ENVIRONMENTAL PROTECTION AGENCY

REGION IX

SURVEILLANCE & ANALYSIS DIVISION

NPDES Compliance Monitoring Report

Permittee: Kerr-McGee Chemical Corporation
Oklahoma City, Oklahoma

Facility: Kerr-McGee Chemical Corporation
Henderson NV

Permit No.: NV0000078

Date of Inspection: June 19, 1980

Inspection Participants:

EPA: Kenneth D. Greenberg
Environmental Engineer

Facility: Charles B. Armstrong
Plant Manager

Richard F. Wohletz
Superintendent, Plant Technical Services

Report Prepared by: Kenneth D. Greenberg

FINDINGS

Introduction

The Kerr-McGee Chemical Corporation operates an inorganic chemical production plant at the Basic Management, Inc. (BMI) industrial complex in Henderson, Nevada. The Kerr-McGee facility is subject to NPDES Permit No. NV0000078 which became effective on February 24, 1977 and expires on September 30, 1981. Under the permit, Kerr-McGee is authorized to discharge a daily maximum of 4.0 mgd of non-contact cooling water during the period of June 1 through September 30. The non-contact cooling water is discharged through an open ditch to Las Vegas Wash. Other process streams are either recycled or discharged to lined evaporation ponds located at the plant site. Pond parameters are summarized in Table-1 and their locations are shown in Figure 1.

The BMI industrial complex was originally owned by the U.S. Government which produced magnesium metal at the facility. In 1945, the portion of the industrial complex which is currently owned by Kerr-McGee was taken over by the Western Electrochemical Company. Western Electrochemical merged into American Potash and Chemical Corp. which took over operations at the facility in 1955. Finally, American Potash and Chemical Corp. merged into Kerr-McGee which gained control of the plant operations in 1967. Except for expansion to the production of boron compounds in the early 70's, the list of inorganic products at the facility (see details below) is basically unchanged since 1945.

Prior to 1976, liquid waste streams and slurried solid wastes from the facility were discharged to the unlined BMI ponds located across Boulder Highway to the northeast of the production area. In the mid-70's lined ponds were constructed on the Kerr-McGee plant property to accomodate liquid waste and recycle streams. Solid wastes have been and continue to be disposed on the Kerr-McGee plant property. Solid wastes were also disposed at the BMI dump, located northwest of the facility, until the dump closed in early 1980.

Production Processes and Wastewater Streams

Production at the Kerr-McGee facility is divided into four major processes: 1) Sodium chlorate, 2) perchlorates, 3) manganese dioxide, and 4) boron chemicals.

In the first process, sodium chlorate ($NaClO_3$) is produced in an electrolytic process from raw materials of sodium chloride and water. Sodium chlorate is sold for use in paper pulp bleaches and is also used as an intermediate in the production of perchlorates at the Henderson facility. Waste from the production of sodium chlorate consists of a filter cake containing impurities from the raw materials and filter aid.

In the past, the filter cake (containing calcium sulfate, calcium carbonate, graphite, and diatomaceous earth) has been slurried to the BMI ponds or disposed at the BMI dump. The filter cake, which contains 50% moisture, is currently dumped on the ground surface in the northwest corner of the plant property (see Figure 1).

Spills, cooling tower leaks, and excess storm runoff from the sodium chlorate process are discharged to the lined ponds, P-2, and P-3. Water from these ponds is recycled back to the process.

During the summer, non-contact cooling water, used in the sodium chlorate process is discharged to Las Vegas Wash via the BMI storm ditch and the Alpha ditch. Additional details on this discharge are provided in the subsection below on plant effluent.

The second major process at Kerr-McGee involves the production of ammonium perchlorate (NH_4ClO_4) and potassium perchlorate ($KClO_4$) which are used in the manufacture of rocket fuels. In this process, a solution of sodium chlorate is first electrolytically converted to sodium perchlorate ($NaClO_4$). The sodium perchlorate is then combined with salts of either ammonia or potassium to form the respective perchlorates.

Wastes from the ammonium perchlorate process include a filter cake and chromic hydroxide which is derived from the use of chromium as a filter aid. In the past, the filter cake, containing calcium sulfate and calcium carbonate, was slurried to the BMI ponds. Now the filter cake and chromic hydroxide are discharged in slurry form to the lined ponds AP-1 or AP-2. At the time of the inspection pond AP-2 was not in use and was empty. Liquid from these ponds is recycled back to the process through the pump basin AP-3. Emergency overflows from the ammonium perchlorate cooling tower are discharged to the lined pond AP-4. A minor stream from a caustic scrubber in the ammonium perchlorate process is discharged to pond P-2 along with wastes from the sodium chlorate process (described above). A waste stream from the potassium perchlorate process containing NaCl, KCl, and $KClO_4$ is discharged to the lined pond S-1.

The third major process at Kerr-McGee is the production of manganese dioxide which is sold for use in high performance dry cells. Low grade manganese ore is crushed, roasted, and then combined with sulfuric acid. The resulting manganous sulfate is then converted to manganese dioxide (MnO_2) by electrolysis. Wastes from this process include a solid waste containing silica, alumina, iron, and heavy metals which is filtered from the roasted ore after it has been combined with sulfuric acid. This waste, which amounts to 50% by weight of the raw ore, is currently disposed in piles at the Kerr-McGee plant site (see Figure 1).

A minor waste stream of sodium phosphate solution is discharged to pond C-1. The solution, which is used for cleaning the electrolytic cell electrodes, is discharged in batches of approximately 5,000 gallons once or twice per week. All other water used in the production of manganese dioxide is recycled.

The fourth major process at Kerr-McGee is the production of elemental boron (B), boron trichloride (BCl_3), and boron tribromide (BBr_3). Boron trichloride is used in the manufacture of boron filament for aircraft structures. Boron tribromide is used in semiconductor doping. Elemental boron is used in pyrotechnics. Waste streams from the production of boron chemicals include a leachate stream containing magnesium sulfate (500 gal./day) and a wet scrubber stream (7000 gal./day). These wastes were being discharged to pond S-1 at the time of the inspection.

Pond C-1 receives a waste stream from the plant's main boiler and cooling tower blowdown. The company reported that the discharge to pond C-1 contains 22,450 ppm total dissolved solids. Liquid in pond C-1 is not recycled back to the plant.

<u>Ponds and Pond Leakage Monitoring</u>

The Kerr-McGee discharge permit requires that:

"1. If any waste waters... are placed in ponds, such ponds shall be located and constructed so as to:

   a. contain with no discharge the once-in-one-hundred years storm at said location;

   b. Withstand with no discharge the once-in-one-hundred years flood of said location; and

   c. prevent escape of waste water by leakage.

2. The permittee shall submit to the Director and the Regional Administrator a summary of the results obtained from monitoring for seepage and leakage at the frequency specified in Part 1.C.2."

Plant personnel conduct a program of monitoring for pond leakage which involves 1) checking the level of liquid in each pond once or twice per week and 2) analyzing the concentration of certain salts in each pond every two or three weeks. With this data, large leaks can be detected by looking for unusual changes in the level of a pond or the load of dissolved salts in a pond. The levels of liquid in adjacent ponds is also compared as a means for detecting losses of liquid in excess of the evaporation rate. A spot check of recorded data from this monitoring program revealed no unusual drops in pond level. Kerr-McGee officials stated that the monitoring program had revealed leaks in the liners of ponds P-1 and AP-2 which have now been repaired.

However, the current leakage monitoring program is not capable of detecting small leaks. The following techniques would make leak detection more exact but would still be subject to inaccuracies due to inherent errors in measurements. A continuous level recorder at each pond would provide a more complete picture of liner integrity and make comparison of levels in different ponds easier. However, it would still be difficult to separate liquid losses due to evaporation and small leaks. Continuous level recorders would also provide estimates of the volume of inflow to ponds which currently is not measured. TIMET, one of the other companies at the BMI complex, uses a lithium tracer for detection of leaks in their lined ponds. A known quantity of lithium carbonate is placed in each pond. Periodically the lithium concentration and the pond volume is determined. From this data the load of lithium in each pond can be calculated. A drop in the amount of lithium in a given pond would be due to loss through leakage since the lithium load is not affected by evaporation. It is not necessary to measure pond inflow with the lithium tracer technique.

As noted above, Kerr-McGee has been recording data from their leakage monitoring program. However, they have not been reporting this data to the Nevada DEP or EPA as required by the permit. The plant superintendent said that he was not aware of the requirement to report this data.

Originally all of the lined ponds at the Kerr-McGee facility were lined with a single layer of polyvinyl chloride (PVC) on the bottom joined to chlorinated polyethylene (CPE) on the side walls. CPE was used on the side walls of the pond because of its greater resistence to solar radiation. Kerr-McGee officials explained that the PVC/CPE pond liners have been deteriorating over the years because the two membrane materials are incompatable when in contact with each other. In four of the Kerr-McGee ponds, the original PVC/CPE liner developed leaks and have been replaced with a liner made of nylon reinforced rubber. During the inspection the plant superintendent stated that the company planned to take pond S-1 out of service in the near future in order to replace its PVC/CPE lining. The potassium perchlorate waste stream would be rerouted to pond P-1 which has a nylon reinforced rubber liner but was not in use at the time of the inspection. Ponds AP-1 and AP-4 still have the original PVC/CPE liners which the superintendent claimed were in satisfactory condition. In future inspections, the condition of the AP-1 and AP-4 pond linings should be checked. The new nylon reinforced hypolon liners appear to be holding without excessive deterioration.

Plant Effluent and Monitoring Requirements

During the summer months, an average of 3.2 mgd of non-contact cooling water is used in the sodium chlorate process. As authorized by the NPDES permit, this non-contact cooling water is discharged to an unlined, open ditch. The discharge flows approximately 200 ft. to the north at which point it flows into the BMI storm ditch (another unlined open ditch) and continues to the east (see Figure 1). In accordance with their permit, the Kerr-McGee discharge passes under Boulder Highway in the BMI siphon, and through the crossover pipe to the Alpha ditch and on to Las Vegas Wash (see Figure 2).

The BMI storm ditch is also used by Stauffer Chemical Company for their permitted stormwater discharges. Stauffer is located immediately west of Kerr-McGee in the BMI complex. However, under Stauffer's permit, their stormwater discharges are required to flow through the BMI siphon and down the acid ditch which discharges to the upper BMI ponds. If Stauffer discharged stormwater during the summer months it would combine with the Kerr-McGee discharge of non-contact cooling water in the BMI storm ditch. Under their discharge permit, Stauffer would be required to close the crossover pipe in order to route their stormwater discharge to the upper BMI ponds. However, closing the crossover pipe would also cause the Kerr-McGee effluent to flow to the upper BMI ponds. Kerr-McGee is not authorized to discharge to the upper BMI ponds. On the other hand, if the crossover pipe were left open, then the Kerr-McGee effluent and the Stauffer stormwater would flow into the Alpha ditch. The flow of Stauffer stormwater to the Alpha ditch is not allowed under the Stauffer discharge permit. The conflict described above can be resolved either by 1) a permit modification or, 2) a rearrangement of the discharge ditches so the Kerr-McGee and Stauffer discharges do not use a common discharge route.

Under their discharge permit Kerr-McGee is required to monitor their effluent for flow, temperature, pH and oil and grease. The company is also required to measure the change in total dissolved solids and suspended solids of the non-contact cooling water which occurs in the process. Temperature is measured and recorded on a continuous basis while composites for TDS, suspended solids, and oil and grease are collectd manually at the head of the open discharge ditch which carries the non-contact cooling water (see Figure 1). Composites are made once a week by filling 8 glass jars on an hourly basis from discharge water grabbed in a plastic bucket. The plant superintendent explained that the composites are not flow proportioned because the effluent flow is constant. A spot check of effluent flow charts revealed that this is generally true. However, the flow does fluctuate significantly on some days. Therefore, composite samples should be flow proportioned.

An orifice meter located in the plant production area is used to measure the flow which is reported in the discharge monitoring reports . This meter is only capable of measuring the discharge of non-contact cooling water. Other Kerr-McGee discharges which may occur would not be measured by the orifice meter. Other potential discharges to the BMI storm ditch by Kerr-McGee are storm water entering the unbermed ditch, pond overflows, or process spills. Many of the floor drains in the production area have been plugged to prevent such possibilities. However, during an earlier plant visit in August 1979, water leaking from a supply line in the plant was observed to be discharging through the open ditch which joins the BMI storm ditch near pond C-1. Due to the slope of the land and the lack of berms along the open ditches, storm runoff from Kerr-McGee plant property could easily enter the ditches and flow off plant property. Under their NPDES permit, Kerr-McGee is allowed to discharge noncontact cooling water. The discharge of any other liquids is not permitted.

Kerr-McGee has installed a weir and flow meter on the BMI storm ditch at the point it passes to TIMET property (see Figure 1). This meter would be capable of measuring all Kerr-McGee discharges in the BMI storm ditch. However, this meter would also measure any flow which may be discharged in the BMI storm ditch by Stauffer Chemical Company. Furthermore, the weir is not properly installed since it is not perpendicular to the axis of flow in the ditch. It is also possible for Kerr-McGee to discharge through an open ditch which enters TIMET property at a point south of the BMI storm ditch (see Figure 1). There is no flow measuring device on this ditch. In summary, with the flow measuring devices in place at the time of the inspection, it is not possible to measure all potential discharges from the Kerr-McGee plant.

A review of the plant's discharge monitoring reports for the summer months of 1979 revealed that the discharge was within the permitted limits with the exception of some exceedances of the pH limit. In 1979, the maximum limit on pH of 8.5 was exceeded in July (8.9), August (8.8), and October (8.6). The plant water supply (used for cooling water) has an average pH of 8.0 which contributes to the high pH of the discharge. The State of Nevada Division of Environmental Protection granted Kerr-McGee permission to continue their discharge of non-contact cooling water in October 1979. Due to unusually warm weather, the company found it necessary to continue the discharge until October 25, 1979.

SELF-MONITORING DEFICIENCIES

All self-monitoring procedures were in accordance with EPA requirements, EPA recommendations, and NPDES permit specifications with the exception of the following:

1. The permittee has failed to report the results of monitoring for leakage from holding ponds as required by the permit. (see detail in Findings Section above).

2. Composite samples of the plant effluent are not flow proportioned during collection as required by the permit. Plant personnel claim that, due to the uniform nature of the effluent, analysis results would not change significantly if the sample were flow proportioned. Kerr-McGee should show that this is true by comparing results obtained under both compositing techniques.

TABLE 1: KERR-McGEE CHEMICAL CORPORATION PONDS

POND	Process Waste	Evaporation or Recycle	Liner*	Surface Area (acres)	Capacity (gallons)
C-1	Steam Plant (Boiler), Cooling Tower	Evaporation	PVC w/reinforced rubber walls	1.4	2,750,000
P-1**	$KClO_4$ (future plans)	Evaporation	Reinforced rubber	0.7	>900,000
P-2	$NaClO_3$ spills and NH_4ClO_3 scrubber	Recycle	Reinforced rubber	0.25	350,000
P-3	$NaClO_3$ spills	Recycle	Reinforced rubber	0.25	350,000
AP-1	NH_4ClO_4	Recycle	PVC w/CPE walls	0.3	425,000
AP-2**	NH_4ClO_4	Recycle	Reinforced rubber	0.3	425,000
AP-3	Pump basin for AP-1 and AP-2	Recycle	unknown	0.1	50,000
AP-4	NH_4ClO_4 Cooling Tower	Evaporation	PVC w/CPE walls	0.4	650,000
S-1	$KClO_4$ and Boron Compounds	Evaporation	PVC w/CPE walls	1.0	2,000,000

* All ponds have single layer linings.

** Ponds which were not in use at time of inspection (June, 1980).

April 6, 1983

Ms. Karen Schwinn
Regional Project Officer
U. S. Environmental Protection Agency
215 Fremont Street
San Francisco, California 94103

Dear Ms. Schwinn:

Enclosed you will find the materials which we have prepared under Work Assignment R-09-011 relative to the Kerr McGee Facility in Henderson, Nevada.

We have enclosed four copies each of the Groundwater Inspection report, the 265 Subpart F Groundwater Monitoring Evaluation and the 264 Subpart F Groundwater Monitoring Evaluation.

It is our feeling that the most critical deficiency with the data gathered by Kerr McGee is the failure to have gathered a sufficient number of samples since the regulations took effect. It is fairly obvious that some contamination is taking place, originating from the RCRA units at Kerr McGee. We believe that if they had taken a sufficient number of samples to run a student's t-test, it is likely that significant differences between upgradient and downgradient groundwater quality would be demonstrated.

In addition, depending upon the background standard and the hazardous constituents chosen by the Region IX Regional Administrator, it seems likely that Kerr McGee will function in a compliance monitoring - corrective action made under 264 Subpart F.

Please do not hesitate to contact us if you have any questions regarding these reports.

Sincerely,

ERTEC ROCKY MOUNTAIN, INC.

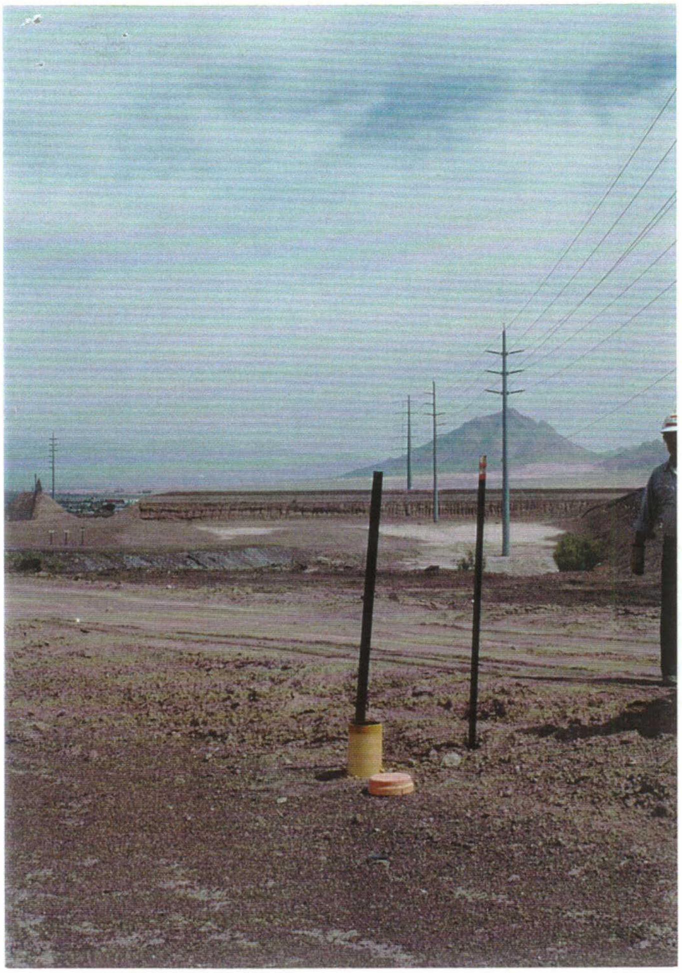
Kyla Smith-Juvonen

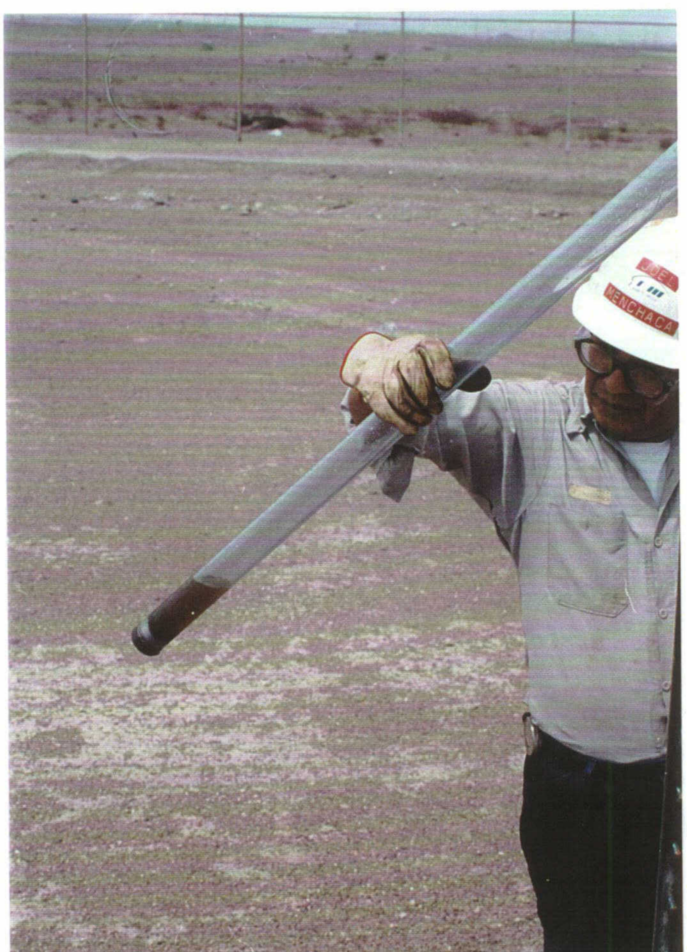
Kyla Smith-Juvonen
Hydrogeologist

David W. Stoner
Manager of Hydrology

Enclosures


Qorpak Bottles




MENCHACA