December 17, 1996

Ms. Patricia B. Swain
Science Applications
International Corporation
11251 Roger Bacon Drive
Reston, VA 22090

SUBJECT: ENVIRONMENTAL ASSESSMENT FOR LICENSE RENEWAL OF FANSTEEL, INC., MUSKOGEE, OKLAHOMA (TAC NO. L30705)

Dear Ms. Swain:

Your November 12, 1996, request for additional information (RAI), needed for completion of the environmental assessment for the license renewal of Fansteel, Inc., has been forwarded to the licensee. Because Fansteel has requested renewal for a five year term, several of the RAI questions were edited to reflect this time period. The edited questions are enclosed for your review. Fansteel has been given 30 days to respond to the RAI, at which time the information will be forwarded to you.

Some of the questions in the RAI can be partially or fully answered by Fansteel's response to previous RAI's requested by the NRC in review of a recent proposed license amendment. Consequently, original Question 4 ("General" section) of the RAI, concerning an update of Table 3-3 of the Environmental Report using 1990 census data, has been deleted. Enclosed for you information are Fansteel's responses dated August 10, 1995, and March 21, 1996, to the two previous RAI's.

If you have any questions regarding this matter, please contact me at (301) 415-8102.

Sincerely,
ORIGINAL SIGNED BY:
Susan Chotoo
Licensing Section 2
Licensing Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Docket 40-7580
License SMB-911

NFO3

Enclosures: 1. RAI
2. Ltr to JHunter fm ADatta dtd 7/18/96
3. Ltr to ADatta fm JHunter dtd 8/10/95
4. Ltr to RHogg fm JHunter dtd 3/21/96

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NAME	SChotoo SDC		PShea PS		GPangburn		MWeber	
DATE	12/17/96		12/16/96		12/17/96		12/ /96	

REQUEST FOR ADDITIONAL INFORMATION
FANSTEEL, INC., SOURCE MATERIAL LICENSE SMB-911
DOCKET 40-7580

GENERAL

1. Provide a copy of the report entitled "Facility Background and Operating Data" (1995).

2. Provide a copy of the report entitled "On-Site Contamination of Affected Soils and Groundwater Recovery and Treatment System" (February 1996).

3. Describe changes in land use or in area industries that have occurred since submittal of the license renewal application.

4. Are there any buried drums on site? (Refer to Section 2.4 of the Remedial Assessment). If so, how many drums were buried, what did the drums contain, and where were they buried?

5. Provide an estimate of the annual average volume of non-contaminated waste for the next 5 years and identify expected disposal locations.

6. Provide copies of the D&D Plan Figures 2, 3 (updated version of Drawing 1748474A), 4, 5, and 6 and of Drawing 1748406.

ENVIRONMENTAL

1. Per D&D Plan Appendix A, Section 2.2.4.1, what sources other than Fansteel operations may have contributed to radioactivity in groundwater?

2. Has there ever been flooding at the site? If so, provide flood levels, rates, and time of occurrence.

3. Per Remedial Assessment Section 3.3.1, was bedrock removed when the french drain was installed at Pond 3?

4. Confirm that the nearest resident is located "on the west side of State Highway 165, approximately 1/4 mile from buildings on site" (Environmental Report Section 3.4.2). If not, identify the location for the nearest resident.

5. What sources supply drinking water for area residents and the facility? Include groundwater and surface water sources.

6. What is the location of the nearest downstream municipal water intake on the Arkansas River?

7. Provide a copy of the current atmospheric release permits.

ENCLOSURE 1

8. Provide an estimate of the annual average release of fluoride to the atmosphere for the WIP processing period. Describe effluent controls and monitors for the fluoride releases.

WORK IN PROGRESS (WIP) OPERATIONS

1. Provide a brief, non-proprietary description of WIP operations including changes since the June 1995 license amendment application.

2. Provide a summary of estimates of annual release rates of radioactive material to the atmosphere and surface waters from WIP operations for five years.

3. Provide estimates of the amounts of product streams containing radioactive material and radiologically contaminated solid residues produced in WIP processing for five years. Provide estimates of the concentrations of radioactive material in each of these streams.

4. Provide non-proprietary descriptions of atmospheric emission clean-up or control systems used in WIP operations.

5. Provide a copy of the NPDES permit expected to be in place for WIP operations.

6. Provide a non-proprietary version of a water balance for expected operations. Include the distribution of uses including D&D, site clean-up, sanitary, non-contact cooling, and process waters. Identify sources including city water, well and river water and groundwater.

SOIL REMOVAL AND SOLIDIFICATION AND D&D

1. Provide estimates of affected areas, depths of excavation, and average uranium and thorium content for each of the 11 contaminated areas presently projected for remediation. Provide an updated version of Tables 5-3a and 5-3b of Appendix A (Technical Report Feasibility Study) of Vol. 1 of the D&D Plan. Verify that the level of radiological contamination data presented in this table refers to the sum of levels of uranium-234, -235, and -238 and thorium-228 and -232.

2. Provide a list which correlates soil sampling locations with the 11 contaminated soil areas.

3. Identify excavation techniques and types of equipment that are planned for use in removal and movement of contaminated soil. Describe planned fugitive dust control measures. Provide estimates of the number of pieces of each type of equipment and of the amount of time of use of each piece of equipment in remediation of the 11 areas. What is the planned sequence of clean-up for the 11 areas?

4. Where will the soil stockpile and soil stabilization equipment be located?

5. Describe soil preparation (e.g., crushing and sizing) and solidification equipment that will be used to prepare the stabilized waste form. Provide a block diagram of the stabilization process which identifies inlet and outlet streams and major processing steps.

6. Provide estimates of emission rates and radiological characteristics for soil stabilization plant gaseous and liquid effluent. Describe control measures for these effluent streams.

7. List the categories, annual average volumes, and radiological characteristics of operational and D&D wastes expected to be generated during the next five years.

8. Describe D&D activities other than WIP processing and contaminated soil stabilization planned for the WIP operational period. Identify specific areas and clean-up actions. Specify gaseous and liquid effluent rates and radiological characteristics for these D&D activities.

9. What criteria were applied to determine that samples were significantly above background as described in Remedial Assessment Section 2.13, paragraph 4?

10. Identify representative locations for the upwind and downwind air samples to be collected during D&D activities. What constituents will be monitored? What are the action levels and what actions will be taken if these levels are exceeded?

DISPOSAL CELL CHARACTERISTICS

1. Describe the differing categories of material (e.g., soil, clay liners, etc.) planned for emplacement in the containment cell and provide estimates of volumes and radiological characteristics of each category.

2. Provide estimates of the expected and maximum dimensions and waste volumes for the containment cell.

3. Provide estimates of the water-to-cement, soil-to-cement, and flyash-to-cement weight ratios for the proposed waste form. Use dry cement weight prior to mixing as the basis for the ratios.

4. Provide experimental data or literature references supporting use of the waste form permeability cited in Section 4.2 (p.4-5) of the D&D Plan Addendum No. 1.

5. What is the present vertical hydraulic gradient in the vicinity of the containment cell?

6. How rapidly do groundwater levels fluctuate in response to rainfall?

7. Well data presented in D&D Plan Addendum No. 1, Appendix B and summarized in D&D Plan Addendum No. 1, Figure 7 indicate that near surface soils comprise an upper silty clay layer and a lower, relatively thinner sand layer. Is this interpretation consistent with borehole data, measured hydraulic conductivities, and the location of the near-surface aquifer water table at a depth of 15 feet? Why would it not be possible to complete a well in the coarse material described as present at the base of the upper aquifer?

8. Section 3.5.2 of the 1994 Environmental Report states that wells developed in the shallow alluvial aquifer have yields ranging from 20 to 400 gallons per minute. Reconcile this data with the dose assessment model assumptions (D&D Plan Addendum No. 1, pps. 4-7 and -8) that the on-site well intake is conservatively located 100 feet below the water table and that the unsaturated zone thickness is 3.35 meters. Identify the aquifer, near-surface or deeper shale, to which this well take-off point is referenced.

9. Section 3.5.2 of the Environmental Report states that the near-surface aquifer hydraulic conductivity ranges from 3.12E-3 to 1.32E-2 cm/s while the dose assessment (D&D Plan Addendum No. 1, p. 4-8) proposes 1.01E-4 cm/s (32.6 m/y) as the value of the unsaturated zone hydraulic conductivity. Provide a rationale for the selected model parameter value which discusses the applicability of the above referenced data.

10. Section 4.2 of D&D Plan Addendum No. 1 (p. 4-9) states that the thorium distribution coefficient value (60,000 ml/g) representative of clay is appropriate to the containment cell dose assessment. The value is applied to the RESRAD model contaminated, unsaturated, and saturated zones. Provide support for this value for each of these zones in light of published survey values of the parameter of 3,100 and 5,800 ml/g for sand and clay, respectively (Sheppard, M.I. and D. H. Thibault, Health Physics, Vol. 59, No. 4, pp. 471-482, October 1990).

11. Identify, in relation to the containment cell, the location of the hypothetical on-site resident considered in the RESRAD dose analysis.

12. Provide an estimate of the infiltration rate through existing soils in the vicinity of the containment cell and for infiltration through the completed containment cell under conditions at which groundwater is at the 100-year flood level.

EFFLUENT AND ENVIRONMENTAL MONITORING

1. What are the diameter, height above ground, height above roof, gas temperature, and exit gas velocity for the main plant stack?

2. What are the action levels and associated actions for the monitored gaseous and liquid effluent streams?

3. What are the lower limits of detection for radiological components for the effluent and environmental monitoring programs? Describe these limits for all media sampled.

4. Per Section 4.1.1.2 of the Environmental Report, the liquid effluent from the waste water treatment facility is analyzed for non-radiological parameters before discharge at Outfall 001. Are there non-radiological action levels that would prohibit release or warrant an investigation? If so, what are these values? Have these action levels ever been exceeded?

5. Describe the containment cell monitoring program planned for the post-closure period.

6. Per Section 4.1.2.2 of the Environmental Report, groundwater is monitored for non-radiological parameters (pH, fluorides, ammonia, total suspended solids, and specific conductance). Are there action levels for these parameters? If so, what are they and what actions are taken?

7. Provide groundwater monitoring data from 1994 to present as an update to Table E-6 of Appendix E of the Environmental Report.

8. Provide radiological effluent monitoring data from 1994 to the present as updates to Tables E-2, E-3, and E-4 of Appendix E of the Environmental Report.

July 18, 1995

Mr. John J. Hunter, Corporate Manager of
Process Engineering and Facilities
Construction
Fansteel, Inc.
Number Ten Tantalum Place
Muskogee, Oklahoma 74401

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION: PROCESSING RESIDUES
(TAC NO. L30756)

Dear Mr. Hunter:

By letter dated June 29, 1995, we requested additional information on your January 25, 1995, amendment application for processing existing residues from past operations.

We have since determined that the said information request should not be withheld from public disclosure, except for those portions that refer to unique processes or specific materials. Accordingly, enclosed is a non-proprietary version of the enclosure to our June 29, 1995, letter. This letter and enclosure will be placed in the public domain.

You may request that any part of your response be withheld from public disclosure in accordance with the requirements of 10 CFR Part 2.790, provided that justification and the required affidavit are enclosed. The NRC will then determine whether your request should be granted.

If you have questions regarding this matter, please contact me at (301) 415-8109.

Sincerely,

Original signed by:

Amar Datta
Licensing Section 2
Licensing Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Docket 40-7580
License SMB-911

Enclosure: As stated

Enclosure 2

Request for Additional Information
Fansteel, Inc., Application Dated January 25, 1995
Docket 40-7580
License SMB-911

1 Provide full information pertaining to the hazardous substances used in the process and the hazardous reaction products, including as a minimum the following:

(a) Toxicity information;
(b) Permissible exposure limits;
(c) Physical data;
(d) Reactivity and corrosiveness data;
(e) Data relating to fire hazard, e.g., flash point;
(f) Thermal and chemical stability data; and
(g) Hazardous effects of mixing, intended or inadvertent, of the different materials, including the process feed.

Note: Hazardous substances should include, but not necessarily be limited to, those listed in 29 CFR Part 1910, Occupational Safety and Health Standards, and 40 CFR Part 68, Environmental Protection Agency List of Regulated Substances.

2. Provide full information pertaining to the technology of the process, including as a minimum the following:

(a) Details of the process chemistry, including the reaction equations; compositions of process-generated off-gases, liquors, solids, slurries, etc.; and detailed mass and energy balances;

(b) Maximum intended inventories;

(c) Safe upper and lower limits of temperatures, pressures, flow rates, and compositions;

(d) An evaluation of the consequences of deviations and their effects on public safety; and

(e) Information pertaining to the equipment used in the process, including materials of construction, P&IDs, design codes and standards employed, and safety devices, if any, e.g., interlocks, detection and alarm systems, etc.

3. Provide a process hazard analysis that examines in a systematic, step-by-step way the process reactions, equipment, and procedures; identifies potential abnormal occurrences that could take place; estimates the likelihood of such occurrences; and evaluates their consequences to public safety.

4. Provide commitment to develop operating procedures and clear instructions, based on the process hazard analysis, for safely operating the various steps of the process, including under unusual circumstances and emergency shutdown.

5. Provide commitment to establish a training program for the process operators and other safety personnel, including refresher training at reasonable intervals.

6. The following comments relate to specific aspects of the submitted process description:

(a) Review and revise the simplified quantitative flow diagram. The mass balance seems to be in error.

(b) Describe the feed preparation step of the process in more detail as to the exact chemical form of the reagents, the chemical reactions, and the products. Discuss possible side reactions and their consequences. Discuss the possibility of generation of flammable/explosive gases and any safety features to prevent their unsafe buildup.

(c) The transit of the corrosive liquids issuing through the scrubber appears to present a risk of failure of the scrubber elements. Describe the features of the scrubber, if any, that assure that it can safely process the liquid passing through it.

(d) Describe measures, if any, to protect the integrity of the leaching vessels from corrosive liquids.

(e) Describe procedures to assure that the process will not leave radioactive material in the waste stream.

(f) Provide details of the process, with respect to the physical, chemical, and toxicological properties of chemicals used, the chemical reactions involved, and potential hazardous products of reaction. Describe safety features, if any are planned, to minimize the hazards of this process. In particular, indicate:

(i) whether acids will be used with or without an inert diluent;

(ii) whether the chemical reactions will be exothermic;

(iii) the maximum temperatures expected; and

(iv) what preventive or mitigative measures are planned to preclude dangerous levels of flammable gases.

40-7580

Fansteel Inc.

August 10, 1995

Mr. Amar Datta
Licensing Section 2
Licensing Branch
Div. of Fuel, Cycle,
Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: Request for Amendment to
License SMB-911
(TAC No. L30756)
(Docket No. 40-7580)

Dear Mr. Datta:

Fansteel is in receipt of your request for more information, subject referenced above (letters dated 29 June and 18 July). This response is provided in two parts, i.e., that which Fansteel regards as confidential and proprietary and that which is not proprietary. In general, the proprietary portion includes:

A. The WIP Process Description and Preliminary Engineering Report.
B. The WIP Process "Mass Balance Diagram", Drawing No. FAN-MBD-001.
C. The WIP Process "Process Flow Diagram", Drawing No. FAN-PFD-001.
D. The WIP Process "General Arrangement", Drawing No. FAN-GAD-001.
E. Affidavit pertaining to confidentiality.

In general, the non-proprietary portion of this submittal includes MSDS's, air pollution equipment designs, and commitments to provide further information, when it is available.

As indicated, further information will be forwarded as it is generated. Should you have any questions, please feel free to contact me.

Sincerely,

JOHN J. HUNTER
Corp. Mgr., Process Eng. &
Facilities Construction

JJH/bsh
enc.
cc: M. J. Mocniak
R. M. McEntee

9509010073 950810
PDR ADOCK 04007580
C PDR

Drawings located in Central Files

Enclosure 3

NON-PROPRIETARY PORTION OF FANSTEEL SUBMITTAL IN ANSWER TO
TAC NO. L30756, DOCKET NO. 40-7580
DATE: AUGUST 11, 1995

- Answers to your request item number 1 are included in the manufacturer's MSDS sheets. Where variances to this information is noted, it will appear in the process description.

- Item 2 is answered by submittal of the process description and preliminary engineering report. Fansteel will inventory an approximate 30 day supply of operating consumables.

- Item 3, 4 - As has been indicated, Fansteel has just completed plant preliminary engineering. The formation of P&IDs, individual section P & FD's, and specific layouts, is just beginning. When this detailed engineering is completed, the process hazard analysis will be done. The hazard analysis will be done in conjunction with the development of operating procedures and instructions. The NRC will be provided a copy of this when it is completed, which currently is expected to be early in the fourth quarter.

- Item 5 - As has been Fansteel's past practice, training sessions will be held to:

  1. Review process flows.
  2. Review hazard analyses.
  3. Establish personnel health base parameters.
  4. Review equipment capabilities and instructions.

  In addition to the initial training sessions, refresher training will be done:

  1. As process changes are indicated.
  2. On a regular repetitive basis, as required and indicated by need.

- Item 6 - This item is considered answered by submittal of the process documents.

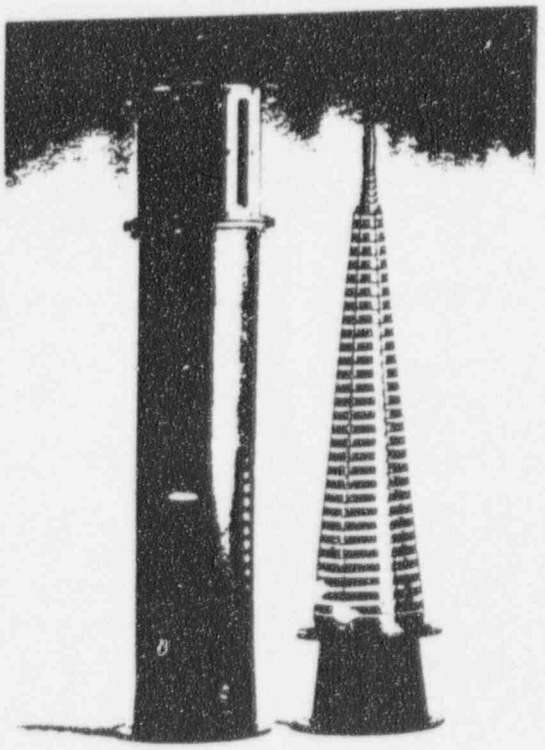
10 AUG 95

Aerodynamic Particulate Collection

The Economical Solution to Particulate Collection

Aerodynamic Particulate Collection

The patented aerodynamic module (ADM) consists of a tubular casing enclosing an aerodynamically designed conical ring and dust removal assembly. Flue gas containing particulate contaminants enters the wide opening of the conical shaped ring assembly. The gas flows from the inside of the cone to the outer casing, with the "cleaned" gas flow continuing through the duct to the I. D. fan and stack for discharge to atmosphere. This aerodynamic gas flow enhances the collection of dust particles in the center of the cone, while minimizing pressure losses and erosion. The concentrated dust particles are removed from the gas stream through a diverter assembly to a dust hopper for subsequent return to the process or for disposal.



Pilot Installations Performance Data

Operating data from the commercial installations forms a key part of EPR's performance data base. Additionally, the ADM has been tested by independent consultants, including TRC Environmental Corporation in Windsor, Connecticut and General Applied Science Laboratories, Inc. in Ronkonkoma, New York. These independent tests obtained efficiencies ranging from 97.63% to 99.62% on phosphate dust.

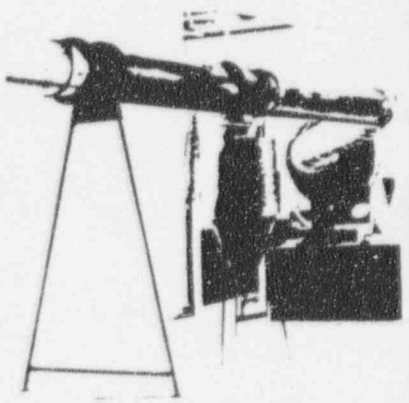
A major part of the performance program is the installation of pilot units to expand the data base. The pilot test program provides a means for interested companies to install a test module to measure the particulate removal efficiency of the ADM for their specific process.

Commercial Installations

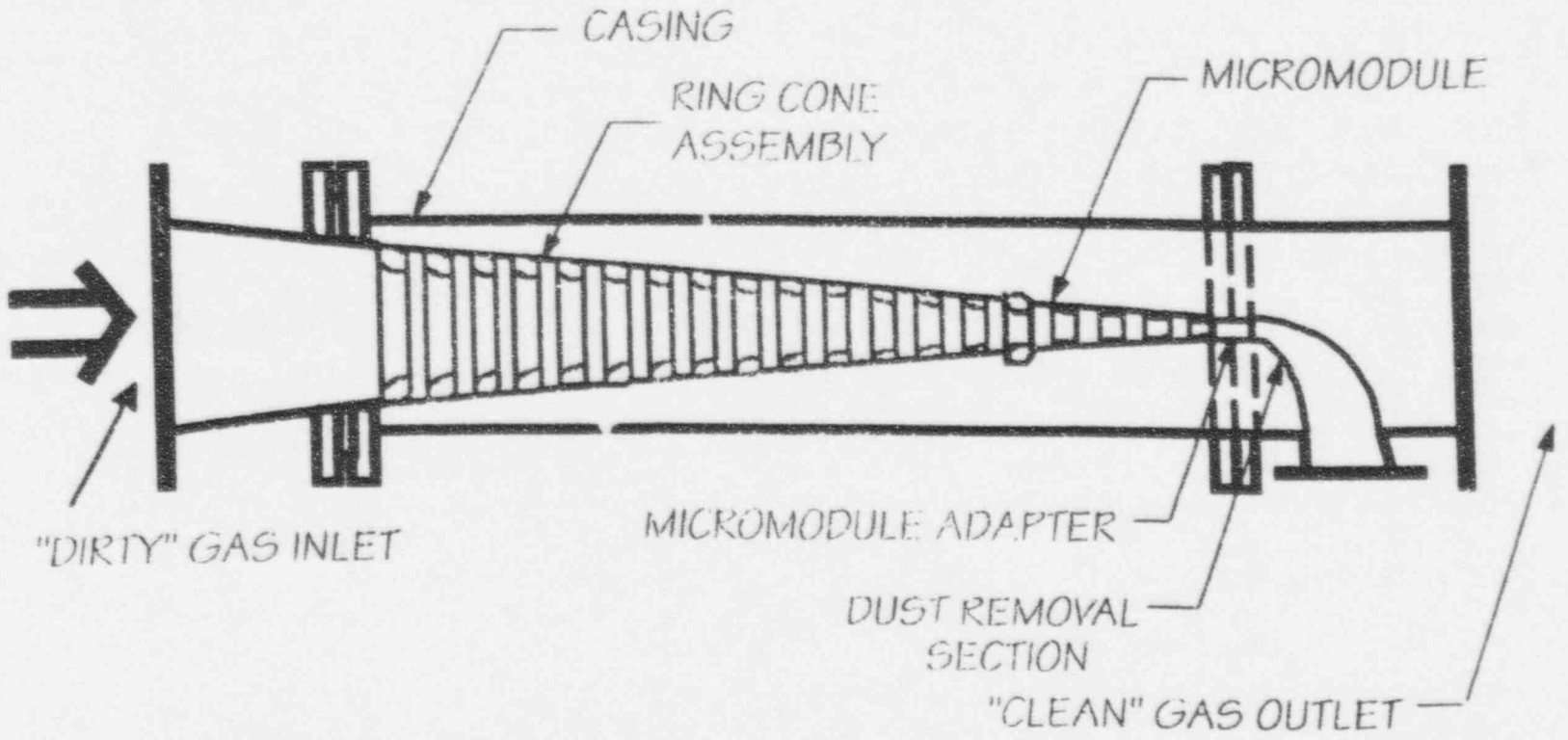
The initial pilot work was followed by commercial installations in various industries in Russia. These include metallurgical, cement, asphalt and power plant installations.

Capacity	2,400 to 144,000 ACFM
Efficiency	92.3% to 99%

Individual ADM modules are arranged in parallel "blocks" to provide the necessary design capacity (gas flow). These "blocks" may be installed in single or series arrangements, to meet efficiency requirements.



Cross Section of ADM



DynaWave® | engineered scrubbing systems

Model DW-3P-12 Packaged Scrubber

The *DynaWave* packaged scrubber is a completely assembled, skid mounted air pollution control system. The system includes two Reverse Jets in series, disengagement vessel, chevron demister, circulation pump, instrumentation, piping, valves and structural steel.

Performance

The Model DW-3P-12 *DynaWave* packaged scrubber is designed to quench and clean hot, dirty gas. The scrubber will remove typical contaminants such as:

Component	Removal Efficiency
HCl	99%
SO_2	99%
Particulate	90%

Capacity

Model DW-3P-12 can handle a wide range of flowrates and conditions. The table below shows the maximum gas rates for this scrubber.

Inlet Temperature °F	Inlet Gas Flow ACFM	Outlet Temperature °F	Outlet Gas Flow ACFM
2000	7400	174	3500
1800	7300	171	3500
1600	7100	168	3500
1400	6700	165	3500
1200	6400	160	3500
1000	6100	155	3500
800	5500	150	3500
600	5000	141	3500
400	4400	130	3500

Monsanto Enviro·Chem Systems Inc.

Monsanto
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St Louis MO 63178 USA
Telephone 314-275-5700
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Fax Int + 32-2-761-4040

Monsanto Do Brasil S.A.
Rua Paes Leme, 524-15 Andar
05424 - Sao Paulo BRASIL
Telephone Int + 55-11-[illegible]
Fax Int + 55-11-[illegible]

Process Parameters

• System pressure drop	23" wc
• Liquid circulation rate to each Jet	123 gpm
• Fresh water makeup rate[1]	0 to 7 GPM
• Blowdown rate[1]	0 to 1 GPM
• Solids concentration in blowdown	up to 20%
• Pump operating horsepower	11 bhp

[1] Fresh water makeup and blowdown rates depend upon specific inlet gas temperature, water content and contaminant levels.

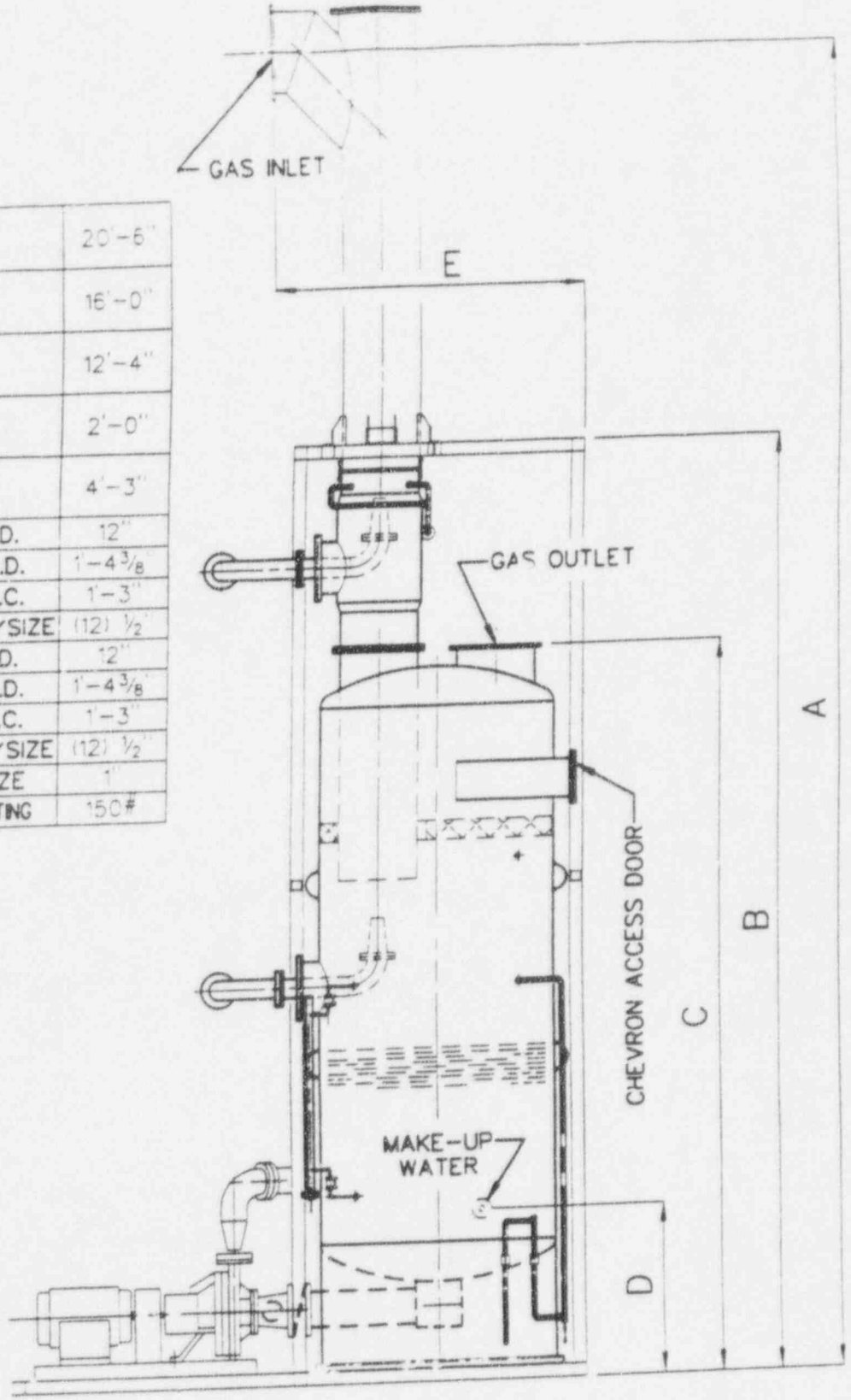
Equipment Specifications

- 12" diameter, alloy steel (RA-333, RA-330 or AL6XN) inlet duct for high temperature and acid gas resistance
- 3' diameter, Derakane 411 FRP disengagement vessel
- FRP chemical resistant pump including 20 HP, TEFC direct drive motor and double mechanical seal with silicon carbide faces
- CPVC piping
- High temperature, polypropylene chevron for minimizing liquid carryover
- Instrumentation including temperature indicator, pressure indicators, liquid level controller and low flow switch
- Two steel skids, both completely pre-piped, pre-assembled and easily installed in field

Options

- Caustic addition system for acid gas control including metering pump and pH control instrumentation
- I.D. fan rated for operating condition of 23" wc pressure differential and design condition of 28" wc pressure differential. Arrangement # 9 with overhung bearing, AL6XN wheel and rubber lined carbon steel housing. Belt driven, 2600 RPM, NEMA 4, TEFC motor. Radial inlet damper with pneumatic actuator.
- Weather enclosure for outdoor installation

A		20'-6"
B		16'-0"
C		12'-4"
D		2'-0"
E		4'-3"
GAS INLET	I.D.	12"
	O.D.	1'-4 3/8"
	B.C.	1'-3"
	NO./SIZE	(12) 1/2"
GAS OUTLET	I.D.	12"
	O.D.	1'-4 3/8"
	B.C.	1'-3"
	NO./SIZE	(12) 1/2"
MAKE-UP WATER	SIZE	1"
	RATING	150#



ISSUE

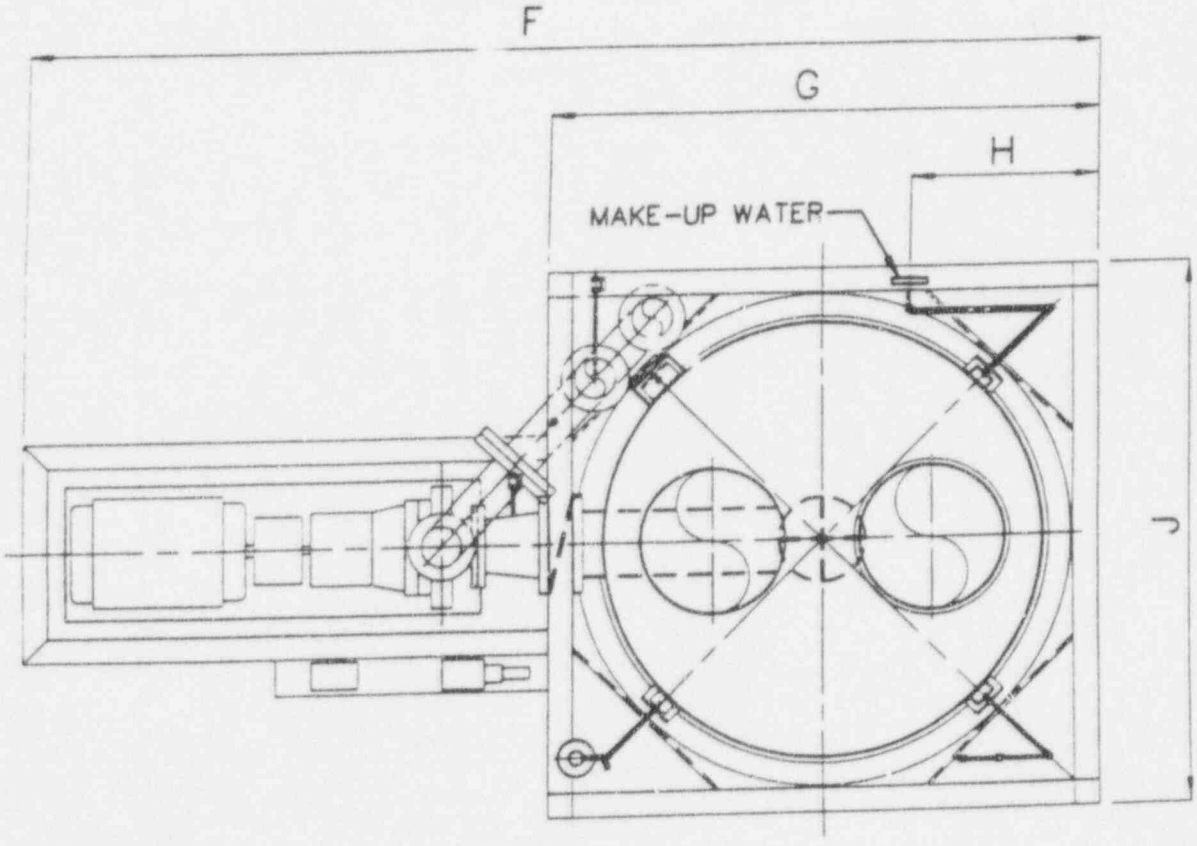
DWG. # DYPACK 10503210008

DynaWave®
engineered scrubbing systems

Monsanto Enviro-Chem Systems Inc.
St. Louis, Missouri

PACKAGED SCRUBBER ELEVATION
MODEL NO. [illegible]-3P 12"

F	G	H	J
8'-0"	4'-7"	2'-15/8"	4-3"



ISSUE

DWG. # DYPACK 1050321100B

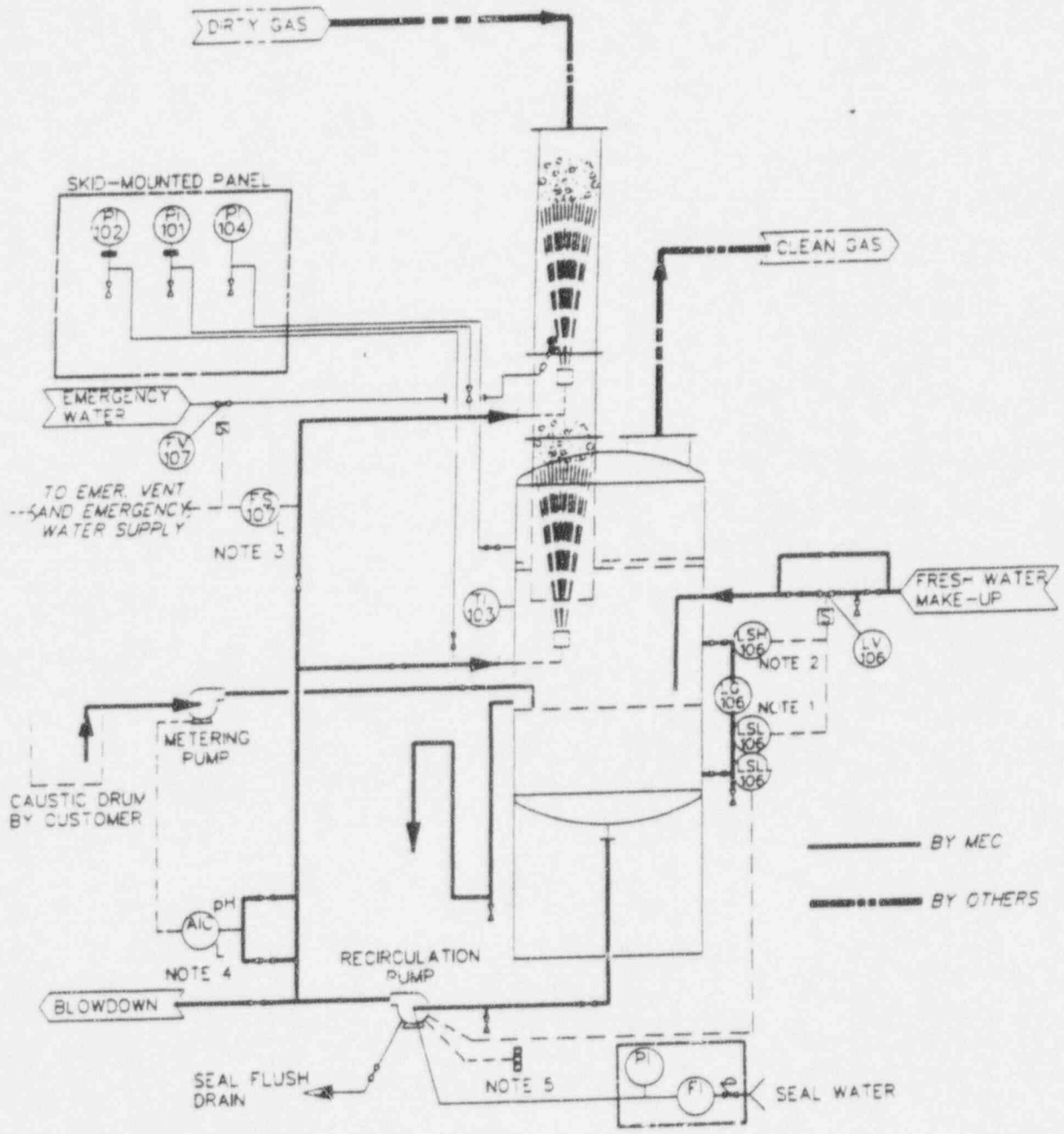
DynaWave®
engineering scrubbing systems

Monsanto Enviro-Chem Systems Inc.
St. Louis, Missouri

PACKAGED SCRUBBER PLAN
MODEL NO. DW-3P 12"

NOTES:

1. Low level switch
2. High level switch
3. Low flow switch
   in... of emergency water
   flow ... opens emergency
   gas ve... to atmosphere
   (Optional)
4. Low pH switch
5. Low-Low level switch



DWG # DYPACK 1050321100

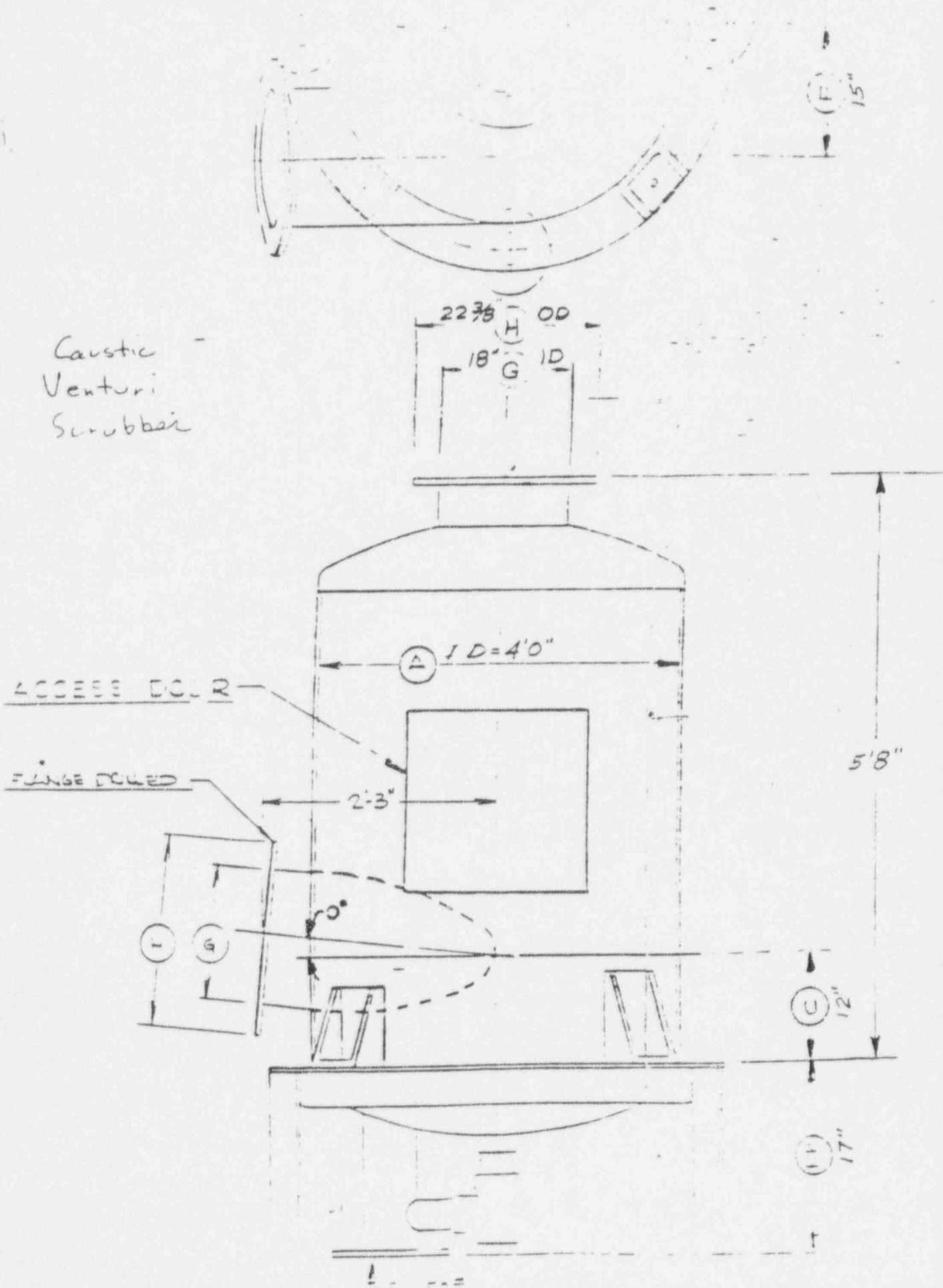
ISSUE

DynaWave®
engineered scrubbing systems

Monsanto Envirc-Chem Systems Inc.
St. Louis, Missouri

PACKAGED SCRUBBER ENGINEERING FLOW DIAGRAM

Caustic
Venturi
Scrubber



Fansteel
Inc.

40-7580

March 21, 1996

Mr. Robert Hogg
Licensing Section 2
Licensing Branch
Div. of Fuel Cycle Safety & Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Hogg:

Attached you will find Fansteel's response to the NRC's requests for additional information regarding Fansteel's License Amendment Request submitted 25 January 1995. This, along with the previously submitted responses should complete the information requested.

This submittal is in two parts, i.e., that which Fansteel considers non-confidential and that which Fansteel considers confidential. The non-confidential portion includes pages 1 - 19, and deals primarily with the NRC's request for additional environmental information. The confidential portion includes an affidavit attesting to confidentiality, final plant flow diagram, general arrangements, final process description, P&ID's and a process hazard analysis.

Fansteel would appreciate your expeditious review of these documents so as to proceed to the license amendment and construction of the plant. Should you have any questions, please feel free to contact Fansteel at any time.

Sincerely,

JOHN J. HUNTER
Corp. Mgr., Process Engineering &
Facilities Construction

JJH/bsh
attach.
cc: A. Davis, EPA (p. 1-19)
D. Dillon, OKDEQ (p. 1-19)
J. Englert, K&L
M. D. Tourdot, ESC
M. J. Mocniak

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Enclosure 4

Dr... to Docket File

NRC REQUEST FOR

ADDITIONAL INFORMATION

(TAC No. L30756)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING FANSTEEL'S LICENSE AMENDMENT REQUEST,
DATED 25 JANUARY 1995
DOCKET 40-7580

- **NRC COMMENT** - Section 4.2 states that gross alpha and gross beta content are analyzed on a sample of the effluent discharged from Outfall 001. Describe the frequency of this analysis, the method of analysis, and the lower limit of detection for the analysis.

FNL RESPONSE - Samples are drawn thrice weekly when discharging over a period of time, or 1 sample per 24 hours if discharging is sporadic. The method for analysis is EPA Method 900, "Gross Alpha and Gross Beta Radioactivity in Drinking Water." The lower limits of analysis are specified in this methodology.

- **NRC COMMENT** - Chapter 4 should specify action levels for discharge of radioactivity to the Arkansas River. These action levels should be specified for radionuclides present in the effluent, and should be a modest fraction (e.g., 10%-20%) of the effluent limits in Column 2 of Table 2 of Appendix B to 10 CFR Part 20.

FNL RESPONSE - When the effluent reaches 15 pCi/l alpha, or 50 pCi/l beta, isotopics are run to determine the constituents of the effluent. Action limit used for analyzation of trends is 25% of the effluent limits in 10 CFR, Part 20, Appendix B.

- **NRC COMMENT** - With reference to Section 2.1.5 of the Environmental Report, describe how the IX resins containing radioactive elements will be stored.

FNL RESPONSE - It is not planned to store IX resins containing radioactive elements. The nature of the operation is such that all materials deposited on the IX resins will be backwashed off and go on to further processing. The only resins stored will be new resins. At the conclusion of operations, any resins left which exhibit radioactive tendencies will be disposed of in accordance with governing regulations.

. **NRC COMMENT** - The demography data in Section 3.3 and Table 3-3 of the Environmental Report should be updated to reflect the 1990 census.

FNL RESPONSE - The following information was obtained from the US Department of Commerce, 1990 Census:

Location	Population
Muskogee County	68,078
Cherokee County	34,049
Wagoner County	47,883
Okmulgee County	36,490
McIntosh County	16,779
Haskell County	10,940
Sequoyah County	Not Available
City of Muskogee	37,708
City of Fort Gibson	Not Available
City of Wagoner	6,623
City of Tulsa	503,341

. **NRC COMMENT** - The listing of historic sites should be updated to include any sites added since the 1985 listing.

FNL RESPONSE - The following sites have been added to the list of Historic Places in Muskogee County:

SITE	LOCATION
Administration Building-Post Hospital	803 Garrison Avenue, Fort Gibson
Commandant's Quarters	905 Coppinger Avenue, Fort Gibson
Post Adjutant's Office and Post Blacksmith Shop	905 Garrison Avenue, Fort Gibson
Seawell-Ross-Isou House	Beauregard and Elm St., Fort Gibson
Nancy Taylor #1 Oil Well Site	Haskell Lake Road, West of US 64
George A. Murphy House	1321 W. Okmulgee Street, Muskogee
Surety Building	117 North Ninth St., Muskogee
First Baptist Church	Sixth and Denison Street, Muskogee
Ward Chapel AME Church	319 North Ninth St., Muskogee

Source: National Register of Historic Places 1966-1994

. **NRC COMMENT** - The biota reference is from 1943. Any significant changes in local biota in the past 50 years should be notes.

FNL COMMENT - Based upon available information, there have not been any significant changes to local biota of Muskogee in the past 50 years. Information compiled from the US Fish and Wildlife Service data provided in the 1995 Code of Federal Regulations indicates that five species have been added to the previous list of Threatened and Endangered Species of Oklahoma.

The five additional species are: the black-capped vireo, endangered; the ivory billed woodpecker, endangered, the winged mapleleaf mussel, endangered; the neosho madtum, threatened; and the eastern prairie fringed orchid, threatened.

. **NRC COMMENT** - Section 3.8.1.2 states that the Oklahoma State Department of Health measures alpha, beta, radium, and uranium concentrations in the Arkansas River monthly, and provides averages of 1984-1986 data. If more current River data is available, it should be provided.

FNL RESPONSE - According to the Oklahoma Department of Environmental Quality, there is no new data to be added to that previously furnished.

. **NRC COMMENTS** - Section 2.2.1 of the Environmental Report states that a groundwater collection and treatment system will be installed along the southern and eastern boundaries of the plant to collect and treat groundwater from the shallow water-bearing zone. Provide the following information about this system:

a. Describe the purpose of this system. What is the source of groundwater that the system will be designed to intercept? Why should the groundwater be collected and treated? If it is contaminated with radioactive materials, describe the source of the contamination and actions that have been taken to stop the source.

b. If the groundwater to be collected and treated by this system is contaminated with radioactive materials, describe the nature and extent of the contamination. Provide a description of the hydrogeology of the site, including boring logs, geologic cross-sections, and water levels. Show the locations and depths of monitoring wells that have been used to indicate the presence and extent of contamination, and provide groundwater sample analytical data that indicates the presence or absence of contamination.

c. Describe the design of the collection system. Include plan and elevation drawings of the system, appropriate cross sections, and materials of construction. Demonstrate that the design is appropriate for the hydrogeology of the site and will meet the purpose for which it is constructed.

d. Describe the operation of the system. Include the method for removing collected water, and for assuring that the system is functioning as designed. Describe the monitoring, treatment (if any), and the disposal of the liquids removed from the system.

FNL RESPONSE

a. The purpose of the proposed system is to collect groundwater present within the shallow water bearing zone which has been impacted by both radiological and chemical constituents. The source of groundwater which the system will intercept is the shallow groundwater bearing zone present under the site. The primary source of water for the shallow groundwater bearing zone is precipitation. The source of the radioactive materials identified within the shallow groundwater bearing zone is believed to be associated with the supernatant discharge which occurred from Pond 3 on June 18, 1989. The circumstances surrounding the release and the subsequent corrective actions are detailed in both the Remedial Assessment Work Plan and the Remediation assessment Report which have been prepared for the Fansteel Facility. Please refer to sections 1.2 and 1.3 of the Remedial Assessment Work Plan and section 1.3 of the Remediation Assessment Report for the Fansteel facility for specific details.

b. The nature and extent of the radioactive material contamination of the shallow groundwater bearing zone is discussed in detail within the Remediation Assessment Report for the Fansteel facility. Please refer to section 4.2.4.1 of the report for a discussion of the nature and extent of the identified contamination. A detailed discussion of the hydrogeology of the site is provided in chapter 3 of the report. Boring logs and well construction details are contained within Appendix A of the report. Cross sections for the site are provided in Figure 5 of the report. Water levels for the shallow groundwater bearing zone are summarized both in Table 1 and Figure 7 of the report. Figure 2 of the report illustrates the location of all shallow groundwater bearing zone monitoring wells. Table 16 of the report summarizes the analytical data associated with groundwater samples collected from monitoring wells completed within the shallow groundwater bearing zone at the site.

c. The conceptual design of the shallow groundwater collection system for the site is detailed in Chapter 5 of the Feasibility Study contained in Appendix A of the Decommissioning Plan for the Fansteel facility presented to the NRC in June 1994. Generally, the collection system will be installed to the bedrock surface and will act as a large french drain system which will intercept groundwater present within the shallow groundwater bearing zone. The collected groundwater will be gravity fed to one or more collection areas at which point it will be pumped to the facility's waste water treatment system for treatment and ultimate discharge through existing NPDES permitted outfalls. The treatment system currently in operation at the site is presently treating groundwater collected from the french drain system and wet well located in the area of Pond 3. This groundwater exhibits significantly similar characteristics to that which the proposed system will collect and treat. The expense associated with developing a detailed engineering design for the

system will not be expended until such time as the NRC has approved the concept of the proposed collection system.

d. The operation of the system has been addressed both in the response to c, above, and within Chapter 5 of the Feasibility Study referenced earlier. the system will be monitored to ensure that it is functioning as designed through a program which will include periodic sampling of monitoring wells present on site, sampling and analysis of collected groundwater and system effluent, and through a system operations and maintenance program which will be developed in conjunction with the detailed design of the system. Monitoring, treatment, and disposal of the liquids removed from the system have been discussed conceptually within Chapter 5 of the feasibility Study.

Included herein is the portion of the Decommissioning Plan Addendum dealing with the Groundwater Remediation, submitted in March 1996.

3.0 Groundwater Remediation

Groundwater in the alluvial perched aquifer underlying the Fansteel facility was shown by the 1993 remedial assessment (Earth Sciences, 1993) to be affected by somewhat elevated but relatively low levels of radioactive materials. The study also demonstrated that the aquifer yielded very little water and that the formation has a low hydraulic conductivity.

The remediation strategy identified in the Feasibility Study consists of the construction of a collection trench around the downgradient perimeter of the site. The location of this trench is shown in Figure 5. This trench will be used to collect groundwater and route it to a treatment facility. Treated groundwater will be discharged to the Arkansas River through the National Pollutant Discharge Elimination System- (NPDES) permitted outfall. A description of the treatment system follows.

3.1 Background

The collection and treatment of affected groundwater at the Fansteel site is an important component of the long-term remediation of the processing facility and surrounding property. Based on the result of the characterization and remediation assessments carried out by Earth Sciences, concepts for treatment of the groundwater were evaluated. Based on the currently available technology, treatment by collection will result in achievement of accepted standards for environmental performance both in the near and long term.

3.2 Design Objectives

The design objectives of the groundwater collection and treatment system include adjustment of the natural groundwater level, placement of an impervious barrier to restrict groundwater migration, collection of affected groundwater, and treatment of the groundwater to remove constituents to acceptable regulatory levels for discharge to the Arkansas River through an NPDES-permitted outfall.

3.3 Conceptual Design of Groundwater Collection System

Subsurface drains were determined to be the optimal groundwater collection system due to the relatively low hydraulic transmissivities at the site, the shallow extent of the water-bearing unit, and low costs for operation and maintenance of subsurface drains compared to pump

recovery. A subsurface drain consists of a conduit buried at the base of the water-bearing unit which utilizes gravity to transport groundwater to a central sump. The sump contains mechanical pumps for fluid recovery. The subsurface drain redirects groundwater flow by creating a continuous zone of influence along the length of the conduit.

During pump tests performed at the facility in 1993, the approximate zone of influence from a single pump was determined to be less than 35 feet. For groundwater interception along the length of the eastern and southern perimeter of the facility which totals approximately 3,000 feet, pump recovery would require at least 86 recovery points. Subsurface drains, however, will require only 4 recovery points and will have an estimated influence of 200 and 1,600 feet perpendicular to the drain system.

3.3.1 Design Overview

The design of the subsurface drain will include excavation of a 2-foot-wide trench along the eastern and southern site boundary, installation of an impermeable barrier (20- to 30-millimeter HDPE liner or sheet rock) along the downgradient side of the trench, insertion of 4- to 6-inch HDPE drainpipe with a nylon filter sock into the base of the trench, placement of 2 to 3 feet of pea-size gravel over the drainpipe as filter pack material, and backfilling the excavation with unaffected soil to the original ground surface elevation. Four collection sumps will be excavated at points along the trench and pumps installed for transportation of collected groundwater. The subsurface drain will intercept and transport all groundwater underlying the affected areas of the facility to the sumps via gravity flow. The complete trench will consist of two laterals. One lateral (denoted the east trench) will extend along the eastern property line of the facility and the second lateral (denoted the south trench) will extend westward along the southern border of the facility. Figure 5 shows the location of the trench system.

3.3.2 Design Criteria

Based on the objectives of the design, site-specific data collected in February/March 1993 and presented in the remediation assessment were reviewed and analyzed. The hydrogeological design criteria considered during the conceptual design phase included groundwater elevation; depth to top of water-bearing unit; depth to base of water-bearing unit; hydraulic conductivity, transmissivity, and saturated thickness of water-bearing unit; and estimated groundwater

yields. The available data were used to determine the configuration of the subsurface drain, location of the collection sumps, groundwater flow rate into the drain, width of influence of the infiltration system, and storage capacity of the water-bearing unit. Design calculations are presented in Appendix B.

3.3.3 Collection Trench Design Components and Installation

The subsurface drains will be installed using a one-pass trenching machine. The trenching machine will excavate a 2-foot-wide trench and emplace the collection conduit, impermeable barrier, and filter pack in one step. Geologic cross sections for the areas of the facility where the trenches will be located have been prepared from logs of groundwater monitoring wells and soil borings installed at the facility in February/March 1993. The cross section locations are presented in Figure 6. The eastern site boundary cross section and southern site boundary cross section are presented in Figures 7 and 8 respectively.

The east trench has a proposed length of 2,100 feet. Three collection sumps will be positioned at 110 feet, 830 feet, and 1,730 feet along the east trench measured south from the north end of the trench. The south trench has a proposed length of 870 feet. One collection sump will be located on the south trench approximately 190 feet measured west from the east end of the trench.

The trenches were designed to utilize the natural contour of the sand formation, maintain conduit slopes between 0.5 and 3 percent, and minimize the amount of shale required to be removed to achieve adequate slopes. The slopes of trenches will be minimized to ensure that the outermost ends of the trench are continuously below the groundwater level to minimize bacterial growth and resultant plugging. Figures 7 and 8 depict the east trench system and south trench system superimposed on geologic cross sections.

3.3.4 Subsurface Drain Design

The subsurface drain conduit will be comprised of 4- to 6-inch nominal diameter HDPE drainpipe with a nylon filter sock fitted around the piping. The pipe will be placed either directly on the surface of the excavated shale or on 6 inches of filter pack. Approximately 2 to 3 feet of pea-size gravel will be placed on the conduit as filter pack. The combination of conduit, nylon sock, and filter pack reduces plugging of the infiltration system which increases

the effectiveness of the drain at the outermost areas of the laterals. Cleanout access to the drain conduits will also be provided for each lateral of the system. Figure 9 shows the typical configuration of the collection trench.

During construction of the infiltration system and initial start up of the system, a large initial volume of groundwater will be removed to create the cone of depression. This water will be stored in a temporary storage tank prior to treatment. The steady-state groundwater elevation in the trench is expected to be a few feet above the conduit. The combined average yield from the collection trenches is estimated to be approximately 12 gallons per minute.

3.3.5 Filter Pack Material Selection

The optimal filter pack material for sand formations has a larger mean grain-size diameter than the formation to reduce plugging due to migration of fine grain sediments toward the collection conduit. Pea-size gravel has been selected as the appropriate filter pack material. Sieve analysis of representative samples of the formation material underlying the facility will be completed during construction to confirm the selection of pea-size gravel. In addition, the diameter of the filter pack material will be slightly larger than the pores on the nylon filter sock.

3.3.6 Collection Sump Design

Based on the natural contour of the water-bearing unit underlying the facility, it has been determined that four collection sumps are required to recover groundwater from the infiltration system. The design objective was to minimize the number of sumps, minimize length of the laterals, and obtain trench slopes between 0.5 and 3 percent. The sumps will consist of vertical 5-foot-diameter reinforced concrete pipes with manhole covers and built-in ladders. The depth of each sump will extend approximately 3 to 5 feet below the depth of the infiltration conduit. Figure 10 shows the typical configuration of the collection sumps. The selected locations of Sumps 1 and 2 will segregate low pH groundwater from high pH groundwater to reduce precipitation of minerals in the conduit and sumps.

Sump 1 will extend approximately 22 feet below the ground surface. At steady-state conditions, Sump 1 is expected to yield approximately 6 gallons per minute of groundwater. Sump 2 will extend approximately 28 feet below ground surface and yield approximately 4 gallons per

minute. Sump 3 will extend approximately 26 feet below the ground surface and Sump 4 will extend approximately 19 feet below the ground surface. Sumps 3 and 4 are each expected to yield 1 gallon per minute of groundwater. A pair of stainless steel sump pumps will be installed in the base of each sump to transport groundwater to the wastewater treatment system. The pumps will be sized to ensure adequate pumping efficiency and will be equipped with float switches to measure on-off water levels. The groundwater will be pumped via double-contained piping equipped with a leak detection system to equalization tanks associated with the groundwater treatment system. The treatment system is discussed in Section 3.2.2.

3.3.7 Monitoring

Trench effectiveness will be monitored using existing facility groundwater monitoring wells as piezometers located perpendicular to the axis of the trench laterals. Specifically, Monitoring Wells MW-58S, MW-67S, and MW-73S are located upgradient within 10 to 20 feet of the proposed trenches. Monitoring Wells MW-65S, MW-69S, MW-71S, and MW-72S are located at least 100 feet upgradient of the proposed trenches. Monitoring Wells MW-60S, MW-61S, and MW-75S are located within 10 to 20 feet downgradient of the proposed trenches. Four piezometers will be installed in the filter pack material along the trench. Water levels will be collected during start up of the trench to monitor dewatering of the formation near the trench and to determine when steady-state pumping levels are attained. Once steady-state level is attained, water levels will be monitored periodically to assess the efficiency of the trench and to ensure that plugging has not occurred.

3.4 Conceptual Design of Groundwater Treatment System

The groundwater treatment system will utilize to the extent possible the existing WWTP already constructed at the Fansteel site. Variations and modifications to the system will be required to achieve the levels required for the affected groundwater collected from the collection trench. Design modifications to address the groundwater using the existing system are discussed in the following sections.

3.4.1 Design Overview

Groundwater underlying the facility shows the presence of heavy metals, ammonia, fluoride, methyl isobutyl ketone (MIBK), and radionuclides. Several treatment methods including aeration, metals precipitation, microfiltration, and air stripping will be used for removal of the

constituents. Figure 11 presents a conceptual process flow diagram of the proposed groundwater treatment system.

3.4.2 Design Criteria

The criteria utilized in the groundwater treatment system conceptual design included the expected volume of water to be treated, constituent concentrations in groundwater, and degree of removal required to meet NPDES effluent limits for discharge of the treated water to the Arkansas River. The design objectives are to produce an effluent which meets the discharge limits while minimizing the generation of solid waste.

3.4.3 Groundwater Collection/Equalization System Design

The groundwater collection system described in Section 3.2.1 will capture groundwater infiltration, transport the water to a series of collection sumps, and pump the collected groundwater to equalization tanks associated with the groundwater treatment system. Two equalization tanks will segregate Sumps 1 and 2 groundwater from groundwater collected from Sumps 3 and 4 to reduce accumulation of solids due to precipitation in the equalization tanks. A 30,000-gallon-capacity equalization tank will collect groundwater from Sumps 1 and 2 at a rate of 10 gallons per minute. The groundwater collected from Sumps 3 and 4 will be transferred to a 6,000-gallon-capacity equalization tank at a rate of 2 gallons per minute.

3.4.4 Aeration

The equalization tanks will be equipped with diffused aeration systems for the removal of ammonia and MIBK. A blower will introduce air into the water in the tanks via submerged air nozzles. Such systems are ideal for influent flow rates less than 30 gallons per minute.

3.4.5 Lime Precipitation/Sedimentation

Two chemical pretreatment steps will be used for the groundwater remediation system. Since metals with low solubilities generally precipitate in a highly basic solution and Fansteel currently has the capability for calcium hydroxide treatment, the primary reagent for metals precipitation in the first chemical pretreatment step is calcium hydroxide followed by gravity settling. (Co-precipitating agents such as calcium chloride may be required to promote removal of constituents such as fluoride.) A second chemical pretreatment process is proposed for removal of constituents which are difficult to remove with calcium hydroxide such as arsenic

and selenium. Treatability studies are necessary for the selection of reagents for the second chemical precipitation step, although iron, aluminum, and barium compounds are being considered. The second pretreatment step is followed by microfiltration as discussed in the following section.

3.4.6 Microfiltration Treatment

The microfiltration treatment system consists of multiple tubular units constructed of inert fluorocarbon-based membrane with 0.1-micron pore size. The membrane is capable of withstanding pH ranges from 0 to 14 as well as severe oxidizing and reducing conditions. The technology has been applied in heavy metal and radionuclide removal from groundwater at two uranium mill tailings sites. In such applications, the system was successful in reducing constituent concentrations in the groundwater to meet strict NPDES levels.

Following secondary chemical pretreatment, the water is directed to a concentrate tank. From the concentrate tank, water flows through the membrane tubes at a high velocity and under turbulent conditions to produce two effluent streams. At the normal operating pressure of 20 to 40 pounds per square inch gauge, clean water is forced through the membrane pores. A liquid concentrated with suspended contaminants is returned to the concentrate tank while the filtered water exits the system. Microfiltration will be followed by air stripping which is discussed in the next section. The membranes will be cleaned as required to maintain acceptable performance. Hypochlorite solutions will be used to remove heavy metals from the membranes.

3.4.7 Air Stripping

Air stripping will follow the microfiltration process for removal of ammonia and MIBK. Stripping is a low-cost technology for removal of constituents with low molecular weight, low solubility, and high Henry's Law constant. Liquid effluent from the air-stripping process will discharge to the facility's on-site sedimentation ponds for further solids settling. Treated water in compliance with NPDES discharge limits will then be discharged to the Arkansas River.

3.4.8 Solids Handling

Residual solids generated by the groundwater treatment system containing calcium fluoride will be dewatered in a filter press unit and stored on site for further processing.

FIGURE 5
TRENCH LOCATION

FANSTEEL, INC
MUSKOGEE, OKLAHOMA

APPROVED	[illegible] 12/4/96
CHECKED	LLR CUMMINS
DRAWN	01/03/1996
DRAWING NUMBER	0111219

Earth Sciences Consultants, Inc.

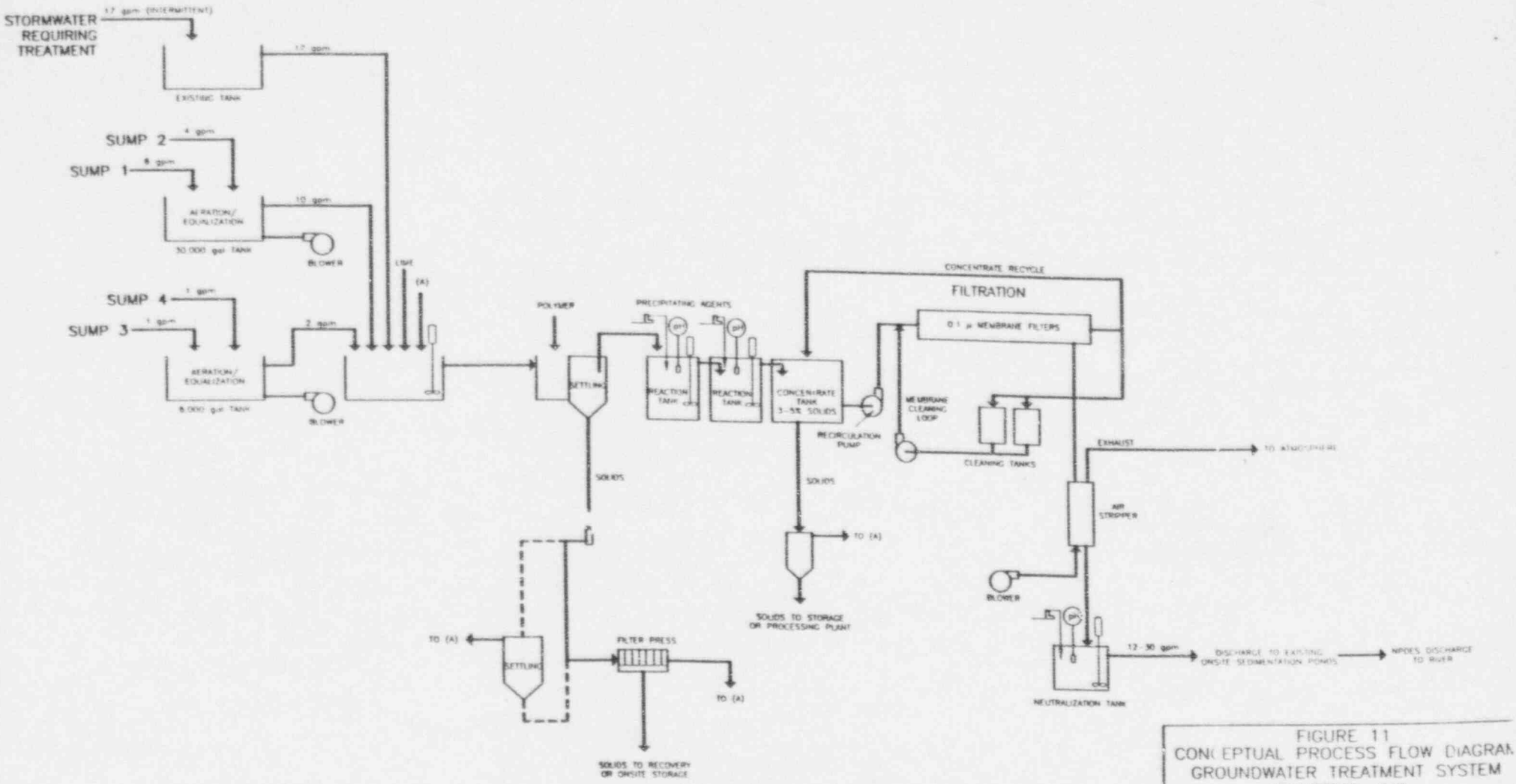


FIGURE 11
CONCEPTUAL PROCESS FLOW DIAGRAM
GROUNDWATER TREATMENT SYSTEM
FANSTEEL, INC.
MUSKOGEE, OKLAHOMA

REVISION	DATE	DESCRIPTION

APPROVED
CHECKED
DRAWN 01/03/1996
DRAWING NUMBER 0111223

Earth Sciences Consultants, Inc

- **NRC COMMENT** - If the purpose of the groundwater collection and treatment system is to remove groundwater contaminated with radioactive materials, describe the impact of this contamination on the environment. Include any pathway analyses performed to evaluate the impact of the contamination on human health.

FANSTEEL RESPONSE - Baseline chemical and radiological risk assessments have been performed for contamination identified at the facility. These risk assessments, including pathway analyses, are contained within Attachments B, B-1, B-2, B-2.1, B-2.2, B-3.1, B-3.2, B-3.3, B-3.4, B-3.5 and C of the Feasibility Study contained within the Decommissioning Plan for the Fansteel facility submitted to the NRC in June of 1994.

- **NRC COMMENTS** - Fire Safety

2.1 Describe any procedures established to ensure fire safety, which should include:

a. An annual review by the management (or a Safety Committee) of the procedures and their implementation and a plant walk-down inspections at more frequent intervals;

b. Control of storage, transfer, and use of combustible objects in process areas;

c. Control of hot working, such as welding and torch-cutting, in process areas;

d. Written operating instructions for processes involving fire hazard;

e. Regular maintenance of process and fire protection equipment.

2.2 Describe any fire suppression equipment installed or available at the facility. The description should include municipal fire main and hydrant systems, with a site map showing the locations of fire hydrants and other suppression equipment.

2.3 Describe the construction of the process buildings and fire safety features, such as smoke detectors, installed therein.

2.5 Describe any automatic or manual fire detection/alarm system installed in the facility. Indicate whether a central alarm panel is monitored around-the-clock and/or the alarm is directly transmitted to the local fire department.

2.6 Describe a training program on general fire safety for all employees and fire fighting training for an emergency team, if one is organized.

2.7 Indicate whether the facility has a contractual agreement with the local fire department to come to its aid in the event of a fire and whether the fire department personnel are given at least one familiarization tour of the facility annually.

FANSTEEL RESPONSE - The buildings in use for processing are constructed of either brick and steel or are metal sheeting over steel framing. When operating, the buildings will have smoke alarms for in-place detection and will have fire alarms secured through a constant surveillance system which are transmitted to the local fire department. The local fire department is familiarized annually with plant materials and operation. Updates are issued to the fire departments, as necessary.

Inasmuch as this is a rather small plant, the entire workforce will be trained in fire protection procedures at initial hiring and will be updated formally on an annual basis.

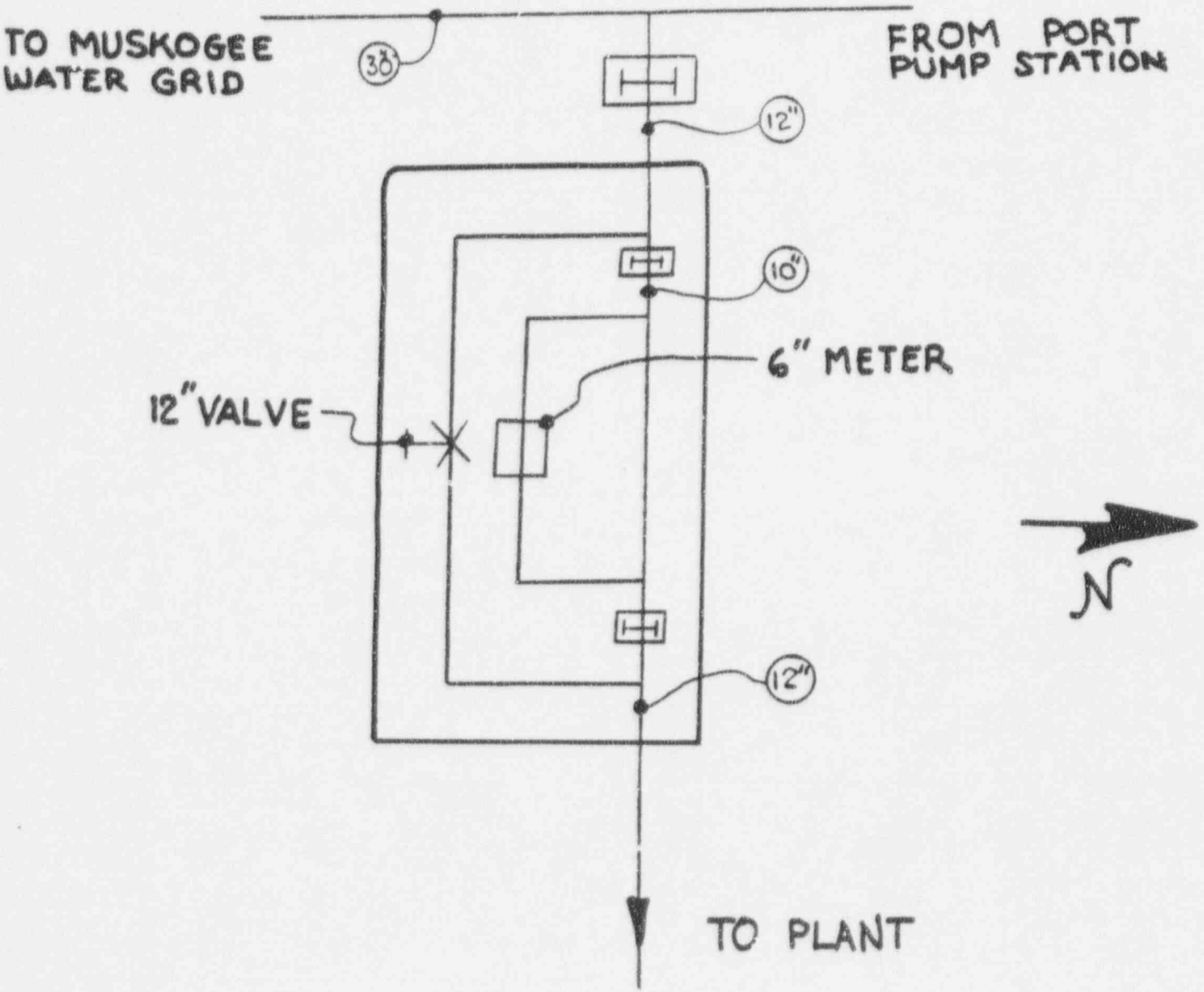
A community emergency plan, and a notification listing is in effect for all emergent conditions.

The plant had "hot work" procedures in effect prior to shutdown and these will be reenergized for the proposed process plant.

Maintenance of alarms, extinguishers and other fire safety equipment is done in accordance with national safety standards and manufacturer's recommendations.

The proposed plant will be a continuous operating plant. Personnel will be on site 24 hours a day. Management safety reviews will be done semi-annually on a formal basis and as often as required to keep personnel updated and working safely.

Enclosed are three figures describing the plant water and fire fighting system.



FANSTEEL, INC.
MUSKOGEE, OK
WATER INLET TO PLANT

FIG. 1

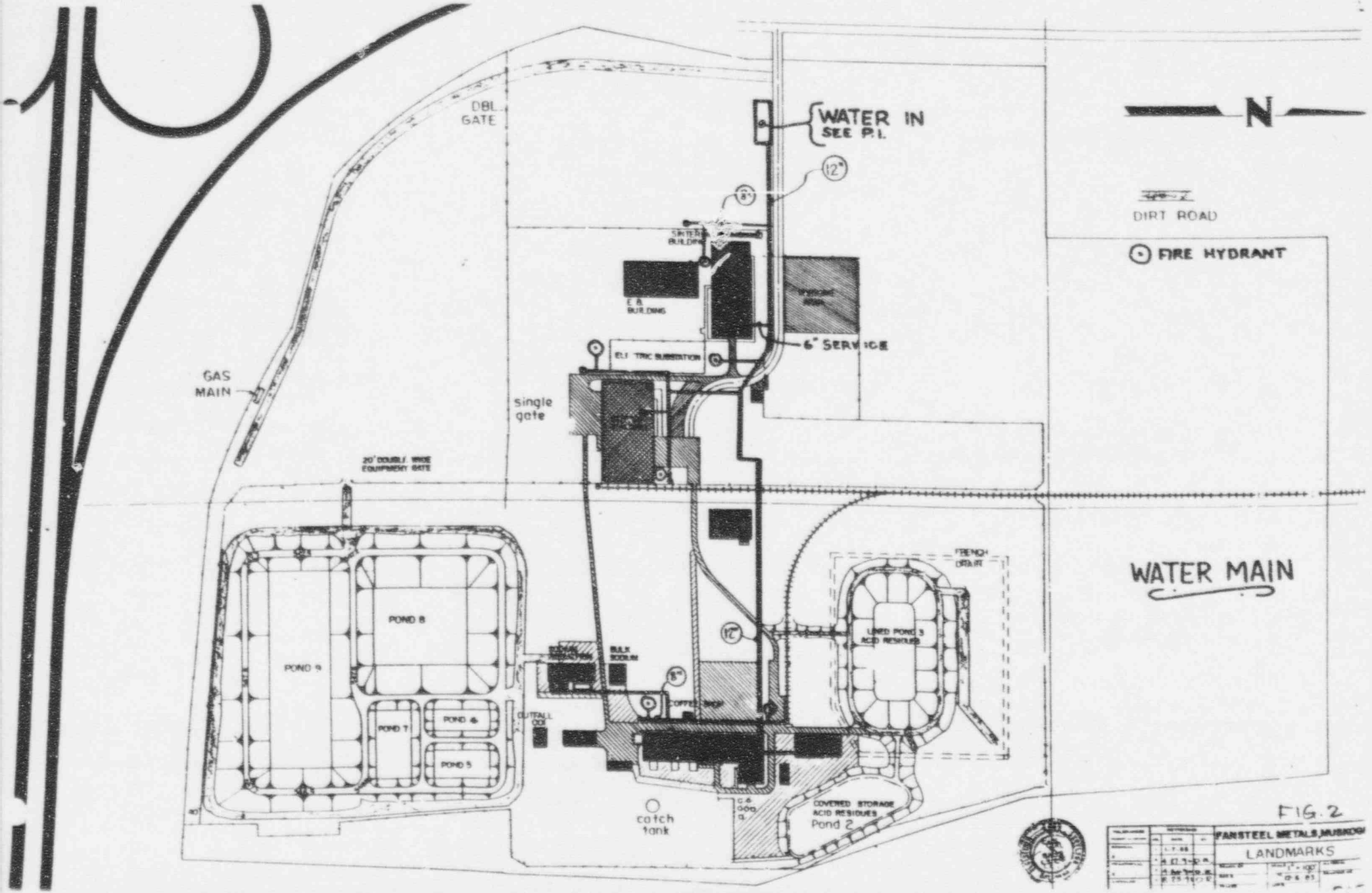
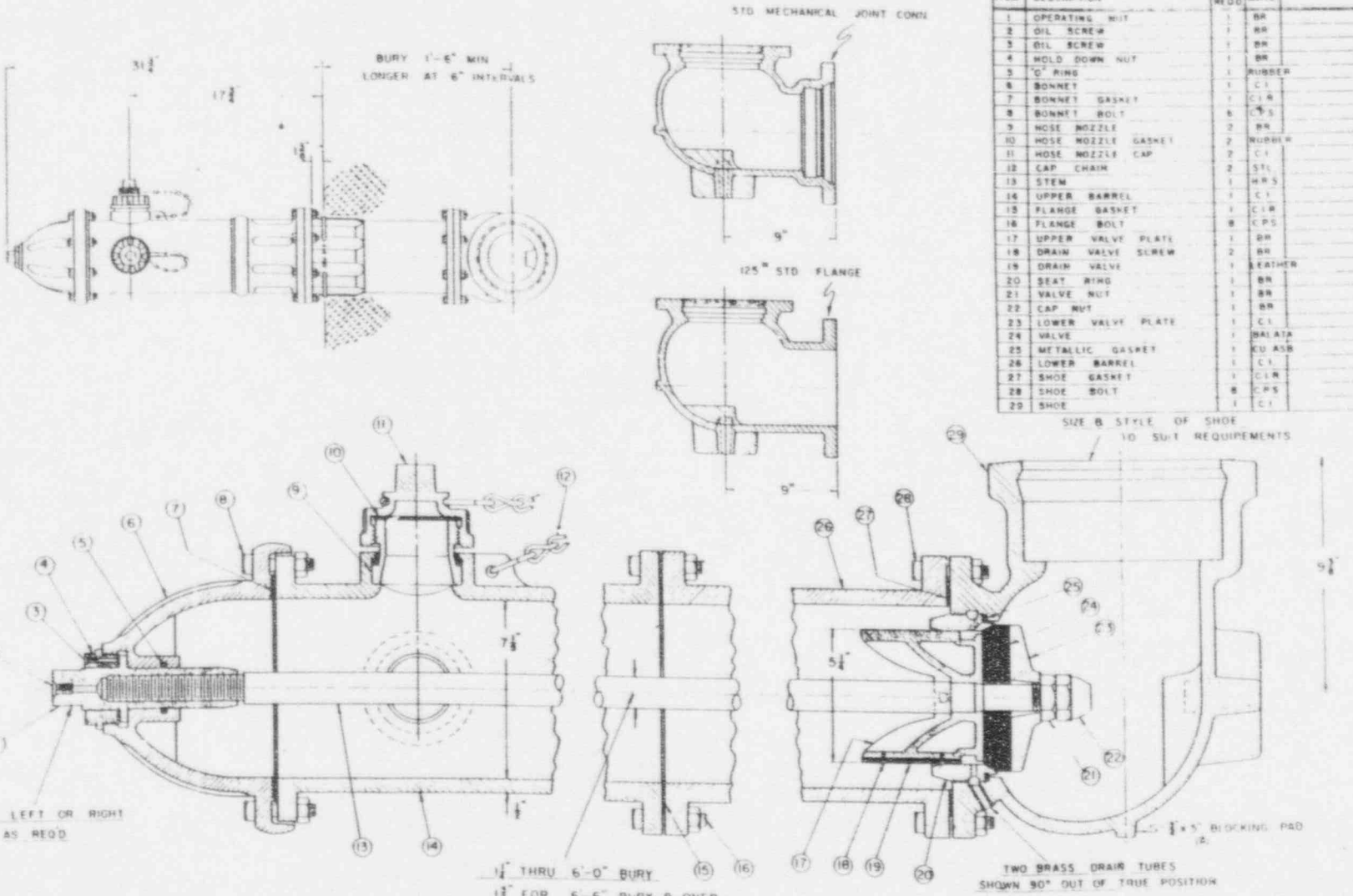


FIG. 2

FANSTEEL METALS, MUSKOGEE

LANDMARKS

DWG NO 5851 5½ A 2400B STANDARD AWWA FIRE HYDRANT WITH TWO HOSE OUTLETS



PARTS LIST

ITEM	DESCRIPTION	NO REQD	MATL
1	OPERATING NUT	1	BR
2	OIL SCREW	1	BR
3	OIL SCREW	1	BR
4	HOLD DOWN NUT	1	BR
5	"O" RING	1	RUBBER
6	BONNET	1	C I
7	BONNET GASKET	1	C I R
8	BONNET BOLT	6	C P S
9	HOSE NOZZLE	2	BR
10	HOSE NOZZLE GASKET	2	RUBBER
11	HOSE NOZZLE CAP	2	C I
12	CAP CHAIN	2	STL
13	STEM	1	H R S
14	UPPER BARREL	1	C I
15	FLANGE GASKET	1	C I R
16	FLANGE BOLT	8	C P S
17	UPPER VALVE PLATE	1	BR
18	DRAIN VALVE SCREW	2	BR
19	DRAIN VALVE	1	LEATHER
20	SEAT RING	1	BR
21	VALVE NUT	1	BR
22	CAP NUT	1	BR
23	LOWER VALVE PLATE	1	C I
24	VALVE	1	BALATA
25	METALLIC GASKET	1	CU ASB
26	LOWER BARREL	1	C I
27	SHOE GASKET	1	C I R
28	SHOE BOLT	8	C P S
29	SHOE	1	C I

SCALE - ½" = 1"

FIG. 3

MUELLER CO