THABARAJ

KAISER
ALUMINUM & CHEMICAL CORPORATION

February 28, 1973

State of Florida
Department of Pollution Control
225 D Street Northwest
Winter Haven, Florida 33881

Attention: Mr. Lee Kerner

Gentlemen:

Subject : Kaiser's Mulberry Disposal Well Application for Permit to Operate

Enclosed is Kaiser Aluminum & Chemical Corporation's application for a permit to operate the waste water disposal well built at its Mulberry plant pursuant to State of Florida construction permit No. IC 1295.

Attached to this letter is a report of the status of those 27 provisos to the construction permit which were set forth in the March 8, 1972 letter of your department. Your attention is invited, in particular, to Items 25 and 26 of that letter wherein your department provided that preinjection neutralization of the acidic waste would not be required unless gaseous carbon dioxide is evolved in the cavity and that cavity development be fully evaluated. Trial operation of the well since its completion last October substantiates that gaseous carbon dioxide evolution is not occurring. We believe cavity evaluation cannot be properly performed until the well has been in use for approximately one year, and presently intend to accomplish that evaluation at that time.

Kaiser personnel stand ready to furnish such additional information as you may require in your review of this application. You may also find it helpful to consult with those state and federal personnel who reviewed the plans, and in a number of instances made helpful suggestions, during preparation and processing of the construction permit application last year. Each of these gentlemen understands that the waste is injected unneutralized into the disposal zone, where neutralization occurs through reaction with limestone. Each is also familiar with the monitoring system included in the well design. They are:

R. O. Vernon, Director of Interior - State of Florida
C. W. Hendry, Chief - Bureau of Geology - State of Florida
F. Andrews, Geologist - Florida Bureau of Pollution Control

G. Parker - S. W. Florida Water Management District
J. C. Holzchuh - S. W. Florida Water Management District

J. Rosenshein - U. S. Geological Survey, Tampa

J. C. White, Asst. Administrator - Region IV - EPA Atlanta
C. W. Seaver, Engineer - Region IV - EPA Atlanta

We believe that all conditions for the issuance of an operating permit have been met or, as appropriate, will be met.

Very truly yours,

W. P. Ward

W. P. Ward
KAISER CHEMICALS
Environmental Control Engineer
P. O. Box 737
Gramercy, Louisiana 70052

WPW:ew
Attachments

cc: K. K. Huffstutler, Department of Pollution Control
C. W. Hendry, Department of Natural Resources
G. Parker, S.W.F.W.M.D.
J. Rosenshein, USGS
G. Faulkner, USGS
R. J. Funk, Subsurface Disposal Corporation
S. F. Crawford, Mulberry - Kaiser
J. E. O'Connell, Oakland - Kaiser
Jack Ravan, Director of Atlanta Office, EPA

State of Florida
Mr. Lee Kerner

February 28, 1973

ATTACHMENT A

Current Status of Those Provisos to Construction Permit No. IC 1295 Set Forth in the March 8, 1972, Letter of the Florida Department of Pollution Control

Proviso 1. Construction of this installation shall be completed by November 1, 1972.

Current Status: Construction was completed October 20, 1972.

Proviso 2. This installation shall be operated by a competent and qualified person. Operations shall be conducted according to the best accepted practices and the recommendations of the Department of Pollution Control.

Current Status: Kaiser pledges full compliance.

Proviso 3. This construction permit is issued with the understanding that the owner may need to comply with county, municipal, or other local regulations prior to construction.

Current Status: Kaiser has complied with all known regulations.

Proviso 4. The applicant shall continue the retention of the engineer of record for the inspection of the construction of this project. Upon completion, the engineer shall inspect for conformity to construction permit applications and associated documents. A report of such inspection shall be submitted by the engineer to the Department of Pollution Control for consideration toward the issuance of an operation permit. Notification of the pending completion of this project shall be transmitted in writing to the Department by the engineer approximately two weeks before the completion of construction.

Current Status: Kaiser has fully complied. See enclosed letters from Mr. R. E. Funk, P.E., to Mr. W. E. Linne of October 10, 1972, and October 20, 1972.

Proviso 5. This construction permit expires on May 1, 1973, following an initial period of operation for appropriate testing to determine compliance with the Rules of the Florida Department of Pollution Control.

Current Status: Test operations confirm compliance with the rules. This application is to operate the well as constructed under Permit IC-1295 which expires May 1, 1973.

Proviso 6. Detailed plans and specifications for this report shall be available upon request by the Department of Pollution Control.

Current Status: Detailed plans and specification are available for review upon request.

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Proviso 7. The Florida Department of Pollution Control shall be notified of any changes or revisions made during construction of this system.

Current Status: The Department was notified of all changes. (See enclosed as built drawing.)

Proviso 8. Any time this system is found to be performing inadequately because of overloading, neglect, or other reasons, the owner shall provide additional measures to correct the cause of inadequate performance.

Current Status: Kaiser will comply.

Proviso 9. A completely closed circulatory system shall be provided during construction of the injection well for containing all saline water produced.

Current Status: This condition was fully met.

Proviso 10. The injection well and casing arrangement shall be constructed in accordance with Subsurface Disposal Corporation Drawings 871-232 (Revision dated 2/2/72), 871-233-1 (Revision dated 2/2/72), 871-233-2 (Revision dated 2/2/72) and 871-233-3 (Revision dated 2/2/72).

The hastelloy steel casing shall be extended through the anhydrite zone into the injection zone.

Current Status: The Florida Department of Pollution Control has been notified of all changes. (See enclosed as built drawing.)

Proviso 11. The injection well shall be located a minimum of 25 feet from septic tanks and drainfields.

Current Status: This condition has been fully met.

Proviso 12. Provisions for monitoring the fresh water aquifer and the aquifer immediately above the anhydrite aquiclude shall conform with the addendum of February 7, 1972, to the original construction permit application, incorporating monitoring revisions called for in the Department of Pollution Control's letter of December 20, 1971. Any further changes in monitoring provisions will be subject to approval by the Department of Pollution Control.

Current Status: This condition has been fully met.

<u>Proviso 13.</u> Geophysical logging during and after construction of the injection well shall include sonic, temperature, gamma ray, formation density, caliper, and induction electric logs. Sonar logging accompanied with sonic logging shall be conducted every two years.

In regard to assistance during logging by the Bureau of Geology Florida Department of Natural Resources and/or the USGS, it is important that the office which will assist in logging be advised of progress and allowed sufficient time for logger scheduling at the project.

<u>Current Status</u>: See enclosed logs. A sonar and sonic log will be run at the end of one year of operation and thereafter at least once every two years. Kaiser believes that at at least one year's cavity development is required to obtain a meaningful log of cavity size.

<u>Proviso 14.</u> Cuttings shall be submitted by bus collect by well driller to the State Geologist, Tallahassee, Florida. Samples shall be taken at not more than 10 feet intervals.

<u>Current Status</u>: This condition was fully met.

<u>Proviso 15.</u> The injection well shall be provided with an adequate relief valve.

<u>Current Status</u>: This condition was met.

<u>Proviso 16.</u> The injection pressure shall not exceed 1000 psi.

<u>Current Status</u>: Kaiser will observe this limit on injection pressures.

<u>Proviso 17.</u> Sidewall cores from the confining layer and disposal strata shall be obtained during drilling, if possible.

<u>Current Status</u>: Appropriate cores were provided whenever possible. See enclosed core analysis data report. Original cores are available for your examination upon request.

<u>Proviso 18.</u> Drill stem or other formation tests in the disposal zone shall be conducted during injection well construction for obtaining disposal zone pressures and formation fluid samples. A complete chemical analysis shall be conducted on the formation fluids.

The USGS shall be advised sufficiently in advance as to the time of testing and sampling disposal zone formation fluids so that USGS personnel can be on-site for conducting comprehensive geochemical sampling in addition to sampling by Kaiser Aluminum & Chemical Corporation.

<u>Current Status</u>: Samples of the disposal zone connate waters were taken by Kaiser and the USGS for analysis. These analyses are available on request.

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Proviso 19. A separate monitoring well shall be drilled to the disposal zone if injection tests substantiate that injection pressures will exceed certain limits to be established by the USGS. These injection tests to be conducted upon completion of the injection well and logging shall include tests described in the construction permit application addendum of February 7, 1972, or as requested by the Department of Pollution Control upon advice from the USGS.

Current Status: The USGS has reviewed the initial injection data and advises that a monitor well is not necessary at this time. They will review the data periodically and, if at some future date a monitor well is required, Kaiser will fulfill this requirement.

Proviso 20. A sample of the disposal zone fluids shall be taken by a recognized chemist, examined for chlorides, and the results submitted to this office.

Current Status: A sample of the disposal zone fluid was analyzed for chlorides by Interscience Laboratories in Tampa with a result of 69,000 ppm chlorides.

Proviso 21. The injection well shall be capped when not in use.

Current Status: Kaiser will observe this requirement

Proviso 22. The injected waste water shall be monitored continuously for flow and pressure. The injected waste water shall also be sampled daily with examinations to be conducted for chlorides, specific conductance, pH, sulfates, fluorides, alkalinity, total acidity as HCl and calcium magnesium ratios.

Well annular pressure shall be monitored continuously.

Both fresh water aquifer and the aquifer immediately above the anhydrite aquiclude zone shall be monitored at least on a daily basis for flow, chlorides, specific conductance, pH, sulfates, fluorides, alkalinity, total acidity as HCl, and calcium magnesium ratios in close cooperation with the Bureau of Geology, Florida Department of Natrual Resources and the USGS.

Monthly operation reports containing these test results shall be submitted in duplicate to the West Central Florida Regional Office, Post Office Box 944, Winter Haven, Florida 33881 as well as the Bureau of Geology, Florida Department of Natural Resources, Post Office Drawer 631, Tallahassee, Florida 32302; the District Chief, USGS, 903 West Tennessee Street, Tallahassee, Florida 32304; and the Subdistrict Chief, USGS, Room 437, Federal Building, 500 Zack Street, Tampa, Florida 33602.

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Proviso 22.

Current Status: Kaiser has fully met the above conditions of the construction permit.

Values of pH and specific conductivity for the injected waste were found to be of no value because of the relatively high concentrations involved. Sulfate levels were below the limit of detectability. Therefore, to monitor operation of the well, the flow and pressure of the injected waste water will be recorded continuously. In addition, the waste water will be sampled daily with a composite analysis run weekly. The sample will be analyzed for calcium magnesium ratio, chlorides, fluorides, and total acidity as HCl.

In the monitors for the fresh water aquifers at 1300 and 2900 feet, the flow has been measured at zero (the wells must be pumped). In addition, the Florida Bureau of Geology has advised that any changes in composition of the fresh water aquifers would take place very slowly, over a period of many months. Therefore, to monitor the operation of the well, both the fresh water aquifer and the aquifer immediately above the anhydrite and aquiclude zone will be sampled weekly. These samples will be analyzed for specific conductance, pH, alkalinity, calcium magnesium ratio, sulfates, chlorides and fluorides.

Monthly operating reports containing these test results will be submitted in duplicate to the West Central Regional Office, Post Office Box 944, Winter Haven, Florida 33881; Bureau of Geology, Florida Department of Natrual Resources, Post Office Drawer 631, Tallahassee, Florida 32302; the District Chief, USGS, 903 West Tennessee Street, Tallahassee, Florida 32304; and the Subdistrict Chief, USGS, Room 437, Federal Building, 500 Zack Street, Tampa, Florida 33602.

The well annular pressure will be recorded continuously.

Proviso 23. Prior to the construction of the injection well, supply wells on adjacent properties shall be sampled by Kaiser Aluminum & Chemical Corporation. Analysis shall be conducted by an independent laboratory. Property owners shall be provided with the results for future reference.

Current Status: This condition has been fully met.

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Proviso 24. Kaiser Aluminum & Chemical Corporation shall implement immediate corrective action in the event that salt water or effluent intrusion into usable area gound water supplies can be traced to either the construction or operation of this injection well.

Current Status: Kaiser pledges compliance with this condition.

Proviso 25. The HCl concentration of the injected waste water shall not exceed 5% in order to insure that carbon dioxide generated in the reaction between the waste water and the disposal zone limestone formation will be maintained in the soluble form. Reference is made to Kaiser Aluminum & Chemical Corporation's carbon dioxide solubility graph included in the original application of October 8, 1971.

Current Status: Kaiser has complied and will continue to comply with this requirement.

Proviso 26. This construction permit is issued with the understanding that the characteristics of the waste water following neutralization in the disposal zone will approximate that of the disposal zone fluids and that gaseous carbon dioxide will not be evolved. In this regard, an operation permit will not be issued until cavity development has been fully evaluated and it has been substantiated that evolution of gaseous carbon dioxide is not occurring. Otherwise, adequate neutralization of waste water prior to injection will be requied.

Current Status: Trial operation of the well since its completion last October substantiates that gaseous carbon dioxide evolution is not occurring. The Florida Bureau of Geology and Kaiser believe the wastes will cause an enlargement of the honeycombed structure already existing in the disposal zone. An attempt to measure the cavity size and shape will be made after the well has been in operation for one year.

Proviso 27. The issuance of a permit to drill will await notification by Kaiser Aluminum & Chemical Corporation to this Department as to the driller, and a letter from the driller indicating his retention.

Current Status: This requirement was met.

ATTACHMENT B

APPLICATION FOR PERMIT TO OPERATE
and
ENGINEERING REPORT

for

DISPOSAL WELL SYSTEM

at

KAISER ALUMINUM & CHEMICAL CORPORATION

MULBERRY, FLORIDA

FEBRUARY 28, 1973

INTRODUCTION

The Kaiser Chemical Mulberry Plant produces Sodium Silico Fluoride (Na_2SiF_6) by the reaction of Salt ($NaCl$) with a Fluosilicate waste (H_2SiF_6).

The Fluosilicate waste used in the operation is obtained from several of the Phosphoric Acid manufacturers in Florida.

The installation of a disposal well in accordance with the State of Florida Department of Pollution Control construction permit IC 1295 has been completed. The geology at the site was found to be as anticipated and verified by the enclosed logs.

The operation of this disposal well system will allow the plant to dispose of its chloride effluent in a subsurface disposal zone. The stream will be injected into a porous limestone zone 4500 ft. below the surface where it will be neutralized and disbursed with the naturally occurring chloride brines.

State of Florida
Department of Air and Water Pollution Control

Application For Permit to Operate Water Pollution Sources

Applicant:
(Owner or authorized agent).

(Name and Title)

Name of Establishment: Kaiser Aluminum & Chemical Corp., Mulberry Works
(Corporation, Company, Political SD, Firm, etc.)

Mailing Address: P. O. Box 646, Mulberry, Florida 33860

Type of Pollution Source: Industrial
(Be Specific)

Location of Pollution Source: Intersection of SR-60 & Old Hwy. 60
(Number of Street) (City)
Polk County, Florida
(County)

Location of Pollution Control Plant: Sodium Silico Fluoride Production
At existing plant site.

Permit Applied For Operating:

New Source ☐

Existing Source after Modification ☒

Existing Source after Reconstruction ☐

Existing Source After Expansion ☐

Existing Source After Relocation ☐

Project Engineer:

1) J. E. O'Connell
Name

2) Kaiser Aluminum & Chemical Corporation
Firm

3) 300 Lakeside Drive
Oakland, California 94604
Mailing Address

4) Joseph E. O'Connell 2/28/73
Signature

5) 17208
Florida Registration Number

For Department's Use Only ⟶ Permit No. ____________ Date: ____________

Project History

APC CONSTRUCTION PERMIT NO. & DATE IC 1295 dated 2/21/72

DIVISION OF HEALTH SERIAL NO. & DATE Not Applicable

The undersigned owner or authorized representative* of Kaiser Chemicals, Mulberry, Florida is fully aware that the statements made in this form and the attached exhibits and statements constitute the application for an Operation Permit from the Florida Department of Air and Water Pollution Control and certifies that the information in this application is true, correct and complete to the best of his knowledge and belief. Further, the undersigned agrees to comply with the provisions of Chapter 403, Florida Statutes, and all the rules and regulations of the Department or revisions thereof. He also understands that the Permit is non transferable and, if granted a permit, will promptly notify the Department upon sale or legal transfer of the permitted establishment.

S F Crawford

Signature of owner or agent.

Plant Superintendent

Name and Title

Date: March 1, 1973

*Attach letter of authorization.

Information Regarding Pollution Sources and Control Facilities

Actual Cost of Control Facilities

Total $ 800,000

Treatment Units $ 500,000

Collection Systems $ 300,000

I General

A. Domestic Waste Source

1. Present population (municipality, institutions, etc.)
2. Population served by plant.
3. New design population to be served. Not Applicable
4. Present approved capacity of plant ____________ MGD.
5. New design capacity ____________ MGD.

B. Area Water Supply.

1. Source Two Water Wells (About 200 Ft. deep)
2. Volume used 200 GPM Maximum (150 gpm avg)
3. Name and address of owner Kaiser Aluminum & Chemical Corp., P. O. Box 646, Mulberry, Flodira 33860

C. Industrial Waste Source.

1. Type of industry or products manufactured.

   a) The Mulberry Facility produces the industrial chemical, Sodium Silico Fluoride.

2. Raw materials and chemicals used (if confidential information is involved, see Section 17-4.04 (1)(c) FAC).

   a) Major raw materials are Fluosilicic Acid and Sodium Chloride.

   b) Minor amounts of Sodium Carbonate, a non-biodegradable wetting agent and boiler water treatment chemicals are routinely consumed.

3. Estimated Production Rate 200 Tons/Day of Na_2SiF_6
(Tons/day, Lbs/Day, etc.)

4. Normal operation: 24 hrs/day - 7 days/week
(Hrs/Day, Days/Week)

5. Attach an 8½" x 11" schematic flow diagram showing the source of each waste, method of collection, measurement and transmission to the treatment plant.

D. Include a USGS topography map detailing the location of the establishment, all permanent structures and roadways in the vicinity, the waste treatment plant, the receiving stream and points of effluent discharge. (See also p. 8-B, item C 5.)

E. Submit a diagrammatic layout of the treatment plant units and indicate the direction of waste flow.

II Raw Waste Characteristics

A. Daily Flow, gpd	Average	Maximum	Design
1. Domestic Waste			
2. Industrial:	360,000 GPD	432,000 GPD	432,000 GPD
3. Total	360,000 GPD	432,000 GPD	432,000 GPD

B. 5-day BOD load	ppm (average)	lbs/day (average)	lbs/day Maximum	lbs/day Design
1. Domestic Waste				
2. Industrial:				

Non-degradable inorganic chemicals only.

3. Total NO BOD LOAD

Other Raw Waste Characteristics (Complete where applicable)

Constituent	Concentration	Constituent	Concentration
Suspended Solids (vol.)		Total Nitrogen	
Suspended Solids (fixed)		Total Phosphate	0.1%
Suspended Solids (total)	0.9%	Surface-active agents	Tr.
Total Solids (vol.)		Oils and Greases	
Total Solids (fixed)		Carbon Chloroform Extr.	
Total Solids	5.5%	Chlorides	6.5%
Dissolved Solids (total)	4.6%	Fluorides	0.3%
Settleable Solids	0.9%	Phenolic Compounds	
Turbidity		pH	< 1.0
Color	Off White	Iron	
Specific Conductance		Cyanides	
Temperature	Ambient	Cyanates	
Dissolved Oxygen		Hex. Chromium	
COD		Total Chromium	
Total Coliform		Copper	
Fecal Coliform		Zinc	
Organic Nitrogen		Lead	
Ammonia Nitrogen		Arsenic	
Nitrate Nitrogen		Silver	
Radioactive Materials		Others Total acidity as HCl	< 5.0%
Mercury			

III Treatment and Disposal Units

A. List the sequence of treatment units and disposal systems and specify the number, dimensions, capacity and design criteria. Use additional sheets if necessary.

Treatment or Disposal Unit	Dimensions, Areas Capacities and Other Descriptive Data	Design Criteria

1. The plant effluent flows by gravity from the process unit to a Hypalon lined storage pond (400 x 68 x 12').
2. The stream is then transferred to a 40,000 gal. lined pump tank for injection into the deep disposal well.
3. The injection pumps are capable of injecting the effluent into the deep-disposal well.
4. The effluent is then injected into the corrosion resistant well where it is neutralized with the natural occurring limestone formation 4500 ft. below the surface.

B. Indicate the reduction in concentration of each pollutant with each successive step in treatment (Eg. –BOD: Raw –250 ppm, primary settling –130 ppm, secondary settling –20 ppm, polishing pond 10 ppm). Do not include any disposal structures such as drainfields, seepage ponds or ditches. Effluent samples for final effluents should be collected prior to chlorination or after dissipation of excessive residual chlorine in polishing ponds. Use table other than the one given below if additional pollutants are to be listed.

Treatment Units in Sequence	Pollutants Concentration, mg/1									
			Total Solids				Nitrogen			
			Dissolved		Suspended					
	5-day BOD	COD	Vol.	Fixed	Vol.	Fixed	Org	NH_4	NO_3 NO_2	Total Phosphate
RAW	NOT APPLICABLE									
Final Effluent										
Overall Per Cent Reduction										

C. Other Characteristics of Final Effluent: pH < 1.0
Temperature Ambient
FECAL Coliform Not Applicable

D. Chlorination Not Applicable

1. Yes [ ] No XX
2. Points of application
3. Type of chlorinator
4. Maximum capacity of chlorinator
5. Chlorine dosage
6. Retention time in contact tank (based on peak flow)
7. Average chlorine residual in effluent

IV Ultimate Effluent Disposal

A. Type of Receiving Body

1. Surface waters: Fresh ☐ Salt or Brackish ☐

2. Ground waters:
   - surface or sub-surface irrigation ☐
   - ponding and percolation ☐
   - recharge wells ☐

   Subsurface Disposal

3. Evaporation to atmosphere ☐

B. If Discharge is to Surface waters complete the following:

1. Drainage ditch ☐
   River ☐
   Landlocked Lake ☐
   Tidal Estuary ☐
   Small Stream ☐
   Man-made Canal ☐
   Lake with outlet ☐
   Ocean or Gulf ☐

2. Identify and describe the drainage path of effluents to major body of water.

   Not Applicable.

3. Minimum weekly-average flow of the receiving bodies of water for 10 year period.

   Not Applicable.

4. Degree of dilution provided by receiving waters at minimum flow.

   Not Applicable.

5. Use and classification of the receiving waters.

   Not Applicable.

6. Indicate in a separate sheet, the physical, chemical and biological characteristics of the receiving waters. Include information on tidal effects, turbulence, quiescence etc., which may be pertinent to the capacity of the waters to assimilate effluents.

   Not Applicable.

Description of Outfall   **Not applicable - No outfall.**

1. Approximate water depth at outfall during low flow.

2. Approximate depth below outfall invert.

3. Diameter of outfall.

4. Approximate length of outfall from shoreline.

5. Show the location of outfall(s) in relation to water supply intakes, other waste outfalls and other activities in the receiving stream and the high and low water elevations on the USGS map, item D, p. 4-B.

6. Submit the plan and profile of the outfall in an 8½" x 11" sheet and indicate the depth of the outfall in relation to normal, high and low water lines.

D. If discharge into ground waters is involved during treatment of disposal, furnish the following information. Include plans, sketches and additional sheets to give all the relevant information.

1. Surface or Sub-Surface Irrigation. –   **See attached Report**

a) Description of disposal structure(s)

b) Area under irrigation

Total:

Per Rotation:

c) Irrigation rate:

d) Percolation rate:

e) Ultimate disposal of surface or sub-surface runoff

f) Cover Crop.

2. Seepage Ponds. –

a) Area of the pond Not applicable.

b) Depth of water in the pond

c) Percolation rate

d) Indicate if there will be any overflow during rainfall.

3. Describe the geohydrology of groundwater in the disposal area. Indicate the elevations of groundwater table and piezometeric surface of any artesian aquifer in reference to mean sea level. Show the direction of groundwater flow. Identify the number of wells within 500 feet of disposal area and indicate the water level elevations.

a) See attached Report

b) Two water wells on plant site (depth 200ft.)

4. Approximate number of wells within 1 mile of the disposal area.

20 Shallow Wells (less than 100' deep)

5. Indicate all sources and uses of surface water within 1 mile of the disposal area and the water level elevations.

Not Applicable.

6. Describe the chemical and biological characteristics and uses of the area ground water.

Deepest fresh water is at 1300'. Saline water exists below this level. Fresh water is used for drinking and process water. No known use for saline waters.

V. Other Information on Treatment and Control

A. Sludge Handling and Disposal

1. List sludge treatment units

Storage Pond and Pump Tank

2. Volume and composition of the final sludge

Small amount of Na_2SiF_6 and SiO_2

3. Methods of ultimate sludge disposal

Impoundment on plant property

B. Laboratory

1. List tests for which equipment/chemicals are provided

Not Applicable.

2. List tests to be performed routinely, sampling points and the frequency of sampling

a) Test for solids once per shift.

b) Sample effluent daily and analyzed weekly.

c) Sample and analyze monitor wells weekly.

C. Operation

1. Name(s) of full time operators and their qualifications

J. P. Mullenax   G. M. Anderson

F. L. Hazel   J. M. Hobby

2. List the names of part-time operators and their qualifications

NONE

3. Duration of time in a day the plant will be under the supervision of qualified personnel.

24 hours/day

D. State if any of the treatment units will be bypassed. Specify when such bypasses are to be used and under what conditions.

The storage pond would be used to hold effluent while maintenance is being performed on the disposal well system.

E. Is auxiliary power provided for operation of treatment plant, lift stations and chlorinator?

No auxiliary power is provided. The plant would be shut down when power is lost.

F. List all the stand-by equipment provided; types and locations of measuring and recording equipments and any other special operational features.

1. An installed standy-by injection pump.
2. Effluent Stream Flow and Pressure Recorders.
3. Disposal well annulus pressure recorder.
4. Conductivity alarm failed during start-up. Continued recording of oil pressure indicates no leakage; this system performs satisfactorily as back up for the conductivity alarm.
5. Fresh water monitor wells set to a 1300' depth and 2900' depth.

G. Describe the control procedures to prevent any accidental spills (or shock loads) from being discharged from the plant without adequate treatment.

The Storage Pond will contain any accidental spills.

H. If "in-plant" waste reduction and/or reuse is proposed, give the following information: Not Applicable.

1. List the procedures to reduce, recover and/or reuse any material in the plant discharge which would otherwise have increased the pollution strength or character of the discharge.
2. Categorize the estimated reduction in pollutional strength of effluents achieved by H (1) above before treatment.
3. State the total amount of water in different processes and the amount of process effluents reused.

Not Applicable.

STATE OF FLORIDA
DEPARTMENT OF POLLUTION CONTROL

APPLICATION TO OPERATE/CONSTRUCT POLLUTION SOURCES

SECTION I – GENERAL INFORMATION FOR ALL POLLUTION SOURCES

I TO BE FILLED IN BY APPLICANT

Source Type: Domestic/Municipal Wastewater

Type application: [X] Operation [ ] Temporary Operation [ ] Construction

Status Source: [ ] New [X] Existing [ ] Modification

Source Name: Kaiser Aluminum & Chemical Corporation County: Polk

Source Location: Street: P. O. Box 646 City: Mulberry, Florida 33860

(Water Source Only) Lat: 27 ° 54 ' 06 " Long: 82 ° 00 ' 03 "

(Air Source Only) UTM: East ______ North ______

Appl. Name and Title: Sam F. Crawford, Plant Superintendent

Appl. Address: P. O. Box 646, Mulberry, Florida 33860

II TO BE FILLED IN BY REGION (*BY BUREAU OF PERMITTING)

Control No: Region ______ County ______ Type ______ *Project ______

Type Permit	Date Rec'd	*Permit No.	*Issue Date	*Compl. Date	*Exp. Date
Operation					

Source Description: Effluent from Sodium Silico Fluoride Production

Control Equipment: Disposal Well

Water Permits

Receiving Body Code: No Surface Discharge Surface Water Code: Not Applicable

Station No.: Influent: Not Applicable Effluent: Not Applicable

Effluent:	Average	Design	% Reduction
Flow rate, MGD	0.360	0.432	No further discharge to surface waters.
BOD, lbs/day			
Susp. Sol., lbs/day			
Other:			

Air Permits

Operating Time: [ ] Continuous [ ] Intermittent

Fuel: Type ______ M-BTU/hr. In Put ______

Incinerator: Capacity, tons/day ______ Type Waste ______

Mfg. & Model ______

Pollutant Emissions, lbs/day	Actual	Design	Allowable
Particulate			
Sulfur Oxides			
Other:			

Implementation: Estimated Appl. Filing Date ______

Estimated Start of Const. ______ Estimated Compliance Date ______

DESCRIPTION OF PROPOSED PROJECT

A. Describe the nature and extent of the proposed project. Refer to existing pollution control facilities, DPC permits, conditions, orders and notices, expected improvement in performance of the facilities and state whether the proposed project will result in full compliance of the source. Attach additional sheet if necessary.

Injection of Plant effluent in disposal well constructed in accordance with DPC Construction Permit No. IC-1295. This project will result in full compliance of the source.

B. Schedule of Project Covered in this Application (Construction Permit Application Only).

Federally or State Financed Projects only:

Planning Complete

Financing Program Complete

Indicate other local, state and/or federal agency approvals and dates

All projects:

Start of Construction

Completion of Construction

C. Costs of Construction (Show a breakdown of costs for individual components/units of the proposed project serving pollution control purpose only). Information on actual costs shall be furnished with the application for operation permit.

Surface Facilities	$300,000
Disposal Well	$500,000

D. Indicate any previous DPC permits, issuance dates, and expiration dates.

Temporary Permit No. IT-53-8 dated April 15, 1971, Exp. April 15, 1972
Construction Permit No. IC-1295 dated Feb. 21, 1972, Exp. May 1, 1973

F. Indicate the relationship between this project and area regional planning for sewage treatment. List steps to be taken for this sewage treatment plant to become part of an area wide sewerage system.

Not Applicable.

DOMESTIC WASTEWATER TREATMENT PROCESS

A. **General**

Not Applicable.

1. Present Population: ____________
2. Population Served by Existing Plant: ____________
3. New Design Population to be Served: ____________
4. Present Approved Capacity of Plant: ____________ MGD
5. New Design Capacity Proposed: ____________ MGD

B. **Wastewater Treatment Process** Not Applicable.

1. Describe treatment process and identify treatment units:

____

2. Advanced Waste Treatment:

[ ] Nitrogen Removal
[ ] Phosphate Removal
[ ] BOD/Suspended Solids Removal
[ ] Other ____________

C. **Chlorination**

Not Applicable.

Points of Application: ____________

Chlorine Dosage: ____________

D. List sludge treatment units: Not Applicable.

E. Volume, Composition, and Site and Method of Ultimate Disposal of Sludge (Provide name and address of carrier, if applicable.)

Not Applicable.

F. Method(s) and location(s) of flow measurement

Not Applicable.

G. Describe practices to be followed to insure adequate treatment and disinfection during emergencies such as power and equipment failures.

Not Applicable.

DOMESTIC WASTEWATER CHARACTERISTICS

Information furnished in this section for Construction Permit shall be based on reasonable prediction and good professional judgment. However, actual data shall be submitted when applying for an operation permit.

A. Flow (MGD) Average

Not Applicable.

B. Water Quality Characteristics

Parameter	Influent ppm	Effluent (Before Chlorination)			Per Cent Removal
		ppm	Ave. lbs./day	Design lbs./day	
5-day BOD					
Total Solids: Total:					
Volatile:					
Suspended Solids: Total:					
Volatile:					
Total Nitrogen (N)*					
Total Phosphorus (P)*					
Other:					

*This requirement, if necessary, will be specified in construction permit.

C. Average Chlorine Residual in Effluent ____________ ppm

D. List industrial wastes, if any, treated in combination with domestic wastes:

ULTIMATE EFFLUENT DISPOSAL

A. Type of Receiving Body

1. Surface waters: Fresh [ ] 1
   Salt or Brackish [ ] 2

2. Ground Waters: Surface or Sub-surface Irrigation [ ] 3
   Ponding and Percolation [ ] 4
   Recharge Wells [ ] 5

   Subsurface Disposal Zone 4000' to 5000'

3. Evaporation to Atmosphere [ ] 6

B. If discharge is to surface waters complete the following:

Not Applicable.

1. Drainage Ditch [ ] 1
   River [ ] 2
   Landlocked Lake [ ] 3
   Tidal Estuary [ ] 4
   Small Stream [ ] 5
   Man-made Canal [ ] 6
   Lake with Outlet [ ] 7
   Ocean or Gulf [ ] 8

2. Identify and describe the drainage path of effluents to major body of water: No surface discharge.

3. Use and Florida's Water Quality Classification of the Receiving Waters:

C. Description of Outfall to Area Surface Water

Not Applicable - No surface discharge.

1. Approximate Water Depth at Outfall During Low Flow: ______

2. Approximate Depth Below Outfall Invert: ______

3. Diameter of Outfall: ______

4. Approximate Length of Outfall from Shoreline: ______

D. If discharge into ground waters is involved during treatment or disposal, furnish the following information.

1. Surface or Sub-surface Irrigation

   a) Description of Disposal Structure(s) Disposal Zone 4000' to 5000' porous limestone. See attached Geology Report.

   b) Area Under Irrigation
      Total: Not Applicable.
      Per Rotation:

   c) Irrigation Rate: Not Applicable.

   d) Percolation Rate: Not Applicable.

   e) Ultimate Disposal of Surface Sub-surface Runoff
      Not Applicable.

f) Cover Crop: Not Applicable.

g) Number and Locations of Groundwater Monitoring Wells: 2 monitor wells adjacent to Disposal Well set to 1300' depth and 2900' depth.

2. Seepage Ponds

a) Area of the Pond(s): Not Applicable.

b) Depth of Water in the Pond: ______

c) Percolation Rate: ______

d) Indicate if there will be any overflow during rainfall: ______

e) Groundwater table elevation in relation to pond bottom: ______

f) Number and locations of groundwater monitoring wells: ______

E. Environmental Data on Pollution Source

Character of Area Within One Mile of Plant: Flat country side.

Distance from the Nearest Municipality: 2 miles.

Owner of Land (if different from applicant): ______

Availability of space for expansion of plant: Owner's property available.

Indicate the number of (potable) water supply wells within 500 feet of effluent disposal area, the depths of these wells and their approximate distances from the disposal area:

Kaiser Wells #1 & 2 - depth 200' - location 125' from disposal well.

CERTIFICATION OF COMPLETION OF CONSTRUCTION

Domestic/Industrial Wastewater Treatment and Disposal Systems (for Application to Operate Only)

DPC Project No.:

County: Polk

Name of Project: Disposal Well

Name of Owner: Kaiser Aluminum & Chemical Corp.

Name of Engineer: J. E. O'Connell

Scope of Project: Disposal Well and Surface Facilities

Cost: Estimated $ 800,000 Actual $800,000

Plant Design: Flow: ______ gpcd 0.432 MGD

Population ______ No. of Connections ______

Deviations from Plans Approved by the DPC: None

Effluent Drainage Path from Plant: None

Address & Telephone No. of Plant: Kaiser Aluminum & Chemical Corporation
P. O. Box 646, Mulberry, Florida 33860
(813) 425-1195

Name(s) of Operator(s): J. P. Mullenax, F. L. Hazel, G. M. Anderson, J. M. Hobby

Date Plant Placed in Operation: 1957

This is to certify that, with the exception of deviations noted above, the construction of the project has been completed in accordance with the plans authorized by Construction Permit No.: IC-1295 Dated Feb. 21, 1972.

Date: 2/28/73

Joseph E. O'Connell

Signature of Project Engineer

STATEMENTS BY APPLICANT AND ENGINEER

A. **Applicant**

The undersigned owner or authorized representative of * Kaiser Aluminum & Chemical Corporation is fully aware that the statements made in this application for a Operation permit are true, correct and complete to the best of his knowledge and belief. Further, the undersigned agrees to maintain and operate the pollution source and pollution control facilities in such a manner as to comply with the provisions of Chapter 403 Florida Statutes and all the rules and regulations of the Department or revisions thereof. He also understands that a permit, if granted by the Department, will be non-transferable and he will promptly notify the Department upon sale or legal transfer of the permitted establishment.

S F Crawford
Signature of the Owner or Authorized Representative

Sam F. Crawford, Plant Superintendent
Name and Title (Please Type)

Date: 2/28/73 Telephone No.: (813) 425-1195

* Attach a letter of authorization

B. **Professional Engineer Registered in Florida:**

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the Department. It is also agreed that the undersigned will furnish the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signature Joseph E. O'Connell

Name: J. E. O'Connell
(please type)

Florida Registration Number 17208
(Please affix seal)

Mailing Address: Kaiser Alum. & Chem. Corp.
300 Lakeside Drive
Oakland, California 94604

Telephone No.: (415) 271-5468

Date: 2/28/73

White copy

STATE OF FLORIDA

DEPARTMENT OF POLLUTION CONTROL

SUITE 300, TALLAHASSEE BANK BUILDING
315 SOUTH CALHOUN STREET, TALLAHASSEE, FLORIDA 32301

VINCENT D. PATTON
EXECUTIVE DIRECTOR

DAVID H. LEVIN
CHAIRMAN

March 8, 1972

Polk County IW
Kaiser Aluminum and Chemical Corporation
Mulberry Works

Mr. S. F. Crawford
Plant Manager
Mulberry Works
Kaiser Aluminum and Chemical Corporation
Post Office Box 646
Mulberry, Florida 33860

Dear Mr. Crawford:

This will acknowledge receipt of construction permit applications and other applicable documents for a deep injection well waste water disposal system to serve the Kaiser Aluminum and Chemical Corporation sodium silico fluoride plant located at State Road 60 and Old Highway 60, East of Mulberry, in Polk County, Florida.

These documents have been reviewed and the attached construction permit No. IC 1295 dated February 21, 1972 has been issued subject to the following provisos:

1. Construction of this installation shall be completed by November 1, 1972.

2. This installation shall be operated by a competent and qualified person. Operations shall be conducted according to the best accepted practices and the recommendations of the Department of Pollution Control.

3. This construction permit is issued with the understanding that the owner may need to comply with county, municipal, or other local regulations prior to construction.

4. The applicant shall continue the retention of the engineer of record for the inspection of the construction of this project. Upon completion, the engineer shall inspect for conformity to construction permit applications and associated documents. A report of such inspection shall be submitted by the engineer to the Department of Pollution Control for consideration toward the issuance of an operation permit. Notification of the pending completion of this project shall be transmitted in writing to the Department by the engineer approximately two weeks before the completion of construction.

5. This construction permit expires on May 1, 1973, following an initial period of operation for appropriate testing to determine compliance with the Rules of the Florida Department of Pollution Control.

6. Detailed plans and specifications for this report shall be available upon request by the Department of Pollution Control.

7. The Florida Department of Pollution Control shall be notified of any changes or revisions made during construction of this system.

8. Any time this system is found to be performing inadequately because of overloading, neglect, or other reasons, the owner shall provide additional measures to correct the cause of inadequate performance.

9. A completely closed circulatory system shall be provided during construction of the injection well, for containing all saline water produced.

10. The injection well and casing arrangement shall be constructed in accordance with Subsurface Disposal Corporation Drawings 871-232 (Revision dated 2/2/72), 871-233-1 (Revision dated 2/2/72), 871-233-2 (Revision dated 2/2/72) and 871-233-3 (Revision dated 2/2/72).

    The hastelloy steel casing shall be extended through the anhydrite zone into the injection zone.

11. The injection well shall be located a minimum of 25 feet from septic tanks and drainfields.

12. Provisions for monitoring the fresh water aquifer and the aquifer immediately above the anhydrite aquiclude shall conform with the addendum of February 7, 1972 to the original construction permit application, incorporating monitoring revisions called for in the Department of Pollution Control's letter of December 20, 1971. Any further changes in monitoring provisions will be subject to approval by the Department of Pollution Control.

13. Geophysical logging during and after construction of the injection well shall include sonic, temperature, gamma ray, formation density, caliper, and induction electric logs. Sonar logging accompanied with sonic logging shall be conducted every two years.

    In regard to assistance during logging by the Bureau of Geology Florida Department of Natural Resources and/or the USGS, it is important that the office which will assist in logging be advised of progress and allowed sufficient time for logger scheduling at the project.

14. Cuttings shall be submitted by bus collect by well driller to the State Geologist, Tallahassee, Florida. Samples shall be taken at not more than 10 feet intervals.

15. The injection well shall be provided with an adequate relief valve.

16. The injection pressure shall not exceed 1000 psi.

17. Sidewall cores from the confining layer and disposal strata shall be obtained during drilling, if possible.

18. Drill stem or other formation tests in the disposal zone shall be conducted during injection well construction for obtaining disposal zone pressures and formation fluid samples. A com-plest chemical analysis shall be conducted on the formation fluids.

 The USGS shall be advised sufficiently in advance as to the time of testing and sampling disposal zone formation fluids so that USGS personnel can be on-site for conducting comprehensive geochemical sampling in addition to sampling by Kaiser Aluminum and Chemical Corporation.

19. A separate monitoring well shall be drilled to the disposal zone if injection tests substantiate that injection pressures will exceed certain limits to be established by the USGS. These injection tests to be conducted upon completion of the injection well and logging, shall include tests described in the construction permit application addendum of February 7, 1972, or as requested by the Department of Pollution Control upon advice from the USGS.

20. A sample of the disposal zone fluids shall be taken by a recognized chemist, examined for chlorides, and the results submitted to this office.

21. The injection well shall be capped when not in use.

22. The injected waste water shall be monitored continuously for flow and pressure. The injected waste water shall also be sampled daily with examinations to be conducted for chlorides, specific conductance, pH, sulfates, fluorides, alkalinity, total acidity as HCl and calcium magnesium ratios.

 Well annular pressures shall be monitored continuously.

Both fresh water aquifer and the aquifer immediately above the anhydrite aquiclude zone shall be monitored at least on a daily basis for flow, chlorides, specific conductance, pH, sulfates, fluorides, alkalinity, total acidity as HCl, and calcium magnesium ratios in close cooperation with the Bureau of Geology, Florida Department of Natural Resources and the USGS.

Monthly operation reports containing these test results shall be submitted in duplicate to the West Central Florida Regional Office, Post Office Box 944, Winter Haven, Florida 33881 as well as the Bureau of Geology, Florida Department of Natural Resources, Post Office Drawer 631, Tallahassee, Florida 32302; the District Chief, USGS, 903 West Tennessee Street, Tallahassee, Florida 32304; and the Subdistrict Chief, USGS, Room 437, Federal Building, 500 Zack Street, Tampa, Florida 33602.

23. Prior to the construction of the injection well, supply wells on adjacent properties shall be sampled by Kaiser Aluminum and Chemical Corporation. Analysis shall be conducted by an independent laboratory. Property owners shall be provided with the results for future reference.

24. Kaiser Aluminum and Chemical Corporation shall implement immediate corrective action in the event that salt water or effluent intrusion into usable area ground water supplies can be traced to either the construction or operation of this injection well.

25. The HCl concentration of the injected waste water shall not exceed 5% in order to insure that carbon dioxide generated in the reaction between the waste water and the disposal zone limestone formation will be maintained in the soluble form. Reference is made to Kaiser Aluminum and Chemical Corporation's carbon dioxide solubility graph included in the original application of October 8, 1971.

26. This construction permit is issued with the understanding that the characteristics of the waste water following neutralization in the disposal zone will approximate that of the disposal zone fluids and that gaseous carbon dioxide will not be evolved. In this regard an operation permit will not be issued until cavity development has been fully evaluated and it has been substantiated that evolution of gaseous carbon dioxide is not occuring. Otherwise adequate neutralization of waste water prior to injection will be required.

27. The issuance of a permit to drill will await notification by Kaiser Aluminum and Chemical Corporation to this Department as to the driller, and a letter from the driller indicating his retention.

Your cooperation in this matter will be appreciated.

Sincerely,

W. E. Linne, Acting Chief
Bureau of Permitting

WEL/wjt

Attachment

cc: West Central Regional Engineer
Polk County Health Department
Polk County Board of County Commissioners
Mr. Rabey J. Funk, P.E.
Mr. J. E. O'Connell
USGS, Tallahassee
Southwest Fla. Water Management District
Bureau of Geology
Mr. Donald E. Baxter
Division of Planning
Dr. G. J. Thabaraj
USGS, Tampa

SUBSURFACE DISPOSAL CORP.
5535 WEST LOOP SOUTH, HOUSTON 77401

SCALE: NO	APPROVED BY: RJJ	DRAWN BY: CC
DATE: 10-16-72		REVISED
	WELL DESIGN	DRAWING NUMBER 1072-100

SURFACE FACILITIES

1) Normal Operation - The surface facilities for the disposal well will be installed as shown on Drawing S-118-5. The plant effluent will flow by gravity to a Hypalon lined earthen storage pond from where it will be transferred to a 40,000 gallon rubber lined surge tank. A corrosion resistant injection pump will inject the waste into the well. The fluid level in the surge tank will be maintained by a level control system. Other instrumentation on the system will provide for flow, temperature and pressured indication.

2) Safety Features

   The following safety features will be included in the design of the disposal system:

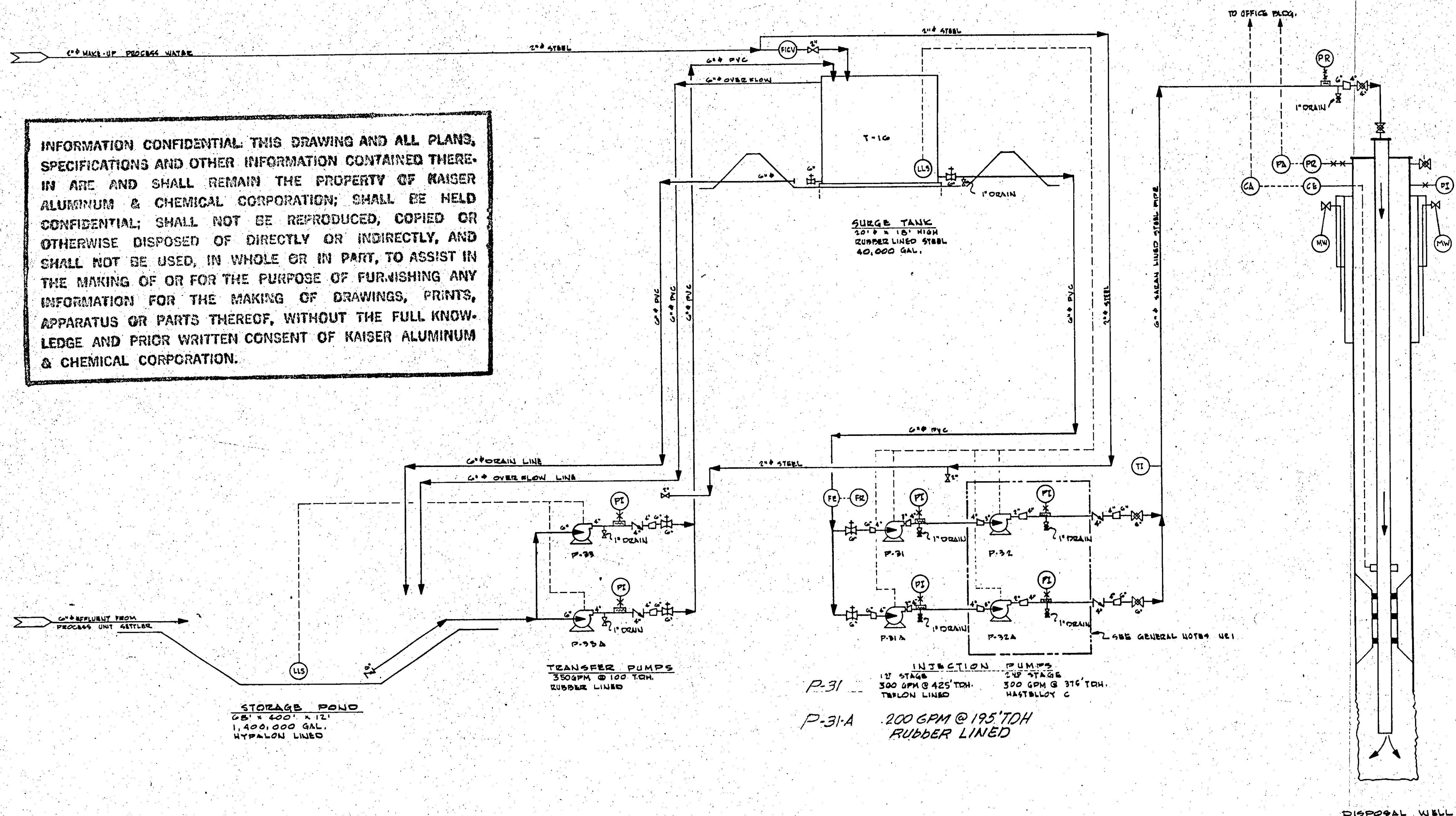
   a) Waste Flow Alarm - An alarm will be provided to indicate if the flow is out of normal operating range.

   b) Surge Tank Level Alarm - An alarm will be provided to indicate abnormal tank levels.

   c) Well Pressure Alarm - A pressure recorder with alarm will be used to monitor the well annulus pressure. An alarm would indicate a leak in the well casing or injection pipe.

   d) Well Conductivity Alarm - A conductivity recorder and alarm will also monitor the fluid in the well annulus. An alarm would indicate a leak in the well casing or injection pipe.

INFORMATION CONFIDENTIAL: THIS DRAWING AND ALL PLANS, SPECIFICATIONS AND OTHER INFORMATION CONTAINED THEREIN ARE AND SHALL REMAIN THE PROPERTY OF KAISER ALUMINUM & CHEMICAL CORPORATION; SHALL BE HELD CONFIDENTIAL; SHALL NOT BE REPRODUCED, COPIED OR OTHERWISE DISPOSED OF DIRECTLY OR INDIRECTLY, AND SHALL NOT BE USED, IN WHOLE OR IN PART, TO ASSIST IN THE MAKING OF OR FOR THE PURPOSE OF FURNISHING ANY INFORMATION FOR THE MAKING OF DRAWINGS, PRINTS, APPARATUS OR PARTS THEREOF, WITHOUT THE FULL KNOWLEDGE AND PRIOR WRITTEN CONSENT OF KAISER ALUMINUM & CHEMICAL CORPORATION.



SYMBOLS:

- (PI) PRESSURE INDICATOR
- (FR) FLOW RECORDER
- (FE) FLOW ELEMENT
- (TI) TEMPERATURE INDICATOR
- (CA) CONDUCTIVITY ALARM
- (CE) CONDUCTIVITY ELEMENT
- (PR) PRESSURE RECORDER
- (PA) PRESSURE ALARM
- (LLS) LOW LEVEL SWITCH
- (MW) MONITER WELL
- (FICV) FLOW INDICATOR CONTROL VALVE
- GATE VALVE
- CHECK VALVE
- PINCH VALVE
- PLUG VALVE

GENERAL NOTES:

1. THE SECOND STAGE INJECTION PUMPS WILL NOT BE INSTALLED WITH THE ORIGINAL INSTALLATION. THE SECOND STAGE PUMPS WILL BE SIZED AND PURCHASED AFTER THE WELL HAS BEEN DRILLED AND TESTED. TEMPORARY JUMPER PIPING WILL BE INSTALLED TO ALLOW OPERATION OF THE SYSTEM AT A REDUCED RATE.

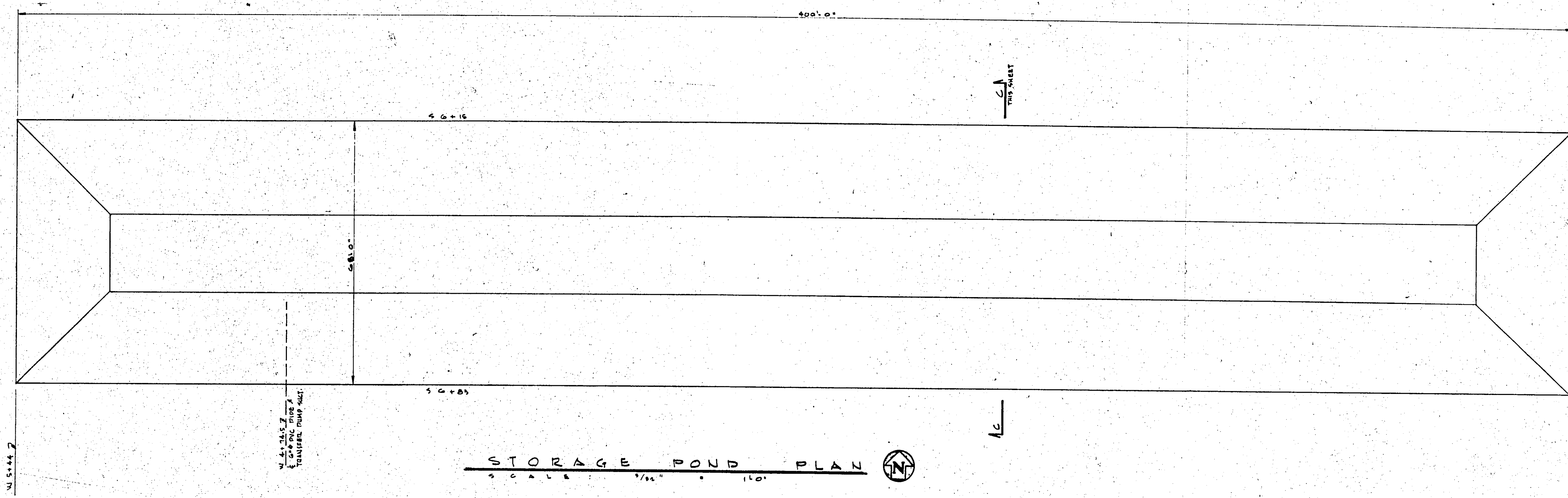
KAISER ALUMINUM & CHEMICAL CORP.
CHEMICAL DIVISION—GRAMERCY, LOUISIANA

MULBERRY PLANT AREA 118
NEW DISPOSAL WELL FACILITIES
P & I D

DRAWN C.E.LEDIG	DATE 12-7-71	SCALE NONE	
CHECKED	DATE	JOB NO. KFI 183	
APPROVED	DATE	DWG. NO.	REV.
APPROVED	DATE	118-5 SHEET 1 OF	0
APPROVED	DATE		

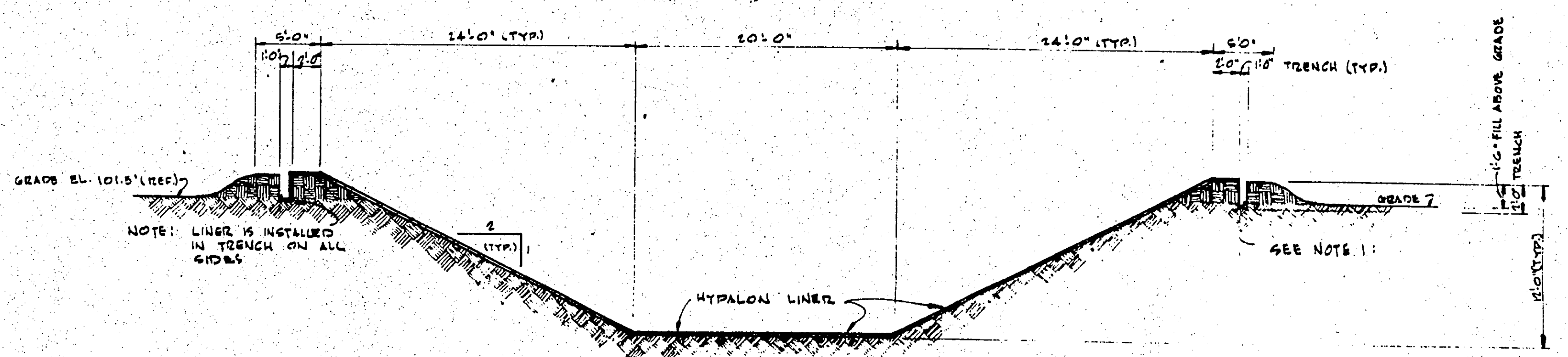
KAISER REFERENCE DRAWINGS	NUMBER	CONTRACTOR REFERENCE DRAWINGS	NUMBER

NO.	DATE	REVISION	BY	CHECKED	APPROVED	NO.	DATE	REVISION	BY	CHECKED	APPROVED



STORAGE POND PLAN

SCALE: 1/32" = 1'-0"



SECTION "C-C"

SCALE: 3/16" = 1'-0"

GENERAL NOTES:

1. LINING ANCHOR TRENCH TO BE DUG AND BACKFILLED BY LINING INSTALLATION CONTRACTOR.
2. HYPALON LINER TO BE FURNISHED AND INSTALLED IN ACCORDANCE WITH KACC SPECIFICATION MC-19.
3. PRIOR TO INSTALLATION OF LINER, POND SURFACE TO BE HAND RAKED BY CIVIL CONTRACTOR.

KAISER ALUMINUM & CHEMICAL CORP.
CHEMICAL DIVISION—GRAMERCY, LOUISIANA

MULBERRY PLANT — AREA 118
NEW DISPOSAL WELL FACILITIES
STORAGE POND
PLAN & SECTION

DRAWN C.R.LEDIG	DATE 12-28-71	SCALE AS SHOWN	
CHECKED	DATE	JOB NO. R-183-14-000	
APPROVED	DATE	DWG. NO. 118-5 SHEET 2 OF	REV. 0
APPROVED	DATE		
APPROVED	DATE		

KAISER REFERENCE DRAWINGS | NUMBER | CONTRACTOR REFERENCE DRAWINGS | NUMBER

NO. | DATE | REVISION | BY | CHECKED | APPROVED | NO. | DATE | REVISION | BY | CHECKED | APPROVED

Operational Details

The low pH chloride waste from the Mulberry plant will be injected into a limestone reservoir by means of a disposal well. This naturally occurring limestone will neutralize any acid present. The effect of the waste is not necessarily to continually enlarge the well bore, but principally to enlarge existing openings such as fissures, porosity (solution openings) and fractures.

As the waste is forced from the well bore back into the matrix of the formation it will continually be enlarging the natural openings thus reducing the forces necessary to move the acid back into the matrix. With the enlargement of the openings, the effect of suspended solids in plugging the passages in the disposal zone will be reduced. The amount of limestone dissolved will be greater than the suspended solids in the injected waste.

Some enlargement of the bore hole will take place, but with the waste continually entering the formation any bore hole enlargement is expected to slow and eventually stabilize. No surface problems are anticipated from the removal of limestone around the well bore as evidenced by the presence of the cavernous boulder zones found about 200 feet deep throughout a large section of the Florida peninsula.

After the well has been in service for one year, Kaiser plans to have a sonar caliper survey run on the well. This will measure the diameter of the down hole enlargement.

Anticipated Volumes

Volumes to be injected are as follows:

Minimum GPM	Maximum GPM	Average GPM
150	300	250

Yearly Volumes are

Gallons	Gallons	Gallons
78,840,000	157,680,000	131,400,000

Formation Characteristics

The lower Cedar Keys from 4000' to approximately 4500' is a Dolomite, porous to very porous, finely crystalline, partly Dolitic and slightly Gypsiferous.

The Lawson Formation from 4500' to approximately 5265' is a Dolomite, coarsely crystalline, hard, porous to very porous and clean.

The disposal zone is expected to be a very excellent reservoir as verified by the enclosed core analysis report.

Compatibility

There should be no incompatibility problems between the connate waters and plant effluent. However, acid neutralization by the limestone will follow the reaction,

$$\underset{(72)}{2HCl} + \underset{(100)}{CaCO_3} \rightarrow \underset{(110)}{CaCl_2} + \underset{(18)}{H_2O} + \underset{(44)}{CO_2}$$

This reaction shows that for every 72 pounds of hydrochloric acid (HCl) injected, 100 pounds of limestone ($CaCO_3$) will be consumed and will generate 110 pounds of calcium chloride ($CaCl_2$), 18 pounds of water (H_2O) and 44 pounds of carbon dioxide (CO_2).

Since we do not desire to have gaseous carbon dioxide in the disposal zone, we must determine the solubility of carbon dioxide in the neutralized waste effluent.

The solubility of carbon dioxide in various aqueous solutions can be calculated from the enclosed graphs utilizing the following equation:

$$S = \left(\frac{S_s}{S_o}\right) S_{TP} \qquad (1)$$

S = Calculated Solubility
S_s = Solubility of CO_2 in Aqueous Solution
S_o = Solubility of CO_2 in fresh water
S_{TP} = Solubility of CO_2 in fresh water at desired temperature and pressure

Example:

Determine the solubility of CO_2 in a 6% $CaCl_2$ solution at 100° F and 2,000 psi.

1. From the graph labeled "Carbon Dioxide Solubility in Calcium Chloride Solutions" we find the solubility of CO_2 in 6% $CaCl_2$ (S_s) is 2.77 STD. cubic feet/barrel (petroleum). From the same graph we fine the solubility of CO_2 in 0% $CaCl_2$ (S_o) is 4.00 STD. cubic feet/barrel (petroleum).
2. From the graph labeled "Pressure Effect on Solubility of Carbon Dioxide in Water" we find the solubility of CO_2 at 100° F and 2,000 psi in 168 STD. cubic feet/barrel (petroleum).

3. Solving for S in equation (1) we find

$$S = \left(\frac{2.77}{4.00}\right)168 = 116.3 \text{ SCF/BBL}$$

4. The solubility of CO_2 in 6% $CaCl_2$ is 116.3 SCF/BBL or 2.77 SCF/Gallon.

The Mulberry plant effluent contains both hydrochloric acid (HCl) and sodium chloride (NaCl). The sodium chloride concentration remains at a relatively constant 3% both before and after the neutralization of hydrochloric acid (HCl) by limestone ($CaCO_3$). From the graphs labeled "Carbon Dioxide Solubility in Sodium Chloride Solutions" and "Carbon Dioxide Solubility in Calcium Chloride Solutions" we find that the solubility of CO_2 in 3% NaCl or 3% $CaCl_2$ is 3.3 SCF/BBL. Therefore, for the purpose of calculating CO_2 solubilities in the neutralized effluent we can assume the 3% NaCl is 3% $CaCl_2$.

The following are calculations for the solubility of CO_2 in the reaction product from various concentrations of HCl in the plant effluent.

A. 2% Hydrochloric Acid (HCl)

In 300 gallons of plant effluent containing 2% HCl you have 50.5 pounds of HCl. From the aforementioned neutralization reaction with limestone ($CaCO_3$) we find that this much HCl will produce 77.1 pounds of $CaCl_2$ (3%) and 249.6 SCF of CO_2. To determine the solubility of CO_2 in 300 gallons of this neutralized plant effluent we add 3% for the NaCl and solve for 6% $CaCl_2$ as follows:

$$S = \frac{\left(\frac{2.77 \text{ SCF/BBL}}{4.00 \text{ SCF/BBL}}\right)\left(168 \text{ SCF/BBL}\right)\left(300 \text{ GAL.}\right)}{42 \text{ GAL/BBL}}$$

$$S = 831 \text{ SCF } CO_2/300 \text{ GAL. Reaction Product}$$

B. 4% Hydrochloric Acid (HCl)

In 300 gallons of plant effluent containing 4% HCl you have 102 pounds of HCl. From the aforementioned neutralization reaction with limestone ($CaCO_3$) we find that this much HCl will produce 155.8 pounds of $CaCl_2$

(6%) and 504 SCF of CO_2. To determine the solubility of CO_2 in 300 gallons of this neutralized plant effluent we add 3% for the NaCl and solve for 9% $CaCl_2$ as follows:

$$S = \frac{\left(\frac{2.39 \text{ SCF/BBL}}{4.00 \text{ SCF/BBL}}\right)\left(168 \text{ SCF/BBL}\right)\left(300 \text{ GAL.}\right)}{42 \text{ GAL/BBL}}$$

$S = 717$ SCF CO_2/300 GAL. Reaction Product

C. 6% Hydrochloric Acid (HCl)

In 300 gallons of plant effluent containing 6% HCl you have 154.4 pounds of HCl. From the aforementioned neutralization reaction with limestone ($CaCO_3$) we find that this much HCl will produce 235 pounds of $CaCl_2$ (9%) and 761 SCF of CO_2. To determine the solubility of CO_2 in 300 gallons of this neutralized plant effluent we add 3% for the $NaCl_2$ as follows:

$$S = \frac{\left(\frac{2.12 \text{ SCF/BBL}}{4.00 \text{ SCF/BBL}}\right)\left(168 \text{ SCF/BBL}\right)\left(300 \text{ GAL.}\right)}{42 \text{ GAL/BBL}}$$

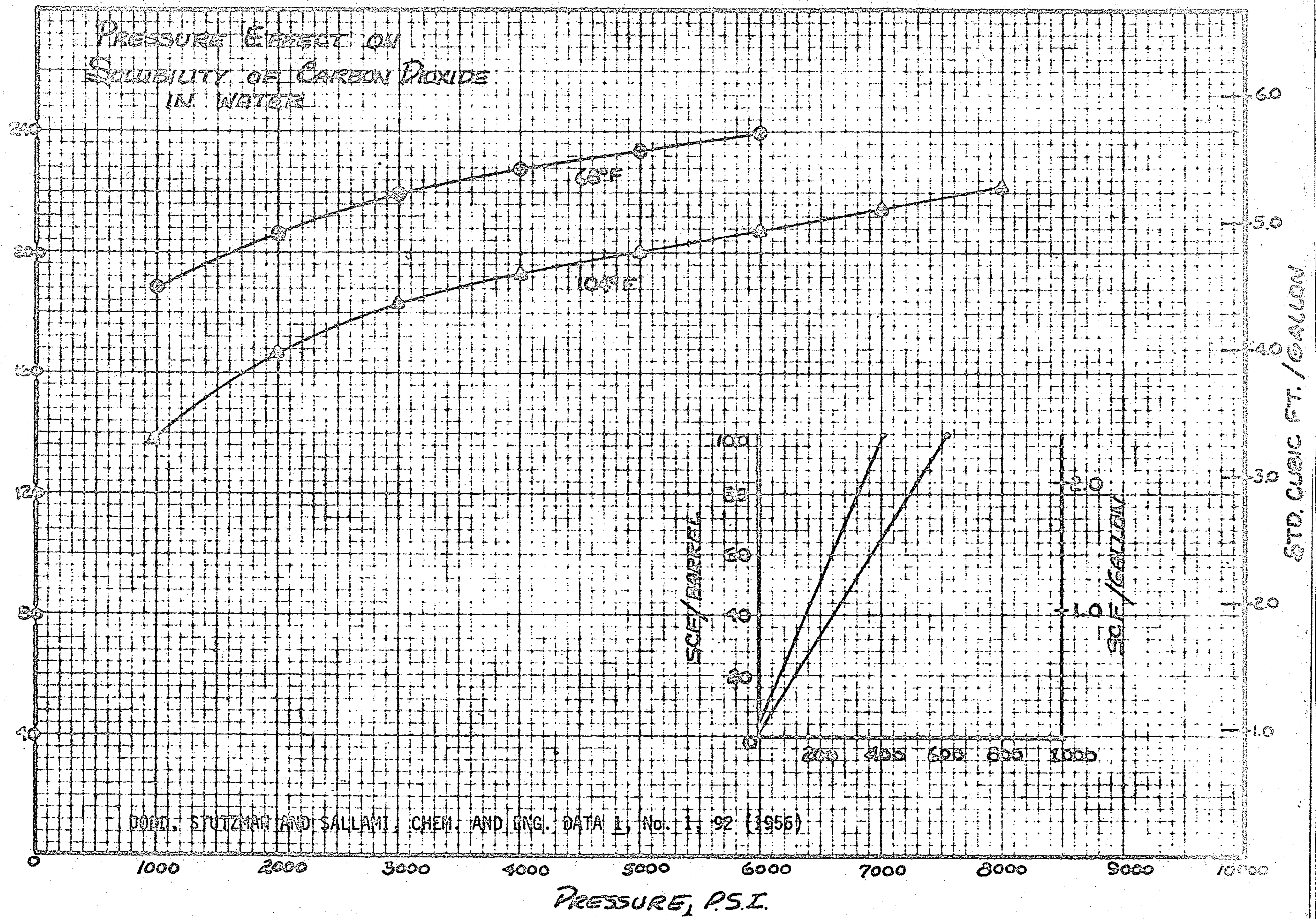
$S = 636$ SCF CO_2/300 GAL. Reaction Product

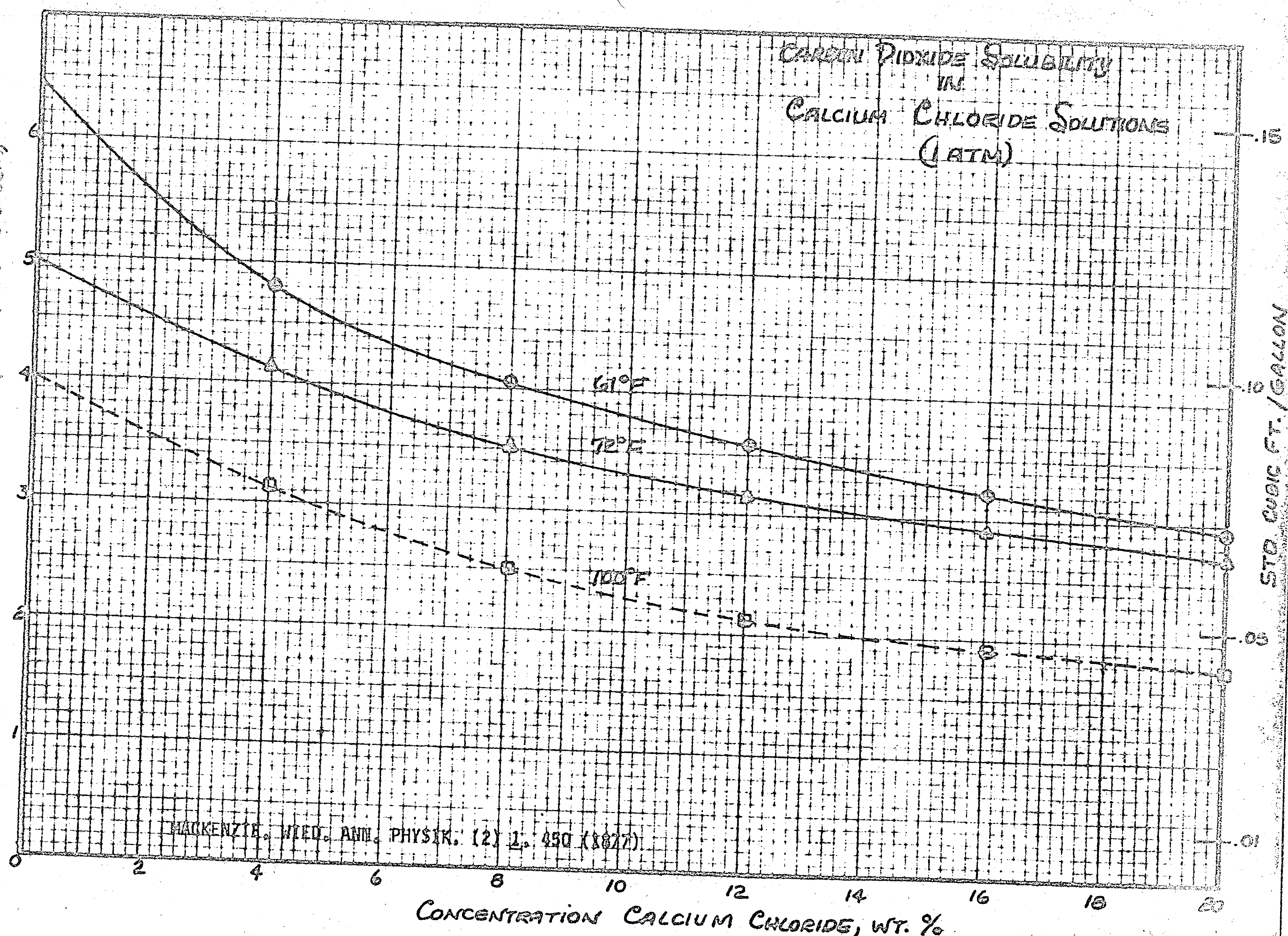
D. 8% Hydrochloric Acid (HCl)

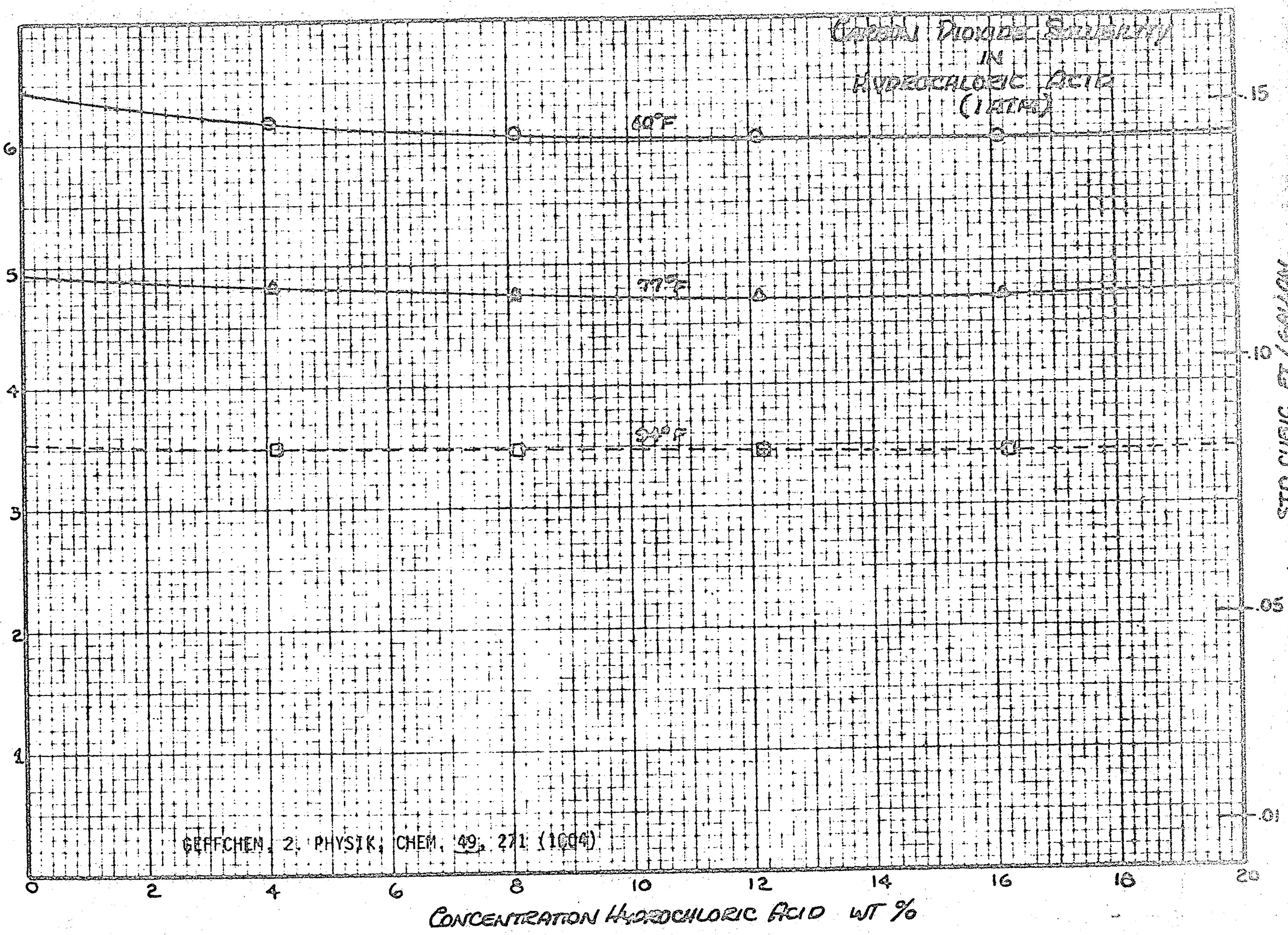
In 300 gallons of plant effluent containing 8% HCl you have 207 pounds of HCl. From the aforementioned neutralization reaction with limestone ($CaCO_3$) we find that this much HCl will produce 316 pounds of $CaCl_2$ (12%) and 1023 SCF of CO_2. To determine the solubility of CO_2 in 300 gallons of this neutralized plant effluent we add 3% for the NaCl and solve for 15% $CaCl_2$ as follows:

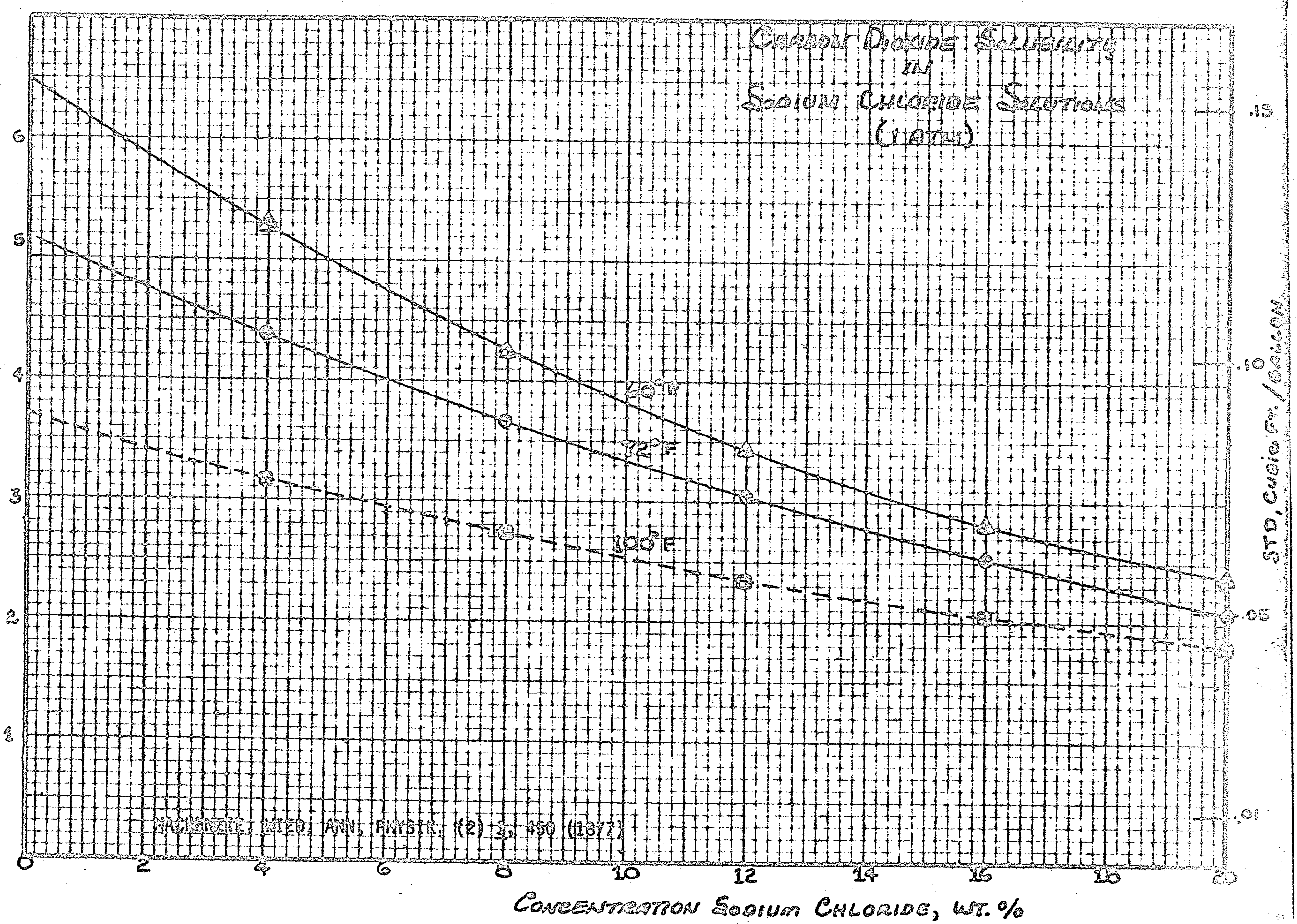
$$S = \frac{\left(\frac{1.95 \text{ SCF/BBL}}{4.00 \text{ SCF/BBL}}\right)\left(168 \text{ SCF/BBL}\right)\left(300 \text{ GAL.}\right)}{42 \text{ GAL/BBL}}$$

$S = 585$ SCF CO_2/300 GAL Reaction Product


PRESSURE EFFECT ON
SOLUBILITY OF CARBON DIOXIDE
IN WATER
68°F
104°F
SCF/BARREL
SCF/GALLON
STD. CUBIC FT. /GALLON
1.0
2.0
3.0
4.0
5.0
6.0
200
400
600
800
1000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
DODD, STUTZMAN AND SALLAMI, CHEM. AND ENG. DATA 1, No. 1, 92 (1956)
PRESSURE, P.S.I.

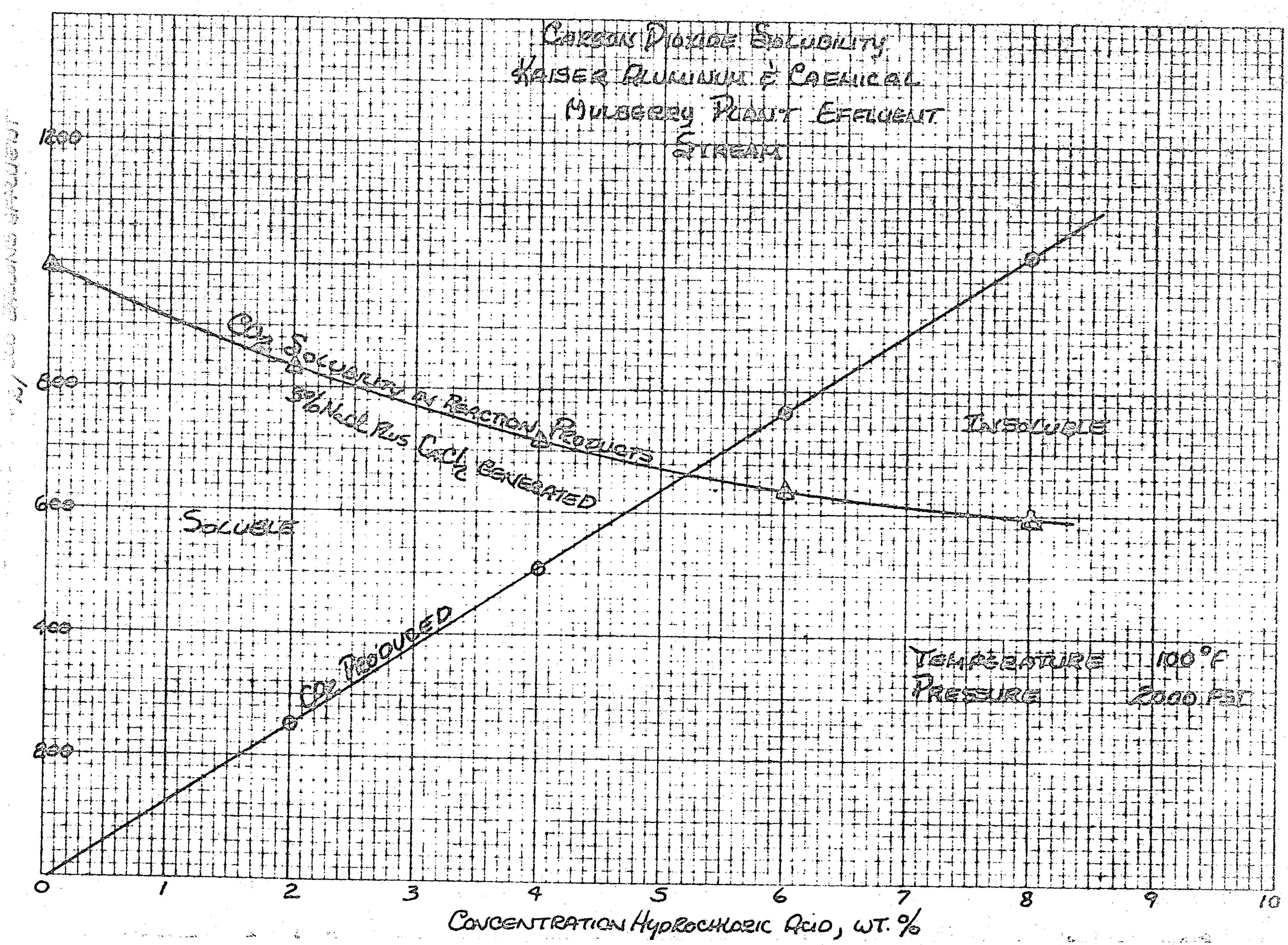

CARBON DIOXIDE SOLUBILITY
IN
CALCIUM CHLORIDE SOLUTIONS
(1 ATM)
61°F
72°F
100°F
STD. CUBIC FT. / GALLON
.15
.10
.05
.01
0
1
2
3
4
5
6
2
4
6
8
10
12
14
16
18
20
CONCENTRATION CALCIUM CHLORIDE, WT. %
MACKENZIE, WIED. ANN. PHYSIK. (2) 1, 450 (1877)


CARBON DIOXIDE SOLUBILITY
IN
HYDROCHLORIC ACID
(1 ATM)
40°F
77°F
32°F
GEFFCHEN, Z. PHYSIK. CHEM. 49, 271 (1904)
CONCENTRATION HYDROCHLORIC ACID WT %
STD CUBIC FT / GALLON
0
2
4
6
8
10
12
14
16
18
20
1
2
3
4
5
6
.01
.05
.10
.15


Carbon Dioxide Solubility
in
Sodium Chloride Solutions
(1 Atm)
60°F
72°F
100°F
Mackenzie, Wied. Ann. Physik. (2) 1, 450 (1877)
0
2
4
6
8
10
12
14
16
18
20
1
2
3
4
5
6
.01
.05
.10
.15
Std. Cubic Ft. / Gallon
Concentration Sodium Chloride, Wt. %

10 X 10 PER INCH

MADE IN U. S. A.



Schlumberger

INDUCTION - ELECTRICAL LOG

COUNTY POLK
FIELD or LOCATION SEC.3-30S-23E
WELL DISPOSAL WELL NO. 1

COMPANY KAISER CHEMICAL CO

COMPANY KAISER CHEMICAL CORP.
WELL DISPOSAL WELL NO. 1
FIELD MULBERRY
COUNTY POLK STATE FLORIDA
LOCATION 2300' SNL & 373' WEL
Other Services: BHC-GR FDC-GR ST
Sec. 3 Twp. 30S Rge. 23E

Permanent Datum: GROUND LEVEL, Elev. 120
Log Measured From RKB 16.6 Ft. Above Perm. Datum
Drilling Measured From SAME
Elev.: K.B. 136.6 D.F. - G.L. 120.0

Date	7-16-72	8-9-72		
Run No.	ONE	TWO		
Depth—Driller	2953	5000		
Depth—Logger	2915	4999		
Btm. Log Interval	2914	4998		
Top Log Interval	205	2925		
Casing—Driller	24" @ 200	10-3/4 @2931	@	@
Casing—Logger	205	2925		
Bit Size	18-1/2	9-7/8		
Type Fluid in Hole	GEL, CAUSTIC	GEL, CAUSTIC		
Dens. | Visc.	9.7 | 40	8.8 | 31		
pH | Fluid Loss	9.0 | 9.2 ml	N/A | 51.5 ml	ml	ml
Source of Sample	CIRCULATED	CIRCULATED		
R_m @ Meas. Temp.	1.82 @ 80 °F	0.92 @ 85 °F	@ °F	@ °F
R_{mf} @ Meas. Temp.	1.12 @ 107 °F	0.40 @ 132 °F	@ °F	@ °F
R_{mc} @ Meas. Temp.	1.53 @ 107 °F	1.05 @ 132 °F	@ °F	@ °F
Source: R_{mf} | R_{mc}	C | C	C | C		
R_m @ BHT	1.36 @ 107 °F	0.60 @ 132 °F	@ °F	@ °F
Time Since Circ.	6 HOURS	4 HOURS		
Max. Rec. Temp.	107 °F	132 °F	°F	°F
Equip. | Location	5656 | FT.MY	5656 | FT.MY		
Recorded By	YOUNGBLOOD	YOUNGBLOOD		
Witnessed By	FUNK, BAXTER	FUNK, BAXTER		

FOLD HERE — The well name, location and borehole reference data were furnished by the customer.

REMARKS S.O. #56518 SP NOISE APPARENTLY BEING INDUCED BY NEARBY HIGH VOLTAGE LINE.

Changes in Mud Type or Additional Samples		
Date | Sample No.		
Depth—Driller		
Type Fluid in Hole		
Dens. | Visc.		
ph | Fluid Loss	ml	
Source of Sample		
R_m @ Meas. Temp.	@ °F	@ °F
R_{mf} @ Meas. Temp.	@ °F	@ °F
R_{mc} @ Meas. Temp.	@ °F	@ °F
Source: R_{mf} | R_{mc}		
R_m @ BHT	@ °F	@ °F
R_{mf} @ BHT	@ °F	@ °F
R_{mc} @ BHT	@ °F	@ °F

Scale Changes			
Type Log	Depth	Scale Up Hole	Scale Down Hole
RESISTIVITY	3900	20 OHMS	10 OHMS
CONDUCTIVITY	3900	1000 MMHOS	2000 MMHOS
RESISTIVITY	2916	50 OHMS	20 OHMS
CONDUCTIVITY	2916	200 MMHOS	1000 MMHOS

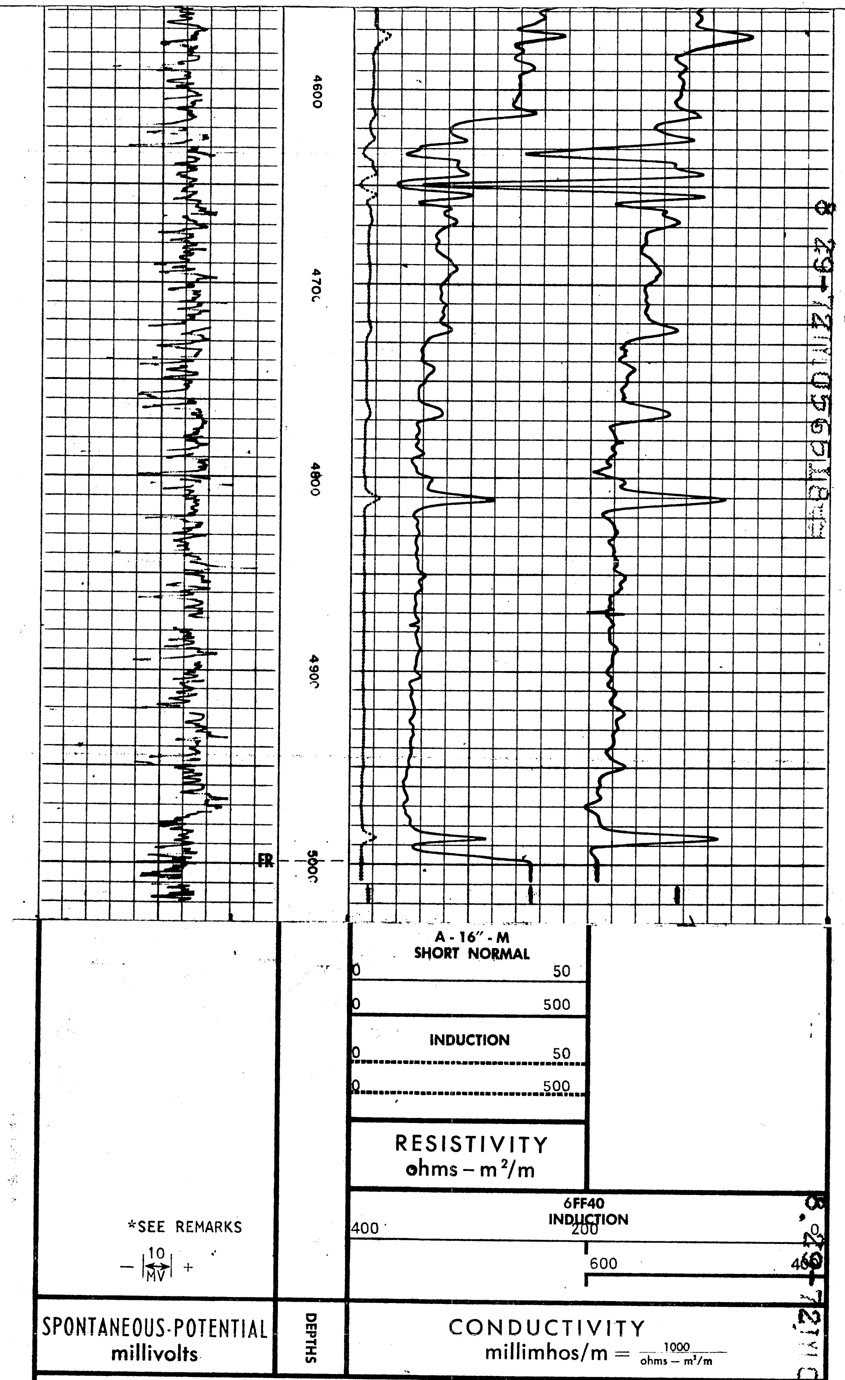
Equipment Data			
Run No.	Tool Type	Tool Position	Other

Run No.:	ONE	TWO
C.D.:	NONE	USED
S.O.:	0	1.5"
Equip. PANEL No.:	F-352	F-352
Used: CART. No.:	F 286	F-201
SONDE No.:	M-298	M-298
IAP No.:	D-318	D-318
S.B.R.:	1.0	1.0
GR CART. No.:		
T.C.:		
F.P.M.:		

Check one, filling in blanks where applicable:
[X] Surface determined sonde errors used for 6FF40.
[ ] 6FF40 sonde error corrected for inch borehole signal at Rm =
[ ] 6FF40 zero set in hole at depth of feet.

8-29-72 056518

SPONTANEOUS-POTENTIAL millivolts	DEPTHS	CONDUCTIVITY millimhos/m = 1000 / ohms. m²/m
− |10 MV| +		6FF40 INDUCTION 400 200 0; 600 400
		RESISTIVITY -ohms. m²/m — A-16"-M SHORT NORMAL 0 50; 0 500 — INDUCTION 0 50; 0 500



A - 16" - M
SHORT NORMAL
0 50
0 500

INDUCTION
0 50
0 500

RESISTIVITY
ohms – m²/m

6FF40
INDUCTION
400 200 0
600 400

*SEE REMARKS
– |10 MV| +

SPONTANEOUS-POTENTIAL
millivolts

DEPTHS

CONDUCTIVITY
millimhos/m = $\frac{1000}{\text{ohms} - m^2/m}$

COMPANY KAISER CHEMICAL COMPANY
WELL DISPOSAL WELL NO. 1
FIELD MULBERRY
COUNTY POLK STATE FLORIDA

SCHL. FR 2914
SCHL. TD 2915
DRLR TD 2953
Elev:
KB 136.6
DF –
GL 120.0

DETAIL LOG
5" = 100'

SPONTANEOUS-POTENTIAL
millivolts

DEPTHS

CONDUCTIVITY
millimhos/m = $\frac{1000}{\text{ohms} - m^2/m}$

– |10 MV| +

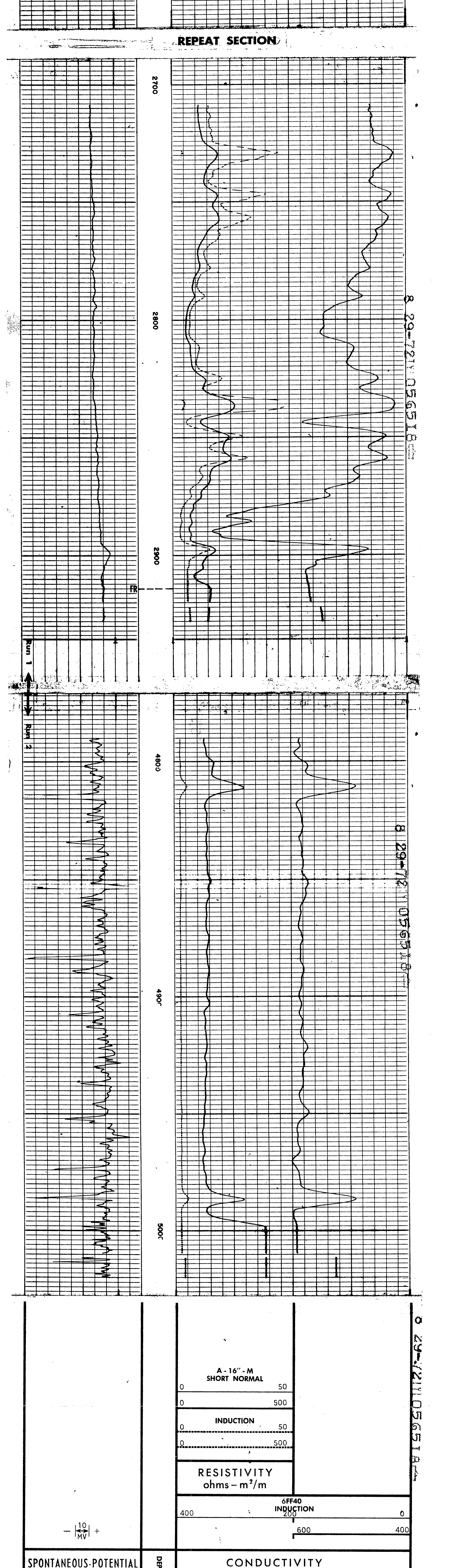
6FF40
INDUCTION
400 200 0
600 400

RESISTIVITY
ohms – m²/m

A - 16" - M
SHORT NORMAL
0 50
0 500

INDUCTION
0 50
0 500

REPEAT SECTION



A - 16" - M
SHORT NORMAL
0 — 50
0 — 500

INDUCTION
0 — 50
0 — 500

RESISTIVITY
ohms – m²/m

6FF40
INDUCTION
400 — 200 — 0
600 — 400

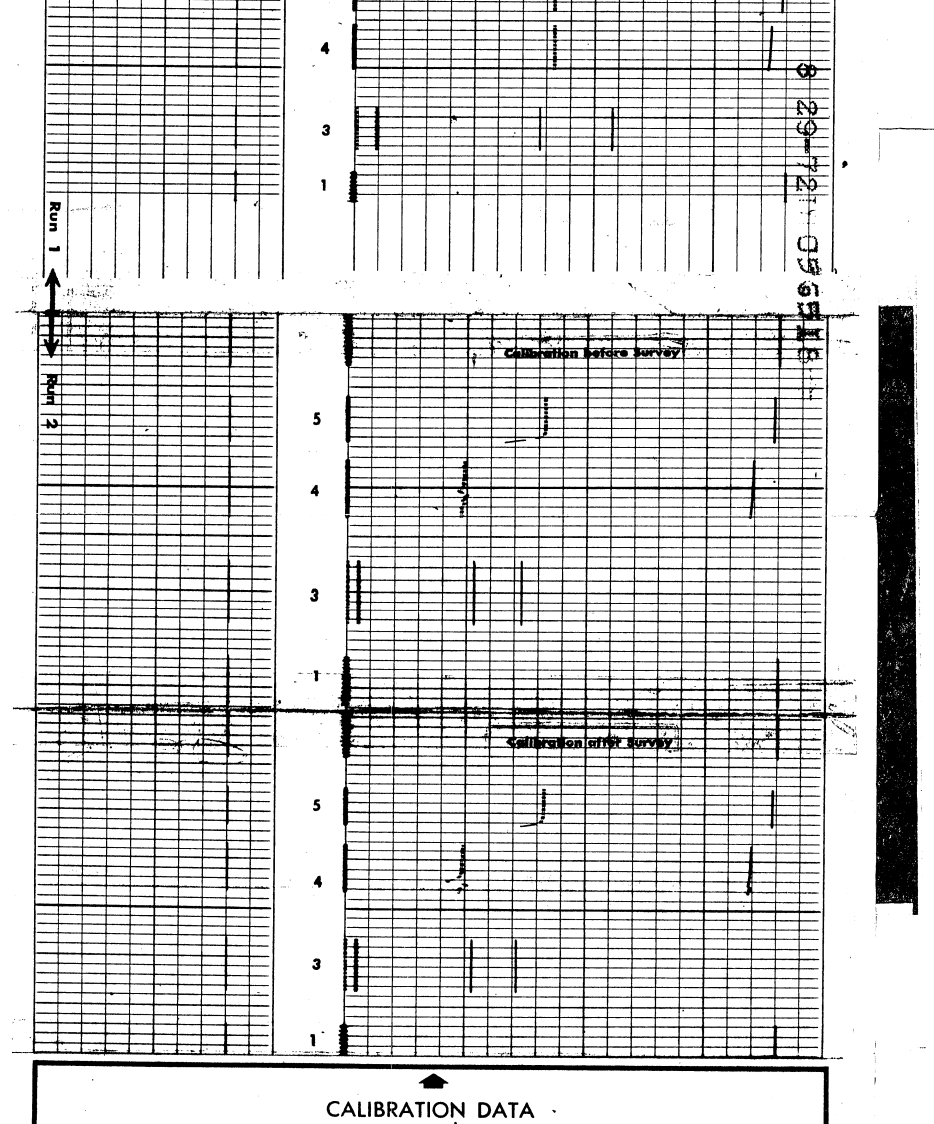
— |10 MV| +

SPONTANEOUS-POTENTIAL millivolts	DEPTHS	CONDUCTIVITY millimhos/m = $\frac{1000}{ohms - m^2/m}$

COMPANY KAISER CHEMICAL COMPANY
WELL DISPOSAL WELL NO. 1
FIELD MULBERRY
COUNTY POLK STATE FLORIDA

SCHL. FR 2914
SCHL. TD 2915
DRLR TD 2953
Elev: KB 136.6
DF -
GL 120.0

CALIBRATION DATA



CALIBRATION DATA

COMPANY KAISER CHEMICAL COMPANY
WELL DISPOSAL WELL NO. 1
FIELD MULBERRY
COUNTY POLK STATE FLORIDA

SCHL. FR 2914
SCHL. TD 2915
DRLR TD 2953
Elev: KB 136.6
DF -
GL 120.0

CORE LABORATORIES, INC. CORE LAB

FINAL REPORT

Petroleum Reservoir Engineering

COMPANY SUBSURFACE DISPOSAL CORPORATION
DATE ON 8-11-72
FILE NO. 532-4516

WELL KAISER-MULBERRY
DATE OFF 8-11-72
ENGRS. CARR

FIELD UNKNOWN
FORMATION
ELEV.

COUNTY UNKNOWN STATE UNKNOWN
DRLG. FLD.
CORES SCHLUMBERGER

LOCATION
REMARKS SERVICE NO. 4

Side Wall Core Analysis Data

IN. REC.	DEPTH, FEET	PERM.,* Md.	POR., %	% POR. SAT. OIL	% POR. SAT. TOTAL WATER	PROB. PROD.	% OIL VOL.	% GAS VOL.	°API	DESCRIPTION
0.0	4492									LOST IN HOLE
0.8	4500	28.	24.6	0.0	81.3	WATER	0.0	4.6		LIMESTONE NO ODR MIN FLU
1.0	4600	14.	25.4	0.0	80.6	WATER	0.0	3.0		LIMESTONE SLI CHALKY NO ODR MIN FLU
1.0	4650	16.	27.9	0.0	90.3	WATER	0.0	2.7		LIMESTONE SLI CHALKY NO ODR MIN FLU
1.0	4700	8.4	27.2	0.0	91.0	WATER	0.0	2.5		LIMESTONE CHALKY NO ODR MIN FLU
1.2	4800	7.6	28.0	0.0	97.5	WATER	0.0	0.7		LIMESTONE CHALKY NO ODR MIN FLU
0.8	4850	9.8	25.8	0.0	88.3	WATER	0.0	3.0		LIMESTONE CHALKY NO ODR MIN FLU
0.8	4900	13.	25.6	0.0	91.0	WATER	0.0	2.3		LIMESTONE CHALKY NO ODR MIN FLU
0.8	4950	5.0	24.9	0.0	90.6	WATER	0.0	2.2		LIMESTONE CHALKY NO ODR MIN FLU

* PERMEABILITY VALUES FOR PERCUSSION TYPE SIDEWALL CORES DETERMINED EMPIRICALLY

DISTRIBUTION OF REPORT:

SUBSURFACE DISPOSAL CORPORATION
5555 WEST LOOP SOUTH
BELAIRE, TEXAS 77401 (5)

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C/O GENERAL DELIVERY
MULBERRY, FLORIDA 33860 (2)