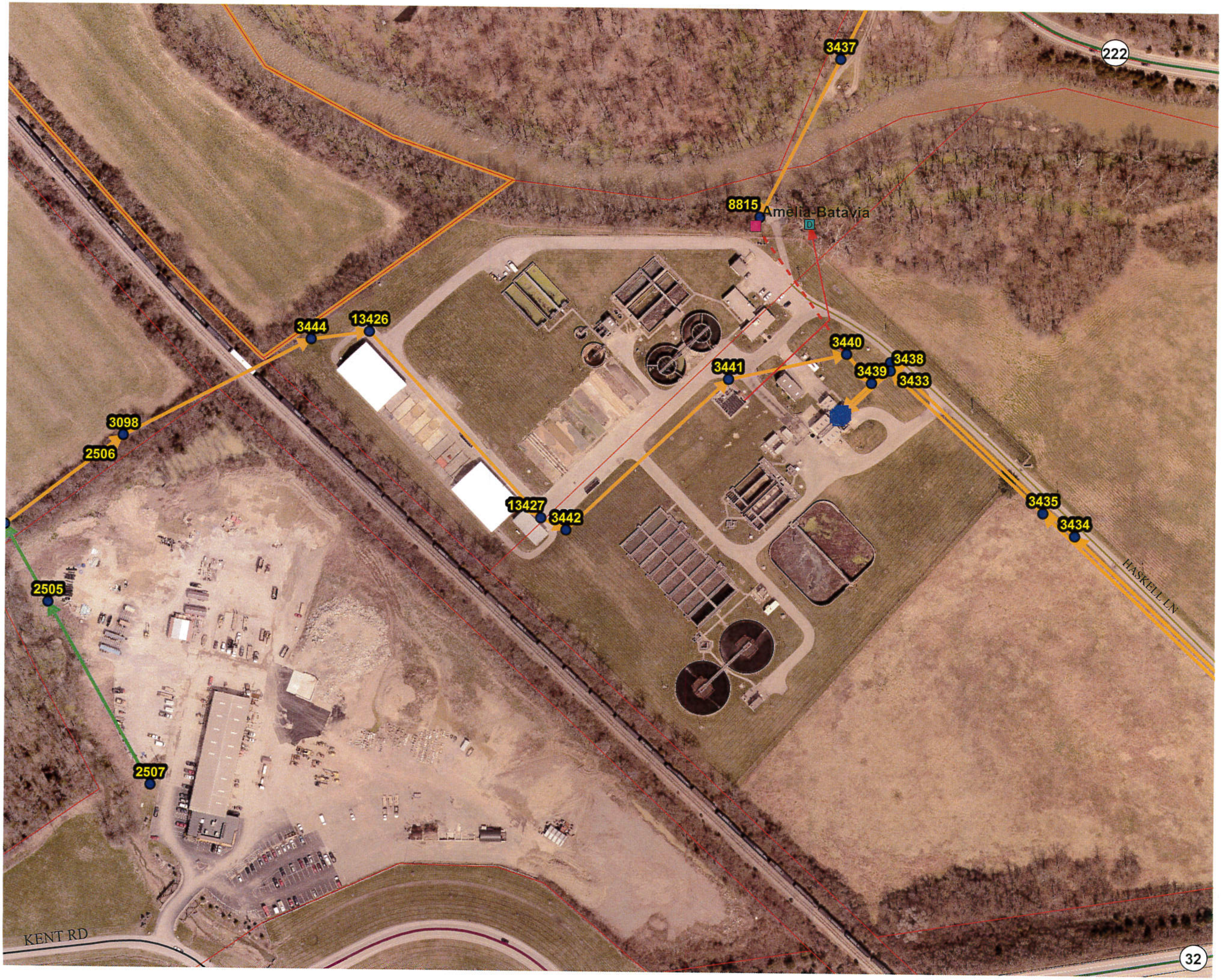
MEF WWTP

- Grit Removal
- Fine Screening
- Aeration
- Septic Station

Hand-out 7/15/2020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HASKELL LN

CHAPTER 6.3

GRIT REMOVAL

1.0 INTRODUCTION

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2.1 Design Data
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3.0 OPERATING STRATEGY

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1.0 INTRODUCTION

After the coarse screening process the wastewater still contains inorganic solids such as sand, cinders and gravel and non-putrescible organics such as coffee grounds, fruit rinds and seeds. These solids are referred to as **grit**. Grit must be removed from the wastewater early in the treatment process to protect moving plant equipment from **abrasion** and **wear** and to **reduce deposition** of grit particles in pipes or channels. Grit particle deposition in pipes could eventually clog the conduit. Deposition in tanks takes up valuable space that should be used for treatment, especially in your aerobic digesters.

Originally, grit removal capabilities were installed in plants exclusively treating wastewater collected by combined sewer systems because of the large amounts of grit conveyed by such systems. As mechanization of wastewater treatment plants became more evident, both in quantity and complexity, greater consideration was given to the installation of grit removal for most treatment facilities. Today grit removal capabilities are available in a much greater number of facilities where sewage is collected by separate or combined sewer systems. Therefore, the amount of grit a treatment facility receives depends on the type and age of the collection system.

Removal of grit can be accomplished by several different methods. Factors of choice include **headloss needs** and **space availability** for the treatment process. **Velocity controlled** grit removal is accomplished by slowing the velocity of the wastewater flow to about 1.0 (0.7 - 1.3) feet per second (fps). Flow velocity can be adjusted by either use of multiple grit channels or the use of a proportional weir. **Fixed fine screens** (static screens) have recently been used to provide removal of inorganic solids along with the screenings. The screens have openings of 1.5 mm (0.06") that permit the removal of both grit and screenings. **Aerated grit chambers** are a popular method of grit removal design today, especially at plants such as activated sludge facilities where an air supply is readily available. In this process air is introduced along one side of a tank through diffusers. The bubble pattern created forces grit particles to the tank bottom, but allows lighter organic particles to be resuspended and continue to the next process. **Constant level short term sedimentation tanks** were one of the first methods of grit removal and are still widely used today. Commonly referred to as "detritus grit removal tanks", these units are designed to remove both organic and inorganic particles. After removal from the tank, the organic particles are washed from the inorganic particles and then returned to the flow for treatment in a subsequent process.

The Middle East Fork Regional Wastewater Treatment Plant (MEFRWWTP) includes a type of grit removal not described above. A method of grit removal becoming more popular is **forced vortex** grit removal. A vortex is created within a tank. The speed of the vortex remains constant during fluctuations in incoming flow resulting in grit removal over a wide range of flows. The vortex can be created by various methods, but the MEFRWWTP grit removal units use the flow velocity introduced to the grit removal process to create the vortex. The vortex forces grit to the bottom of the tank but allows lighter organics to continue to following processes for biological treatment.

The principle of operation is that of **subcyclonic separation**. A forced vortex in conjunction with gravity forces the grit to the chamber floor. The grit that settles to the bottom moves along with other material towards the center of the unit. EUTEK's **Teacup Solids Classifier** utilizes a combination of free-vortex centrifugal and gravitational forces to separate and classify inorganic solids from organic solids and water. It is perfectly matched to the sewer's hydraulics to achieve the most efficient grit removal under maximum grit loadings. Figure 6.3-1 shows the location of the grit process in relation to the other MEFRWWTP process. Figure 6.3-2 graphically illustrates the principles behind the teacup grit removal processes.

FIGURE 6.3-1
LOCATION OF GRIT REMOVAL TEACUPS

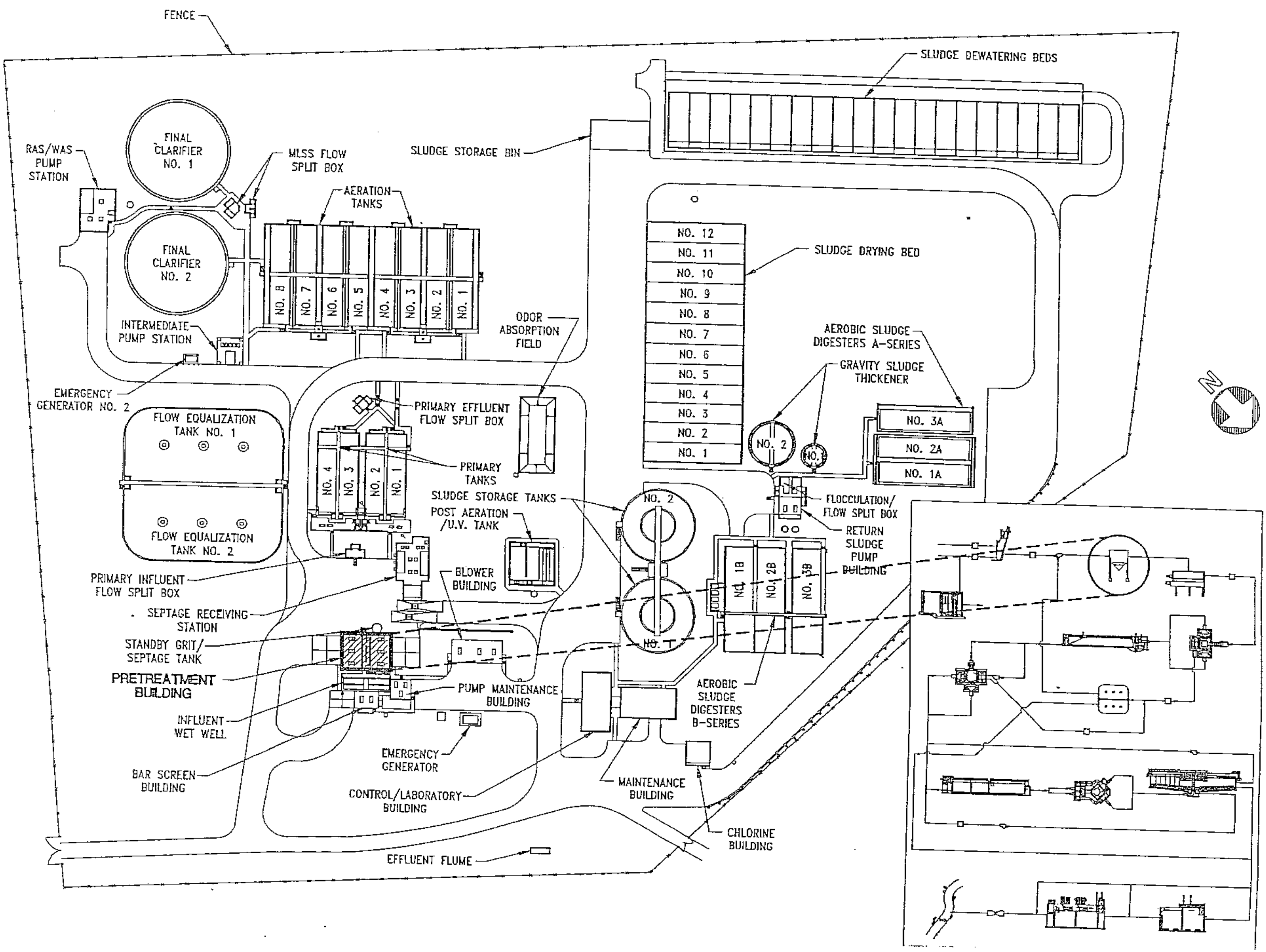
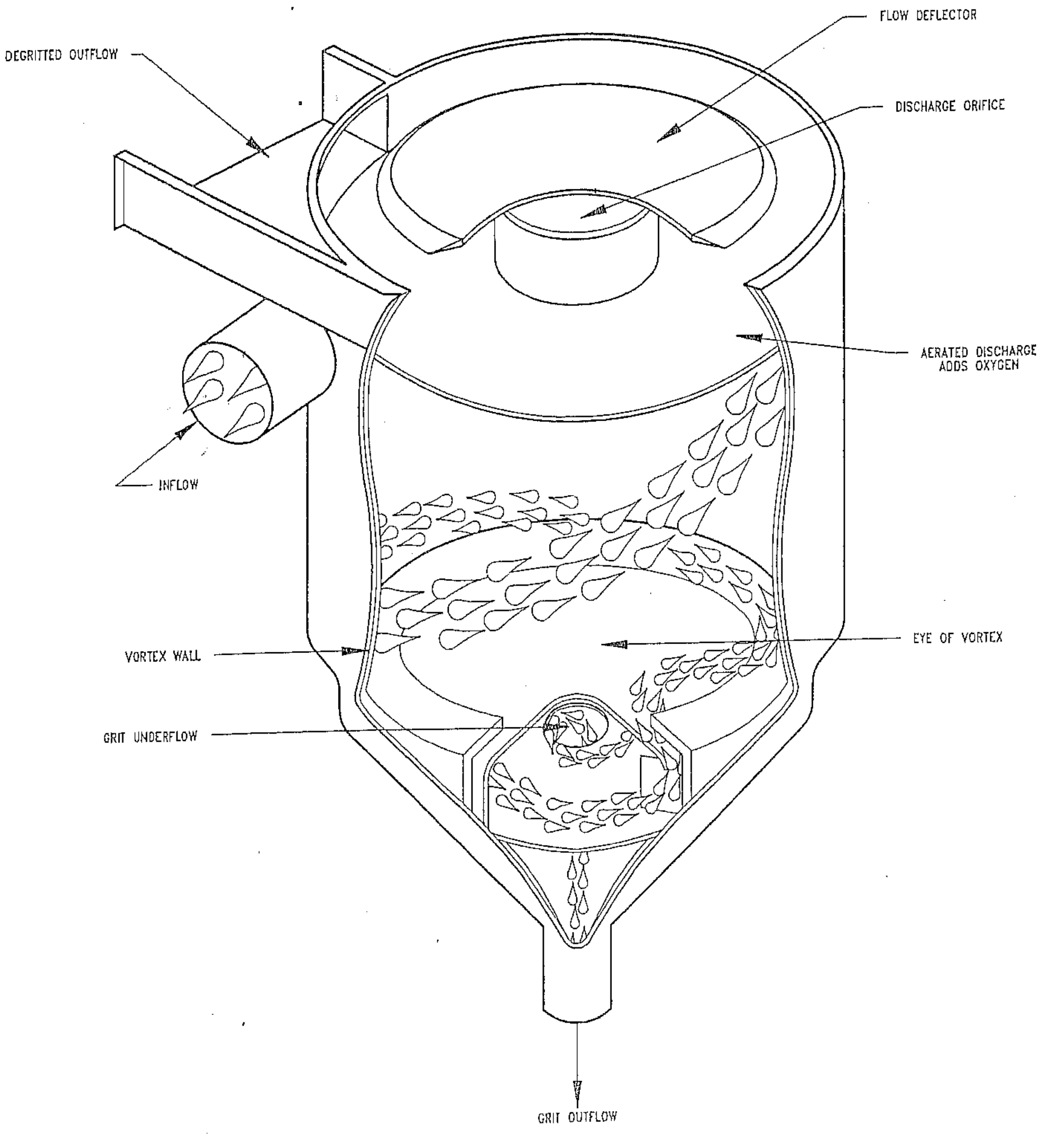


FIGURE 6.3-2
TEACUP GRIT REMOVAL



2.0 DESCRIPTION

2.1 Design Data

- **EUTEK TEACUP SOLIDS CLASSIFIER**

Number:	3
Diameter:	86 inches
Removal Capacity:	95% of solids larger than 110 micron when flow is greater than 3.2 MGD
Headloss at 4.0 MGD:	71 inches

- **EUTEK GRIT ESCALATOR**

Number:	2
Removal Capacity:	2 cuyd/hr

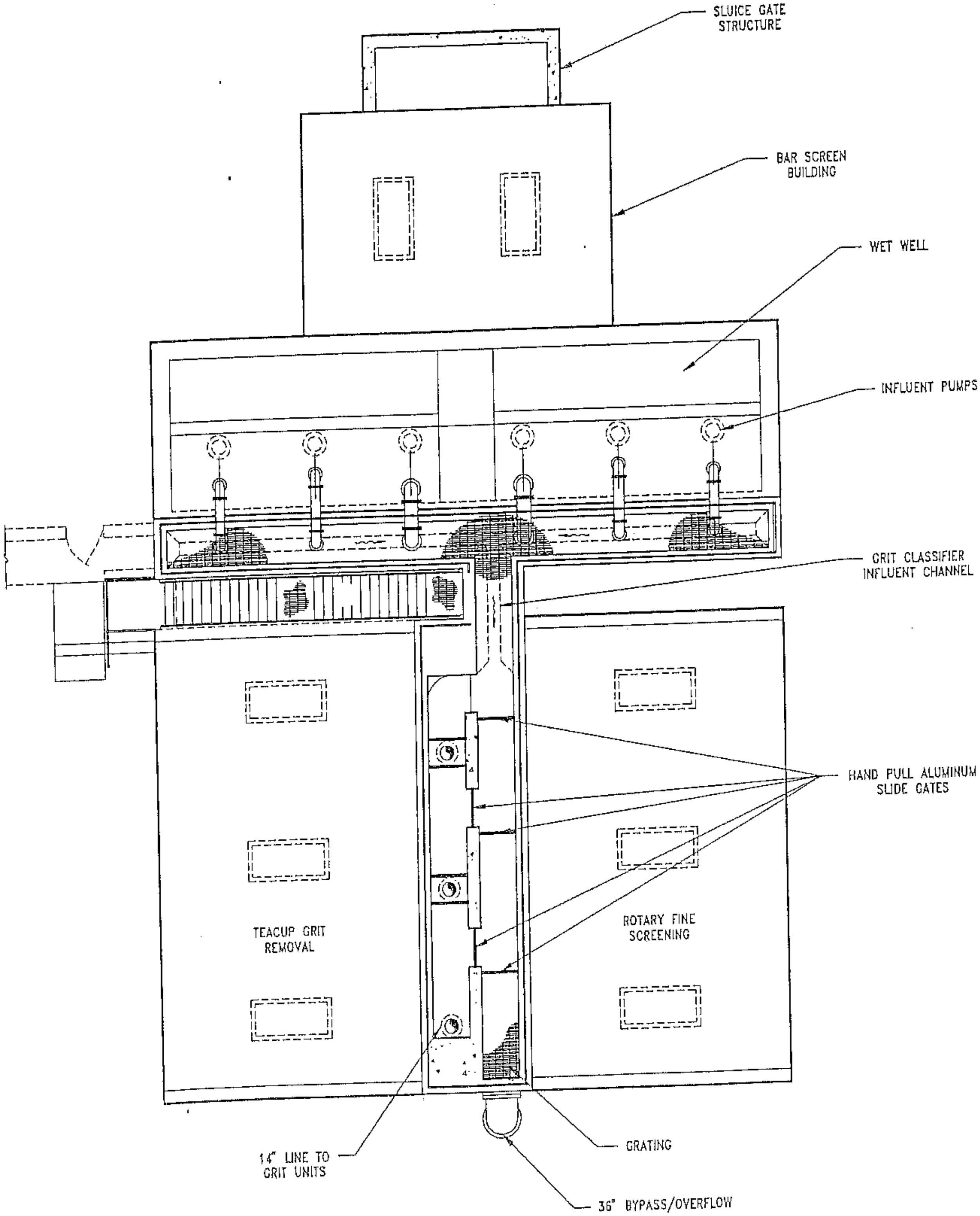
2.2 Process/Equipment Description

After Coarse Screening the influent is pumped from the wet well to a channel at the top of the Pretreatment Building with an opening directly above each of three (3) **Grit Classifiers**. Flow to selected Grit Classifiers is controlled by a series of hand pull aluminum slide gates located in the channel above the classifiers. These gates can also be used to bypass the Grit Process completely. The flow can be directed to a 36 inch bypass/overflow pipe which continues directly to the Primary Clarifiers. Figure 6.3-3 shows the orientation of the slide gates with respect to each Grit Classifier. The peak flow for the entire grit removal system is 12.0 MGD.

The Grit Classifiers are most efficient at a flow rate of 3.2 MGD or greater. When flows approach this rate, 95% of grit 110 microns in size is removed with a maximum headloss of 45 inches. when flows increase to the maximum of 4.0 MGD, the headloss is 71 inches. Each Grit Classifier is approximately seven (7) feet in diameter.

Grit that is collected in the bottom of the Grit Classifiers is discharged out the bottom of the Grit Classifier and onto a **Grit Escalator**. The Grit Escalator dewaters the collected grit while carrying it to a dumpster for final disposal. The Grit Escalator can be controlled by a motor driven, repeat cycle timer. The timer may be used to turn on and off the Grit Escalator repeatedly preset intervals. Under normal operating conditions, the grit escalator is

FIGURE 6.3-3
GRIT CLASSIFIER INFLUENT CHANNEL



run continuously without the use of the timer. The dumpsters are emptied weekly by Rumpke.

Wastewater leaves each grit classifier through a 3½ foot outlet which drops to another channel and into the 20 inch Rotary Screen Influent lines.

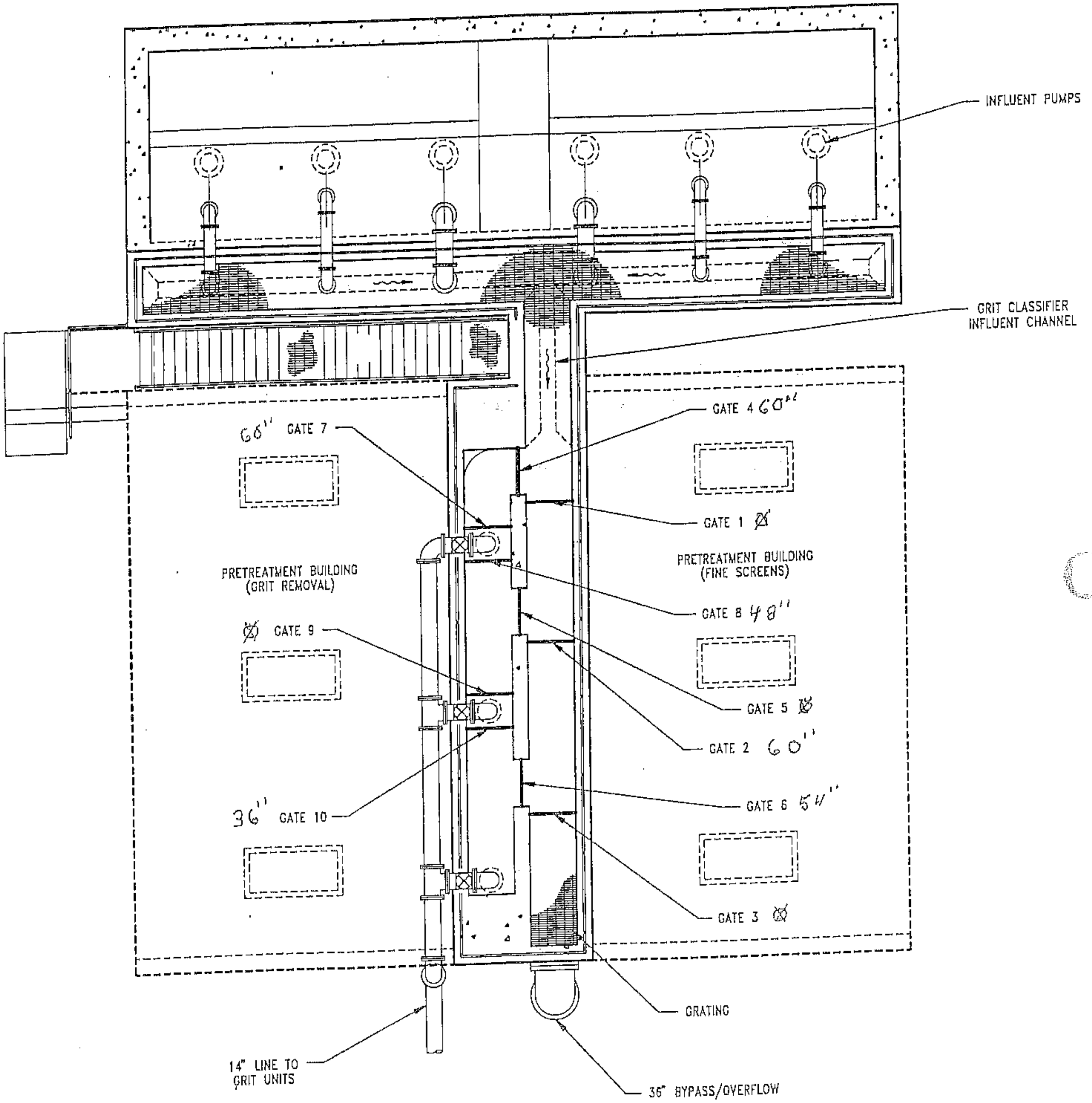
3.0 OPERATING STRATEGY

Little operational control is necessary with the Teacup grit removal system. Unlike other forced vortex grit removal systems, no additional method of controlling the vortex is supplied, and therefore, requires no control.

One control that is available is achieved by the use of slide gates located on top of the Pretreatment Building. There are ten (10) locations available for installation of the lsidge gates, although only six (6) are used. The slide gates are used to direct and control the flow to the three (3) teacup units. Three (3) gates are 60" high, one (1) gate is 54" high, 1 gate is 48" high and one (1) gate is 36" in height. The gates are intended to be used as follows (refer to Figure 6.3-4).

Location Number	Gate Size Installed
1	None
2	60"
3	None
4	60"
5	None
6	54"
7	60"
8	48"
9	None
10	36"

FIGURE 6.3-4
SLIDE GATE LOCATIONS



One control that must be determined by experience is the frequency of collected grit removal. This task is accomplished by opening a valve to fluidize the grit and also manually opening a valve which directs the fluidized grit to the snail. The amount of fluidized water flow and frequency of collected grit removal is determined by experience.

A general guideline is that 1 - 4 cubic feet of grit is removed for every million gallons of wastewater treated. This range is generally used for wastewater treatment facilities receiving flow from a separate collection system, where storm and sanitary flows are collected individually. Those collection systems collecting sanitary and storm waters collectively will contribute more grit to the plant. Higher flows related to storm events will also cause more grit conveyed to the plant. Flow is split to each unit by a series of hand pull aluminum stop gates. Each Teacup Unit has the operating capacity of 0 - 4.0 MGD. Therefore, normally only one unit will be in service.

4.0 PROCESS MONITORING

The process objective is to remove grit which mostly consists of inorganic abrasive material. The two major concerns are 1) to provide grit removal and 2) provide that removal with removing a minimal amount of organics. The grit removal process requires very little process monitoring from the laboratory. Periodically (weekly or monthly), the amount of removed organic matter in the grit should be checked. Performing a volatile solids test on the grit removed will determine the organic content. The volatile (organic) fraction of the grit should be less than five percent. If laboratory results are greater than five percent the operator should investigate the fluidizing operation of the units.

Process monitoring also includes keeping records on the quantity of grit removed. The useful units to measure this are cubic feet of grit per million gallons of wastewater treated (cf/MG).

Other useful data to maintain include:

- Quantity of grit removed per MG of wastewater treated; and
- Dry weather vs. wet weather grit removal quantities.

An indirect measure of the efficiency of the grit removal process would be to monitor the grit accumulation in downstream channels, basins and hoppers.

5.0 TROUBLESHOOTING

Troubleshooting is the process of locating and eliminating sources of problems. A troubleshooting guide is provided in Table 6.3-1 to assist MEFRWWTP operating personnel in effectively troubleshooting problems associated with the grit removal process. Please note that some of the listed guidelines are general in character and serve as suggestions of items to investigate in effort to find causes and/or solutions of a problem.

The troubleshooting guide should be updated as "hands-on" experience with the process and associated equipment is gained. Keep the guidelines simple and to the point. Refer the reader to more detailed descriptions if necessary.

6.0 START-UP/SHUT-DOWN PROCEDURE

The following step-by-step procedures are guidelines to be used in conjunction with manufacturer's manuals for starting and stopping the grit removal process and associated equipment.

TEACUP GRIT CLASSIFIER (start-up):

- Close the grit underflow and fluidizing lines of the Teacup(s)
- Introduce flow to the Teacup system

- Check all pipe connections for leaks

- After 30 minutes, feed clear water through the one inch Teacup fluidizing line(s) for 15 seconds.

- Close the fluidizing line(s) and open the Teacup grit underflow line(s) and blow down the Teacup(s) into the dewater equipment until no more grit slurry exists.

  Note: Normally very little grit will be seen following a 30 minute Teacup run.

- Close the Teacup grit underflow line(s).

  Note: MAKE CERTAIN THAT CLEAR WASTEWATER IS ENTERING THE DEWATERING EQUIPMENT BEFORE CLOSING THE GRIT UNDERFLOW LINE(S). THIS IS TO INSURE THAT GRIT DOES NOT SETTLE OUT IN THE GRIT UNDERFLOW LINE(S) WHICH WILL RESULT IN PLUGGING PROBLEMS.

TEACUP GRIT CLASSIFIER (Shut-down):

- Stop feed to the Teacup system. Allow the Teacup(s) to drain completely through the grit underflow line. Hose down the inside of the Teacup(s).

- Remove the Flow Deflector and remove the Discharge Element.

- Look inside each Teacup and clean out any large solids which may be on the bottom or lodged between the Baffle Support Plate and the Baffle.

- From inside each Teacup, verify that the Baffle is attached to the Baffle Support Plate. Verify that the distance from the edge of the hole in the Baffle Support Plate to the top of the Baffle is ¾ ". Adjust the clearance by turning the countersunk screws on top of the Baffle Support Plate. Verify that the Baffle Support Plate is sitting level.

- If it is necessary to remove the Baffle Support Plate/Baffle assembly, remove the ¼" diameter screws in the Baffle Support Plate which secures the Baffle Support Plate to the Support Ring beneath the Baffle Support Plate. THE

BAFFLE SUPPORT PLATE MUST BE SECURED WITH THESE SCREWS BEFORE THE TEACUP(S) ARE PLACED BACK INTO OPERATION.

- Replace the Discharge Element and the Flow Deflector or Access Lid.

GRIT ESCALATOR (Start-up):

- Make sure that the belt is centered on the Head and Tail rolls.

- The belt should be tensioned so that the cleats open and clear the tail roll by one (1) inch as they pass around the tail roll.

- The head roll scrapper and retainer are designed to keep the cleats closed as they rotate around the head roll. Ensure the belt is properly tensioned and the cleats will stay closed. If the cleats do not remain closed as they rotate around the head roll, grit will accumulate on the underside of the cleats and cause the escalator to jam.

- Set the variable speed motor to the lowest speed and turn the motor on. Slowly increase the speed to one (1) fpm. Make sure snail belt travels freely and tracks properly. Adjust the counterweight so that the head roll scrapper disengages smoothly from the cleats. If this does not occur, immediately shut off power and correct the problem.

- Increase speed to the maximum of five (5) fpm and repeat the above checks.

- With power off, introduce flow to the clarifier. When the tail roll is partially submerged, turn the motor on and set belt speed to one (1) fpm. Slowly increase speed in 20% increments until five (5) fpm is reached. Allow the belt to run at each speed for five (5) minutes. Make sure cleats are held close at all speeds.

- For daily operation, the belt should be operated continuously at the lowest practical speed (1 fpm) to provide maximum dewatering.

GRIT ESCALATOR (Shut-down):

- Stop feed to clarifier.

- When no more solids are removed by the clarifier, shut off the power.

- Drain the clarifier by opening the three (3) inch drain line.

- Hose down the belt and clarifier.

7.0 MAINTENANCE

Volume II of these O&M Manuals describes the preventive maintenance system for the plant. Included in the manual is a Nameplate Data Sheet and a Preventive Maintenance Schedule for the grit removal process. The equipment in this process group that pertains to the grit removal process is numbered and identified in Table 6.3-2. Refer to the index number or equipment number when looking for information in the Preventive Maintenance Volume. Refer to the equipment manufacturer's O&M manuals for detailed maintenance descriptions.

TABLE 6.3-2

GRIT REMOVAL EQUIPMENT

Index Number	Equipment Name	Equipment Name	Priority
140	Pretreatment Building Facility Structure	PBFS	1
141	Grit Removal Unit-1	PBGU-1	1
142	Grit Removal Unit-2	PBGU-2	3
143	Grit Removal Unit-3	PBGU-3	4
145	Grit Dewatering/Conveying System-1	PBDS-1	3
146	Grit Dewatering/Conveying System-2	PBDS-2	4
147	Grit Dewatering/Conveying System Controls-1	PBGC-1	3
148	Grit Dewatering/Conveying System Controls-2	PBGC-2	4

CHAPTER 6.4

FINE SCREENING

1.0 INTRODUCTION

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2.1 Design Data
2.2 Process/Equipment Description

3.0 OPERATING STRATEGY

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5.0 TROUBLESHOOTING

6.0 START-UP/SHUT-DOWN PROCEDURES

7.0 MAINTENANCE

8.0 READER CHAPTER SIGN-OFF

1.0 INTRODUCTION

As described in this chapter and chapter 6.1, both fine and coarse screening processes are part of the Middle East Fork Regional Wastewater Treatment Plant (MEFRWWTP). As discussed in Chapter 6.1, coarse screens have larger openings and are employed as the first unit treatment process. Coarse screens are used to remove solids and trash that could otherwise damage or interfere with the downstream operations of treatment plant equipment such as pumps and valves. Fine screens, as described in this chapter, have smaller openings and are used to remove material that may significantly increase operation and maintenance in downstream liquid and sludge processes.

2.0 DESCRIPTION

2.1 Design Data

- **ROTARY SCREEN**

Number:	2
Screen Diameter:	36″
Screen Width:	120″
Screen Opening:	0.100″
Motor hp:	1½
Motor phase:	3
Motor rpm:	1800
Motor voltage:	230/460
Capacity:	4900 gpm peak flow @ 400 mg/L TSS

- **HELICON SCREENINGS CONVEYOR**

Number:	2
Screw Length:	10′
Screw Diameter:	10″
Motor hp:	1
Motor phase:	3
Motor rpm:	1800
Motor voltage:	230/460

- **HYPRESS SCREEN PRESS**

Number:	1
Motor hp:	3
Motor phase:	3
Motor rpm:	1800
Motor voltage:	230/460

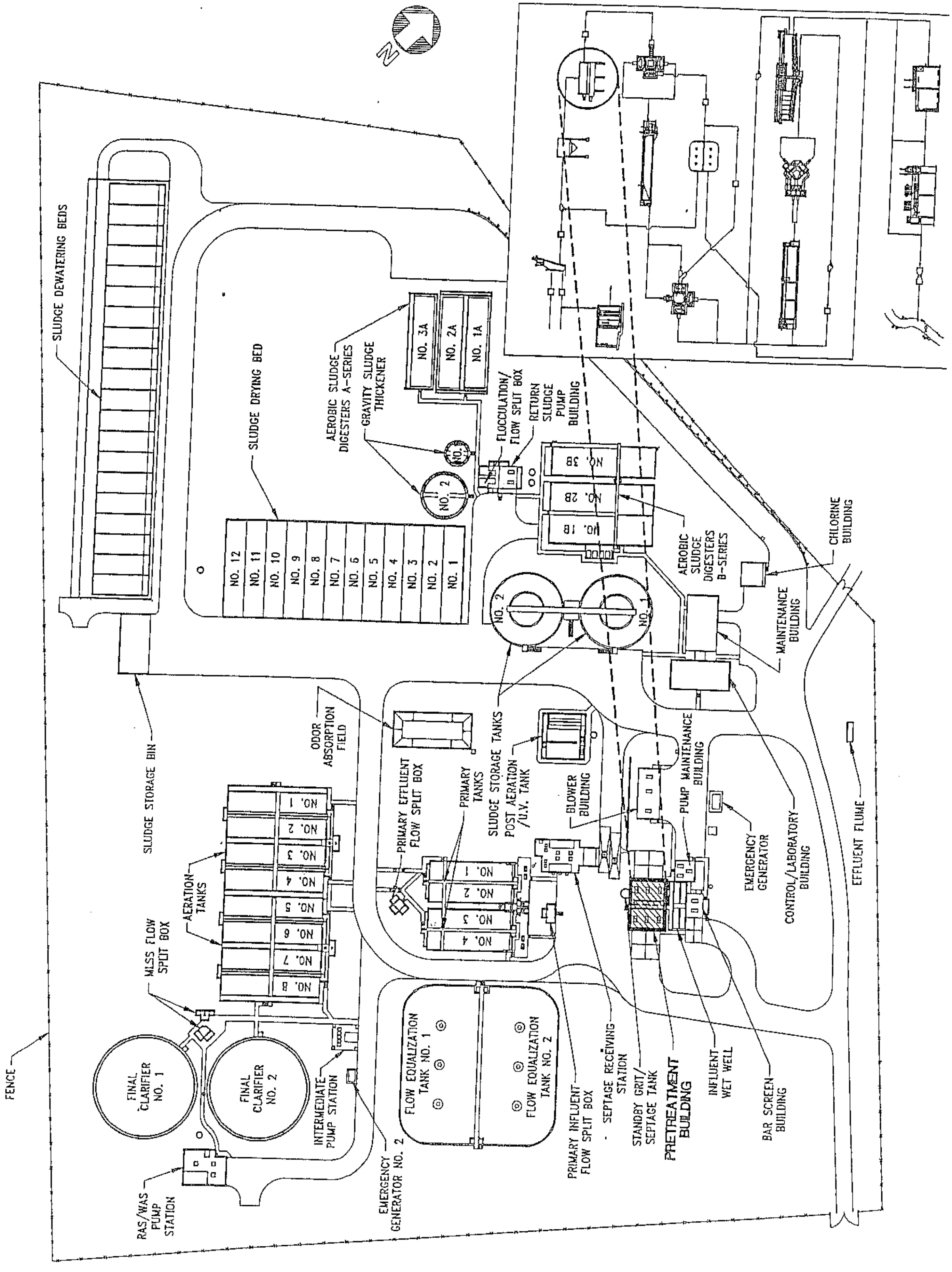
2.2 Process/Equipment Description

The location of the **screening process** is shown in Figure 6.4-1. Figures 6.4-2 and 6.4-3 show the location of the screening process in the Pretreatment Building in plan and section views. Flow leaving the **Grit Removal** process is directed to the **Rotary Screens** through two (2) 20 inch lines. Flow can be directed to either of the two (2) Rotary Screens by 20 inch knife gate valves located on the influent line to each screen. When the Rotary Screens are inoperable, flow can be bypassed through a 30 inch bypass line located after the grit removal process (refer to Figure 6.4-2).

The Rotary Screen (Rotostrainer designed to remove fine screenings in the wastewater flow) has been placed into the MEFRWWTP to optimize the operation of the downstream processes. The Rotostrainer solids dewatering screen is used to remove suspended solids from the wastewater. The fine screen operation removes objectionable materials that typically pass through the system to downstream processes, even materials small enough to remain in the sludges produced in subsequent processes. Figure 6.4-4 presents a front and side view of the MEFRWWTP Rotostrainer.

Each Rotary Screen receives flow through a 20 inch line. The wastewater passes through the slowly rotating cylindrical screen. Any solids which are larger than the screen opening (0.100″) ride over the top of the screen, are scrapped off the screen by the

FIGURE 6.4-1
LOCATION OF ROTARY FINE SCREENS



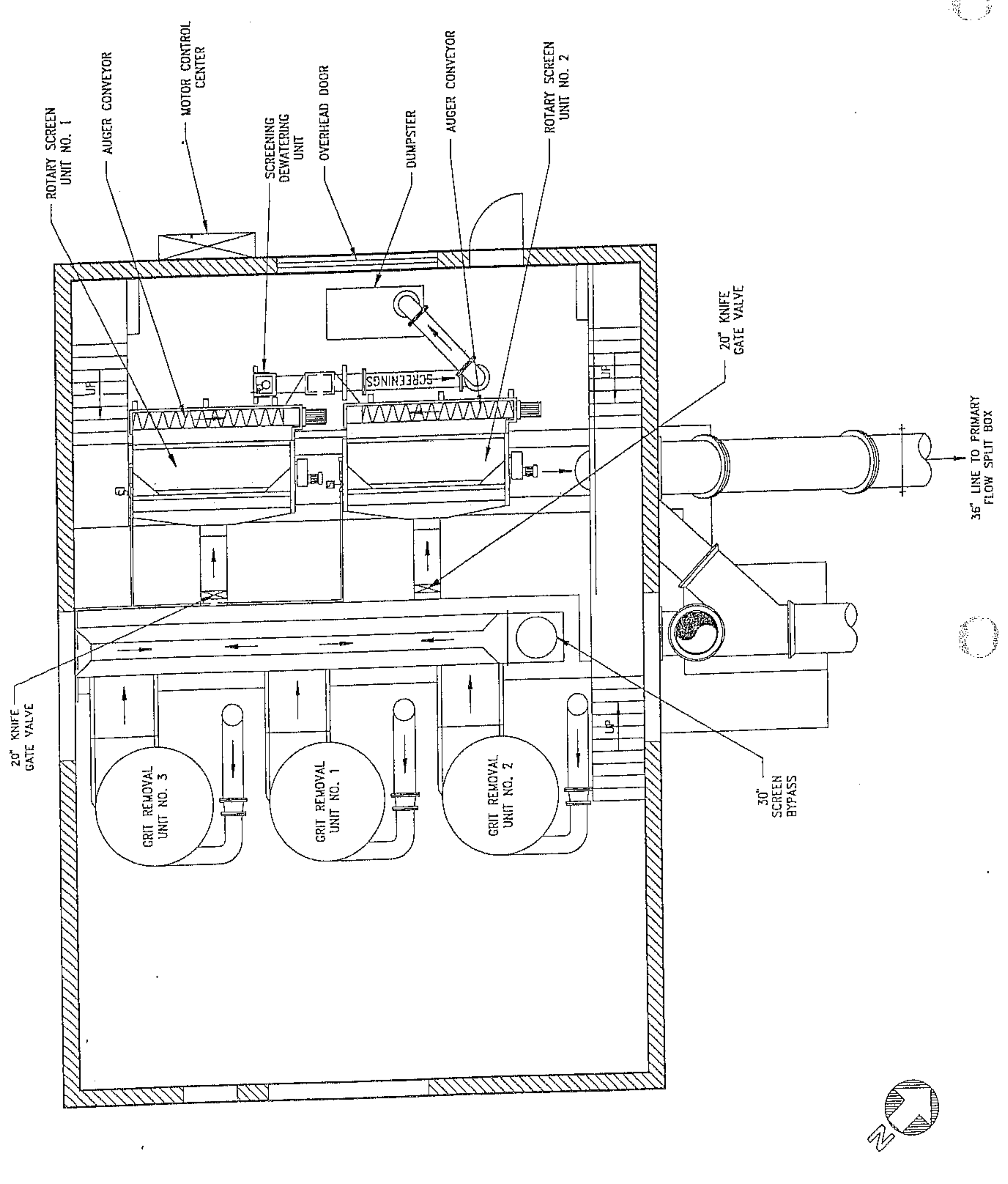


FIGURE 6.4-2
INFLUENT/PRETREATMENT BUILDING
(PLAN VIEW)

FIGURE 6.4-3
INFLUENT/PRETREATMENT BUILDING
(SECTION VIEW)

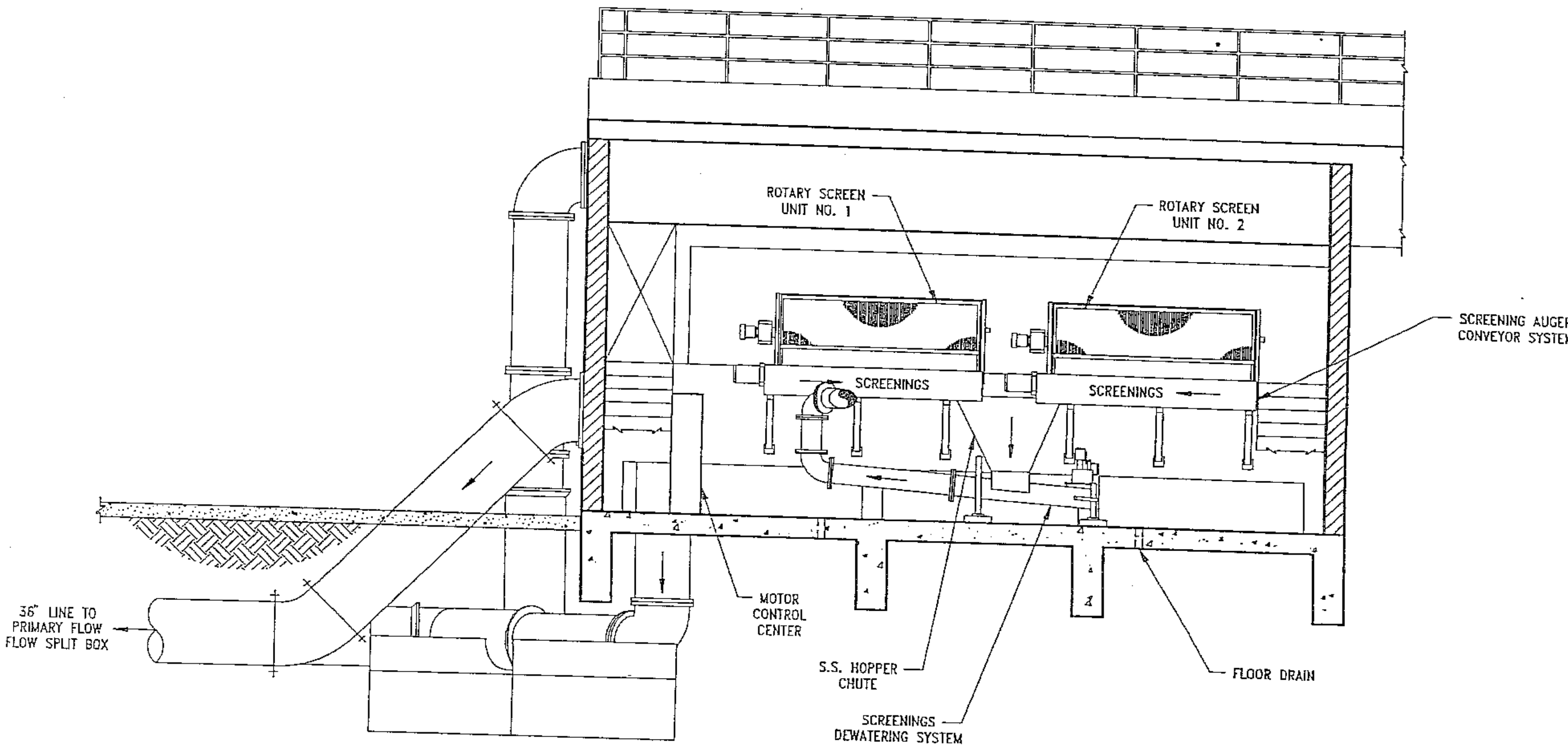
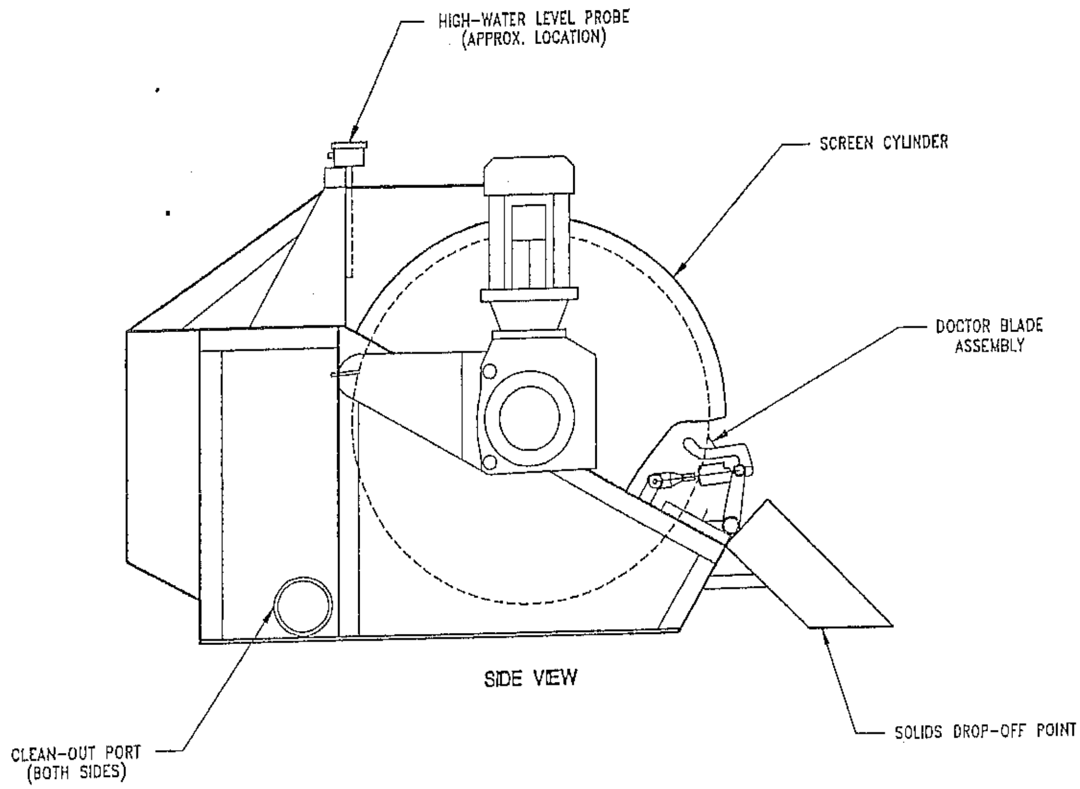
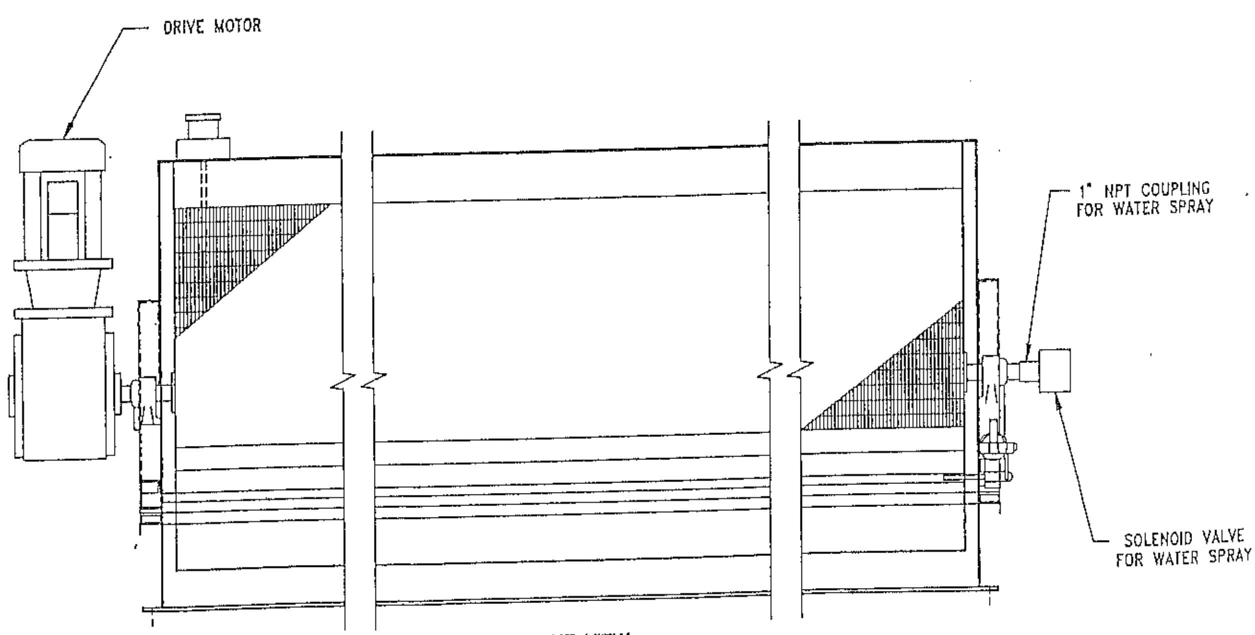


FIGURE 6.4-4
ROTARY FINE SCREEN



SIDE VIEW



FRONT VIEW

doctor blade and dropped onto a conveyor which carries the screenings to the Screen Press (Refer to Figure 6.4-5). The screened wastewater flows through the screen and drops through the bottom. As the wastewater flows through the bottom of the screen, it backwashes any solids which have remained in the screen. Each screen unit is equipped with a high water level sensor. The sensor is mounted to the headbox and will cause the screen to operate when a high influent level is detected.

The Rotary Screen (Rotostrainer) is manufactured by Hycor. It has a 36 inch diameter, 120 inch wide screen cylinder. The Rotostrainer unit is controlled by a 1½ hp, 1800 rpm motor. It is designed to received a maximum flow of 7 MGD (4900 gpm) at a suspended solids concentration of 400 mg/L.

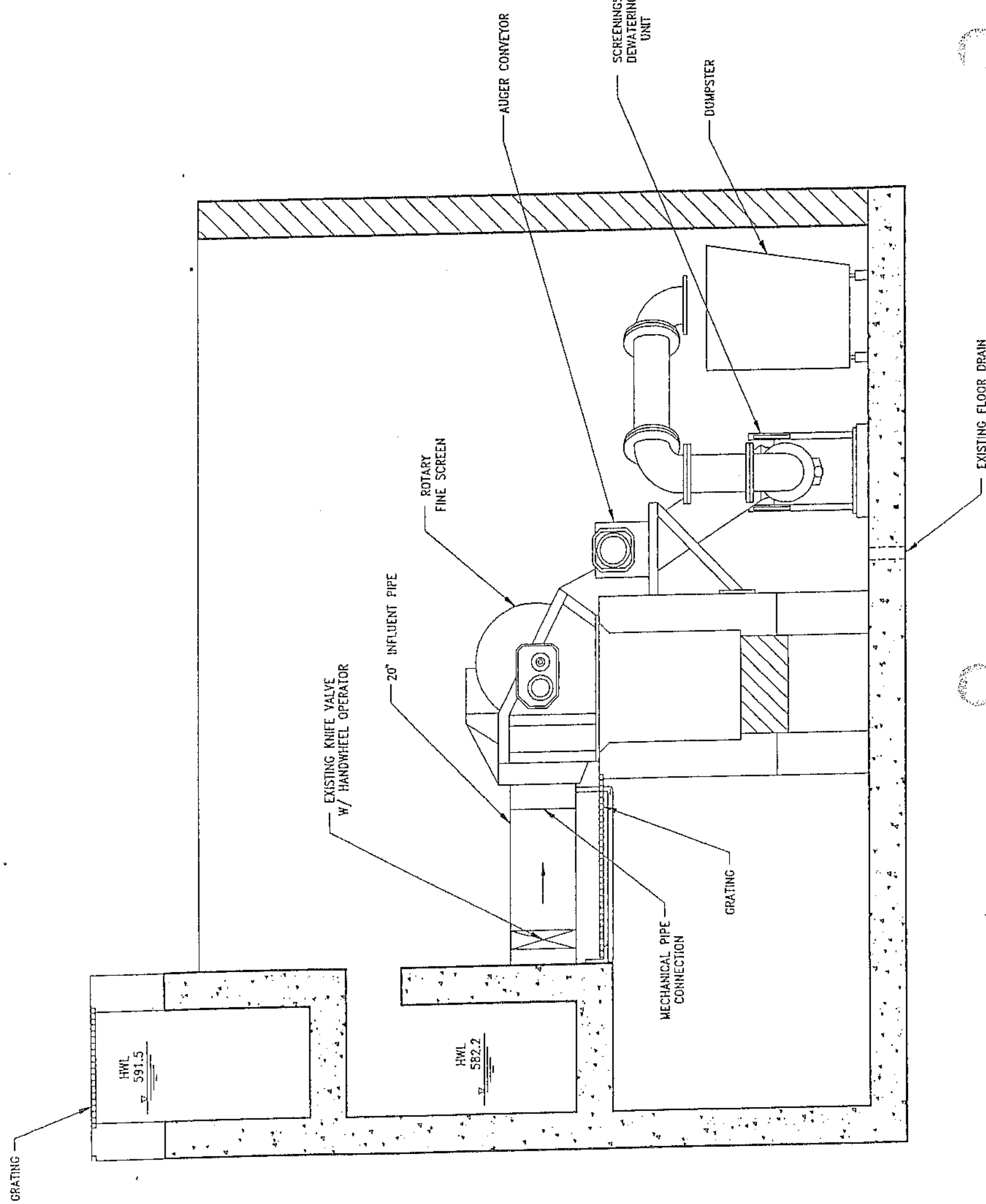
As screenings are removed from the wastewater flow they are deposited onto a **Helicon Spiral Conveyor** which transports the collected screenings to the press. The spiral screw is ten (10) inches in diameter and ten (10) feet long and constructed of stainless steel. A one (1) horsepower, 1800 rpm motor drives the screw.

The Screenings Conveyor discharges screenings to a **dewatering press** manufactured by Hycor. The Hycor Hypress is a solids dewatering device and a solids transport conveyor. This unit (Model HP 1020) is designed to dewater screenings and discharge the materials to an outside dumpster. The press consists of a basic unit with supports, a hydraulic power pack and a friction cylinder. The unit has a pressing capacity of 30 - 60 cubic feet per hour. A 3 hp, 1800 rpm motor operates the Hypress unit. The press discharges dewatered screenings to a dumpster located inside the Pretreatment Building. The screenings are ultimately disposed of by Rumpke.

The Screenings Press will produce a compressed plug of screenings that has no significant free water with an average solids content of at least 30 percent.

Flow leaves the Fine Screening process through a 36 inch line and continues to the Primary Influent Flow Split Box. During periods when the Rotary Screens are inoperable the flow can be bypassed directly to the Primary Influent Flow Split Box.

FIGURE 6.4-5
ROTARY FINE SCREENS
(SECTION VIEW)



3.0 OPERATING STRATEGY

The **Rotary Screen** requires wastewater flow passing through the rotating cylinder at all times during operation. The constant wastewater flow acts as a lubricant for the doctor blade and allows for self-cleaning of the screen. The backwashing effect of the wastewater forces trapped particles out of the screen openings. If wastewater is allowed to pass through the screen while the cylinder is stationary, solids will fill up the screen openings forcing the wastewater to backup and eventually flow over the top of the screen. As the flow backs up, organic materials tend to settle out in the channel depleting the dissolved oxygen in the wastewater and causing septic conditions to develop. The operator must therefore be sure that the cylinder is rotating whenever the rotary screen is in use.

The septic conditions produce hydrogen sulfide which has a "rotten-egg" odor, causes corrosion to concrete, metal and paint and can also produce a toxic and explosive atmosphere in poorly ventilated areas.

When a large accumulation of debris is cleaned from the Rotary Screen, a sudden rush of septic wastewater can create a "shock load" on the treatment plant and subsequent processes.

The material removed from the screen is offensive and potentially hazardous. This material stinks and attracts rats and flies. Burial or incineration are two (2) common methods of disposal. As previously discussed, screenings removed from the MEFRWWTP are disposed of by Rumpke.

4.0 PROCESS MONITORING

The screening process does not require any laboratory monitoring tests, but some useful operational records to keep to help in the efficient operation of the process include:

- Record of quantity of screenings collected;
- Calculation of cubic feet of screenings removed per million gallons treated;
- Seasonal and wet weather accumulations; and
- Disposal volume and pickup by disposal operator.

5.0 TROUBLESHOOTING

The troubleshooting guides provided in Table 6.4-1 for the screening process should be consulted when problems arise in the operation of this unit process. You will notice that these guides give only general solutions to check and try and, therefore, these suggestions have to be adapted to the particular situations.

The troubleshooting guides should be updated with hands-on experience that is gained through plant operation. Keep guides simple and to the point.

6.0 START-UP/SHUT-DOWN PROCEDURES

Rotostrainer (Start-up):

If the Rotostrainer Rotary Screen is newly installed or has not been run for a long period of time the following procedures should be performed:

- Check oil level in gear reducer;
- Make sure the end splash guards are in place;
- Check and tighten cylinder support bolts; and
- Start Rotostrainer, check cylinder rotation, and open influent.

Rotostrainer (Shut-down):

When shutting down the Rotostrainer Rotary Screen the following procedures should be performed:

- Shut off influent flow to the Rotary Screen;
- Allow the cylinder to run for an additional 3 - 4 rotations to fully drain the cylinder; and
- Once the Rotostrainer is shut off completely, thoroughly hose down the screen cylinder to remove any additional solids.

2.0 THE MEFRWWTP AERATION SYSTEM PROCESS DESCRIPTION

Biological treatment begins with the aeration system process at the MEFRWWTP. The location of tanks and associated appurtenances associated with the aeration system process, as they relate to other plant processes, are shown in Figure 6.6-7. As described in Chapter 6.5 (Flow Equalization and Primary Clarification), Primary settled wastewater flows through two (2) 24 inch lines to the Primary Effluent Flow Split Box. One (1) of the 24 inch lines carries primary effluent from Primary Tanks-1 & -2 while the other line carries flow from Primary Tanks-3 & -4. As shown in Figure 6.6-8, the Primary Effluent Flow Split Box can deliver primary effluent to any of three (3) locations:

1) **Aeration Tanks-1 through -4;**

2) **Aeration Tanks-5 through -8; and/or**

3) **Flow Equalization Tank.**

Two (2) manually operated weir gates (48 inch by 36 inch) at the Primary Effluent Flow Split Box are used to direct flow to the Aeration Tanks. Additionally, a six (6) foot by three (3) foot weir gate, dual stem with motorized actuator, is used to direct/control primary effluent to the Flow Equalization Tank. The operation of the motorized weir gate is controlled by the level in the Primary Effluent Flow Split Box. An ultrasonic level sensor located in the split box determines the valve operation. When the wastewater level in the split box reaches a predetermined level, the motorized valve opens to direct flow to the Flow Equalization Tank.

Depending on the aeration system operating mode, primary effluent flow from the Primary Effluent Flow Split Box is directed to one (1) or both Aeration Tank Influent Flow Split Boxes. As will be presented in more detail later in this chapter, when the aeration system is operated as a single stage, primary effluent is directed to one (1) or both Aeration Tank Influent Flow Split Boxes dependent upon number of aeration tanks required. Conversely, when the aeration system is operated as a two-stage process, primary effluent is directed to the Aeration Tank Influent Flow Split Box that feeds Aeration Tanks 5 through 8. Figure 6.6-9 shows the flow distribution for Aeration Tanks 5 through 8. This layout is typical of the first four (4) Aeration Tanks also.

FIGURE 6.6-6
ACTIVATED SLUDGE BULKING TROUBLESHOOTING

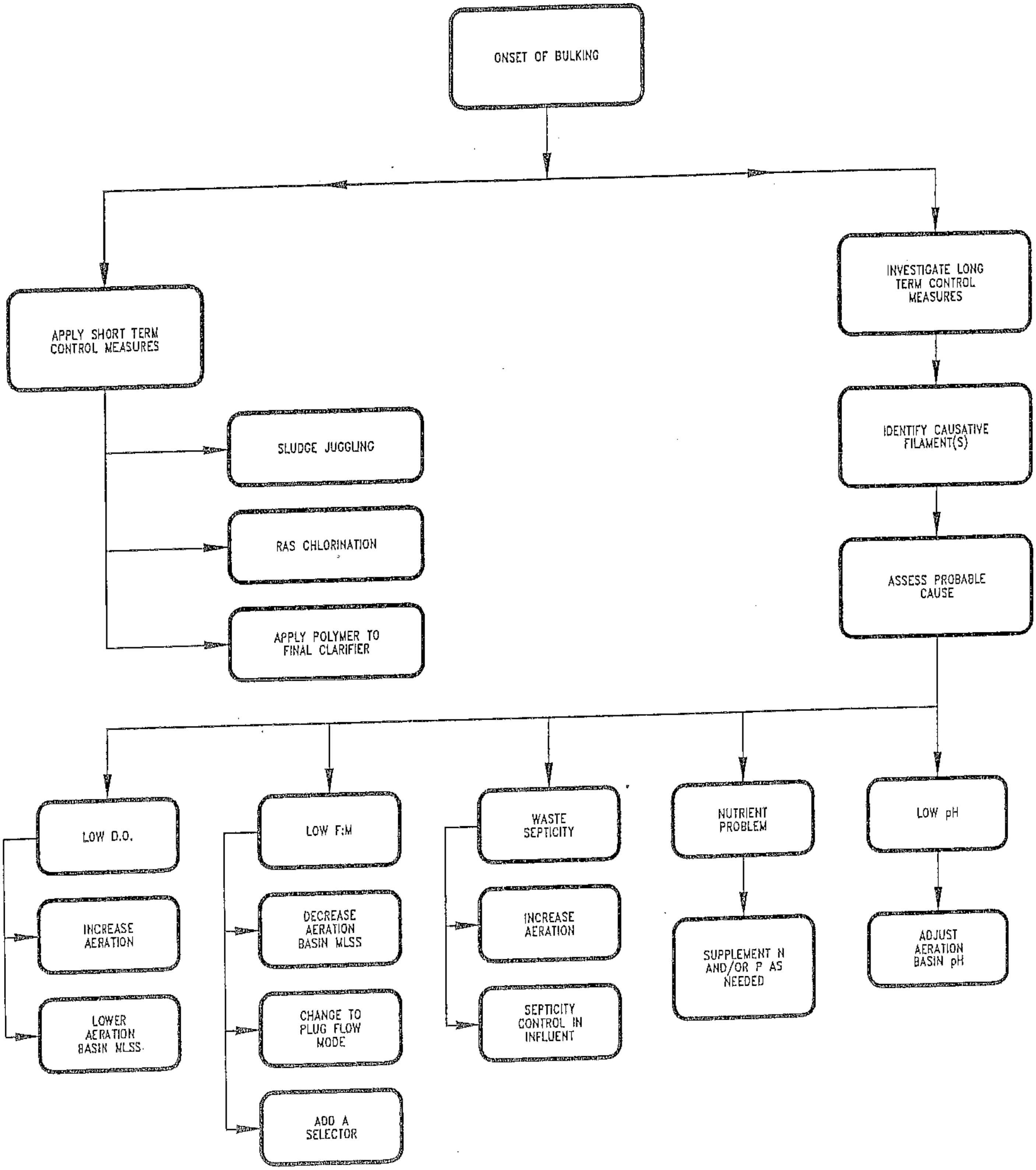


FIGURE 6.6-7
LOCATION OF AERATION SYSTEM PROCESS

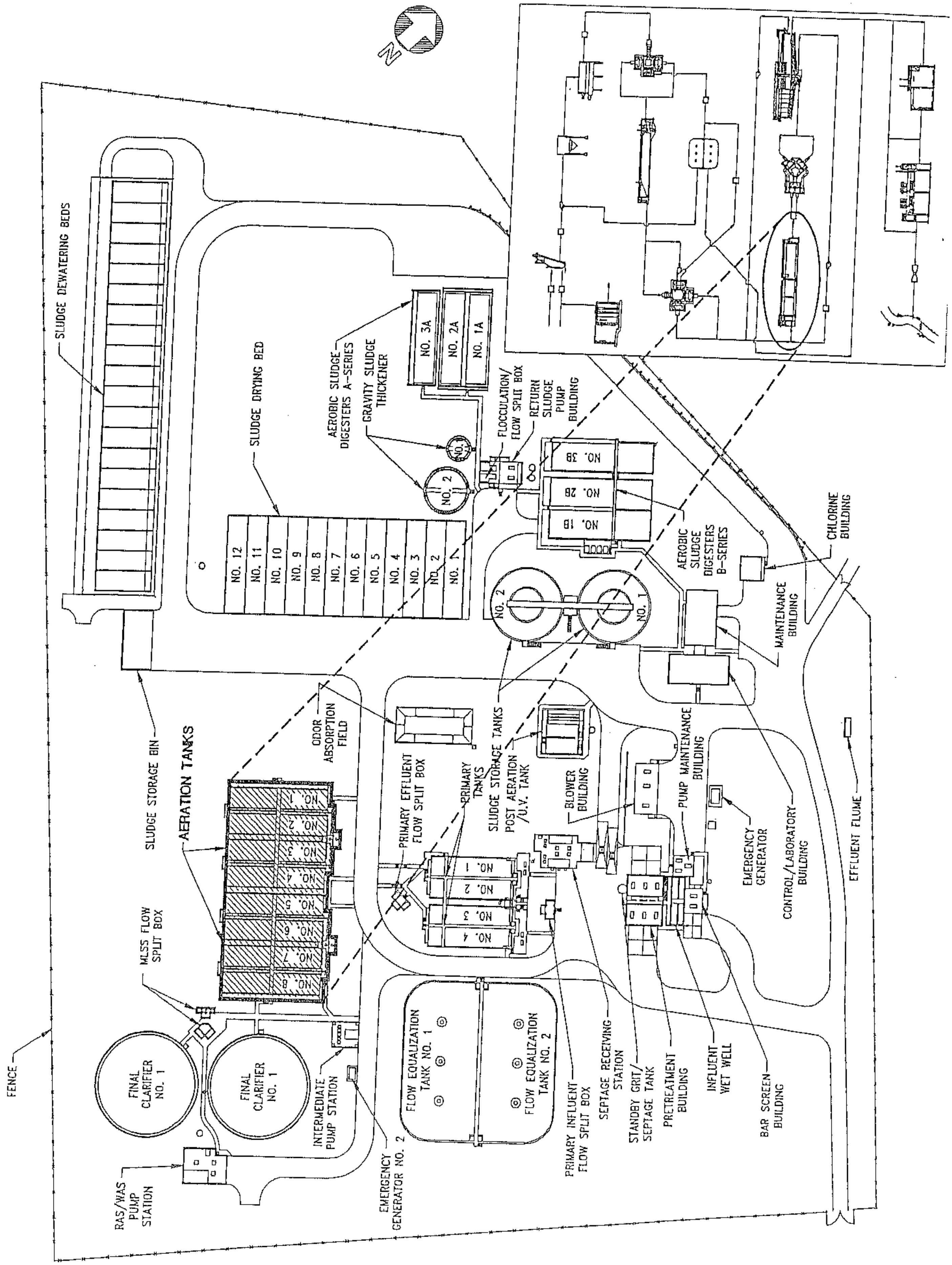


FIGURE 6.6-8
PRIMARY EFFLUENT FLOW SPLIT BOX
(PLAN VIEW)

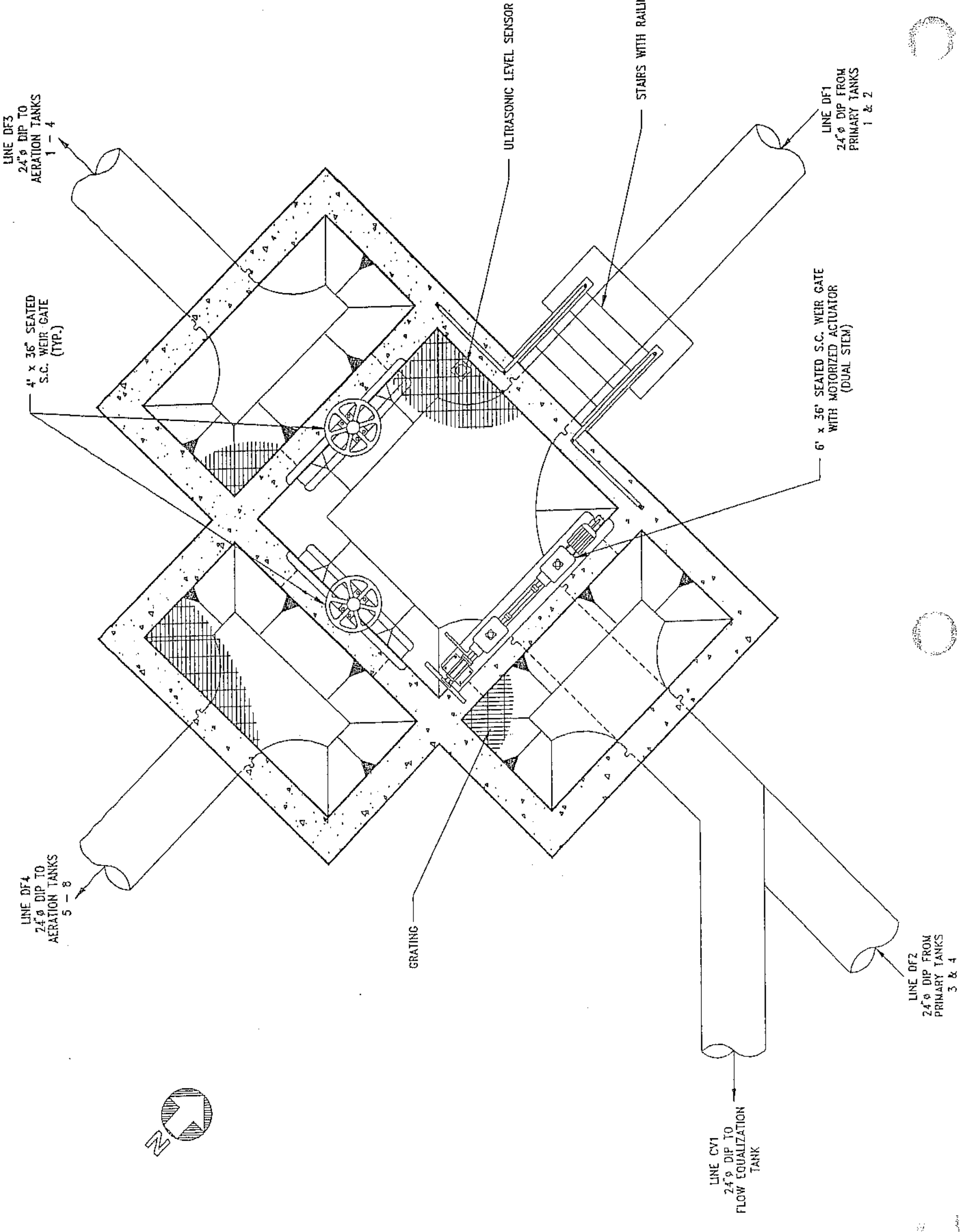
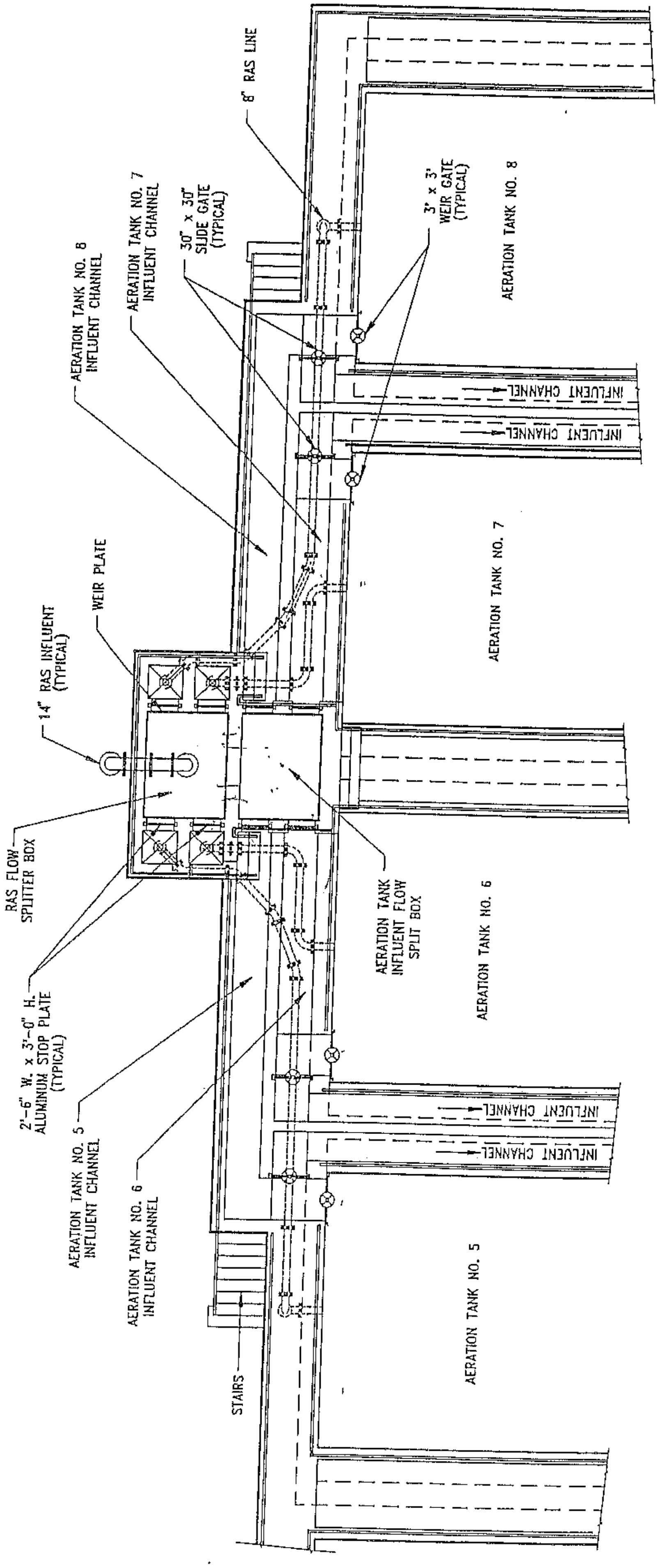


FIGURE 6.6-9
AERATION TANK DISTRIBUTION (TYPICAL)



As illustrated in Figure 6.6-9, a 24 inch line from the Primary Effluent Flow Split Box delivers primary effluent to the Aeration Tank Influent Flow Split Box. From this split box, direction of flow is controlled by aluminum stop plates. Each stop plate is 2.5 feet wide and three (3) feet high. Pulling the stop plate permits flow to enter the influent channel of that respective Aeration Tank. The influent channel to each Aeration Tank is 2.5 feet wide.

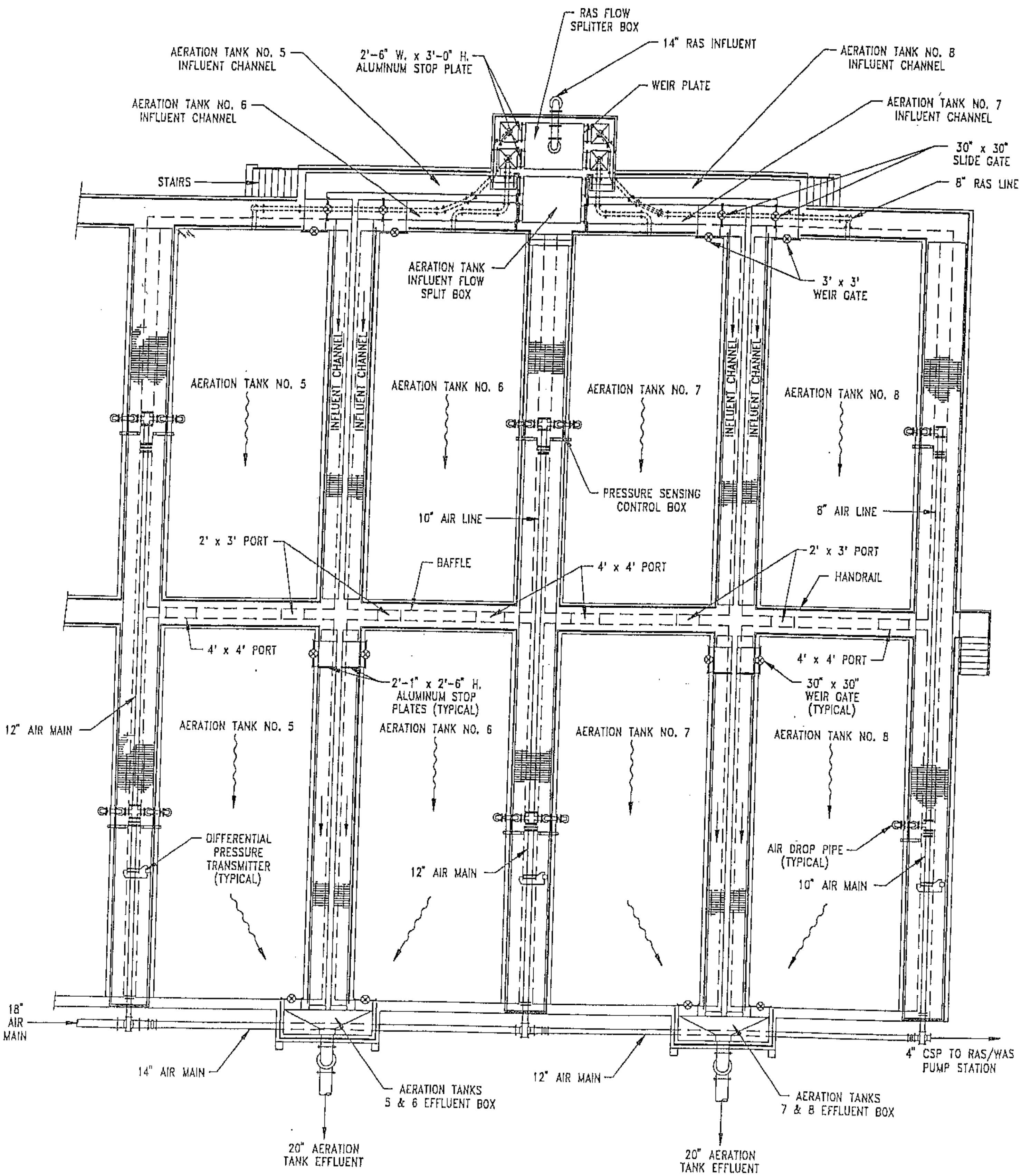
Each Aeration Tank consists of two (2) compartments. Figure 6.6-10 shows, that through the operation of slide gates and weir gates, aeration process influent flow can be introduced at the beginning of Compartment-1 or Compartment-2 of each tank depending on the operating mode. A concrete baffle separates the compartments of each tank. Two (2) ports (24 inches by 36 inches) in each baffle wall allows flow from Compartment-1 to Compartment-2.

Manually operated slide gates located at the end of each tank permit the discharge of each Aeration Tank to enter an Effluent Box (refer to Figure 6.6-10). One (1) Effluent Box is used to handle the discharge from each pair of Aeration Tanks. For example, one (1) Effluent Box handles the effluent from Aeration Tanks 1 and 2, another handles effluent from Aeration Tanks 3 and 4 and so on for the remaining four (4) Aeration Tanks.

From the clarification process (discussed in detail in Chapter 6.7), return activated sludge (RAS) is pumped to the aeration process and introduced to the Aeration Tanks through the Sludge Flow Splitter Box. Figure 6.6-9 shows the associated piping for Aeration Tanks 5 through 8. Tanks 1 through 4 are typical. RAS is delivered to the Sludge Flow Splitter Box through a 14 inch line. From the splitter box, RAS flow distribution is controlled by use of stop plates. Aluminum stop plates (24 inches wide by 12 inches high) are pulled to direct flow to each Aeration Tank. Eight (8) inch pipes deliver RAS flow to the beginning of Compartment-1 of each Aeration Tank.

Each Aeration Tank Compartment is 50 feet long and 25′-2″ wide. The side water depth (swd) of each tank is 15 feet. These dimensions yield a holding capacity of 18,875 cubic feet (141,185 gallons). As described previously, each Aeration Tanks consists of two (2) compartments. Therefore, the total holding capacity of each Aeration Tank is 282,370 gallons. The total aeration capacity (all eight (8) tanks) is 2,258,960 gallons.

FIGURE 6.6-10
AERATION TANKS 5-8
(PLAN VIEW)



2.1 Design Data

AERATION TANKS

Number:	8
Compartments per tank:	2
Tank Length:	100 feet
Tank Width:	25'-2"
Side Water Depth (swd):	15 feet
Holding Capacity (each):	282,370 gallons
Holding Capacity (total):	2,258,960 gallons

AERATION BLOWERS

Number:	5
Type:	Centrifugal-Turbine
Capacity (each):	2,980 scfm
Motor Size:	125 hp
Motor Speed:	3,500 rpm

DIFFUSERS

Type:	Fine Pore Ceramic Disc
Size:	9 inch diameter
Practical Operating Range:	0.5 - 3.0 cfm per diffuser
Number (compartment-1 of each tank):	455
Number (compartment-2 of each tank):	315
Number (total):	6,160
AOR (total):	30,137 pounds O_2/day
Minimum Air Supplied:	11,200 scfm

AERATION PROCESS

Design Mass:	1,850 mg/L
F:M Ratio (MLSS)	0.123 #BOD_5/#MLSS
F:M Ratio (MLVSS):	0.154 #BOD_5/#MLVSS
Average Nominal Detention Time:	17.5 hrs
BOD_5 Loading:	21.9 lbs/day/1000 cf

2.2 Subsurface Diffused Aeration

Compressed air is introduced at the bottom of the aeration tanks for two (2) main reasons:

1) Oxygen must be dissolved in the liquid in sufficient quantities to maintain the biomass that makes up the mixed liquor suspended solids (MLSS); and

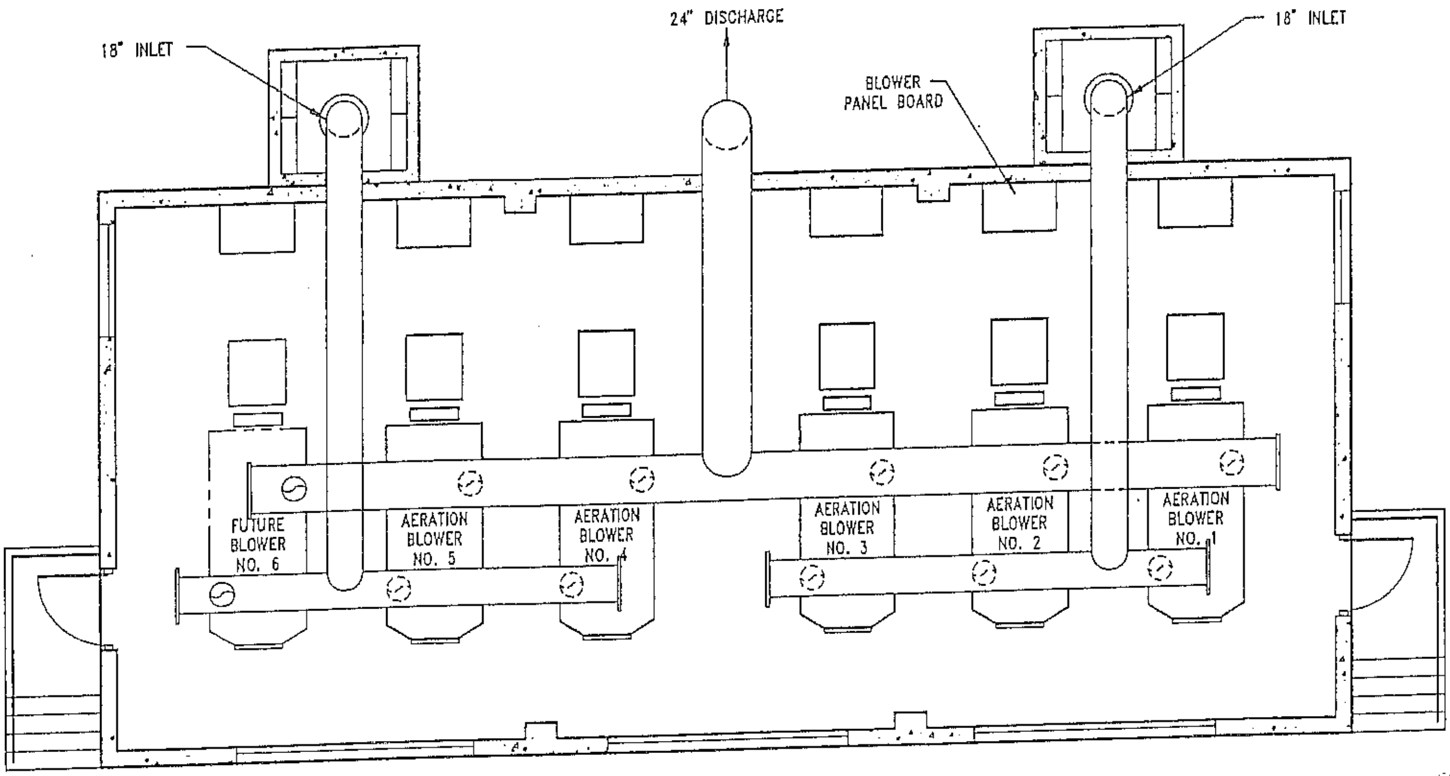
2) The aeration tank contents must be adequately mixed to keep the solids in suspension and mixed with the wastewater.

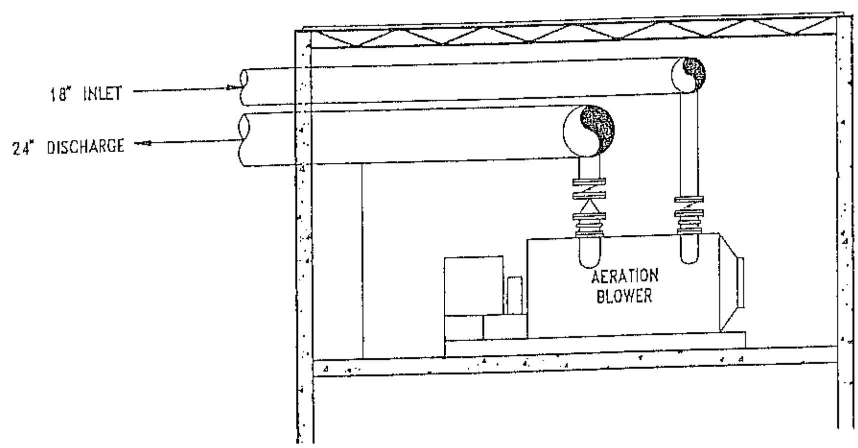
This is accomplished at the MEFRWWTP with blowers, piping, and fine bubble diffusers. Five (5) blowers are available for air supply to the aeration process and are located in the Blower Building. (These blowers can also supply air to A series and B series digesters.) There is room for one (1) future blower if necessary. Each Blower is of the centrifugal turbine type. The capacity of each unit is 2,980 cubic feet per minute (cfm) with an inlet pressure at 14.4 psia, discharge pressure of 22.3 psia and inlet temperature of 100°F. Each blower is powered by a 125 horsepower electric motor operating at 3,500 rpm, 460 volt, 3 phase and 60 hertz. The motor and blower are connected by a Sierbath 2½ inch gear-type coupling.

Figure 6.6-11 shows that two (2) inlet air lines feed the blowers. One (1) 18 inch line feeds Blowers-1, -2 & -3 and the other feeds Blowers-4 & -5. An Air Filter is attached to each inlet line to filter particulate matter from the air fed to the units. A flexible coupling and butterfly valve is located on each suction pipe of each blower. On the discharge pipe of each unit, air flow is pumped through a flexible coupling, check valve and butterfly valve. The flexible couplings are provided to isolate the piping from the blower to prevent excess weight on the unit. The butterfly valves are provided for blower isolation and air adjustment. The unit should be started with the discharge valve closed to prevent motor overload and then opened to the desired output in accordance with the blower manufacturer's recommendations. Both suction and discharge valves can be throttled for air adjustment. The check valve located on the discharge piping allows air flow in one (1) direction only.

For monitoring purposes, pressure gauges and temperature gauges are located on the suction and discharge sides of each blower. To monitor load indication, each unit is equipped with a calibrated ammeter. The instrument is calibrated by the blower manufacturer and indicated air flow volume as a function of ampere input to the machine. The ammeter supplies information such as air flow, surge level and full ampere input. Additionally, "low-current", "shutdown", and "high bearing temperature shut down" interlocks

FIGURE 6.6-11
AERATION TANK BLOWER BUILDING
(PLAN AND SECTION VIEW)





are provided.

All blower discharges deliver air into a comment 24 inch discharge line which exits the Blower Building. From the Blower Building, an air line (of varying size) conveys air to the aeration process. The main air line runs parallel to the south side of the Aeration Tanks and is reduced in size as shown if Figure 6.6-12. As shown in the Figure, each Aeration Tank Compartment is fed by a six (6) inch header - two (2) headers per tank. Air flow is monitored at five (5) locations:

- Air flow to Aeration Tank-1 (1,500 scfm range);
- Air flow to Aeration Tanks-2 & -3 (3,000 scfm range);
- Air flow to Aeration Tanks-4 & -5 (3,000 scfm range);
- Air flow to Aeration Tanks-6 & -7 (3,000 scfm range); and
- Air flow to Aeration Tank-8 (1,500 scfm range).

The locations of the Aeration Tank flow meters are shown in Figure 6.6-12. Each flow meter is a Mass Flowmeter (with a straightening vane spool piece) with a local flow rate indicator.

As briefly discussed previously, the basic methods of aerating wastewater are:

1) Introduce air (or pure oxygen - O_2) into the wastewater (i.e. aeration tank contents) with submerged diffusers or other aeration device; or

2) to agitate the wastewater mechanically to encourage solution of air from the atmosphere.

The Aeration Tanks of the MEFRWWTP are equipped with fine pore diffusers. The diffusers are nine (9) inches in diameter and constructed of ceramic material (see Figure 6.6-13). Oxygen is transferred to the microorganisms in the mixed liquor (MLSS) by blowing air through the porous ceramic diffusers. Blowing air through the porous ceramic diffusers forms millions of fine bubbles that rise through the mixed liquor. Sizes of the bubbles and the oxygen transfer efficiency are affected by the air rate per diffuser. Higher air rates per diffuser will form larger bubbles and result in lowered transfer efficiency. Lower air rates per diffuser will form smaller bubbles and result in greater oxygen transfer efficiency. The practical operating range of the porous diffusers is between 0.5 scfm and 3.0 scfm per diffuser. Generally, the diffusers are designed to operate between 1.0 scfm and 1.5 scfm per diffuser at average daily air flow.

FIGURE 6.6-12
AERATION TANKS AIR SYSTEM
(PLAN VIEW)

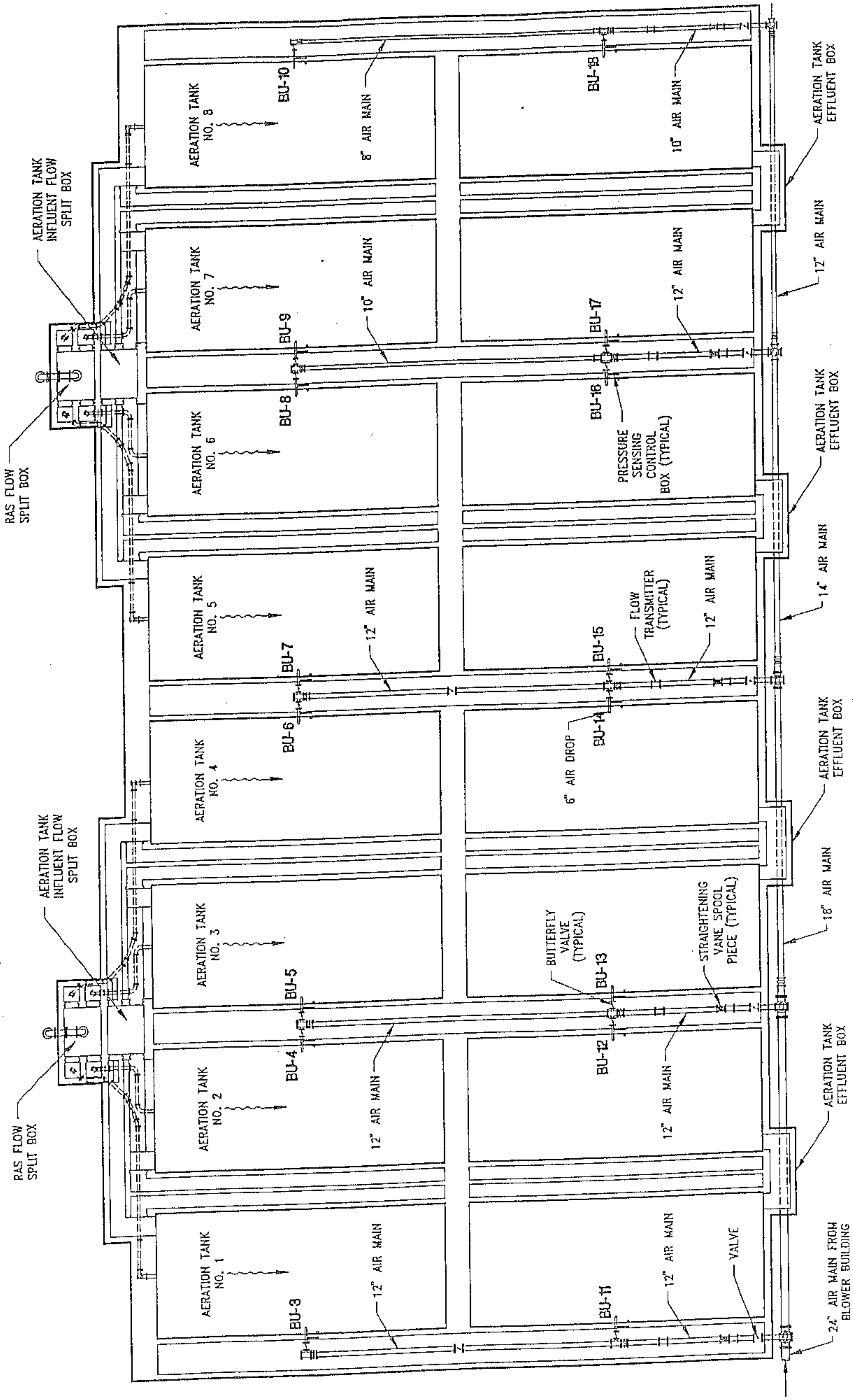
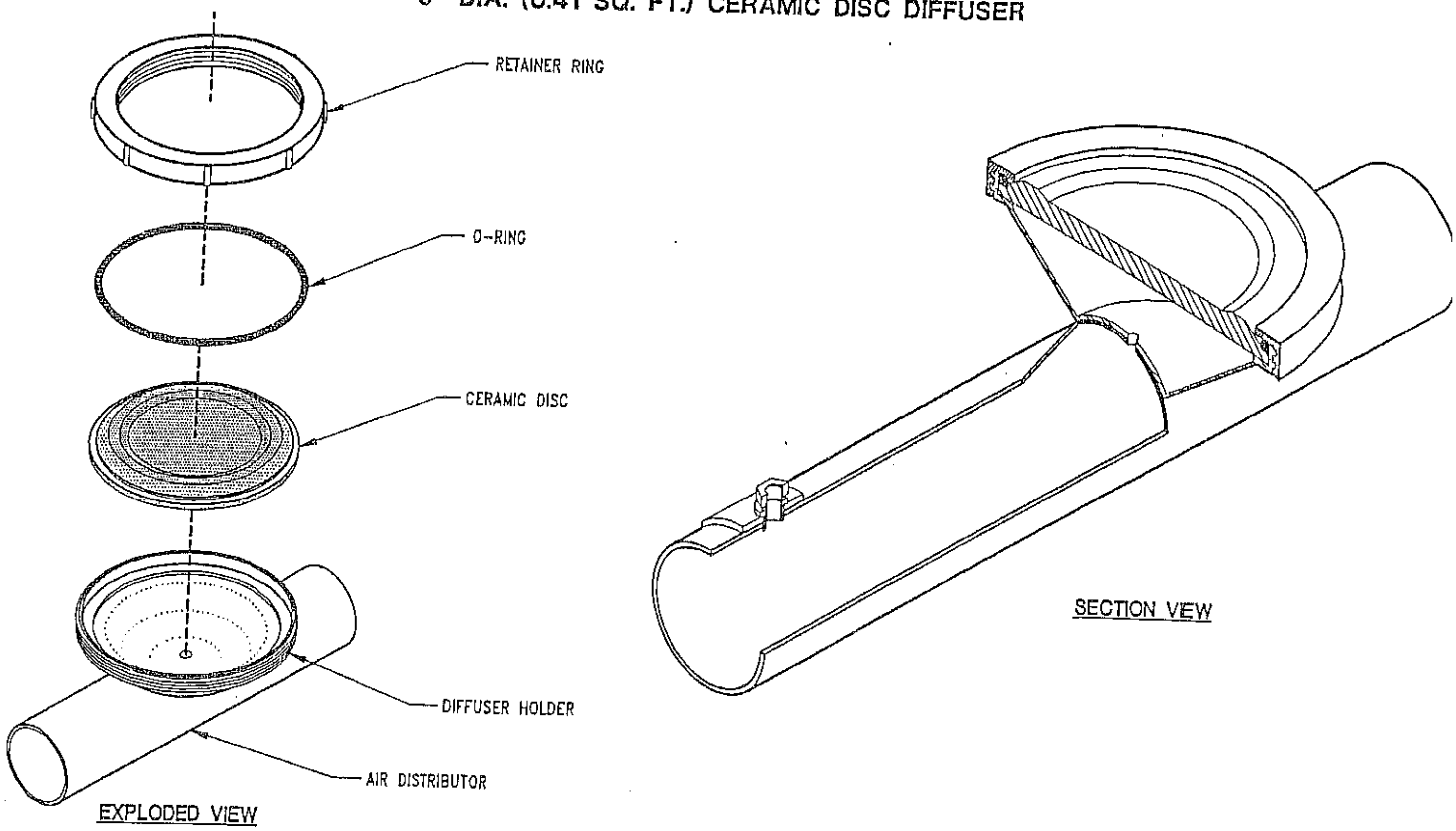


FIGURE 6.6-13
9" DIA. (0.41 SQ. FT.) CERAMIC DISC DIFFUSER



The MEFRWWTP operator is instructed **not to operate the diffusers at less than 0.5 scfm per diffuser.** Operating at very low air rates may not provide enough mixing and then solids settle on the diffusers causing increased pressure and eventual loss of efficiency. Low air rates may allow biological growths or slime to grow on the surface of the diffusers causing increased pressure and eventual loss of efficiency. Operating at very low air rates may cause poor air distribution among diffusers. The manufacturer suggests that if excessively high residual dissolved oxygen levels are consistently encountered and the minimum air rate (0.5 scfm/diffuser) is being used, the operator should consider removing diffuser elements and plugging those air holes.

The operator is also cautioned **not to turn off the air to the diffusers when they are submerged in mixed liquor.** When diffusers are not pressurized, the hydrostatic head will force MLSS and solids into the very fine pores of the diffuser element. When the system is re-pressurized, the air will blow the water and solids back through the pores of the element. Some of the pores may become plugged and can increase pressure.

Because more organic load is placed at the front of each Aeration Tank in plug flow mode and more oxygen is required, more diffusers have been installed in Compartment-1 (the upstream chamber) of each tank than the latter compartment (the downstream chamber). Compartment-1 of each of the eight (8) Aeration Tanks contains 455 diffusers while Compartment-2 of each tank contains 315 diffusers. This ratio of the number of compartment diffusers distributes approximately 60 percent of the air to Compartment-1 and 40 percent to Compartment-2. A total of 6,160 diffusers have been installed in the aeration system. The total system is capable of transferring a maximum total Actual Oxygen Rate of 30,137 pounds per day or 3,767 pounds per day per tank under field conditions. The diffuser system is capable of transferring the total Actual Oxygen Rate of 30,137 pounds per day by the use of 11,200 scfm of air or less at a water depth of 15.4 feet. An additional 20 percent of plugged diffuser outlets have been provided on the diffuser laterals for future additional oxygen transfer capacity.

Each aeration grid (aeration grid = aeration compartment) is equipped with one (1) drain line sump and airlift purge extending above the water surface - refer to Figure 6.6-14. The purge line is equipped with a ball valve for the draining operation. When the system is first started, after power outages and as routine maintenance (i.e. daily or weekly as experience dictates), the aeration grid must be purged of the entrained water. With the air turned on, open the purge valve and water and air will be blown out until the system is dry. This may take 30 - 45 minutes in a large grid that is completely filled with water. In very warm and very humid climates it may not be possible to completely purge all entrained water. Warm humid air will condense and condensate will form in the aeration grid during certain weather conditions. This condensate should routinely be purged. The frequency of purging will vary from plant-to-plant and season-to-season. In multiple aeration grid systems, such as the MEFRWWTP system, opening all the purge valves at one time may rob too much air from the diffusers. In this case, the operator should purge one (1) or two (2) grids at a time.

The fine pore ceramic diffusers at the MEFRWWTP can clog. The rate of this clogging will vary and is dependent upon a number of factors. Some of the factors can be controlled and some cannot. Lack of diffuser maintenance can lead to decreased oxygen transfer efficiency, increased blower pressure and increased operational costs. Diffuser clogging can be categorized into two (2) categories; air side clogging and liquor side clogging.

CHAPTER 7.1

SEPTAGE RECEIVING STATION

1.0 INTRODUCTION

2.0 DESCRIPTION
2.1 Design Data
2,2 Process/Equipment Description

3.0 OPERATING STRATEGY
3.1 Septage Receiving Station

3.2 Odor Control System

4.0 PROCESS MONITORING
4.1 Septage Receiving Station

5.0 TROUBLESHOOTING

6.0 START-UP/SHUT-DOWN PROCEDURES

7.0 MAINTENANCE

8.0 RAPID TECHNIQUE FOR TOXICITY & TREATABILITY

9.0 SEPTAGE RECEIPT LOG

10.0 READER CHAPTER SIGN-OFF

1.0 INTRODUCTION

The purpose of the **Septage Receiving Station** is to provide a controlled location for the discharge of septic tank cleanings and leachate into the Middle East Fork Regional Wastewater Treatment Plant (MEFRWWTP). The acceptance of septage is a service provided by Clermont County. Without this service, the plant could still experience the results of septage discharged illegally into remote manholes. All septage and leachate haulers are expected to discharge their truck contents into the septic receiving boxes located near the Pretreatment Building at the (MEFRWWTP).

To make the acceptance of septage at the MEFRWWTP a satisfactory operation, a more sophisticated receiving and pumping process was required. The septage handling system consists of two (2) completely enclosed tanks with submersible grinder pumps, blowers and diffusers to aerate the septage, the necessary piping for pumping the septage to the Pretreatment Building and an odor absorption field.

2.0 DESCRIPTION

2.1 Design Data

Design Parameters

Average Flow:	46,182 gpd
BOD_5 Loading:	2,475 lbs/day (6,426mg/l)
NH_3 Loading:	53 lbs/day (138 mg/L)
TKN Loading:	247 lbs/day (641 mg/L)

Septage Storage Tanks

Number:	2
Length:	36 feet
Width	15 feet
Sidewater Depth:	13 feet
Volume:	50,000 gallons
Average Flow:	46,225 gpd
Storage Capability:	2.17 days @ Avg Flow 1.03 days @ Peak Flow

Grit Storage Hopper

Number:	2 (1 per septage tank)
Length:	28.5 feet each
Width (Bottom):	2.0 feet each
Width (Top):	4.0 feet each
Depth:	2.0 feet each
Volume:	6.5 cu. yards each

Submersible Recessed Impeller Pump (Pump to Solids Handling Facilities)

Number:	2
Capacity:	250 gpm @ 40 feet TDH
Motor Speed:	1800 rpm
Motor Size:	7½ hp
Motor Voltage:	460
Motor Phase:	3

Flow Meter

Number:	1
Type:	Magnetic
Size:	3"
Range:	0-500 gpm

Submersible Grinder Pumps (Pump to Plant Headworks)

Number:	2
Capacity:	80 gpm @ 34 feet TDH
Motor Speed:	3600 rpm
Motor Size:	5 hp
Motor Voltage:	460
Motor Phase:	3

Flow Meter

Number:	1
Type:	Magnetic
Size:	3"
Range:	0-500 gpm

Mechanical Bar Screen

Number:	1
Design Flow:	600 gpm
Screen Height:	3 feet
Channel Width:	2 feet
Channel Depth:	3 feet 10 inches
Bar Thickness:	⅜ inch
Bar Opening:	½ inch
Angle in channel:	80°
Motor Size:	¾ hp
Motor Voltage:	230/460
Motor phase:	3

Overhung Centrifugal Air Blower (Exhaust Air to Odor Adsorption Beds

Number:	2
Motor Speed:	3600 rpm
Motor Size:	10 hp each
Design Capacity:	550 scfm @ 1.5 psig

Positive Displacement Blower (Air Supply to Septage Tank Diffusion System)

Number:	3
Motor Size:	15 hp each
Design Capacity:	200 scfm @ 7.5 psig

Portable Grit Pump

Number:	1
Capacity:	220 gpm @ 95' TDH
Shut off Head:	150 feet
Motor Size:	14½ hp
Motor Speed:	3000 rpm

Odor Control System

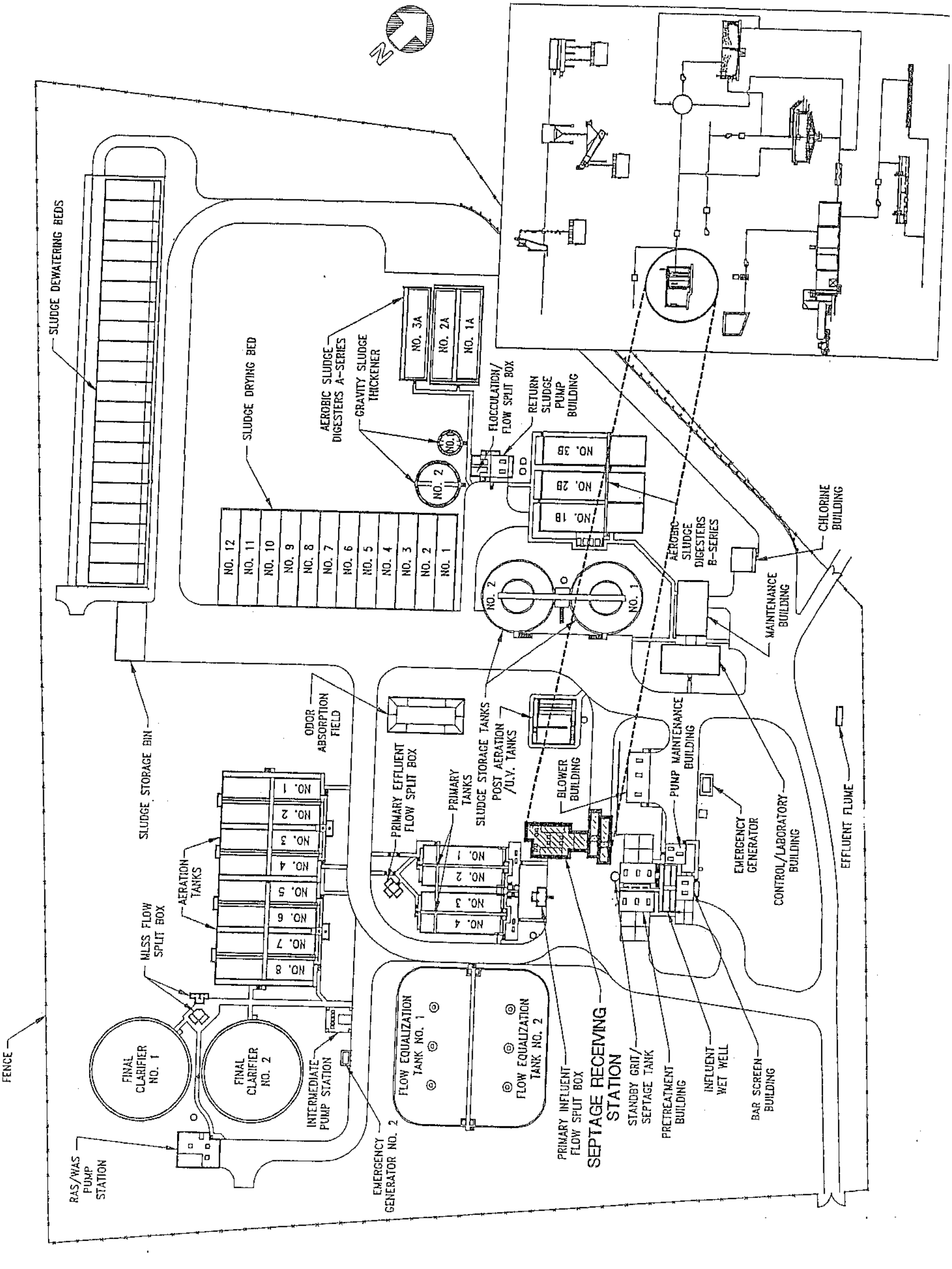
Number:	2
Type:	Soil Filter
Area:	600 sf each
Media Type:	Local loam soil plus leaf type compost
Media Depth:	2 feet
Volume:	1200 cf each
Air Supply Capacity:	1100 scfm
Loading Rate:	0.92 scfm/sf
Detention Time:	2.2 minutes

2.2 Process/Equipment Description

Figure 7.1-1 shows the general relationship of the **Septage Receiving Station** to the other plant components.

Trucked wastewaters which are unloaded at the Septage Receiving Station flow into one (1) of two (2) septage receiving boxes. The box contents flow through a six (6) inch line to a **Mechanical Bar Screen**, or alternatively a **Manual Bar Rack**. The Mechanical Bar Screen has a 600 gpm capacity and is controlled by a ¾ horsepower motor. The bars are ⅜ inch thick with ½ inch spacings. The Manual Bar Rack has bar space openings of 1¼ inches with a maximum headloss of 1½ feet. Both bar screen channels are two (2) feet wide. After passing through the Bar Screen, the septage flows into a grease collection area prior to entering either of two (2) **Septage Receiving Tanks**. Each Septage Receiving Tank is 36 feet long and 15 feet wide with a

FIGURE 7.1-1
LOCATION OF SEPTAGE RECEIVING STATION



sidewater depth of 13 feet. Total volume of each tank is 50,000 gallons. The septage receiving tanks are each equipped with one (1) **Recessed Impeller Submersible Pump**, one (1) **Submersible Grinder Pump** and **Air Diffusers** to aerate the septage. Figure 7.1-2 shows the lower plan view of the Septage Receiving Station.

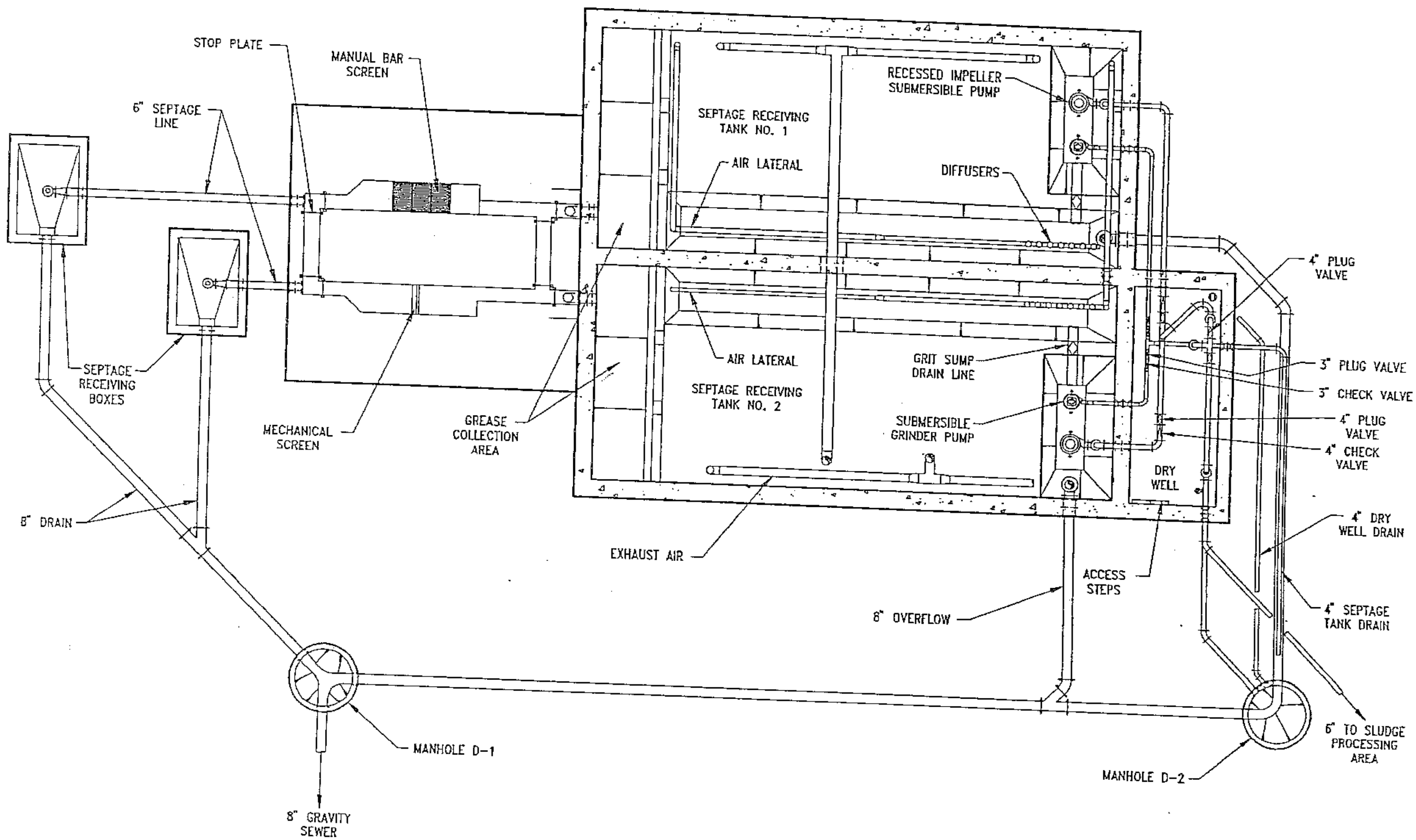
Air is supplied to the Septage Receiving Tanks by three (3) Positive Displacement Blowers. The blowers are located above Tank #1 at ground level. Figure 7.1-3 is an upper plan view of the Septage Receiving Station showing the location of the blowers. The blowers have a four (4) inch air intake equipped with a filter and silencer. Each blower is operated by a 15 horsepower motor with a capacity of 200 scfm. The discharge side of each blower contains a pressure relief valve, a four (4) inch check valve and a four (4) inch butterfly valve. Figure 7.1-4 is a section view which shows the blowers. Air from the blowers is directed through a four (4) inch air header to an air lateral which runs the length of each Septage Receiving Tank. The air lateral contains diffusers which aerate the septage (refer to Figure 7.1-2).

The pumps located in the Septage Receiving Tanks are manufactured by The Ohio Pump Company. The Recessed Impeller Pumps have a capacity of 250 gpm at 40 feet TDH. They are controlled by a 7½ horsepower motor. Figure 7.1-5 illustrates the pump curve for the two (2) Recessed Impeller Submersible Pumps. The explosion proof pumps are mounted with a rail system to allow the pump to be removed without entering the septage tank. The pump discharge is a four (4) inch line equipped with a plug valve and a check valve.

The Submersible Grinder Pumps have a capacity of 80 gpm at 34 feet TDH and are operated by a five (5) horsepower motor. Figure 7.1-6 illustrates the pump curve for the Grinder Pumps installed at the MEFRWWTP Septage Receiving Station. Like the recessed impeller pumps described above, the grinder pumps are also explosion proof units mounted on individual rail systems. The Grinder Pumps discharge through a three (3) inch line equipped with a plug valve and a check valve.

Discharge from the submersible grinder pumps is sent to the plant headworks. The purpose of the low design pumping rate (i.e. 80 gpm each) is to prevent overloading of the MEFRWWTP's unit processes. Septage which is sent to the plant headworks, flows into **Manhole D-2** and is carried to **Manhole D-1** through an eight (8) inch line. From Manhole D-1

FIGURE 7.1-2
SEPTAGE RECEIVING STATION
(LOWER PLAN VIEW)



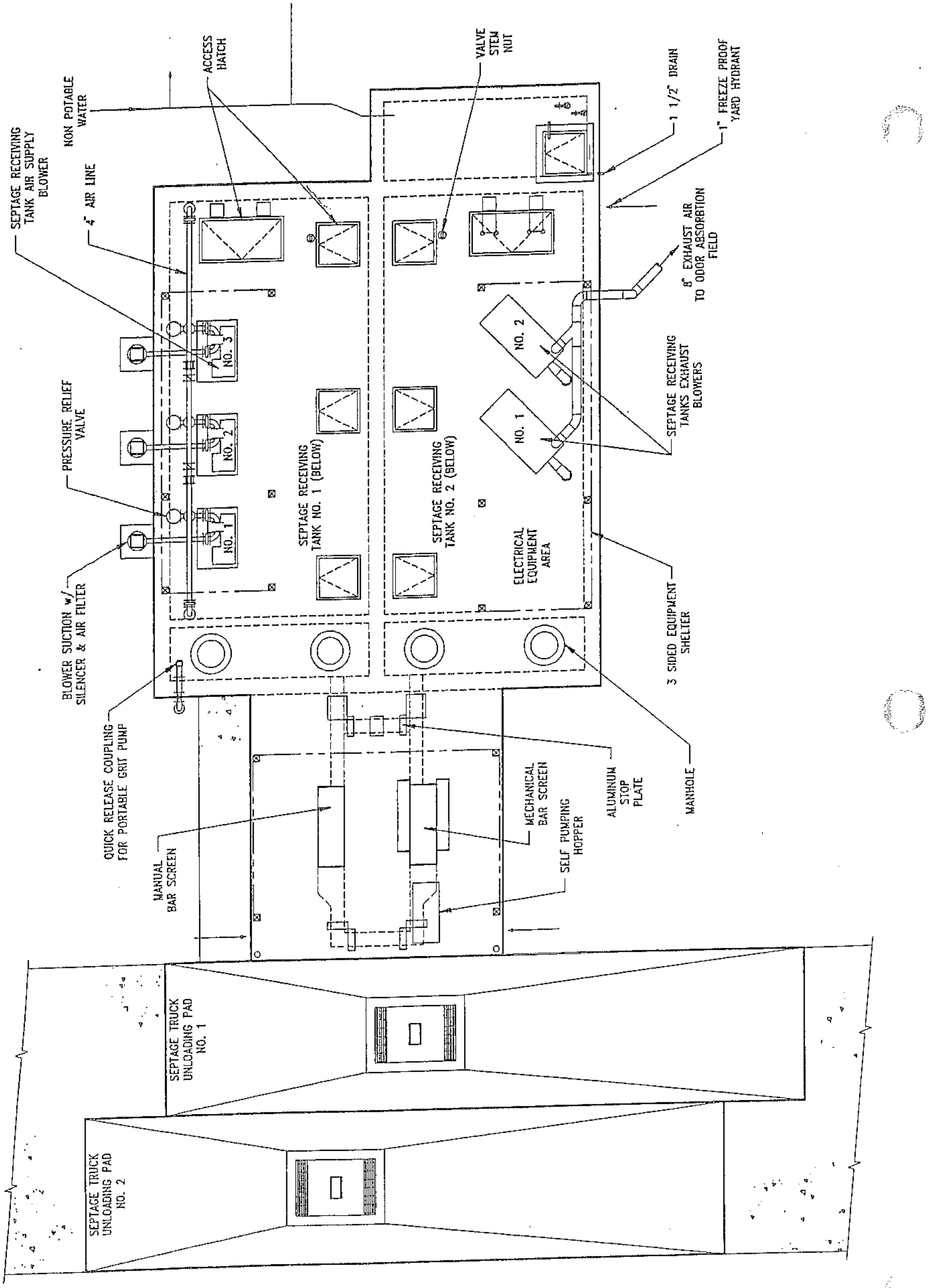


FIGURE 7.1-3
SEPTAGE RECEIVING STATION
(UPPER PLAN VIEW)

FIGURE 7.1-4
SEPTAGE RECEIVING STATION
(SECTION VIEW)

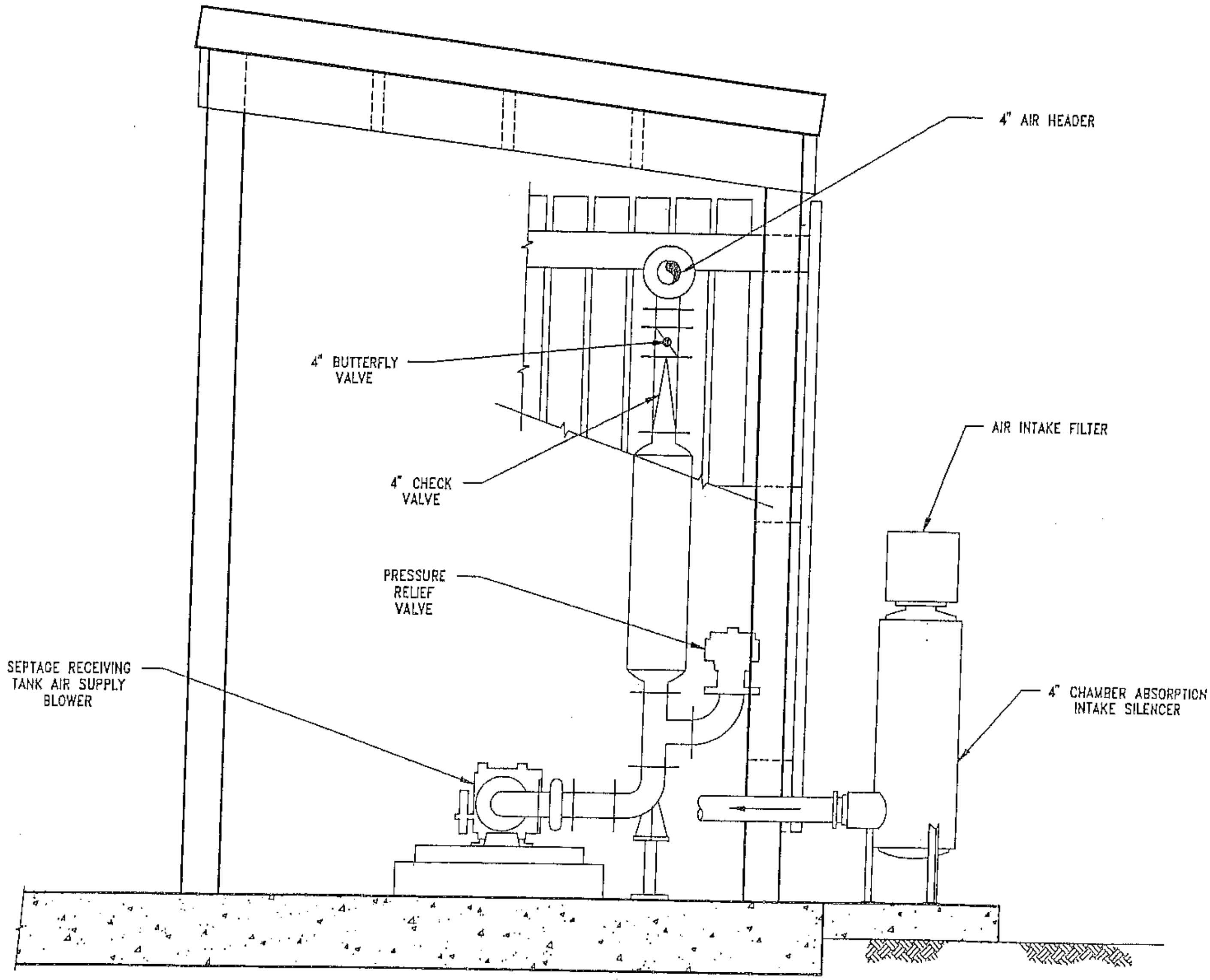
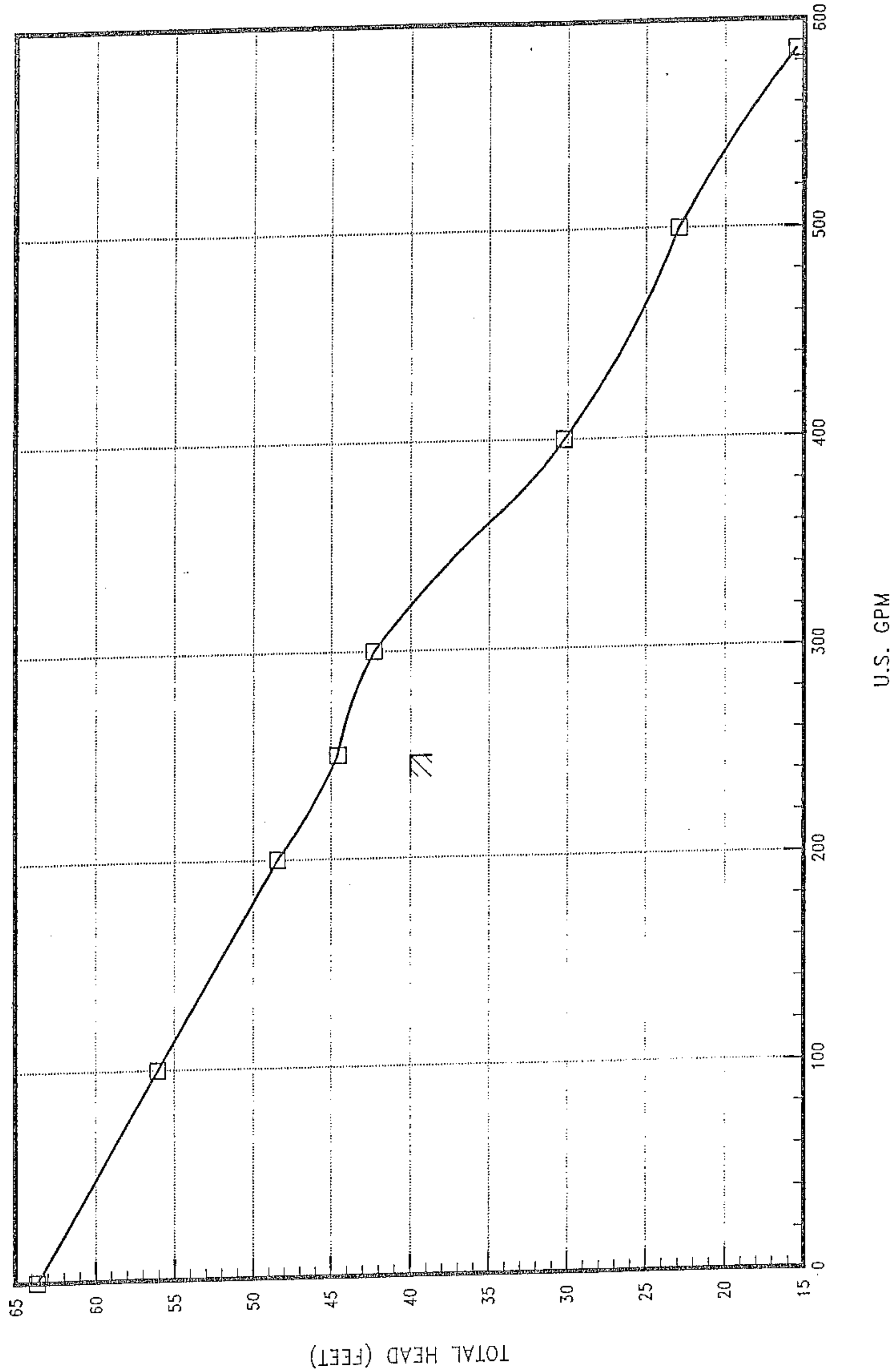


FIGURE 7.1-5
RECESSED IMPELLER PUMP CURVE



- Ensure an adequate spare parts inventory is maintained.

- Observe and adhere to good safety procedures.

3.1 Truck Discharge

The operator monitoring the station should observe the unloading of each truck. With each truck load, the operator should ensure the following items are collected or performed:

- A properly completed manifest which, at a minimum, should contain the name of the hauler company, name of the hauler, the origin of the septage and the time of arrival.

- The volume of the septage dumped. If a flow meter is not utilized, the operator should assume the truck is full and record the size of the tank.

- A sample of the septage. If the septage proposed to be discharged is suspected of containing a toxic waste or one that is not easily treatable, a sample should be collected prior to discharge to the Septage Receiving Station. The sample should be analyzed for pH as well as some type of toxicity test performed. At the time of this writing, the MEFRWWTP has a automated large volume respirometer which is capable of toxicity testing (refer to manufacturer's procedure). Alternatively, a rapid technique for evaluation of sewage for toxicity and treatability is included in Section 8.0 of this chapter. Based on analytical results, a "dump" or "no dump" decision can be made. Also, samples could be collected routinely and held and analyzed if a process upset occurs.

- Observe hauler activities during discharge including proper use of the unloading pit and cleanliness. The septage dumping rate must be limited to the mechanical screen flow-through capacity of 600 gpm.

- Maintain or enforce the billing system in-place and ensure that all required forms are properly completed.

3.2 Screening Facility

As described in Section 2.2 of this chapter, a mechanical and a manual bar rack are provided to remove debris, rags, plastic materials and other potentially troublesome materials to equipment.

The Septage Receiving Station was intended for all septage flow to be directed to the mechanical screen when operable. The openings of the mechanical screen are narrower than the manually-cleaned unit which results in more debris removal when in operation.

When a truck is discharging its contents to the station, the mechanical screen should be turned on manually which ensures the operator is present to monitor the dumping procedure. For example, if the septage discharge is at a rate greater than the mechanical screen's capacity (600 gpm), the operator is present to direct the hauler to lower the dumping rate. When septage discharge has stopped, the screen should also be stopped. The area and screenings channel should be cleaned by hosing down.

Alternatively, when the mechanical bar screen is not operable, septage must be discharged through the manually-cleaned unit. When using this screen, the operator will have to manually remove screenings as they accumulate while septage discharge is occurring. Screenings should be raked to the drainage plate located directly behind the screen. Then, after excess water has drained from the screenings, the screenings should be placed in the dumpster for final disposal.

3.3 Aerated Grit Tanks

Septage flow discharged through the mechanical bar screen of the manually-cleaned screen can be directed to either or both covered aerated grit tanks. The purpose of the tanks are:

1) Flow equalization and pumping of septage;
2) grease and scum removal;
3) mixing;
4) grit removal; and
5) exhaust of excess air.

The aerated grit tanks (septage receiving tanks) are designed to receive the septage during working hours and transport its contents to the plant headworks over a 24 hour period or more quickly to the plant's sludge handling facilities. The tanks are not designed to biologically treat the septage, but to dampen its impact to downstream processes by flow equalization. Pumps (described in detail in the following section) are provided to pump the tank's contents. A good operational strategy is to time pumping from the septage tank(s) during "non-peak" hours so that the tanks are empty when the treatment plant begins accepting septage in the morning hours. Each tank is provided with an overflow at the 14 foot tank depth level. This is one (1) foot above the design septage tank operating depth of 13 feet. The station operator is discouraged from operating either station tank at this high level because this level is close to the exhaust air intakes. Potential problems are more evident when operating at this high level when foaming conditions are present. Also, discharge of the septage to the plant headworks via the overflows is undesirable because the rate cannot be regulated and discharge may be at an excessive rate which could result in downstream process overloading and upsets.

A grease collection area is located at the beginning of each aerated grit tank. Grease and scum entrapment will occur in the four foot wide baffled area in the upstream zone of the tank. The station operator should remove the grease and scum when it reaches a depth of approximately two (2) feet. Access to this area is provided by four (4) secured manhole lids (two for each tank). One method of measurement is by boring with a disc attached to a dowel rod. At a minimum, a measurement should be taken weekly or more often if experience dictates.

A vacuum truck should be used to remove the grease and scum which could then be dewatered on one of the plant's drying beds. If a vacuum truck is not available, then the portable grit pump and piping to the Pretreatment Building could be used. This method is more difficult and less desirable since the grease and scum in the line may contribute to plugging.

The contents of the aerated grit tanks is mixed by use of utilization of an air supply and diffusion system. Each tank is provided with 67 plastic coarse bubble diffusers with membranes. The solid membranes are designed to close off the coarse bubble orifices when air is turned off, precluding the entry of septage. This greatly reduces the possibility of plugging. Each diffuser is sized to receive an average air flow of three (3) standard cubic feet per minute (scfm) and a peak flow of five (5) scfm. Total air supply for each tank is approximately 200 scfm, although it is possible to provide up to 335 scfm per tank with this number of diffusers. As previously mentioned, the purpose of the aerated grit tanks is not to provide biological treatment. As a result, the aeration system in the tanks is designed to provide mixing, although some freshening of the septage will obviously occur with the air addition. The diffuser system is designed to set up a spiral flow pattern in the tank and cause grit to fall out of solution.

Three (3) blowers (200 scfm capacity each) are provided for the air supply. One (1) is provided for each tank plus a standby unit. The blowers distribute air though a four (4) inch diameter manifold to both septage receiving tanks. Isolation valving and a check valve are provided for each blower. Blower-1 is dedicated to Septage Receiving Tank-1 and Blower-3 is dedicated to Septage Receiving Tank-2. Blower-2 can be used for either tank by proper operation of the two (2) butterfly valves on the common discharge manifold. The operator should not direct the output of two (2) blowers to a sole tank. The output of two (2) blowers could overload the diffusers and possibly cause the membranes to break loose from the diffuser bodies. Additionally, excess air could cause grit to be carried over to the pumps resulting in excess wear.

As previously described, the two (2) Septage Receiving Tanks are specifically designed to remove grit. Consequently, the tanks are shaped as conventional aerated grit tanks with hoppered bottoms. The applied air is released from the diffusers over the grit hopper to induce a spiral air flow pattern to preferentially separate grit from the septage and move it to the hopper at the bottom. The baffle is installed at a 45 degree angle above the diffuser and aids in the formation of the spiral flow pattern.

The grit hopper of each tank is about two (2) feet deep and holds approximately 6.5 cubic yards of material. It is very important that the station operator routinely monitor the volume of accumulated grit so removal can be scheduled before the 6.5 cubic yard capacity is used. Grit volumes from septage can be significant and vary greatly. If grit accumulation is not routinely monitored and removed as necessary, grit can accumulate around the pumps resulting in excessive pump wear making pump repair necessary or even replacement.

Grit accumulation can be monitored by probing. An aluminum or wooden rod can be used as a probe for estimating accumulation. The grit hopper of each tank should be probed at various locations and the top of the grit and concrete felt. When 1 to 1½ feet of grit has accumulated in the hopper, the station operator should schedule removal of the grit.

Grit accumulation can be removed by either a vacuum truck or a portable grit pump (a three inch portable pump was supplied with the upgrade). If a vacuum truck is used, the hard piped suction should be located on the grit hopper bottom at various locations and the grit sucked out. Each septage tank is provided with three (3) access hatches located over the grit hopper for cleaning. If the grit pump is used for removal, it will discharge the grit to the grit line located at the northeast corner of the structure. Quick release couplings are provided. Suction of grit with a pump is the same as that for the vacuum truck. A piece of hard piping instead of hose needs to be used in the tank to locate the suction down in the hopper. The grit line directs the flow to the influent of the MEFRWWTP's grit removal tanks. The grit will be removed along with the wastewater's grit contained in the plant influent with the forced vortex grit removal units. Before pumping grit through this line, it is necessary to check the dumpster collecting the grit to ensure enough room is available for the grit removed from the septage receiving process .

Air introduced to the septage receiving tanks is exhausted by the use of two (2) centrifugal blowers. Air exhaustion is necessary because when air from the diffusers exits the stored septage, it contains odorous gases from the septage. The exhausted air is transported to one (1) of two (2) odor adsorption beds for odor control. Air is exhausted from each septage receiving tank via six (6) inch and eight (8) inch diameter PVC piping. Two (2) entrances for the exhausted air are provided. One (1) 550 scfm exhaust blower is provided for each tank with no standby unit provided. Any time an air supply blower is in operation for a respective septage receiving tank, the station operator should ensure the corresponding exhaust blower for that tank is also in operation.

3.4 Pumping

Two (2) 80 gpm submersible grinder pumps (one per tank) are provided to transport septage from the septage receiving tanks. Pump discharge is directed to Manhole D-2 (refer to Figure 7.1-2) for subsequent transport to the MEFRWWTP influent wet well. Two (2) 250 gpm recessed impeller submersible pumps, again, one (1) for each tank, are provided to transport septage to the MEFRWWTP solids handling facilities.

The flow rate of the submersible grinder pumps is limited so that the addition of septage to the MEFRWWTP process flow stream will not adversely affect treatment. The septage directed to the treatment processes (i.e. plant influent wet well) should be limited to 80 gpm. Therefore, only one tank should be pumped from at a time. A suggested operation is for the station operator is to coordinate the emptying of one Septage Receiving tank while the other is being filled. The two (2) inch magnetic flow meter that measures septage returned to the plant headworks should be monitored for both flow rate and flow amount totals. Figures 7.1-7 and 7.1-8 show the routing of septage for this suggested mode of operation.

Like the submersible grinder pump output, the flow rate of the recessed impeller pumps should also be limited so that downstream sludge facilities of gravity thickening and/or aerobic digestion will not be adversely affected. This pumping system should be operated similarly to the grinder pumps as described above. Figures 7.1-9 and 7.1-10 show the routing of septage for this mode of operation with the recessed impeller pumps.

These pumps may also be used for emptying the septage receiving tanks. If the tanks are hosed down, this water may be disposed to the plant headworks via MHD-2 by use of the drain to MHD-2.

Both pumping discharge headers are furnished with one (1) inch blow off lines. For instance, if air becomes entrapped in either header, the line can become "air-bound" thereby reducing or even eliminating capacity. The blow offs should only be used to bleed air off the header if it accumulates.

3.5 Odor Control System

The odor control system consists of two (2) odor adsorption beds, also referred to as "soil filters". According to USEPA's Handbook-Septage Treatment and Disposal, October, 1984, "soil filters primarily reduce odors by biological oxidation of sulfide to sulfate." The adsorption beds should be kept moist and the soil temperature should be maintained at 25 to 30 degrees Celsius. Figure 7.1-11 shows the air piping for the odor adsorption beds. The two (2) beds installed at the MEFRWWTP may be operated to have both adsorption beds on-line or only one bed in service by operation of the valves in the odor adsorption field distribution box. Operator experimentation with bed use will determine best bed operation. For example, it may be best to have only one bed on-line in the winter in order to maintain higher temperature in the bed for effective odor control.

The air lines are supplied with blow off valves to blow off any water that collects in the air lines. Water should be blown off when a sufficient amount collects in the air lines so that excess head is evidenced at the exhaust blower discharge. Water accumulates in these lines from condensation. As the warm moist exhaust air cools in the ground, the water condenses and potentially accumulates depending on the amount of condensation.

FIGURE 7.1-7
SEPTAGE RECEIVING STATION VALVING
(GRINDER PUMP, FILL TANK NO. 2, EMPTY TANK NO. 1)

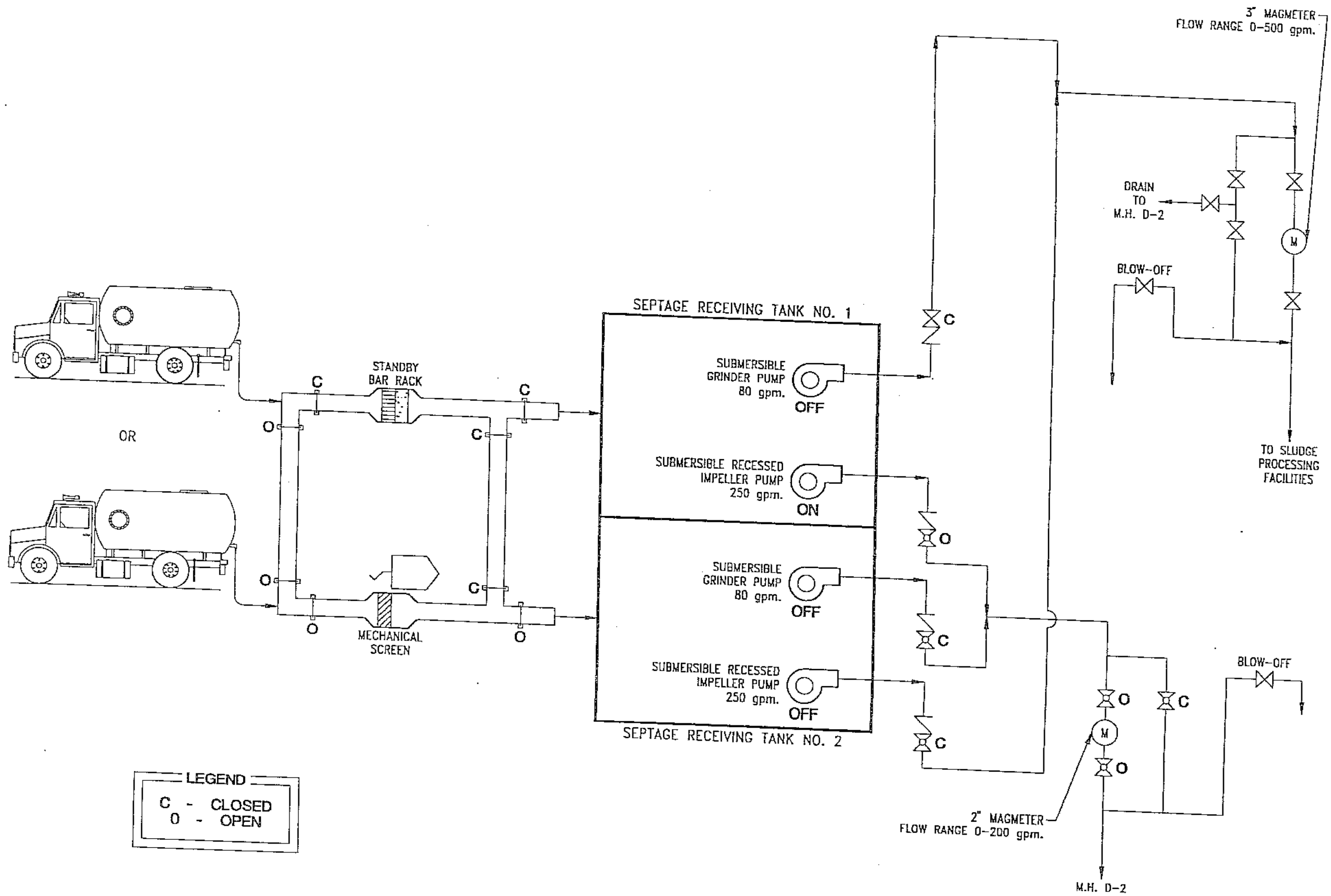


FIGURE 7.1-8
SEPTAGE RECEIVING STATION VALVING
(GRINDER PUMP, FILL TANK NO. 1, EMPTY TANK NO. 2)

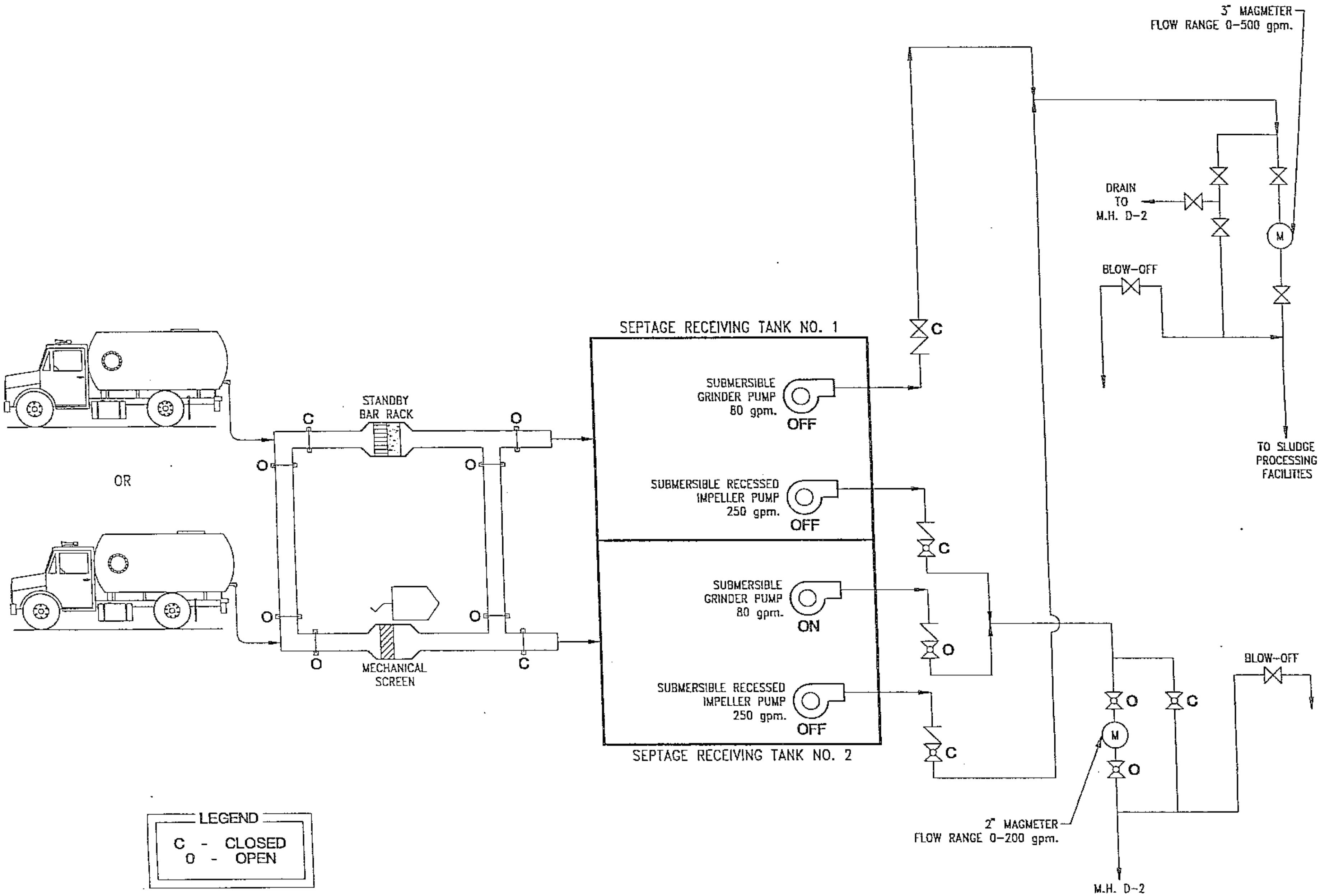


FIGURE 7.1-9
SEPTAGE RECEIVING STATION VALVING
(RECESSED IMPELLER PUMP, FILL TANK NO. 2, EMPTY TANK NO. 1)

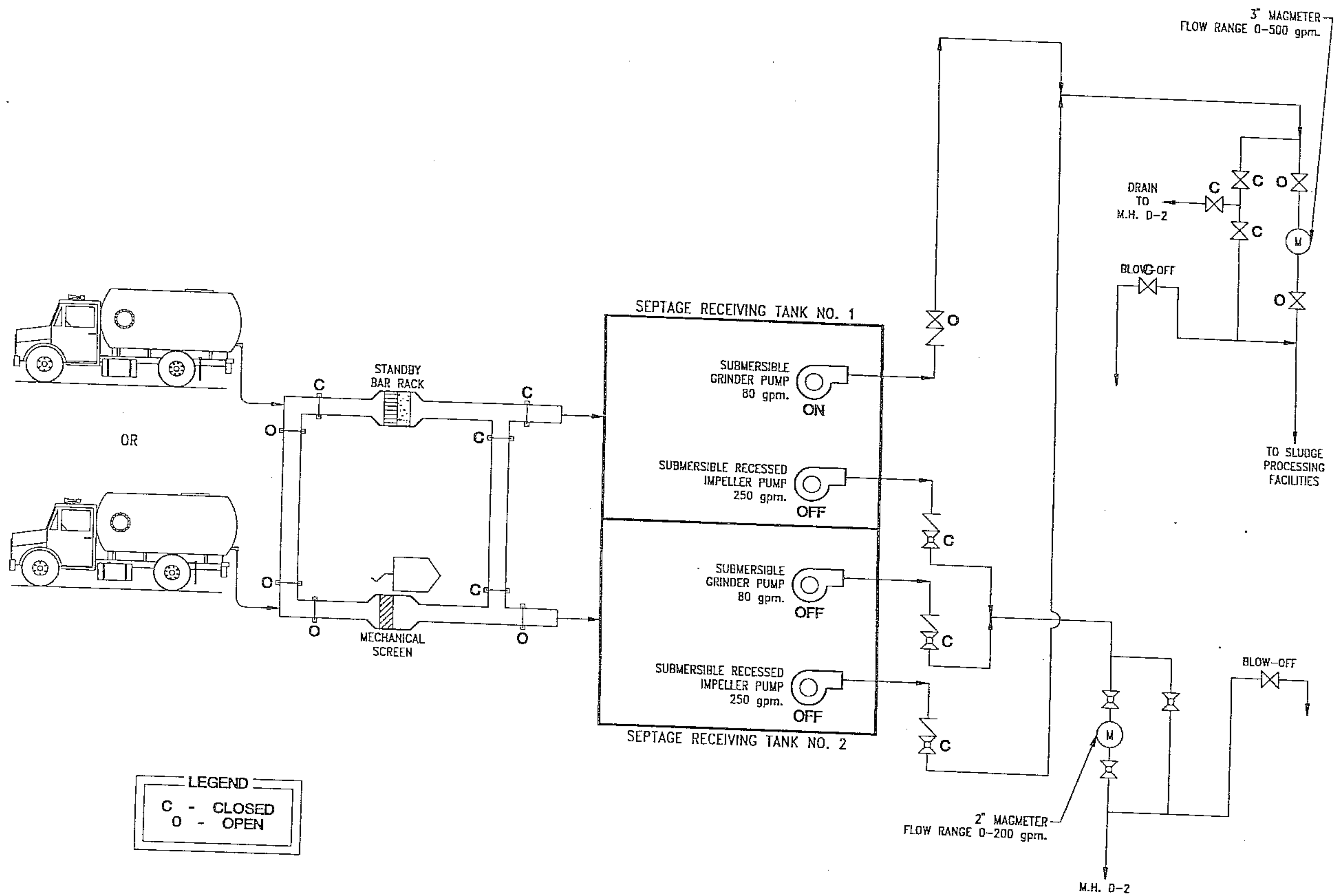


FIGURE 7.1-10
SEPTAGE RECEIVING STATION VALVING
(RECESSED IMPELLER PUMP, FILL TANK NO. 1, EMPTY TANK NO. 2)