

JOPLIN REPORT

TO : Chief, Field Operations Branch

DATE: July 3, 1974

FROM : James L. Hatheway
Sanitary Engineer

SUBJECT: Report on the Evaluations of Industries in the Joplin Area,
Spring River Basin, Missouri

INTRODUCTION

The Environmental Protection Agency, Region VII, requested the National Field Investigations Center-Denver (NFIC-D), Office of Enforcement, EPA, to conduct water quality investigations in the Spring River Basin (Joplin, Missouri area). These studies, conducted during the periods of November 26 to December 6, 1973 and January 14 to February 1, 1974, included an evaluation of industrial waste sources and limited stream surveys on Center Creek, Turkey Creek, Lone Elm Creek, and Grove Creek to determine the impact of waste loads on the quality of the receiving waters. The primary objectives of the survey were to: 1) evaluate water pollution control practices for industrial waste sources; 2) determine if the receiving waters are quality limiting for those constituents presently being discharged by industries (e.g., heavy metals, nutrients); 3) determine the degree of treatment, beyond best practicable control technology currently available which may be necessary to meet water quality standards; 4) obtain current data and information to aid in preparing National Pollutant Discharge Elimination System (NPDES) permits; and 5) determine the status of alleged non-filers.

The raw data collected during the survey are available for inspection at NFIC-D.

WASTE SOURCE EVALUATIONS

Thirty-eight industries were investigated of which thirty were alleged non-filers [Appendix A]. Discharges from ten of these industries were evaluated to determine wasteloads reaching the receiving waters [Figure 1-Table 1]. Data were obtained on each of the following through interviews with company officials, in-plant surveys and review of Refuse Act permit applications (when available).

1. Atlas Powder Company
2. Eagle Picher Industries, Inc.
3. Farmers Chemical Company
4. W. R. Grace and Company
5. Gulf Oil Corporation
6. Hercules, Inc.
7. Herrod Packing Company, Inc.
8. Independent Gravel Company
9. Missouri Steel Castings Company
10. Tamko Asphalt Products, Inc.

Atlas Powder Company

Atlas Powder Company (subsidiary of Tyler Corporation) manufactures ammonia (390 tons/day), urea (220 tons/day), ammonium nitrate (430 tons/day), nitric acid (350 tons/day), and nitroglycerin (19 tons/day). The latter is used to produce various grades of industrial explosives.

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TABLE 1

LIST OF SAMPLING STATIONS
SPRING RIVER BASIN SURVEY, 1973-1974

| <u>Map Key^{1/}</u> | <u>River Mile^{2/}</u> | <u>Station Description</u> |
|-----------------------------|--------------------------------|---|
| 1 | 37.0/18.5/3.55 | Grove Creek upstream of W. R. Grace and Co. |
| 2 | 37.0/18.5/2.65/1.25 | Unnamed tributary to Grove Creek upstream of W. R. Grace and Co., gypsum pile. |
| 3 | 37.0/18.5/2.65/0.40 | Unnamed tributary to Grove Creek downstream from W. R. Grace and Co., gypsum pile. |
| 4 | 37.0/18.5/2.65/0.15 | Discharge from superphosphate drain (001) ^{3/} , W. R. Grace and Co. |
| 5 | 37.0/18.5/2.62 | Discharge from granulation and sulfate plants (002), W. R. Grace and Co. |
| 6 | 37.0/18.5/2.57 | Discharge from sulfuric acid plant (003), W. R. Grace and Co. |
| 7 | 37.0/18.5/1.85 | Discharge from emergency holding pond (004), Atlas Powder Company. |
| 8 | 37.0/18.5/1.78 | Discharge from nitroglycerin storehouse (005), Atlas Powder Company. |
| 9 | 37.0/18.5/1.72 | Discharge from nitric acid production nitroglycerin storehouse, and Stengel ammonium nitrate process (003), Atlas Powder Company. |
| 10 | 37.0/18.5/1.25 | Discharge from cooling tower in fertilizer manufacturing area (002), Atlas Powder Company. |
| 11 | 37.0/18.5/0.65/0.73 | Discharge from fertilizer manufacturing lagoons (001), Atlas Powder Company. |
| 12 | 37.0/18.5/0.65/0.01 | Discharge from fertilizer manufacturing lagoons (001) at Grove Creek. |
| 13 | 37.0/18.5/0.5 | Grove Creek at low water bridge. |
| 14 | 37.0/21.3 | Center Creek upstream of Grove Creek. |
| 15 | 37.0/17.0 | Center Creek at Hwy HH bridge. |
| 16 | 37.0/16.25 | Discharge from manufacture of commercial explosives (006), Hercules, Inc. |
| 17 | 37.0/16.12 | Discharge from nitroglycerin nitrating house (005), Hercules, Inc. |
| 18 | 37.0/16.00 | Discharge from nitroglycerin storehouse (004), Hercules, Inc. |
| 19 | 37.0/15.95" | Discharge from Mixhouse No. 1 (002), Hercules, Inc. |
| 20 | 37.0/15.85 | Discharge from acid recovery tower (001), Hercules, Inc. |
| 21 | 37.0/13.8 | Center Creek at Hwy 66 Bridge. |
| 22 | -- | Intake (mine) water, Independent Gravel Company. |
| 23 | 37.0/7.6/1.9 | Discharge from sedimentation ponds, Independent Gravel Company. |
| 24 | 37.0/0.9 | Center Creek near mouth. |
| 25 | -- | Discharge from Lagoon, Herrod Packing Company, Inc. |

TABLE 1

LIST OF SAMPLING STATIONS
 SPRING RIVER BASIN SURVEY, 1973-1974
 (CONTINUED)

| <u>Map Key</u> ^{1/} | <u>River Mile</u> ^{2/} | <u>Station Description</u> |
|------------------------------|---------------------------------|---|
| 26 | 37.0/6.52/2.05 | Discharge from Missouri Steel Castings Company. |
| 27 | 35.1/8.32 | Discharge from Tamko Asphalt Products, Inc. |
| 28 | 35.1/5.92/1.60 | Lone Elm Creek upstream of Eagle Picher Industries, Inc. |
| 29 | 35.1/5.92/1.55 | Discharge from couples plant (001), Eagle Picher Industries, Inc. |
| 30 | 35.1/5.92/1.32 | Discharge from chemical plant (002), Eagle Picher Industries, Inc. |
| 31 | 35.1/5.92/1.10 | Discharge from fibers plant (003), Eagle Picher Industries, Inc. |
| 32 | 35.1/5.92/0.9 | Lone Elm Creek downstream of Eagle Picher Industries, Inc. |
| 33 | 35.1/5.94 | Turkey Creek upstream of Lone Elm Creek wastewater treatment plant. |
| 34 | 35.1/5.93 | Turkey Creek downstream from Lone Elm Creek wastewater treatment plant. |
| 35 | 35.1/5.0 | Turkey Creek downstream from Lone Elm Creek. |
| 36 | 35.1/0.1 | Turkey Creek near the mouth. |
| 37 | 28.4/5.0 | Short Creek upstream of Farmers Chemical Company. |
| 38 | -- | Discharge into gypsum pile, Farmers Chemical. |
| 39 | 28.4/4.3 | Short Creek downstream from Farmers Chemical Company. |
| 40 | 28.4/3.0 | Short Creek at Galena, Kansas. |
| 41 | 28.4/1.2 | Short Creek near the mouth. |
| 42 | 31.1 | Discharge from 120 acre pond, Gulf Oil Corporation. |

^{1/}See Figure 1 and respective figures for each industry.

^{2/}Starting at the mouth of Spring River as zero.

^{3/}No. in parentheses are the serial numbers of discharges reported in the RAPP application.

Wastewaters from the fertilizer manufacturing area, except cooling water, are treated in three lagoons prior to discharge [Figure 2]. Nitroglycerin (NG) wastes pass through baffled tanks to remove free NG prior to discharge [Appendix B]. These wastes, cooling water and untreated wastes from the nitric acid manufacturing area are discharged into Grove Creek at five discrete points [Figure 2].

During the period January 23-27, 1974, hourly grab samples were collected daily of each effluent, except the NG discharges, using SERCO automatic samplers and composited on an equal volume basis over the 24-hour period [Appendix C-Study Methods]. Grab samples of the NG discharges were collected manually [Tables 2, 3, 4].

The company discharged large quantities of nutrients (e.g., 1125 Kg/day-2,500 lbs/day of ammonia) into Grove Creek, an unclassified water [Appendix D] increasing the concentrations in this stream and Center Creek by more than 20 times that of upstream conditions. Although these discharges caused water quality degradation, the quality standards applicable to these streams were not violated.

Bioassays were conducted on the discharge from the lagoons serving the fertilizer manufacturing process (Station 12) [Appendix E]. The 96-hour TLM for raw wastewater containing 4.6 mg/l ammonia and 0.25 mg/l copper was 5.6% concentration. These data indicate synergistic effects occurring between copper and ammonia. Algal growth potential tests substantiated the toxicity of this discharge. A sample comprised of 25% wastewater (which contained 320 mg/l of $\text{NH}_3\text{-N}$)

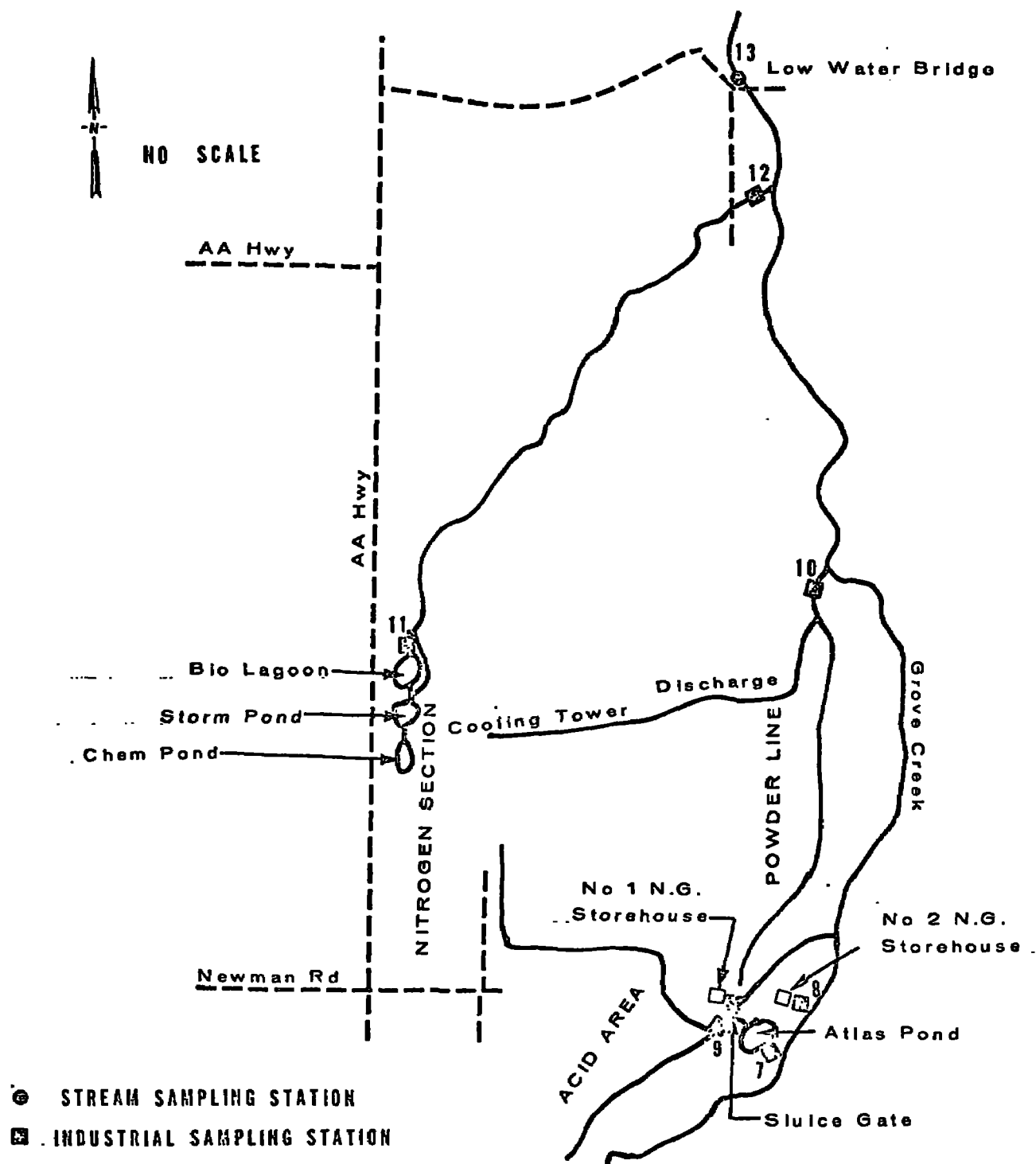


Figure 2. Sampling Locations - Atlas Powder Co. , Near Joplin, Missouri

TABLE 3
SUMMARY OF NUTRIENT DATA^{1/}
ATLAS POWDER COMPANY, JOPLIN, MISSOURI
JANUARY 23-27, 1974

| Map Key ^{2/} | Station Description | TKN | NH ₃ -N | Organic Nitrogen-N | NO ₂ +NO ₃ -N | Total P | Ortho P |
|-----------------------|--|-----------------------------|--------------------|-----------------------|-------------------------------------|-------------------|-------------------|
| 11 | Discharge from fertilizer manufactur- ing lagoons (001) RM 37.0/18.5/0.65/0.73 | Range 860-1,510 Avg 1170 | 670-850 750. | 190-730 420 | 28-85 41 | 0.56-0.74 0.63 | 0.35-0.58 0.42 |
| 12 | Discharge from fertilizer manu- facturing lagoons at Grove Creek (001) RM 37.0/18.5/0.65/0.01 | Range 440-535 Avg 485 | 245-280 265 | 195-265 220 | 23-30 26 | 0.21-0.29 0.26 | 0.16-0.18 0.17 |
| 10 | Discharge from cooling tower in fertilizer manufacturing area (002) RM 37.0/18.5/1.25 | Range 1.1-3.4 Avg 2.1 | 0.4-1.7 0.8 | 0.6-2.7 1.3 | 7-13 9 | 0.36-0.45 0.41 | 0.17-0.30 0.27 |
| 9 | Discharge from nitric acid pro- duction, NG storehouse and Stengel ammonium nitrate process (003) RM 37.0/18.5/1.72 | Range 20-66 Avg 38 | 17-48 30 | 2-18 8 | 38-133 65 | 0.57-1.20 0.81 | 0.20-0.67 0.44 |
| 7 | Discharge from emergency holding pond (004) RM 37.0/18.5/1.85 | Range 155-180 Avg 170 | 137-169 150 | 11-26 18 | 160-280 190 | 0.09-0.28 0.14 | 0.04-0.14 0.07 |
| 8 | Discharge from NG storehouse (005) RM 37.0/18.5/1.78 | Range - Avg - | 0.01-0.25 0.07 | - - | 1,000-4,050 2,070 | - - | - - |

^{1/}All values are mg/l

^{2/}For location see Figure 2

TABLE 4
SUMMARY OF HEAVY METAL DATA^{1/}
ATLAS POWDER COMPANY, JOPLIN, MISSOURI
JANUARY 23-27, 1974

| Map Key ^{2/} | Station Description | | Cadmium | Chromium | Copper | Lead | Zinc | Mercury ug/l |
|-----------------------|--|--------------|--------------------------|-------------------|-------------------|--------------------|-------------------|-----------------|
| 11 | Discharge from fertilizer manufactur- ing lagoons (001) RM 37.0/18.5/0.65/0.73 | Range Avg | - <0.01 ^{3/} | 0.82-0.96 0.88 | 0.61-1.1 0.86 | 0.02-0.08 0.05 | 0.52-0.62 0.57 | <0.2-2.7 0.9 |
| 12 | Discharge from fertilizer manufactur- ing lagoons (001) RM 37.0/18.5/0.65/0.01 | Range Avg | - <0.01 ^{3/} | 0.25-0.33 0.29 | 0.24-0.27 0.26 | <0.01-0.03 0.01 | 0.31-0.65 0.50 | 0.3-1.1 0.7 |
| 10 | Discharge from cooling tower in fertilizer manufacturing area (002) RM 37.0/18.5/1.25 | Range Avg | - <0.01 ^{3/} | 0.07-0.23 0.13 | 0.01-0.03 0.02 | <0.01-0.09 0.2 | 0.16-0.23 0.18 | 0.4-3.0 1.2 |
| 9 | Discharge from nitric acid pro- duction, NG storehouse and Stengel ammonium nitrate process (003) RM 37.0/18.5/1.72 | Range Avg | - <0.01 ^{3/} | 0.31-0.80 0.57 | 0.04-0.11 0.07 | <0.01-0.09 0.06 | 0.50-0.76 0.63 | 1.0-5.6 2.4 |
| 7 | Discharge from emergency holding pond (004) RM 37.0/18.5/1.85 | Range Avg | <0.01-0.01 <0.01 | 0.18-0.23 0.20 | 0.04-0.06 0.05 | 0.01-0.08 0.04 | 0.27-0.39 0.35 | 0.5-2.3 1.1 |

^{1/}All values are mg/l except where noted

^{2/}For location see Figure 2

^{3/}All values are the same

and 75% Center Creek water collected upstream of Grove Creek inhibited algal growth. Algal growth was stimulated as the percent of wastewater was reduced. As the discharge comprised less than 25% of the flow in Center Creek, algal growth could be increased by this discharge. A severe reduction in the amount of copper and ammonia presently discharged is required to eliminate the toxic effects of this wastewater. Company officials stated that a new treatment system to reduce by 50% the amount of ammonia presently discharged should be in operation for the ammonia production facility by January 1, 1976. The treatment system, manufactured in Sweden, is considered proprietary. The company also will eliminate the discharge of copper used in the manufacturing of ammonia (ammonium copper acetate system).

The discharge from the nitroglycerin storehouses contained 2 to 350 mg/l of NG and 27 to 2,500 mg/l of ethylene glycol dinitrate (EGDN). As mentioned earlier, this wastewater passes through baffled tanks to remove free NG before discharging into Grove Creek. The company is conducting pilot studies to develop a method for removing dissolved NG and EGDN from the wastewater. Algal growth potential tests were conducted on the discharge from the NG storehouse. Additions of 5% of wastewater (which contained 4000 mg/l $\text{NO}_3 + \text{NO}_2$) in Center Creek water inhibited algal growth. As the discharge comprised less than 5% of the flow in Center Creek, algal growth could be increased by this discharge. At present, a treatment system has not been developed

which will adequately reduce the NG-EGDN concentrations of these discharges. The company will continue the pilot studies as well as conduct bioassay studies on the effluent.

Based on information obtained during the survey, it was determined that Best Practicable Control Technology Currently Available (BPT) should prevent violations of Missouri Water Quality Standards. Therefore the NPDES permit for Atlas Powder Company [Appendix F], which was sent to Region VII on May 23, 1974, included a requirement that BPT be implemented for fertilizer and acid manufacturing discharges and the requirement for the permittee to continue pilot plant and conduct bioassay studies to determine a suitable treatment for nitroglycerin and ethylene glycol dinitrate. The permit was discussed with company officials and Region VII personnel. It is anticipated that the permit will be sent to public notice within two weeks.

Eagle Picher Industries, Inc.

Eagle Picher Industries, Inc. operates three separate plants in Joplin, Missouri [Figure 3]. These are a couples plant (dry cell battery manufacturer), a chemical plant (lead oxide) and a fibers plant (commercial insulation). A NPDES permit to discharge wastewaters into Lone Elm Creek, an unclassified water tributary to Turkey Creek [Appendix D], was issued on March 16, 1973. The initial and final permit limitations are summarized in Table 5.

Self-monitoring data for the period April 15 to June 30, 1973, shows that six samples from the couples, chemical and fibers plant discharges were in violation of permit conditions as follows.

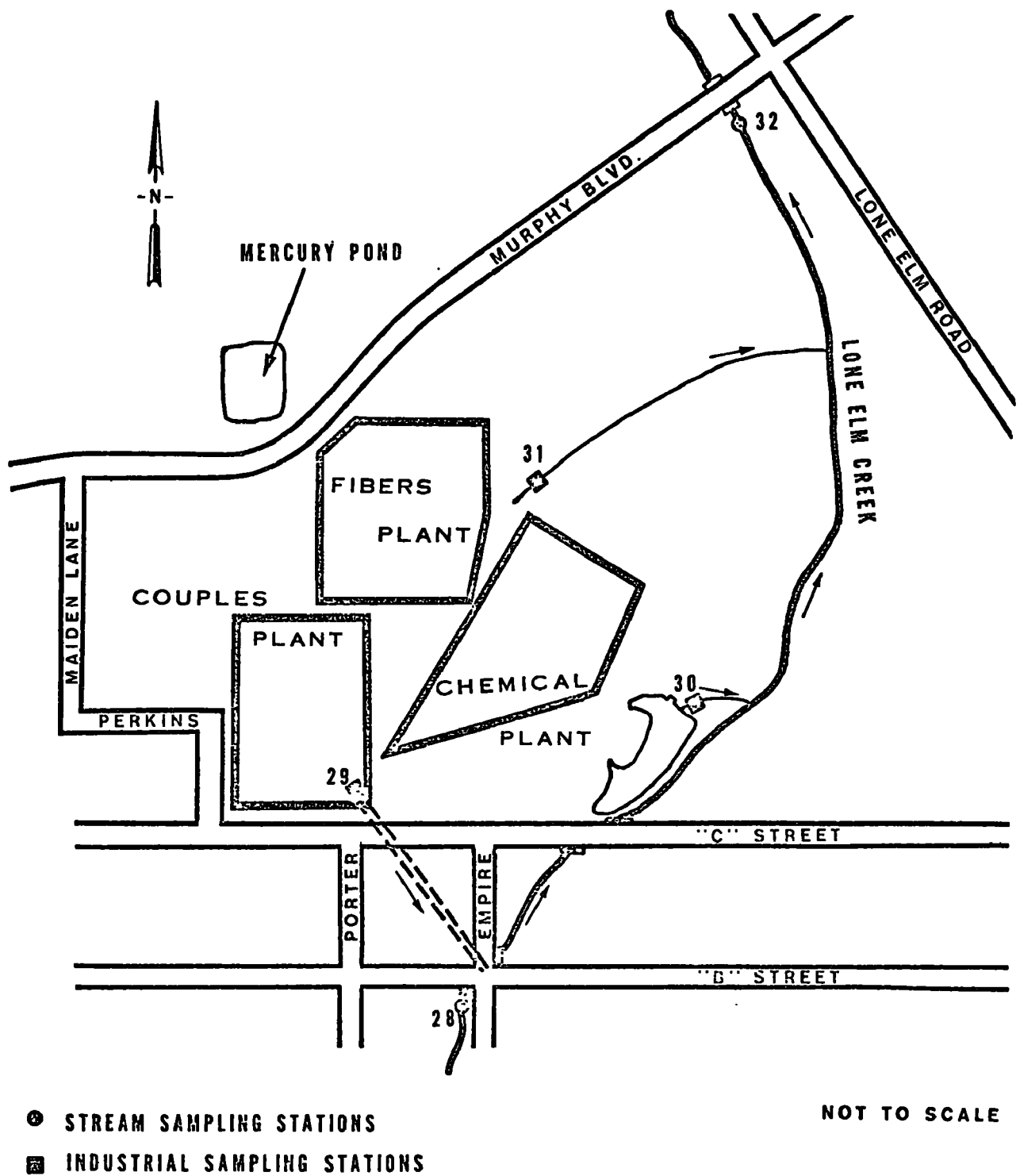


Figure 3. Sampling Locations Eagle Picher Ind., Inc. - Joplin, Missouri

TABLE 5

SUMMARY OF PERMIT REQUIREMENTS
EAGLE PICHER INDUSTRIES, INC.
JOPLIN, MISSOURI

Initial Conditions (Ending March 31, 1975)

| <u>Discharge Serial No.</u> | <u>Parameter</u> | <u>Maximum Allowable Value</u> | <u>Frequency of Analysis</u> | <u>Sample Type</u> |
|---------------------------------|-----------------------|------------------------------------|----------------------------------|------------------------|
| 001 - Couples Plant | Flow (mgd) | 0.37 | twice/monthly | -- |
| | pH (range) | 6.0-9.0 | twice/monthly | grab |
| | Cyanide mg/l | 0.02 | twice/monthly | grab |
| | Cadmium mg/l | 0.01 | twice/monthly | grab |
| | Copper mg/l | 0.04 | twice/monthly | grab |
| | Zinc mg/l | 3.6 | twice/monthly | grab |
| | Mercury µg/l | 1.2 | twice/monthly | grab |
| 002 - Chemical Plant | Flow (mgd) | 0.14 | twice/monthly | -- |
| | pH (range) | 7.0-11.0 | twice/monthly | grab |
| | Cadmium mg/l | 0.1 | twice/monthly | grab |
| | Chlorides mg/l | 1,325 | twice/monthly | grab |
| | Lead mg/l | 1.2 | twice/monthly | grab |
| 003 - Fibres Plant | Flow (mgd) | 0.10 | twice/monthly | -- |
| | pH (range) | 6.8-7.6 | twice/monthly | grab |
| | Aluminum mg/l | 1.7 | twice/monthly | grab |
| | Iron mg/l | 62 | twice/monthly | grab |
| | BOD ₅ mg/l | 86 | twice/monthly | grab |

Final Conditions (Beginning April 1, 1975)

| <u>Discharge Serial No.</u> | <u>Parameter</u> | <u>Avg Quantity(lbs/day)</u> | <u>Maximum Quantity(lbs/day)</u> | <u>Maximum Conc. (mg/l)</u> |
|---------------------------------|------------------|------------------------------|--------------------------------------|---------------------------------|
| 001 | cadmium | 0.021 | 0.031 | 0.01 |
| 001 | cyanide | 0.041 | 0.062 | 0.02 |
| 001 | copper | 0.041 | 0.062 | 0.02 |
| 001 | zinc | 0.21 | 0.31 | 0.10 |
| 002 | chlorides | 390 | 585 | -- |
| 002 | cadmium | 0.00777 | 0.0117 | 0.01 |
| 002 | lead | 0.077 | 0.117 | 0.10 |
| 003 | iron | 0.551 | 0.835 | 2.0 |
| 003 | BOD ₅ | 5.560 | 8.348 | -- |

The pH of the effluent shall not be less than 6.5 nor greater than 9.0 at any time. In addition, visible foam, visible floating solids, and detectable settleable solids are prohibited in the discharges.

Number of Violations

| <u>Parameter</u> | <u>Couples Plant</u> | <u>Chemical Plant</u> | <u>Fibers Plant</u> |
|------------------|----------------------|-----------------------|---------------------|
| Flow | 0 | 0 | 0 |
| Cyanide | 0 | N/A | N/A |
| Cadmium | 4 | 0 | N/A |
| Copper | 2 | N/A | N/A |
| Mercury | 6 | N/A | N/A |
| Zinc | 1 | N/A | N/A |
| pH | 4 | N/A | 1 |
| Lead | N/A | 2 | N/A |
| Chlorides | N/A | 0 | N/A |
| Aluminum | N/A | N/A | 2 |
| BOD | N/A | N/A | 0 |
| Iron | N/A | N/A | 0 |

Results of NFIC-D compliance monitoring January 23 through February 1, 1974, showed that 33 of 44 samples collected from the couples plant effluent violated the initial permit limitations. Discharges from the other plants were in compliance with all limitations, except for pH [Tables 6 and 7]. The maximum copper and zinc loads discharged to Lone Elm Creek during the survey were 0.09 and 5.1, respectively. Final permit criteria require that the total discharge contain no more than 0.062 lbs/day of copper and 0.31 lbs/day of zinc.

Bioassays were conducted on the discharge from the couples plant [Appendix E]. The 96-hour TLm of the raw wastewater which contained

TABLE 6
SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA
EAGLE PITCHER INDUSTRIES, INC.
JOPLIN, MISSOURI
JANUARY-FEBRUARY, 1974

| Map Key ^{1/} | Station Description | | Flow (mgd) | Temp °C | Conductivity µmhos/cm | pH | COD mg/l | Total Solids mg/l | Total Suspended Solids mg/l |
|--------------------------|---|--|--------------------------------|--------------------------|--------------------------|-----------------------|---------------------|-------------------------|--------------------------------------|
| 29 | Discharge from Couples ^{2/} Plant (001) RM 35.1/5.92/1.55 | Range Avg. No. Violations Per No. Samples | 0.032-0.041 0.036 - - | 11.5-15.0 - - - | 220-2000 - - - | 6.4-11.6 - 6/12 | 17-82 34 - | 234-348 300 - | 12-38 28 - |
| 30 | Discharge from Chemical ^{2/} Plant (002) RM 35.1/5.92/1.32 | Range Avg. No. Violations Per No. Samples | 0.112-0.142 0.132 - - | 9.5-13.5 - - - | 700-1800 - - - | 7.7-11.2 - 1/12 | 2-10 6 - | 400-660 510 - | 1-12 6 0/4 |
| 31 | Discharge from Fibres ^{2/} Plant (003) RM 35.1/5.92/1.10 | Range Avg. No. Violations Per No. Samples | 0.027-0.055 0.036 - - | 6.0-15.0 - - - | 320-1600 - - - | 5.9-7.8 12/21 | 350-880 590 - | 455-1010 795 - | 28-314 140 - |

^{1/} For location see Figure 3.

^{2/} Temp, conductivity and pH are instantaneous values. All other parameters are based on 24-hour composite.

TABLE 7

SUMMARY OF HEAVY METALS DATA
EAGLE PICHER INDUSTRIES, INC.
JOPLIN, MISSOURI
JANUARY-FEBRUARY, 1974

| Map Key ^{1/} | Station Description | | Cadmium mg/l | Chromium mg/l | Copper mg/l | Lead mg/l | Zinc mg/l | Mercury µg/l |
|--------------------------|---|--|---------------------------|---------------------------|---------------------|---------------------|-----------------|-----------------|
| 29 | Discharge from Couples ^{2/} Plant (001) RM 35.1/5.92/1.55 | Range Avg. No. Violations Per No. Samples | < 0.01-0.24 0.04 | 0.03-0.10 0.05 | < 0.01-0.29 0.16 | < 0.01-0.14 0.05 | 2.0-17.0 9.7 | 10-30 18 |
| | | | 5/8 | - | 7/8 | - | 7/8 | 8/8 |
| 30 | Discharge from Chemical ^{2/} Plant (002) RM 35.1/5.92/1.32 | Range Avg. No. Violations Per No. Samples | < 0.01-0.01 < 0.01 | - < 0.01 ^{3/} | < 0.01-0.05 0.02 | 0.83-1.07 0.90 | 0.05-4.2 1.1 | 0.2-1.2 0.5 |
| | | | 0/4 | - | - | 0/4 | - | - |
| 31 | Discharge from Fibres ^{2/} Plant (003) RM 35.1/5.92/1.10 | Range Avg. No. Violations Per No. Samples | - < 0.01 ^{3/} | < 0.01-0.02 < 0.01 | < 0.01-0.04 0.02 | 0.36-2.60 1.39 | 0.5-2.0 1.4 | 0.5-3.2 1.5 |
| | | | - | - | - | - | - | - |

^{1/} For location see Figure 3.

^{2/} All parameters are based on 24-hour composites.

^{3/} All values are the same.

zinc, aluminum and copper (2.6 mg/l, 0.58 mg/l and 0.04 mg/l, respectively) was 18.75%. There was synergy occurring and designation of any single metal as the toxic component was not possible. The final conditions of the NPDES permit should be modified to include a limit of 0.1 mg/l aluminum in the couples plant discharge.

Engineering reports on planned wastewater treatment modifications for the couples, chemical and fibers plants have been submitted to the Missouri Clean Water Commission. The reports show that the discharge from the fibers plant will be completely recycled and new treatment facilities will be constructed by March 31, 1975, at the couples and chemical plants. These modifications should enable the company to meet the final requirements of the NPDES permit [Table 5].

Farmers Chemical Company

Farmers Chemical Company produces NPK (nitrogen, phosphate and potassium) grades of fertilizers and feed grade calcium phosphate. Wastewater, consisting of cooling water and in-plant spills, is pumped to a 40-acre gypsum tailings pile and discharged to the surface [Figure 4]. Although there is no direct discharge, seepage along the entire north perimeter of this tailings pile entered Short Creek, an unclassified water [Appendix D]. The major area of seepage was located at the west end of the pile. The wastewater contained 0.51 pCi/l of radium 226* which is below the Maximum Permissible Concentration of 3.3 pCi/l set by the International Commission for Radiological Protection.

*A sample of the gypsum contained 20 pCi/g of radium 226.

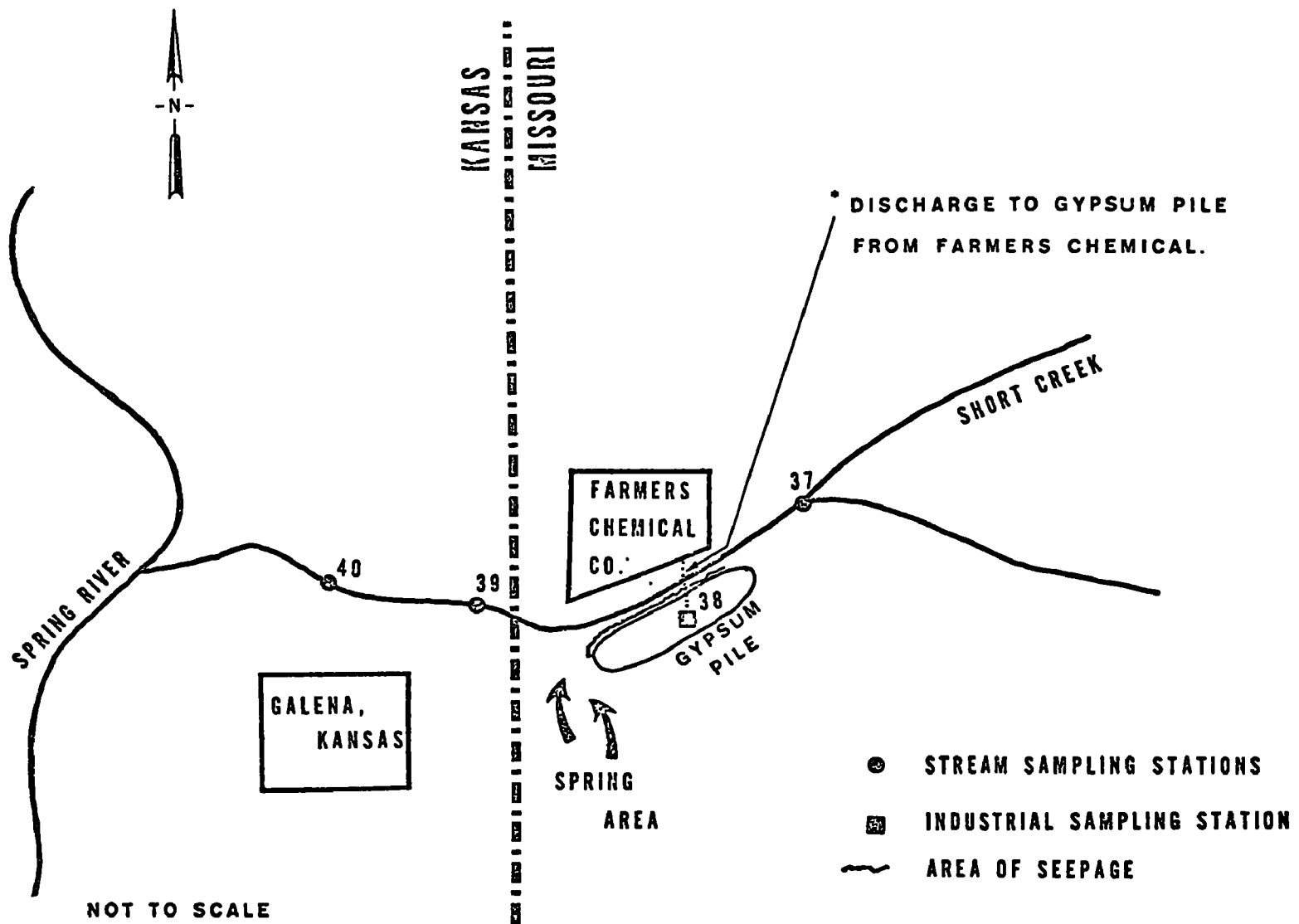


Figure 4. Sampling Location - Farmers Chemical Company Near Joplin, Missouri

Results of the in-plant survey, November 28-30, 1973, showed that the discharge to the gypsum pile had a low pH, was high in solids, sulfates, flouride and phosphorus and contained heavy metals [Tables 8, 9 and 10]. The low pH causes increased leaching of radium 226 and other pollutants from the gypsum pile.

Samples collected from Short Creek showed that the seepage from the gypsum pile affected the receiving water quality. The average concentration of sulfates, flourides, radium 226 and total phosphorus increased 3, 17, 2 and 8 times, respectively in samples collected downstream from the gypsum pile. Removing the wastewater discharge to the pile, and grading and sealing the surface to prevent infiltration would eliminate this seepage to Short Creek.

The company was advised that a NPDES permit was required for their operation. To date an application has not been received. Technical data were furnished to the Legal Branch, Region VII, EPA.

W. R. Grace and Company

W. R. Grace and Company produces sulfuric acid and phosphate fertilizers. Production figures are considered confidential by the company. Process water is obtained from a mine shaft. Untreated wastewater is discharged to Grove Creek at three points. In addition to these discharges, seepage from an abandoned 120-acre gypsum pile also enters Grove Creek via an unnamed tributary [Figure 5].

TABLE 8

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA^{1/}
 FARMERS CHEMICAL COMPANY AND SHORT CREEK, JOPLIN, MISSOURI AREA
 NOVEMBER 1973

| Map Key ^{2/} | Station Description | | Flow (MGD) | Temp. (°C) | Cond. (µmhos/cm) | pH | COD | Total Solids | Total Suspended Solids | Settleable Solids | Sulfate | Flouride | Radium pCi/l |
|--------------------------|--|---------------|----------------------|----------------|---------------------|--------------|---------------|------------------------|------------------------------|--------------------------|------------------|-------------------|--------------------|
| 38 | Farmer's Chem. Co. Discharge into Gypsum Pile | Range Avg. | 0.130-0.144 0.136 | 15.5-24.5 - | 1400-5200 - | 2.7-6.4 - | 99-250 150 | 1490-113,000 24,700 | 120-105,000 19,400 | 4-90 32 | 150-3500 1050 | 0.2-190 68 | <u>3/</u> |
| 37 | Short Creek Upstream of Farmer's Chem. Co. Gypsum Pile RM 24.8/5.0 | Range Avg. | 4.9-8.0 6.3 | 8.5-12.0 - | 310-370 - | 6.6-8.3 - | 15-48 34 | 147-307 223 | 2-51 17 | - - | 65-105 80 | 0.25-0.76 0.38 | 0.03-0.15 0.09 |
| 39 | Short Creek Down- stream of Farmer's Chem. Co. Gypsum Pile RM 24.8/4.3 | Range Avg. | 3.4-11.3 7.7 | 9.0-12.0 - | 520-700 - | 6.1-8.3 - | 11-49 32 | 239-591 433 | 5-81 30 | - < 0.1 ^{4/} | 165-480 245 | 4.4-10.0 6.6 | 0.06-0.69 0.20 |
| 40 | Short Creek at Bridge North of Galena, Kansas RM 24.8/3.0 | Range Avg. | 10.5-18.4 15.0 | 9.5-13.5 - | 460-650 - | 6.0-8.5 - | 8-41 26 | 307-493 402 | 11-65 23 | - < 0.1 ^{4/} | 145-195 175 | 3.2-6.0 4.0 | <0.01-1.08 0.51 |

^{1/} All samples were grab samples. All units are mg/l except where noted.

^{2/} See Figure 4 for location.

^{3/} A sample of the gypsum pile contained 20 pCi/g of radium.

^{4/} All values were the same.

TABLE 9
SUMMARY OF NUTRIENTS DATA^{1/}
FARMERS CHEMICAL COMPANY AND SHORT CREEK, JOPLIN, MISSOURI AREA
NOVEMBER 1973

| Map Key ^{2/} | Station Description | | TKN | NH ₃ -N | Organic N-N | NO ₃ + NO ₂ -N | Total P | Ortho P |
|-----------------------|---|---------------|----------------|--------------------|---------------------------|--------------------------------------|-----------------|-----------------|
| 38 | Farmer's Chem. Co. Dis-charge into Gypsum Pile | Range Avg. | 20-370 105 | - - | - - | 0.13-6.0 2.3 | 300-1600 800 | 200-1400 630 |
| 37 | Short Creek Upstream of Farmer's Chem. Co. Gypsum Pile RM 24.8/5.0 | Range Avg. | 0.5-1.2 0.6 | 0.12-1.2 0.39 | < 0.1-0.7 0.3 | 0.13-3.0 0.8 | 1.1-8.0 5.4 | 1.1-7.3 4.7 |
| 39 | Short Creek Downstream of Farmer's Chem. Co. Gypsum Pile RM 24.8/4.3 | Range Avg. | 3.7-6.4 4.9 | 3.7-6.4 4.9 | - < 0.01 ^{3/} | 0.33-1.8 1.2 | 31-60 46 | 21-56 35 |
| 40 | Short Creek at Bridge North of Galena, Kansas RM 24.8/3.0 | Range Avg. | 2.2-4.2 3.0 | 2.2-4.2 3.0 | < 0.1-0.1 < 0.1 | 0.38-2.1 1.3 | 20-34 25 | 13-33 22 |

^{1/} All values are mg/l and all samples were grab samples.

^{2/} See Figure 4 for location.

^{3/} All values are the same.

TABLE 10
SUMMARY OF HEAVY METALS DATA^{1/}
FARMERS CHEMICAL COMPANY AND SHORT CREEK, JOPLIN, MISSOURI AREA
NOVEMBER 1973

| Map Key ^{2/} | Station Description | | Lead | Zinc | Chromium | Copper | Cadmium | Mercury µg/l |
|-----------------------|---|---------------|---------------------------|----------------|---------------------------|---------------------------|---------------------------|--------------------|
| 38 | Farmer's Chem. Co. Dis- charge into Gypsum Pile | Range Avg. | < 0.08-1.24 0.27 | 2.7-6.9 4.7 | 0.39-1.1 0.9 | < 0.04-0.32 0.12 | 0.10-0.17 0.14 | 0.5-13.0 5.3 |
| 37 | Short Creek Upstream of Farmer's Chem. Co. Gypsum Pile RM 24.8/5.0 | Range Avg. | - < 0.08 ^{3/} | 1.6-2.4 1.9 | - < 0.01 ^{3/} | - < 0.04 ^{3/} | - < 0.02 ^{3/} | < 0.2- 16.0 6.8 |
| 39 | Short Creek Downstream of Farmer's Chem. Co. Gypsum Pile RM 24.8/4.3 | Range Avg. | - < 0.08 ^{3/} | 3.4-6.1 4.5 | < 0.01-0.19 0.05 | - < 0.04 | < 0.02-0.03 0.02 | 0.03-15.0 4.3 |
| 40 | Short Creek at Bridge North of Galena, Kansas RM 24.8/3.0 | Range Avg. | - < 0.08 ^{3/} | 22-33 28 | - < 0.01 ^{3/} | 0.13-0.25 0.19 | 0.26-0.33 0.29 | 0.3-90.0 17.8 |

^{1/} All samples were grab and all values are mg/l except where noted.

^{2/} See Figure 4 for location.

^{3/} All values are the same.

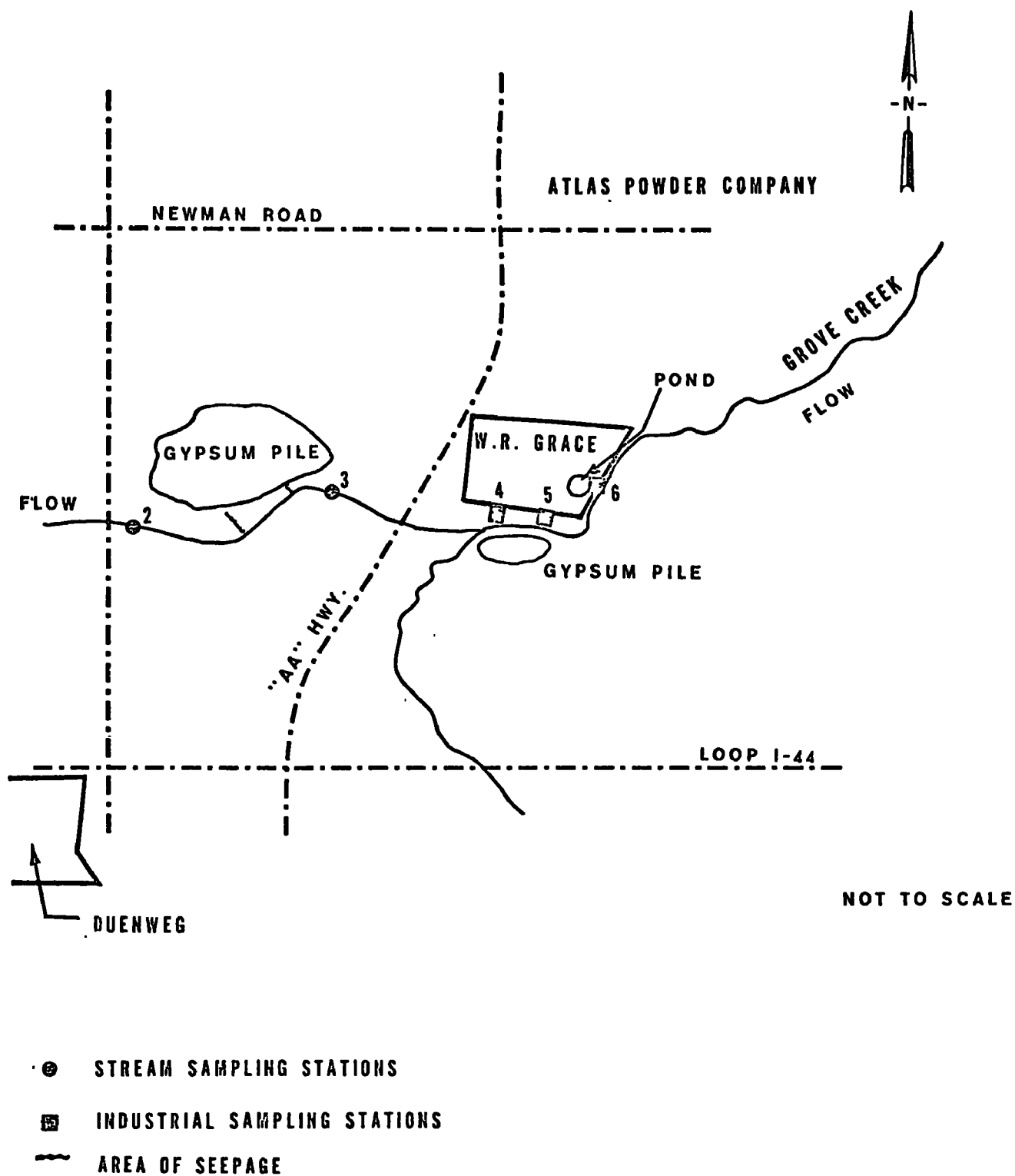


Figure 5. Sampling Locations - W.R. Grace and Company Near Joplin, Missouri

During the period January 23-26, 1974, hourly grab samples were collected from each of the three discharges using SERCO samplers and composited on an equal volume basis over the 24-hour period. In addition, grab samples were collected from the unnamed tributary upstream and downstream from the gypsum pile [Tables 11, 12, 13].

The discharge from the granulation and sulfate plants (Station 5) had a low pH and contained over 80% of the sulfate and ammonia discharged. The three discharges will be intercepted and collected into a non-overflow pond before September 30, 1974. This water will be reused in the production of fertilizers, thus eliminating the discharge of wastewater pollutants from the fertilizer manufacturing activities. Only wastewater from the sulfuric acid plant will be intermittently discharged to Grove Creek.

Grab samples of the unnamed tributary to Grove Creek showed that the water quality was degraded by the seepage from the gypsum pile. The average concentrations of sulfates, fluorides and radium 226 increased 2, 13, and 2 times respectively. The company has attempted with limited success to grow grass on the top of the gypsum pile in an attempt to reduce infiltration. Grading and sealing the surface of the pile may be required to eliminate this seepage.

The proposed NPDES permit for W. R. Grace and Company [Appendix F] was transmitted from NFIC-D to Region VII on May 23, 1974. The permit requires zero discharge of wastewater pollutants from the fertilizer manufacturing process by October 1, 1974 and BPT for

TABLE 11
SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA
W. R. GRACE AND COMPANY, JOPLIN, MISSOURI
JANUARY, 1974

| Map ^{1/} Key | Station Description | | Flow (mgd) | Temp (°C) | Conductivity µmhos/cm | pH | Total Solids mg/l | Total Suspended Solids mg/l | Sulfate mg/l | COD mg/l | Fluorides mg/l | Radium pCi/l |
|--------------------------|--|---------------|--------------------------|----------------|--------------------------|--------------|-------------------------|--------------------------------------|---------------------|-------------|-------------------|------------------|
| 2 | Unnamed tributary to Grove Creek upstream of W. R. Grace and Company gypsum pile R.M. 370/18.5/2.65/1.25 | Range Avg. | 0.073-0.144 0.095 | 1.0-7.0 - | 380-630 - | 6.8-7.1 - | 222-315 273 | 5-18 10 | 120-150 130 | 2-16 11 | 0.2-1.3 0.4 | 0.02-0.0 0.04 |
| 3 | Unnamed tributary to Grove Creek downstream from W. R. Grace and Company gypsum pile R.M. 37.0/18.5/2.65/0.40 | Range Avg. | - 0.627 ^{2/} | 5.5-12.0 - | 675-800 - | 6.5-6.7 - | 557-702 619 | 3-19 10 | 280-290 280 | 4-17 7 | 4.8-5.6 5.2 | 0.02-0.0 0.08 |
| 4 | Discharge from superphosphate drain (001) ^{3/} , W. R. Grace and Company R.M. 37.0/18.5/2.65/0.15 | Range Avg. | 0.058-0.069 0.062 | 10.0-12.0 - | 460-4200 - | 5.6-6.5 - | 516-814 647 | 15-40 26 | 140-340 260 | 13-18 16 | - - | - - |
| 5 | Discharge from granulation and sulfate plants (002), W. R. Grace and Company R.M. 37.0/18.5/2.62 | Range Avg. | - 0.02 ^{2/} | 8.0-12.0 - | 5000-19,000 - | 2.2-2.5 - | 2480-22,000 7470 | 26-55 39 | 1340-16,800 5420 | 18-45 28 | - - | - - |
| 6 | Discharge from sulfuric acid plant (003), W. R. Grace and Company R.M. 37.0/18.5/2.57 | Range Avg. | 0.070-0.199 0.107 | 12.0-22.5 - | 1000-3400 - | 7.7-8.2 | 905-1460 990 | 11-18 16 | 83-140 116 | 5-10 7 | - - | - - |

^{1/} For location see Figure 5.

^{2/} All values are the same.

^{3/} Numbers in parenthesis are RAPP application numbers.

TABLE 12
SUMMARY OF NUTRIENT DATA^{1/}
W. R. GRACE AND COMPANY
JANUARY 1974

| Map ^{2/} Key | Station Description | | TKN | NH ₃ -N | Organic Nitrogen-N | NO ₂ + NO ₃ -N | Total Phosphorous | Ortho-P |
|--------------------------|---|---------------|------------------|--------------------|-----------------------|--------------------------------------|----------------------|-----------------|
| 2 | Unnamed tributary to Grove Creek upstream of W. R. Grace and Company gypsum pile R.M. 370/18.5/2.65/1.25 | Range Avg. | 0.4-1.7 0.6 | 0.02-1.2 0.15 | 0.3-0.5 0.4 | 1.2-1.8 1.6 | 0.49-9.4 2.6 | 0.44-7.8 2.1 |
| 3 | Unnamed tributary to Grove Creek downstream from W. R. Grace and Company gypsum pile R.M. 37.0/18.5/2.65/0.40 | Range Avg. | 0.7-1.3 0.9 | 0.12-0.16 0.15 | 0.5-1.2 0.7 | 4.1-5.8 4.7 | 16-20 19 | 15-20 18 |
| 4 | Discharge from superphos- phate drain (001) ^{3/} , W. R. Grace and Company R.M. 37.0/18.5/2.65/0.15 | Range Avg. | 2.2-25.0 10.2 | 1.5-25.0 9.2 | < 0.1-3.1 1.1 | 3.7-5.7 4.5 | 26-86 57 | 26-86 51 |
| 5 | Discharge from granulation and sulfate plants (002), W. R. Grace and Company R.M. 37.0/18.5/2.62 | Range Avg. | 180-215 200 | 180-215 190 | < 0.1-15 7.5 | 61-66 64 | 73-160 100 | 68-140 91 |
| 6 | Discharge from sulfuric acid plant (003), W. R. Grace and Company R.M. 37.0/18.5/2.57 | Range Avg. | 0.5-0.9 0.6 | 0.09-0.38 0.23 | 0.4-0.6 0.4 | 1.1-2.6 1.7 | 1.2-2.2 1.6 | 0.9-1.3 1.2 |

^{1/} All values are mg/l.

^{2/} For location see Figure 5.

TABLE 13
SUMMARY OF HEAVY METAL DATA^{1/}
W. R. GRACE AND COMPANY
JANUARY, 1974

| Map ^{2/} Key | Station Description | | Cadmium | Chromium | Copper | Lead | Zinc | Mercury μg/l |
|--------------------------|---|---------------|-------------------------|---------------------------|-----------------------|-----------------------|-------------------|-----------------|
| 2 | Unnamed tributary to Grove Creek upstream of W. R. Grace and Company gypsum pile R.M. 37.0/18.5/2.65/1.25 | Range Avg. | 0.01-0.03 0.02 | - < 0.01 ^{3/} | < 0.01-0.01 < 0.01 | < 0.01-0.03 < 0.01 | 3.3-7.5 5.0 | 0.3-0.8 0.5 |
| 3 | Unnamed tributary to Grove Creek downstream from W. R. Grace and Company gypsum pile R.M. 37.0/18.5/2.65/0.40 | Range Avg. | < 0.01-0.02 < 0.01 | < 0.01-0.02 < 0.01 | < 0.01-0.01 < 0.01 | < 0.01-0.06 0.01 | 0.67-1.7 1.12 | 0.4-1.0 0.7 |
| 4 | Discharge from superphos- phate drain (001) ^{3/} , W. R. Grace and Company R.M. 37.0/18.5/2.65/0.15 | Range Avg. | 0.01-0.03 0.02 | 0.01-0.03 0.02 | 0.02-0.04 0.03 | < 0.01-0.04 0.02 | 1.4-2.1 1.7 | 0.4-2.0 0.9 |
| 5 | Discharge from granulation and sulfate plants (002), W. R. Grace and Company R.M. 37.0/18.5/2.62 | Range Avg. | - 0.07 ^{3/} | 0.09-0.21 0.13 | 0.11-0.55 0.24 | < 0.01-1.4 0.9 | 9.0-9.8 9.4 | 0.6-1.1 0.8 |
| 6 | Discharge from sulfuric acid plant (003), W. R. Grace and Company R.M. 37.0/18.5/2.57 | Range Avg. | - 0.01 ^{3/} | 0.14-0.42 0.24 | < 0.01-0.02 < 0.01 | < 0.01-0.04 0.01 | 0.52-0.73 0.62 | 0.3-0.6 0.4 |

^{1/} All values are mg/l except where noted.

^{2/} For location see Figure 5.

^{3/} All values are the same.

the sulfuric acid plant discharge by July 1, 1977. The permit was discussed with company officials and Region VII personnel. It is anticipated that the permit will be sent to public notice within two weeks.

Gulf Oil Corporation

Gulf Oil Corporation manufactures nitric acid (750 ton/day), and specialty chemicals (agricultural herbicides and pesticides, 1750 lb/day). Ammonia is purchased and combined with nitric acid to produce ammonium nitrate fertilizer (1000 tons/day). Process water is obtained from the Spring River and passes through a sedimentation basin prior to use. Concentrated wastes from the ammonium nitrate, acid and specialty chemical areas of the plant are discharged into two evaporation ponds. These ponds can discharge into a 120-acre cooling water (and other wastes) pond when the evaporation rate is not adequate [Figure 6]. The effluent from the cooling water pond enters Spring River [Appendix D]. Cooling water from the ammonium nitrate prilling area is discharged directly to Spring River. Samples collected by EPA, Region VII, on May 29, 1973, showed that the effluent from the 120-acre pond contained 10.3 µg/l of outfox (cyprozine), a herbicide. The concentration of outfox is not considered harmful.

During the period November 29 through December 1, hourly grab samples were collected daily of the discharge from the 120-acre pond using SERCO samplers and composited on an equal volume basis over the 24-hour period [Table 14]. The effluent contained 1215 kg/day

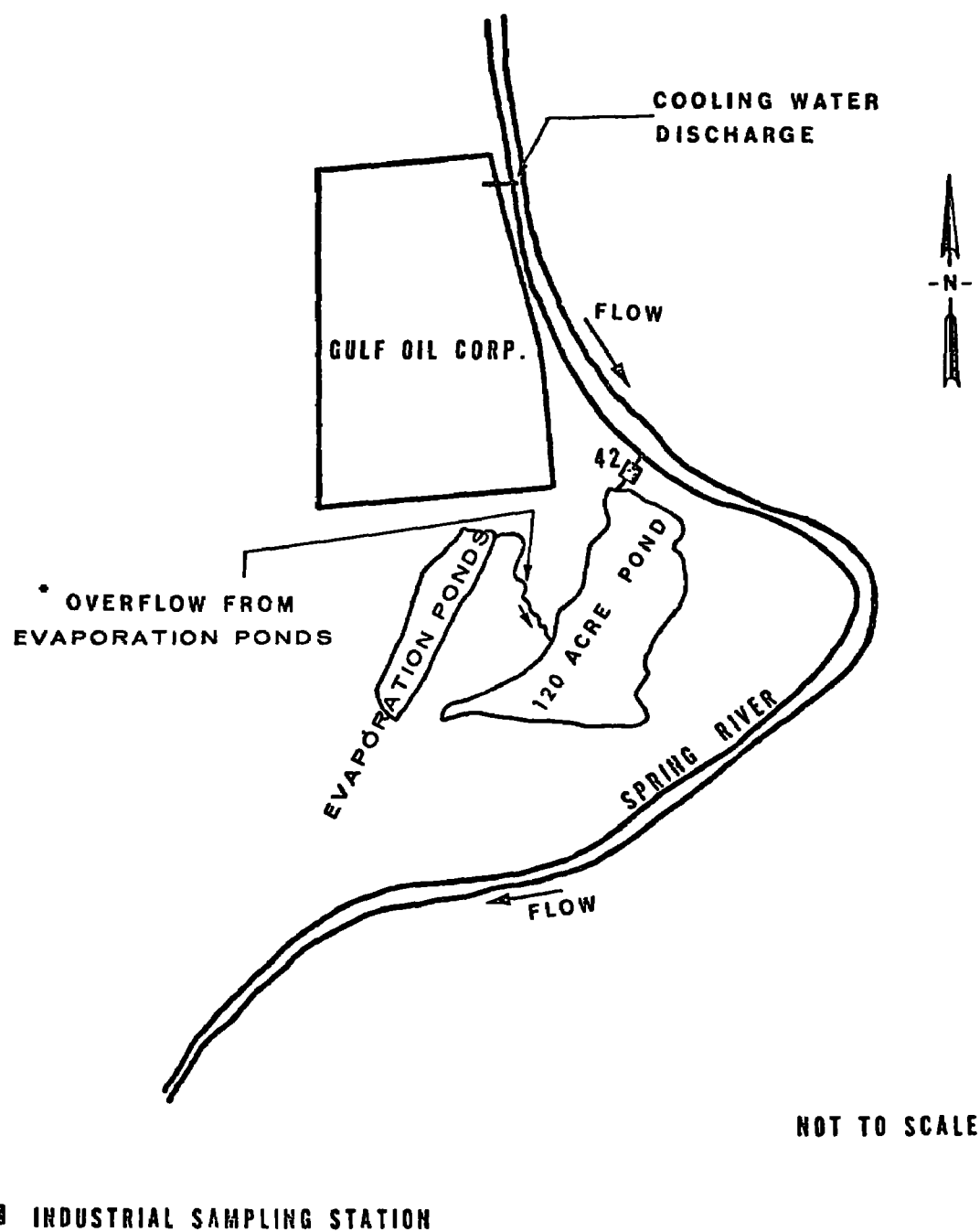


Figure 6. Sampling Location - Gulf Oil Corporation Near Pittsburg ,Kansas

TABLE 14

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA^{1/}
 GULF OIL CORPORATION
 NOVEMBER 24-DECEMBER 1, 1973

| <u>PARAMETER</u> ^{2/} | <u>RANGE</u> | <u>AVERAGE</u> |
|--------------------------------------|--------------|----------------------|
| Flow | 3.955-4.628 | 4.382 |
| Temp °C | 5.0-15.5 | - |
| Conductivity µmhos/cm | 560-1100 | - |
| pH | 8.7-9.5 | - |
| Total Solids | 354-519 | 453 |
| Total Suspended Solids | 60-90 | 75 |
| Settleable Solids | - | < 0.1 ^{3/} |
| COD | 56-74 | 67 |
| TKN | 3.3-4.5 | 4.0 |
| NH ₃ -N | 1.2-3.1 | 2.0 |
| Organic Nitrogen-N | 1.4-2.6 | 2.0 |
| NO ₂ + NO ₃ -N | 9.4-9.9 | 9.7 |
| Total P | 0.94-53 | 18.7 |
| Ortho P | 0.48-50 | 17.4 |
| Cadmium | - | < 0.02 ^{3/} |
| Chromium | < 0.01-0.01 | < 0.01 |
| Copper | - | < 0.04 ^{3/} |
| Lead | - | < 0.08 ^{3/} |
| Zinc | 0.11-0.17 | 0.13 |
| <u>Mercury, µg/l</u> | 7.5-20 | 15.2 |

^{1/} See Figure 6, Station 42. Wastewater is discharged to Spring River at RM 31.1.

^{2/} All values are mg/l except where noted.

^{3/} All values are the same.

(2700 lb/day) of suspended solids, 36 kg/day (80 lb/day) ammonia and 158 kg/day (350 lb/day) nitrate-nitrite and no detectable concentrations of pesticides. Algae comprised most of the suspended solids.

Company officials stated that no additional wastewater treatment facilities are planned.

The permit proposed for Gulf Oil Corporation limits the amount of ammonia, nitrate and pesticides which can be discharged but does not limit suspended solids. The limitations on nutrients should reduce the growth of algae and therefore the discharge of suspended solids.

Hercules, Inc.

Hercules, Inc., Carthage Works, manufactures dynamite, ammonium nitrate fuel oil explosives, slurry explosives or water gels and nitro carbonitrate. Nitroglycerine (NG) is made as an intermediate product. Spent acid from the NG manufacturing is reclaimed in the nitric acid recovery tower. Production figures are confidential.

Wastes from all manufacturing activities are discharged to Center Creek [Figure 7]. Treatment consists of baffled tanks to remove free NG from the discharges from the nitrator and NG store-houses and neutralization of the nitrator waste. The hot car washing facility is no longer used.

Grab samples of the discharges were collected during the period January 28-30, 1974 [Tables 15, 16 and 17]. Since NG is produced on a batch basis, 8 to 16 batches per day, the wastewater from the NG

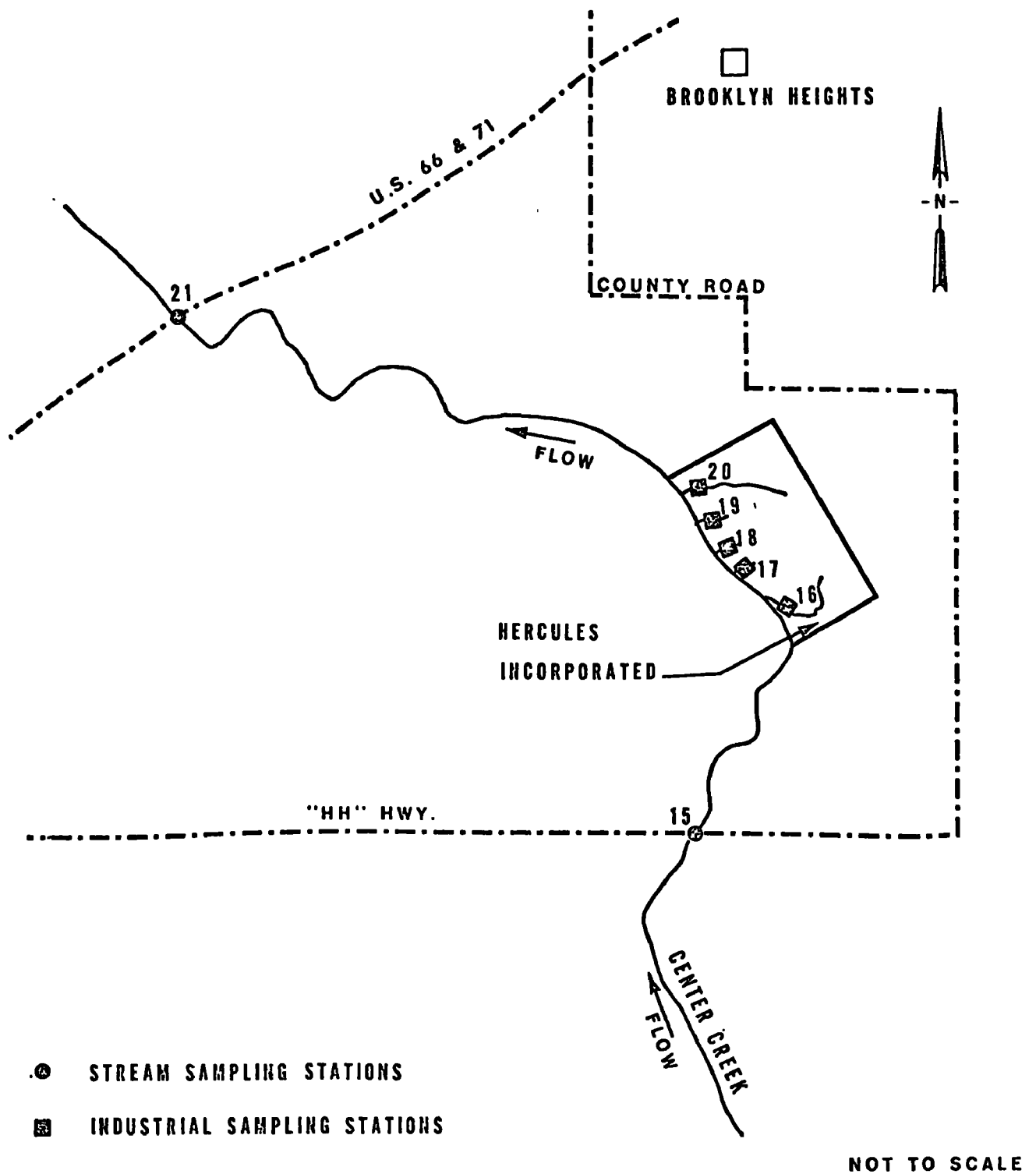


Figure 7. Sampling Location - Hercules Incorporated Near Carthage, Missouri

TABLE 15
SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA
HERCULES, INC.-CARTHAGE, MISSOURI^{1/}
JANUARY, 1974

| Map Key ^{2/} | Station Description | | Flow mgd | Temp °C | Conductivity µmhos/cm | pH S.U. | COD | Total Solids | Total Suspended Solids | Sulfate | Nitroglycerin | Ethyl Glycol Dinitrate |
|--------------------------|---|---------------|---------------------------------|----------------|--------------------------|----------------|-------------------|-----------------|------------------------------|-------------------------|---------------|---------------------------|
| 20 | Discharge from acid recovery tower (001) R.M. 37.0/15.85 | Range Avg. | 0.050-0.094 0.079 | 8.0-13.0 - | 750-1,110 - | 4.0-7.2 - | 2-34 15 | 491-577 535 | 1-20 5 | 190-270 236 | - - | - - |
| 19 | Discharge from ^{3/} mixhouse No. 1 (002) R.M. 37.0/15.95 | Range Avg. | - 0.021 | - 10.5 | - 2000 | - 3.5 | - 170 | - 430 | - 90 | - 56 | - - | - - |
| 18 | Discharge from nitroglycerin storehouse (004) R.M. 37.0/16.00 | Range Avg. | 274.5 gal per dis- charge | 11.0-16.0 - | 2300-9000 - | 10.3-11.2 - | 240-840 490 | - - | - - | 37-150 74 | 0.05-42 - | 0.26-990 - |
| 17 | Discharge from nitroglycerin nitrating house (005) R.M. 37.0/16.12 | Range Avg. | 330 gal per dis- charge | 15.0-19.0 - | >80,000 - | 0.0-1.6 - | 1800-4500 3130 | - - | - - | 11,400-52,500 36,800 | - 46-650 | - 830-7600 |
| 16 | Discharge from manufacture of commercial explosives (006) R.M. 37.0/16.25 | Range Avg. | 0.135-0.213 0.173 | 6.5-10.0 - | 600-3200 - | 7.5-10.0 - | 14-50 30 | 338-587 442 | 1-5 3 | 19-44 35 | - - | - - |

^{1/} All values are mg/l except where indicated.

^{2/} See Figure 7 for location.

^{3/} Single sample (grab).

TABLE 16
SUMMARY OF NUTRIENTS DATA^{1/}
HERCULES, INC.-CARTHAGE, MISSOURI
JANUARY, 1974

| Map Key ^{2/} | Station Description | | TKN | NH ₃ -N | Organic-N | NO ₃ + NO ₂ -N | Total P | Ortho P |
|--------------------------|--|---------------|----------------|--------------------|----------------|--------------------------------------|-------------------|-------------------|
| 20 | Discharge from acid recovery tower (001) R.M. 37.0/15.85 | Range Avg. | 0.5-0.9 0.6 | 0.06-0.19 0.10 | 0.3-0.8 0.5 | 8.1-11 9.7 | 0.03-0.19 0.10 | 0.01-0.06 0.03 |
| 19 | Discharge from mixhouse ^{3/} No. 1 (002) R.M. 37.0/15.95 | Range Avg. | - 19 | - 15 | - 4 | - 32 | - 0.03 | - 0.03 |
| 18 | Discharge from nitro- glycerin storehouse (004) R.M. 37.0/16.00 | Range Avg. | 2.2-4.1 3.2 | 0.01-0.24 0.06 | 2.2-4.1 3.2 | 97-350 210 | 0.03-0.12 0.07 | 0.02-0.08 0.04 |
| 17 | Discharge from nitro- glycerin nitrating house (005) R.M. 37.0/16.12 | Range Avg. | 8.5-21 14.2 | 0.42-1.2 0.8 | 8.0-20 13.4 | 14,000-21,000 18,000 | 0.03-0.18 0.08 | 0.02-0.03 0.03 |
| 16 | Discharge from manu- facture of commercial explosives (006) R.M. 37.0/16.25 | Range Avg. | - - | 2.2-6.6 4.2 | 0.5-6.0 2.7 | 19-42 28 | 0.03-0.27 0.08 | 0.01-0.20 0.05 |

^{1/} All values are mg/l except where indicated.

^{2/} See Figure 7 for location.

^{3/} Single sample (grab).

TABLE 17
SUMMARY OF HEAVY METALS DATA^{1/}
HERCULES, INC. - CARTHAGE, MISSOURI
JANUARY, 1974

| Map Key ^{2/} | Station Description | | Cadmium | Chromium | Copper | Lead | Zinc | Mercury µg/l |
|--------------------------|--|---------------|---------------------------|---------------------------|---------------------------|---------------------|-------------------|-----------------|
| 20 | Discharge from acid recovery tower (001) R.M. 37.0/15.85 | Range Avg. | - < 0.01 ^{3/} | < 0.01-0.01 < 0.01 | - < 0.01 ^{3/} | < 0.01-0.06 0.03 | 0.13-0.20 0.16 | 0.3-7.7 2.3 |
| 19 | Discharge from mixhouse ^{4/} No. 1 (002) R.M. 37.0/15.95 | Range Avg. | - < 0.01 | - 0.05 | - 0.02 | - 0.18 | - 0.43 | - 0.8 |
| 18 | Discharge from nitro- glycerin storehouse (004) R.M. 3.0/16.00 | Range Avg. | - - | - - | - - | - - | - - | - - |
| 17 | Discharge from nitro- glycerin nitrating house (005) R.M. 37.0/16.12 | Range Avg. | - - | - - | - - | - - | - - | - - |
| 16 | Discharge from manu- facture of commercial explosives (006) R.M. 37.0/16.25 | Range Avg. | - < 0.01 ^{3/} | - < 0.01 ^{3/} | < 0.01-0.01 < 0.01 | < 0.01-0.17 0.04 | 0.06-0.17 0.09 | 0.3-2.2 0.9 |

^{1/} All values are mg/l except where indicated.

^{2/} See Figure 7 for location.

^{3/} All values are the same.

^{4/} Single sample (grab).

storehouse and nitrator (Stations 17 and 18) are discharged on a batch basis. The mixhouse (Station 19) discharges air scrubber water from dust collectors when dynamite is being mixed. This discharge was sampled once as the operating schedule of the mixhouse precluded the collection of additional samples.

The mixhouse discharge (Station 19) contained a high concentration of suspended solids (90 mg/l) and ammonia (19 mg/l). Samples from the nitrator (Station 21) were collected upstream of the limestone neutralization, therefore the pH was extremely low (0.0-1.6).

Company officials reported that after neutralization with limestone the pH can vary from 0.7 to 7.8. The discharge of NG and ethylene glycol dinitrate (EGDN) from the nitrator was 1.3 and 11.8 lb per batch discharge respectively. Based on a minimum of 8 batches per operating day at least 10 lb of NG and 95 lb of EGDN are discharged daily from this outfall. Additional treatment including reliable neutralization of this discharge is required. At present there is no method available for treating NG and EGDN wastes. The company is considering using spray irrigation to remove the nitrator and NG storehouse effluents and possibly all effluents from Center Creek.

The NPDES permit for Hercules, Inc. [Appendix F] which was sent from NFIC-D to Region VII on May 31, 1974, included a requirement that BPT be implemented for the acid recovery operation and the requirement for the permittee to conduct bioassay studies and determine a suitable treatment for nitroglycerin and ethylene glycol dinitrate. The permit was discussed with company officials and Region VII personnel. It is anticipated that the permit will be sent to public notice within two weeks.

Herrod Packing Company, Inc.

Herrod Packing Company, Inc. slaughters and processes 50 head of cattle/day (45,000 lb LWK*). Grease, blood, and solids are rendered on site. All process wastes pass through grease traps and discharge into a facultative lagoon (1.65 acres). Domestic wastes are also discharged to this lagoon. Observations showed only a small amount of grease buildup on the lagoon surface, which had a green cast. The effluent enters Silver Creek, a tributary of Shoal Creek [Figure 1].

A plant survey was conducted November 28-30, 1973. Three 8-hour composite samples (composited on an equal-volume basis) were collected manually from the lagoon effluent. Grab samples were collected periodically for oil and grease analyses [Table 18].

The BOD ranged from 26-43 mg/l (0.15-0.34 lb/1000 lb LWK), suspended solids from 43-62 mg/l (0.28-0.50 lb/1000 lb LWK) and oil and grease from < 1-5 mg/l (trace-0.03 lb/1000 lb LWK). The current discharge meets the requirements of BPT for oil and grease. Additional treatment facilities are necessary to meet the BOD and suspended solids limitations. Company officials stated that they are considering the construction of a polishing lagoon to accomplish these objectives.

The NPDES permit for Herrod Packing Company, Inc., written by Region VII personnel, was issued on April 30, 1974 and is based on BPT.

Independent Gravel Company

Independent Gravel Company near Webb City, Missouri, uses mine water to wash chatt (chert fragments) sands. The wash water passes through two settling ponds operated in series and flows in an open channel for more than a mile before leaving company property. This

*LWK = Live Weight Kill

TABLE 18

SUMMARY OF FIELD MEASUREMENTS AND CHEMICAL ANALYSES^{1/}
 HERROD PACKING COMPANY, INC.--JOPLIN, MISSOURI
 NOVEMBER 1973

| <u>PARAMETER^{2/}</u> | <u>RANGE</u> | <u>AVERAGE</u> |
|-------------------------------------|--------------|----------------|
| Flow (MGD) | 0.030-0.043 | 0.039 |
| Temperature (°C) | 7.0-11.0 | -- |
| Conductivity (µmhos/cm) | 570-650 | -- |
| pH (S.U.) | 7.0-7.6 | -- |
| Total Solids | 394-450 | 415 |
| Total Suspended Solids | 43-62 | 52 |
| COD | 114-154 | 129 |
| BOD ₅ | 26-43 | 35 |
| Oil and Grease ^{3/} | <1-5 | 2.3 |
| Settleable Solids | 4-5 | 4 |
| TKN | 14-18 | 16 |
| NH ₃ -N | 9.7-12 | 10.9 |
| Organic Nitrogen (-N) | 2-8.3 | 5.4 |
| NO ₂ +NO ₃ -N | 0.35-0.53 | 0.46 |
| Total P | 3.5-8.8 | 6.1 |
| Ortho P | 2.4-7.7 | 4.4 |

^{1/} See Figure 1, Station 25.

^{2/} All values are mg/l except where noted.

^{3/} Freon extractable material.

discharge eventually enters Center Creek, a Class A stream [Figure 1]. Observations showed that the discharge from the second pond was clear.

Grab samples of the incoming wash water and the second pond discharge were collected during the period November 28 through December 1, 1973 [Table 19].

The wash water contained 0.48 and 12.5 mg/l of lead and zinc respectively. Concentrations of these constituents were lower in the effluent from the settling ponds (0.09 mg/l and 8.6 mg/l respectively). The suspended solids concentration in the settling pond discharge varied from 9 to 51 mg/l (23 mg/l average).

The permit issued to Independent Gravel on March 12, 1974 only limited suspended solids (30 mg/l daily average and 45 mg/l daily maximum). The State of Missouri has proposed effluent heavy metal standards*. When adopted, the permit should be revised to include these standards.

Missouri Steel Castings Company

Missouri Steel Castings Company produces 400 tons of steel castings per month. Water is used to cool furnaces and subsequently in air scrubbers to remove particulate matter. The scrubber water passes through two settling tanks operated in series to remove solids and is discharged to a storm drain which empties into Joplin Creek, an unclassified water [Appendix D]. Observations showed that the effluent was black in color and contained very fine sediment. This

*Proposed criteria are a maximum of 0.10 and 1.0 mg/l respectively for lead and zinc.

TABLE 19

SUMMARY OF FIELD MEASUREMENTS, ANALYTICAL DATA AND HEAVY METALS
INDEPENDENT GRAVEL COMPANY, WEBB CITY, MISSOURI
NOVEMBER-DECEMBER 1973

| <u>STATION DESCRIPTION</u> | <u>PARAMETER</u> | <u>RANGE</u> | <u>AVERAGE</u> |
|---|----------------------------------|--------------|---------------------|
| Intake (mine) water (Station 22) ^{1/} | Flow (MGD) | -- | -- |
| | Temperature (°C) | 13-16 | -- |
| | Conductivity (μmhos/cm) | 1900-2100 | -- |
| | pH (S.U.) | 6.8-7.6 | -- |
| | Total Solids (mg/l) | 1820-1940 | 1860 |
| | Total Suspended Solids (mg/l) | 25-71 | 44 |
| | Lead (mg/l) | <0.08-1.68 | 0.48 |
| | Zinc (mg/l) | 11.6-13.5 | 12.5 |
| | Copper (mg/l) | <0.04-0.51 | 0.16 |
| | Mercury (μg/l) | 0.4-1.2 | 0.6 |
| Discharge from sedimentation ponds (Station 23) ^{1/} RM 37.0/7.6/1.9 | Flow (MGD) | 0.025-0.616 | 0.356 |
| | Temperature (°C) | 10.0-11.0 | -- |
| | Conductivity (μmhos/cm) | 1750-1900 | -- |
| | pH (S.U.) | 7.6-8.3 | -- |
| | Total Solids (mg/l) | 1450-1680 | 1600 |
| | Total Suspended Solids (mg/l) | 9-51 | 23 |
| | Lead (mg/l) | <0.08-0.12 | 0.08 |
| | Zinc | 7.6-9.6 | 8.6 |
| | Copper (mg/l) | -- | <0.04 ^{2/} |
| | Mercury (μg/l) | 0.3-0.6 | 0.4 |

^{1/} See Figure 1 for location

^{2/} All values the same.

discharge resulted in a gross color change in Joplin Creek which violated General Criteria of the Missouri Water Quality Standards (i.e., free from materials producing color. . .in such a degree to create a nuisance).

Four composite samples (equal volume basis) were collected during the period January 29 to February 1, 1974. The effluent contained high concentrations of suspended solids (1000-5500 mg/l) [Table 20]. Grab samples contained < 1 mg/l of oil and grease.

The company has retained the consulting engineering firm of Allgeier Martin and Associates to design a wastewater treatment system for the plant. The type of treatment to be installed had not been determined at the time of the survey.

The NPDES permit transmitted to Region VII on May 23, 1974 [Appendix F] limited the discharge of suspended solids. The permit was discussed with company officials and Region VII personnel. It is anticipated that the permit will be sent to public notice within two weeks.

Tamko Asphalt Products, Incorporated

Tamko Asphalt Products, Incorporated, 601 N. High Street, manufactures asphalt roofing. Felt made from waste paper and rags is saturated with hot asphalt. Colored "sands" manufactured by 3M (Minnesota Mining and Manufacturing) are then sprinkled onto the asphalt. Following this, the material is cooled by a water spray. The spent cooling water containing the "sand" particles is treated in

TABLE 20

SUMMARY OF FIELD MEASUREMENTS AND CHEMICAL DATA^{1/}
MISSOURI STEEL CASTINGS COMPANY--JOPLIN, MISSOURI
JANUARY 1974

| <u>PARAMETER</u> ^{2/} | <u>RANGE</u> | <u>AVERAGE</u> |
|--------------------------------|--------------|--------------------|
| Flow (MGD) | 0.012-0.028 | 0.017 |
| Temperature (°C) | 4.0-23.5 | -- |
| Conductivity (µmhos/cm) | 320-460 | -- |
| pH (S.U.) | 6.8-7.9 | -- |
| COD | 250-1300 | 675 |
| Total Solids | 1320-5700 | 3390 |
| Total Suspended Solids | 1000-5500 | 3100 |
| Cadmium | --- | 0.02 ^{3/} |
| Chromium | 0.02-0.16 | 0.10 |
| Copper | 0.13-0.58 | 0.35 |
| Lead | 0.09-0.32 | 0.22 |
| Zinc | 0.34-3.8 | 1.6 |
| Mercury (µg/l) | 0.3-0.5 | 0.4 |

1/ See Figure 1, Station 26. Wastewater is discharged to Joplin Creek at RM 37.0/6.52/2.05.

2/ All values are mg/l except where noted.

3/ All values are the same.

a 3-stage settling basin from which the solids are periodically removed and landfilled on company property. The effluent is discharged to a drainage ditch which empties into Turkey Creek [Appendix D].

Three 24-hour composites (equal volume basis) were collected during the period November 29 to December 1, 1973. Grab samples were also collected periodically for oil and grease analyses [Table 21]. Suspended solids and oil and grease concentrations ranged from 130-660 mg/l (330 mg/l average) and 1-41 mg/l respectively.

The NPDES permit issued on May 24, 1974 requires that by July 1, 1976, the discharge shall not contain more than 45 mg/l (daily maximum) or 30 mg/l (daily average) of suspended solids and 15 mg/l (daily maximum) or 10 mg/l (daily average) of oil and grease. Additional wastewater treatment facilities will be necessary to meet these limitations.

STREAM SURVEY

During the period January 22-31, 1974, water quality data was obtained at selected stations on Center Creek near the mouth (RM 37.0/0.9) to upstream of Grove Creek (RM 37.0/21.3); Grove Creek at Low Water Bridge (RM 37.0/18.5/0.5) to upstream of W. R. Grace and Company; Turkey Creek near the mouth (RM 35.1/0.1) to upstream of Lone Elm Creek Wastewater Treatment Plant (RM 35.1/5.94); and Lone Elm Creek downstream from Eagle Picher (RM 35.1/5.92/0.9) to upstream of Eagle Picher (RM 35.1/5.92/1.60) [Figure 1]. The analytical data are provided in Tables 22, 23, and 24. Stream flows were high due to heavy rains.

TABLE 21

SUMMARY OF FIELD MEASUREMENTS AND CHEMICAL DATA^{1/}
TAMKO ASPHALT PRODUCTS, INC.--JOPLIN, MISSOURI
NOVEMBER 1973

| <u>PARAMETER</u> ^{2/} | <u>RANGE</u> | <u>AVERAGE</u> |
|--------------------------------|--------------|----------------|
| Flow (MGD) | 0.126-0.185 | 0.162 |
| Temperature (°C) | 16.5-21.0 | -- |
| Conductivity (µmhos/cm) | 260-320 | -- |
| pH (S.U.) | 7.3-8.2 | -- |
| COD | 17-148 | 72 |
| Total Solids | 265-809 | 545 |
| Total Suspended Solids | 130-660 | 330 |
| Oil and Grease ^{3/} | 1-41 | 10 |

1/ See Figure 1, Station 27. Wastewater is discharged to Turkey Creek at RM 35.1/8.32.

2/ All values are mg/l except where noted.

3/ Freon extractable material.

TABLE 22

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA^{1/}
 GROVE CREEK, CENTER CREEK, AND TURKEY CREEK
 JANUARY, 1974

| Map Key ^{2/} | Station Description | | Flow mgd | Temp. °C | Conductivity µmhos/cm | pH S.U. | Total Solids | Total Suspended Solids | Sulfates | Fluorides | COD | Nitroglycerin | Ethylene Glycol Dinitrate |
|--------------------------|--|---------------|-------------------|----------------|--------------------------|--------------|-----------------|------------------------------|-------------|--------------------------|-------------|----------------------|---------------------------------|
| 13 | Grove Creek at Low Water Bridge R.M. 37.0/18.5/0.5 | Range Avg. | 13.6-20.0 16.1 | 8.5-13.5 - | 400-600 - | 7.0-8.3 - | 252-593 330 | 2-20 9 | 30-83 65 | < 0.1-2.4 1.9 | 3-21 10 | 0.01-0.32 0.20 | 0.64-6.0 3.2 |
| 14 | Center Creek Up- stream of Grove Creek R.M. 37.0/21.3 | Range Avg. | 170-200 184 | 6.5-10.0 - | 280-1000 - | 6.6-7.9 - | 133-179 160 | 2-7 4 | 11-18 13 | - < 0.1 ^{3/} | 3-17 8 | - - | - - |
| 15 | Center Creek at Hwy HH Bridge R.M. 32.0/17.0 | Range Avg. | 181-229 207 | 6.0-11.0 - | 280-520 - | 6.7-7.7 - | 159-246 194 | 3-17 7 | 13-16 14 | < 0.1-0.2 0.18 | 4-21 11 | 0.01-0.07 0.03 | 0.11-0.69 0.38 |
| 21 | Center Creek at Hwy 66 Bridge R.M. 37.0/13.8 | Range Avg. | 181-229 207 | 7.0-10.0 - | 310-420 - | 6.8-7.5 - | 146-200 177 | 2-16 5 | 12-30 16 | - 0.2 ^{3/} | 6-17 10 | 0.01-0.05 0.03 | 0.19-0.69 0.42 |
| 24 | Center Creek near the Mouth R.M. 37.0/0.9 | Range Avg. | 255-273 266 | 7.0-10.0 - | 380-440 - | 7.2-7.6 - | 225-251 239 | 4-25 8 | 37-59 48 | 0.1-0.3 0.2 | 2-46 12 | < 0.001-0.05 0.02 | 0.007-0.38 0.23 |
| 28 | Lone Elm Creek up- stream of Eagle Picher R.M. 35.1/5.92/1.60 | Range Avg. | 0.24-0.32 0.28 | 11.5-14.0 - | 2100-2200 - | 5.6-7.7 - | 2-12 6 | 1960-2070 2010 | 2-38 14 | - - | - - | - - | - - |
| 32 | Lone Elm Creek downstream from Eagle Picher R.M. 35.1/5.92/0.1 | Range Avg. | 0.71-1.68 0.93 | 7.0-14.0 - | 1100-1400 - | 6.2-7.1 - | 718-945 861 | < 1-9 5.4 | - - | - - | 10-34 23 | - - | - - |
| 33 | Turkey Creek up- stream from Lone Elm Creek Waste- Water Treatment Plant R.M. 35.1/5.94 | Range Avg. | 13.3-26.4 19.7 | 4.5-10.0 - | 380-480 - | 7.2-8.1 - | 215-307 256 | 2-19 8 | - - | - - | 4-36 14 | - - | - - |

TABLE 22, Page 2

| Map Key ^{2/} | Station Description | | Flow mgd | Temp. °C | Conductivity µmhos/cm | pH S.U. | Total Solids | Total Suspended Solids | Sulfates | Fluorides | COD | Nitroglycerin | Ethylene Glycol Dinitrate |
|--------------------------|---|---------------|-------------------|---------------|--------------------------|--------------|-----------------|------------------------------|----------|-----------|-------------|---------------|---------------------------------|
| 34 | Turkey Creek down- stream from Lone Elm Creek Wastewater Treatment Plant R.M. 35.1/5.93 | Range Avg. | 26.1-45.5 34.4 | 8.0-11.0 - | 480-650 - | 7.2-8.0 - | 285-365 340 | 6-38 20 | - - | - - | 14-70 46 | - - | - - |
| 35 | Turkey Creek down- stream from Lone Elm Creek R.M. 35.1/5.0 | Range Avg. | 33.9-45.2 38.0 | 7.0-10.5 - | 440-650 - | 7.2-7.4 - | 311-366 338 | < 1-25 12 | - - | - - | 11-70 35 | - - | - - |
| 36 | Turkey Creek near the mouth R.M. 35.1/0.1 | Range Avg. | 38.6-52.7 44.0 | 6.0-10.5 - | 500-600 - | 7.1-7.2 - | 286-366 332 | < 1-12 7 | - - | - - | 13-88 31 | - - | - - |

^{1/} All data in mg/l except where indicated.

^{2/} See Figure 1 for location.

^{3/} All values the same.

TABLE 23
SUMMARY OF NUTRIENT DATA^{1/}
GROVE CREEK, CENTER CREEK, AND TURKEY CREEK
JANUARY, 1974

| Map ^{2/} Key | Station Description | | TKN | NH ₃ -N | Organic Nitrogen-N | NO ₃ +NO ₂ -N | Total P | Ortho-P |
|--------------------------|--|---------------|----------------|--------------------|-----------------------|-------------------------------------|-------------------|-------------------|
| 13 | Grove Creek at Low Water Bridge R.M. 37.0/18.5/0.5 | Range Avg. | 11-26 17 | 9.0-15 11 | 1-11 6 | 11-21 16 | 1.1-2.8 1.6 | 0.83-2.20 1.17 |
| 14 | Center Creek Upstream of Grove Creek R.M. 37.0/21.3 | Range Avg. | 0.3-0.8 0.5 | 0.02-0.06 0.04 | 0.2-0.8 0.4 | 2.4-13.0 4.2 | 0.07-0.17 0.09 | 0.04-0.07 0.05 |
| 15 | Center Creek at Hwy HH Bridge R.M. 32.0/17.0 | Range Avg. | 1.5-2.4 2.0 | 0.72-1.3 0.92 | 0.6-1.5 1.0 | 3.4-4.7 4.0 | 0.15-0.46 0.26 | 0.14-0.41 0.22 |
| 21 | Center Creek at Hwy 66 Bridge R.M. 37.0/13.8 | Range Avg. | 1.2-2.2 1.6 | 0.56-1.09 0.76 | 0.5-1.2 0.8 | 3.8-17 6.0 | 0.15-0.97 0.34 | 0.14-0.89 0.28 |
| 24 | Center Creek near the Mouth R.M. 37.0/0.9 | Range Avg. | 0.6-1.0 0.9 | 0.23-0.49 0.36 | 0.3-0.7 0.5 | 3.2-4.3 3.7 | 0.19-0.87 0.33 | 0.13-0.77 0.27 |
| 33 | Turkey Creek upstream from Lone Elm Creek Waste- water Treatment Plant R.M. 35.1/5.94 | Range Avg. | - - | - - | - - | - - | - - | - - |
| 34 | Turkey Creek downstream from Lone Elm Creek Wastewater Treatment Plant R.M. 35.1/5.93 | Range Avg. | - - | - - | - - | - - | - - | - - |
| 35 | Turkey Creek downstream from Lone Elm Creek R.M. 35.1/5.0 | Range Avg. | - - | - - | - - | - - | - - | - - |
| 36 | Turkey Creek near the mouth R.M. 35.1/0.1 | Range Avg. | - - | - - | - - | - - | - - | - - |

^{1/} All values are mg/l.

^{2/} For location see Figure 1.

TABLE 24
SUMMARY OF HEAVY METALS DATA^{1/}
GROVE CREEK, CENTER CREEK, AND TURKEY CREEK
JANUARY, 1974

| Map Key ^{2/} | Station Description | | Cadmium | Chromium | Copper | Lead | Zinc | Mercury ug/l |
|--------------------------|--|---------------|---------------------------|-----------------------|-----------------------|---------------------|---------------------|------------------|
| 13 | Grove Creek at Low Water Bridge R.M. 37.0/18.5/0.5 | Range Avg. | - < 0.01 ^{3/} | 0.01-0.16 0.06 | < 0.01-0.10 0.02 | < 0.01-0.07 0.02 | 0.18-0.39 0.27 | 0.3-2.8 1.1 |
| 14 | Center Creek Upstream of Grove Creek R.M. 37.0/21.3 | Range Avg. | - < 0.01 ^{3/} | < 0.01-0.01 < 0.01 | < 0.01-0.01 < 0.01 | < 0.01-0.02 0.01 | < 0.01-0.05 0.03 | < 0.2-2.8 1.0 |
| 15 | Center Creek at Hwy HH Bridge R.M. 32.0/17.0 | Range Avg. | - < 0.01 ^{3/} | < 0.01-0.01 < 0.01 | < 0.01-0.14 0.07 | < 0.01-0.06 0.03 | 0.04-0.31 0.12 | 0.3-4.4 1.4 |
| 21 | Center Creek at Hwy 66 Bridge R.M. 37.0/13.8 | Range Avg. | - < 0.01 ^{3/} | < 0.01-0.01 < 0.01 | < 0.01-0.18 0.05 | < 0.01-0.50 0.07 | 0.05-0.18 0.10 | 0.3-4.8 1.4 |
| 24 | Center Creek near the Mouth R.M. 37.0/0.9 | Range Avg. | - < 0.01 ^{3/} | < 0.01-0.01 < 0.01 | < 0.01-0.01 < 0.01 | < 0.01-0.03 0.01 | 0.49-0.69 0.65 | < 0.2-3.1 1.3 |
| 28 | Lone Elm Creek upstream of Eagle Picher R.M. 35.1/5.92/1.60 | Range Avg. | - < 0.01 ^{3/} | < 0.01-0.03 0.01 | < 0.01-0.01 < 0.01 | < 0.01-0.08 0.04 | 5.2-8.1 5.9 | 0.4-2.0 0.8 |
| 32 | Lone Elm Creek downstream from Eagle Picher R.M. 35.1/5.92/0.1 | Range Avg. | - < 0.01 | < 0.01-0.02 0.01 | < 0.01-0.06 0.02 | < 0.01-0.09 0.08 | 2.0 1.7 | 0.5-5.8 2.2 |
| 33 | Turkey Creek upstream from Lone Elm Creek Wastewater Treatment Plant R.M. 35.1/5.94 | Range Avg. | - < 0.01 ^{3/} | < 0.01-0.01 < 0.01 | < 0.01-0.01 < 0.01 | < 0.01-0.12 0.03 | 0.60-1.2 0.78 | 0.3-3.0 0.8 |

TABLE 24, Page 2

| Map Key ^{2/} | Station Description | | Cadmium | Chromium | Copper | Lead | Zinc | Mercury µg/l |
|--------------------------|---|---------------|---------------------------|-----------------------|-----------------------|---------------------|-------------------|-----------------|
| 34 | Turkey Creek downstream from Lone Elm Creek Wastewater Treatment Plant R.M. 35.1/5.93 | Range Avg. | - < 0.01 ^{3/} | < 0.01-0.01 < 0.01 | < 0.01-0.01 < 0.01 | < 0.01-0.12 0.03 | 0.60-1.2 0.78 | 0.3-3.0 0.8 |
| 35 | Turkey Creek downstream from Lone Elm Creek R.M. 35.1/5.0 | Range Avg. | - < 0.01 ^{3/} | < 0.01-0.02 0.01 | < 0.01-0.05 0.02 | < 0.01-0.08 0.03 | 0.65-0.93 0.80 | 0.4-2.9 1.1 |
| 36 | Turkey Creek near the mouth R.M. 35.1/0.1 | Range Avg. | - < 0.01 ^{3/} | < 0.01-0.03 < 0.01 | < 0.01-0.02 < 0.01 | < 0.01-0.06 0.02 | 0.73-1.0 0.80 | 0.4-1.3 0.7 |

^{1/} All values are mg/l except where noted.

^{2/} For location see Figure 1.

^{3/} All values the same.

Fish survival studies were conducted at selected stations. The results are discussed in Appendix E.

Grove Creek

Grove Creek is classified as a water of the State and the general water criteria apply [Appendix D]. An unnamed tributary enters Grove Creek upstream of W. R. Grace and contains seepage from the abandoned gypsum pile [Re: W. R. Grace Plant Evaluation]. As noted earlier, this water was degraded by gypsum pile seepage [Tables 11, 12 and 13].

As a result of W. R. Grace Company and Atlas Powder Company discharges, the concentration of nutrients, nitroglycerin (NG) and ethylene glycol dinitrate (EGDN) increased significantly in the creek. Grove Creek at Low Water Bridge [Station 13, Figure 1] contained 11 mg/l ammonia, 1.6 mg/l phosphorous, 0.20 mg/l NG and 3.2 mg/l of EGDN. Caged fish survived the 10-day exposure test in the unnamed tributary upstream of the gypsum pile and in Grove Creek at Low Water Bridge [Figure 8, Appendix E].

During low flow periods, the flow in Grove Creek is essentially comprised of wastewater discharged from W. R. Grace and Atlas Powder Company. Due to the amounts of $\text{NH}_3\text{-N}$ and nitrate contained in these discharges, fish would not survive in Grove Creek at Low Water Bridge.

Center Creek

Center Creek, a Class A water [Appendix D], was relatively unpolluted upstream of Grove Creek. The influence of Grove Creek was

evident at HH Bridge (Station 15). For example the concentration of ammonia and copper increased 23 and 7 times respectively. However, the ammonia and copper levels did not violate water quality standards. Fish exposed in Center Creek upstream and downstream from Grove Creek, survived the 10-day exposure [Appendix E].

The flow in Center Creek at HH Bridge averaged 207 cfs. The 7-day low flow (based on 10 years of record) is 20 cfs. If low flow conditions had prevailed, the $\text{NH}_3\text{-N}$ and copper concentrations would have been at least 14 mg/l and 1.5 mg/l respectively. Due to the synergistic effects of these two constituents [Appendix E], fish would not survive in Center Creek during periods of low flow.

The discharges from Hercules did not affect the water quality of Center Creek as is evident by comparing the analytical data for Center Creek upstream (Station 15) and downstream from Hercules (Station 21).

Lone Elm Creek

Lone Elm Creek, an unclassified water [Appendix D], originates from mine drainage upstream of Eagle Picher Industries. The stream contained an average of 0.04 mg/l lead, 5.9 mg/l zinc and 0.8 $\mu\text{g/l}$ mercury [Table 24] upstream of Eagle Picher (RM 35.1/5.92/1.60 - Station 28). Fish exposed at this station died within 48 hours [Appendix E].

Eagle Picher Industries discharges heavy metals to Lone Elm Creek at three locations. Although the concentrations of lead, zinc and mercury in Lone Elm Creek downstream from these discharges were

lower than upstream values, the loading increased 6.7, 1.5, and 11.2 times respectively as a result of these discharges. All fish survived the 10-day exposure test at this downstream station.

Turkey Creek

Turkey Creek, a Class A water [Appendix D], receives discharges from industries, one municipal wastewater treatment plant, and Lone Elm Creek.

Upstream at Station 33 (RM 35.1/5.94), the stream was clear and contained an average of 8 mg/l suspended solids, 0.03 mg/l lead, 0.78 mg/l zinc and 1.1 µg/l of mercury. Downstream from the Lone Elm Creek Wastewater Treatment Plant (RM 35.1/5.93) Turkey Creek contained an average of 20 mg/l of suspended solids. The heavy metal concentrations remained approximately the same. At Station 35, downstream of the confluence of Lone Elm Creek, the heavy metal concentrations remained unchanged. Samples collected near the mouth (Station 36) showed the stream quality was similar to that at the upstream station.

All fish survived the exposure period in Turkey Creek upstream of the wastewater treatment plant but survived less than 48 hours downstream from the plant. A 60% mortality was reported at Station 35 after six days of exposure [Appendix E, Figure 9]. Mortality at the latter two stations was undoubtedly a result of residual chlorine discharged from the Lone Elm Creek Wastewater Treatment Plant. Fish exposed near the mouth of Turkey Creek survived the 10-day exposure period.

SUMMARY AND CONCLUSIONS

1. Atlas Powder Company discharged 2,500 lbs/day (average) of ammonia and 2 lbs/day of copper. The combined effects of copper and ammonia in the discharge were extremely toxic to fish. The company will discontinue discharging copper to Grove Creek within one year. The elimination of copper and reduction of ammonia by the installation of best practicable treatment should insure fish survival in Center Creek during low flow conditions.

2. Numerous violations of the initial NPDES permit criteria for Eagle Picher occurred during the survey. Violations have also been reported on self-monitoring data. Company officials have submitted engineering reports to the State of Missouri on wastewater treatment modifications. Although these modifications should enable the company to meet the final NPDES permit criteria, the permit should be modified to include a limitation on the discharge of aluminum from the couples plant.

3. Farmers Chemical Company discharges wastewater to the surface of an abandoned gypsum pile. Seepage from the pile resulted in water quality degradation in Short Creek. To date the company has not applied for a NPDES permit to discharge wastewaters to Short Creek.

4. W. R. Grace and Company is constructing a closed water recycle system to eliminate the discharge of fertilizer manufacturing wastewaters to Grove Creek. This new system will be in operation by October 1, 1974. After this date only an intermittent discharge from sulfuric acid manufacturing process will enter Grove Creek.

Seepage from an abandoned gypsum pile resulted in water quality degradation in Grove Creek. Company officials have been experimenting with little success with ways of seeding the surface of the pile with grass to prevent infiltration. Grading and sealing the surface would eliminate this seepage.

5. Gulf Oil Corporation discharged 2700 lbs/day suspended solids, 80 lbs/day ammonia and 350 lbs/day nitrate-nitrite to Spring River. The NPDES permit to be issued specifies limits on ammonia and nitrate but not on suspended solids. The reduction in nutrients should reduce the growth of algae and therefore the discharge of suspended solids.

6. Hercules Incorporated discharged suspended solids, nutrients, NG and EGDN to Center Creek, a Class A water. However, the effects of the discharges were not detectable in Center Creek downstream from the plant. Company officials are considering spray irrigation to treat their wastewaters to meet the requirements of the NPDES permit as issued [Appendix F].

7. Herrod Packing Company, Inc. discharged 0.15 to 0.34 lbs/1000 lb LWK of BOD, 0.28 to 0.50 lbs/1000 lb LWK of suspended solids and 0-0.03 lbs/1000 lb LWK of oil and grease. The current discharge meets best practicable treatment for oil and grease but additional treatment is required for the BOD and suspended solids loadings to meet established effluent guidelines for this industry.

8. Independent Gravel Company discharged an average of 0.48 mg/l lead, 12.5 mg/l zinc, 0.16 mg/l copper and 23 mg/l suspended solids. The NPDES permit only limits the discharge of suspended solids. The present heavy metals discharge exceeds the effluent heavy metal standards proposed by the State of Missouri.

9. Missouri Steel Castings discharged from 1000 to 550 mg/l of suspended solids into Joplin Creek. This discharge resulted in a color change in the creek which violated the General Criteria of the Missouri Water Quality Standards. The NPDES permit, to be issued to this company, limits the discharge of suspended solids to 0.10 lb/1000 lb of product [Appendix F]. Company officials have retained a consulting engineering firm to design a wastewater treatment system to remove these solids.

10. Tamko Asphalt Products, Incorporated discharged 130 to 660 mg/l of suspended solids and 1 to 41 mg/l of oil and grease to Turkey Creek, a Class A water. The NPDES permit issued to Tamko requires that the daily maximum discharge shall not exceed 45 and 15 mg/l for suspended solids and oil and grease, respectively. To meet these permit conditions will require additional wastewater treatment facilities.

11. The stream flows were abnormal due to excessive rains which started in November and lasted throughout the survey. Although streams were degraded by industrial wastewater discharges, none of the streams were determined to be water quality limiting.

Recommendations

It is recommended that:

1. Region VII, Office of Enforcement, monitor the results of the bioassay and pilot plant treatment tests on nitroglycerin and ethylene glycol dinitrate bearing wastes. As soon as data are available, the permit issued to Atlas Powder Company and Hercules, Incorporated, be modified to limit the discharges of NG and EGDN to minimum loads attainable as determined by the testing program, or otherwise eliminate the discharges of these materials to the receiving streams.
2. The construction progress of wastewater treatment facilities at Eagle Picher Industries, Inc., be monitored to insure that the compliance schedule is achieved. The NPDES permit be revised to include a limit of 0.1 mg/l of aluminum in the couples plant discharge.
3. Appropriate legal action be initiated against Farmers Chemical Company for failure to apply for a NPDES permit; that the company be advised that the requirements for BPT, i.e., no discharge of pollutants, will become effective on July 1, 1977; that permit conditions require submission of a plan acceptable to the Missouri Clean Water Commission and the Environmental Protection Agency to eliminate the discharge of gypsum pile seepage to Short Creek.
4. Progress by W. R. Grace and Company, of construction of the closed-cycle process modifications, be monitored to insure that the NPDES permit requirement for no discharge of pollutants from the fertilizer manufacturing operation is achieved by October 1, 1974; that the BPT requirement, i.e., no discharge of pollutants by July 1, 1977 contained in the permit limits for the sulfuric acid manufacturing

operation, be rigidly enforced; and that the permit special conditions requiring submission within six months of a plan acceptable to the Missouri Clean Water Commission and the Environmental Protection Agency to eliminate the discharge of gypsum pile seepage to Grove Creek or its tributaries be enforced [Appendix F].

5. Herrod Packing Company, Gulf Oil Corporation and Tamko Asphalt Products, Inc., be formally advised that additional treatment will be required in order to meet their respective permit conditions.

6. The permit issued to Independent Gravel Company be revised to include limits on heavy metals as follows:

- a) Lead shall not exceed a maximum concentration of 0.10 mg/l.
- b) Zinc shall not exceed a daily maximum concentration of 1.0 mg/l.

That the permit language specify that dilution of the mine water supply, as a means of meeting these limits, is not acceptable.

7. Compliance schedule for Missouri Steel Castings Company be closely monitored to insure that permit requirements are achieved by July 1, 1977 [Appendix F].

APPENDIX A
ALLEGED NON-FILERS
SPRING RIVER BASIN, MISSOURI

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
NATIONAL FIELD INVESTIGATIONS CENTER—DENVER
BUILDING 53, BOX 25227, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

TO : Chief, Field Operations Branch

DATE: February 28, 1974

FROM : James L. Hatheway

SUBJECT: Alleged Non-Filers in the Spring River Basin, Missouri

Data obtained during the period January 15-22, 1974, for alleged non-filers^{1/} are summarized below:

1. Pearce Restaurant and Service Station; Roger's Cafe and Service Station; and Monett Rendering Company are no longer in business. Country Kitchen Food Products and Buddy L. Corporation discharge all wastewaters to City sewers.
2. Blevins Asphalt Company was temporarily closed due to the weather. Regional personnel should obtain information on this company next summer.
3. Farmers Chemical Company produces NPK grades of fertilizers and feed grade calcium phosphate (SIC 2871). Wastewater consisting of cooling water and in-plant spills are pumped to a 40-acre gypsum pile. There is no direct discharge, however seepage from the pile enters Short Creek. Because of this, the company was advised that a NPDES permit was required.

Short Creek was monitored during the period November 28-30, 1973, to determine the effect of the seepage on receiving water quality. The monitoring results will be discussed in the Spring River Basin report.

4. Missouri Steel Castings Company produces steel castings at the rate of 400 tons/month. Water used to cool furnaces (non-contact cooling) is then used in the air scrubbers to remove particulate matter. The scrubber water passes through two settling tanks to remove solids prior to discharge into a storm drain which empties into Joplin Creek^{2/}. The Company recently filed for a permit to discharge.

^{1/} See attached table.

^{2/} Waters of the State on which the basic standards, i.e., "Free Froms" apply.

This discharge was sampled during the period January 28-31, 1974. Results will be discussed in the Spring River Basin report.

5. Tamko Asphalt Products, Inc.; (Newman Road Plant) produces roofing felt (40,000 tons/yr) and roofing asphalt (60,000 tons/yr). Wastewater is collected and pumped to three lagoons in series for treatment. The effluent from the lagoons is discharged to the City sewer.

During the in-plant visit, grayish water was observed flowing along Newman Road to Turkey Creek^{3/}. Company officials stated that there was no discharge other than to the City sewer. Further investigation however showed that a portion of the wastewater (estimated at 2-5 gpm) from the east side of the plant was not being collected but was being discharged to a drainage ditch and thence to the ditch along Newman Road. A subsequent discussion was held with company officials who will determine the source of this wastewater and notify this office of corrective actions taken to eliminate this discharge to Turkey Creek.

6. FAG Bearings, Inc., a German-owned company, assembles ball and roller bearings (rated capacity 20,000 bearings/day). The company discharges no process wastes. Domestic wastes are treated in a lagoon (100' x 200'). The effluent (estimated at less than 1 gpm) is discharged into a ditch and flows toward I-44 and Silver Creek.

Although the discharge is negligible, it is recommended that this company determine if a NPDES permit is required.

7. Crouch's Locker; Kahre and Sons Slaughtering and Processing; and Mt. Vernon Electric Refrigeration Cooperation, Inc. are small custom meat (cattle, hogs and sheep) processors. Wastewaters are treated in a lagoon which discharges to a pasture; a non-overflow lagoon, and a septic tank-leach field, respectively. Grease, blood, bones, etc., are collected and sold to a renderer. Based on information obtained and field observations, none of these meat processors require a NPDES permit.

^{3/} A Class A water.

8. G & R Industries, Inc. operates a custom machine shop in Purdy, Missouri, and a plating (Ag, Cd, Cr, Ni, Cu) job shop in Monett, Missouri. The machine shop discharges less than 1 gpm of air compressor cooling water, which is used to water cattle. The plating wastes are discharged to a non-overflow, 2-cell lagoon. Although there is no direct discharge, seepage of approximately 3 gpm was observed along the north bank. It is recommended that the company seal the lagoon to insure that all seepage is eliminated.
9. Ozark Trout Farm hatches and rears trout to commercial size (approximately 300,000 lbs/yr). Spring water (5-7 mgd) passes through the hatchery and raceways to Cedar Creek, a tributary of Shoal Creek. The raceways are cleaned once or twice per month using a steel broom. These wastes are discharged to Cedar Creek without treatment. The owner was advised that this operation did require a NPDES permit to discharge.
10. The Joplin Travelodge treats all wastes from the motel and restaurant in a lagoon. The sanitary wastes from the Texaco Station located immediately north of the motel are also discharged into this lagoon. Lagoon effluent enters Silver Creek^{2/}, a tributary of Shoal Creek. Upon the completion of a gravity sewer (estimated completion Fall 1974), this discharge will be eliminated. It is recommended that Regional personnel contact City officials prior to January 1, 1975, to insure that the Travelodge has connected to the municipal sewer.
11. Nickerson & Nickerson, Inc. operates a restaurant, gas station, and gift shop near Stotts City, Missouri (junction of State Highway 97 and I-44). Wastes (kitchen and restrooms) are treated in a lagoon, approximately 75' x 90'. The lagoon effluent (approximately 1 gpm) flows through a marsh area to a drainage ditch which empties into an intermittent water course. The lagoon had not been maintained as evident by weed growth on the banks. Also the marsh area is a mosquito haven. It is recommended that the lagoon be expanded to preclude a discharge.
12. Truckers Inn and Restaurant (Skelly Oil Company) located at Highway 43 and I-44 consists of a motel, restaurant and service station. Wastewater is treated in three lagoons operated in series. Wastewater is periodically siphoned into a ditch which flows into a wooded area. The wastewater seeps into the ground and does not enter a receiving stream. All used oils and service bay cleanup water are collected in holding tanks and removed by the Southwest Oil Company.

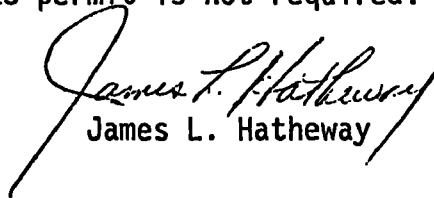
13. Rex Hamilton operates a gas station (West Joplin Texaco) at the junction of Highway 43 and I-44. All domestic wastes are discharged into a lagoon (50 ft in diameter). The effluent from the lagoon is discharged into a pasture. Based on field observations, an NPDES permit is not required.
14. Empire District Electric Company--Asbury Plant burns 600,000 tons of coal per year to produce 1,250 million KW hr. Water is used to sluice fly and bottom ash to two lagoons (15-acres and 78-acres) operated in parallel. There is normally no discharge from these lagoons. Water is siphoned from the 78-acre lagoon to Blackberry Creek during periods of low flow. If the practice of discharging water to Blackberry Creek is continued, a NPDES permit will be required for the Asbury Plant.
15. Tri-State Motor Transit Company at Duenweg maintains approximately 600 trucks which haul explosives, radioactive materials, aircraft engines, earth moving equipment, etc. All domestic and truck washing wastes are treated in a 5,000 gal/day extended aeration basin. The effluent from the basin passes through a filter and chlorination facilities prior to discharge into Shoal Creek.

The engineering firm of Murry, Link and Thomas is designing a new system to recycle truck wash water. The firm is also filling out a NPDES application for this company.
16. Lee Dairy, a dairy farm and milk processing plant, discharges all wastes into a 200 ft square oxidation lagoon. The lagoon effluent and barnyard run-off flow through a ditch 3-5 miles before entering Center Creek. At the time of the visit, the flow was estimated at 5-10 gpm. A NPDES permit is required for this operation.
17. Lacarni Marble Company cuts, grinds and polishes marble and granite. Spring River water (50,000 to 100,000 gpd) is used in the process. Water used in product finishing is discharged into a 200' x 500' non-overflowing pond. All other process water enters a 100' x 300' pond. According to company officials, heavy rainfalls have resulted in the discharge of a small amount of water being discharged to the Spring River. A discharge permit is not required for this company.
18. Reynolds Transportation Company operates 12-15 tank trucks to haul toxic and hazardous materials, e.g. nitric, sulfuric and phosphoric

acids, augua regia, hydrofluo silic acid, liquid nitrogen fertilizer, gasoline, oil, diesel fuel and dry fertilizer. Water used to wash the inside of the tanks is discharged into a sealed non-overflow lagoon. Wastewater containing silt, detergent, etc., from exterior washing is discharged to the Spring River. A NPDES permit is required for this discharge.

19. Stuckey's and Nickerson Farms, Inc. treat wastes in lagoons. The effluents are discharged into a pasture and dry ditch, respectively. Roy W. Grace Oil Company, Inc. treats wastes in a septic tank-leach field. Based on field observations, NPDES permits are not required.
20. Blue Top Restaurant and Inn treats wastes from the restaurant, a service station and motel in two lagoons operated in series. The lagoon effluent enters a ditch and thence the North Fork of Spring River. A NPDES permit application is required for this discharge.
21. Morrow Milling Company has two plants and a truck washing operation in the Carthage area. The turkey processing plant is connected to the City sewer. The animal and poultry feed plant uses well water for boiler feed. There is no discharge from this operation.

Trucks used to haul turkeys, are washed with Spring River water. The wash water enters two lagoons operated in series. Although an overflow pipe exists in the second lagoon, there was no discharge or evidence of discharge from these lagoons. Based on field observations, a NPDES permit is not required.


James L. Hatheway

cc: Mr. Bob Markey
Mr. Ron McCutcheon

SUMMARY OF NON-FILERS
SPRING RIVER BASIN, MISSOURI

| <u>No.</u> | <u>Industry & Address</u> | <u>Type of Industry</u> | <u>Flow</u> | <u>State Permit</u> |
|--|--|-------------------------|------------------|---------------------|
| SIGNIFICANT INDUSTRIAL SOURCES ^{1/} | | | | |
| 1. | Farmers Chemical Co. P.O. Box 225, Joplin, Mo. | Fertilizer Mfg. | 200 to 1,100 gpd | In Review |
| 2. | Missouri Steel Castings Co. 905 E. 3rd St. Joplin, Mo. | Steel Castings | 20 gpd | No |
| 3. | Tamko Asphalt Products, Inc. (Newman Rd. Plant) 601 No. High St. Joplin, Mo. | Asphalt Roofing | 10-30 gpd | No |
| MINOR INDUSTRIAL SOURCES ^{2/} | | | | |
| 4. | Norma FAG Bearings Corp. 3900 Rangeline Rd., Joplin, Mo. | Bearings | 2000 gpd | Yes |
| 5. | Country Kitchen Food Prod., Inc., R. R. #3 Carthage, Mo. | Food Products | 1500-gpd | Yes |
| 6. | Crouch's Slaughtering & Proc. Monett, Mo. | Meat Processing | 4800 gpd | Yes |
| 7. | G & R Industries, Inc. Monett Industrial Tract Monett, Mo. | Metal Finishing | -- | No |
| 8. | Kahre Slaughter & Processing Pierce City, Mo. | Meat Processing | 800 gpd | Yes |
| 9. | Mt. Vernon Electric Refrig. Cooperation, Inc., Mt. Vernon, Mo. | Meat Processing | -- | Yes |
| 10. | Tri-State Motor Trans. Co. Duenweg, Mo. | Trucking | 3000 gpd | Yes |

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SPRING RIVER BASIN, MISSOURI

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|--|---|-------------------------|-------------|---------------------|
| COMMERCIAL SOURCES ^{3/} | | | | |
| 11. | Blue Top Restaurant & Inn Lamar, Mo. | Motel & Restaurant | 9500 gpd | Yes |
| 12. | Grace, Ray W. Jct. I-44 & Co. Rd 10, Carthage, Mo. | Restaurant | 3500 gpd | Yes |
| 13. | Hamilton, Rex I-44 & State 43 Joplin, Mo. | Restaurant | 1500 gpd | Yes |
| 14. | Joplin Travelodge 3555 Rangeline Rd., Joplin, Mo. | Motel & Restaurant | 0.031 mgd | Yes |
| 15. | Nickerson Farms, Inc. I-44 S.W. of city, Joplin, Mo. | Restaurant | 8300 gpd | Yes |
| 16. | Nickerson Farms, Inc. I-44, Stotts City, Mo. | Restaurant | 5300 gpd | Yes |
| 17. | Pearce Rest. & Serv. Sta. U.S. 71A S. of city, Carthage, Mo. | Restaurant | 500 gpd | Yes |
| 18. | Roger's Cafe & Service Sta. Hwy 66 W. of city, Carthage, Mo. | Restaurant | 2700 gpd | Yes |
| 19. | Skelly Oil Co. Hwy U & I-44, Joplin, Mo. | Restaurant | 1500 gpd | Yes |
| 20. | Stuckey's Co Rd 10 & I-44, Carthage, Mo. | Restaurant | 2000 gpd | Yes |
| POTENTIAL INDUSTRIAL SOURCES ^{4/} | | | | |
| 21. | Blevins Asphalt Co. N. Francis St, Carthage, Mo. | Hot-Mix Asphalt | --- | No |
| 22. | Buddy L. Mfg. Co. Neosho, Mo. | Metal Products | -- | No |

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|------------|--|-------------------------|-------------|---------------------|
| 23. | Empire Distr. Electr. Co. Asbury Plant, Asbury, Mo. | Electric Power | 0.014 mgd | Yes |
| 24. | G & R Metal Finishing Co. Purdy, Mo. | Metal Products | -- | No |
| 25. | Harris (Lee) Dairy Carthage, Mo. | Dairy | -- | Yes |
| 26. | Locarni Marble Co. N.W. of City, Carthage, Mo. | Marble Products | -- | No |
| 27. | Morrow Milling Co. N. Main St., Carthage, Mo. | Truck Washing | -- | Yes |
| 28. | Monett Rendering Co. Monett, Mo. | Animal By-Products | -- | No |
| 29. | Ozark Trout Farms N. of City, Neosho, Mo. | Trout Rearing | -- | No |
| 30. | Reynold's Cartage Co. Cartersville, Mo. | Trucking | -- | No |

1/ Discharge observed in the field

2/ Source listed in Interim Basin Plan or has State Operating Permit

3/ Source has State Operating Permit

4/ Source listed in Interim Basin Plan, State files, or was observed in the field as a type of operation normally having a discharge. Discharge not confirmed. Some may be closed systems.

APPENDIX B
ATLAS POWDER COMPANY
JOPLIN, MISSOURI

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
NATIONAL FIELD INVESTIGATIONS CENTER—DENVER
BUILDING 53, BOX 25227, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

TO : Mr. James Hatheway

DATE: October 25, 1973

FROM : Barrett E. Benson

SUBJECT: Atlas Powder Company (ICI America) Plant Visit, October 17, 1973,
Joplin, Missouri

Atlas Chemical Industries, Inc., a subsidiary of the Tyler Corporation, Dallas, Texas, has operated a powder plant in Webb City, Missouri, since 1912. The plant was built in 1910 and was sold to Atlas by DuPont. The company manufactures nitrogen fertilizers, ammonium nitrate, industrial explosives, nitric acid, urea, and nitroglycerine. Major raw materials used in processes include ethylene glycol, ethylene glycol denitrate, ethylene glycol tritrate, sodium nitrate, TNT, DNT, nitrocotton, sulfur, charcoal, pulp, meals, bagasse, and oleum.

The plant operates 24 hours per day, 7 days per week and employs about 500 people. A RAPP application was filed on June 24, 1971 under the name of ICI America, Inc. The contact at the plant is Mr. Tom Douglass, Quality Control Supervisor.

Water Supply and Uses

Water used in production and for domestic purposes is obtained from 6 deep wells and a fresh water spring. Atlas also supplies water to the W. R. Grace Company which operates a chemical plant on Atlas' property. The spring supplies up to 2,200 gpm and is the main source of water. During dry seasons, the spring water is supplemented by the wells which range in depth from > 1500 to 2000 feet. Only three wells are first used to supplement the supply as the water is of good quality. The three remaining wells are used only during periods of extreme shortages of water because the supply is of poor quality. The latter source is mine water and contains zinc and iron which causes problems with the cooling towers. Three ion exchangers are the only treatment devices used and only for water used in the six boilers. Each boiler has the capacity to produce 5,500 gpm of steam. The power house has a sodium zeolite exchanger; the nitric acid area has a continuous demineralizer (caustic and HCL); and the nitroglycerine area has two separate exchangers, acid and sodium units.

Quantities of water used within the plant were determined by Mr. Douglass and is attached.

Domestic Wastes

The domestic wastes from the acid area flow to septic tanks; some tanks discharge to leach fields while others discharge directly to Grove Creek. A small Chicago Pump Company package activated sludge (not extended aeration) treats wastes from the nitrogen area. The remaining wastes flow to a bio lagoon (discussed later).

Mr. Douglass could not furnish flows on domestic waste, however, the RAPP application shows that 30,000 gpd are used. This flow would include the laundry operation which uses 3,000 gpd.

Process Description and Wastes Generated

Explosives Area

- A. Nitroglycerine Production - An average of 2,520 lbs of nitroglycerine (NG) is produced per hour using the Mario Biazzi Process. The process is continuous and is described as follows: From 82 to 86 lbs per minute of mixed acid (53% HNO_3 + 47% H_2SO_4) are added to a weighing pot to calibrate the mixed acid flow meter (Rotometer). Once the precise flow rate has been set, the mixed acid flows to a nitration pot; 18 lbs per minute of glycerine glycol (80% glycol and 20% glycerine) is continuously added and nitrated at a controlled temperature (65°F). The nitration pot is internally cooled with 4 sets of coils containing sodium nitrate. The NaNO_3 is brine chilled; brine is not used for cooling due to the explosion hazard if the coils rupture or leak. After nitration, the resultant NG and spent acids flow to a separator where NG is removed from the top and the acid from the bottom. The NG flows to a series of 3 washers in which 13% soda ash solution and water are added (Na_2CO_3 added only to first washer, water to other two washers) to remove residual acid. The NG + water + soda ash solution flows from the building to the storage area (two buildings). The solution separates in the storage tanks, Na_2CO_3 and water come off the top and the NG is drawn off the bottom and stored in additional tanks. About 2.33 lbs of NG is produced per pound of glycerine glycol.

Waste acid from the nitrator is recovered and sent back to the acid plant. The waste acid (about 9-10% HNO_3 and 74% H_2SO_4) is heated by hot water to destroy any NG in the acid. The waste acid flows to a 30 TPD nitric acid concentrator; nitric acid (97%) is recovered and sent to the mixed acid operation for reuse in the Biazzi process or sold as mixed acid. The sulfuric acid is either returned to the W. R. Grace Company for reprocessing or stored in the H_2SO_4 storage tanks before being added to the mixed acid operation.

If an incorrect mixture of mixed acid and glycerine glycol occur, the solution is dumped to a water tank below. The NG and acids are recovered and the dilution water is discharged to Grove Creek. The soda ash solution separated from the NG in the storage tanks in building #2 is discharged to Grove Creek through outfall 005. The wastes from building #1 flows through outfall 003. In total, about 50 tons/month of HNO_3 , H_2SO_4 , and NG are lost to the receiving water. The flows from both buildings average 15 gpm each.

- B. Ammonium Nitrate Production - Ammonium nitrate (AN) is produced by the Stengel Process; average production is 120 TPD although the process has a capacity of 280 TPD. In the Stengel Process, the AN is crystallized as opposed to a prill tower which produces tear drop shape granules. Crystals are required in the manufacture of dynamite. The AN process is as follows: concentrated (55-59%) nitric acid is sprayed through nozzles onto stainless steel packing at the top of a reactor and ammonia added. The mixture flows through a stripper to remove NH_3 fumes (operated under basic conditions; $\text{pH} > 8.4$). Air is introduced and the fumes and air are scrubbed; the air mixture is discharged to the atmosphere and the water (weak HNO_3) is sent to the slurry operation (discussed later). There are plans to condense the weak HNO_3 and send it to the nitric acid concentrator. The AN then flows from the reactor either to 1) the Stengel Process, 2) to 3 kettles (batch operation), or 3) to a charge tank. The AN has no impurities because of the closed reactor system. The Stengel Process is as follows: the molten AN (99.5%) flows onto a continuous Sandvik belt and solidifies. The thickness of the sheet is dependent on belt speed and temperature (cooling water flows underneath the belt). The AN is discharged from the belt to a flake breaker (sheets are broken into flakes) and then to a conveyer which empties into an elevator (robolift). The elevator discharges to two comminuting Fitz mills (screens to get correct grind - 10 to 100 U. S. Seive); the particles drop to a wax coater for moisture protection, then go to a clay coater (Celeton MN 41 - diatomaceous earth). The AN then is conveyed to another robolift elevator and screened and sized into fine or coarse grades. The different grades of AN is used in dynamite for various density powders.

The molten AN added to the kettles requires about 1 hour to crystalize. About 1500-2000 lb/hr/kettle is produced. The kettles give much finer grains which are more easily handled in the process machinery. The kettles are jacketed and water cooled.

Clean-up is essentially a dry operation with all sweepings burned. Minimum amounts of water are used for washdown. Discharges flow to outfall 003.

- C. Dope House and Mix House Processes - The dope house operation consists of blending many ingredients (ammonium nitrate, sodium nitrate, pulp, meals, charcoal, bagasse, sulfur, starch, etc.) before mixing with NG. Clean-up is a dry operation.

The mix house operation consists of adding NG to the mixture prepared at the dope house to produce various grades of dynamite. The dynamite is then packaged and shipped or stored in 8 magazines. The clean-up operation is also dry.

- D. AN/FO Process - Ammonium nitrate fuel oil is produced in a trailer. It is essentially a mixing of #2 grade fuel oil, aluminum, AN, and ferrophosphorus or ferrosilican. All clean-up operations are dry and the sweepings are burned.
- E. Slurry Explosives Process - Slurries, or water gels, are produced in one building in a batch operation. The slurries are mixed (water, ethylene glycol, ground smokeless powder, AN, Sodium nitrate, etc.) and packaged in polyethylene bags. The slurries produced include two emulsions, Aquaram and Aquanol, and two gels, Aquaflo and Aquagel. Paint grade aluminum is used in the production of Aquagel. Clean-up wastes flow to a 3 compartment sump where the pH is raised to 11.5 with caustic. The aluminum hydroxide precipitates in a settling pond; the pond effluent discharges to the receiving stream. According to Mr. Douglass, the problem is that the employees do not adequately treat the wastes prior to discharge.
- F. NCN and Petron Processes - Nitrocarbonitrate is produced in one building and stored in a special trailer. Major constituents include DNT, fuel oil, bagasse, aluminum, pulp, and ammonium nitrate. The NCN is packaged in cylindrical cans for use in seismographic work. Spills are swept up and burned.
- Petron is an explosive made from TNT. The TNT is regraded from its flake form in the mix and canning operation. Clean-up is a dry operation.
- G. Nitric Acid Production - Nitric acid is produced in two plants, a 50 TPD and a 300 TPD plant. Ammonia from the ammonia plant is reacted with oxygen and a platinum catalyst to form nitric acid (57%). The nitric acid is then concentrated in a 30 TPD nitric acid concentrator, or used in the Stengel Ammonium Nitrate process.

Two cooling towers serve the two acid plants. The water in the 2 cell cooling tower for the 50 TPD plant is treated with zinc chromate. The water is recycled 4-5 times and has a recirculation rate of 12,000 gpm. The 300 TPD acid plant cooling tower (4 cell) is also treated with zinc chromate (50-75 lb/day), is recycled 5 to 6 times, and has a recirculation rate of 26,000 gpm. The blowdown from the 4 cell cooling tower discharges through outfall 002. The cooling water from the 2 cell tower is recycled.

There are also 2 once through heat exchangers and an evaporative cooler which use about 900 gpm of untreated water. Approximately 400 gpm goes to the cooling towers while the rest goes through outfall 002. The discharge will have high concentrations of zinc and iron when the mine water is used.

- H. Sulfuric Acid Area - W. R. Grace supplies an average of 30 TPD of oleum (109% H_2SO_4) for use in the mixed acid operation. The mixed acids are used in the manufacture of nitroglycerine. Spent sulfuric acid (73%) is returned to W. R. Grace. The only losses of sulfuric acid are in the Biazzi process and in the nitric acid concentrator operation.

Nitrogen Area

- A. Ammonia Production - Basically, natural gas (CH_4) is reacted with steam and air to produce NH_3 , CO, CO_2 , and inert gases. The CO is burned in 3 boilers, one-third of the CO_2 is used in the urea process and the rest vented to the atmosphere. Excess NH_3 and the inert gases go to a reforming process using a continuous recirculated copper ammonium acetate system. The absorbent picks up the CO at low temperature and drives off CO at high temperatures. The inert gases are incinerated. The NH_3 is either stored in three 2,000 ton capacity spheres for use in the ammonium nitrate process and the aqua ammonia process, or used in the urea plant, or sold as anhydrous ammonia. The ammonia plant has a capacity of 390 TPD. Wastewaters containing ammonia flow to the three pond system before discharge through outfall 001 (pond system described later).
- B. Ammonium Nitrate Process - Ammonia is reacted with nitric acid from the two nitric acid plants to form an ammonium nitrate solution. The solution is concentrated by heat and sprayed into the top of the prill tower against countercurrent air. The droplets reach the bottom of the tower as solid pellets of NH_4NO_3 . The AN is then coated, stored, bagged, and shipped. About 370 TPD is produced.

Wash water used to clean the prill tower flows to a sump and is recycled back to the process. A leaf filter is used to remove AN sludge; the sludge is discharged to a sludge pond located just north of the 3 pond system. The filtered water goes to the storm pond (part of 3 pond system) before discharge through outfall 001.

- C. Urea Process - Ammonia and CO_2 from the ammonia process are synthesized to form 99.8% urea (NH_2CONH_2)² and water. The urea is sprayed into the urea prill tower; the resulting droplets are screened and stored. The urea is then bagged or coated and shipped. Feed grade urea contains 42% and 45% nitrogen while the fertilizer grade urea contains 45% and 46% nitrogen.

Ammonia and CO_2 are also synthesized to make a 78% urea solution which is combined with ammonium nitrate from the prill plant. The urea-AN solution is processed with nitric acid to form non-pressure nitrogen fertilizer solutions which contain 28%, 30%, or 32% nitrogen.

The urea plant has a capacity of 215 TPD. A desorber has been installed in the urea plant to remove ammonia. The waste stream has about 2000 mg/l NH_3 and 5000 mg/l urea. The NH_3 is reduced to 600 mg/l, but the urea passes untreated. The company is currently investigating treatment methods such as hydrolyzing the urea and recycling it in the process (urea is broken down to NH_3), but firm plans for treatment have not been made. There are also problems occurring during shutdown. The urea and ammonia concentrations increase to 8,000 mg/l and 5,000 mg/l respectively. The plant has a 20,000 gallon vessel used to store the urea solutions during shutdowns; the solution is recirculated back to the process which increases the concentrations in the waste stream. All wastewaters flow to the 3 pond system.

Waste Treatment

- A. Nitrogen Area - The 3 pond system previously mentioned consists of a chemical pond (600,000 gallon capacity), a storm pond (1.1×10^6 gallons), and a bio lagoon (740,000 gallons - 3-4 days detention). Floating aerators have been installed in the chemical pond and bio lagoon. All intermittent waste flows go to the chemical pond. The aerators are used to strip ammonia. Continuous waste flows and the effluent from the chemical pond discharge to the storm pond. Continuous waste flows containing ammonia are discharged to the storm pond via an outfall pipe located about 10-15 feet above the water surface. The effluent from the storm pond passes through a Parshall Flume and is continuously recorded. The effluent can either flow to the bio lagoon or by-pass directly to outfall 001 about 1 mile away.

At the time of the plant visit, the effluent was flowing into the bio lagoon. Sludge from the storm pond is periodically removed for land disposal. Occasionally, farmers will pump water off the top of the storm pond and use it for fertilizer.

The bio lagoon receives domestic wastes; however studies conducted by Atlas showed that the lagoon would be too expensive to operate (\$200-\$300/day) and therefore it is currently being used as a polishing pond.

A steam oxidation system is used to treat a copper bearing solution. The residue is hauled by a private contractor in drums and the effluent is discharged to the chem pond.

- B. Powder Area - Outfall 002 contains waste from cooling towers and powder operations. The powder operations are dry clean-up which results in minor discharges of cleaning water and some cooling water.
- C. Acid Area - Three outfalls serve the acid area. The discharge through outfall 003 contains minor, continuous flows of drainage through a natural ditch plus intermittent discharges from NG storehouse #1. The ditch has a remote controlled sluice gate to trap and contain spills, however the storehouse #1 discharge is located downstream of the sluice gate. The area upstream of the sluice gate contains discharges from nitric acid, NG, and AN (Stengel Process) operations. The effluents from these areas pass through a surface baffled area for oil entrapment, and then to a continuously indicating-recording-controlling conductivity instrument. When the conductivity increases above 2,000 mg/l, the sluice gate closes and the flow is directed to the Atlas pond until the condition is corrected.

The Atlas pond also receives intermittent discharges of wash water from the NCN process the effluent of which is passed through a wax separator before discharge to the pond. The residue is burned. The Atlas pond discharges to Grove Creek through outfall 004 on a controlled basis utilizing flow, pH, and NH_3 levels in the receiving streams as the guide to the rate of discharge. The pond is neutralized with soda ash before discharge.

Outfall 005 contains flow from NG storehouse #2. Waste from the storehouse (soda ash plus NG) is discharged to four baffled rectangular tanks in series. The tanks are continuously fed with water and soda ash; the residue is periodically removed and burned.

- D. Acid Addition to Creeks - When Grove and Center Creek flows become very low (13-14 mgd: normal flow 30-40 mgd), sulfuric acid is added to the creeks via the number 2 cooling tower discharge (outfall 002) to keep the pH low, which in turn reduces the toxicity of NH_3 to aquatic life. The pH in the cooling tower ditch is around 2 and the pH of Grove and Center Creeks between 6.5 to 7.5.

Comments

A map of the area showing the outfalls and process sequence diagrams is attached. All five outfalls are reported to contain high levels of nitrogen. Only outfall 001 should be free of NG and ethylene glycol denitrate.

cc: Mr. Harp
Mr. Masse



ICI America Inc.

DATE: JUNE 12, 1973

TO: MR. H. T. CLARK, MANAGER,
EXPLOSIVES PRODUCTION-ENGINEERING

FROM: ATLAS PLANT

DIVISION: QUALITY CONTROL GROUP

FILE: 107

SUBJECT: cc: MR. L. I. LUEHRING, TECHNICAL SUPERINTENDENT
MR. E. P. TAIPALE, PLANT MANAGER

The following information was requested by Mr. Roger A. Minear, Assistant Professor of Environmental Engineering, Department of Environmental Engineering, Illinois Institute of Technology, Chicago, Illinois, during his visit to Atlas Plant June 1:

Summary of Information:

- o Explosives Section - Production Information
- o Plant Water Balance
- o Explosives Section Water Usage (Includes Laundry Operation)
- o Acid and Explosives Section - Steam Production
- o Acid Section - Cooling Towers
- o Betz Laboratories Product Data - Water Treatment Chemicals
- o Acid Section - Tankage
- o Flow Sheet and Process Description - Nitric Acid Concentrator
- o Description of Aquagel - Waste Treatment (HTC to Attach)
- o Plant Maps and Flow Sheets
- o Form 4805 - Water Quality Considerations for IRS Permit to Manufacture Explosives
- o Application for Permit or Letter of Approval - Missouri Clean Water Commission
- o Part A and Part B - Environmental Protection Agency (Corps of Engineers Application for Discharge Permit)
- o Part B Attachments on Urea and Nitroglycerin Concentrations

TJD:kr

Attach.

T. J. DOUGLASS,
QUALITY CONTROL SUPERVISOR

EXPLOSIVES SECTION

PRODUCTION INFORMATION

Average over an 18 month period -- October, 1971, through March, 1973 -- Includes manufacture for other powder companies:

| | <u>Average Lbs./Month</u> |
|-----------------------------|---------------------------|
| Gelatins | 3,077,000 |
| Dynamites | 1,881,000 |
| Slurry and Related Products | 344,000 |
| ANFO and Related Products | 271,000 |
| Canned Explosives | <u>73,000</u> |
| | 6,646,000 |

PLANT WATER BALANCE

(AVERAGES)

USAGE (MMGPD)

| | | | |
|---------------------|---|----------|-------------|
| Atlas Plant Pumpage | - | 3.50 | (2,430 GPM) |
| To W. R. Grace | - | (-) 0.20 | |
| Atlas Plant Usage | - | 3.30 | |
| Explosives & Acid | - | 1.97 | |
| Nitrogen | - | 1.33 | |

DISCHARGES (MMGPD)

| <u>NO.</u> | <u>EXPLOSIVES</u> | <u>ACID</u> | <u>NITROGEN</u> | <u>TOTALS</u> |
|------------|-------------------|-------------|-----------------|---------------|
| 1 | 0.00 | 0.00 | 0.30 | 0.30 |
| 2 | 0.35 | 0.00 | 0.60 | 0.95 |
| 3 | 0.10 | 0.80 | 0.10 | 1.00 |
| 4 | 0.00 | 0.25 | 0.00 | 0.25 |
| 5 | <u>0.02</u> | <u>0.00</u> | <u>0.00</u> | <u>0.02</u> |
| | 0.47 | 1.05 | 1.00 | 2.52 |

EVAPORATION (MMGPD)

| | | |
|------------|---|-------------|
| Explosives | - | 0.00 |
| Acid | - | 0.20 |
| Nitrogen | - | <u>0.50</u> |
| | | 0.70 |

BALANCE (MMGPD)

| | <u>EXPLOSIVES</u> | <u>ACID</u> | <u>NITROGEN</u> | <u>TOTALS</u> |
|-------------|-------------------|-------------|-----------------|---------------|
| Usage | ----- 1.97 ----- | | 1.33 | <u>3.30</u> |
| Discharges | 0.47 | 1.05 | 1.00 | |
| Evaporation | <u>0.00</u> | <u>0.20</u> | <u>0.50</u> | |
| | 0.47 | 1.25 | 1.50 | <u>3.22</u> |

EXPLOSIVES SECTION
WATER USAGE

DISCHARGE NO. 2 (0.35 MMGPD)

Contains water from the laundry; ⁽¹⁾ eleven York condensers (Refrigeration); two Kathabar units, manufactured by Ross Corporation; four exhausters (vapor scrubbers) located at the three Mix Houses and Slurry Operation; and sanitary wastes. The Refrigeration and Kathabar units use untreated, once-through cooling water during five months of warm weather and steam is used for space heating about seven months of the year. Steam to the Explosives Section is then increased by about 100,000 lbs./day and the condensate is not returned.

DISCHARGE NO. 3 (0.10 MMGPD)

Contains water from two Kathabar units; one exhauster (vapor scrubber); steam condensate; and sanitary waste.

DISCHARGE NO. 5 (0.02 MMGPD)

Contains water from the Biazzi (N.G.) operation. Origin of water in wastewater follows:

| | | |
|----------------|-----------------|------------|
| | | <u>GPM</u> |
| Total | (Soda-Wash | 2.8 |
| Emulsion Water | (Transfer | 8.2 |
| | Dilution | 4.0 |
| | Total Discharge | 15.0 |

(1) LAUNDRY OPERATION

Uniforms, gloves, socks, etc., are washed daily:

Washing Machine

- o The American Laundry Machine Company
- o Model - 40" Diameter x 30" Long
- o Cascadex - End Loading

Operation

- o About 18 Loads Per Day
- o Two Fillings Per Load
- o Estimate a Maximum of 3,000 GPD Water Usage .

Materials

- o 1 Gallon of Clorox Per Day
- o 100 Lbs. of Procter & Gambles "Lo-Range" Controlled Suds Detergent Per Week

ACID AND EXPLOSIVES SECTIONS

STEAM PRODUCTION

POWER HOUSE PRODUCTION

| | | <u>LBS./DAY</u> |
|--|---|-----------------|
| Steam Production | - | 755,000 |
| Treated Water | - | 718,000 |
| Return Condensate (Return from Air Compressors, Etc. at Power House) | - | 52,000 |
| Blowdown | - | 15,000 |

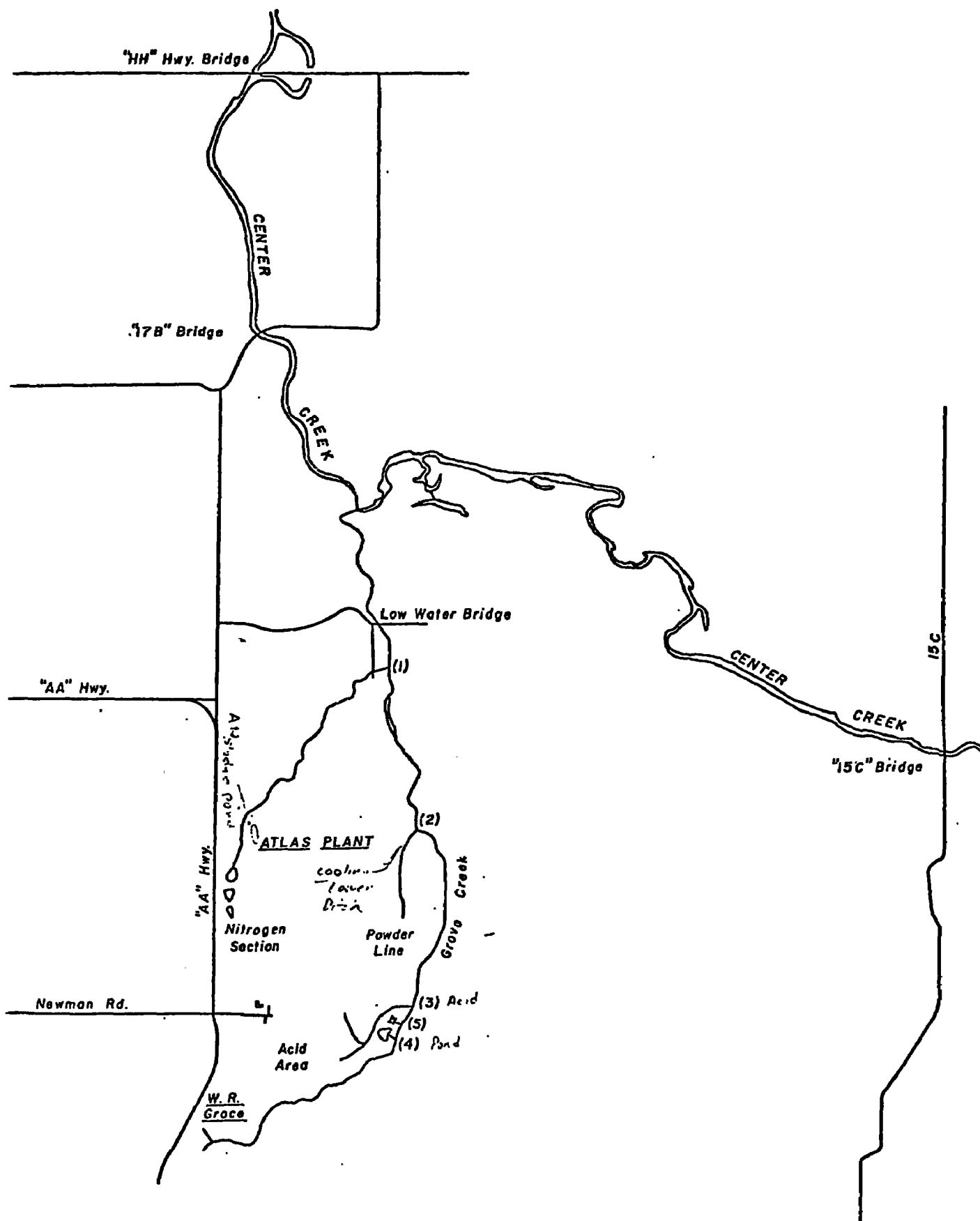
DISTRIBUTION

| | | <u>LBS./DAY</u> |
|-------------------------------------|---|--------------------|
| Explosives Section (175 PSIG) | - | 120,000 To 140,000 |
| Acid Section (175 PSIG) | - | 530,000 To 550,000 |
| Nitric Acid Concentrator (255 PSIG) | - | 85,000 |

CHEMICAL USAGE (TOTAL)

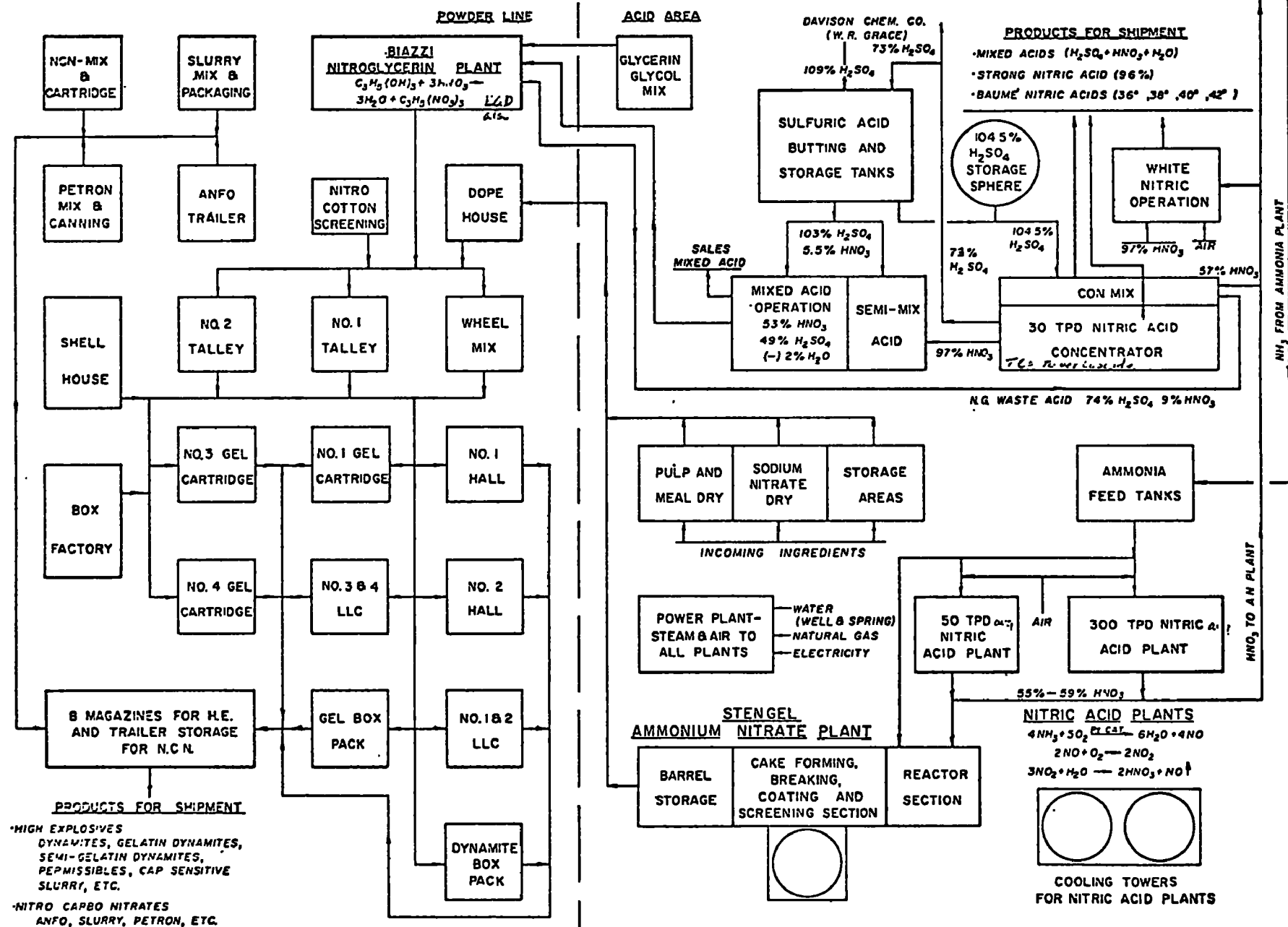
| | | <u>LBS./DAY</u> |
|----------------------------------|---|-----------------|
| Phosphate (A-Gel) | - | 8 |
| Purchased from Betz Laboratories | | |
| Sulfite (Corrogen) | - | 15 |
| Purchased from Betz Laboratories | | |
| Sodium Hydroxide | - | 21 |
| Sodium Chloride | - | 500 |
| (Softener - Dealkalizer System) | | |

About 23,000 lbs./hour steam is produced at a self-sustaining 265 RTPD Nitric Acid Plant. 2,000 to 4,000 lbs./hour is exported to the Power House.

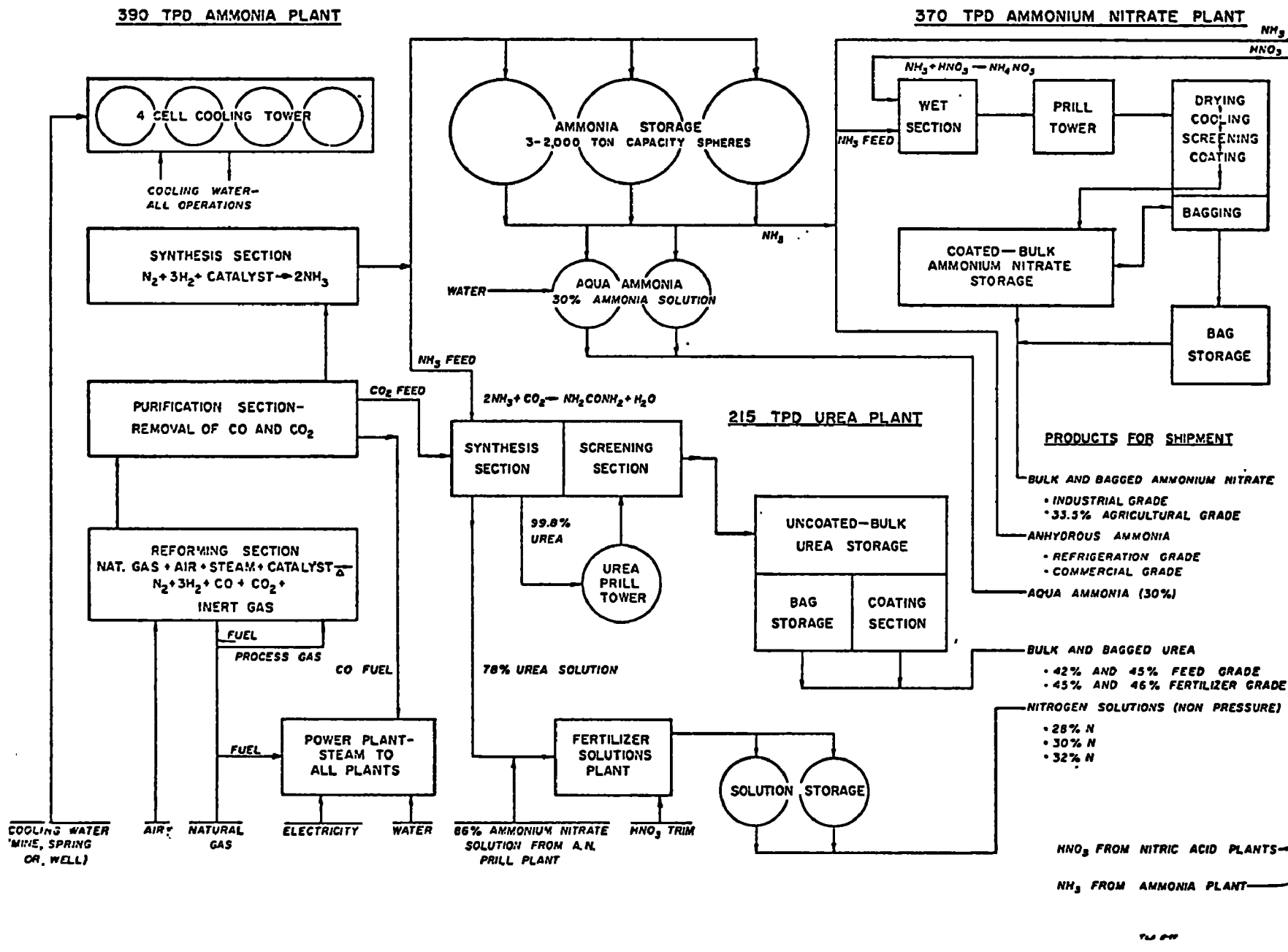


EPA Discharges (1)-(5)

ATLAS PLANT-EXPLOSIVES SECTION



ATLAS PLANT—NITROGEN SECTION



APPENDIX C
STUDY METHODS
BIOASSAYS

APPENDIX C

STUDY METHODS

WASTE SOURCE EVALUATIONS

Ten industrial waste sources were investigated. Information was obtained, through in-plant surveys, review of Refuse Act permit applications, and plant officials, on water pollution control practices at each plant.

Composite samples were collected from Atlas Powder Company, except nitroglycerin wastes, Eagle Picher Industries, Inc., W. R. Grace and Company, Gulf Oil Corporation, Missouri, Steel Castings Company and Tamko Asphalt Products, Inc. using SERCO automatic samples and composited on an equal volume basis. Composite samples were collected manually (equal volume basis) from Herrod Packing Company, Inc. Grab samples were collected of the wastewater discharges from Atlas Powder Company nitroglycerin discharge, Farmers Chemical Company, Hercules, Inc. and Independent Gravel Company. Flow was obtained using "V" notch weirs and stage recorders and by bucket and stop watch.

Samples for chemical analyses were collected in clean, unused containers. Field measurements of pH, temperature, and conductivity were made periodically. Samples were delivered to the NFIC-D mobile laboratory (Joplin, Missouri) and analyzed for selected parameters (e.g., settleable solids, suspended solids, and oil and grease). Appropriate, preserved aliquots were shipped to the NFIC-D Laboratory (Denver, Colorado) and analyzed for COD, heavy metals, nutrients, nitroglycerin, ethylene glycol denitrate and radium.

All other laboratory analyses and field measurements employed were conducted in accordance with accepted standard techniques.

STREAM SURVEYS

Limited stream surveys were conducted in order to determine the effects of wastewater discharges on the receiving waters. The collection times of samples were varied to achieve a time spread.

Sampling and analytical procedures were similar to those described in the previous section. Stream flow measurements were made at all stream stations except Center Creek at HH Bridge and Center Creek at Highway 66. Flow rates for Center Creek at HH Bridge were obtained from USGS data and for Center Creek at Highway 66 Bridge were estimated.

BIOASSAYS

Bioassays were done to determine the toxicity of:

- 1) The 001 discharge from the Atlas Powder Co. (Nitrogen plant)
- 2) Eagle Picher Industries Inc. discharge 001 from the couples plant.

A continuous flow proportional diluter was used to provide a series to six dilutions [100, 50, 25, 12.5, and 6.25 percent effluent and 100 percent dilution water (Control)]. Where a lower range of concentrations was required effluent was pre-diluted prior to being introduced into the system. All effluent reservoirs were replenished twice daily.

Dilution water for the bioassay of Atlas Powder Company discharge (001) was obtained from Center Creek (River Mile 21.3 or Km 34.27) upstream from Grove Creek. Eagle Picher couples plant discharge (001) was bioassayed using dilution water from Turkey Creek (River Mile 5.91 or Km 9.50) upstream of Lone Elm Creek and the Lone Elm Creek Waste Water Treatment plant.

Test water for the Atlas Powder Company (discharge 001) bioassay was obtained from a drainage ditch approximately 50 meters upstream of its confluence with Grove Creek, a tributary of Center Creek. Test water from Eagle Picher industries (discharge 001) was taken directly from the couples plant discharge (001) pipe. An automatic sampling device which drew proportional aliquots hourly over a 24 hour period was used.

Each test chamber was of glass construction and had a seven liter capacity. All concentrations were done in duplicate with five channel catfish (Ictalurus punctatus) tested in each of the twelve chambers.

The minimum turn-over rate for any test chamber was eight times in a 24 hour period.

All test aquaria were monitored daily for pH, temperature, dissolved oxygen, and conductivity. Chambers containing water from the Atlas Powder Company were also analyzed for total ammonia. Water from the Eagle Picher discharge 001 was analyzed for heavy metals.

All bioassay tests were continued for 96 hours and mortalities were recorded at 24-hour intervals. TL_m values were calculated using the straight line graphical interpolation method.

APPENDIX D
EXCERPTS FROM
MISSOURI WATER QUALITY STANDARDS

MISSOURI

WATER QUALITY STANDARDS

MISSOURI CLEAN WATER COMMISSION
P. O. Box 154
JEFFERSON CITY, MISSOURI 65101

JUNE, 1973

Section IV. WATER USES AND STREAM AND LAKE CLASSIFICATION

Present and anticipated future uses of listed streams and lakes are tabulated below. These uses were so designated as a result of public hearings 1966-1968 and have been occasionally revised following subsequent hearings. Future uses not specified herein are not expressly excluded; however, such future uses are not anticipated. In addition, streams and lakes are classified in the following groups. Streams or lakes suitable for whole body water (primary) contact recreation, such as swimming, water skiing, skin diving, or any other activity in which raw water may be accidentally ingested, are given an "A" classification. Waters that are not suitable for primary contact recreation, but are of sufficient quality for secondary water contact recreation, such as fishing, wading, and boating, will be given a "B" classification. Also, streams and lakes classified "A" or "B" will be maintained at a level of quality necessary for the propagation of fish and aquatic wildlife, for use as a raw water source for public water supply, and for agricultural and industrial uses. A few streams will not be classified "A" or "B" because of poor water quality due to natural phenomena, man-made pollution, or technological limitations. These streams are listed as "exceptions" with an explanation of their poor quality.

The designation "B", under the heading "Propagation of warm water sports fish" indicates that the stream or lake supports smallmouth bass. The designation "TF" under the heading "fishing" indicates that those lakes and streams so designated will support trout for fishing purposes, but are not suitable for propagation.

A list of reaches where there is now stocking and propagation of trout is given.

In addition to these tabulated uses, all classified streams are assumed to have aesthetic value, to receive surface runoff, and to be used for wildlife watering. The Missouri and Mississippi Rivers are used also for navigation.

Classification Exceptions

Big Blue River - Zone 3 (Guinotte Dam to mouth)

The low water dam constructed by Sheffield Steel Company and Guinotte Dam pose barriers to fish migration from the Missouri River. Industrial ownership of the land on both sides of the river below Guinotte Dam do not lend this zone of the Blue River to recreational use of the stream.

Turkey Creek [in the Grand (Neosho) River Basin near Joplin, Missouri]

Due to past mining activities, surface water concentrations of zinc approach the toxic limit for fish of 1 mg/l and it is felt that even higher concentrations may exist on the stream bed, thus possibly precluding the propagation of fish. Sewage treatment plant effluent comprises almost the entire flow of this stream during extensive periods making it unsuitable for recreational use. However, waste effluents to the stream will be sufficiently treated to protect the established water uses for Spring River in Kansas.

WATER USES
GRAND (NEOSHO) RIVER BASIN

| Name of stream or lake | Present | | Irrigation | Livestock watering | Propagation of commercial fish | Propagation of warm water sport fish | Propagation of cold water sport fish | Industrial cooling water | Industrial process water | Drinking water supply | Hydroelectric power | Boating and canoeing | Fishing | Whole body water contact recreation | Receive effluents | Use Classification |
|------------------------|---------|---|------------|--------------------|--------------------------------|--------------------------------------|--------------------------------------|--------------------------|--------------------------|-----------------------|---------------------|----------------------|---------|-------------------------------------|-------------------|--------------------|
| | Future | | | | | | | | | | | | | | | |
| SPRING RIVER | | | | | | | | | | | | | | | | |
| Spring River | P | x | x | | x | | x | | | | | x | x | x | x | A |
| | F | x | x | | x | | x | | | x | | x | x | x | x | |
| Turkey Creek | P | | | | | | | | | | | | | | x | Exception |
| | F | | | | | | | | | | | | | | x | |
| Williams Creek | P | | x | | x | | | | | | | | x | | x | B |
| | F | | x | | x | | | | | | | | x | | x | |
| CENTER CREEK | | | | | | | | | | | | | | | | |
| Center Creek Zone 1 | P | x | x | | x | x | | | | | | x | x | x | x | A |
| | F | x | x | | x | x | x | x | x | | | x | x | x | x | |
| Center Creek Zone 2 | P | x | x | | x | | | | | | | x | x | x | x | A |
| | F | x | x | | x | | x | x | | | | x | x | x | x | |

Center Creek - Zone 1 - Headwaters to west boundary of S34, T28N, R31W.

Center Creek - Zone 2 - West boundary of S34, T28N, R31W, to Mouth.

V WATER QUALITY CRITERIA

General Criteria

1. All tributary streams and all municipal, industrial, agricultural, and mining effluents shall not create conditions in the stream which will adversely affect the present water uses or the future water uses as they become current.

2. The following minimum water quality conditions shall be applicable to all waters of the State including but not limited to: 1) low-flow streams which are defined as any stream with a flow of 0.1 cfs or less for an average of seven consecutive days which average flow is expected to recur at least once every 2 years; 2) any streams for which an exception to the water quality criteria has been granted due to low-flow conditions or other reasons; and 3) any other streams for which criteria have not been specifically established. The waters of the state shall be:

- a. free from substances attributable to municipal, industrial, mining, or other discharges or agricultural practices that will cause the formation of putrescent or otherwise objectionable sludge deposits.
- b. free from floating debris, oil, scum and other floating materials attributable to municipal, industrial, mining or other discharges or agricultural practices in sufficient amounts to be unsightly or deleterious.
- c. free from materials attributable to municipal, industrial, mining or other discharges or agricultural practices producing color, odor or other conditions in such degree as to create a nuisance.
- d. free from substances attributable to municipal, industrial, mining or other discharges or agricultural practices that will have a harmful effect on human, animal, or aquatic life.

3. The Missouri Clean Water Commission will require all necessary and reasonable measures to prevent the water quality of all waters of the State from being less than these minimum standards.

Specific Criteria

1. Water Quality

The following water quality criteria shall apply to all classified streams and lakes except as noted. See Section IV for classification of streams and lakes.

a. pH

The pH shall be between 6.5 and 8.5

pH values outside of this range shall not be due to effluents or surface runoff.

b. Dissolved Oxygen

The dissolved oxygen shall not be less than 5 mg/l at any time due to effluents.

The dissolved oxygen shall not be less than 6 mg/l in

1. reaches of streams designated for stocking or propagation of trout, and
2. all classified lakes. (Except for Lake Springfield and Thomas Hill Reservoir, which shall be maintained at 5 mg/l.)

c. Temperature

Effluents will not elevate or depress the temperature of the stream more than 5°F. The stream temperature shall not exceed 90°F due to effluents.

For reaches of streams designated for stocking or propagation of trout, the temperature shall not be elevated more than 2°F due to effluents. No activity of man shall cause reaches of streams used for stocking or propagation of trout to exceed 68°F.

No elevation in the temperature of lakes shall be due to effluents.

(It is recognized that Lake Springfield and Thomas Hill Reservoir were constructed especially to provide industrial cooling water, and so will have a mixing zone of heated water.)

For the Mississippi River:

The river water temperature outside the mixing zone shall not exceed the maximum limits indicated in the following table during more than one percent of the time in any calendar year. At no time shall the river water temperature outside the mixing zone exceed the listed limits by more than 3°F. Immediate reduction of thermal loading shall be initiated at any time that the temperature limits are exceeded.

The Clean Water Commission will consider granting exceptions to these limits. Environmental Protection Agency concurrence will be obtained before any exceptions are granted. The Missouri Department of Conservation will be consulted before an exception is granted.

Zone 1 - Des Moines River to Alton Lock and Dam

Zone 2 - Alton Lock and Dam to the Missouri-Arkansas State Line

| | Zone 1 | Zone 2 | | Zone 1 | Zone 2 |
|----------|----------------------|--------|-----------|--------|--------|
| Janurary | 45 (⁰ F) | 50 | July | 88 | 89 |
| February | 45 | 50 | August | 88 | 89 |
| March | 57 | 60 | September | 86 | 87 |
| April | 68 | 70 | October | 75 | 78 |
| May | 78 | 80 | November | 65 | 70 |
| June | 86 | 87 | December | 52 | 57 |

d. Substances Potentially Toxic or Detrimental

Streams and lakes shall be free from substances attributable to municipal, industrial or other discharges or agricultural practices in concentrations or combinations which are toxic or detrimental to human, animal, plant or aquatic life.

e. Bacteria

For Class "A" streams and lakes:

The fecal coliform count shall not exceed a geometric mean of 200/100 ml (either MPN or MF count) nor shall more than 10% of total samples during any 30-day period exceed 400/100 ml. These criteria will not be applicable when the stream or lake is affected by storm water runoff.

For Class "B" streams and lakes:

The fecal coliform count shall not exceed 2,000/100 ml (either NPN or MF count) except in specified mixing zones adjacent to or downstream from waste outfalls. This criterion shall not be applicable when the stream or lake is affected by storm water runoff.

f. Taste and Odor Producing Substances

Taste and odor producing substances discharged shall be limited to concentrations in the stream or lake that will not impart unpalatable flavor to food fish or in any other way make fish inedible, or result in noticeable offensive odors in the vicinity of the water, or otherwise interfere with legitimate use of the water.

For those streams and lakes listed for drinking water supply use, the taste and odor producing substances discharged shall be limited to concentrations in the stream or lake that will not interfere with the production of potable water by reasonable water treatment processes.

g. Turbidity

There shall be no turbidity of other than natural origin that will

cause substantial visible contrast with the natural appearance of the stream or lake or interfere with its legitimate uses.

h. Color

There shall be no color of other than natural origin that will cause substantial visible contrast with the natural appearance of the stream or lake or interfere with its legitimate uses.

i. Oil and Grease

The stream or lake shall be virtually free of oil and grease. There shall be no residue attributable to waste water, visible oil film, or globules of grease. Emulsified oil and grease concentrations will be kept below levels which would interfere with legitimate uses.

j. Solids

The stream or lake shall be free from substances attributable to municipal, industrial or other discharges or agricultural practices that will settle to form sludge deposits, and free from floating debris, scum and other floating materials (attributable to municipal, industrial or other discharges or agricultural practices) in amounts sufficient to be unsightly or deleterious.

The lake floor shall be free of materials which will adversely alter the composition of the bottom fauna, interfere with the spawning of fish or their eggs or adversely change the physical nature of the bottom.

k. Radioactive materials

The dissolved radium 226 and strontium 90 will not exceed 3 and 10 picocuries/liter (pc/l) respectively due to effluents or surface runoff. In the absence of strontium 90 and alpha emitters, the gross beta concentration shall not exceed 1,000 pc/l due to effluents or surface runoff.

l. Fluoride

The soluble fluoride concentration shall not exceed 1.2 mg/l due to effluents or surface runoff in streams and lakes designated as sources of potable water supply.

m. Undissociated Ammonium Hydroxide as Nitrogen

Undissociated ammonium hydroxide as nitrogen shall not exceed 0.1 mg/l in the stream or lake.

Although the best practical technology for ammonia removal is now being applied by a chemical complex located on Center Creek - Zone 2, it is recognized that the ammonia criterion of 0.1 mg/l will not always be met. For Center Creek - Zone 2, the undissociated ammonium hydroxide as N shall not exceed 0.3 mg/l in the stream.

n. Lead and Zinc

For Center Creek and Spring River:

The natural lead and zinc concentrations in southwestern Missouri and southeastern Kansas streams is significant; therefore, it will be necessary to control discharges of these metals. Insofar as possible, concentrations of lead and zinc in the stream shall not exceed 0.1 mg/l and 1 mg/l respectively.

APPENDIX E
BIOASSAY AND FISH
SURVIVAL STUDIES

BIOASSAY

Continuous flow bioassays were conducted on effluents from the Atlas Powder Company and Eagle Picher Industries, Inc. The bioassay of Atlas Powder Company discharge #001 (Station #12) was conducted from 24 January through 27 January 1974. High concentrations of potentially toxic ammonia in this discharge (Table 3) were of particular concern.

In this report the following terminology will be used for ammonia.
Total ammonia ($\text{NH}_4^+ + \text{NH}_3$) expressed as nitrogen
Un-ionized ammonia (NH_3) expressed as nitrogen.

Only the portion of total ammonia representing the un-ionized ammonia molecule is considered toxic to fish (9). The proportion of un-ionized ammonia in a given concentration of total ammonia is a function of pH and water temperature (16). For example, an increase of 0.5 pH unit (within the pH range of 6.5 to 9.0) will approximately triple the percentage of un-ionized ammonia and a 10°C temperature rise (within a 5°C to 25°C range) doubles the percentage. These two factors are additive; for example an increase in pH from 8.0 to 8.5 in conjunction with a temperature rise from 10°C to 20°C will increase un-ionized ammonia by over 500%.

The dissolved oxygen (DO) content of the water also influences ammonia toxicity to fish. A reduction of DO from 100% to 50% saturation can more than double the toxic effect of un-ionized ammonia (10).

Concentrations of total ammonia-N reported to be acutely toxic vary from 2.5 to 35 mg/l (9, 18). Un-ionized ammonia-N has been shown to be acutely toxic at concentrations of 0.29 to 0.40 mg/l (2, 9). The maximum concentrations of ammonia recommended to protect fish from chronic damages (to normal growth, maturation and reproduction) is 1.5 mg/l total ammonia-N (18) and 0.02 mg/l un-ionized ammonia-N (17, 19).

The 96-hour TL_m for Atlas discharge #001 (Station #12) was determined to be a 5.6% concentration of raw effluent containing 4.6 mg/l total ammonia-N (0.19 mg/l un-ionized ammonia-N). Survival data and water chemistry are listed in Table 25. This relatively high toxicity suggests synergism may be occurring in the effluent. Analyses for heavy metals (Table 4) revealed an average copper concentration of 0.25 mg/l in the raw effluent. This copper concentration can by itself be acutely toxic to fish (9). Synergistic effects of copper on ammonia have been demonstrated: the addition of 0.1 mg/l copper increased the acute toxicity of total ammonia by 300% (15).

The standard application factor for the protection of fish from the chronic toxic effects of ammonia is 0.05 (1/20) of the 96 hr TL_m (17, 18). For Atlas discharge #001 (at pH 8.3 and temperature 15°C) this factor would produce a maximum acceptable level of total ammonia-N of 0.23 mg/l and an un-ionized ammonia-N level of 0.009 mg/l.

It appears that two major conditions must be overcome before this effluent can realistically meet water quality standards; 1.5 mg/l total ammonia-N and 0.025 mg/l un-ionized ammonia-N.

- 1) Reduction of copper concentration discharged in the effluent to less than 0.1 mg/l to eliminate the possibility of toxicity occurring from copper alone. Also this would reduce greatly the possibility of synergy occurring with ammonia.
- 2) Lowering the pH to less than 8.0 in the effluent is imperative to reducing the toxic effect of the total ammonia-N. This condition may occur naturally when the concentration of total ammonia-N is lowered.

TABLE 25

BIOASSAY DATA ON DISCHARGE 001 (STATION 12)
 ATLAS POWDER COMPANY, JOPLIN, MISSOURI
 JANUARY 24-27, 1974^{1/}

| Parameter | % Effluent-----10 | | 5 | | 2.5 | | 1.25 | | 0.625 | | 0(Control) | |
|-------------------------------|-------------------------------|---------------------|--------------------|--------------------|--------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | A | B | A | B | A | B | A | B | A | B | A | B |
| Total ammonia-N (mg/l) | \bar{X} 7.5 (6.8-8.3) | 7.6 (6.7-8.2) | 4.1 (3.4-5.1) | 4.1 (3.7-5.1) | 2.4 (1.8-3.5) | 2.3 (1.8-2.8) | 1.4 (1.2-1.6) | 1.4 (1.1-1.7) | -- (<1-1.1) | -- (<1-1.0) | <1 | <1 |
| pH | \bar{X} 8.5 (8.2-8.5) | 8.4 (8.3-8.5) | 8.2 (8.2-8.3) | 8.2 (8.2-8.2) | 8.2 (8.2-8.2) | 8.1 (8.1-8.2) | 8.0 (7.9-8.1) | 8.1 (8.0-8.2) | 7.9 (7.6-8.1) | 8.0 (7.8-8.2) | 7.7 (7.0-8.1) | 7.8 (7.3-8.1) |
| DO (mg/l) | \bar{X} 11.2 (10.0-13.4) | 11.5 (10.6-13.4) | 10.7 (9.2-13.0) | 10.6 (9.2-13.0) | 10.2 (8.6-12.4) | 10.4 (8.8-13.0) | 9.5 (8.6-10.2) | 9.4 (8.6-10.2) | 9.0 (8.0-10.0) | 9.3 (8.3-10.2) | 9.7 (9.0-10.4) | 9.5 (8.9-10.2) |
| Temperature (°C) | \bar{X} 15 (14-17) | 14.5 (14-15) | 15 (13-18) | 14.5 (12-17) | 14.5 (12-17) | 14.5 (12-17) | 14.2 (11-17) | 14.2 (11-17) | 14.5 (11-17) | 14.5 (11-17) | 14.5 (11-17) | 14.5 (11-17) |
| Conductivity (mhos/cm) | \bar{X} 495 (440-520) | 470 (440-520) | 410 (400-420) | 402 (380-420) | 365 (320-400) | 365 (320-400) | 325 (290-360) | 332 (310-360) | 327 (300-360) | 320 (300-330) | 335 (320-360) | 330 (320-350) |
| Fish survival time (in hours) | | | | | | | | | | | | |
| 24 | 0 | 0 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 48 | 0 | 0 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 72 | 0 | 0 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 96 | 0 | 0 | 3 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

^{1/}Duplicates (A & B) 5 young-of-the-year channel catfish in each container.

The bioassay of the Eagle Picher Couples plant (001 discharge) was conducted from 28 January through 1 February 1974. Survival data and water chemistry are listed in Table 26. This effluent contained a mixture of heavy metals (Table 7) which included cadmium, chromium, copper, lead, zinc and mercury, as well as aluminum. The highest average concentrations were for zinc, aluminum and copper (9.7 mg/l, 3.1 mg/l, 0.2 mg/l respectively).

Zinc has been found acutely toxic to fish in concentrations ranging from 1.9 mg/l to 12.9 mg/l. (2,5,9) The toxicity of zinc is a function of water hardness (9), being more toxic in softer waters. Aluminum is acutely toxic to fish at 5.2 mg/l and has been shown to increase in toxicity at higher pH levels (8.5 to 9.0)(6). Acute copper toxicity occurs with concentrations as low as 0.2 mg/l (8).

Of greater importance than the individual toxic levels of these metals is that recent work shows that combinations of these metals produce a toxicity-increasing interaction which is greater than directly additive (i.e., it took less of them in combination to reach a lethal threshold concentration than would be expected on the basis of their individual toxic levels) (5). In particular, the toxicity of zinc was shown to double (from 5.0 mg/l to 21 mg/l) when in combination with small amounts of copper and cadmium (0.145 and 0.300 mg/l, respectively) (5).

The 96-hour TL_m for the Eagle Picher discharge #001 was calculated to be a 18.75% concentration of effluent containing Zn, Al, and Cu in concentrations of 2.6 mg/l, 0.58 mg/l and 0.04 mg/l respectively. There was synergy occurring and designation of any single metal as the sole toxic component was not possible. However, it is very probable that the Zn and Al components were responsible for the major portion

TABLE 26

BIOASSAY DATA ON DISCHARGE 001
EAGLE PICHER INDUSTRIES, INC., JOPLIN, MISSOURI
JANUARY 29 - FEBRUARY 1, 1974¹/₁

| X Effluent-----100 | | 50 | | 25 | | 12.5 | | 6.25 | | 0(Control) | | | |
|-------------------------------|-----------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Parameter | | A | B | A | B | A | B | A | B | A | B | | |
| Zinc (mg/l) | \bar{X} | 9.7 | | 5.6 | | 3.0 | | 1.9 | | 1.4 | 0.8 | | |
| pH | \bar{X} | 8.4 (8.0-9.0) | 8.4 (8.0-8.9) | 8.1 (8.0-8.5) | 8.1 (8.0-8.5) | 7.8 (7.7-7.9) | 7.9 (7.8-8.0) | 7.6 (7.6-7.7) | 7.7 (7.6-7.7) | 7.4 (7.2-7.5) | 7.5 (7.3-7.6) | 7.2 (7.0-7.3) | 7.3 (7.2-7.5) |
| DO (mg/l) | \bar{X} | 10.3 (9.8-10.4) | 10.4 (10.0-10.6) | 10.1 (9.6-10.9) | 10.4 (10.2-10.8) | 10.0 (9.4-10.6) | 10.3 (9.8-10.6) | 10.4 (10.2-10.8) | 10.5 (10.2-10.8) | 10.2 (9.8-10.2) | 10.6 (10.2-10.9) | 10.4 (10.2-11.0) | 10.4 (10.2-10.8) |
| Temperature (°C) | \bar{X} | 12.6 (12.0-13.0) | 13.0 (12.0-14.0) | 12.5 (12.0-14.0) | 12.5 (12.0-14.0) | 12.2 (12.0-13.0) | 12.2 (12.0-13.0) | 11.9 (11.0-13.0) | 11.9 (11.0-13.0) | 11.9 (11.0-13.0) | 11.9 (11.0-13.0) | 12.7 (12.0-14.0) | 12.0 (11.0-13.0) |
| Conductivity (umhos/cm) | \bar{X} | 540 (440-590) | 538 (460-600) | 492 (440-520) | 488 (460-500) | 474 (430-500) | 472 (440-500) | 448 (400-480) | 431 (400-450) | 435 (390-460) | 426 (380-450) | 430 (380-460) | 426 (380-450) |
| Fish survival time (in hours) | | | | | | | | | | | | | |
| 24 | | 0 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 48 | | 0 | 0 | 0 | 0 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 72 | | 0 | 0 | 0 | 0 | 3 | 0 | 5 | 5 | 5 | 5 | 5 | 5 |
| 96 | | 0 | 0 | 0 | 0 | 3 | 0 | 5 | 5 | 5 | 5 | 5 | 5 |

¹/Duplicates (A & B) 5 young-of-the-year channel catfish in each container

of the toxicity, with copper synergism occurring. Both aluminum and zinc exert toxic action on fish at the gill filaments; aluminum by causing extreme gill hyperplasia (6) and zinc by forming insoluble compounds with the mucous covering the gills.

The recommended application factor for zinc concentrations producing no long term harmful effects to fish is $1/40$ of the TL_m (13). This factor would yield a safe chronic level of zinc for this effluent of 0.065 mg/l. ($0.025 \times TL_m$ 2.6 mg/l) This level is a lower zinc concentration than believed to be chronically harmful to fish (5). A zinc concentration of 0.20 mg/l would be a safe chronic level for this effluent providing the synergistic effect of the other associated metals is eliminated. To assure this aluminum and copper should not exceed 0.1 mg/l; cadmium, chromium, and lead concentrations should not exceed 0.05 mg/l; and mercury levels should remain below 20 μ g/l.

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FISH SURVIVAL STUDIES

Young-of-the-year channel catfish (10 per cage) were exposed in situ at 14 sites in the following streams: an unnamed tributary to Grove Creek; Grove; Center; Lone Elm; Turkey; and Short creeks. Center, Turkey and Short creeks are all tributaries to Spring River.

All caged fish survived at the following sites in Center Creek and its tributaries: an unnamed tributary to Grove Creek (upstream of Atlas Powder Company); Grove Creek (downstream from Atlas Powder Company); Center Creek (upstream of Grove Creek); and Center Creek (downstream from Grove Creek) (Figure 8)

Upstream of Eagle Picher, Inc., in Lone Elm Creek (a tributary to Turkey Creek), all caged fish died within 48 hours (Figure 9). Analysis of Lone Elm Creek water at this location revealed that zinc concentrations ranged from 5.9 to 8.4 mg/l and averaged 7.0 mg/l during fish exposure. In this period, pH values ranged from 6.3 to 6.7 and averaged 6.5. Mount (1966) found the 96 hr TLm of zinc to fathead minnows to be 6.4 mg/l. At pH 8.6, zinc concentrations of 0.25 mg/l have been found to inhibit spawning and kill newly hatched bluegill fry (Cairns and Sparks, 1971). Downstream from Eagle Picher, Inc., in Lone Elm Creek, all caged channel catfish survived.

Similarly all fish exposed in Turkey Creek (RM 5.91 or Km 9.50) upstream of Lone Elm Creek Wastewater Treatment Plant survived. However, in Turkey Creek downstream from Lone Elm Creek Wastewater Plant (RM 5.9 or Km 9.49), all fish died within 48 hours of exposure. At the exposure site downstream from Lone Elm Creek (RM 5.0 or Km 8.05), 60% of the fish were dead after six days (Figure 9).

Mortality at the latter two sites was probably caused by residual chlorine discharged from the Lone Elm Creek Wastewater

Treatment Plant. Wastewaters containing residual chlorine ranging from 0.10 to 30 mg/l contributed 0.04 to 0.10 mg/l residual chlorine in Turkey Creek. The 96 hr TL_{50} for black bullheads and fathead minnows is 0.099 mg/l and between 0.05 and 0.16 mg/l residual chlorine, respectively (Brungs, 1973). Arthur (1971) considered 0.0165 mg/l residual chlorine as the safe concentration for fathead minnows. Tsai (1971) observed a 50% reduction in fish species diversity in a residual chlorine concentration of 0.01 mg/l downstream from a sewage outfall.

In Short Creek, all fish survived upstream of Farmers Chemical. However, all caged channel catfish in Short Creek downstream from Farmers Chemical died within 24 hours (Figure 10). At this location zinc concentrations ranged from 3.4 to 6.1 mg/l and pH ranged from 6.0 to 8.3. The zinc concentration of 6.1 mg/l occurred at the time the pH was 8.3. This combination was similar to that found by Mount (1966) to be lethal to fathead minnows. The highest zinc concentration found in Short Creek was near its mouth, where 32 mg/l was observed to be lethal to all caged fish. This site was located downstream of discharges from mine tailings and Eagle Picher, Inc., plant at Galena, Kansas.

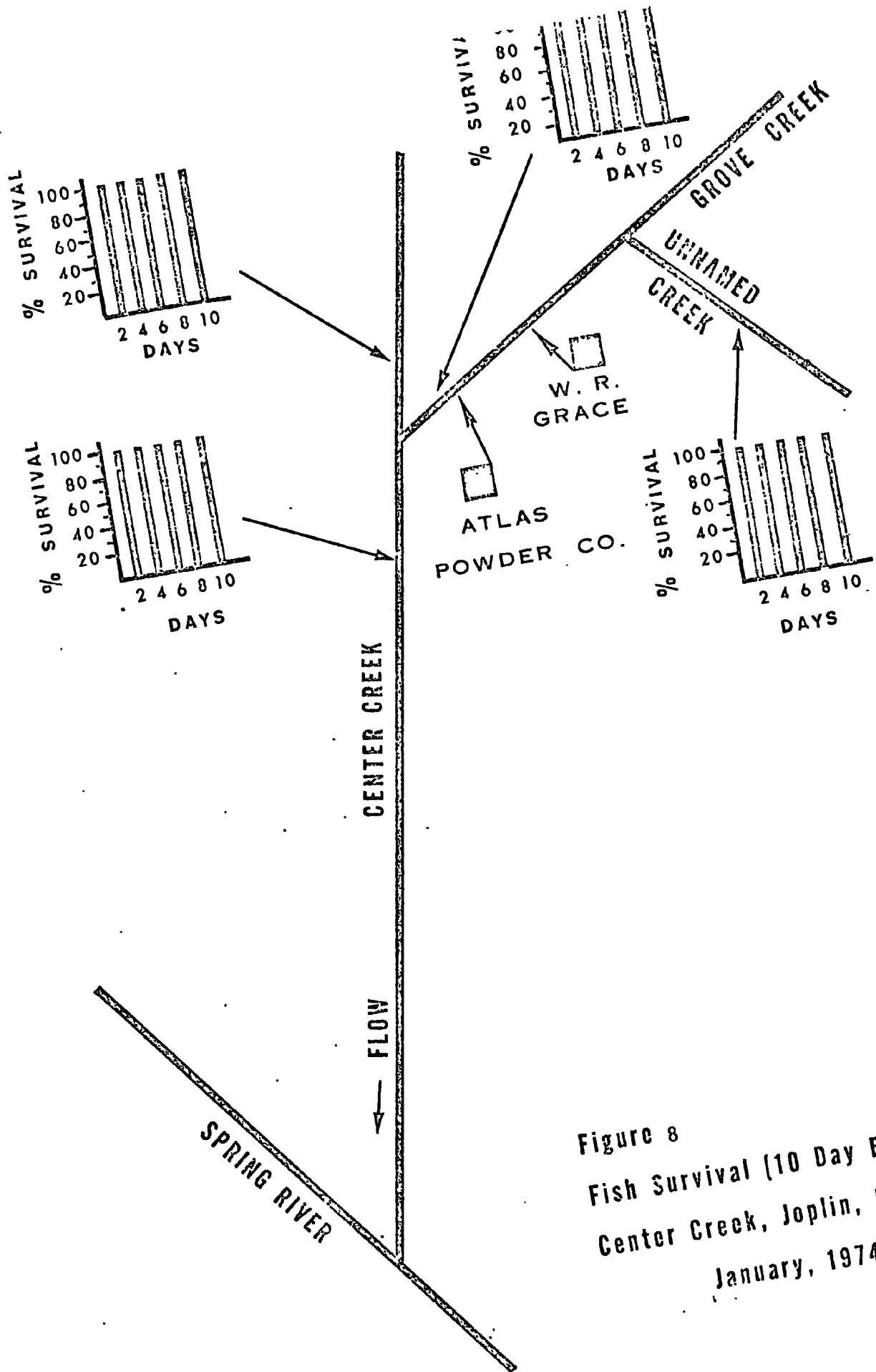


Figure 8
Fish Survival (10 Day Exposure)
Center Creek, Joplin, Missouri
January, 1974

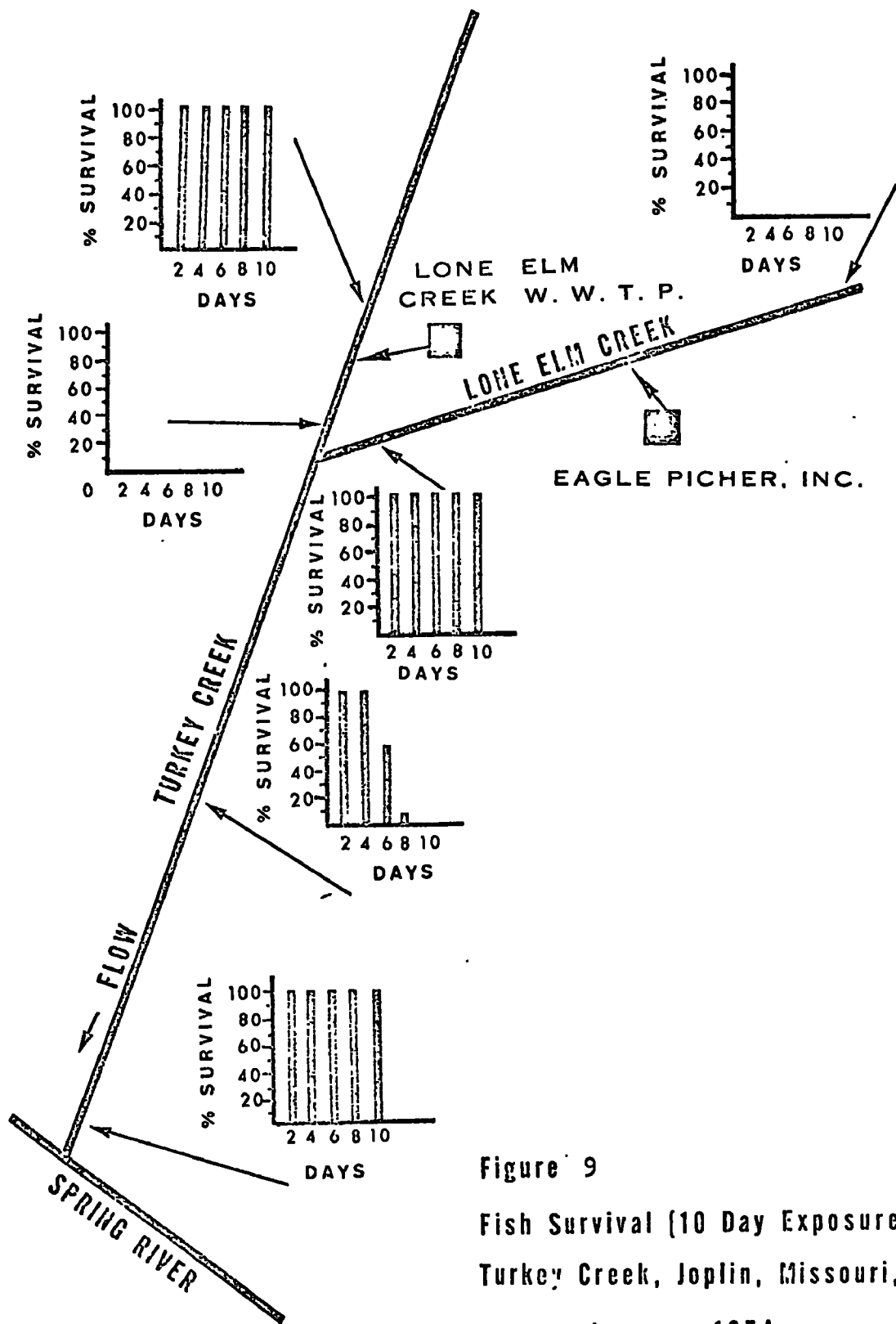


Figure 9

Fish Survival (10 Day Exposure)

Turkey Creek, Joplin, Missouri,

January, 1974

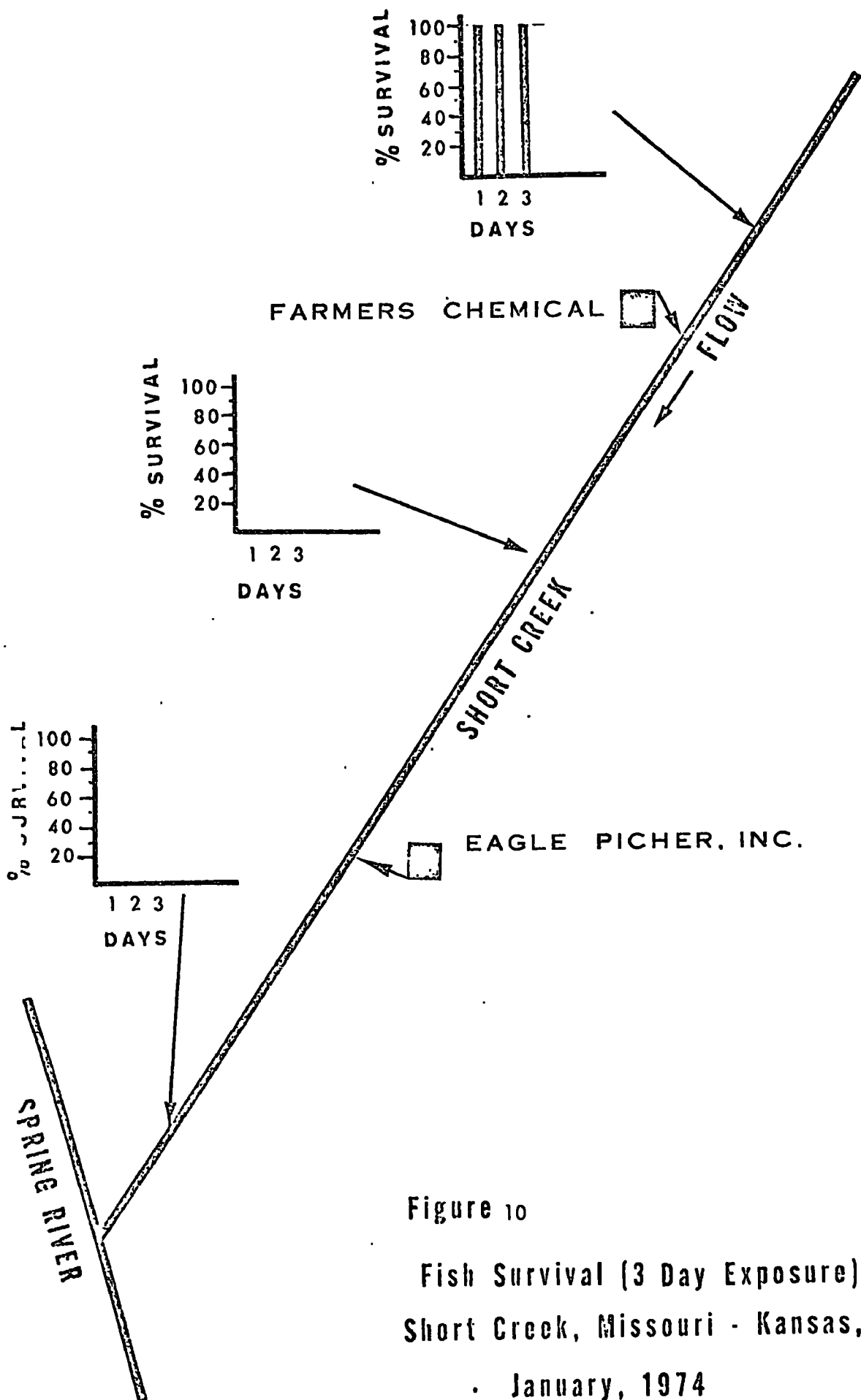


Figure 10

Fish Survival (3 Day Exposure)
Short Creek, Missouri - Kansas,
January, 1974

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APPENDIX F

PERMITS PREPARED BY NFIC-D

**AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM**

In compliance with the provisions of the Federal Water Pollution Control Act, as amended,
(33 U.S.C. 1251 et. seq; the "Act"),

ATLAS POWDER COMPANY (SUBSIDIARY OF TYLER CORPORATION)

is authorized to discharge from a facility located at **ATLAS, JASPER COUNTY, MISSOURI**

to receiving waters named **GROVE CREEK**

in accordance with effluent limitations, monitoring requirements and other conditions set forth
in Parts I, II, and III hereof.

This permit shall become effective on date of issuance.

This permit and the authorization to discharge shall expire at midnight, five years from
date of issuance.

Signed this day of

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning date of issuance and lasting through September 30, 1975, the permittee is authorized to discharge from outfall(s) serial number(s) 001 (urea, ammonium nitrate and ammonia production).

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|--------------------------------|-----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Continuous | N/A |
| Ammonia (as N) | N/A | N/A | 750 | 950 | Weekly | 24 hr composite |
| Organic Nitrogen (as N) | N/A | N/A | 420 | 750 | Weekly | 24 hr composite |
| Nitrate (as N) | N/A | N/A | 390 | 600 | Weekly | 24 hr composite |
| Copper | N/A | N/A | 0.9 | 1.8 | Weekly | 24 hr composite |

The pH shall not be less than 6.0 standard units nor greater than 10.0 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 001 discharge from the existing wastewater treatment facilities.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning October 1, 1975 and lasting through June 30, 1977, the permittee is authorized to discharge from outfall(s) serial number(s) 001 (urea, ammonium nitrate and ammonia production).

Such discharges shall be limited and monitored by the permittee as specified below:

| Effluent Characteristic | Discharge Limitations | | | | Monitoring Requirements | |
|--------------------------------|--|-------------|-----------------------|------------|--------------------------|-----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units.(Specify) | | Measurement Frequency | Sample Type |
| | Daily Max. | 30-Day Avg. | mg/1 | | | |
| | | | Daily Avg. | Daily Max. | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Continuous | N/A |
| Ammonia (as N) | N/A | N/A | 750 | 950 | Weekly | 24 hr composite |
| Organic Nitrogen (as N) | N/A | N/A | 420 | 750 | Weekly | 24 hr composite |
| Nitrate (as N) | N/A | N/A | 390 | 600 | Weekly | 24 hr composite |
| Copper | There shall be no discharge of copper from the copper ammonium acetate system. | | | | Monthly | 24 hr composite |

The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 001 discharge from the existing wastewater treatment facilities.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 001 (ammonia production).

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|--------------------------------|-----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units.(Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Continuous | N/A |
| Ammonia (as N) | 0.125(0.125) | 0.0625(0.0625) | N/A | N/A | Weekly | 24 hr composite |
| Copper | There shall be no discharge of copper from the copper ammonium acetate system. | | | | Monthly | 24 hr composite |

The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 001 downstream from all waste source inputs before discharge into Grove Creek.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 001 (urea production).

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|--------------------------------|-----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| | | | mg/1 | | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Continuous | N/A |
| Ammonia (as N) | 0.1 (0.1) | 0.05 (0.05) | N/A | N/A | Weekly | 24 hr composite |
| Organic Nitrogen (as N) | 0.25(0.25) | 0.125(0.125) | N/A | N/A | Weekly | 24 hr composite |

The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 001 downstream from all waste source inputs before discharge into Grove Creek.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 001 (ammonium nitrate production).

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|----------------------------------|------------------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units.(Specify) | | <u>Measurement Frequency</u> | <u>Sample Type</u> |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| | | | mg/l | | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Continuous | N/A |
| Ammonia (as N) | 0.2 (0.2) | 0.1 (0.1) | N/A | N/A | Weekly | 24 hr composite |
| Nitrate (as N) | 0.22(0.22) | 0.11(0.11) | N/A | N/A | Weekly | 24 hr composite |

The pH shall not be less than 6.0 standard units nor greater than 8.5 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 001 downstream from all waste source inputs before discharge into Grove Creek.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule: 001

- | | |
|--|--|
| a) Report on design of waste disposal and treatment equipment. Also includes methods to be employed to eliminate copper and reduce the pH. | December 31, 1974 |
| b) Report on procurement status and installation of waste disposal and treatment equipment. Achieve copper and pH effluent limitation. | October 1, 1975 |
| c) Progress reports on installation of waste disposal and treatment equipment. | March 31, 1976 October 31, 1976 March 31, 1977 |
| d) Achieve effluent limitations for all wastewater discharges. | July 1, 1977 |

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning date of issuance and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 002.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|---|-------------------|--------------------------------|-----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement | Sample |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | <u>Frequency</u> | <u>Type</u> |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Continuous | N/A |
| Ammonia (as N) | N/A | N/A | 2 | 10 | Weekly | 24 hr composite |
| Ammonia (as N)* | N/A | N/A | 20 | 40 | Weekly | 24 hr composite |
| Temperature | N/A | N/A | Shall not change the receiving stream temperature by more than 5°F (2.8°C) and shall not be greater than 90°F (32°C). | | Weekly | Grab |

Note: The discharge shall consist of non-contact cooling water and miscellaneous surface drainage.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 002 prior to entering Grove Creek.

*Limits apply only when mine water is used for cooling. Permittee shall notify the Compliance Branch per subsection C-2 at least 2 days prior to such use.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning date of issuance and lasting through September 30, 1976, the permittee is authorized to discharge from outfall(s) serial number(s) 003 and 004 (nitric acid, ammonium nitrate and nitroglycerin production)

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|----------------------------------|-------------|--|------------|--------------------------------|-----------------|
| | Kg/KKg of Product Produced | | Other Units. (Specify) | | Measurement Frequency | Sample Type |
| | (lb/1000 lb of product produced) | | | | | |
| | Daily Max. | 30-Day Avg. | mg/l | | | |
| | | | Daily Avg. | Daily Max. | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Continuous | N/A |
| Ammonia (as N) | N/A | N/A | 38 | 48 | Weekly | 24 hr composite |
| Nitrate (as N) | N/A | N/A | 100 | 200 | Weekly | 24 hr composite |
| Nitroglycerin | N/A | N/A | Must not exceed nitroglycerin and ethylene glycol dinitrate saturation curves up to 80°F and based on 12 gpm to be analyzed by the infra-red spectrophotometer method. | | Weekly | Grab |
| Ethylene glycol dinitrate | N/A | N/A | | | Weekly | Grab |

The pH shall not be less than 3.0 standard units nor greater than 9.0 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Flow, ammonia and nitrate to be taken upstream of the sluice gate. Nitroglycerin and ethylene glycol dinitrate to be taken from the nitroglycerin storehouse discharge.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning October 1, 1976 and lasting through June 30, 1977*, the permittee is authorized to discharge from outfall(s) serial number(s) 003 and 004 (nitric acid, ammonium nitrate and nitroglycerin production). Such discharges shall be limited and monitored by the permittee as specified below:

| Effluent Characteristic | Discharge Limitations | | | | Monitoring Requirements | |
|--------------------------------|--|-------------|---|------------|--------------------------|-----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units. (Specify) | | Measurement Frequency | Sample Type |
| | Daily Max. | 30-Day Avg. | Daily Avg. | Daily Max. | | |
| | | | mg/l | | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Continuous | N/A |
| Ammonia (as N) | N/A | N/A | 38 | 48 | Weekly | 24 hr composite |
| Nitrate (as N) | N/A | N/A | 68 | 150 | Weekly | 24 hr composite |
| Nitroglycerin | N/A | N/A | Must not exceed nitroglycerin and ethylene glycol dinitrate saturation curves up to 80°F and based on 12 gpm to be analyzed by the infrared spectrophotometer method. | | Weekly | Grab |
| Ethylene glycol dinitrate | N/A | N/A | | | Weekly | Grab |

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): Flow, ammonia and nitrate to be taken upstream of the sluice gate. Nitroglycerin and ethylene glycol dinitrate to be taken from the nitroglycerin storehouse discharge.

*This date may be changed for nitroglycerin and ethylene glycol dinitrate as data becomes available from aquatic bioassay and treatability studies.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 003 and 004 (nitric acid production).

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|---|-------------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (lb/1000 lb of product produced) | | Other Units. (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Continuous | N/A |
| Temperature | N/A | N/A | mg/l Shall not change the stream temperature by more than 5°F (2.8°C) and shall not be greater than 90°F (32°F). | | Weekly | Grab |

There shall be no discharge of process wastewater pollutants.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored continuously.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 003 upstream of the sluice gate.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 003 and 004 (ammonium nitrate production).

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|--------------------------------|-----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units.(Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Continuous | N/A |
| Ammonia (as N) | 0.2 (0.2) | 0.1 (0.1) | N/A | N/A | Weekly | 24 hr composite |
| Nitrate (as N) | 0.22(0.22) | 0.11(0.11) | N/A | N/A | Weekly | 24 hr composite |

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored continuously.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 003 upstream of sluice gate.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 003 (nitroglycerin production).

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units.(Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |

Discharge limitations on nitroglycerin and ethylene glycol dinitrate will be assigned when aquatic bioassay data are available and treatment methods developed for these compounds. The company shall continue to monitor these compounds as specified on page 10.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): discharge from nitroglycerin storehouse.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule: 003, 004

- a) Report on design of waste disposal and treatment equipment. December 31, 1974
- b) Report on procurement status and installation of waste disposal and treatment equipment. October 1, 1975
- c) Progress reports on installation of waste disposal and treatment equipment. March 31, 1976
- d) Progress reports on installation of waste disposal and treatment equipment. Achieve pH effluent limitations. October 1, 1976
- e) Progress reports on installation of waste disposal and treatment equipment. March 1, 1977
- f) Achieve final effluent limitations for all waste-water discharges. July 1, 1977

Note: Progress reports on aquatic bioassay and treatability studies for nitroglycerin and ethylene glycol dinitrate compounds also required on each of the above dates.

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning date of issuance and lasting through June 30, 1977*, the permittee is authorized to discharge from outfall(s) serial number(s) 005.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|-------------|---|------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | Daily Max. | 30-Day Avg. | mg/l Daily Avg. | Daily Max. | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Weekly | Estimate |
| Nitroglycerin | N/A | N/A | Must not exceed nitroglycerin and ethylene glycol dinitrate saturation curves up to 80°F and based on 12 gpm to be analyzed by the infrared spectrophotometer method. | | Weekly | Grab |
| Ethylene glycol dinitrate | N/A | N/A | | | Weekly | Grab |

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 005.

*This date may be changed for nitroglycerin and ethylene glycol dinitrate as data becomes available from aquatic bioassay and treatability studies.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 005.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|--------------------------------|-------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units.(Specify) | | Measurement | Sample |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | <u>Frequency</u> | <u>Type</u> |

Discharge limitations on nitroglycerin and ethylene glycol dinitrate will be assigned when aquatic bioassay data are available and treatment methods developed for these compounds. The company shall continue to monitor these compounds as specified on page 15.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 005.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule: 005

- | | |
|--|--------------------------------------|
| a) Progress report on toxicity of nitroglycerin and ethylene glycol dinitrate and treatability studies. | December 31, 1974 October 1, 1975 |
| b) Treatment methods available and effluent levels attainable for each method. Recommended treatment to be employed. | March 31, 1976 |
| c) Progress report on installation (if approved) of waste treatment equipment. | October 31, 1976 March 31, 1977 |
| d) Achieve effluent limitations for all wastewater discharges. | July 1, 1977 |

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

C. MONITORING AND REPORTING

1. *Representative Sampling*

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. *Reporting*

Monitoring results obtained during the previous 3 months shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on . Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

U.S. Environmental Protection Agency

ATTN: Compliance Branch

1735 Baltimore, Room 249

Kansas City, Missouri 64108

Telephone: 816-374-2576

Missouri Clean Water Commission

P.O. Box 154

Jefferson City, Missouri 65101

Telephone: 314-751-3241

3. *Definitions*

- a. The "daily average" discharge means the total discharge by weight during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by this permit, the daily average discharge shall be determined by the summation of all the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made.
- b. The "daily maximum" discharge means the total discharge by weight during any calendar day.

4. *Test Procedures*

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Act, under which such procedures may be required.

5. *Recording of Results*

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

- a. The exact place, date, and time of sampling;
- b. The dates the analyses were performed;
- c. The person(s) who performed the analyses;

d. The analytical techniques or methods used; and

e. The results of all required analyses.

6. *Additional Monitoring by Permittee*

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

7. *Records Retention*

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the State water pollution control agency.

A. MANAGEMENT REQUIREMENTS**1. *Change in Discharge***

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. *Noncompliance Notification*

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Regional Administrator and the State with the following information, in writing, within five (5) days of becoming aware of such condition:

- a. A description of the discharge and cause of noncompliance; and
- b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

3. *Facilities Operation*

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. *Adverse Impact*

The permittee shall take all reasonable steps to minimize any adverse impact to navigable waters resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. *Bypassing*

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) where unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. The permittee shall promptly notify the Regional Administrator and the State in writing of each such diversion or bypass.

6. *Removed Substances*

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

7. *Power Failures*

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

- a. In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the wastewater control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I,

- b. Halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

B. RESPONSIBILITIES

1. *Right of Entry*

The permittee shall allow the head of the State water pollution control agency, the Regional Administrator, and/or their authorized representatives, upon the presentation of credentials:

- a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and
- b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. *Transfer of Ownership or Control*

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator and the State water pollution control agency.

3. *Availability of Reports*

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public

inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

4. *Permit Modification*

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

- a. Violation of any terms or conditions of this permit;
- b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
- c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. *Toxic Pollutants*

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. *Civil and Criminal Liability*

Except as provided in permit conditions on "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. *Oil and Hazardous Substance Liability*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. *State Laws*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. *Property Rights*

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. *Severability*

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

PART III

OTHER REQUIREMENTS

The permittee shall submit with his monitoring report as indicated in Part 1, C-2, records indicating the daily production figures during the reporting period.

Aquatic bioassay studies shall be conducted, using Fathead minnows (Pimephales promelas Rafinesque), by the permittee on discharge 003 (nitroglycerin storehouse discharge) or 005 to determine the 96 hour TL_m . Center Creek water, upstream of Grove Creek, will be used for dilution water. Information reported shall include, but not be limited to, (a) percent of effluent used to obtain the 96 hour TL_m , (b) concentration of nitroglycerin and ethylene glycol dinitrate in the effluent, and (c) pH, temp, hardness, DO and heavy metals (Cd, Cr, Cu, Pb, Zn) of the effluent and receiving water. In addition, the permittee shall also conduct aquatic bioassay studies on nitroglycerin and ethylene glycol dinitrate independently of each other. Within 90 days of issuance the permittee shall submit for approval, the procedure(s) to be used to accomplish these studies.

The permittee shall continue to conduct pilot plant tests on discharge 003 (nitroglycerin storehouse discharge) or 005 to determine a suitable treatment to reduce the concentrations of nitroglycerin and ethylene glycol dinitrate to levels such that the 96 hour mortality rate in the undiluted effluent is no greater than in Center Creek upstream of Grove Creek.

Composite Sample - A sample consisting of a minimum of twelve grab samples collected at regular intervals over a normal operating day and combined proportional to flow, or a sample continuously collected proportional to flow.

Grab Sample - An individual sample collected in a period of less than 15 minutes.

Definition of Production Day to Meet Monitoring Requirements -
Samples shall be collected on days when the plant is operating at average or greater production capacities (as reported in the permit application).

**AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM**

In compliance with the provisions of the Federal Water Pollution Control Act, as amended,
(33 U.S.C. 1251 et. seq; the "Act"),

W. R. GRACE AND COMPANY

is authorized to discharge from a facility located at

**LATITUDE: 37 degrees; 05 minutes; 44 seconds
LONGITUDE: 94 degrees; 29 minutes; 40 seconds
JOPLIN, JASPER COUNTY, MISSOURI**

to receiving waters named **Grove Creek**

in accordance with effluent limitations, monitoring requirements and other conditions set forth
in Parts I, II, and III hereof.

This permit shall become effective on date of issuance

This permit and the authorization to discharge shall expire at midnight, 5 years from date
of issuance.

Signed this day of

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on the effective date and lasting through September 30, 1974, the permittee is authorized to discharge from outfall(s) serial number(s) 001, 002.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|---|-------------------|----------------------------------|------------------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | <u>Measurement Frequency</u> | <u>Sample Type</u> |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | mg/l <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Phosphate (as P) | N/A | N/A | Concentrations shall not exceed current operating levels. | | Monthly | 24 hr Composite |
| Ammonia (as N) | N/A | N/A | | | Monthly | 24 hr Composite |

The pH shall not be less than 2.0 standard units nor greater than 9.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 001 and 002.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule: 001, 002.

Achieve zero discharge of
wastewater pollutants

October 1, 1974

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 003.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|--|-------------------|--------------------------------|-----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units.(Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow | N/A | N/A | N/A | N/A | Continuous | N/A |
| Sulfates | N/A | N/A | N/A | N/A | Weekly* | 24 hr Composite |
| Temperature | N/A | N/A | mg/l Shall not change the receiving stream temperature by more than 5°F (2.8°C) and shall not be greater than 90°F (32°C) | | | |

There shall be no discharge of process wastewater pollutants.

Note: The discharge is intermittent. Permittee shall monitor and report amount of wastewater and period of time discharged. Samples shall be collected as specified in Part III.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored continuously when discharge occurs.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 003 when discharge occurs.

*Influent and effluent shall be monitored.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule: 003

a. Report of progress:

December 31, 1974
September 30, 1975
June 30, 1976
March 31, 1977

b. Achieve final effluent limitations for wastewater discharge.

July 1, 1977

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

C. MONITORING AND REPORTING

1. *Representative Sampling*

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. *Reporting*

Monitoring results obtained during the previous 3 months shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on . Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

U.S. Environmental Protection Agency

ATTN: Compliance Branch

1735 Baltimore, Room 249

Kansas City, Missouri 64108

Telephone: 816-374-2576

Missouri Clean Water Commission

P.O. Box 154

Jefferson City, Missouri 65101

Telephone: 314-751-3241

3. *Definitions*

- a. The "daily average" discharge means the total discharge by weight during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by this permit, the daily average discharge shall be determined by the summation of all the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made.
- b. The "daily maximum" discharge means the total discharge by weight during any calendar day.

4. *Test Procedures*

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Act, under which such procedures may be required.

5. *Recording of Results*

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

- a. The exact place, date, and time of sampling;
- b. The dates the analyses were performed;
- c. The person(s) who performed the analyses;

- d. The analytical techniques or methods used; and
- e. The results of all required analyses.

6. *Additional Monitoring by Permittee*

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

7. *Records Retention*

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the State water pollution control agency.

A. MANAGEMENT REQUIREMENTS

1. *Change in Discharge*

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. *Noncompliance Notification*

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Regional Administrator and the State with the following information, in writing, within five (5) days of becoming aware of such condition:

- a. A description of the discharge and cause of noncompliance; and
- b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

3. *Facilities Operation*

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. *Adverse Impact*

The permittee shall take all reasonable steps to minimize any adverse impact to navigable waters resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. *Bypassing*

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) where unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. The permittee shall promptly notify the Regional Administrator and the State in writing of each such diversion or bypass.

6. *Removed Substances*

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

7. *Power Failures*

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

- a. In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the wastewater control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I,

- b. Halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

B. RESPONSIBILITIES

1. *Right of Entry*

The permittee shall allow the head of the State water pollution control agency, the Regional Administrator, and/or their authorized representatives, upon the presentation of credentials:

- a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and
- b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. *Transfer of Ownership or Control*

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator and the State water pollution control agency.

3. *Availability of Reports*

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public

inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

4. *Permit Modification*

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

- a. Violation of any terms or conditions of this permit;
- b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
- c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. *Toxic Pollutants*

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. *Civil and Criminal Liability*

Except as provided in permit conditions on "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. *Oil and Hazardous Substance Liability*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. *State Laws*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. *Property Rights*

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. *Severability*

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

PART III

OTHER REQUIREMENTS

Within six months from date of permit issuance, a program including a time schedule for implementation be developed for, but not limited to, grading and sealing the surface of the gypsum pile to prevent infiltration. Such a program shall be submitted to the State of Missouri and the Environmental Protection Agency for review and comment.

Definitions

Daily Average Concentration - The daily average concentration is the concentration in a composite sample.

Maximum Concentration - The maximum concentration is the concentration in any single grab sample.

Composite Sample - A sample consisting of a minimum of eight grab samples collected at regular intervals over a normal operating day and combined proportional to flow, or a sample continuously collected proportional to flow.

Definition of Production Day to Meet Monitoring Requirements - Samples shall be collected on days when the plant is operating at average or greater production capacities (as reported in the permit application).

**AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM**

In compliance with the provisions of the Federal Water Pollution Control Act, as amended,
(33 U.S.C. 1251 et. seq; the "Act"),

HERCULES INCORPORATED

is authorized to discharge from a facility located near Carthage, Jasper County, Missouri,

to receiving waters named Center Creek

in accordance with effluent limitations, monitoring requirements and other conditions set forth
in Parts I, II, and III hereof.

This permit shall become effective on date of issuance.

This permit and the authorization to discharge shall expire at midnight, five years from
date of issuance.

Signed this day of

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning date of issuance and lasting through September 30, 1975, the permittee is authorized to discharge from outfall(s) serial number(s) 001.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|----------------------------------|------------------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | <u>Measurement Frequency</u> | <u>Sample Type</u> |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Monthly | Estimate |
| Total Suspended Solids | N/A | N/A | 20 | 30 | Monthly | Grab |
| Sulfates | N/A | N/A | 225 | 300 | Monthly | Grab |

The pH shall not be less than 4.0 standard units nor greater than 9.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 001.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning September 30, 1975 and lasting through June 30, 1977, the permittee is authorized to discharge from outfall(s) serial number(s) 001.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Monthly | Estimate |
| Total Suspended Solids | N/A | N/A | 20 | 30 | Monthly | Grab |
| Sulfates | N/A | N/A | 225 | 300 | Monthly | Grab |

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored continuously.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 001.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 001.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|--|-------------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day | N/A | N/A | N/A | N/A | Monthly | Estimate |
| Total Suspended Solids | N/A | N/A | 20 | 30 | Monthly | Grab |
| Temperature | N/A | N/A | mg/l Shall not exceed the stream temperature by more than 5°F (2.8°C) and shall not be greater than 90°F (32°F). | | Monthly | Grab |

There shall be no discharge of process wastewater pollutants.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored continuously.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 001.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule: 001

- | | |
|---|---|
| a) Report on design of waste disposal and treatment equipment. Also include method(s) to be employed to adjust the pH. | December 31, 1974. |
| b) Report on procurement status and installation of waste disposal and treatment equipment. Achieve pH effluent limitation. | October 1, 1975 |
| c) Progress reports on installation of waste disposal and treatment equipment. | March 31, 1976. October 31, 1976 March 31, 1977 |
| d) Achieve effluent limitations for all wastewater discharges. | July 1, 1977 |

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning date of issuance and lasting through September 30, 1975, the permittee is authorized to discharge from outfall(s) serial number(s) 002.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|----------------------------------|------------------------|
| | Kg/KKg of Product Produced (lb/1000 lb of product produced) | | Other Units (Specify) | | <u>Measurement Frequency</u> | <u>Sample Type</u> |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Monthly | Estimate |
| Total Suspended Solids | N/A | N/A | 90 | 150 | Monthly | Grab |

The pH shall not be less than 3.0 standard units nor greater than 9.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 002.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning October 1, 1975 and lasting through June 30, 1977, the permittee is authorized to discharge from outfall(s) serial number(s) 002.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|----------------------------------|--------------------|-----------------------|-------------------|--------------------------------|--------------------|
| | Kg/KKg of Product Produced | | Other Units (Specify) | | <u>Measurement Frequency</u> | <u>Sample Type</u> |
| | (1b/1000 lb of product produced) | | mg/l | | | |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (GMD) | N/A | N/A | N/A | N/A | Monthly | Estimate |
| Total Suspended Solids | N/A | N/A | 90 | 150 | Monthly | Grab |

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 002.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 002.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|----------------------------------|------------------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | <u>Measurement Frequency</u> | <u>Sample Type</u> |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Monthly | Estimate |
| Total Suspended Solids | N/A | N/A | 20 | 30 | Monthly | Grab |

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 002.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule: 002

- | | |
|---|---|
| a) Report on design of waste disposal and treatment equipment. Also include method(s) to be employed to adjust the pH. | December 31, 1974. |
| b. Report on procurement status and installation of waste disposal and treatment equipment. Achieve pH effluent limitation. | October 1, 1975 |
| c) Progress reports on installation of waste disposal and treatment equipment. | March 31, 1976. October 31, 1976 March 31, 1977 |
| d) Achieve effluent limitations for all wastewater discharges. | July 1, 1977 |

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning date of issuance and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 003.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (lb/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |

THERE SHALL BE ZERO DISCHARGE OF WASTEWATER.

Note: The Company no longer washes equipment in the hod wash house.

The pH shall not be less than N/A standard units nor greater than N/A standard units and shall be monitored N/A

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 003.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning date of issuance and lasting through September 30, 1975, the permittee is authorized to discharge from outfall(s) serial number(s) 004.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|--|-------------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Monthly | Estimate |
| Nitroglycerin | N/A | N/A | Must not exceed nitroglycerin and ethylene glycol dinitrate saturation curves up to 80°F and based on 300 gal/batch discharge to be analyzed by the infrared spectrophotometer method. | | Monthly | Grab |
| Ethylene glycol dinitrate | N/A | N/A | | | Monthly | Grab |

The pH shall not be less than 6.0 standard units nor greater than 11.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 004.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning October 1 , 1975 and lasting through June 30, 1977* the permittee is authorized to discharge from outfall(s) serial number(s) 004.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|--|-------------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Monthly | Estimate |
| Nitroglycerin | N/A | N/A | Must not exceed nitroglycerin and ethylene glycol dinitrate saturation curves up to 80°F and based on 300 gal/batch discharge to be analyzed by the infrared spectrophotometer method. | | Monthly | Grab |
| Ethylene glycol dinitrate | N/A | N/A | | | Monthly | Grab |

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 004.

*This date may be changed as nitroglycerin and ethylene glycol dinitrate data becomes available.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 004.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |

Discharge limitations on nitroglycerin and ethylene glycol dinitrate will be assigned when aquatic bioassay data are available and treatment methods developed for these compounds. The company shall continue to monitor these compounds as specified on page 12.

Note: The limitations developed will apply to the discharge from both storehouse #1 and #2.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 004.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning date of issuance and lasting through September 30, 1975, the permittee is authorized to discharge from outfall(s) serial number(s) 005.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|--|-------------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Monthly | Estimate |
| Nitroglycerin | N/A | N/A | Must not exceed nitroglycerin and ethylene glycol dinitrate saturation curves up to 80°F and based on 300 gal/batch discharge to be analyzed by the infrared spectrophotometer method. | | Monthly | Grab |
| Ethylene glycol dinitrate | N/A | N/A | | | Monthly | Grab |

The pH shall not be less than 0.7 standard units nor greater than 9.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 005.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning October 1 , 1975 and lasting through June 30, 1977* the permittee is authorized to discharge from outfall(s) serial number(s) 005.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|--|-------------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | | | Monthly | Estimate |
| Nitroglycerin | N/A | N/A | Must not exceed nitroglycerin and ethylene glycol dinitrate saturation curves up to 80°F and based on 300 gal/batch discharge to be analyzed by the infrared spectrophotometer method. | | Monthly | Grab |
| Ethylene glycol dinitrate | N/A | N/A | | | Monthly | Grab |

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 005.

*This date may be changed as nitroglycerin and ethylene glycol dinitrate data becomes available.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977 and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 005.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|--------------------------------|----------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | Measurement Frequency | Sample Type |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |

Discharge limitations on nitroglycerin and ethylene glycol dinitrate will be assigned when aquatic bioassay data are available and treatment methods developed for these compounds. The company shall continue to monitor these compounds as specified on page 15.

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored weekly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 005.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule: 004 and 005

a) Progress report on toxicity of nitroglycerin and ethylene glycol dinitrate and treatability studies. Include method(s) to be employed to adjust the pH. December 31, 1974

b) Progress report on toxicity of nitroglycerin and ethylene glycol dinitrate and treatability studies. Achieve pH effluent limitation. October 1, 1975

c) Treatment methods available and effluent levels attainable for each method. Recommended treatment to be employed. March 31, 1976

d) Progress report on installation (if approved) of waste treatment equipment. October 31, 1976
March 31, 1977

e) Achieve effluent limitations for all wastewater discharges. July 1, 1977

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning date of issuance and lasting through expiration of permit, the permittee is authorized to discharge from outfall(s) serial number(s) 006.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|----------------------------------|------------------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | <u>Measurement Frequency</u> | <u>Sample Type</u> |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Flow-m ³ /Day (MGD) | N/A | N/A | N/A | N/A | Monthly | Estimate |
| Total Suspended Solids | N/A | N/A | 20 | 30 | Monthly | Grab |

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): 006.

C. MONITORING AND REPORTING

1. *Representative Sampling*

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. *Reporting*

Monitoring results obtained during the previous 6 months shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on . Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

U.S. Environmental Protection Agency

ATTN: Compliance Branch

1735 Baltimore, Room 249

Kansas City, Missouri 64108

Telephone: 816-374-2576

Missouri Clean Water Commission

P.O. Box 154

Jefferson City, Missouri 65101

Telephone: 314-751-3241

3. *Definitions*

a. The "daily average" discharge means the total discharge by weight during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by this permit, the daily average discharge shall be determined by the summation of all the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made.

b. The "daily maximum" discharge means the total discharge by weight during any calendar day.

4. *Test Procedures*

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Act, under which such procedures may be required.

5. *Recording of Results*

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The dates the analyses were performed;

c. The person(s) who performed the analyses;

d. The analytical techniques or methods used; and

e. The results of all required analyses.

6. *Additional Monitoring by Permittee*

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

7. *Records Retention*

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the State water pollution control agency.

6. *Removed Substances*

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

7. *Power Failures*

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

- a. In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the wastewater control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I,

- b. Halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

B. RESPONSIBILITIES

1. *Right of Entry*

The permittee shall allow the head of the State water pollution control agency, the Regional Administrator, and/or their authorized representatives, upon the presentation of credentials:

- a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and
- b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. *Transfer of Ownership or Control*

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator and the State water pollution control agency.

3. *Availability of Reports*

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public

inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

4. *Permit Modification*

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

- a. Violation of any terms or conditions of this permit;
- b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
- c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. *Toxic Pollutants*

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. *Civil and Criminal Liability*

Except as provided in permit conditions on "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. *Oil and Hazardous Substance Liability*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. *State Laws*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. *Property Rights*

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. *Severability*

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

PART III

OTHER REQUIREMENTS

The permittee shall submit with his monitoring report as indicated in Part 1, C-2, records indicating the daily production figures during the reporting period.

Aquatic bioassay studies shall be conducted, using Fathead minnows (Pimephales promelas Rafinesque), by the permittee on discharge 004 (nitroglycerin storehouse discharge) to determine the 96 hour TL_m . Center Creek water, upstream of discharge 006, will be used for dilution water. Information reported shall include, but not be limited to, (a) percent of effluent used to obtain the 96 hour TL_m , (b) concentration of nitroglycerin and ethylene glycol dinitrate in the effluent, and (c) pH, temp, hardness, dissolved oxygen and heavy metals (Cd, Cr, Cu, Pb, Zn) of the effluent and receiving water. Within 90 days of issuance, the permittee shall submit for approval, the procedure(s) to be used to accomplish these studies.

The permittee shall determine by any means available (e.g. pilot plant studies, literature reviews, laboratory research or the elimination of all stream discharge) a suitable treatment method which will reduce the concentrations of nitroglycerin and ethylene glycol dinitrate in discharges 004 and 005 to levels such that the 96 hour mortality rate in the undiluted effluent is no greater than in Center Creek upstream of discharge 006. Progress reports shall be submitted semi-annually to the State of Missouri and the EPA.

Composite Sample - A sample consisting of a minimum of twelve grab samples collected at regular intervals over a normal operating day and combined proportional to flow, or a sample continuously collected proportional to flow.

Grab Sample - An individual sample collected in a period of less than 15 minutes.

Definition of Production Day to Meet Monitoring Requirements - Samples shall be collected on days when the plant is operating at average or greater production capacities (as reported in the permit application).

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended,
(33 U.S.C. 1251 et. seq; the "Act"),

MISSOURI STEEL CASTINGS COMPANY

is authorized to discharge from a facility located at 905 East 3rd Street, Joplin, Missouri.

to receiving waters named Joplin Creek via storm sewer.

in accordance with effluent limitations, monitoring requirements and other conditions set forth
in Parts I, II, and III hereof.

This permit shall become effective on date of issuance

This permit and the authorization to discharge shall expire at midnight, five years from
date of issuance.

Signed this day of

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on the effective date of this permit and lasting through June 30, 1977, the permittee is authorized to discharge from outfall(s) serial number(s) 001.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|----------------------------------|------------------------|
| | Kg/KKg of Product Produced (lb/1000 lb of product produced) | | Other Units (Specify) | | <u>Measurement Frequency</u> | <u>Sample Type</u> |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Total Suspended Solids | 12.5 (12.5) | 10 (10) | N/A | N/A | Monthly | 24-hr Composite |

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the point of discharge to the city storm sewer.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning July 1, 1977, and lasting through the expiration date of this permit, the permittee is authorized to discharge from outfall(s) serial number(s) 001.

Such discharges shall be limited and monitored by the permittee as specified below:

| <u>Effluent Characteristic</u> | <u>Discharge Limitations</u> | | | | <u>Monitoring Requirements</u> | |
|--------------------------------|--|--------------------|-----------------------|-------------------|----------------------------------|------------------------|
| | Kg/KKg of Product Produced (1b/1000 lb of product produced) | | Other Units (Specify) | | <u>Measurement Frequency</u> | <u>Sample Type</u> |
| | <u>Daily Max.</u> | <u>30-Day Avg.</u> | <u>Daily Avg.</u> | <u>Daily Max.</u> | | |
| Total Suspended Solids | 0.10 (0.10) | 0.08 (0.08) | N/A | N/A | Monthly | 24-hr Composite |

The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored monthly.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the point of discharge to the city storm sewer.

B. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

| | |
|---|--------------------|
| a. Report on design and procurement of all required waste disposal and treatment equipment. | March 31, 1975 |
| b. Report on procurement status and installation of waste disposal and treatment equipment. | December 31, 1975 |
| c. Report on installation of waste disposal and treatment equipment. | September 30, 1976 |
| d. Achieve effluent limitations for wastewater discharge. | July 1, 1977 |

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

C. MONITORING AND REPORTING

1. *Representative Sampling*

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. *Reporting*

Monitoring results obtained during the previous 6 months shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. The first report is due on . Duplicate signed copies of these, and all other reports required herein, shall be submitted to the Regional Administrator and the State at the following addresses:

U.S. Environmental Protection Agency

ATTN: Compliance Branch

1735 Baltimore, Room 249

Kansas City, Missouri 64108

Telephone: 816-374-2576

Missouri Clean Water Commission

P.O. Box 154

Jefferson City, Missouri 65101

Telephone: 314-751-3241

3. *Definitions*

- a. The "daily average" discharge means the total discharge by weight during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by this permit, the daily average discharge shall be determined by the summation of all the measured daily discharges by weight divided by the number of days during the calendar month when the measurements were made.
- b. The "daily maximum" discharge means the total discharge by weight during any calendar day.

4. *Test Procedures*

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Act, under which such procedures may be required.

5. *Recording of Results*

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

- a. The exact place, date, and time of sampling;
- b. The dates the analyses were performed;
- c. The person(s) who performed the analyses;

- d. The analytical techniques or methods used; and
- e. The results of all required analyses.

6. *Additional Monitoring by Permittee*

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

7. *Records Retention*

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the State water pollution control agency.

A. MANAGEMENT REQUIREMENTS**1. *Change in Discharge***

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. *Noncompliance Notification*

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Regional Administrator and the State with the following information, in writing, within five (5) days of becoming aware of such condition:

- a. A description of the discharge and cause of noncompliance; and
- b. The period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

3. *Facilities Operation*

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. *Adverse Impact*

The permittee shall take all reasonable steps to minimize any adverse impact to navigable waters resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. *Bypassing*

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) where unavoidable to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. The permittee shall promptly notify the Regional Administrator and the State in writing of each such diversion or bypass.

6. *Removed Substances*

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

7. *Power Failures*

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

- a. In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the wastewater control facilities;

or, if such alternative power source is not in existence, and no date for its implementation appears in Part I,

- b. Halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

B. RESPONSIBILITIES

1. *Right of Entry*

The permittee shall allow the head of the State water pollution control agency, the Regional Administrator, and/or their authorized representatives, upon the presentation of credentials:

- a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and
- b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

2. *Transfer of Ownership or Control*

In the event of any change in control or ownership of facilities from which the authorized discharges emanate, the permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Regional Administrator and the State water pollution control agency.

3. *Availability of Reports*

Except for data determined to be confidential under Section 308 of the Act, all reports prepared in accordance with the terms of this permit shall be available for public

inspection at the offices of the State water pollution control agency and the Regional Administrator. As required by the Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Act.

4. *Permit Modification*

After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

- a. Violation of any terms or conditions of this permit;
- b. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
- c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

5. *Toxic Pollutants*

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. *Civil and Criminal Liability*

Except as provided in permit conditions on "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. *Oil and Hazardous Substance Liability*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. *State Laws*

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. *Property Rights*

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

10. *Severability*

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

PART III

OTHER REQUIREMENTS

The permittee shall submit with his monitoring report as indicated in C-2, records indicating the daily flow and production figure during the period of effluent sampling.

Composite Sample - A sample consisting of a minimum of twelve grab samples collected at regular intervals over a normal operating day and combined proportional to flow, or a sample continuously collected proportional to flow.

Definition of Production Day to Meet Monitoring Requirements - Samples shall be collected on days when the plant is operating at average or greater production capacities (as reported in the permit application).