connecticut General Statutes and Section 402(b) of the Federal Water Pollution Control Act, as amended, 33 USC 1251, et. seq. and pursuant to an approval dated September 26, 1973 by the Administrator of the United States Environmental Protection Agency for the State of Connecticut to administer an NPDES permit program.

This action is further found to be consistent with the applicable policies of the Connecticut Coastal Management Act (Section 22a-92 of the Connecticut General Statutes, as amended by Section 2 of Public Act 79-535).

The Commissioner has determined that compliance with this permit will ensure that best available technology economically achievable is achieved.

The Commissioner has determined that Avco Lycoming is in full compliance with the provisions of Order No. 2453 entered on May 20, 1980. The Commissioner, acting under Section 22a-430, hereby permits Avco Lycoming to discharge stormwater, cooling water, boiler blowdown and treated metal finishing wastewaters in accordance with the following conditions.

1) The wastewater shall be collected, treated and discharged in accordance with the plans and specifications approved by the Assistant Deputy Commissioner on May 31, 1984 and the authorization of the Commissioner dated

2) The discharges described in this permit shall not exceed and shall otherwise conform to the specific terms and general conditions specified herein:

A) Discharge Serial No. 001, 002, 003, 004, 005, 006
Description - Intermittent stormwater (code 1080000)
Receiving Stream - Housatonic River (basin code 6000)
Present/Future Water Quality Standard - SC/SB
Average Daily Flow (wet weather) - Intermittent

Phone:
165 Capitol Avenue • Hartford, Connecticut 06106
An Equal Opportunity Employer

Parameter	Code	Maximum Daily Concentration	Average Monthly Concentration
Total Oil and Grease	622	15.0 mg/l	10.0 mg/l
Phenols	820	0.2 mg/l	0.1 mg/l
Total Suspended Solids	614	30.0 mg/l	20.0 mg/l

1. The pH of the discharge shall not be less than 6.0 or greater than 9.0. (code 609)
2. The discharge shall not contain or cause in the receiving stream a visible oil sheen or floating solids.
3. The discharge shall not cause visible discoloration or foaming in the receiving waters beyond any zone of influence as provided in the "Connecticut Water Quality Standards & Criteria" adopted September 9, 1980.
4. The temperature of the discharge shall not increase the temperature of the receiving stream above 85 degrees F or raise the normal temperature of the receiving stream more than 4 degrees F beyond any zone of influence as provided in the "Connecticut Water Quality Standards & Criteria" adopted September 9, 1980.
5. The maximum daily concentration specified above shall not be exceeded by more than a factor of 1.5 at any time as measured by a grab sample.

B) Discharge Serial No. 007
Description - Non-contact cooling water and boiler blowdown, stormwater (code 108000C)
Receiving Stream - Housatonic River (basin code 6000)
Present/Future Water Quality Standard - SC/SB
Average Daily Flow - 1,836,000 gallons per day } ?
Design Flow Rate - 4,166 gallons per minute

Parameter	Code	Maximum Daily Concentration	Average Monthly Concentration
Total Oil and Grease	622	15.0 mg/l	10.0 mg/l
Phenols	820	0.2 mg/l	0.1 mg/l
Total Suspended Solids	614	30.0 mg/l	20.0 mg/l

1. The pH of the discharge shall not be less than 6.0 or greater than 9.0. (code 609)
2. The discharge shall not contain or cause in the receiving stream a visible oil sheen or floating solids.
3. The discharge shall not cause visible discoloration or foaming in the receiving waters beyond any zone of influence as provided in the "Connecticut Water Quality Standards & Criteria" adopted September 9, 1980.
4. The temperature of the discharge shall not increase the temperature of the receiving stream above 85 degrees F or raise the normal temperature of the receiving stream more than 4 degrees F beyond any zone of influence as provided in the "Connecticut Water Quality Standards & Criteria" adopted September 9, 1980.
5. The maximum daily concentration specified above shall not be exceeded by more than a factor of 1.5 at any time as measured by a grab sample.

C) Discharge Serial No. 008
Description - Treated metal finishing wastewaters (code 101035Z)
Receiving Stream - Housatonic River (basin code 6000)
Present/Future Water Quality Standard - SC/SB
Average Daily Flow - 190,000 gallons per day
Design Flow Rate - 400 gallons per minute

Parameter	Code	Maximum Daily Concentration	Average Monthly Concentration
Cadmium	107	0.5 mg/l	0.1 mg/l
Chromium, Total	109	2.0 mg/l	1.0 mg/l
Chromium, Hexavalent	108	0.2 mg/l	0.1 mg/l
Copper	111	2.0 mg/l	1.0 mg/l
Nickel	119	2.0 mg/l	1.0 mg/l
Iron	113	4.0 mg/l	2.0 mg/l
Zinc	127	2.0 mg/l	1.0 mg/l
Total Suspended Solids	614	20.0 mg/l	15.0 mg/l
Total Toxic Organics	628	1.0 mg/l	-

1. The pH of the discharge shall not be less than 6.0 or greater than 10.0. (code 609)
2. The discharge shall not contain or cause in the receiving stream a visible oil sheen or floating solids.
3. The discharge shall not cause visible discoloration or foaming in the receiving waters beyond any zone of influence as provided in the "Connecticut Water Quality Standards & Criteria" adopted September 9, 1980.
4. The temperature of the discharge shall not increase the temperature of the receiving stream above 85 degrees F or raise the normal temperature of the receiving stream more than 4 degrees F beyond any zone of influence as provided in the "Connecticut Water Quality Standards & Criteria" adopted September 9, 1980.
5. The maximum daily concentration specified above shall not be exceeded by more than a factor of 1.5 at any time as measured by a grab sample.

D) Discharge Serial No. 008A
Description - Cyanide wastewaters after pretreatment (code 101035N)
Receiving Stream - Housatonic River (basin code 6000)
Present/Future Water Quality Standard - SC/SB
Average Daily Flow - 1,600 gallons per day

Parameter	Code	Maximum Daily Concentration
Cyanide, Amenable	504	0.32 mg/l
Cyanide, Total	505	0.65 mg/l

1. The pH of the discharge shall not be less than 6.0 or greater than 10.0. (code 609)
2. The maximum daily concentration specified above shall not be exceeded by more than a factor of 1.5 at any time as measured by a grab sample.

3) This permit authorizes the discharge of wastewater pollutants as described in paragraph 2 above and in the permit application submitted by Avco Lycoming - Stratford Army Engine Plant on February 1, 1985. The discharge of any such pollutants in quantities or concentrations greater than those so authorized or the discharge of any other pollutant in a quantity or concentration which has or may have an adverse impact on the receiving waters is prohibited.

4) The discharges shall be monitored and results reported to the Director of Water Compliance by the 10th of each month according to the following schedule:

A) Discharge Serial Nos. 001, 002, 003, 004, 005 and 006

Parameter	Code	Minimum Frequency of Sampling	Sample Type
Total Oil and Grease	622	Monthly(if discharge occurs)	Daily Composite
Phenols	820	Monthly(if discharge occurs)	Daily Composite
Total Suspended Solids	614	Monthly(if discharge occurs)	Daily Composite
pH	609	Monthly(if discharge occurs)	Range during compos

1. Record the total flow (code 626) and number of hours of discharge (code 629) for each day of sample collection.
2. The report shall include a detailed explanation of any violations of the limitations specified in paragraph 2 above.

B) Discharge Serial No. 007

Parameter	Code	Minimum Frequency of Sampling	Sample Type
Total Oil and Grease	622	Monthly	Daily Composite
Phenols	820	Monthly	Daily Composite
Total Suspended Solids	614	Monthly	Daily Composite
pH	609	Monthly	Range during composite
1,1,1 Trichloroethane	460	Monthly	Daily Composite
Toluene	881	Monthly	Daily Composite

C) Discharge Serial No. 008

Parameter	Code	Minimum Frequency of Sampling	Sample Type
Cadmium	107	Weekly	Daily Composite
Chromium, Total	109	Weekly	Daily Composite
Chromium, Hexavalent	108	Weekly	Daily Composite
Copper	111	Weekly	Daily Composite
Nickel	119	Weekly	Daily Composite
Iron	113	Weekly	Daily Composite
Zinc	127	Weekly	Daily Composite
Cyanide, Total	505	Weekly	Daily Composite
Total Suspended Solids	614	Weekly	Daily Composite
Total Toxic Organics	628	Weekly	Daily Composite
pH	609	Weekly	Range during composite

1. Record the total flow (code 626) and number of hours of discharge (code 629) for each day of sample collection.
2. The report shall include a detailed explanation of any violations of the limitations specified in paragraph 2 above.
3. In lieu of analyzing for total toxic organics, each monthly report may include a statement certifying compliance with a Solvent Management Plant in accordance with 40 CFR 433.12 Metal Finishing.

D) Discharge Serial No. 008A

Parameter	Code	Minimum Frequency of Sampling	Sample Type
Cyanide, Amenable	504	Weekly	Grab
Cyanide, Total	505	Weekly	Grab
pH	609	Weekly	Grab

1. Record the total flow (code 626) for each day of sample collection.
2. The report shall include a detailed explanation of any violations of the limitations specified in paragraph 2 above.

5) The treatment facilities or any part thereof shall not be bypassed at any time without the prior written approval of the Commissioner unless such bypass is unavoidable to prevent loss of life, personal injury or severe property damage. If any part of the waste treatment or collection facilities becomes inoperative at any time, the Water Compliance Unit shall be notified immediately during normal business hours (8:30 a.m. to 4:30 p.m. Monday through Friday), or on the next business day if the incident occurs outside these hours. A written report shall follow, giving the cause of the problem, duration and corrective measures taken.

6) The disposal of screenings, sludges and other solids or oils and other liquid chemical wastes shall be at locations approved in accordance with the provisions of Chapter 446k of the Connecticut General Statutes or to waste haulers licensed under Chapter 446k of the Connecticut General Statutes.

7) Process controls or such other means or facilities as approved by the Assistant Deputy Commissioner on May 31, 1984 shall be maintained to insure that no discharge of untreated or partially treated wastewaters will occur during a failure of the primary power source.

This permit shall be considered as the permit required by Section 402 of the Federal Water Pollution Control Act and Section 22a-430 of the Connecticut General Statutes and shall expire on the 29th day of July, 1990.

This permit shall be subject to all NPDES General Conditions dated April 27, 1979 which are hereby incorporated into this permit, except as superceded by the following definitions:

A. "Average Monthly Concentration" means the average concentration of all Daily Composite samples taken in a particular month.

B. "Maximum Daily Concentration" means the maximum concentration allowed in a Daily Composite sample.

C. "Daily Composite" means a composite sample taken over a full operating day for as long as the discharge exists on that day.

D. "Composite" means a mixture of aliquot samples collected at regular intervals over a time period, proportional to flow or the sampling interval (for constant volume samples), or a sample collected continuously, proportional to flow over the same time period.

The Commissioner reserves the right to make appropriate revisions to the permit in order to establish any appropriate effluent limitations, schedules of compliance or other provisions which may be authorized under the Clean Water Act in order to bring all discharges not in compliance with the Clean Water Act.

Entered as a permit of the Commissioner on this 29th day of July, 1985.

Stanley J. Pac
Stanley J. Pac
COMMISSIONER

NPDES No. CT 0002984

State Application No. 85-037

XVI. SURFACE IMPOUNDMENT OPERATION

This section outlines how AVCO will operate the four existing surface impoundments to comply with specific Part B information requirements for surface impoundments in Part 270.17.

The four surface impoundments at the AVCO facility are operated as storage units. The function of the equalization lagoon and the three sludge storage lagoons was described in Section II. As previously mentioned, the equalization lagoon stores industrial wastewater containing the following constituents:

chromium (trivalent and hexavalent)
cadmium
copper
magnesium
nickel
zinc
cyanides

The material that is discharged to the sludge storage lagoons from the industrial wastewater treatment system contains hydroxides of trivalent chromium, cadmium, copper, nickel, and zinc. Cyanides should not be present in the sludge storage lagoons because they are oxidized, via alkaline chlorination, in the wastewater treatment system. Likewise, hexavalent chromium should not be present in the sludge storage lagoons because it is reduced to trivalent chromium in the treatment system.

The surface impoundments have been operated since 1958. The sludge storage lagoons were originally designed as sludge drying beds. However, as the hydroxide sludge settled and lined the lagoons, the amount of percolation has decreased considerably. Evaporation is now a larger contributor to sludge thickening than percolation. Because of the original intent to have the sludge storage lagoons operate as sludge drying beds, none of the sludge storage lagoons are lined.

AVCO has implemented a ground water monitoring program according to 40 CFR Part 265 Subpart F to monitor the ground water quality in the vicinity of the surface impoundments. This program is designed to meet the requirements of Part 264 Subpart F. The ground water monitoring program is described in detail in Section XIV.

The sludge storage lagoons are operated so that any one of the three lagoons can receive the metal hydroxide slurry from the wastewater treatment system. The ability to select which lagoon receives the metal hydroxide slurry allows the surface impoundment operator to control the level of liquid in each impoundment and maintain a minimum two feet of freeboard.

The equalization lagoon is operated strictly as a wastewater storage basin. Because this lagoon stores untreated wastewater, it is lined with a bentonite liner. The liquid level in the equalization lagoon can be controlled in two different manners. The wastewater, prior to being pumped to the equalization lagoon, is stored in a sump tank. Typically the wastewater is pumped from the sump tank to the equalization lagoon over an eight-hour period, from 8:00 a.m. to 4:00 p.m. The wastewater is pumped from the equalization lagoon to the industrial wastewater treatment system over the same eight-hour period. Therefore, there is the capability of controlling the liquid level in the impoundment by pumping the wastewater out of the equalization lagoon or by stopping the flow of wastewater into the lagoon. The operator of the equalization lagoon is therefore able to maintain a minimum freeboard of two feet.

The surface impoundments will be operated and maintained so that there is a minimum of two feet of freeboard. The impoundment dikes are structurally sound, and will be maintained until the impoundments are closed in May 1986. Some of the dikes have been recently rehabilitated to ensure successful operation of the impoundments.

A certification by a qualified engineer which attests to the structural integrity of each dike has not been obtained because the four surface impoundments will be closed in May 1986.

The surface impoundments are located in a floodplain. To prevent flood water from overtopping the impoundment dikes, a dike is located around the AVCO facility which will prevent a 100-year flood from reaching the facility. The dike around the facility may allow the crests of waves from a 100-year flood to enter the facility, but this should contribute very little water to the area (see the discussion in Section III regarding the prevention of the flood waters from reaching the surface impoundments).

The four surface impoundments will be inspected weekly and after storms to detect evidence of any of the following:

1. Deterioration, malfunctions, or other signs that the sump tank pump and equalization lagoon pump are operational. These pumps serve to control the liquid level in the lagoon.
2. Sudden drops in the level of the impoundments' contents.
3. Severe erosion or other signs of deterioration in dikes or other containment devices.

Further detail on the inspection program for the surface impoundments is discussed in Section VII.

The procedure to remove a surface impoundment from service has been discussed in Section IX. The closure plan, which is presented in Section XV, describes how hazardous waste residues and contaminated material will be removed from the impoundments at closure. Since all waste materials and residues defined as being contaminated by the U.S. EPA and Connecticut DEP will be removed at closure, AVCO does not need to comply with 264.228(b).

There are no ignitable wastes that knowingly enter any of the four surface impoundments. The only waste constituent that could be considered reactive or incompatible is cyanide. However, the concentration of cyanide in the equalization lagoon is very small. This is because the majority of wastewater containing cyanides is rinsewater that has been used to clean plating pieces. Of the total 192,000 gallons per day of wastewater flowing to the equalization lagoon, only 1,600 gallons per day of this total are cyanide-containing wastewaters. Therefore, the cyanides are diluted in the rinsewater and are again diluted by the other non-cyanide-containing wastewater flows.

Cyanides should not be present in the sludge storage lagoons, because they are oxidized in the wastewater treatment system prior to being discharged to the sludge storage lagoons.

AVCO does not generate wastes that could be defined by EPA hazardous waste numbers F020, F021, F022, F023, F026 or F027. Therefore, AVCO does not need to address those requirements contained in Part 270.17 (j).

Table 1

AVCO-LYCOMING DIVISION
OBSERVATIONAL DATA ON
MONITOR WELL SAMPLING
March 31, 1982

Well	SWL (ft below TOC) a/	Elevation of TOC b/ (ft-MSL)	Elevation of SWL (ft-MSL)	Comment
1	8.25	12.91	4.66	Sulfur odor, trace of black fibrous material, yellow tint
2	8.03	12.59	4.56	Strong sulfur odor, greenish tint
3	7.09	11.81	4.72	Sulfur odor, yellow tint
4	4.86	9.47	4.61	Slight sulfur odor, yellow tint
5	7.64	13.60	5.96	Slight sulfur odor, yellow tint

a/ TOC is TOP OF CASING; the water-level measuring point.

b/ Elevations taken from Appendix G, Groundwater Monitoring Section, Report t
AVCO-Lycoming Division, Roy Weston, Inc.,

Table 2

AVCO-LYCOMING DIVISION
STRATFORD, CONNECTICUT

Calculated Values of Arithmetic Mean
and Variance for Contamination Index
Parameters Based on Four Replicate Analyses
Sampling on March 31, 1982

Well	Total organic halogen (mg/l)		Total organic carbon (mg/l)		pH		Specific conductance (umhos)	
	mean	variance	mean	variance	mean	variance	mean	variance
1	112	0.19 1/	83.00	3.87	6.29	$7.5x10^{-5}$	3570	150
2	152	84.50	100.05	1.59	6.49	$7.5x10^{-5}$	5438	1718.75
3	73.25	36.69	94.06	17.26	6.795	$7.5x10^{-5}$	4470	48,850
4	829.25	155.69	87.56	9.39	6.2	$7.5x10^{-5}$	3432.5	118.75
5	884.50	40.75	87.59	4.67	5.48	$4.68x10^{-4}$	981.0	1.0

BARON CONSULTING CO.
HA AGAHIGIAN, Ph.D., DIRECTOR
analytical services
P.O. BOX 663, ORANGE CT. 06477

April 21, 1982

To: Mr. J. Naso
Leggette, Brashears & Graham Inc.
Consulting Ground-Water Geologists
72 Danbury Rd.
Wilton, Conn. 06897

From: Robert O. Blake, Jr. , David Ditta

Re: Analysis of Avco Lycoming Water Samples BC# 33202

	1	2	3	4	5
Hg	ND<0.001	ND<0.001	ND<0.001	ND<0.001	ND<0.001
As	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Ba	.096	.096	.19	.048	.096
Cd	ND<.005	ND<.005	ND<.005	ND<.005	ND<.005
Pb	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Cr (total)	.048	.024	.024	.024	.10
Se	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Ag	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Fe	7.90	7.30	29.20	1.80	27.10
Mn	.49	4.00	12.60	.15	2.80
Na	451.00	838.00	559.00	539.00	102.00
F	.70	.64	.12	.33	.92
SO_4	612.00	587.20	483.60	233.00	354.20
NO_3 as N	19.50	28.00	22.00	33.00	28.00
pH	6.30 6.28 6.30 6.30	6.50 6.50 6.48 6.50	6.80 6.80 6.80 6.78	6.20 6.22 6.22 6.22	5.50 5.45 5.50 5.50
Cl.	673.20	1194.00	930.00	831.00	132.00
Endrin	ND<0.0002	ND<0.0002	ND<0.0002	ND<0.0002	ND<0.0002
Lindane	ND<.004	ND<.004	ND<.004	ND<.004	ND<.004
Toxaphene	ND<.005	ND<.005	ND<.005	ND<.005	ND<.005
Methoxy-chlor	ND<.10	ND<.10	ND<.10	ND<.10	ND<.10
2,4D	ND<.10	ND<.10	ND<.10	ND<.10	ND<.10
Silvex	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
TOX	1.00 .50 1.24 1.72	155.00 165.00 148.00 140.00	70.00 78.00 65.00 80.00	819.00 850.00 820.00 828.00	868.00 900.00 890.00 880.00

 BC# 33202

TOC	82.50 85.90 80.40 83.20	99.00 100.24 102.50 100.85	92.00 89.00 95.00 100.25	85.05 91.10 90.05 84.02	87.10 84.50 90.50 88.25
Phenols	ND<.05	ND<.05	ND<.05	ND<.05	ND<.05
Coliforms*	TNTC	TNTC	TNTC	TNTC	TNTC
Specific Conductance (umhos)	3570 3590 3560 3560	5450 5500 5400 5400	4850 4360 4300 4370	3430 3450 3420 3430	980 982 982 980
Radium (pci/l)	.15	.12	.20	.20	.21
Gross Beta (pci/l)	.50	.50	.80	.80	.90
Gross Alpha (pci/l)	2.0	1.4	1.9	1.9	2.1

All values are expressed in mg/l unless otherwise designated.

* We suggest re-sampling.

Robert O. Blake Jr

ROB/rsb

Robert O. Blake, Jr.
Baron Consulting Co.

Table 1

AVCO-LYCOMING DIVISION
OBSERVATIONAL DATA ON
MONITOR WELL SAMPLING
June 29, 1982

Well	SWL (ft below TOC)[a/]	Elevation of TOC[b/] (ft-MSL)	Elevation of SWL (ft-MSL)	Comment evacuation discharge/sample
1	7.42	12.91	5.49	black to gray, strong sulfur; green tint strong sulfur odor
2	7.25	12.59	5.34	gray, pungent, same odor
3	6.33	11.81	5.48	yellow tint, slight odor; yellow tint, slight odor
4	4.06	9.47	5.41	green tint, sulfur odor; same
5	7.31	13.60	6.29	gray, sulfur odor; clear, slight sulfur odor

a/ TOC is TOP OF CASING; the water-level measuring point.

b/ Elevations taken from Appendix G, Groundwater Monitoring Section, Report to AVCO-Lycoming Division, Roy Weston, Inc.,

BARON CONSULTING CO.

BARON AGAHIGIAN, Ph.D., DIRECTOR

analytical services

P.O. BOX 663, ORANGE CT. 06477

August 11, 1982

3(d

To: Mr. J. Naso
Leggette, Brashears & Graham Inc.
Consulting Ground-Water Geologists
72 Danbury Rd.
Wilton, Conn. 06897

From: Robert O. Blake, Jr.

Re: Analysis of Avco Lycoming Samples
BC# 34039

	1	2	3	4	5
As	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Ba	.[illegible]0	.20	.21	.40	ND<.05
Cd	ND<.005	ND<.005	ND<.005	ND<.005	ND<.005
Pb	ND<.02	ND<.02	ND<.02	.10	ND<.02
Cr (Total)	.10	.11	.11	.30	.10
Se	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Ag	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Fe	20.20	16.71	27.20	150.4	17.1
Mn	.40	5.30	15.80	2.71	5.11
Na	475.20	818.80	737.51	675.00	150.22
F	1.80	.40	ND<.01	.40	4.10
SO_4	487.90	570.9	291.6	232.0	247.1
Nitrate as N	38.40	29.6	48.0	20.8	41.6
Turbidity	500	250	500	2500	250
Cl	467.3	990.0	1006.5	874.5	168.3
pH	6.52	7.12	7.00	6.43	6.88
	6.55	7.10	7.00	6.45	6.90
	6.55	7.12	7.05	6.45	6.90
	6.55	7.12	7.05	6.45	6.89
Specific Cond. (u mhos)	2910	4300	4410	3200	947
	2915	4290	4420	3220	950
	2920	4290	4415	3220	950
	2915	4290	4410	3220	950
TOC	66.0	49.0	363.0	49.0	33.0
	60.5	52.0	349.0	52.0	27.0
	64.5	51.5	340.0	52.9	27.9
	64.9	48.9	357.5	49.9	30.3
Phenols	ND<.05	ND<.05	ND<.05	ND<.05	ND<.05
Coliform Colonies / 100ml	40	0	0	0	0

	1	2	3	4	5
Radium pCi/l	.10	.11	.10	.10	.11
Beta pCi/l	.4	.4	.5	.4	.4
Gross Alpha pCi/l	1.1	1.4	2.0	1.0	1.0
Endrin	ND<0.002	ND<0.002	ND 0.002	ND 0.002	ND<0.002
Lindane	ND<0.004	ND<0.004	ND 0.004	ND<0.004	ND<0.004
Methoxychlor	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
Toxaphene	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
2,4 D	ND<0.10	ND<1.10	ND<0.10	ND<0.10	ND<0.10
Silvex	ND<0.01	ND<0.01	ND<0.01	ND<0.01	ND<0.01
TOX	ND<0.02 ND<0.02 ND<0.02 ND<0.02	ND<0.02 ND<0.02 ND<0.02 ND<0.02	ND<0.02 ND<0.02 ND<0.02 ND<0.02	ND<0.02 ND<0.02 ND<0.02 ND<0.02	ND<0.02 ND<0.02 ND<0.02 ND<0.02

All results are in mg/l unless otherwise stated.

Robert O. Blake, Jr.

Robert O. Blake, Jr.
Baron Consulting Company

BARON CONSULTING CO.

ARRY AGAHIGIAN, Ph.D., DIRECTOR

analytical services

P.O. BOX 663, ORANGE CT. 06477

August 24, 1982

To: Mr. J. Naso
Leggette, Brashears & Graham Inc.
Consulting Ground-Water Geologists
72 Danbury Rd.
Wilton, Conn. 06897

From: Dr. Harry Agahigian

Re: Analysis of Avco Lycoming Samples BC# 34039

I have reviewed our procedures and found we were having a problem in the purging of the samples. The purgable total organic halides is less than 5 ppb for each sample of the second set.

We repeated the samples and found non-purgables much lower values for the first series. Since it appears that almost a factor of 1000 exists between the first and second series that there must have been error. The numbers do not make sense because the other analysis are not consistent. There was some confusion relative to our non-purgable standard so I am certain that was the problem with the first set.

Sorry for the mix-up.

Harry Agahigian

Harry Agahigian, Ph. D.
Chief Consultant

HA/rsb

APPENDIX A

Previously Collected Ground

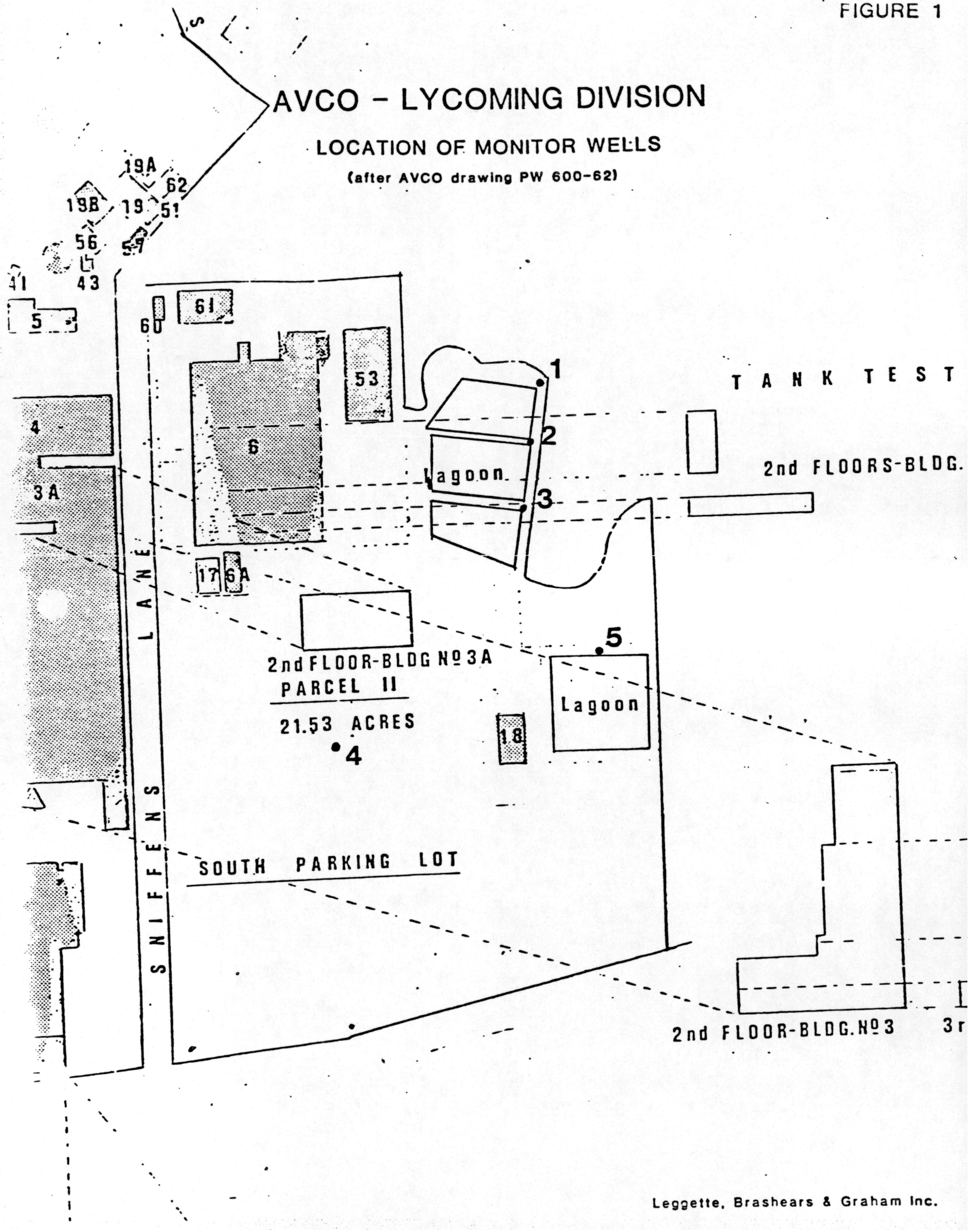
Water Monitoring Data

FIGURE 1

AVCO – LYCOMING DIVISION

LOCATION OF MONITOR WELLS

(after AVCO drawing PW 600-62)



Leggette, Brashears & Graham Inc.

TABLE 1

AVCO-LYCOMING DIVISION

Observational Data on Monitor Well Sampling
September 29, 1982

Well	SWL (ft below TOC) a/	Elevation of TOC b/ (ft-MSL)	Elevation of SWL (ft-MSL)	Comment evacuation discharge/sample
1	8.47	12.73	4.26	Green tint, slight sulfur odor; sample same.
2	8.27	12.54	4.27	Dark gray with silt, strong sulfur odor; green tint, strong sulfur odor.
3	7.37	11.76	4.39	Dark gray, black silt; clear, slight sulfur odor.
4	5.04	9.36	4.32	Green tint, very slight sulfur odor; sample same.
5	8.22	13.62	5.40	Gray to green, slight sulfur odor; dark gray, slight sulfur odor.

a/ TOC is TOP OF CASING; the water-level measuring point.

b/ Elevations from personal communication with M. Nosenzo (Weston update) on September 29, 1982.

TABLE 2

AVCO-LYCOMING DIVISION

Arithmetic Mean and Variance For Monitor Wells
Sampled During the First Year of EPA/RCRA Ground Water Monitoring

Well	pH		Specific conductance		TOX[1/]		TOC	
	Mean	Variance	Mean µmhos/cm	Variance $(\mu mhos/cm)^2$	Mean mg/l	Variance $(mg/l)^2$	Mean mg/l	Variance $(mg/l)^2$
1	6.58	0.05	3,340	126,620	0.44 (0.21)	0.297 (0.036)	50.21	834
2	6.81	0.09	4,300	1.67×10^6	38.2 (0.27)	5,780 (0.064)	52.90	1,110
3	6.91	0.01	4,400	23,850	18.4 (0.08)	1,350 (0.004)	134.39	21,750
4	6.65	0.10	3,780	1.91×10^6	207.5 (0.23)	171,870 (0.024)	52.96	904
5	6.54	0.56	4,950	6.37×10^7	221.6 (0.66)	195,340 (0.076)	81.41	7,060

1/ Values in parantheses were calculated excluding the suspect second-quarter TOX data.

BARON CONSULTING CO.

HARDY AGAHIGIAN, Ph.D., DIRECTOR

analytical services

P.O. BOX 663, ORANGE CT. 06477

October 27, 1982

To: Mr. John Naso
Leggette, Brashears & Graham Inc.
Consulting Ground-Water Geologists
72 Danbury Rd.
Wilton, Conn. 06897

From: David Ditta

Re: Avco Lycoming Water Samples

Enclosed are corrected copies for the three sets of Avco Lycoming Water Samples. Mercury was tested for in all sets of samples but was omitted from the original reports. The values for lead and Endrin were incorrectly typed on the original reports.

We regret any inconvenience.

David Ditta

David Ditta, Chemist
Baron Consulting Co.

DD/rsb

BARON CONSULTING CO.

H .Y AGAHIGIAN, Ph.D., DIRECTOR

analytical services

P.O. BOX 663, ORANGE CT. 06477

October 8, 1982

LEGGETTE, BRASHEARS & GRAHAM
RECEIVED
OCT 27 1982

To: Mr. John Naso
Leggette, Bradhears & Graham Inc.
Consulting Ground-Water Geologists
72 Danbury Rd.
Wilton, Conn. 06897

From: Robert O. Blake, Jr., David Ditta

Re: Analysis of Avco Lycoming Samples BC# 34880

	1	2	3	4	5
Hg	ND<0.001	ND<0.001	ND<0.001	ND<0.001	ND<0.001
As	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Ba	.49	.39	.39	.58	.39
Cd	ND<.01	ND<.01	ND<.01	ND/.01	ND/.01
Pb	ND<.01	ND<.01	ND<.01	ND/.01	ND/.01
Cr(total)	.29	.27	.21	.37	.69
Se	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Ag	ND<.01	.75	ND<.01	ND<.01	ND<.01
Fe	35.33	10.67	19.00	11.33	27.67
Mn	.59	2.03	10.08	.45	2.02
Na	419.48	726.60	629.22	397.00	2809.03
F	.27	.18	ND<.01	.04	.40
SO_4	800.4	741.8	99.0	74.7	741.1
Nitrate as N	.72	2.56	1.64	1.16	1.32
Turbidity(JTU)	80	80	160	80	400
Cl	1782.0	1106.2	1089.5	677.4	4241.7
pH	6.76;6.80 6.80;6.79	7.01;6.99 7.00;7.00	6.90;6.89 6.91;6.91	6.64;6.65 6.65;6.65	6.58; 6.59 6.59; 6.59
Specific Cond. (μmhos)	3685;3690 3690;3690	5000;4990 4990;4990	4276;4280 4276;4276	2690;2685 2685;2687	16,900; 16,950 16,900; 16,945
Phenols	0.63	ND/0.05	0.10	0.10	0.15
Coliform Colonies /100 mls	0	0	0	0	0
Radium pCi/l	<.01	<.01	<.01	<.01	<.01
Beta pCi/l	.01	.01	.01	.01	.01
Gross Alpha pCi/l	.01	.01	.01	.01	.01

 Analysis of Avco Lycoming Samples BC# 34880

	1	2	3	4	5
Endrin	ND<0.0002	ND<0.0002	ND<0.0002	ND<0.0002	ND<0.0002
Lindane	ND<0.004	ND<0.004	ND<0.004	ND<0.004	ND<0.004
Toxaphene	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Methoxychlor	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
2,4D	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
Silvex	ND<0.01	ND<0.01	ND<0.01	ND<0.01	ND<0.01
TOC	19.79;19.90	28.05;29.00	51.15;50.95	19.80;20.01	197.60;198.00
	20.00;19.70	29.00;28.85	50.85;51.00	20.12;19.90	196.24;198.14
TOX (ppb.)	50;42	560;610	52;58	115;118	750;790
	46;41	545;575	60;56	105;120	765;810

All values are in mg/l unless otherwise stated.

Please review the data & contact us if you wish more information.

Robert O. Blake Jr

ROB/rsb

Robert O. Blake, Jr.
Baron Consulting Co.

BARON CONSULTING CO.

HARRY AGAHIGIAN, Ph.D., DIRECTOR

analytical services

P.O. BOX 663, ORANGE CT. 06477

July 23, 1982

LEGGETTE, BRASHEARS & GRAHAM
RECEIVED
OCT 27 1982

To: Mr. J. Naso
Leggette, Brashears & Graham Inc.
Consulting Ground-Water Geologists
72 Danbury Rd.
Wilton, Conn. 06897

From: Robert O. Blake, Jr, David Ditta

Re: Analysis of Avco Lycoming Samples
BC# 34039

	1	2	3	4	5
Hg	ND<0.001	ND<0.001	ND<0.001	ND<0.001	ND<0.001
As	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Ba	.10	.20	.21	.40	ND<.05
Cd	ND<.005	ND<.005	ND<.005	ND<.005	ND<.005
Pb	ND<.01	ND<.01	ND<.01	.10	ND<.01
Cr (total)	.10	.11	.11	.30	.10
Se	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Ag	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Fe	20.20	16.71	27.20	150.4	17.1
Mn	.40	5.30	15.80	2.71	5.11
Na	475.20	818.80	737.51	675.00	150.22
F	1.80	.40	ND<.01	.40	4.10
SO_4	487.90	570.9	291.6	232.0	247.1
Nitrate as N	38.40	29.6	48.0	20.8	41.6
Turbidity	500	250	500	2500	250
Cl	467.3	990.0	1006.5	874.5	168.3
pH	6.52	7.12	7.00	6.43	6.88
	6.55	7.10	7.00	6.45	6.90
	6.55	7.12	7.05	6.45	6.90
	6.55	7.12	7.05	6.45	6.89
Specific Cond. (u mhos)	2910	4300	4410	3200	947
	2915	4290	4420	3220	950
	2920	4290	4415	3220	950
	2915	4290	4410	3220	950
TOC	66.0	49.0	363.0	49.0	33.0
	60.5	52.0	349.0	52.0	27.0
	64.5	51.5	340.0	52.9	27.9
	64.9	48.9	357.5	49.9	30.3
Phenols	ND<.05	ND<.05	ND<.05	ND<.05	ND<.05
Coliform Colonies /100 ml	40	0	0	0	0

Radium pCi/l	.10	.11	.10	.10	.11
Beta pCi/l	.4	.4	.5	.4	.4
Gross Alpha pCi/l	1.1	1.4	2.0	1.0	1.0
Endrin	ND<0.0002	ND<0.0002	ND<0.0002	ND<0.0002	ND<0.0002
Lindane	ND<0.004	ND<0.004	ND<0.004	ND<0.004	ND<0.004
Methoxychlor	ND<0.10	ND<0.10	ND<0.10	ND<0.10	ND<0.10
Toxaphene	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
2,4D	ND<0.10	ND<C.10	ND<0.10	ND<0.10	ND<0.10
Silvex	ND<0.01	ND<0.01	ND<0.01	ND<0.01	ND<0.01
TOX (ppb)	410	90	50	380	365
	470	95	53	450	325
Purgable	420	87	43	405	330
	390	79	51	410	315

All results are in mg/l unless otherwise stated.

Robert O. Blake Jr

ROB/rsb

Robert O. Blake, Jr.
Baron Consulting Co.

BARON CONSULTING CO.

H[illegible]Y AGAHIGIAN, Ph.D., DIRECTOR

analytical services

P.O. BOX 663, ORANGE CT. 06477

April 21, 1982

To: Mr. J. Naso
Leggette, Brashears & Graham Inc.
Consulting Ground-Water Geologists
72 Danbury Rd.
Wilton, Conn. 06897

From: Robert O. Blake, Jr. , David Ditta

Re: Analysis of Avco Lycoming Water Samples BC# 33202

	1	2	3	4	5
Hg	ND<0.001	ND<0.001	ND<0.001	ND<0.001	ND<0.001
As	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Ba	.096	.096	.19	.048	.096
Cd	ND<.005	ND<.005	ND<.005	ND<.005	ND<.005
Pb	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Cr (total)	.048	.024	.024	.024	.10
Se	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Ag	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
Fe	7.90	7.30	29.20	1.80	27.10
Mn	.49	4.00	12.60	.15	2.80
Na	451.00	838.00	559.00	539.00	102.00
F	.70	.64	.12	.33	.92
SO_4	612.00	587.20	483.60	233.00	354.20
NO_3 as N	19.50	28.00	22.00	33.00	28.00
pH	6.30 6.28	6.50 6.50	6.80 6.80	6.20 6.22	5.50 5.45
	6.30 6.30	6.48 6.50	6.80 6.78	6.22 6.22	5.50 5.50
Cl	673.20	1194.00	930.00	831.00	132.00
Endrin	ND<0.0002	ND<0.0002	ND<0.0002	ND<0.0002	ND<0.0002
Lindane	ND<.004	ND<.004	ND<.004	ND<.004	ND<.004
Toxaphene	ND<.005	ND<.005	ND<.005	ND<.005	ND<.005
Methoxy-chlor	ND<.10	ND<.10	ND<.10	ND<.10	ND<.10
2,4D	ND<.10	ND<.10	ND<.10	ND<.10	ND<.10
Silvex	ND<.01	ND<.01	ND<.01	ND<.01	ND<.01
TOX	1.00	155.00	70.00	819.00	868.00
	.50	165.00	78.00	850.00	900.00
	1.24	148.00	65.00	820.00	890.00
	1.72	140.00	80.00	828.00	880.00

 BC# 33202

TOC	82.50 85.90 80.40 83.20	99.00 100.24 102.50 100.85	92.00 89.00 95.00 100.25	85.05 91.10 90.05 84.02	87.10 84.50 90.50 88.25
Phenols	ND<.05	ND<.05	ND<.05	ND<.05	ND<.05
Coliforms*	TNTC	TNTC	TNTC	TNTC	TNTC
Specific Conductance (umhos)	3570 3590 3560 3560	5450 5500 5400 5400	4850 4360 4300 4370	3430 3450 3420 3430	980 982 982 980
Radium (pci/l)	.15	.12	.20	.20	.21
Gross Beta (pci/l)	.50	.50	.80	.80	.90
Gross Alpha (pci/l)	2.0	1.4	1.9	1.9	2.1

All values are expressed in mg/l unless otherwise designated.

* We suggest re-sampling.

Robert O. Blake Jr

ROB/rsb

Robert O. Blake, Jr.
Baron Consulting Co.

TABLE 1

AVCO-LYCOMING DIVISION
OBSERVATIONAL DATA ON MONITOR WELL SAMPLING
AUGUST 18, 1983

Well	SWL (ft below TOC)[a/]	Elevation of TOC (ft/MSL)[b/]	Elevation of SWL (ft/MSL)	Comments
1	8.08	10.13	2.05	Brown; strong odor
2	7.87	9.94	2.07	Black; strong odor
3	6.58	9.13	2.55	Very slow recovery; brown; strong odor
4	4.65	6.88	2.23	Light brown; moderate odor
5	7.57	11.00	3.43	Brown; strong odor
6	5.52	7.78	2.26	Clear; slight odor
7	6.05	8.32	2.27	Clear; slight odor.

a/ TOC is top of casing; the water-level measuring point
b/ U.S.C. & GS Mean Sea Level Datum

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SCIENCE
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50 WALNUT STREET • MIDDLETOWN, CONN. 06457
TELEPHONE: 347-6961

Laboratory Report

LEGGETTE, BRASHEARS & GRAHAM
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LAB REPORT NO
C-949

State Certification No. PH-0476

DATE August 18, 1983

CLIENT Mr. John Naso
LB&G
72 Danbury Road
Wilton, Connecticut 06897

CLIENT PHONE NO. 762-1207

SPECIAL INSTRUCTIONS
Avco Lycoming
Quarterly Monitoring Program

SAMPLE DESCRIPTION	TEST		RESULTS	
	Well #1	Well #2	Well #3	Well #4
pH	6.4	6.9	6.9	6.3
	mg/l	mg/l	mg/l	mg/l
Copper	0.01	<0.01	<0.01	<0.01
Chromium - total	0.08	<0.005	0.02	<0.005
Chromium - hexavalent	0.08	<0.005	0.009	<0.005
Cadmium	<0.01	0.01	0.01	<0.01
Mercury	<0.002	<0.002	<0.002	<0.002
Nickel	0.06	0.04	0.03	0.03
Zinc	0.79	0.49	0.56	0.34
Cyanide - total	0.97	0.78	0.62	0.21
Cyanide - amendable	<0.1	<0.1	<0.1	<0.1

REMARKS

August 23, 1983
DATE REPORTED

John M. D[illegible]
LABORATORY DIRECTOR

ENVIRONMENTAL SCIENCE CORPORATION
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TELEPHONE: 347-6961

Laboratory Report

LAB REPORT NO C-949

State Certification No PH-0476

CLIENT
Mr. John Naso
LB&G

DATE August 18, 1983

CLIENT PHONE NO

SPECIAL INSTRUCTIONS

SAMPLE DESCRIPTION	TEST	RESULTS

	Well #5	Well #6	Well #7
pH			
	mg/l	mg/l	mg/l
Copper	<0.01	<0.01	<0.01
Chromium - total	0.02	<0.005	<0.005
Chromium - hexavalent	0.02	<0.005	<0.005
Cadmium	<0.01	<0.01	<0.01
Mercury	<0.002	<0.002	<0.002
Nickel	0.05	0.04	0.03
Zinc	0.48	0.59	0.48
Cyanide - total	0.37	<0.1	<0.1
Cyanide - amendable	<0.1	<0.1	<0.1

REMARKS

August 23, 1983
DATE REPORTED

John M. D[illegible] (signature)
LABORATORY DIRECTOR

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Laboratory Report

LAB REPORT NO
C-949

State Certification No. PH 0476

CLIENT
Mr. John Naso
LB&G
72 Danbury Road
Wilton, Connecticut 06897

DATE
August 18, 1983

CLIENT PHONE NO
762-1207

SPECIAL INSTRUCTIONS
Avco Lycoming
Quarterly Monitoring

SAMPLE DESCRIPTION	TEST	RESULTS			
Volatile Hydrocarbons		Well #1	Well #2	Well #3	Well #4
Benzene	ppb	<5	<5	<5	<5
T[illegible]ene	ppb	<5	<5	<5	<5
Xylenes	ppb	<10	<10	<10	<10
Volatile Organics		ppb	ppb	ppb	ppb
Chloroform		<2	<2	<2	<2
Trichloroethane		<2	<2	<2	<2
Trichloroethylene		<2	<2	<2	5
Tetrachloroethylene		<2	<2	<2	<2

REMARKS

GETTE, BRASHEARS & GRAHAM
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September 1, 1983
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Laboratory Report

LAB REPORT NO: C-949

State Certification No. PH-0476

CLIENT: Mr. John Naso
LB&G

DATE: August 18, 1983

CLIENT PHONE NO:

SPECIAL INSTRUCTIONS

SAMPLE DESCRIPTION		TEST		RESULTS
Volatile Hydrocarbons		Well #5	Well #6	Well #7
Benzene	ppb	<5	<5	<5
luene	ppb	<5	<5	<5
Xylenes	ppb	<10	<10	<10
Volatile Organics		ppb	ppb	ppb
Chloroform		<2	<2	3.4
Trichloroethane		41	<2	2.7
Trichloroethylene		5	<2	2.8
Tetrachloroethylene		26	<2	<2

REMARKS

September 1, 1983
DATE REPORTED

John Bysatz [signature]
LABORATORY DIRECTOR

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State Certification No. PH-0476

CLIENT
Mr. John Naso
LB&G

DATE August 18, 1983

CLIENT PHONE NO

SPECIAL INSTRUCTIONS

SAMPLE DESCRIPTION	TEST	RESULTS
	Well #5	Well #6	Well #7
pH	6.7	6.5	6.5

REMARKS

September 1, 1983
DATE REPORTED

LABORATORY DIRECTOR

TABLE 1

AVCO-LYCOMING DIVISION
OBSERVATIONAL DATA ON MONITOR WELL SAMPLING
NOVEMBER 14, 1983

Well	SWL (ft below TOC)[a/]	Elevation of TOC (ft/MSL)[b/]	Elevation of SWL (ft/MSL)	Comments
1	8.08	10.13	2.05	Greenish tint; sulfur odor.
2	7.88	9.94	2.06	Greenish tint; sulfur odor.
3	6.64	9.13	2.49	Black due to silt (peat); sulfur odor.
4	4.85	6.88	2.03	Clear to cloudy; sulfur odor.
5	7.84	11.00	3.16	Clear; sulfur odor.
6	5.68	7.78	2.10	Clear to cloudy to brown; sulfur odor.
7	6.26	8.32	2.06	Clear; slight odor.

a/ TOC is top of casing; the water-level measuring point
b/ U.S.C. & GS Mean Sea Level Datum

TABLE 2

AVCO-LYCOMING

Summary of Monitor Well
Water-Quality Data
(Sampling Date 11/14/83)

Parameter	Present below CPWDC[1/] in monitor wells ppm[2/]	Present above CPWDC in monitor wells ppm
Copper	1-7	
Chromium (total)	3, 6	1, 2, 4, 5
Chromium (hexavalent)	ND <0.005	
Cadmium	ND <0.01	
Mercury	ND <0.002	
Nickel	1-7	
Zinc	1-7	
Cyanide (total)	5	1-3
Cyanide (amendable)	ND <0.1	
Benzene (ppb)[3/]	ND <5.0	
Toulene (ppb)	ND <5.00	
Xylenes (ppb)	ND <10.00	
1,1,1 Trichloroethane (ppb)	5	
Trichloroethylene (ppb)	1-3, 6, 7	4, 5
Tetrachloroethylene (ppb)	5	

1/Connecticut Public Water Drinking Code
2/Parts per million
3/Parts per billion

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Laboratory Report

LAB REPORT NO
C-1352

State Certification No PH-0476

DATE November 14, 1983

CLIENT
Mr. John Naso
L B & G
72 Danbury Road
Wilton, Conn. 06892

CLIENT PHONE NO 762-1207

SPECIAL INSTRUCTIONS
AVCO Lycoming Quarterly Monitoring Program

SAMPLE DESCRIPTION		TEST		RESULTS	
SAMPLE WELL NUMBER		#1	#2	#3	#4
Copper	mg/l	0.03	0.10	0.01	0.01
Chromium-total	mg/l	0.16	0.35	0.02	0.16
Chromium-hexavalent	mg/l	<0.005	<0.005	<0.005	<0.005
Cadmium	mg/l	<0.01	<0.01	<0.01	<0.01
Mercury	mg/l	<0.002	<0.002	<0.002	<0.002
Nickel	mg/l	0.05	0.04	0.02	0.08
Zinc	mg/l	0.60	0.56	0.62	0.16
pH		6.3	6.2	6.8	6.3
Cyanide Total	mg/l	0.60	0.45	0.95	<0.1
Cyanide Amenable	mg/l	<0.1	<0.1	<0.1	<0.1

REMARKS

continued on page 2

LEGGETTE, BRASHEARS & GRAHAM
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December 5, 1983
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[signature]
LABORATORY DIRECTOR

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Laboratory Report

LAB REPORT NO C-1352

State Certification No PH-0476

DATE November 14, 1983

CLIENT
Mr. John Naso
L B & G
72 Danbury Road
Wilton, Conn. 06892

CLIENT PHONE NO 762-1207

SPECIAL INSTRUCTIONS
AVCO Lycoming Quarterly Monitoring Program

SAMPLE DESCRIPTION		TEST	RESULTS	
SAMPLE WELL NUMBER		#5	#6	#7
Copper	mg/1	0.01	0.05	0.02
Chromium-total	mg/1	0.11	0.02	<0.01
Chromium-hexavalent	mg/1	<0.005	<0.005	<0.005
Cadmium	mg/1	<0.01	<0.01	<0.01
Mercury	mg/1	<0.002	<0.002	<0.002
Nickel	mg/1	0.07	0.14	0.10
Zinc	mg/1	0.44	0.36	0.18
pH		6.6	6.5	6.6
Cyanide Total	mg/1	0.17	<0.1	<0.1
Cyanide Amenable	mg/1	<0.1	<0.1	<0.1

REMARKS

continued on page 3

December 5, 1983

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Laboratory Report

LAB REPORT NO
C-1352

State Certification No PH-0476

CLIENT
Mr. John Naso
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72 Danbury Road
Wilton, Ct. 06892

DATE November 14, 1983

CLIENT PHONE NO 762-1207

SPECIAL INSTRUCTIONS
AVCO Lycoming Monitoring Program

SAMPLE DESCRIPTION	TEST	RESULTS			
SAMPLE WELL NUMBER		#1	#2	#3	#4
Volatile Hydrocarbons					
Benzene	ppb	<5	<5	<5	<5
Toulene	ppb	<5	<5	<5	<5
Xylenes	ppb	<10	<10	<10	<10
Volatile Organics					
1,1,1 Trichloroethane	ppb	<2	<2	<2	<2
Trichloroethylene	ppb	6	5	4	62
Tetrachloroethylene	ppb	<2	<2	<2	<2

REMARKS

continued page 4

December 5, 1983
DATE REPORTED

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TELEPHONE. 347-6961

Laboratory Report

LAB REPORT NO C-1352

State Certification No. PH-0476

CLIENT
Mr. John Naso
L B & G
72 Danbury Road
Wilton, Conn. 06892

DATE November 14, 1983

CLIENT PHONE NO 762-1207

SPECIAL INSTRUCTIONS
AVCO Lycoming Quarterly Monitoring Program

SAMPLE DESCRIPTION		TEST		RESULTS
SAMPLE WELL NUMBER		#5	#6	#7
Volatile Hydrocarbons				
Benzene	ppb	<5	<5	<5
Toulene	ppb	<5	<5	<5
Xylenes	ppb	<10	<10	<10
Volatile Organics				
1,1,1 Trichloroethane	ppb	26	<2	<2
Trichloroethylene	ppb	37	2	9
Tetrachloroethylene	ppb	17	<2	<2

REMARKS

December 5, 1983
DATE REPORTED

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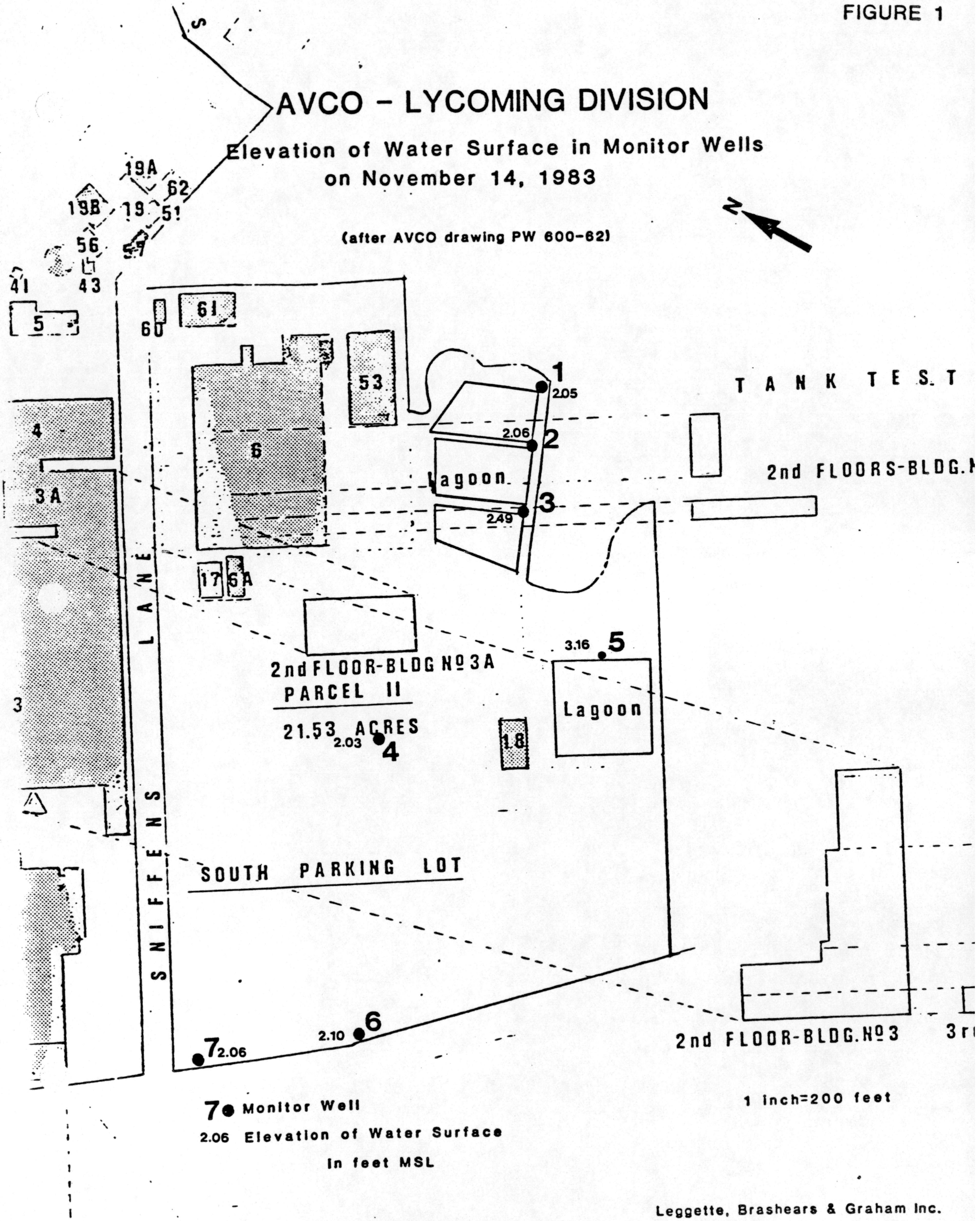
FIGURE 1



Leggette, Brashears & Graham Inc.

TABLE 1

AVCO-LYCOMING DIVISION
OBSERVATIONAL DATA ON MONITOR WELL SAMPLING
FEBRUARY 13, 1984

Well	SWL (ft below TOC)[a/]	Elevation of TOC (ft/MSL)[b/]	Elevation of SWL (ft/MSL)	Comments
1	8.20	10.13	1.93	Greenish tint; strong sulfur odor.
2	7.94	9.94	2.00	Greenish tint; strong sulfur odor.
3	6.32	9.13	2.81	Dark green (peat); strong sulfur odor.
4	4.80	6.88	2.08	Cloudy green; sulfur odor.
5	7.75	11.00	3.25	Clear; strong sulfur odor.
6	5.58	7.78	2.20	Light green; sulfur odor.
7	6.15	8.32	2.17	Clear; no odor.

a/ TOC is top of casing; the water-level measuring point
b/ U.S.C. & GS Mean Sea Level Datum

TABLE 2

AVCO-LYCOMING

Summary of Monitor Well
Water-Quality Data
(Sampling Date 2/13/84)

Parameter	Present at/or below CPWDC[1/] in monitor wells ppm[2/]	Present above CPWDC in monitor wells ppm
Copper	1-7	
Chromium (total)	1, 4, 6, 7	3, 5
Chromium (hexavalent)	ND *0.005	
Cadmium	ND *0.01	
Mercury	ND *0.002	
Nickel	1-7	
Zinc	1-7	
Cyanide (total)	5	1-4
Cyanide (amendable)	ND *0.1	
Benzene (ppb)[3/]	ND *2.0	
Toulene (ppb)	ND *2.0	
Xylenes (ppb)	ND *10	
1,1,1 Trichloroethane (ppb)	1-7	
Trichloroethylene (ppb)	1-7	
Tetrachloroethylene (ppb)	1-7	
Chloroform	1-7	

* Denotes less than.

1/Connecticut Public Water Drinking Code
2/Parts per million
3/Parts per billion

LEGGETTE, BRASHEARS & GRAHAM, INC.

TABLE 3

AVCO-LYCOMING
STRATFORD, CONNECTICUT

First Year Ground-Water Quality

Date sampled	Well no.	Copper (ppm)	Chromium total (ppm)	Chromium hexavalent (ppm)	Cadmium (ppm)	Mercury (ppm)	Nickel (ppm)	Zinc (ppm)	Cyanide total (ppm)	Cyanide amendable (ppm)	TOC (ppm)	TOX as chloride (ppm)	Benzene (ppb)	Toluene (ppb)	Xylenes (ppb)	1,1,1 Trichloroethane (ppb)	Trichloroethylene (ppb)	Tetrachloroethylene (ppb)	Chloroform (ppb)	pH	Specif Conductance (umhos/
08/18/83	1	*0.01	0.08	0.08	*0.01	*0.002	0.06	0.79	0.97	*0.1			*5	*5	*10	*2	*2	*2		6.4	
11/14/83	1	0.03	0.16	*0.005	*0.01	*0.002	0.05	0.60	0.60	*0.1			*5	*5	*10	*2	6	*2		6.3	
02/13/84	1	0.05	0.01	*0.005	*0.01	*0.002	0.07	0.63	0.68	*0.1	44	0.101	*2	*2	*10	*2	*2	*2	*2	6.8	600
	1																				
08/18/83	2	*0.01	*0.005	*0.005	*0.01	*0.002	0.04	0.49	0.78	*0.1			*5	*5	*10	*2	*2	*2		6.9	
11/14/83	2	*0.10	0.35	*0.005	*0.01	*0.002	0.04	0.56	0.43	*0.1			*5	*5	*10	*2	5	*2		6.2	
02/13/84	2	0.03	*0.005	*0.005	*0.01	*0.002	0.07	0.92	0.62	*0.1	34	0.157	*2	*2	*10	*2	*2	*2	*2	7.2	95
	2																				
08/18/83	3	*0.01	*0.02	0.009	*0.01	*0.002	0.03	0.56	0.62	*0.1			*5	*5	*10	*2	*2	*2		6.9	
11/14/83	3	*0.01	0.02	*0.005	*0.01	*0.002	0.02	0.62	0.95	*0.1			*5	*5	*10	*2	4	*2		6.8	
02/13/84	3	0.05	0.12	*0.005	*0.01	*0.002	0.09	0.75	0.39	*0.1	42	0.073	*2	*2	*10	*2	*2	*2	*2	7.3	97
	3																				
08/18/83	4	*0.01	0.005	*0.005	*0.01	*0.002	0.03	0.34	0.21	*0.1			*5	*5	*10	*2	*5	*2		6.3	
11/14/83	4	*0.01	0.16	*0.005	*0.01	*0.002	0.08	0.16	*0.1	*0.1			*5	*5	*10	*2	62	*2		6.3	
02/13/84	4	0.05	0.05	*0.005	*0.01	*0.002	0.03	0.41	0.56	*0.1	22	0.080	*2	*2	*10	*2	10	*2	*2	7.2	100
	4																				
08/18/83	5	*0.01	0.02	0.02	*0.01	*0.002	0.05	0.48	0.37	*0.1			*5	*5	*10	41	5	26		6.7	
11/14/83	5	*0.01	0.11	*0.005	*0.01	*0.002	0.07	0.44	0.17	*0.1			*5	*5	*10	26	37	17		6.6	
02/13/84	5	0.05	0.07	*0.005	*0.01	*0.002	0.07	0.49	0.10	*0.1	9	0.432	*2	*2	*10	21	13	10	*2	7.2	50
	5																				
08/18/83	6	*0.01	*0.005	*0.005	*0.01	*0.002	0.04	0.59	*0.1	*0.1			*5	*5	*10	*2	*2	*2		6.5	
11/14/83	6	0.05	0.02	*0.005	*0.01	*0.002	0.14	0.36	*0.1	*0.1			*5	*5	*10	*2	*2	*2		6.5	
02/13/84	6	0.04	0.05	*0.005	*0.01	*0.002	0.05	0.32	*0.1	*0.1	10	0.052	*2	*2	*10	*2	*2	*2	*2	6.9	9
	6																				
08/18/83	7	*0.01	*0.005	*0.005	*0.01	*0.002	0.03	0.48	*0.1	*0.1			*5	*5	*10	2.7	2.8	*2		6.5	
11/14/83	7	0.02	0.01	*0.005	*0.01	*0.002	0.10	0.18	*0.1	*0.1			*5	*5	*10	*2	9	*2		6.6	
02/13/84	7	0.05	0.02	*0.005	*0.01	*0.002	0.05	0.33	*0.1	*0.1	6	0.039	*2	*2	*10	*2	5	*2	*2	6.9	9
	7																				

* Denotes less than.

L jette, Brashears

TABLE 3

AVCO-LYCOMING
STRATFORD, CONNECTICUT

First Year Ground-Water Quality

Date sampled	Well no.	Copper (ppm)	Chromium total (ppm)	Chromium hexavalent (ppm)	Cadmium (ppm)	Mercury (ppm)	Nickel (ppm)	Zinc (ppm)	Cyanide total (ppm)	Cyanide amendable (ppm)	TOC (ppm)	TOX as chloride (ppm)	Benzene (ppb)	Toluene (ppb)	Xylenes (ppb)	1,1,1 Trichloroethane (ppb)	Trichloroethylene (ppb)	Tetrachloroethylene (ppb)	Chloroform (ppb)	pH	Specific Conductance (umhos/cm)
08/18/83	1	*0.01	0.08	0.08	*0.01	*0.002	0.06	0.79	0.97	*0.1			*5	*5	*10	*2	*2	*2		6.4	
11/14/83	1	0.03	0.16	*0.005	*0.01	*0.002	0.05	0.60	0.60	*0.1			*5	*5	*10	*2	6	*2		6.3	
02/13/84	1	0.05	0.01	*0.005	*0.01	*0.002	0.07	0.63	0.68	*0.1	44	0.101	*2	*2	*10	*2	*2	*2	*2	6.8	600
	1																				
08/18/83	2	*0.01	*0.005	*0.005	*0.01	*0.002	0.04	0.49	0.78	*0.1			*5	*5	*10	*2	*2	*2		6.9	
11/14/83	2	*0.10	0.35	*0.005	*0.01	*0.002	0.04	0.56	0.45	*0.1			*5	*5	*10	*2	5	*2		6.2	
02/13/84	2	0.03	*0.005	*0.005	*0.01	*0.002	0.07	0.92	0.62	*0.1	34	0.157	*2	*2	*10	*2	*2	*2	*2	7.2	950
	2																				
08/18/83	3	*0.01	0.02	0.009	*0.01	*0.002	0.03	0.56	0.62	*0.1			*5	*5	*10	*2	*2	*2		6.9	
11/14/83	3	*0.01	0.02	*0.005	*0.01	*0.002	0.02	0.62	0.95	*0.1			*5	*5	*10	*2	4	*2		6.8	
02/13/84	3	0.05	0.12	*0.005	*0.01	*0.002	0.09	0.75	0.39	*0.1	42	0.073	*2	*2	*10	*2	*2	*2	*2	7.3	975
	3																				
08/18/83	4	*0.01	0.005	*0.005	*0.01	*0.002	0.03	0.34	0.21	*0.1			*5	*5	*10	*2	*5	*2		6.3	
11/14/83	4	*0.01	0.16	*0.005	*0.01	*0.002	0.08	0.16	*0.1	*0.1			*5	*5	*10	*2	62	*2		6.3	
02/13/84	4	0.05	0.05	*0.005	*0.01	*0.002	0.03	0.41	0.56	*0.1	22	0.080	*2	*2	*10	*2	10	*2	*2	7.2	1000
	4																				
08/18/83	5	*0.01	0.02	0.02	*0.01	*0.002	0.05	0.48	0.37	*0.1			*5	*5	*10	41	5	26		6.7	
11/14/83	5	*0.01	0.11	*0.005	*0.01	*0.002	0.07	0.44	0.17	*0.1			*5	*5	*10	26	37	17		6.6	
02/13/84	5	0.05	0.07	*0.005	*0.01	*0.002	0.07	0.49	0.10	*0.1	9	0.432	*2	*2	*10	21	13	10	*2	7.2	500
	5																				
08/18/83	6	*0.01	*0.005	*0.005	*0.01	*0.002	0.04	0.59	*0.1	*0.1			*5	*5	*10	*2	*2	*2		6.5	
11/14/83	6	0.05	0.02	*0.005	*0.01	*0.002	0.14	0.36	*0.1	*0.1			*5	*5	*10	*2	*2	*2		6.5	
02/13/84	6	0.04	0.05	*0.005	*0.01	*0.002	0.05	0.32	*0.1	*0.1	10	0.052	*2	*2	*10	*2	*2	*2	*2	6.9	900
	6																				
08/18/83	7	*0.01	*0.005	*0.005	*0.01	*0.002	0.03	0.48	*0.1	*0.1			*5	*5	*10	2.7	2.8	*2		6.5	
11/14/83	7	0.02	0.01	*0.005	*0.01	*0.002	0.10	0.18	*0.1	*0.1			*5	*5	*10	*2	9	*2		6.6	
02/13/84	7	0.05	0.02	*0.005	*0.01	*0.002	0.05	0.33	*0.1	*0.1	6	0.039	*2	*2	*10	*2	5	*2	*2	6.9	975
	7																				

* Denotes less than.

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TELEPHONE. 347-6961

Laboratory Report

LAB REPORT NO C-206

State Certification No PH 0476

DATE February 13, 1984

CLIENT
Mr. John Naso
L B & G
72 Danbury Road
Wilton, Ct. 06897

CLIENT PHONE NO 762-1207

SPECIAL INSTRUCTIONS
Avco Lycoming - Quarterly Monitoring Program

SAMPLE DESCRIPTION		TEST		RESULTS	
		WELL #1	WELL #2	WELL #3	WELL #
pH		6.8	7.2	7.3	7.2
ɔpper	mg/1	0.05	0.03	0.05	0.05
Chromium-Total	mg/1	0.01	0.005	0.12	0.05
Chromium-Hexavalent	mg/1	<0.005	<0.005	<0.005	<0.005
Cadmium	mg/1	<0.01	<0.01	<0.01	<0.01
Mercury	mg/1	<0.002	<0.002	<0.002	<0.002
Nickel	mg/1	0.07	0.07	0.09	0.03
Zinc	mg/1	0.63	0.92	0.75	0.41
Cyanide-Total	mg/1	0.68	0.62	0.39	0.56
Cyanide-Amenable	mg/1	<0.1	<0.1	<0.1	<0.1

REMARKS

continued page 2

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SPECIAL INSTRUCTIONS
Avco Lycoming - Quarterly Monitoring Program

SAMPLE DESCRIPTION	TEST	RESULTS WELL #5	WELL #6	WELL #7
pH		7.2	6.9	6.9
Copper	mg/1	0.05	0.04	0.05
Chromium-Total	mg/1	0.07	0.05	0.02
Chromium-Hexavalent	mg/1	<0.005	<0.005	<0.005
Cadmium	mg/1	<0.01	<0.01	<0.01
Mercury	mg/1	<0.002	<0.002	<0.002
Nickel	mg/1	0.07	0.05	0.05
Zinc	mg/1	0.49	0.32	0.33
Cyanide-Total	mg/1	0.10	<0.1	<0.1
Cyandie-Amenable	mg/1	<0.1	<0.1	<0.1

REMARKS

continued page 3

March 9, 1984
DATE REPORTED

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Laboratory Report

LAB REPORT NO: C-206 pg. 3

State Certification No. PH-0476

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L B & G
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Wilton, Ct. 06897

DATE: February 13, 1984

CLIENT PHONE NO: 762-1207

SPECIAL INSTRUCTIONS: Avco Lycoming - Quarterly Monitoring Program

SAMPLE DESCRIPTION	TEST	RESULTS			
		WELL #1	WELL #2	WELL #3	WELL #4
VOLATILE HYDROCARBONS:					
Benzene	ppb	<2	<2 *	<2	<2
Toluene	ppb	<2	<2	<2	<2
Xylenes	ppb	<10	<10	<10	<10
VOLATILE ORGANICS:					
Chloroform	ppb	<2	<2	<2	<2
1,1,1 Trichloroethane	ppb	<2	<2	<2	<2
Trichloroethylene	ppb	<2	<2	<2	10
Tetrachloroethylene	ppb	<2	<2	<2	<2

REMARKS

* Unidentified peak eluted from column at approximately 120° - 135°C. Its concentration would be approximately 50-100 ppb as compared to ethyl benzene (b.p. 136°C) This compound was found in all the other stations (exept #7) in very trace concentrations.

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March 9, 1984

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Laboratory Report

LAB REPORT NO C-206 pg. 4

State Certification No PH-0476

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Wilton, Ct. 06897

DATE February 13, 1984

CLIENT PHONE NO 762-1207

SPECIAL INSTRUCTIONS
Avco Lycoming - Quarterly Monitoring Program

SAMPLE DESCRIPTION	TEST	RESULTS		
		WELL #5	WELL #6	WELL #7
VOLATILE HYDROCARBONS:				
Benzene	ppb	<2 *	<2	<2
Toluene	ppb	<2	<2	<2
Xylenes	ppb	<10	<10	<10
VOLATILE ORGANICS:				
Chloroform	ppb	<2	<2	<2
1,1,1 Trichloroethane	ppb	21	<2	<2
Trichloroethylene	ppb	13	<2	5
Tetrachloroethylene	ppb	10	<2	<2

REMARKS

* Unidentified peak eluted from column at approximately 55°-65°C. Its concentration would be 200-300 ppb as compared to hexane (b.p. 69°C). This compound was found in all the stations at trace levels.

continued page 5

March 9, 1984

John M. Dziato
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Laboratory Report

LAB REPORT NO. C-206 pg. 5

State Certification No. PH-0476

DATE February 13, 1984

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SPECIAL INSTRUCTIONS. Avco Lycoming - Quarterly Monitoring Program

SAMPLE DESCRIPTION / TEST	RESULTS			
	WELL #1	WELL #2	WELL #3	WELL #4
Specific Conductance µmhos/cm	600	950	975	1000
Total Organic Carbon mg/l	44	34	42	22
TOX as Chloride mg/l	0.101	0.157	0.073	0.080

REMARKS

continued page 6

March 9, 1984

John M. Dzialo
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Laboratory Report

LAB REPORT NO C-206 pg. 6

State Certification No PH-0476

DATE February 13, 1984

CLIENT
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CLIENT PHONE NO 762-1207

SPECIAL INSTRUCTIONS Avco Lycoming - Quarterly Monitoring Program

SAMPLE DESCRIPTION TEST	RESULTS WELL #5	WELL #6	WELL #7
Specific Conductance µmhos/cm	500	900	975
Total Organic Carbon mg/l	9	10	6
TOX as Chloride mg/l	0.432	0.052	0.039

REMARKS

March 9, 1984
DATE REPORTED

John M. Dziala
LABORATORY DIRECTOR

FIGURE 1

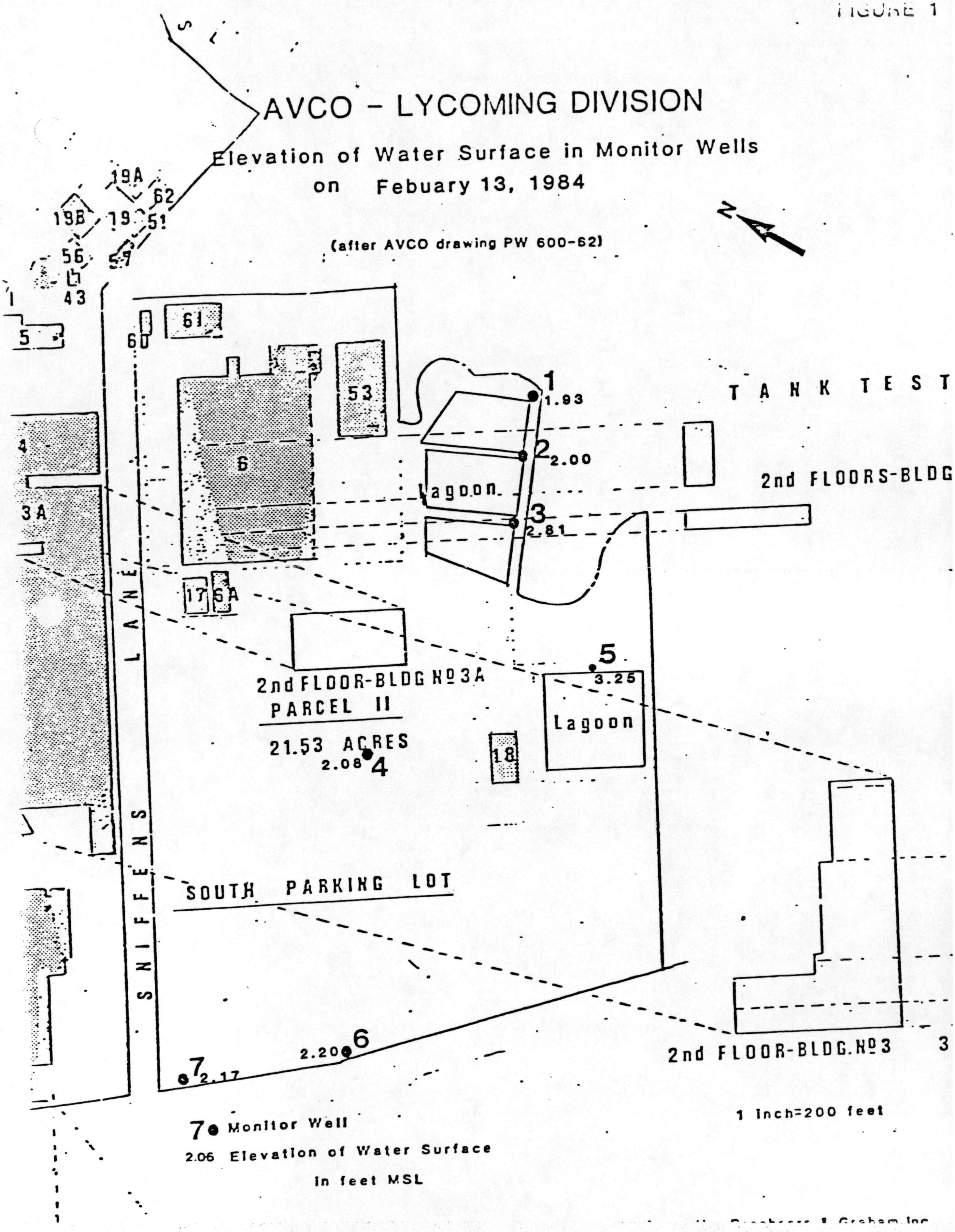

AVCO - LYCOMING DIVISION
Elevation of Water Surface in Monitor Wells
on Febuary 13, 1984
(after AVCO drawing PW 600-62)
19A
62
19B
19
51
56
57
43
5
60
61
53
6
4
3A
TANK TEST
2nd FLOORS-BLDG
Lagoon
1
1.93
2
2.00
3
2.81
17
6A
LANE
2nd FLOOR-BLDG Nº 3A
PARCEL II
21.53 ACRES
2.08
4
5
3.25
Lagoon
18
SNIFFENS
SOUTH PARKING LOT
6
2.20
7
2.17
2nd FLOOR-BLDG.Nº 3
3
1 inch=200 feet
7 Monitor Well
2.06 Elevation of Water Surface
in feet MSL

TABLE 1

AVCO Lycoming Division
Stratford, Connecticut

Fourth Quarter Report
Water-Quality Data
Samples Taken on May 9, 1984

Parameter	Monitor Well 1	2	3	4	5	6	7
Copper (mg/l)	0.02	0.02	0.03	0.10	0.01	0.02	0.02
Chromium total (mg/l)	0.04	0.03	0.10	0.09	0.07	0.04	*0.01
Chromium hexavalent (mg/l)	*0.005	*0.005	*0.005	*0.005	*0.005	*0.005	*0.005
Cadmium (mg/l)	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01
Mercury (mg/l)	*0.002	*0.002	*0.002	*0.002	*0.002	*0.002	*0.002
Nickel (mg/l)	0.02	0.03	0.05	0.08	0.06	0.03	0.02
Zinc (mg/l)	0.11	0.03	0.05	0.09	0.02	0.03	0.02
Cyanide total (mg/l)	0.56	0.66	0.47	0.38	*0.1	*0.1	*0.1
Cyanide amenable (mg/l)	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1	*0.1
TOC (mg/l)	64.0	41.0	55.0	31.0	8.0	11.0	7.0
TOX as chloride (mg/l)	0.058	0.135	0.049	0.12	1.014	0.031	0.031
Benzene (ppb)	Not performed due to flood and excessive holding time						
Toluene (ppb)	Not performed due to flood and excessive holding time						
Xylenes (ppb)	Not performed due to flood and excessive holding time						
1,1,1 Trichloroethane (ppb)	*2	*2	*2	*2	*52	*2	*2
Trichloroethylene (ppb)	*2	*2	*2	26	24	*2	7

TABLE 1
(continued)

AVCO Lycoming Division
Stratford, Connecticut

Fourth Quarter Report
Water-Quality Data
Samples Taken on May 9, 1984

Parameter	Monitor Well 1	2	3	4	5	6	7
Tetrachloroethylene (ppb)	*2	*2	*2	*2	13	*2	*2
Chloroform (ppb)	*2	*2	*2	*2	*2	*2	*2
pH	6.5	6.8	6.8	6.2	6.8	6.5	6.4
Specific conductance (umhos/cm)	620	900	1000	1000	480	920	1000
Ground-water elevation (ft above mean sea level)	2.78	2.79	3.16	2.73	3.71	2.81	3.75

* Denotes less than.

TABLE 2

AVCO Lycoming Division
Stratford, Connecticut

Chemicals Detected in
Ground-Water Samples in
Concentrations Above CPDWC Limits 1/

Parameter	Present in monitor wells above CPDWC limits	CPDWC limit
Copper (ppm)		1.0
Chromium total (ppm)	3,4,5	0.05
Chromium hexavalent (ppm)		0.05
Cadmium (ppm)		0.01
Mercury (ppm)		0.002
Nickel (ppm)		0.70
Zinc (ppm)		5.0
Cyanide total (ppm)	1,2,3,4	0.20
Cyanide amenable (ppm)	3	-- 2/
Benzene (ppb)	NA 3/	1 4/
Toluene (ppb)	NA	1,000 4/
Xylenes (ppb)	NA	-- 2/
1,1,1 Trichloroethane (ppb)		300
Trichloroethylene (ppb)	4	25
Tetrachloroethylene (ppb)		20
Chloroform (ppb)		100

1/ Connecticut Public Drinking Water Code.
2/ Not available.
3/ Not analyzed due to flood and excessive holding time.
4/ Connecticut Department of Health "Action Levels".

TABLE 3

AVCO Lycoming Division
Stratford, Connecticut

Fourth Quarter Report
Observational Data on Monitor Well Sampling
May 9, 1984

Well	Static water level (ft below TOC)[a/]	Elevation of TOC (ft MSL)[b/]	Elevation of static water level (ft MSL)	Comments
1	7.35	10.13	2.78	Dark green, strong odor
2	7.15	9.94	2.79	Dark green, strong odor
3	5.97	9.13	3.16	Dark green, silt, strong odor
4	4.15	6.88	2.73	Light green, odor
5	7.29	11.00	3.71	Dark green, strong odor
6	4.97	7.78	2.81	Light green, no odor
7	4.57	8.32	3.75	Light green, no odor

a/ Top of Casing: The water-level measuring point.
b/ U.S.C. and GS mean sea level datum

TABLE 1

AVCO Lycoming Division
Stratford, Connecticut

First Quarter Report, Second Year
Water-Quality Data Taken on
October 10, 1984

Parameter	Monitor Well 1	2	3	4	5	6	7
Copper (mg/l)	0.04	0.01	0.01	0.01	0.01*	0.01	0.01*
Chromium-total (mg/l)	0.05	0.02	0.03	0.03	0.04	0.03	0.04
Chromium-hexavalent (mg/l)	0.005*	0.005*	0.005*	0.005*	0.005*	0.005*	0.005*
Cadmium (mg/l)	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*	0.01*
Mercury (mg/l)	0.002*	0.002*	0.002*	0.002*	0.002*	0.002*	0.002*
Nickel (mg/l)	0.04	0.03	0.03	0.02	0.05	0.02	0.01
Zinc (mg/l)	0.06	0.01	0.03	0.04	0.02	0.03	0.01*
Temperature (°C)	15	16	17	16	16	19	18
pH	6.5	6.9	7.1	6.6	7.1	6.9	6.8
Specific conductance (umhos/cm)	543	1099	1418	1516	547	978	824
Ground-water elevation (ft above mean sea level)	1.48	1.48	1.81	1.56	3.00	1.62	1.70

* Denotes less than

TABLE 2

AVCO Lycoming Division
Stratford, Connecticut

Metals Detected in Ground-Water Samples in Concentrations Above CPDW Limits[1/]
Samples Taken on October 10, 1984

Parameter	Present in monitor wells above CPDWC limits (well numbers)	CPDW limit
Copper (mg/l)	-	1.0
Chromium-total (mg/l)	1	0.05
Chromium-hexavalent (mg/l)	-	0.05
Cadmium (mg/l)	-	0.01
Mercury (mg/l)	-	0.002
Nickel (mg/l)	-	0.70
Zinc (mg/l)	-	5.0

1/ Connecticut Public Drinking Water Limits

TABLE 3

AVCO Lycoming Division
Stratford, Connecticut

Observational Data on Monitor Well Sampling
October 10, 1984

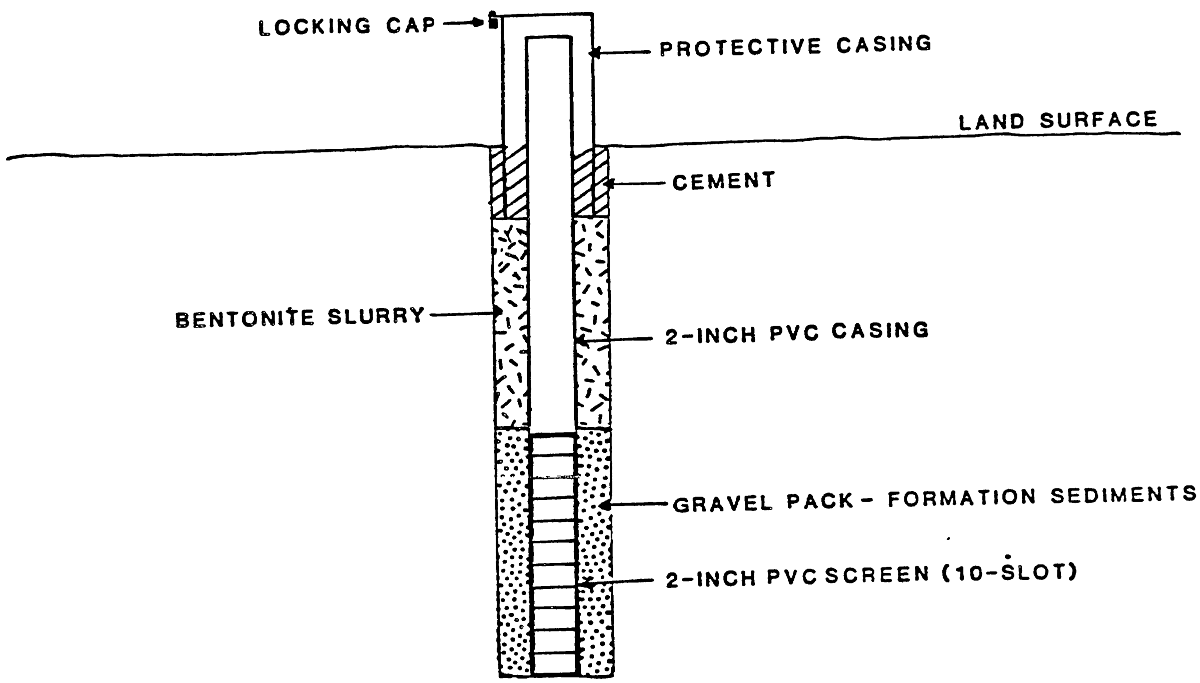
Well	SWL (ft below TOC)[a]	Elevation of TOC (ft/MSL)[b]	Elevation of SWL (ft/MSL)	Comments
1	8.65	10.13	1.48	Dark green tint; strong sulfur odor.
2	8.46	9.94	1.48	Dark green tint; strong sulfur odor.
3	7.32	9.13	1.81	Black; strong sulfur odor.
4	5.32	6.88	1.56	Light green; sulfur odor.
5	8.00	11.00	3.00	Black; strong sulfur odor.
6	6.16	7.78	1.62	Light green; sulfur odor.
7	6.62	8.32	1.70	Light green; sulfur odor.

a/ TOC is top of casing; the water-level measuring point
b/ U.S.C. & GS Mean Sea Level Datum

FIGURE 1

AVCO Lycoming Division
Stratford, Connecticut

Schematic Well Construction



Well no.	I.D. (inches)	Screen setting (ft. bg)1/	Slot size	Gravel pack
1	2.0 PVC	15 - 25	10	formation
2	2.0 PVC	15 - 25	10	formation
3	2.0 PVC	15 - 25	10	formation
4	2.0 PVC	25 - 35	10	formation
5	2.0 PVC	20 - 30	10	formation
6	2.0 PVC	18.92 - 28.92	10	formation
7	2.0 PVC	20 - 30	10	formation

1/ Feet below grade.

FIGURE 2

AVCO - LYCOMING DIVISION

Elevation of Water Surface in Monitor Wells on OCTOBER 10, 1984

(after AVCO drawing PW 600-62)

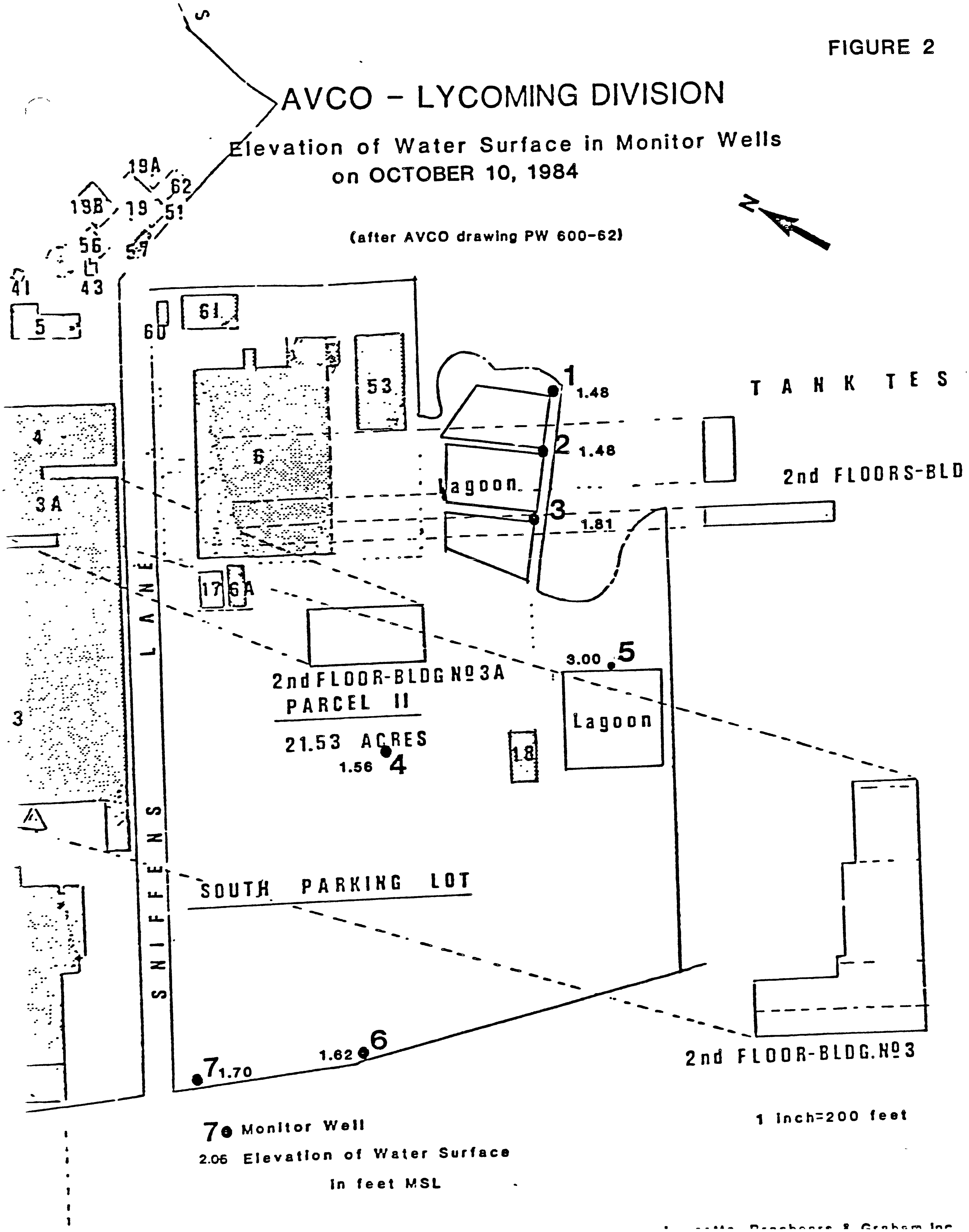


TABLE 1

AVCO Lycoming Division
Stratford, Connecticut

Second Quarter Report
Water-Quality Data Taken on January 24, 1985

Parameter	Monitor Well 1	2	3	4	5	6	7
Metals							
Copper (mg/l)	*0.01	0.02	0.04	*0.01	0.02	0.01	*0.01
Chromium total (mg/l)	0.02	0.04	0.13	*0.01	0.12	0.04	*0.01
Chromium hexavalent (mg/l)	*0.005	*0.005	*0.005	*0.005	*0.005	*0.005	*0.005
Cadmium (mg/l)	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01
Mercury (mg/l)	*0.002	*0.002	*0.002	*0.002	*0.002	*0.002	*0.002
Nickel (mg/l)	0.03	0.05	0.06	0.02	0.07	0.02	0.02
Zinc (mg/l)	0.03	0.04	0.03	0.02	0.01	0.02	0.01
Cyanide total (mg/l)	0.19	0.23	*0.02	0.09	*0.02	*0.02	*0.02
Cyanide amenable (mg/l)	*0.02	*0.02	*0.02	*0.02	*0.02	*0.02	*0.02
Temperature (°C)	15	16	17	16	16	19	18
pH	6.70	6.70	6.90	6.30	6.60	6.70	6.50
	6.75	6.70	6.95	6.35	6.60	6.70	6.50
	6.70	6.70	6.90	6.25	6.60	6.70	6.50
	6.70	6.70	6.90	6.30	6.90	6.70	6.48
Conductivity (umhos/cm)	1900	3500	3005	2100	600	2500	1600
	2000	3500	3005	2100	600	2500	1600
	1950	3500	3005	2100	600	2500	1600
	1950	3500	3005	2100	600	2500	1600
Ground water elevation (ft above mean sea level)	1.34	1.39	2.09	1.53	3.03	1.52	1.55
Halogenated Volatile Organics (Method 8010)							
Benzylchloride (ppb)	*25	*25	*25	*25	*25	*25	*25
Bis(2-chloroethoxy)methane (ppb)	*25	*25	*25	*25	*25	*25	*25
Bis(2-chloroisopropyl)ether (ppb)	*25	*25	*25	*25	*25	*25	*25
Bromobenzene (ppb)	*25	*25	*25	*25	*25	*25	*25
Bromodichloromethane (ppb)	*1	*1	*1	*1	*1	*1	*1
Bromoform (ppb)	*1	*1	*1	*1	*1	*1	*1
Bromomethane (ppb)	*25	*25	*25	*25	*25	*25	*25
Carbontetrachloride (ppb)	*1	*1	*1	*1	*1	*1	*1
Chloroacetaldehyde (ppb)	*25	*25	*25	*25	*25	*25	*25
Choral (ppb)	*25	*25	*25	*25	*25	*25	*25
Chlorobenzene (ppb)	*5	280	*5	*5	*5	*5	*5
Chloroethane (ppb)	*25	*25	*25	*25	*25	*25	*25
Chloroform (ppb)	*1	*1	*1	*1	*1	*1	*1

Table 1
(continued)

Parameter	Monitor Well 1	2	3	4	5	6	7
Halogenated Volatile Organics (Method 8010) (continued)							
1-chlorohexane (ppb)	*25	*25	*25	*25	*25	*25	*25
2-chloroethylvinylether (ppb)	*25	*25	*25	*25	*25	*25	*25
Chloromethane (ppb)	*25	*25	*25	*25	*25	*25	*25
Chloromethylether (ppb)	*25	*25	*25	*25	*25	*25	*25
Chlorotoluene (ppb)	*25	*25	*25	*25	*25	*25	*25
Dibromochloromethane (ppb)	*1	*1	*1	*1	*1	*1	*1
Dibromomethane (ppb)	*25	*25	*25	*25	*25	*25	*25
1,2-dichlorobenzene (ppb)	*25	*25	*25	*25	*25	*25	*25
1,3-dichlorobenzene (ppb)	*25	*25	*25	*25	*25	*25	*25
1,4-dichlorobenzene (ppb)	*25	*25	*25	*25	*25	*25	*25
Dichlorodifluoromethane (ppb)	*25	*25	*25	*25	*25	*25	*25
1,1-dichloroethane (ppb)	*25	*25	*25	*25	*25	*25	*25
1,2-dichloroethane (ppb)	*25	*25	*25	*25	*25	*25	*25
1,1-dichloroethylene (ppb)	*25	*25	*25	*25	*25	*25	*25
trans-1,2-dichloroethylene (ppb)	*25	*25	*25	*25	*25	*25	*25
Dichloromethane (ppb)	*25	*25	*25	*25	*25	*25	*25
1,2-Dichloropropane (ppb)	*25	*25	*25	*25	*25	*25	*25
1,3-Dichloropropylene (ppb)	*25	*25	*25	*25	*25	*25	*25
1,1,2,2-Tetrachloroethane (ppb)	*1	*1	*1	*1	*1	*1	*1
1,1,1,2-Tetrachloroethane (ppb)	*1	*1	*1	*1	*1	*1	*1
Tetrachloroethylene (ppb)	*1	*1	4	*1	7	*1	*1
1,1,1-Trichloroethane (ppb)	*1	*1	*1	*1	12	*1	*1
1,1,2-Trichloroethane (ppb)	*25	*25	*25	*25	*25	*25	*25
Trichloroethylene (ppb)	7	6	3	3	9	*1	*1
Trichlorofluoromethane (ppb)	*25	*25	*25	*25	*25	*25	*25
Trichloropropane (ppb)	*25	*25	*25	*25	*25	*25	*25
Vinyl chloride (ppb)	*25	*25	*25	*25	*25	*25	*25
Total Organic Halides (TOX)							
TOX (ppm)	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01
	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01
	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01
	*0.01	*0.01	*0.01	*0.01	0.044	*0.01	*0.01
Total Organic Carbon (TOC)							
TOC (ppm)	48	46	27	23	15	12	14
	39	47	29	23	14	16	10
	43	47	24	33	16	17	14
	45	46	32	23	14	29	12

Table 1
(continued)

Parameter	Monitor Well 1	2	3	4	5	6	7
Aromatic Volatile Organics (Method 8020)							
Benzene (ppb)	*1	*1	*1	*1	*1	*1	*1
Chlorobenzene (ppb)	*5	305	*5	8	*5	*5	*5
1,2 Dichlorobenzene (ppb)	*10	*10	*10	*10	*10	*10	*10
1,3 Dichlorobenzene (ppb)	*10	*10	*10	*10	*10	*10	*10
1,4 Dichlorobenzene (ppb)	*10	*10	*10	*10	*10	*10	*10
Ethylbenzene (ppb)	*10	*10	*10	*10	*10	*10	*10
Toluene (ppb)	*5	*5	*5	*5	*5	*5	*5
Xylenes (ppb)	*10	*10	*10	*10	*10	*10	*10

* Denotes less than.

TABLE 2

AVCO Lycoming Division
Stratford, Connecticut

Metals Detected in Ground-Water Samples
in Concentrations Above CPDW Limits[1/]

Parameter	Present in monitor wells above CPDW Limits (well numbers)	CPDW Limits
chromium (total)	3, 5	0.05 ppb
cyanide (total)	2	0.2 ppb

1/ Connecticut Public Drinking Water Limits.

TABLE 3

AVCO Lycoming Division
Stratford, Connecticut

Observational Data on Monitor Well Sampling
January 24, 1985

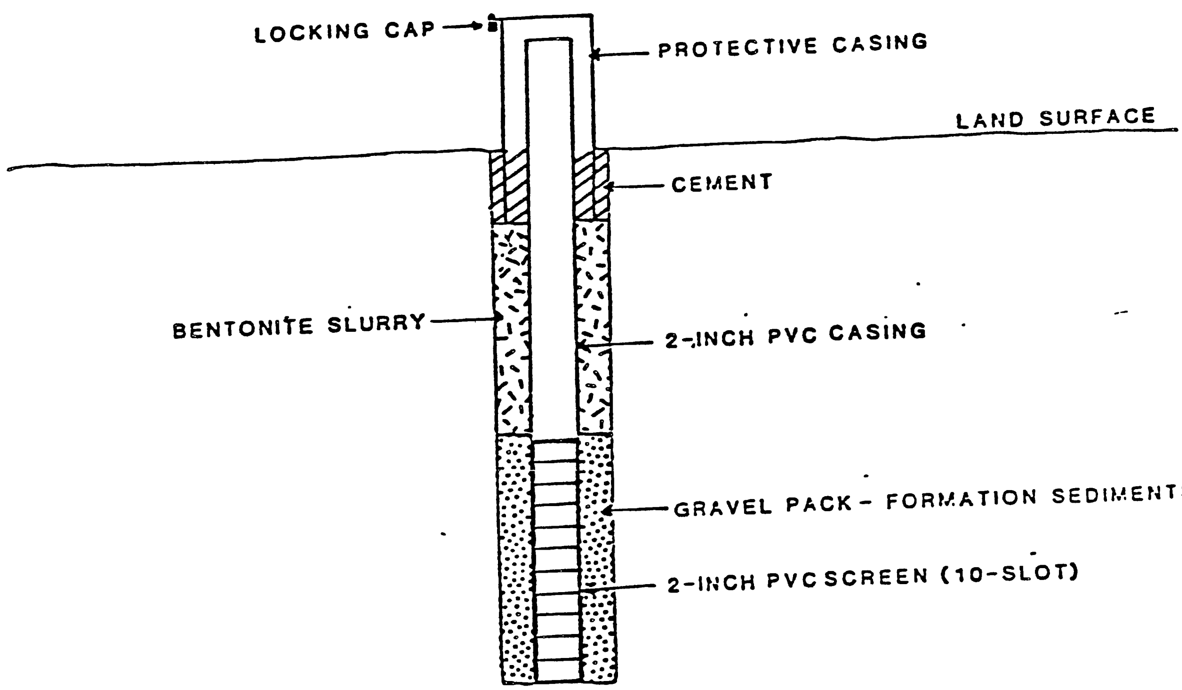
Well	SWL (ft below TOC)a/	Elevation of TOC (ft/MSL)b/	Elevation of SWL (ft/MSL)	Comments
1	8.79	10.13	1.34	Dark green tint; strong sulfur odor.
2	8.55	9.94	1.39	Dark green tint; strong sulfur odor.
3	7.04	9.13	2.09	Black; sulfur odor.
4	5.35	6.88	1.53	Light green; sulfur odor.
5	7.97	11.00	3.03	Light gray; slight sulfur odor.
6	6.26	7.78	1.52	Light gray; slight sulfur odor.
7	6.77	8.32	1.55	Clear; slight sulfur odor.

a/ TOC is top of casing; the water-level measuring point
b/ U.S.C. & GS Mean Sea Level Datum

FIGURE 1

AVCO Lycoming Division
Stratford, Connecticut

Schematic Well Construction



Well no.	I.D. (inches)	Screen setting (ft. bg)[1/]	Slot size	Gravel pack
1	2.0 PVC	15 - 25	10	formation
2	2.0 PVC	15 - 25	10	formation
3	2.0 PVC	15 - 25	10	formation
4	2.0 PVC	25 - 35	10	formation
5	2.0 PVC	20 - 30	10	formation
6	2.0 PVC	18.92 - 28.92	10	formation
7	2.0 PVC	20 - 30	10	formation

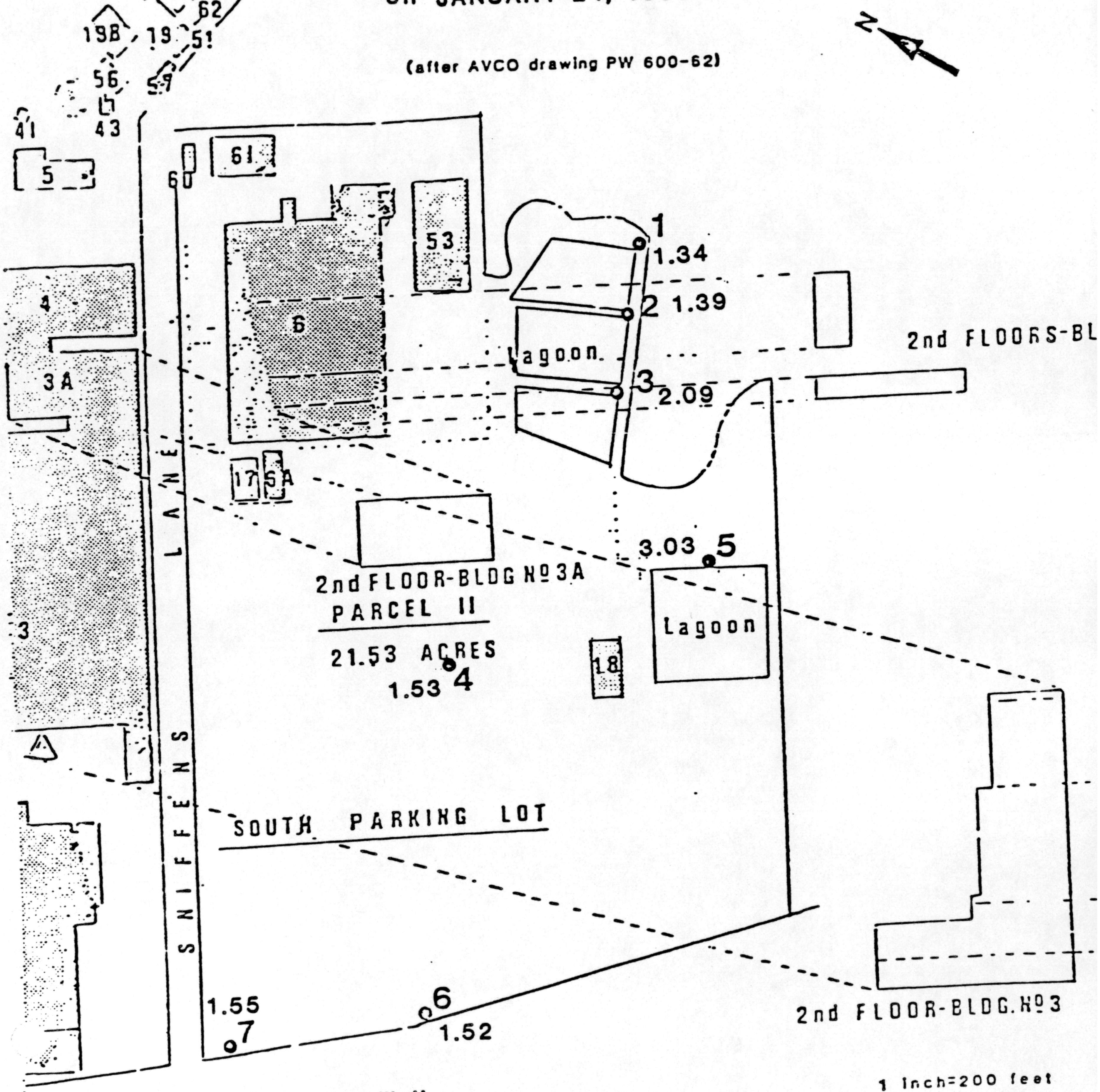
1/ Feet below grade.

FIGURE 2

AVCO - LYCOMING DIVISION

Elevation of Water Surface in Monitor Wells on JANUARY 24, 1985

(after AVCO drawing PW 600-62)



1 inch=200 feet

7o Monitor Well

2.05 Elevation of Water Surface in feet MSL

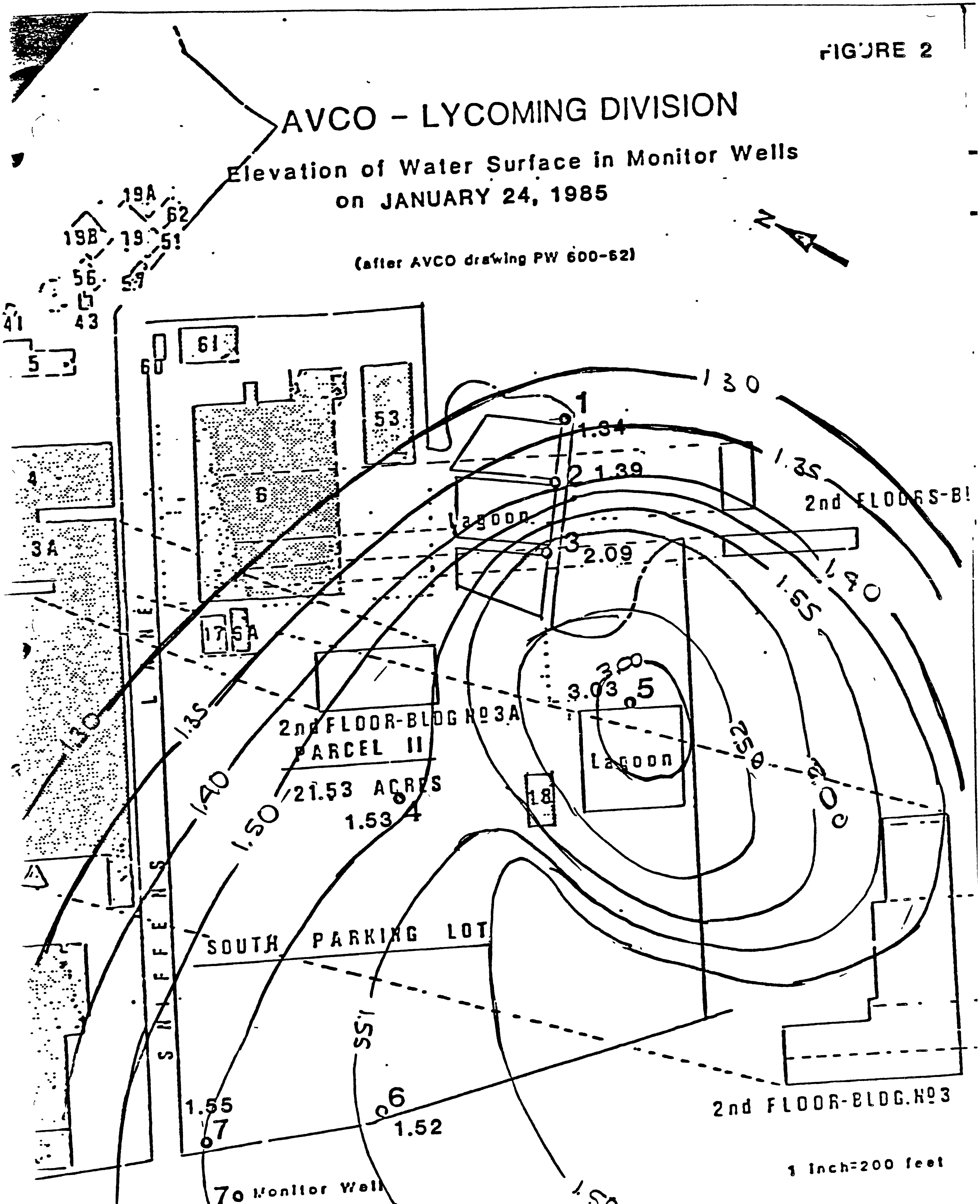
LEGGETTE, BRASHEARS & GRAHAM, INC.

FIGURE 2

AVCO - LYCOMING DIVISION

Elevation of Water Surface in Monitor Wells on JANUARY 24, 1985

(after AVCO drawing PW 600-62)



7o Monitor Well
2.06 Elevation of Water Surface in feet MSL

LEGGETTE, BRASHEARS & GRAHAM, INC.

TABLE 1

AVCO Lycoming Division
Stratford, Connecticut

Third Quarter Report
Water-Quality Data Taken On April 26, 1985

Parameter	Monitor Well 1	2	3	4	5	6	7
Metals							
Copper (mg/l)	*0.01	*0.01	*0.01	*0.01	*0.01	0.06	*0.01
Chromium total (mg/l)	0.02	0.03	0.10	0.02	0.10	0.04	*0.01
Chromium hexavalent (mg/l)	*0.005	*0.005	*0.005	*0.005	*0.005	*0.005	*0.005
Cadmium (mg/l)	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01	*0.01
Mercury (mg/l)	*0.002	*0.002	*0.002	*0.002	*0.002	*0.002	*0.002
Nickel (mg/l)	*0.01	0.04	0.05	*0.01	*0.01	*0.01	*0.01
Zinc (mg/l)	0.06	0.08	0.15	0.06	0.09	0.11	0.06
Cyanide total (mg/l)	0.06	0.05	*0.02	0.09	*0.02	*0.02	*0.02
Cyanide amenable (mg/l)	*0.02	*0.02	*0.02	*0.02	*0.02	*0.02	*0.02
pH	7.6	7.9	7.6	7.0	7.8	7.2	6.7
	7.5	7.9	7.5	7.0	7.0	7.2	6.5
	7.4	7.8	7.5	7.0	7.0	7.2	6.5
	7.6	7.8	7.6	7.1	6.9	7.2	6.7
Conductivity (umhos/cm)	1800	3000	3300	1200	410	1900	2100
	1900	4100	3200	1600	600	2100	1500
	2600	4000	3600	2100	600	2600	1500
	2100	3000	2100	1900	600	2200	1900

*Denotes less than

TABLE 2

AVCO Lycoming Division
Stratford, Connecticut

Third Quarter Report
Metals Detected in Ground-Water Samples in
Concentrations Above the CPDW1/

Parameter	Present in monitor wells above CPDW1/ limit (Well number)	CPDW1/
Chromium	3, 5	0.05 ppm

1/ Connecticut Public Drinking Water Code.

TABLE 3

AVCO Lycoming Division
Stratford, Connecticut

Observational Data on Monitor Well Sampling
April 26, 1985

Well	SWL (ft below TOC)[a/]	Elevation of TOC (ft/MSL)[b/]	Elevation of SWL (ft/MSL)	Comments
1	7.34	10.13	2.79	Brown; strong sulfur odor.
2	8.14	9.94	1.80	Brown; strong sulfur odor.
3	6.35	9.13	2.78	Brown; sulfur odor.
4	4.95	6.88	1.93	Clear; sulfur odor.
5	6.69	11.00	4.31	Brown; slight sulfur odor.
6	6.04	7.78	1.74	Clear; slight sulfur odor.
7	6.57	8.32	1.75	Clear; slight sulfur odor.

a/ TOC is top of casing; the water-level measuring point
b/ U.S.C. & GS Mean Sea Level Datum

Radium pCi/l	.10	.11	.10	.10	.11
Beta pCi/l	.4	.4	.5	.4	.4
Gross Alpha pCi/l	1.1	1.4	2.0	1.0	1.0
Endrin	ND/0.002	ND/0.002	ND/0.002	ND/0.002	ND/0.002
Lindane	ND/0.004	ND/0.004	ND/0.004	ND/0.004	ND/0.004
Methoxychlor	ND/0.10	ND/0.10	ND/0.10	ND/0.10	ND/0.10
Toxaphene	ND/0.005	ND/0.005	ND/0.005	ND/0.005	ND/0.005
2,4 D	ND/0.10	ND/1.0	ND/0.10	ND/0.10	ND/0.10
Silvex	ND/0.01	ND/0.01	ND/0.01	ND/0.01	ND/0.1
TOX (ppb)	410	90	50	380	365
	470	95	53	450	325
Purgable	420	87	43	405	330
	390	79	51	410	315

All results are in mg/l unless otherwise stated.

Robert O. Blake, Jr.
Baron Consulting Company

APPENDIX B - TOPOGRAPHIC MAP

The requirements for Part B of this RCRA permit application include obtaining or preparing a topographic map of the facility area. The features required as part of this topographic map are included in 40 CFR 270.14(b)(19). In fulfillment of these requirements the mapped area presented herein includes the area 1,000 feet around the surface impoundments. The map scale is 1 inch equal to 200 feet, with 2-foot contour intervals.

The topographic map was prepared from survey information collected on October 2 to 4, 1985, as well as information obtained from previous surveys. The entire AVCO Lycoming facility is within the 100-year floodplain as determined from the Flood Insurance Study for Stratford, Connecticut, developed by the Federal Emergency Management Agency (FEMA). The wind rose shown on the map is from the National Climatic Data Center, and is based on 17 years of wind data recorded at the Bridgeport, Connecticut Airport.

APPENDIX C

EXPOSURE ASSESSMENT

APPENDIX C - EXPOSURE ASSESSMENT

This section addresses the regulatory requirements in 40 CFR, Part 270.10(j), concerning exposure information. This citation became effective on July 15, 1985 and was published in the Federal Register of this date.

The potential for the public being exposed to releases of hazardous wastes or hazardous constituents from the four surface impoundments at the AVCO facility is small. The potential pathways for exposure to hazardous waste or hazardous waste constituents are as follows:

- ground water contamination
- surface water contamination
- air emissions
- food chain contamination

With regard to ground water contamination, there is the potential for hazardous constituents entering the ground water below the four surface impoundments. Hazardous constituents can move into the ground water because three of the four surface impoundments are not lined. However, the public should not be exposed to this contaminant migration. First, the material that is stored in the three unlined surface impoundments is a sludge from the industrial wastewater treatment system. The sludge should not contain hexavalent chromium or cyanide because these materials have been treated in the treatment system. Other metals, such as cadmium, zinc, copper, and nickel, will be present in the sludge material as metal hydroxides. The metal hydroxides are very insoluble in water and therefore will be unlikely to migrate into the ground water. If the pH of the material in the lagoons were significantly lowered, the metals could become more mobile. The pH of the sludge material is maintained at 9. If the lagoons were not operated for a period of time, the pH of the sludge material could change. This will not be the case, since the lagoons will be operated through May, 1986, and at this time, closure of the lagoons will begin.

Another consideration, with regard to the potential for ground water contamination, is the quality of the ground water (can it be used as a drinkng source?) and the proximity of drinking water wells to the facility. The ground water at the AVCO facility, as previously discussed, is classified as Class GB water, and as such, can not be used as a drinking water source. In addition, there are no drinking water wells (private or municipal) located near the AVCO facility.

The local ground water direction at the AVCO facility appears to be toward the Marine Basin. Once the ground water enters this body of water, the contaminants would be greatly diluted.

The surface water bodies, located near the AVCO facility, include the Housatonic River, Long Island Sound, and a local tidal estuary. None of these surface waters are used as drinking water sources.

The potential for hazardous air emissions from the four surface impoundments is minimal. This is because the material in the surface impoundments is always wet, so that there is a small likelihood for particulate transport in the air. Organics should not be present in the surface impoundments so that there should not be any volatile emissions.

There are no food crops grown in the vicinity of AVCO. Thus, there is no chance of food chain contamination.

As previously mentioned, the four surface impoundments will be closed in May, 1986. The activities involved with closure should not present any additional exposure to the public of hazardous wastes or hazardous constituents. The method of sludge removal at closure will be a wet method, which will minimize air emissions. The sludge will be dewatered and once it is dewatered, it will be stored on a plastic lined, plastic covered, temporary storage pad. The water generated or accumulated during closure activities will be treated in the industrial wastewater treatment system. Closure will be completed when the soil confirmation sampling program does not detect any additional contaminated material at the site.

The only other possibility for a release of hazardous waste or constituents from the AVCO facility has to do with the off-site shipment of material from the site during closure. Material could be released to the environment if there were an accident in loading or transporting the material. The environmental threat to the public or the environment, with regard to a spill of this material, should be minimal because the material is in a solid form and can be easily handled with earth moving equipment.

In summation, there does not appear to be a potential for hazardous wastes or hazardous constituents to be released from the normal operation or closure of the surface impoundments and pose a threat to the public or environment

APPENDIX D

METCALF & EDDY BORING LOGS

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. AVCO LYCOMING: Stratford

CLIENT METCALF & EDDY

BORING NO. B-1

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
	br.fine-crs.sand, tr.silt, some fine gravel	13-16 12-10	
		4-8 11-13	
		16-16 11-10	
20.0		13-16 11-11	
	BOTTOM OF BORING 20.0 WATER AT 5' @ 0 hrs.		
	2" WELL POINT @ 14' 10' wrapped screen 5' riser ~~1; stickup~~	(20 slot)	
	Backfilled 6.0'-2.0' 1 protector & lock ~~1 bag cement~~		
	DATE: 10/1/85 DRILLER: FAULKNER		

BORING NO. B-2

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
	br.fine-crs.sand, some fine-med. ~~gravel, some silt~~	2-7 8-8	
		1-1 1-1	
		12-37 44-33	
20.0		19-25 24-29	
	BOTTOM OF BORING 20.0 WATER AT 5.5' @ 0 hrs ~~2" WELL POINT @ 14'~~		
	10' wrapped screen 5' riser 1' stickup	(20 slot)	
	Backfilled 5.5'-1.0' 1 protector & lock 1 bag cement		
	DATE: 9/30/85 DRILLER: FAULKNER		

Trio Printers # 1127

1. COL. A ~~strata depth~~
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ____ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. AVCO LYCOMING; Stratford

CLIENT METCALF & EDDY

BORING NO. B-3
LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
4.0	br.fine-med.sand, some fine-crs.gravel cobbles,possible fill	2-6 15-17	
	blk.fine-med.sand, silt,some fine-crs. gravel	8-19 10-4	
		6-10 16-15	
20.0		10-34 50-62	
	BOTTOM OF BORING 20.0 WATER AT 6' @ 0 hrs. Backfilled hole with type II Portland Cement 1 - 90# bag DATE: 9/19/85 DRILLER: FAULKNER		

BORING NO. B-4
LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
4.2	blk.discolored fine-med.sand,tr. silt,some fine-crs. gravel	2-11 17-26 14-15	
6.0	br.fine-med.sand	16-11	
12.3	blk.silt,some fine sand,some peat	2-1 1-2 1-1 2-3	
30.0	br.fine-med.sand, some fine-med. gravel,tr.silt	6-8 12-11 running sand 11-22 40-56 7-56 25-36 running sand	
	BOTTOM OF BORING 30.0 WATER AT 6' @ 0 hrs. Backfilled hole with cement 1 bag DATE: 9/19/85 DRILLER: FAULKNER		

Trio Printers # 1127

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ____ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

CLARENCE WELTI ASSOC., INC.
P.O. BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. AVCO LYCOMING; Stratford

CLIENT METCALF & EDDY

BORING NO. B-5
LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
3.5	br.fine-crs.sand & fine-crs.gravel, tr.silt	5-20 / 31-28	
9.5	gr.fine-med.sand, tr.silt (oily odor)	2-2 / 1-1	
25.0	peat, some fine-med. sand, some silt	1-1 / 2-2; 5-5 / 7-10; 29-34 / 39-33; 17-26 / 37-41	

BOTTOM OF BORING 25.0
WATER AT 5' @ 0 hrs.

Backfilled hole with cement
1 bag

DATE: 10/1/85
DRILLER: FAULKNER

BORING NO. B-6
LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
0.7	concrete slab w/rebar		
8.0	br.fine-med.sand, some fine-med.gravel	14-60-40/2; 6-6 / 4-4	
10.0	blk.fine-med.sand, some fine-crs.gravel		
20.0	gr/br.fine-med.sand, some silt, some fine-med.gravel	30-80/100/4; 3-26 / 33-24	
30.0	gr/br.silt, some fine sand, some organics	56-24 / 12-12; 7-5 / 6-9	

BOTTOM OF BORING 30.0
WATER AT 4.7' @ 0 hrs.

2" WELL POINT @ 14'
10' wrapped screen (20 slot)
5' riser
1' stickup
Backfilled 6.0'-1.0'
1 protector & lock
1 bag cement

DATE: 9/23/85
DRILLER: FAULKNER

Trio Printers # 1127

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ____ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. AVCO LYCOMING; Stratford

CLIENT METCALF & EDDY

BORING NO. B-7

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
3.0	fine-med.sand, some fine-crs. gravel	4-28 / 50-16	
8.0	blk.fine-med.sand, silt,some fine-crs. gravel (very oily)	24-33 / 45-38	
		13-33 / 39-44	
20.0	br.fine-med.sand, tr.silt,some fine-crs.sand	4-10 / 11-22	
		1-0 / 5-6	

BOTTOM OF BORING 20.0
WATER AT 6' @ 0 hrs.

Backfilled hole with cement 1 bag

DATE: 9/20/85
DRILLER: FAULKNER

BORING NO. B-8

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
3.0	br.fine-crs.sand,tr. silt,some fine gravel	3-3 / 5-5	
5.0	**	6-12	
	blk.fine-med.sand, some silt, some fine gravel (very oily)	22-20	
		5-4 / 2-2	
		1-0 / 1-1	
17.6		1-2 / 3-4	
	br.fine-crs.sand, some peat		
		1-2 / 1-2	
		40-60/4"	
30.0		11-13 / 24-29	
35.0	gr.fine-med.sand, tr.silt,some fine gravel	37-38 / 22-40	

**gr/br.fine-med. sand,tr.silt,some fine gravel

BOTTOM OF BORING 35.0'
WATER AT 5.5' @ 0 hrs.

Backfilled hole with cement - 1 bag

DATE: 10/1/85
DRILLER: FAULKNER

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ____ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

Trio Printers # 1127

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. AVCO LYCOMING; Stratford

CLIENT METCALF & EDDY

BORING NO. B-9

LINE & STA.

OFFSET

GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
0.4	bituminous	25-44	
3.0	**	43-38	
9.0	blk.fine-crs.sand, tr.silt,some fine-crs.gravel (very oily)	5-9 7-11 37-43 33-22	
20.0	peat (oily)	1-1 1-1 2-0 1-2 1-0 2-2	
	**br.fine-crs.sand, tr.silt,some fine-crs.gravel		
	BOTTOM OF BORING 20.0 WATER AT 6.5' @ 0 hrs. Backfilled hole with cement 1 bag DATE: 9/20/85 DRILLER: FAULKNER		

BORING NO. B-10

LINE & STA.

OFFSET

GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
1.5	**	1-0	
5.0	gr/br.silt & fine sand,tr.fine gravel	4-13 6-5	
10.0	blk.fine-med.sand, some silt	5-8 9-11 10-11	
15.5	peat w/some fine silty layers	2-1 2-1 1-1	
30.0	gr/br.silt,some organics	1-2 1-1 2-2 1-2 3-2 1-2 2-3 1-1 1-2	
	**br.fine-med.sand, & silt,tr.fine-crs. gravel		
	BOTTOM OF BORING 30.0 WATER AT 5' @ 0 hrs. Backfilled hole with cement 1 bag DATE: 9/25/85 DRILLER: FAULKNER		

Trio Printers # 1127

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ____ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

CLARENCE WELTI ASSOC., INC.
P.O. BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. AVCO LYCOMING; Stratford

CLIENT METCALF & EDDY

BORING NO. B-11
LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
	br.fine-med.sand, some silt	1-4	
3.0		8-9	
	gr/br.fine-med. sand,some silt, some fine-med. gravel	2-0	
		4-7	
		100/6"	
		17-17	
20.0		13-12	
	BOTTOM OF BORING 20.0 WATER AT 3' @ 0 hrs.		
	Backfilled hole with cement 1 bag		
	DATE: 9/26/85 DRILLER: FAULKNER		

BORING NO. B-12
LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
0.3	**	22-50	
1.0	***	60-42	
	gr/br.fine-med. sand,some silt, tr.organics	10-9	
		8-8	
		3-4	
		6-12	
		3-2	
		2-3	
14.0		2-2	
	peat,some fine-med. sand & silt	4-5	
		2-7	
		12-10	
		13-27	
		64-50	
		30-33	
		33-30	
		21-48	
30.0		33-20	
	**bituminous ***br.fine-med.sand, some fine-med.gravel		
	BOTTOM OF BORING 30.0 WATER AT 6' @ 0 hrs.		
	Backfilled hole with cement 1 bag		
	DATE: 9/23/85 DRILLER: FAULKNER		

Trio Printers # 1127

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ______ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. AVCO LYCOMING; Stratford
CLIENT METCALF & EDDY

BORING NO. B-13
LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
0.4	**	20-25	
	fine sand & silt	15-15	
4.4		18-100/3"	
	br.fine-crs.sand, tr.silt,some fine-crs.gravel	20-14	
		11-12	
		17-18	
		23-26	
		14-17	
		23-26	
		20-19	
20.0		23-20	
	**br.fine-med.sand, silt,fine gravel		
	BOTTOM OF BORING 20.0 WATER AT 4.6' @ 0 hrs. Backfilled hole with cement 1 bag DATE: 9/25/85 DRILLER: FAULKNER		

BORING NO. B-14
LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
	br.fine-med.sand, some silt, some fine-med.gravel	4-26	
		54-35	
		11-17	
		18-18	
		100/6"	
20.0		55-58-37	
	BOTTOM OF BORING 20.0 WATER AT 5' @ 0 hrs.		
	2" WELL POINT @ 14' 10' wrapped screen (20 slot) 5' riser 1' stickup Backfilled 6'-1.0' 1 protector & lock 1 bag cement DATE: 10/1/85 DRILLER: FAULKNER		

Trio Printers # 1127

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ______ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
.ASTONBURY, CONN. 06033

"BORING LOG"

PROJ. AVCO LYCOMING: Stratford

CLIENT METCALF & EDDY

BORING NO. B-15

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
0.3	**		
	br.fine-med.sand, some silt, some fine=med.gravel		
20.0			

**bituminous

BOTTOM OF BORING 20.0
WATER AT 5.5' @ 0 hrs.

2" WELL POINT @ 14'

10' wrapped screen (20 slot)
5' riser
1' stickup

Backfilled 5.5'-1'
1 protector & lock
1 bag cement

DATE: 9/30/85
DRILLER: FAULKNER

BORING NO. B-16

LINE & STA.
OFFSET
GR. ELEV.

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
0.3	**	100/3"	
	br.fine-crs.sand,, some fine-crs.gravel	7-6	
		3-8	
		6-7	
		9-8	
		8-9	
		10-9	
		13-10	
		9-8	
		20-24	
		16-11	
		18-18	
		20-17	
		30-43	
26.0		28-31	
	red/br.fine-crs. sand,some fine gravel,tr.silt	25-28	
30.0		28-25	

BOTTOM OF BORING 30.0
WATER AT 4.7' @ 0 hrs.

Backfilled hole with cement
1 bag

DATE: 9/25/85
DRILLER: FAULKNER

Trio Printers # 1127

1. COL. A strata depth
2. COL. B
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ______ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

CLARENCE WELTI ASSOC., INC.
P.O.BOX 397
GLASTONBURY, CONN. 06033

"BORING LOG"

PROJ. AVCO LYCOMING; Stratford

CLIENT METCALF & EDDY

BORING NO. B-17

LINE & STA. ______
OFFSET ______
GR. ELEV. ______

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
0.3	**		
1.1	***	14-37	
	br.fine-crs.sand, some fine-crs. gravel, some silt	39-49	
		6-10	
		8-12	
		13-17	
		12-16	
		11-14	
0.0		17-16	
	**bituminous ***br.fine-crs.sand & gravel		
	BOTTOM OF BORING 20.0 WATER AT 4.5' @ 0 hrs.		
	2" WELL POINT @ 14' 10' wrapped screen 5' riser 1' stickup	(20 slot)	
	Backfilled 6'-2' 1 protector & lock 1 bag of cement		
	DATE: 9/25/85 DRILLER: FAULKNER		

BORING NO. B-18

LINE & STA. ______
OFFSET ______
GR. ELEV. ______

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
	br.fine-med.sand, some silt	7-11	
		16-15	
		19-20	
		22-18	
		12-60-100/4	
		16-24	
20.0		22-24	
	BOTTOM OF BORING 20.0 WATER AT 4' @ 0 hrs.		
	Backfilled hole with cement 1 bag		
	DATE: 9/26/85 DRILLER: FAULKNER		

Trio Printers # 1127

1. COL. A strata depth
2. COL. B ______
3. HAMMER = 140#; FALL 30"
4. SAMPLER = ______ O.D. SPLIT SPOON
5. GWT = GROUND WATER

AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%

FORM 291

GRADATION CURVES

LABORATORY NO. 018 - SO. BOSTON

FIELD SAMPLE NOS. BORING B3

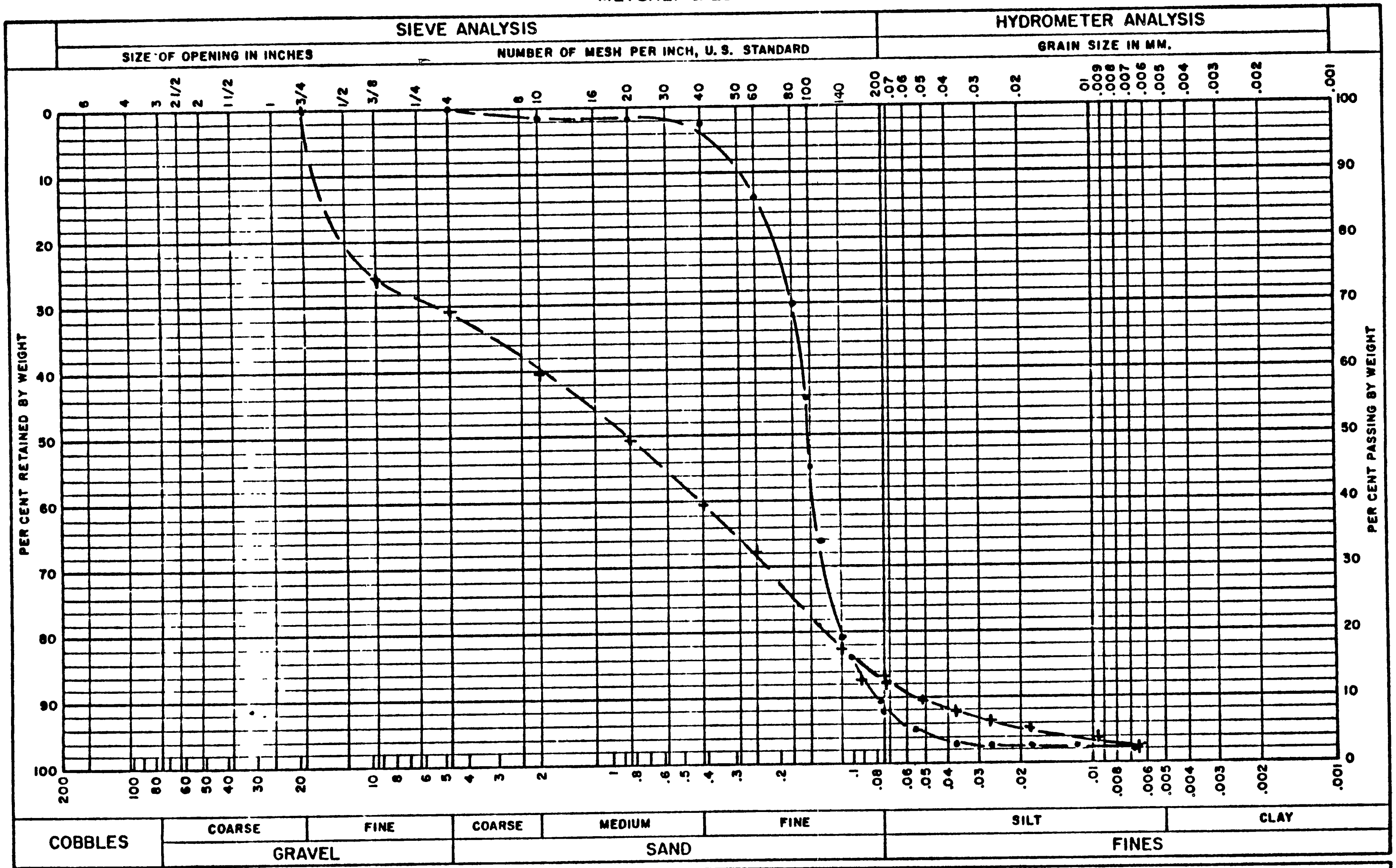
DATE TESTED 10-10-1985

ACCT. ABBR. AVCO-LYCOMING

ACCT. NO. 1569

TESTED BY W. CHECCHI

METCALF & EDDY ENGINEERS



FIELD SAMPLE NO.	KEY	SAMPLE DEPTH	SAMPLE DESCRIPTION
B3- S1	+ — + — + — +	0 - 2'	SM
B3 - S3	• • • •	12'- 14'	SP

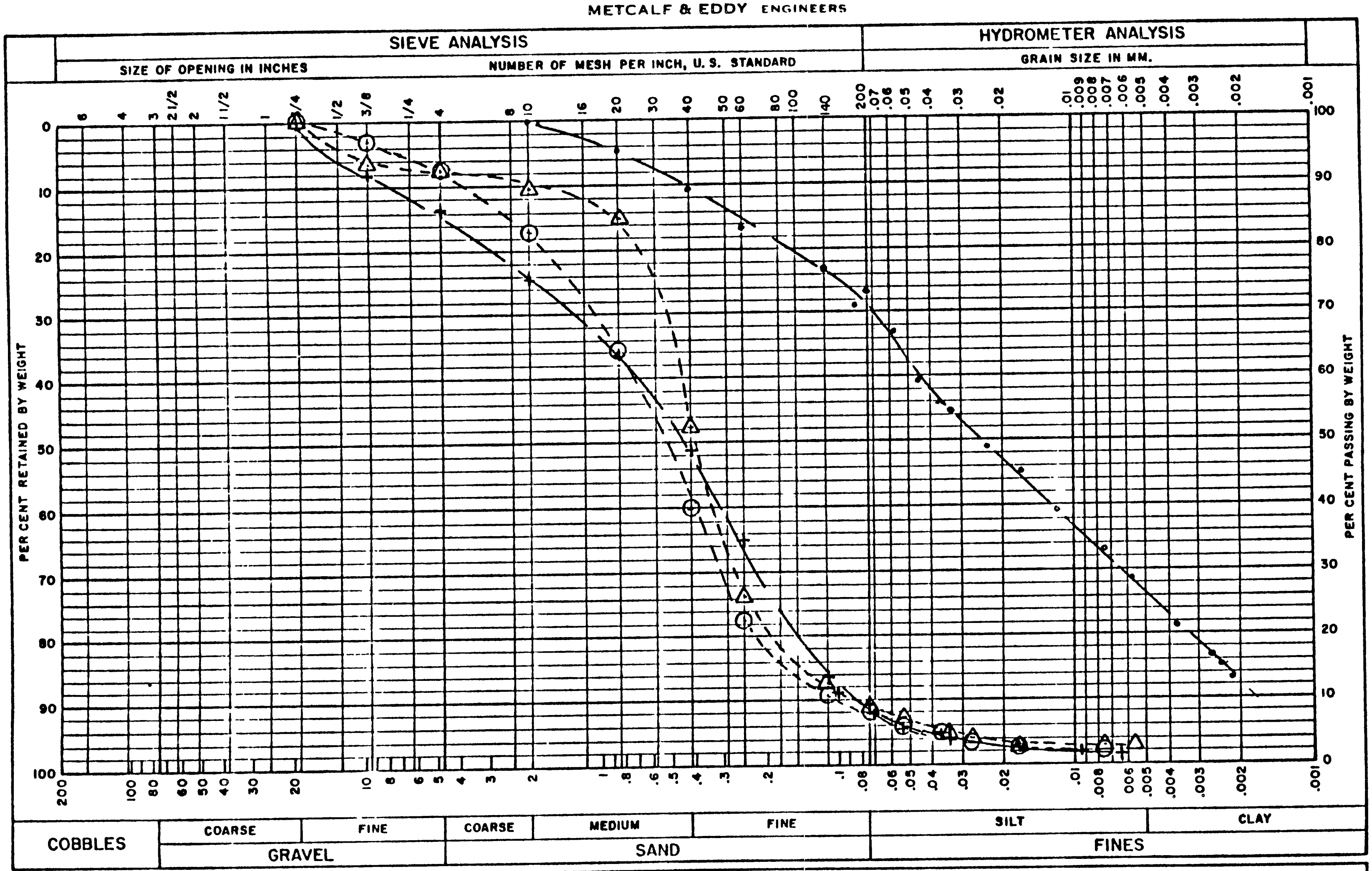
FORM 291

GRADATION CURVES

LABORATORY NO. 018 SO. BOSTON
FIELD SAMPLE NOS. BORING B4
DATE TESTED 10/11

ACCT. ABBR. AVCO-LYCOMING
ACCT. NO. 1569
TESTED BY W. CHECCHI

METCALF & EDDY ENGINEERS



FIELD SAMPLE NO.	KEY	SAMPLE DEPTH	SAMPLE DESCRIPTION
B4 - S2	+——+——+——+	3.5'–5.5'	
B4 - S4	•——∘——∘——∘	10.5'–12.5'	
B4 - S6	△- - -△- - - -△	17.5'- 19.5'	
B4 - S8	⊙- - -⊙- - - -⊙	24.5'-26.5'	

FORM 291

GRADATION CURVES

LABORATORY NO. 018 - SO. BOSTON

FIELD SAMPLE NOS. BORING - B7

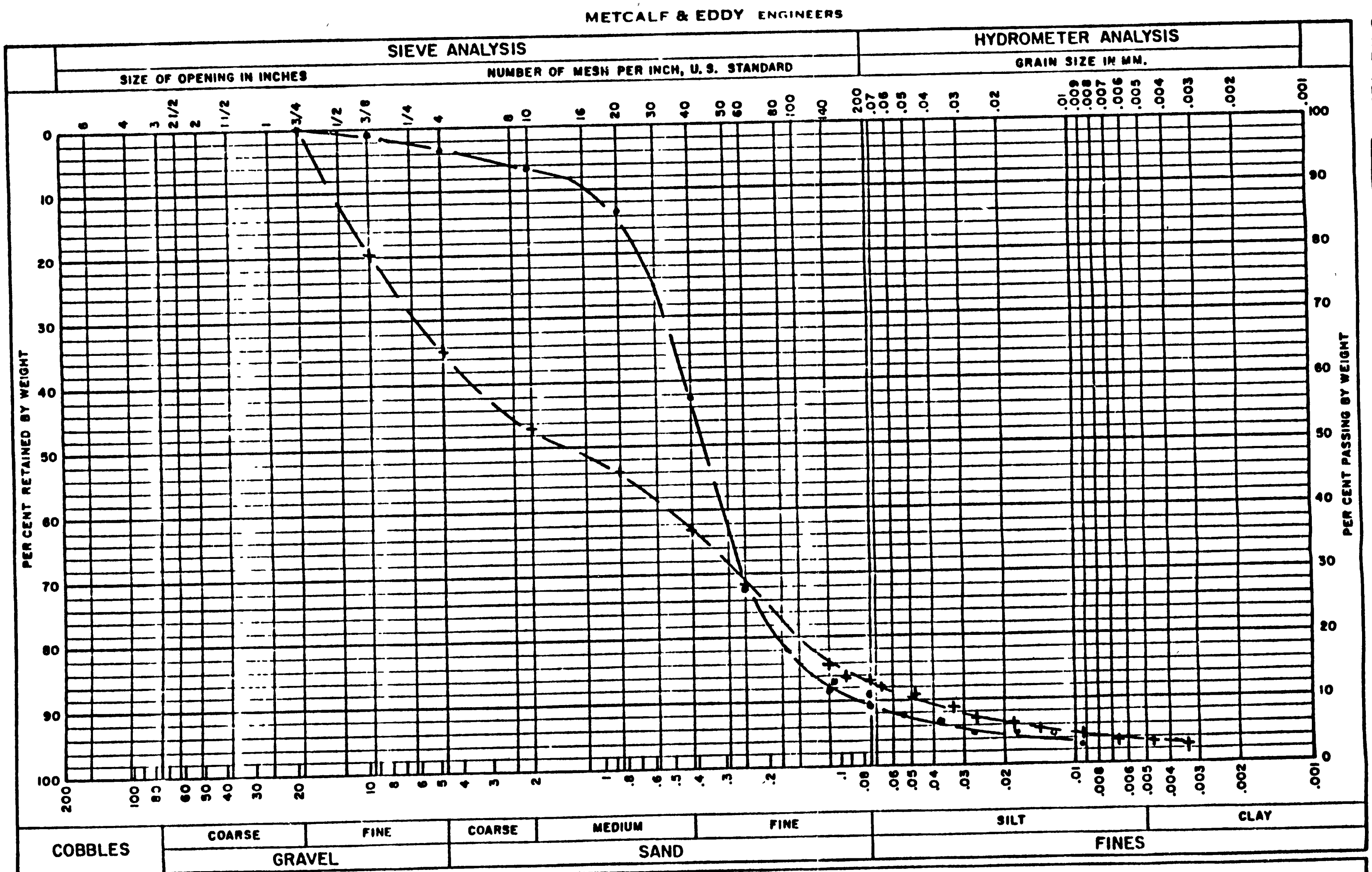
DATE TESTED 10/10 1985

ACCT. ABBR. AVCO-LYCOMING

ACCT. NO. 1669

TESTED BY W. CHECCHi

METCALF & EDDY ENGINEERS



FIELD SAMPLE NO.	KEY	SAMPLE DEPTH	SAMPLE DESCRIPTION
B7- S2	+ — —+— — — +—	3.6'-5.6'	
B7 - S5	• ——— —— • —	14.4'-16.4'	