Gage, Hannah

From: Nick Batker <nbatker@mce.us.com>
Sent: Friday, April 07, 2017 10:55 AM
To: Water Permit Application
Cc: jboston.cod@gmail.com; radler@heavycontractors.com
Subject: City of Decatur WWTP - Permit # AR0022292 - Application for Modification and Construction of Existing Permit

Please accept our NDPES permit application for the referenced facility. Below are links to download the permit application, construction plans, and project manual, which include specifications, design narrative, calculations, and equipment submittal information.

https://www.dropbox.com/s/2663qovh92kx00v/_Decatur%20WWTP%20Project%20Manual_ADEQ%202017-04-17.pdf?dl=0

https://www.dropbox.com/s/g3x8k89m9i4y4nr/Decatur%20WWTP%20Expansion%20Plans%20April%202017.pdf?dl=0

https://www.dropbox.com/s/9iihmrscl38ud9m/Decatur%20WWTP%20Permit%20Application%20April%202017.pdf?dl=0

If you have any questions or need additional information, please do not hesitate to let me know.

Thanks,
Nick

Nick Batker, PE, CFM
Project Manager

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE

1810 N. College Ave. | Fayetteville, AR 72703
P.O. Box 1229 | Fayetteville, AR 72702
479.443.2377 office | 479.443.9241 fax
469.275.6692 cell
nbatker@mce.us.com
www.mce.us.com
Like Us On facebook

PLEASE NOTE MY NEW EMAIL ADDRESS, UPDATE YOUR RECORDS ACCORDINGLY. THANK YOU.

Arkansas Department of Environmental Quality
NPDES PERMIT APPLICATION
FORM 1

INSTRUCTIONS:

1. This form should be **typed or printed in ink**. If insufficient space is available to address any item please continue on an attached sheet of paper.

2. Please complete the following Section(s). If a Section is not required, please check the Not Applicable (N/A) box at the top of the Section.

Sections	A	B	C	D	E	F	G	H	I
POTW	X	X	X	X					X
Industrial User	X	X	X	X	X	X	X		X
Construction Permit Only	X	X	*	X				X	X
Modification	X	X	X	X	X	*	*	X	X
All Other Applicants	X	X	X	X	X				X

* As necessary

3. If you need help on SIC or NAICS go to www.osha.gov/oshstats/sicser.html

4. If you have any questions about this form you may call NPDES Section at 501-682-0622 or go to www.adeq.state.ar.us/water. You may also contact :

Department	Information in Regard to	Telephone #
Arkansas Department of Health	Water Supply	501-661-2623

5. The following EPA Forms in addition to Form 1 is required for processing your application:

   Form 2A - Municipal Dischargers
   Form 2B - Concentrated Animal Feeding Operations
   Form 2C - Existing Manufacturing, Commercial, Mining, and Silvicultural Operations
   Form 2D - New Sources and New Dischargers Application for Permit to Discharge Process Wastewater
   Form 2E - Facilities Which Do Not Discharge Process Wastewater (i.e. Domestic, Non contact cooling water)
   Form 2F - Application for Permit to Discharge Storm Water Discharges Associated With Industrial Activity

6. Where to Submit

   Return the completed form by mail to:

   Arkansas Department of Environmental Quality
   Permits Branch, Water Division
   5301 Northshore Drive
   North Little Rock, AR 72118

   Or by email to:

   Water.Permit.Application@adeq.state.ar.us

NPDES PERMIT APPLICATION

FORM 1

ARKANSAS DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER DIVISION
5301 Northshore Drive
North Little Rock, AR 72118-5317
www.adeq.state.ar.us/water

PURPOSE OF THIS APPLICATION

- ☐ INITIAL PERMIT APPLICATION FOR NEW FACILITY
- ☐ INITIAL PERMIT APPLICATION FOR EXISTING FACILITY
- ☐ MODIFICATION OF EXISTING PERMIT
- ☐ REISSUANCE (RENEWAL) OF EXISTING PERMIT
- ☒ MODIFICATION AND CONSTRUCTION OF EXISTING PERMIT
- ☐ CONSTRUCTION PERMIT

SECTION A- GENERAL INFORMATION

1. Legal Applicant Name (who has ultimate decision making responsibility over the operation of a facility or activity):

   City of Decatur

   Note: The legal name of the applicant must be identical to the name listed with the Arkansas Secretary of State.

2. Operator Type: Private ☐ State ☐ Federal ☐ Partnership ☐ Corporation ☐ Other ☒

   State of Incorporation: Arkansas

3. Facility Name: City of Decatur Wastewater Treatment Plant

4. Is the legal applicant identified in number 1 above, the owner of the facility? ☒ Yes ☐ No

5. NPDES Permit Number (If Applicable): AR0022292

6. NPDES General Permit Number (If Applicable): ARG

7. NPDES General Storm Water Permit Number (If Applicable): _____

8. Permit Numbers and/or names of any permits issued by ADEQ or EPA for an activity located in Arkansas that is presently held by the applicant or its parent or subsidiary corporation which are not listed above:

Permit Name	Permit Number	Held by
State Construction Permit	AR0022292c	Applicant
NPDES Wastewater Discharge Permit	AR0022292	Applicant

9. Give driving directions to the wastewater treatment plant with respect to known landmarks:

   From the intersection of State Highways 102 and 59, travel 0.1 mile north and turn onto Highway 102. Travel 0.3 miles to Austin Avenue. Travel 0.5 miles on Austin Ave to facility entrance.

10. Facility Physical Location: (Attach a map with location marked; street, route no. or other specific identifier)

    Street: 985 Austin Avenue

    City: Decatur County: Benton State: AR Zip: 72722

11. Facility Mailing Address for permit, DMR, and Invoice (Street or Post Office Box):

Name: City of Decatur Title:

Street: P.O. Box 247

City: Decatur State: AR Zip: 72722

E-mail address*: jboston.cod@gmail.com Fax: 479-752-8336

* Is emailing all documents (permit, letters, DMRs, invoices, etc.) acceptable to the applicant? ☒ Yes ☐ No

12. Neighboring States Within 20 Miles of the permitted facility (Check all that apply):

Oklahoma ☒ Missouri ☒ Tennessee ☐ Louisiana ☐ Texas ☐ Mississippi ☐

13. Indicate applicable Standard Industrial Classification (SIC) Codes and NAICS codes for primary processes

4952 SIC Facility Activity under this SIC or NAICS:

221320 NAICS Sewage Treatment Facility

14. Design Flow: 3.8 MGD Highest Monthly Average of the last two years Flow: 2.1 MGD

15. Is Outfall equipped with a diffuser? ☐ Yes ☒ No

16. Responsible Official (as described on the last page of this application):

Name: Robert Tharp Title: Mayor

Address: P.O. Box 247 Phone Number: 479-752-3912

E-mail Address: bobtharp@gmail.com

City: Decatur State: AR Zip: 72722

17. Cognizant Official (Duly Authorized Representative of responsible official as describe on the last page of this application):

Name: James Boston Title: Public Works Director

Address: P.O. Box 247 Phone Number: 479-752-3912

E-mail Address: jboston.cod@gmail.com

City: Decatur State: AR Zip: 72722

18. Name, address and telephone number of active consulting engineer firm (If none, so state):

Contact Name: Nicholas Batker

Company Name: McClelland Consulting Engineers Inc.

Address: 1810 N. College Ave Phone Number: 479-443-2377

E-mail Address: nbatker@mce.us.com

City: Fayetteville State: AR Zip: 72703

19. Wastewater Operator Information

Wastewater Operator Name: Mike Liley License number: 008775

Class of municipal wastewater operator: I ☐ II ☐ III ☐ IV ☒

Class of industrial wastewater operator: Basic ☐ Advanced ☒

SECTION B: FACILITY AND OUTFALL INFORMATION

1. Facility Location (All information must be based on **front door (Gate)** location of the facility):

Lat: 36 ° 20 ‘ 38.99 “ Long: 94 ° 28 ‘ 21.76 “ County: Benton Nearest Town: Decatur

2. **Outfall** Location (The location of the end of the pipe Discharge point.):

Outfall No. 1:

Latitude: 36 ° 20 ’ 37 ” Longitude: 94 ° 28 ’ 24 ”

Where is the collection point? City wide collection terminates at flow equalization weir.

Name of Receiving Stream (i.e. an unnamed tributary of Mill Creek, thence into Mill Creek; thence into Arkansas River):

Columbia Hollow Creek and thence to Spavinaw Creek in segment 3J of the Arkansas River Basin.

Outfall No. _____:

Latitude: _____ ° _____ ’ _____ ” Longitude: _____ ° _____ ’ _____ ”

Where is the collection point? _____

Name of Receiving Stream (i.e. an unnamed tributary of Mill Creek, thence into Mill Creek; thence into Arkansas River):

3. **Monitoring** Location (If the monitoring is conducted at a location different than the above **Outfall** location):

Outfall No. _____:

Lat: _____ ° _____ ‘ _____ “ Long: _____ ° _____ ‘ _____ “

Outfall No. _____:

Lat: _____ ° _____ ‘ _____ “ Long: _____ ° _____ ‘ _____ “

Outfall No. _____:

Lat: _____ ° _____ ‘ _____ “ Long: _____ ° _____ ‘ _____ “

4. Type of Treatment system (Included all components of treatment system and Attach the process flow diagram):

The following outlines the new proposed process: Influent is first screened and then split into one of three equivalent processes. Effluent from the headworks goes to an anaerobic tank, then to a pre-anoxic cell , then to an aerobic cell where air is added from turbo blowers, then to a MBR.

Downstream of the MBR the three separate flows are combined again, this combined flow goes to a permeate tank , then to the UV disinfection system, after disinfection, the treated water is discharged to surface waters. At times of peak flows or during maitenance, excess flow is diverted to an equalization holding pond to be retained until capacity is sufficient for treatment.

5. Do you have, or plan to have, **AUTOMATIC** sampling equipment or **CONTINUOUS** wastewater flow metering equipment at this facility?

Current:	Flow Metering	☒	Yes	Type: automatic	☐	No	☐	N/A ☐
	Sampling Equipment	☒	Yes	Type: automatic	☐	No	☐	N/A ☐
Planned:	Flow Metering	☐	Yes	Type: _____	☐	No	☐	N/A ☐
	Sampling Equipment	☐	Yes	Type: _____	☐	No	☐	N/A ☐

If **YES**, please indicate the present or future location of this equipment on the sewer schematic and describe the equipment below:

The effluent flow meter and sampler is located betweeen the UV disinfection equipment and aerator schematically. Both are physically located near the filter building. The flowmeter is an ISCO 4210 and the sampler is an ISCO 6712FR refrigerated.

If **NO**, please describe the method and location of flow measurement below:

6. Is the proposed or existing facility located above the 100-year flood level? ☒ Yes ☐ No

NOTE: FEMA Map must be included with this application. Maps can be ordered at www.fema.gov .

If "No", what measures are (or will be) used to protect the facility? _____

7. Population for Municipal and Domestic Sewer Systems: 1,758 (Decatur) + 10,556 (Centerton) = 12,314 (Total Population)

8. Backup Power Generation for Treatment Plants

Are there any permanent backup generators? Yes ☒ No ☐

If Yes, How many? 1 Total Horespower (hp)? 2,346

If No, Please explain? _____

SECTION C – WASTE STORAGE AND DISPOSAL INFORMATION

1. Sludge Disposal Method (Check as many as are applicable):

☐ **Landfill**

Landfill Site Name _____ ADEQ Solid Waste Permit No. _____

☐ **Land Application:** ADEQ State Permit No. _____

☐ **Septic tank** Arkansas Department of Health Permit No.: _____

☒ **Distribution and Marketing**: Facility receiving sludge:

Name: Ron Reed; Reed Dozing and Contracting Address: 19935 E. Yater Road

City: Sheldon State: MO Zip: 64784 Phone: 417-884-2629

Rail: ☐ Pipe: ☐ Other: Truck

☐ **Subsurface Disposal** (Lagooning):

Location of lagoon _____ How old is the lagoon? _____

Surface area of lagoon: _____ Acre Depth: _____ ft Does lagoon have a liner? ☐ Yes ☐ No

☐ **Incineration:** Location of incinerator _____

☐ **Remains in Treatment Lagoon(s):**

How old is the lagoon(s)? _____ Has sludge depth been measured? ☐ Yes ☐ No

If Yes, Date measured? _____ Sludge Depth? _____ ft If No, When will it be measured? _____

Has sludge ever been removed? Yes ☐ No ☐ If Yes, When was it removed? _____

☐ **Other** (Provide complete description): _____

SECTION D - WATER SUPPLY

Water Sources (check as many as are applicable):

☒ **Private Well** - Distance from Discharge point: ☒ Within 5 miles ☒ Within 50 miles

☒ **Municipal Water Utility** (Specify City): Decatur

Distance from Discharge point: ☒ Within 5 miles ☒ Within 50 miles

☒ **Surface Water**- Name of Surface Water Source: Crystal Lake

Distance from Discharge point: ☒ ☐ Within 5 miles ☒ Within 50 miles

Lat: 36 ° 20 ‘ 26 “ Long: 94 ° 26 ‘ 21 “

☐ **Other** (Specify): _____

Distance from Discharge point: ☐ ☐ Within 5 miles ☐ Within 50 miles

NOT APPLICABLE (N/A): ☒

SECTION E: FINANCIAL ASSURANCE AND DISCLOSURE STATEMENT

1. Arkansas Code Annotated § 8-4-203provides for financial assurance requirements for permitting non-municipal domestic sewage treatment systems. Arkansas Code 8-4-203 (b)(1)(A)(i) – "The department shall not issue, modify, or renew a National Pollutant Discharge Elimination System permit or state permit for a non-municipal domestic sewage treatment works without the permit applicant first demonstrating to the department its financial ability to cover the estimated costs of operating and maintaining the non-municipal domestic sewage treatment works for a minimum period of five (5) years."

   The applicant must provide a detailed estimate of the operation and maintenance (O&M) costs for the facility for a five year period. Once the O&M estimate is approved, the applicant must provide **financial assurance** in order to show that the facility is able to cover the costs of operating and maintaining the treatment system for the next five years.

   The minimal financial assurance may be demonstrated to the department by using the following as outlined in Arkansas Code 8-4-203(b)(2):

   A. Obtaining insurance that specifically covers operation and maintenance costs
   B. Obtaining a letter of credit;
   C. Obtaining a surety/performance bond;
   D. Obtaining a trust fund or an escrow account; or
   E. Using a combination of insurance, letter of credit, surety bond, trust fund, or escrow account.

2. Disclosure Statement:

   Arkansas Code Annotated Section 8-1-106 requires that all applicants for any type of permit or transfer of any permit, license, certification or operational authority issued by the Arkansas Department of Environmental Quality (ADEQ) file a Disclosure Statement with their application. The filing of a Disclosure Statement is mandatory. No application can be considered administratively complete without a completed Disclosure Statement. The form may be obtained from the ADEQ web site at:

   http://www.adeq.state.ar.us/disclosure_stmt.pdf

NOT APPLICABLE (N/A): ☒

SECTION F – INDUSTRIAL ACTIVITY

1. Does an effluent guideline limitation promulgated by EPA (Link to a Listing of the 40 CFR Effluent Limit Guidelines) under Section 304 of the Clean Water Act (CWA) apply to your facility?

   YES ☐ (Answer questions 2 and 3) NO ☐

2. What Part of 40 CFR? _____

3. What Subpart(s)? _____ _____

4. Give a brief description of all operations at this facility including primary products or services (attach additional sheets if necessary):

5. Production: (projected for new facilities)

Product(s) Manufactured	Last 12 Months lbs/day*		Highest Production Year of Last 5 Years lbs/day*	
(Brand name)	Highest Month	Days of Operation	Monthly Average	Days of Operation

* These units could be off-lbs, lbs quenched, lbs cleaned/etched/rinsed, lbs poured, lbs extruded, etc.

NOT APPLICABLE (N/A): ☒

SECTION G - WASTEWATER DISCHARGE INFORMATION

Facilities that checked "Yes" in question 1 of Section F are considered Categorical Industrial Users and should skip to question 2.

1. **For Non-Categorical Users Only**: List average wastewater discharge, maximum discharge, and type of discharge (batch, continuous, or both), for each plant process. Include the reference number from the process flow schematic (reference Figure 1) that corresponds to each process. [New facilities should provide estimates for each discharge.]

No.	Process Description	Average Flow (GPD)	Maximum Flow (GPD)	Type of Discharge (batch, continuous, none)

If batch discharge occurs or will occur, indicate: [New facilities may estimate.]

Number of batch discharges: _____ per day Average discharge per batch: (GPD)

Time of batch discharges _____ at _____
(days of week) (hours of day)

Flow rate: _____ gallons/minute Percent of total discharge: _____

Answer questions 2, 3, 4, and 5 only if you are subject to Categorical Standards.

2. For Categorical Users: Provide the wastewater discharge flows for each of your processes or proposed processes. Include the reference number from the process flow schematic (reference Figure 1) that corresponds to each process. [Note: 1) New facilities should provide estimates for each discharge and 2) Facilities should denote whether the flow was measured or estimated.]

No.	Regulated Process	Average Flow (GPD)	Maximum Flow (GPD)	Type of Discharge (batch, continuous, none)

No.	Unregulated Process	Average Flow (GPD)	Maximum Flow (GPD)	Type of Discharge (batch, continuous, none)

No.	Dilution (e.g., Cooling Water)	Average Flow (GPD)	Maximum Flow (GPD)	Type of Discharge (batch, continuous, none)

If batch discharge occurs or will occur, indicate: [New facilities may estimate.]

Number of batch discharges: _____ per day Average discharge per batch: (GPD)

Time of batch discharges _____ (days of week) at _____ (hours of day)

Flow rate: _____ gallons/minute Percent of total discharge: _____

3. Do you have, or plan to have, automatic sampling equipment or continuous wastewater flow metering equipment at this facility?

Current: Flow Metering ☐ Yes Type: _____ ☐ No ☐ N/A ☐
Sampling Equipment ☐ Yes Type: _____ ☐ No ☐ N/A ☐

Planned: Flow Metering ☐ Yes Type: _____ ☐ No ☐ N/A ☐
Sampling Equipment ☐ Yes Type: _____ ☐ No ☐ N/A ☐

If yes, please indicate the present or future location of this equipment on the sewer schematic and describe the equipment below:

4. Are any process changes or expansions planned during the next three years that could alter wastewater volumes or characteristics?

☐ Yes ☐ No (If no, skip Question 5)

5. Briefly describe these changes and their effects on the wastewater volume and characteristics:

NOT APPLICABLE (N/A): ☐

SECTION H -TECHNICAL INFORMATION

Technical information to support this application shall be furnished in appropriate detail to understand the project. Information in this Part is required for obtaining a **construction permit** or for **modification** of the treatment system.

1. Describe the treatment system. Include the types of control equipment to be installed along with their methods of operation and control efficiency.

   SEE ATTACHED NARRATIVE…

2. One set of construction plans and specifications, approved (Signed and stamped) by a **Professional Engineer** (PE) registered in **Arkansas**, must be submitted as follows:

   a. The plans must show flow rates in addition to pertinent dimensions so that detention times, overflow rates, and loadings per acre, etc. can be calculated.
   b. Specifications and complete design calculations.
   c. All treated wastewater discharges should have a flow measuring device such as a weir or Parshall flume installed. Where there is a significant difference between the flow rates of the raw and treated wastewater, a flow measuring device should be provided both before and after treatment.

3. If this application includes a construction permit disturbing five or more acres, a storm water construction permit must be obtained by submitting a notice of intent (NOI) to ADEQ.

SECTION I: SIGNATORY REQUIREMENTS

Cognizant Official (Duly Authorized Representative)

40 CFR 122.22(b) states that all reports required by the permit, or other information requested by the Director, shall be signed by the applicant (or person authorized by the applicant) or by a duly authorized representative of that person. A person is duly authorized representative only if:

(1) the authorization is made in writing by the applicant (or person authorized by the applicant);
(2) the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity responsibility, or an individual or position having overall responsibility for environmental matters for the company.

The applicant hereby designates the following person as a Cognizant Official, or duly authorized representative, for signing reports, etc., including Discharge Monitoring Reports (DMR) required by the permit, and other information requested by the Director:

Signature of Cognizant Official: _____ Date: 4/6/2017

Printed name of Cognizant Official: James Boston

Official title of Cognizant Official: Public Works Director Telephone Number: 479-752-3912

Responsible Official

The information contained in this form must be certified by a ***responsible official*** as defined in the "signatory requirements for permit applications" (40 CFR 122.22).

Responsible official is defined as follows:

Corporation, a principal officer of at least the level of vice president
Partnership, a general partner
Sole proprietorship: the proprietor
Municipal, state, federal, or other public facility: principal executive officer, or ranking elected official.

_____ *(Initial)* "I certify that the cognizant official designated above is qualified to act as a duly authorized representative under the provisions of 40 CFR 122.22(b)." NOTE: If no duly authorized representative is designated in this section, the Department considers the applicant to be the responsible official for the facility and only reports, etc., signed by the applicant will be accepted by the Department.

_____ *(Initial)* "I certify that, if this facility is a corporation, it is registered with the Secretary of State in Arkansas. Please provide the full name of the corporation if different than that listed in Section A above."

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. I further certify under penalty of law that all analyses reported as less than detectable in this application or attachments thereto were performed using the EPA approved test method having the lowest detection limit for the substance tested."

Signature of Responsible Official: _____ Date: 4/6/2017

Printed name of Responsible Official: Robert Tharp

Official title of Responsible Official: Mayor Telephone Number: 479-752-3912

Disclaimer

This is an updated PDF document that allows you to type your information directly into the form, print it, and save the completed form.

Note: This form can be viewed and saved only using Adobe Acrobat Reader version 7.0 or higher, or if you have the full Adobe Professional version.

Instructions:

1. Type in your information
2. Save file (if desired)
3. Print the completed form
4. Sign and date the printed copy
5. Mail it to the directed contact.

FACILITY NAME AND PERMIT NUMBER:
City of Decatur Wastewater Treatment Plant #AR0022292

Form Approved 1/14/99
OMB Number 2040-0086

FORM 2A NPDES

NPDES FORM 2A APPLICATION OVERVIEW

APPLICATION OVERVIEW

Form 2A has been developed in a modular format and consists of a "Basic Application Information" packet and a "Supplemental Application Information" packet. The Basic Application Information packet is divided into two parts. All applicants must complete Parts A and C. Applicants with a design flow greater than or equal to 0.1 mgd must also complete Part B. Some applicants must also complete the Supplemental Application Information packet. The following items explain which parts of Form 2A you must complete.

BASIC APPLICATION INFORMATION:

A. **Basic Application Information for all Applicants.** All applicants must complete questions A.1 through A.8. A treatment works that discharges effluent to surface waters of the United States must also answer questions A.9 through A.12.

B. **Additional Application Information for Applicants with a Design Flow ≥ 0.1 mgd.** All treatment works that have design flows greater than or equal to 0.1 million gallons per day must complete questions B.1 through B.6.

C. **Certification.** All applicants must complete Part C (Certification).

SUPPLEMENTAL APPLICATION INFORMATION:

D. **Expanded Effluent Testing Data.** A treatment works that discharges effluent to surface waters of the United States and meets one or more of the following criteria must complete Part D (Expanded Effluent Testing Data):

1. Has a design flow rate greater than or equal to 1 mgd,
2. Is required to have a pretreatment program (or has one in place), or
3. Is otherwise required by the permitting authority to provide the information.

E. **Toxicity Testing Data.** A treatment works that meets one or more of the following criteria must complete Part E (Toxicity Testing Data):

1. Has a design flow rate greater than or equal to 1 mgd,
2. Is required to have a pretreatment program (or has one in place), or
3. Is otherwise required by the permitting authority to submit results of toxicity testing.

F. **Industrial User Discharges and RCRA/CERCLA Wastes.** A treatment works that accepts process wastewater from any significant industrial users (SIUs) or receives RCRA or CERCLA wastes must complete Part F (Industrial User Discharges and RCRA/CERCLA Wastes). SIUs are defined as:

1. All industrial users subject to Categorical Pretreatment Standards under 40 Code of Federal Regulations (CFR) 403.6 and 40 CFR Chapter I, Subchapter N (see instructions); and
2. Any other industrial user that:
   a. Discharges an average of 25,000 gallons per day or more of process wastewater to the treatment works (with certain exclusions); or
   b. Contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the treatment plant; or
   c. Is designated as an SIU by the control authority.

G. **Combined Sewer Systems.** A treatment works that has a combined sewer system must complete Part G (Combined Sewer Systems).

ALL APPLICANTS MUST COMPLETE PART C (CERTIFICATION)

BASIC APPLICATION INFORMATION

PART A. BASIC APPLICATION INFORMATION FOR ALL APPLICANTS:

All treatment works must complete questions A.1 through A.8 of this Basic Application Information packet.

A.1. Facility Information.

Facility name: Decatur Wastewater Treatment Plant

Mailing Address: PO Box 247

Contact person: James Boston

Title: Public Works Director

Telephone number: (479) 752-8336

Facility Address (not P.O. Box): 985 Austin Avenue

A.2. Applicant Information. If the applicant is different from the above, provide the following:

Applicant name: SAME AS ABOVE

Mailing Address:

Contact person:

Title:

Telephone number:

Is the applicant the owner or operator (or both) of the treatment works?

✔ owner ✔ operator

Indicate whether correspondence regarding this permit should be directed to the facility or the applicant.

☐ facility ✔ applicant

A.3. Existing Environmental Permits. Provide the permit number of any existing environmental permits that have been issued to the treatment works (include state-issued permits).

NPDES	AR0022292	PSD	
UIC		Other	
RCRA		Other	

A.4. Collection System Information. Provide information on municipalities and areas served by the facility. Provide the name and population of each entity and, if known, provide information on the type of collection system (combined vs. separate) and its ownership (municipal, private, etc.).

Name	Population Served	Type of Collection System	Ownership
Decatur	1,758	Seperate	City of Decatur
Centerton	10,556	Seperate	City of Centerton

Total population served 12,314

A.5. Indian Country.

a. Is the treatment works located in Indian Country?

☐ Yes ☑ No

b. Does the treatment works discharge to a receiving water that is either in Indian Country or that is upstream from (and eventually flows through) Indian Country?

☑ Yes ☐ No

A.6. Flow. Indicate the design flow rate of the treatment plant (i.e., the wastewater flow rate that the plant was built to handle). Also provide the average daily flow rate and maximum daily flow rate for each of the last three years. Each year's data must be based on a 12-month time period with the 12th month of "this year" occurring no more than three months prior to this application submittal.

a. Design flow rate 3.80 mgd

	Two Years Ago	Last Year	This Year	
b. Annual average daily flow rate	1.11	1.53	1.89	mgd
c. Maximum daily flow rate	2.03	3.64	2.54	mgd

A.7. Collection System. Indicate the type(s) of collection system(s) used by the treatment plant. Check all that apply. Also estimate the percent contribution (by miles) of each.

☑	Separate sanitary sewer	100.00 %
☐	Combined storm and sanitary sewer	%

A.8. Discharges and Other Disposal Methods.

a. Does the treatment works discharge effluent to waters of the U.S.? ☑ Yes ☐ No

If yes, list how many of each of the following types of discharge points the treatment works uses:

i. Discharges of treated effluent	1
ii. Discharges of untreated or partially treated effluent	0
iii. Combined sewer overflow points	0
iv. Constructed emergency overflows (prior to the headworks)	0
v. Other _____	0

b. Does the treatment works discharge effluent to basins, ponds, or other surface impoundments that do not have outlets for discharge to waters of the U.S.? ☐ Yes ☑ No

If yes, provide the following for each surface impoundment:

Location: _____

Annual average daily volume discharged to surface impoundment(s) _____ mgd

Is discharge ☐ continuous or ☐ intermittent?

c. Does the treatment works land-apply treated wastewater? ☐ Yes ☑ No

If yes, provide the following for each land application site:

Location: _____

Number of acres: _____

Annual average daily volume applied to site: _____ Mgd

Is land application ☐ continuous or ☐ intermittent?

d. Does the treatment works discharge or transport treated or untreated wastewater to another treatment works? ☐ Yes ☑ No

If yes, describe the mean(s) by which the wastewater from the treatment works is discharged or transported to the other treatment works (e.g., tank truck, pipe).

_____

If transport is by a party other than the applicant, provide:

Transporter name: _____

Mailing Address: _____

_____

Contact person: _____

Title: _____

Telephone number: _____

For each treatment works that receives this discharge, provide the following:

Name: _____

Mailing Address: _____

_____

Contact person: _____

Title: _____

Telephone number: _____

If known, provide the NPDES permit number of the treatment works that receives this discharge. _____

Provide the average daily flow rate from the treatment works into the receiving facility. _____ mgd

e. Does the treatment works discharge or dispose of its wastewater in a manner not included in A.8.a through A.8.d above (e.g., underground percolation, well injection)? ☐ Yes ☐ No

If yes, provide the following for each disposal method:

Description of method (including location and size of site(s) if applicable):

_____

Annual daily volume disposed of by this method: _____

Is disposal through this method ☐ continuous or ☐ intermittent?

WASTEWATER DISCHARGES:

If you answered "yes" to question A.8.a, complete questions A.9 through A.12 **once for each outfall** (including bypass points) through which effluent is discharged. Do not include information on combined sewer overflows in this section. **If you answered "no" to question A.8.a**, go to Part B, "Additional Application Information for Applicants with a Design Flow Greater than or Equal to 0.1 mgd."

A.9. Description of Outfall.

a. Outfall number 001

b. Location
Decatur (City or town, if applicable) — 72722 (Zip Code)
Benton (County) — AR (State)
36-20-37 (Latitude) — 94-28-24 (Longitude)

c. Distance from shore (if applicable) 0.00 ft.

d. Depth below surface (if applicable) 0.00 ft.

e. Average daily flow rate 1.89 mgd

f. Does this outfall have either an intermittent or a periodic discharge? ☐ Yes ✔ No (go to A.9.g.)

If yes, provide the following information:

Number of times per year discharge occurs: _____

Average duration of each discharge: _____

Average flow per discharge: _____ mgd

Months in which discharge occurs: _____

g. Is outfall equipped with a diffuser? ☐ Yes ✔ No

A.10. Description of Receiving Waters.

a. Name of receiving water Columbia Hollow Creek

b. Name of watershed (if known) Arkansas River Watershed

United States Soil Conservation Service 14-digit watershed code (if known): _____

c. Name of State Management/River Basin (if known): _____

United States Geological Survey 8-digit hydrologic cataloging unit code (if known): _____

d. Critical low flow of receiving stream (if applicable):
acute _____ cfs chronic _____ cfs

e. Total hardness of receiving stream at critical low flow (if applicable): _____ mg/l of $CaCO_3$

A.11. Description of Treatment.

a. What levels of treatment are provided? Check all that apply.

✔ Primary ✔ Secondary

✔ Advanced ☐ Other. Describe: _____

b. Indicate the following removal rates (as applicable):

Design BOD_5 removal or Design $CBOD_5$ removal	97.00	%
Design SS removal	88.00	%
Design P removal	87.00	%
Design N removal	88.00	%
Other _____		%

c. What type of disinfection is used for the effluent from this outfall? If disinfection varies by season, please describe.

_____

If disinfection is by chlorination, is dechlorination used for this outfall? ☐ Yes ☐ No

d. Does the treatment plant have post aeration? ✔ Yes ☐ No

A.12. Effluent Testing Information. All Applicants that discharge to waters of the US must provide effluent testing data for the following parameters. Provide the indicated effluent testing required by the permitting authority for each outfall through which effluent is discharged. Do not include information on combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136. At a minimum, effluent testing data must be based on at least three samples and must be no more than four and one-half years apart.

Outfall number: 001

PARAMETER	MAXIMUM DAILY VALUE		AVERAGE DAILY VALUE		
	Value	Units	Value	Units	Number of Samples
pH (Minimum)	6.00	s.u.			
pH (Maximum)	9.00	s.u.			
Flow Rate			1.89	MGD	
Temperature (Winter)					
Temperature (Summer)					

* For pH please report a minimum and a maximum daily value

POLLUTANT		MAXIMUM DAILY DISCHARGE		AVERAGE DAILY DISCHARGE			ANALYTICAL METHOD	ML / MDL
		Conc.	Units	Conc.	Units	Number of Samples		
CONVENTIONAL AND NONCONVENTIONAL COMPOUNDS.								
BIOCHEMICAL OXYGEN	BOD-5							
DEMAND (Report one)	CBOD-5	15.00	mg/l	4.39	mg/l	3.00	SM 18th 5210	2
FECAL COLIFORM		400.00	col/100ml	157.31	col/100ml	3.00	SM 18th 9222	2
TOTAL SUSPENDED SOLIDS (TSS)		22.50	mg/l	17.67	mg/l	3.00	SM 18th 2540	2

END OF PART A.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE

BASIC APPLICATION INFORMATION

PART B. ADDITIONAL APPLICATION INFORMATION FOR APPLICANTS WITH A DESIGN FLOW GREATER THAN OR EQUAL TO 0.1 MGD (100,000 gallons per day).

All applicants with a design flow rate ≥ 0.1 mgd must answer questions B.1 through B.6. All others go to Part C (Certification).

B.1. Inflow and Infiltration. Estimate the average number of gallons per day that flow into the treatment works from inflow and/or infiltration.

200.00 gpd

Briefly explain any steps underway or planned to minimize inflow and infiltration.

Sanitary Sewer Evaluation underway and isolated repair of identified sections.

B.2. Topographic Map. Attach to this application a topographic map of the area extending at least one mile beyond facility property boundaries. This map must show the outline of the facility and the following information. (You may submit more than one map if one map does not show the entire area.)

a. The area surrounding the treatment plant, including all unit processes.

b. The major pipes or other structures through which wastewater enters the treatment works and the pipes or other structures through which treated wastewater is discharged from the treatment plant. Include outfalls from bypass piping, if applicable.

c. Each well where wastewater from the treatment plant is injected underground.

d. Wells, springs, other surface water bodies, and drinking water wells that are: 1) within 1/4 mile of the property boundaries of the treatment works, and 2) listed in public record or otherwise known to the applicant.

e. Any areas where the sewage sludge produced by the treatment works is stored, treated, or disposed.

f. If the treatment works receives waste that is classified as hazardous under the Resource Conservation and Recovery Act (RCRA) by truck, rail, or special pipe, show on the map where that hazardous waste enters the treatment works and where it is treated, stored, and/or disposed.

B.3. Process Flow Diagram or Schematic. Provide a diagram showing the processes of the treatment plant, including all bypass piping and all backup power sources or redundancy in the system. Also provide a water balance showing all treatment units, including disinfection (e.g, chlorination and dechlorination). The water balance must show daily average flow rates at influent and discharge points and approximate daily flow rates between treatment units. Include a brief narrative description of the diagram.

B.4. Operation/Maintenance Performed by Contractor(s).

Are any operational or maintenance aspects (related to wastewater treatment and effluent quality) of the treatment works the responsibility of a contractor? ____Yes ✔ No

If yes, list the name, address, telephone number, and status of each contractor and describe the contractor's responsibilities (attach additional pages if necessary).

Name: _____

Mailing Address: _____

_____

Telephone Number: _____

Responsibilities of Contractor: _____

B.5. Scheduled Improvements and Schedules of Implementation. Provide information on any uncompleted implementation schedule or uncompleted plans for improvements that will affect the wastewater treatment, effluent quality, or design capacity of the treatment works. If the treatment works has several different implementation schedules or is planning several improvements, submit separate responses to question B.5 for each. (If none, go to question B.6.)

a. List the outfall number (assigned in question A.9) for each outfall that is covered by this implementation schedule.

001

b. Indicate whether the planned improvements or implementation schedule are required by local, State, or Federal agencies.

____Yes ✔ No

c If the answer to B.5.b is "Yes," briefly describe, including new maximum daily inflow rate (if applicable).

_____

d. Provide dates imposed by any compliance schedule or any actual dates of completion for the implementation steps listed below, as applicable. For improvements planned independently of local, State, or Federal agencies, indicate planned or actual completion dates, as applicable. Indicate dates as accurately as possible.

Implementation Stage	Schedule MM / DD / YYYY	Actual Completion MM / DD / YYYY
– Begin construction	___/ ___/ _____	___/ ___/ _____
– End construction	___/ ___/ _____	___/ ___/ _____
– Begin discharge	___/ ___/ _____	___/ ___/ _____
– Attain operational level	12 / 31 / 2018	___/ ___/ _____

e. Have appropriate permits/clearances concerning other Federal/State requirements been obtained? ___Yes ✔No

Describe briefly: Concurrent review by Arkansas Department of Health.

_____

B.6. EFFLUENT TESTING DATA (GREATER THAN O.1 MGD ONLY).

Applicants that discharge to waters of the US must provide effluent testing data for the following parameters. Provide the indicated effluent testing required by the permitting authority for each outfall through which effluent is discharged. Do not include information on combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136. At a minimum, effluent testing data must be based on at least three pollutant scans and must be no more than four and one-half years old.

Outfall Number: 001

POLLUTANT	MAXIMUM DAILY DISCHARGE		AVERAGE DAILY DISCHARGE			ANALYTICAL METHOD	ML / MDL
	Conc.	Units	Conc.	Units	Number of Samples		
CONVENTIONAL AND NONCONVENTIONAL COMPOUNDS.							
AMMONIA (as N)	10.30	mg/l	7.87	mg/l	3.00	SM 18th4500NH3	
CHLORINE (TOTAL RESIDUAL, TRC)							
DISSOLVED OXYGEN							
TOTAL KJELDAHL NITROGEN (TKN)							
NITRATE PLUS NITRITE NITROGEN	10.00	mg/l	5.40	mg/l	3.00	SM 18th4500NO3	
OIL and GREASE							
PHOSPHORUS (Total)	1.00	mg/l	0.55	mg/l	3.00	EPA 365.3	0.05
TOTAL DISSOLVED SOLIDS (TDS)							
OTHER							

END OF PART B.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE

FACILITY NAME AND PERMIT NUMBER:
City of Decatur Wastewater Treatment Plant #AR0022292

Form Approved 1/14/99
OMB Number 2040-0086

BASIC APPLICATION INFORMATION

PART C. CERTIFICATION

All applicants must complete the Certification Section. Refer to instructions to determine who is an officer for the purposes of this certification. All applicants must complete all applicable sections of Form 2A, as explained in the Application Overview. Indicate below which parts of Form 2A you have completed and are submitting. By signing this certification statement, applicants confirm that they have reviewed Form 2A and have completed all sections that apply to the facility for which this application is submitted.

Indicate which parts of Form 2A you have completed and are submitting:

✓ Basic Application Information packet

Supplemental Application Information packet:

✓ Part D (Expanded Effluent Testing Data)

✓ Part E (Toxicity Testing: Biomonitoring Data)

✓ Part F (Industrial User Discharges and RCRA/CERCLA Wastes)

____ Part G (Combined Sewer Systems)

ALL APPLICANTS MUST COMPLETE THE FOLLOWING CERTIFICATION.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name and official title: Robert Tharp, Mayor, City of Decatur

Signature: Robert L. Tharp

Telephone number: (479) 752-3912

Date signed: 04/06/2017

Upon request of the permitting authority, you must submit any other information necessary to assess wastewater treatment practices at the treatment works or identify appropriate permitting requirements.

SEND COMPLETED FORMS TO:

SUPPLEMENTAL APPLICATION INFORMATION

PART D. EXPANDED EFFLUENT TESTING DATA

Refer to the directions on the cover page to determine whether this section applies to the treatment works.

Effluent Testing: 1.0 mgd and Pretreatment Treatment Works. If the treatment works has a design flow greater than or equal to 1.0 mgd or it has (or is required to have) a pretreatment program, or is otherwise required by the permitting authority to provide the data, then provide effluent testing data for the following pollutants. Provide the indicated effluent testing information and any other information required by the permitting authority for each outfall through which effluent is discharged. Do not include information on combined sewer overflows in this section. All information reported must be based on data collected through analyses conducted using 40 CFR Part 136 methods. In addition, these data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136. Indicate in the blank rows provided below any data you may have on pollutants not specifically listed in this form. At a minimum, effluent testing data must be based on at least three pollutant scans and must be no more than four and one-half years old.

Outfall number: 001 (Complete once for each outfall discharging effluent to waters of the United States.)

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/ MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	Number of Samples		
METALS (TOTAL RECOVERABLE), CYANIDE, PHENOLS, AND HARDNESS.											
ANTIMONY					ND	µg/l	ND		2	EPA200.8	1.0000
ARSENIC					0.56	µg/l	0.005	lb	2	EPA200.8	0.5000
BERYLLIUM					ND	µg/l	ND		2	EPA200.8	0.5000
CADMIUM					ND	µg/l	ND		2	EPA200.8	0.100
CHROMIUM					ND	µg/l	ND		2	StdMeth3500-CrB	10
COPPER					1.13	µg/l	0.010	lb	2	EPA200.8	0.5000
LEAD					ND	µg/l	ND		2	EPA200.8	0.5000
MERCURY					0.0088	µg/l	0.000078	lb	2	EPA1631E	0.005
NICKEL					1.205	µg/l	0.0107	lb	2	EPA200.8	0.5
SELENIUM					ND	µg/l	ND		2	EPA200.8	5.0000
SILVER					ND	µg/l	ND		2	EPA200.8	0.5000
THALLIUM					ND	µg/l	ND		2	EPA200.8	0.5000
ZINC					16.5	µg/l	0.146	lb	2	EPA200.8	1.0000
CYANIDE					ND	µg/l	ND		2	StdMeth4500-CN	0.0100
TOTAL PHENOLIC COMPOUNDS					10.75	µg/l	0.951	lb	2	EPA420.1	0.5000
HARDNESS (AS $CaCO_3$)											
Use this space (or a separate sheet) to provide information on other metals requested by the permit writer.											

FACILITY NAME AND PERMIT NUMBER:
City of Decatur Wastewater Treatment Plant #AR0022292

Form Approved 1/14/99
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Outfall number: _____ (Complete once for each outfall discharging effluent to waters of the United States.)

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/ MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	Number of Samples		
VOLATILE ORGANIC COMPOUNDS.											
ACROLEIN					ND	µg/l	ND		2	EPA624	10.53
ACRYLONITRILE					ND	µg/l	ND		2	EPA624	4.82
BENZENE					ND	µg/l	ND		2	EPA624	0.45
BROMOFORM					ND	µg/l	ND		2	EPA624	2.53
CARBON TETRACHLORIDE					ND	µg/l	ND		2	EPA624	0.57
CLOROBENZENE					ND	µg/l	ND		2	EPA624	0.58
CHLORODIBROMO-METHANE					ND	µg/l	ND		2	EPA624	0.71
CHLOROETHANE					ND	µg/l	ND		2	EPA624	1.24
2-CHLORO-ETHYLVINYL ETHER					ND	µg/l	ND		2	EPA624	8.30
CHLOROFORM					ND	µg/l	ND		2	EPA624	0.72
DICHLOROBROMO-METHANE					ND	µg/l	ND		2	EPA624	0.55
1,1-DICHLOROETHANE					ND	µg/l	ND		2	EPA624	2.35
1,2-DICHLOROETHANE					ND	µg/l	ND		2	EPA624	2.16
TRANS-1,2-DICHLORO-ETHYLENE					ND	µg/l	ND		2	EPA624	2.14
1,1-DICHLOROETHYLENE					ND	µg/l	ND		2	EPA624	2.35
1,2-DICHLOROPROPANE					ND	µg/l	ND		2	EPA624	1.65
1,3-DICHLORO-PROPYLENE					ND	µg/l	ND		2	EPA624	0.34
ETHYLBENZENE					ND	µg/l	ND		2	EPA624	0.18
METHYL BROMIDE					ND	µg/l	ND		2	EPA624	1.04
METHYL CHLORIDE					ND	µg/l	ND		2	EPA624	0.65
METHYLENE CHLORIDE					ND	µg/l	ND		2	EPA624	2.51
1,1,2,2-TETRACHLORO-ETHANE					ND	µg/l	ND		2	EPA624	2.31
TETRACHLORO-ETHYLENE					ND	µg/l	ND		2	EPA624	0.50
TOLUENE					ND	µg/l	ND		2	EPA624	0.33

FACILITY NAME AND PERMIT NUMBER:
City of Decatur Wastewater Treatment Plant #AR0022292

Form Approved 1/14/99
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Outfall number: _____ (Complete once for each outfall discharging effluent to waters of the United States.)

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/ MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	Number of Samples		
1,1,1-TRICHLOROETHANE					ND	µg/l	ND		2	EPA624	0.37
1,1,2-TRICHLOROETHANE					ND	µg/l	ND		2	EPA624	2.37
TRICHLORETHYLENE					ND	µg/l	ND		2	EPA624	0.78
VINYL CHLORIDE					ND	µg/l	ND		2	EPA624	0.81
Use this space (or a separate sheet) to provide information on other volatile organic compounds requested by the permit writer.											
ACID-EXTRACTABLE COMPOUNDS											
P-CHLORO-M-CRESOL					ND	µg/l	ND		2	EPA625	6.67
2-CHLOROPHENOL					ND	µg/l	ND		2	EPA625	5.28
2,4-DICHLOROPHENOL					ND	µg/l	ND		2	EPA625	3.36
2,4-DIMETHYLPHENOL					ND	µg/l	ND		2	EPA625	0.92
4,6-DINITRO-O-CRESOL					ND	µg/l	ND		2	EPA625	1.66
2,4-DINITROPHENOL					ND	µg/l	ND		2	EPA625	2.65
2-NITROPHENOL					ND	µg/l	ND		2	EPA625	1.50
4-NITROPHENOL					ND	µg/l	ND		2	EPA625	7.07
PENTACHLOROPHENOL					ND	µg/l	ND		2	EPA625	2.70
PHENOL					ND	µg/l	ND		2	EPA625	5.82
2,4,6-TRICHLOROPHENOL					ND	µg/l	ND		2	EPA625	2.96
Use this space (or a separate sheet) to provide information on other acid-extractable compounds requested by the permit writer.											
BASE-NEUTRAL COMPOUNDS.											
ACENAPHTHENE					ND	µg/l	ND		2	EPA625	1.04
ACENAPHTHYLENE					ND	µg/l	ND		2	EPA625	1.01
ANTHRACENE					ND	µg/l	ND		2	EPA625	1.26
BENZIDINE					ND	µg/l	ND		2	EPA625	3.26
BENZO(A)ANTHRACENE					ND	µg/l	ND		2	EPA625	2.22
BENZO(A)PYRENE					ND	µg/l	ND		2	EPA625	4.33

Outfall number: _____ (Complete once for each outfall discharging effluent to waters of the United States.)

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/ MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	Number of Samples		
3,4 BENZO-FLUORANTHENE					ND	µg/l	ND		2	EPA625	3.05
BENZO(GHI)PERYLENE					ND	µg/l	ND		2	EPA625	2.71
BENZO(K)FLUORANTHENE					ND	µg/l	ND		2	EPA625	4.06
BIS (2-CHLOROETHOXY) METHANE					ND	µg/l	ND		2	EPA625	1.32
BIS (2-CHLOROETHYL)-ETHER					ND	µg/l	ND		2	EPA625	3.96
BIS (2-CHLOROISO-PROPYL) ETHER					ND	µg/l	ND		2	EPA625	2.98
BIS (2-ETHYLHEXYL) PHTHALATE					ND	µg/l	ND		2	EPA625	3.19
4-BROMOPHENYL PHENYL ETHER					ND	µg/l	ND		2	EPA625	4.06
BUTYL BENZYL PHTHALATE					ND	µg/l	ND		2	EPA625	3.04
2-CHLORONAPHTHALENE					ND	µg/l	ND		2	EPA625	1.69
4-CHLORPHENYL PHENYL ETHER					ND	µg/l	ND		2	EPA625	2.48
CHRYSENE					ND	µg/l	ND		2	EPA625	2.04
DI-N-BUTYL PHTHALATE					ND	µg/l	ND		2	EPA625	2.27
DI-N-OCTYL PHTHALATE					ND	µg/l	ND		2	EPA625	3.40
DIBENZO(A,H) ANTHRACENE					ND	µg/l	ND		2	EPA625	4.63
1,2-DICHLOROBENZENE					ND	µg/l	ND		2	EPA625	1.24
1,3-DICHLOROBENZENE					ND	µg/l	ND		2	EPA625	0.97
1,4-DICHLOROBENZENE					ND	µg/l	ND		2	EPA625	0.84
3,3-DICHLOROBENZIDINE					ND	µg/l	ND		2	EPA625	1.54
DIETHYL PHTHALATE					ND	µg/l	ND		2	EPA625	2.43
DIMETHYL PHTHALATE					ND	µg/l	ND		2	EPA625	1.36
2,4-DINITROTOLUENE					ND	µg/l	ND		2	EPA625	3.60
2,6-DINITROTOLUENE					ND	µg/l	ND		2	EPA625	1.99
1,2-DIPHENYLHYDRAZINE					ND	µg/l	ND		2	EPA625	7.30

FACILITY NAME AND PERMIT NUMBER:
City of Decatur Wastewater Treatment Plant #AR0022292

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Outfall number: _____ (Complete once for each outfall discharging effluent to waters of the United States.)

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE					ANALYTICAL METHOD	ML/ MDL
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units	Number of Samples		
FLUORANTHENE					ND	µg/l	ND		2	EPA625	3.05
FLUORENE					ND	µg/l	ND		2	EPA625	2.40
HEXACHLOROBENZENE					ND	µg/l	ND		2	EPA625	3.24
HEXACHLOROBUTADIENE					ND	µg/l	ND		2	EPA625	2.56
HEXACHLOROCYCLO-PENTADIENE					ND	µg/l	ND		2	EPA625	2.75
HEXACHLOROETHANE					ND	µg/l	ND		2	EPA625	1.81
INDENO(1,2,3-CD)PYRENE					ND	µg/l	ND		2	EPA625	3.85
ISOPHORONE					ND	µg/l	ND		2	EPA625	1.10
NAPHTHALENE					ND	µg/l	ND		2	EPA625	0.81
NITROBENZENE					ND	µg/l	ND		2		1.45
N-NITROSODI-N-PROPYLAMINE					ND	µg/l	ND		2	EPA625	2.92
N-NITROSODI- METHYLAMINE					ND	µg/l	ND		2	EPA625	3.41
N-NITROSODI-PHENYLAMINE					ND	µg/l	ND		2	EPA625	3.66
PHENANTHRENE					ND	µg/l	ND		2	EPA625	0.71
PYRENE					ND	µg/l	ND		2	EPA625	4.50
1,2,4-TRICHLOROBENZENE					ND	µg/l	ND		2	EPA625	1.76
Use this space (or a separate sheet) to provide information on other base-neutral compounds requested by the permit writer.											
Use this space (or a separate sheet) to provide information on other pollutants (e.g., pesticides) requested by the permit writer.											

END OF PART D.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE

SUPPLEMENTAL APPLICATION INFORMATION

PART E. TOXICITY TESTING DATA

POTWs meeting one or more of the following criteria must provide the results of whole effluent toxicity tests for acute or chronic toxicity for each of the facility's discharge points: 1) POTWs with a design flow rate greater than or equal to 1.0 mgd; 2) POTWs with a pretreatment program (or those that are required to have one under 40 CFR Part 403); or 3) POTWs required by the permitting authority to submit data for these parameters.

- At a minimum, these results must include quarterly testing for a 12-month period within the past 1 year using multiple species (minimum of two species), or the results from four tests performed at least annually in the four and one-half years prior to the application, provided the results show no appreciable toxicity, and testing for acute and/or chronic toxicity, depending on the range of receiving water dilution. Do not include information on combined sewer overflows in this section. All information reported must be based on data collected through analysis conducted using 40 CFR Part 136 methods. In addition, this data must comply with QA/QC requirements of 40 CFR Part 136 and other appropriate QA/QC requirements for standard methods for analytes not addressed by 40 CFR Part 136.
- In addition, submit the results of any other whole effluent toxicity tests from the past four and one-half years. If a whole effluent toxicity test conducted during the past four and one-half years revealed toxicity, provide any information on the cause of the toxicity or any results of a toxicity reduction evaluation, if one was conducted.
- If you have already submitted any of the information requested in Part E, you need not submit it again. Rather, provide the information requested in question E.4 for previously submitted information. If EPA methods were not used, report the reasons for using alternate methods. If test summaries are available that contain all of the information requested below, they may be submitted in place of Part E.

If no biomonitoring data is required, do not complete Part E. Refer to the Application Overview for directions on which other sections of the form to complete.

E.1. Required Tests.

Indicate the number of whole effluent toxicity tests conducted in the past four and one-half years.

✔ chronic ____ acute

E.2. Individual Test Data. Complete the following chart for each whole effluent toxicity test conducted in the last four and one-half years. Allow one column per test (where each species constitutes a test). Copy this page if more than three tests are being reported.

	Test number:_____	Test number:_____	Test number:_____
a. Test information.			
Test species & test method number	SEE	ATTACHED RESULTS...	
Age at initiation of test			
Outfall number			
Dates sample collected			
Date test started			
Duration			
b. Give toxicity test methods followed.			
Manual title			
Edition number and year of publication			
Page number(s)			
c. Give the sample collection method(s) used. For multiple grab samples, indicate the number of grab samples used.			
24-Hour composite			
Grab			
d. Indicate where the sample was taken in relation to disinfection. (Check all that apply for each)			
Before disinfection			
After disinfection			
After dechlorination			

	Test number:_____	Test number:_____	Test number:_____
e. Describe the point in the treatment process at which the sample was collected.			
Sample was collected:			
f. For each test, include whether the test was intended to assess chronic toxicity, acute toxicity, or both.			
Chronic toxicity			
Acute toxicity			
g. Provide the type of test performed.			
Static			
Static-renewal			
Flow-through			
h. Source of dilution water. If laboratory water, specify type; if receiving water, specify source.			
Laboratory water			
Receiving water			
i. Type of dilution water. It salt water, specify “natural” or type of artificial sea salts or brine used.			
Fresh water			
Salt water			
j. Give the percentage effluent used for all concentrations in the test series.			
k. Parameters measured during the test. (State whether parameter meets test method specifications)			
pH			
Salinity			
Temperature			
Ammonia			
Dissolved oxygen			
l. Test Results.			
Acute:			
Percent survival in 100% effluent	%	%	%
LC_{50}			
95% C.I.	%	%	%
Control percent survival	%	%	%
Other (describe)			

Chronic:			
NOEC	%	%	%
IC_{25}	%	%	%
Control percent survival	%	%	%
Other (describe)			
m. Quality Control/Quality Assurance.			
Is reference toxicant data available?			
Was reference toxicant test within acceptable bounds?			
What date was reference toxicant test run (MM/DD/YYYY)?			
Other (describe)			

E.3. Toxicity Reduction Evaluation. Is the treatment works involved in a Toxicity Reduction Evaluation?

____Yes____No If yes, describe: _____

_____

_____

E.4. Summary of Submitted Biomonitoring Test Information. If you have submitted biomonitoring test information, or information regarding the cause of toxicity, within the past four and one-half years, provide the dates the information was submitted to the permitting authority and a summary of the results.

Date submitted: _____ (MM/DD/YYYY)

Summary of results: (see instructions)

_____

_____

END OF PART E.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE.

SUPPLEMENTAL APPLICATION INFORMATION

PART F. INDUSTRIAL USER DISCHARGES AND RCRA/CERCLA WASTES

All treatment works receiving discharges from significant industrial users or which receive RCRA, CERCLA, or other remedial wastes must complete Part F.

GENERAL INFORMATION:

F.1. Pretreatment Program. Does the treatment works have, or is it subject to, an approved pretreatment program?

____Yes ✔ No

F.2. Number of Significant Industrial Users (SIUs) and Categorical Industrial Users (CIUs). Provide the number of each of the following types of industrial users that discharge to the treatment works.

a. Number of non-categorical SIUs. 1.00

b. Number of CIUs. 0.00

SIGNIFICANT INDUSTRIAL USER INFORMATION:

Supply the following information for each SIU. If more than one SIU discharges to the treatment works, copy questions F.3 through F.8 and provide the information requested for each SIU.

F.3. Significant Industrial User Information. Provide the name and address of each SIU discharging to the treatment works. Submit additional pages as necessary.

Name: Simmons Foods

Mailing Address: 250 S Main Street, Decatur, AR 72722

F.4. Industrial Processes. Describe all of the industrial processes that affect or contribute to the SIU's discharge.

Poultry Processing, then pre-treated before discharged to POTW

F.5. Principal Product(s) and Raw Material(s). Describe all of the principal processes and raw materials that affect or contribute to the SIU's discharge.

Principal product(s): Processed Chickens

Raw material(s): Live Chickens

F.6. Flow Rate.

a. Process wastewater flow rate. Indicate the average daily volume of process wastewater discharged into the collection system in gallons per day (gpd) and whether the discharge is continuous or intermittent.

1,100,000.00 gpd (____continuous or ✔ intermittent)

b. Non-process wastewater flow rate. Indicate the average daily volume of non-process wastewater flow discharged into the collection system in gallons per day (gpd) and whether the discharge is continuous or intermittent.

8,000.00 gpd (____continuous or ✔ intermittent)

F.7. Pretreatment Standards. Indicate whether the SIU is subject to the following:

a. Local limits ✔ Yes ____No

b. Categorical pretreatment standards ____Yes ✔ No

If subject to categorical pretreatment standards, which category and subcategory?

F.8. Problems at the Treatment Works Attributed to Waste Discharged by the SIU. Has the SIU caused or contributed to any problems (e.g., upsets, interference) at the treatment works in the past three years?

____Yes ✔ No If yes, describe each episode.

_____

_____

RCRA HAZARDOUS WASTE RECEIVED BY TRUCK, RAIL, OR DEDICATED PIPELINE:

F.9. RCRA Waste. Does the treatment works receive or has it in the past three years received RCRA hazardous waste by truck, rail, or dedicated pipe? ____Yes ✔ No (go to F.12.)

F.10. Waste Transport. Method by which RCRA waste is received (check all that apply):

_____Truck _____Rail _____Dedicated Pipe

F.11. Waste Description. Give EPA hazardous waste number and amount (volume or mass, specify units).

EPA Hazardous Waste Number	Amount	Units
_____	_____	_____
_____	_____	_____
_____	_____	_____

CERCLA (SUPERFUND) WASTEWATER, RCRA REMEDIATION/CORRECTIVE ACTION WASTEWATER, AND OTHER REMEDIAL ACTIVITY WASTEWATER:

F.12. Remediation Waste. Does the treatment works currently (or has it been notified that it will) receive waste from remedial activities?

____Yes (complete F.13 through F.15.) ✔ No

Provide a list of sites and the requested information (F.13 - F.15.) for each current and future site.

F.13. Waste Origin. Describe the site and type of facility at which the CERCLA/RCRA/or other remedial waste originates (or is expected to originate in the next five years).

_____

_____

_____

F.14. Pollutants. List the hazardous constituents that are received (or are expected to be received). Include data on volume and concentration, if known. (Attach additional sheets if necessary).

_____

_____

F.15. Waste Treatment.

a. Is this waste treated (or will it be treated) prior to entering the treatment works?

____Yes ____No

If yes, describe the treatment (provide information about the removal efficiency):

_____

_____

b. Is the discharge (or will the discharge be) continuous or intermittent?

____Continuous ____Intermittent If intermittent, describe discharge schedule.

_____

END OF PART F.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE

SUPPLEMENTAL APPLICATION INFORMATION

PART G. COMBINED SEWER SYSTEMS

If the treatment works has a combined sewer system, complete Part G.

G.1. System Map. Provide a map indicating the following: (may be included with Basic Application Information)

a. All CSO discharge points.

b. Sensitive use areas potentially affected by CSOs (e.g., beaches, drinking water supplies, shellfish beds, sensitive aquatic ecosystems, and outstanding natural resource waters).

c. Waters that support threatened and endangered species potentially affected by CSOs.

G.2. System Diagram. Provide a diagram, either in the map provided in G.1. or on a separate drawing, of the combined sewer collection system that includes the following information:

a. Locations of major sewer trunk lines, both combined and separate sanitary.

b. Locations of points where separate sanitary sewers feed into the combined sewer system.

c. Locations of in-line and off-line storage structures.

d. Locations of flow-regulating devices.

e. Locations of pump stations.

CSO OUTFALLS:

Complete questions G.3 through G.6 once for each CSO discharge point.

G.3. Description of Outfall.

a. Outfall number _____

b. Location _____
(City or town, if applicable) (Zip Code)

_____
(County) (State)

_____
(Latitude) (Longitude)

c. Distance from shore (if applicable) _____ft.

d. Depth below surface (if applicable) _____ft.

e. Which of the following were monitored during the last year for this CSO?

☐ Rainfall ☐ CSO pollutant concentrations ☐ CSO frequency
☐ CSO flow volume ☐ Receiving water quality

f. How many storm events were monitored during the last year? _____

G.4. CSO Events.

a. Give the number of CSO events in the last year.
_____ events (☐ actual or ☐ approx.)

b. Give the average duration per CSO event.
_____ hours (☐ actual or ☐ approx.)

c. Give the average volume per CSO event.

_____ million gallons (_____ actual or _____ approx.)

d. Give the minimum rainfall that caused a CSO event in the last year.

_____ inches of rainfall

G.5. Description of Receiving Waters.

a. Name of receiving water: _____

b. Name of watershed/river/stream system:_____

United States Soil Conservation Service 14-digit watershed code (if known): _____

c. Name of State Management/River Basin: _____

United States Geological Survey 8-digit hydrologic cataloging unit code (if known): _____

G.6. CSO Operations.

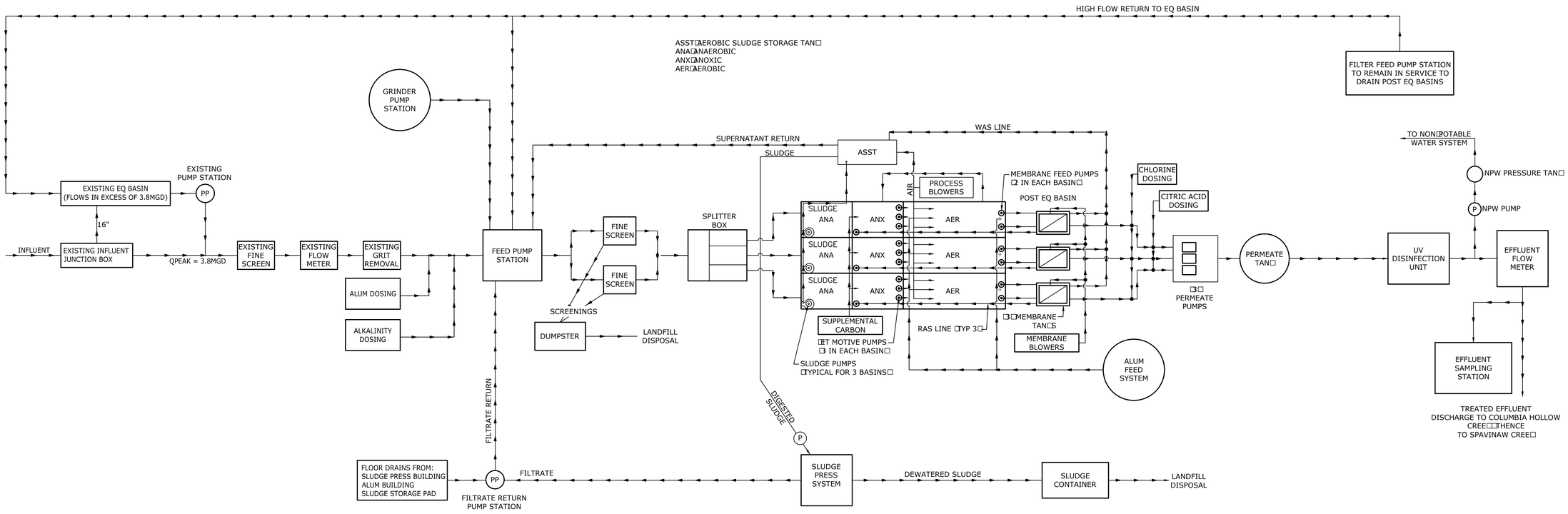
Describe any known water quality impacts on the receiving water caused by this CSO (e.g., permanent or intermittent beach closings, permanent or intermittent shell fish bed closings, fish kills, fish advisories, other recreational loss, or violation of any applicable State water quality standard).

_____

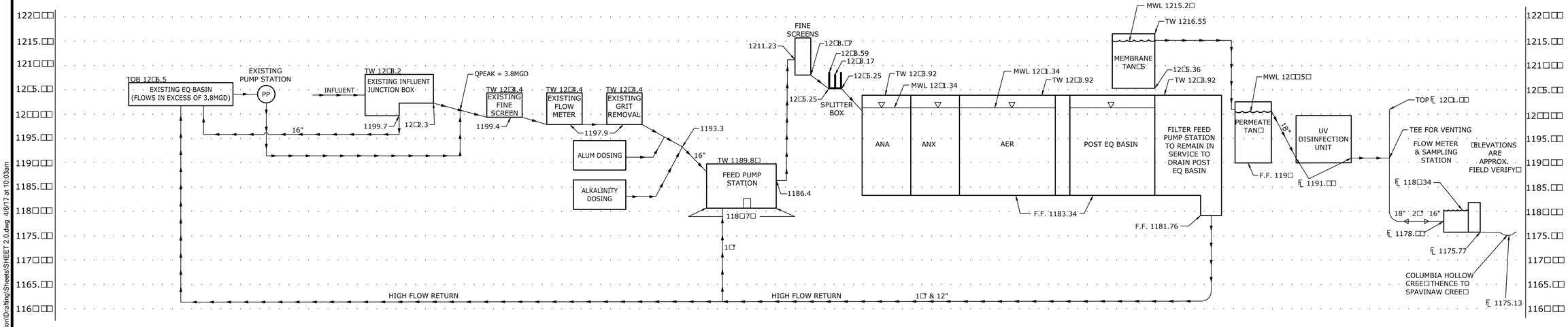
_____

END OF PART G.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHICH OTHER PARTS OF FORM 2A YOU MUST COMPLETE.

Additional information, if provided, will appear on the following pages.



DECATUR WWTP FLOW SCHEMATIC



TW □ TOP OF WALL
MWL □ MAXIMUM WATER LEVEL
FF □ FINISHED FLOOR
TD □ TOP OF DEC□
TOP □ TOP OF PIPE
TOB □ TOP OF BAN□

DECATUR WWTP HYDRAULIC PROFILE

PRELIMINARY
FOR PERMITTING ONLY
NOT FOR CONSTRUCTION

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE
1810 N. College, Fayetteville, Arkansas 72703, 479.442.2377
7202 KANIS RD., Little Rock, Arkansas 72204, PH# 501.371.0272
4606 S. Lincoln Rd. Ste 401, Tulsa, OK 74146, PH# 918.619.0603
HTTP://WWW.MCE-US.COM

ORIGINAL SIGNATURE ON FILE

DECATUR WWTP EXPANSION
DECATUR, ARKANSAS

NO.	DATE	REVISIONS DESCRIPTION

One Call 811 Know what's below. Call before you dig.

FLOW SCHEMATIC AND HYDRAULIC PROFILE

PROJECT ENGR:	DRAWN BY:
AST	BRIN SR
DATE: APRIL 2017	
SCALE: NTS	JOB NUMBER: FY152150

HP-01

W:\2015\FY15-2150 Decatur WWTP Expansion\Drafting\Sheets\SHEET 2.0.dwg 4/6/17 at 10:03am

NO.	DATE	DRN.	APP'D.	DESCRIPTION

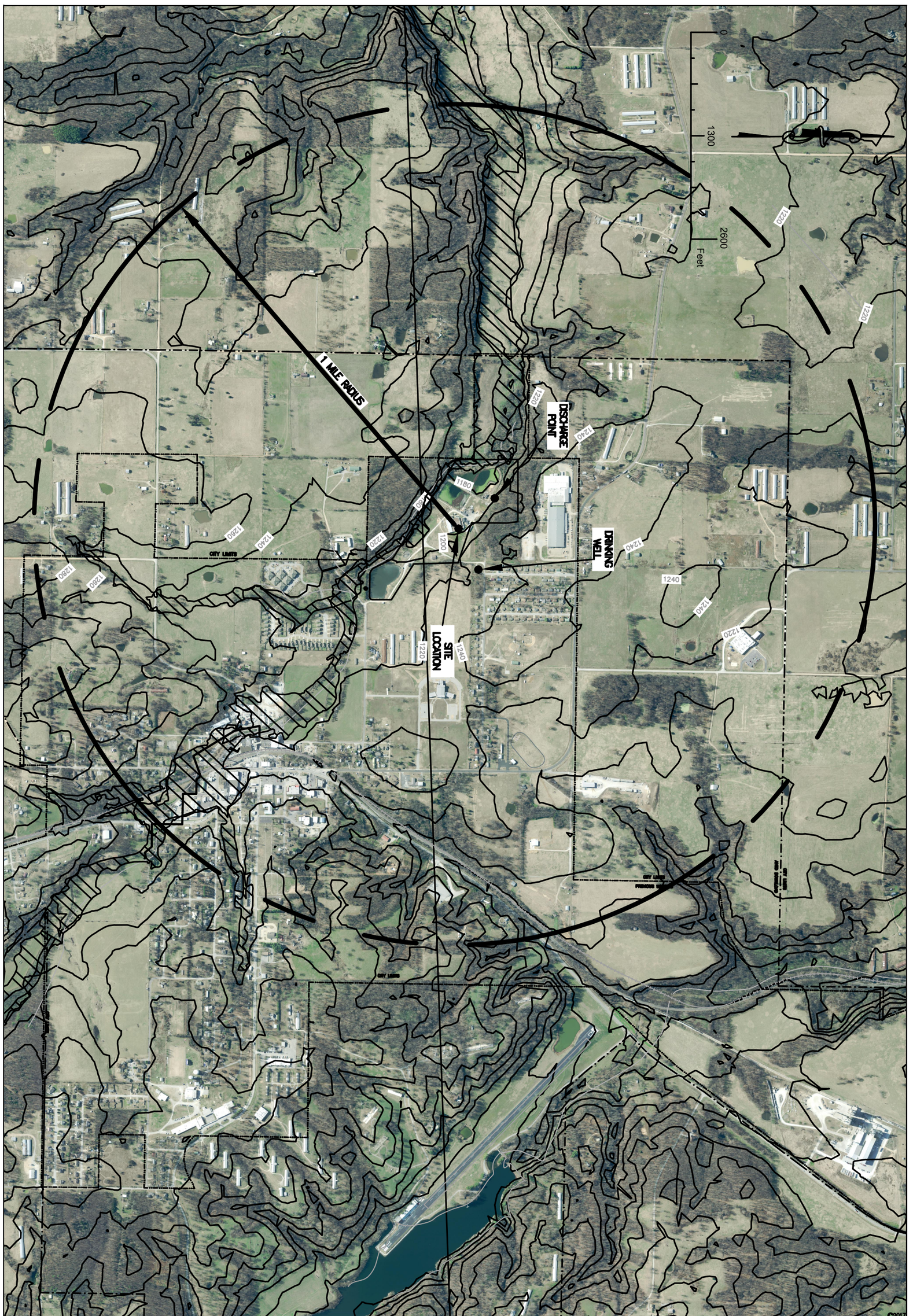
McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE

DECATUR WWTP EXPANSION
NPDES PERMIT MODIFICATION

DECATUR, ARKANSAS

TITLE
AERIAL PHOTO WITH OUTLINE OF FACILITY

DRAWN BY: L.E.W.	APPROVED: N.R.B.
SCALE: 1"=200'	DATE: APR. 2017
JOB. NO. FY152150	FIELD BOOK: –
SHEET NO. 1	REV.



SHEET NO. 2	DRAWN BY: S.L.E.W.	TITLE: AERIAL PHOTO OF PLANT FROM 1-MILE RADIUS VIEW	DECATUR WWTP EXPANSION NPDES PERMIT MODIFICATION
REV. -	APPROVED: M.A.M.		DECATUR, ARKANSAS
	SCALE: 1"=1,100'		
	JOB NO. FY1552150		
	DATE: APR. 2017		
	FIELD BOOK: -		

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE

REVISIONS				
NO.	DATE	DRN.	APP'VD.	DESCRIPTION

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
NAME: DECATUR, CITY OF
ADDRESS: P.O. BOX 247
DECATUR, AR 72722
FACILITY: DECATUR, CITY OF
LOCATION: 985 AUSTIN AV
DECATUR, AR 72722

ATTN: JAMES BOSTON, PUBLIC WORKS DIR

AR0022292	TX1-Q
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	
MM/DD/YYYY	MM/DD/YYYY
10/01/2016	12/31/2016

DMR Mailing ZIP CODE: 72722
MAJOR

001-QUARTERLY-CHRONIC WET TESTING
External Outfall

No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
Pass/Fail Static Renewal 7 Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	******	******	******	******	0	******	0	0	1/90	Compos
TGP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0; fail=1		Quarterly	COMPOS
Pass/Fail Statre 7Day Chronic Pimephales Promelas	SAMPLE MEASUREMENT	******	******	******	******	0	******	0	0	1/90	Compos
TGP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0; fail=1		Quarterly	COMPOS
Low Flow Pass/Fail Survival Test Static Renewal 7 Day Chronic	SAMPLE MEASUREMENT	******	******	******	******	0	******	0	0	1/90	Compos
TLP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0; fail=1		Quarterly	COMPOS
Low Flow Pass/Fail Survival Test Static Renewal 7 Day Chronic	SAMPLE MEASUREMENT	******	******	******	******	0	******	0	0	1/90	Compos
TLP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0; fail=1		Quarterly	COMPOS
NOEC Lethal Static Renewal 7 Day Chronic Ceriodaphnia dubia	SAMPLE MEASUREMENT	******	******	******	******	100	******	%	0	1/90	Compos
TOP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS
NOEC Lethal Static Renewal 7 Day Chronic Pimephales promelas	SAMPLE MEASUREMENT	******	******	******	******	100	******	%	0	1/90	Compos
TOP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS
NOEC Sub-Lethal Static Renewal 7 Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	******	******	******	******	100	******	%	0	1/90	Compos
TPP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE	DATE
James A Boston Public Works Mgr	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Jan A Boston	4197523912	12/1/2016
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA Code / NUMBER	MM/DD/YYYY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

CALENDAR QUARTERS: (JAN-MAR) (APR-JUN) (JUL- SEP) & (OCT-DEC).
(PASS=0/FAIL=1) IF THE NOEC VALUE IS LESS THAN THE CRITICAL DILUTION, REPORT "1"; OTHERWISE, REPORT "0". SEE PART II, #10. 04-00052
Pace Analytical, 9608 Loiret Blvd, Lenexa KS 66219

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004

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DECATUR, AR 72722
FACILITY: DECATUR, CITY OF
LOCATION: 985 AUSTIN AV
DECATUR, AR 72722
ATTN: JAMES BOSTON, PUBLIC WORKS DIR

AR0022292	TX1-Q
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	
MM/DD/YYYY	MM/DD/YYYY
10/01/2016	12/31/2016

DMR Mailing ZIP CODE: 72722
MAJOR

001-QUARTERLY-CHRONIC WET TESTING
External Outfall

No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
NOEC Sub-Lethal Static Renewal 7 Day Chronic Pimephales	SAMPLE MEASUREMENT	******	******	******	******	100	******	%	0	1/90	Compos
TPP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS
Coef Of Var Statre 7Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	******	******	******	******	7.93	******	%	0	1/90	Compos
TQP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS
Coef Of Var Statre 7Day Chronic Pimephales	SAMPLE MEASUREMENT	******	******	******	******	13.01	******	%	0	1/90	Compos
TQP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE
James A Boston Public Works Dir	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	James A Boston	479	7523912	12/7/2016
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA Code	NUMBER	MM/DD/YYYY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

CALENDAR QUARTERS: (JAN-MAR) (APR-JUN) (JUL- SEP) & (OCT-DEC).
(PASS=0/FAIL=1) IF THE NOEC VALUE IS LESS THAN THE CRITICAL DILUTION, REPORT "1": OTHERWISE, REPORT "0". SEE PART II, #10. 04-00052
Pace Analytical, 9608 Loiret Blvd, Lenexa KS 66219

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004

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DECATUR, AR 72722
FACILITY: DECATUR, CITY OF
LOCATION: 985 AUSTIN AV
DECATUR, AR 72722

ATTN: JAMES BOSTON, PUBLIC WORKS DIR

AR0022292	TX1-Q
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	
MM/DD/YYYY	MM/DD/YYYY
07/01/2016	09/30/2016

DMR Mailing ZIP CODE: 72722
MAJOR

001-QUARTERLY-CHRONIC WET TESTING
External Outfall

No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
Pass/Fail Static Renewal 7 Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	******	******	******	******	0	******	0	0	1/90	Compos
TGP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0; fail=1		Quarterly	COMPOS
Pass/Fail Statre 7Day Chronic Pimephales Promelas	SAMPLE MEASUREMENT	******	******	******	******	0	******	0	0	1/90	Compos
TGP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0; fail=1		Quarterly	COMPOS
Low Flow Pass/Fail Survival Test Static Renewal 7 Day Chronic	SAMPLE MEASUREMENT	******	******	******	******	0	******	0	0	1/90	Compos
TLP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0; fail=1		Quarterly	COMPOS
Low Flow Pass/Fail Survival Test Static Renewal 7 Day Chronic	SAMPLE MEASUREMENT	******	******	******	******	0	******	0	0	1/90	Compos
TLP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0; fail=1		Quarterly	COMPOS
NOEC Lethal Static Renewal 7 Day Chronic Ceriodaphnia dubia	SAMPLE MEASUREMENT	******	******	******	******	100	******	%	0	1/90	Compos
TOP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS
NOEC Lethal Static Renewal 7 Day Chronic Pimephales promelas	SAMPLE MEASUREMENT	******	******	******	******	100	******	%	0	1/90	Compos
TOP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS
NOEC Sub-Lethal Static Renewal 7 Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	******	******	******	******	100	******	%	0	1/90	Compos
TPP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS

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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA Code	NUMBER	MM/DD/YYYY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

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(PASS=0/FAIL=1) IF THE NOEC VALUE IS LESS THAN THE CRITICAL DILUTION, REPORT "1"; OTHERWISE, REPORT "0". SEE PART II, #10. 04-00052
Pace Analytical, 9608 Loiret Blvd, Lenexa KS 66214

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
NAME: DECATUR, CITY OF
ADDRESS: P.O. BOX 247
DECATUR, AR 72722
FACILITY: DECATUR, CITY OF
LOCATION: 985 AUSTIN AV
DECATUR, AR 72722

ATTN: JAMES BOSTON, PUBLIC WORKS DIR

AR0022292	TX1-Q
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	
MM/DD/YYYY	MM/DD/YYYY
07/01/2016	09/30/2016

DMR Mailing ZIP CODE: 72722
MAJOR

001-QUARTERLY-CHRONIC WET TESTING
External Outfall

No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
NOEC Sub-Lethal Static Renewal 7 Day Chronic Pimephales	SAMPLE MEASUREMENT	******	******	******	******	100	******	%	0	1/90	Compos
TPP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS
Coef Of Var Statre 7Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	******	******	******	******	17.3	******	%	0	1/90	Compos
TQP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS
Coef Of Var Statre 7Day Chronic Pimephales	SAMPLE MEASUREMENT	******	******	******	******	13.81	******	%	0	1/90	Compos
TQP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Quarterly	COMPOS

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE
James H Boston Public Works Mgr	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	James A Boston	4797523917		10/26/16
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA Code	NUMBER	MM/DD/YYYY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

CALENDAR QUARTERS: (JAN-MAR) (APR-JUN) (JUL- SEP) & (OCT-DEC).
(PASS=0/FAIL=1) IF THE NOEC VALUE IS LESS THAN THE CRITICAL DILUTION, REPORT "1"; OTHERWISE, REPORT "0". SEE PART II, #10. 04-00052
Pace Analytical, 9608 Loiret Blvd, Lenexa KS 66219

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040- 0004

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if different)*
NAME: DECATUR, CITY OF
ADDRESS: P.O. BOX 247
DECATUR, AR 72722
FACILITY: DECATUR, CITY OF
LOCATION: 985 AUSTIN AV
DECATUR, AR 72722

ATTN: JAMES BOSTON, PUBLIC WORKS DIR

AR0022292	TX1- Q
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	
MM/DD/YYYY	MM/DD/YYYY
04/01/2016	06/30/2016

DMR Mailing ZIP CODE: 72722
MAJOR

001- QUARTERLY- CHRONIC WET TESTING
External Outfall

No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
Pass/Fail Static Renewal 7 Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	*******	*******	*******	*******	0	*******	0	0	1/90	Composite
TGP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	*******	*******	*******	*******	Req. Mon. 7 DA AVG	*******	pass= 0; fail= 1		Quarterly	COMPOS
Pass/Fail Statre 7Day Chronic Pimephales Promelas	SAMPLE MEASUREMENT	*******	*******	*******	*******	0	*******	0	0	1/90	Composite
TGP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	*******	*******	*******	*******	Req. Mon. 7 DA AVG	*******	pass= 0; fail= 1		Quarterly	COMPOS
Low Flow Pass/Fail Survival Test Static Renewal 7 Day Chronic	SAMPLE MEASUREMENT	*******	*******	*******	*******	0	*******	0	0	1/90	Composite
TLP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	*******	*******	*******	*******	Req. Mon. 7 DA AVG	*******	pass= 0; fail= 1		Quarterly	COMPOS
Low Flow Pass/Fail Survival Test Static Renewal 7 Day Chronic	SAMPLE MEASUREMENT	*******	*******	*******	*******	0	*******	0	0	1/90	Composite
TLP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	*******	*******	*******	*******	Req. Mon. 7 DA AVG	*******	pass= 0; fail= 1		Quarterly	COMPOS
NOEC Lethal Static Renewal 7 Day Chronic Ceriodaphnia dubia	SAMPLE MEASUREMENT	*******	*******	*******	*******	100	*******	%	0	1/90	Composite
TOP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	*******	*******	*******	*******	Req. Mon. 7 DA AVG	*******	%		Quarterly	COMPOS
NOEC Lethal Static Renewal 7 Day Chronic Pimephales promelas	SAMPLE MEASUREMENT	*******	*******	*******	*******	100	*******	%	0	1/90	Composite
TOP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	*******	*******	*******	*******	Req. Mon. 7 DA AVG	*******	%		Quarterly	COMPOS
NOEC Sub- Lethal Static Renewal 7 Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	*******	*******	*******	*******	100	*******	%	0	1/90	Composite
TPP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	*******	*******	*******	*******	Req. Mon. 7 DA AVG	*******	%		Quarterly	COMPOS

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE		DATE
James A Boston Public Works Mgr	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	James A Boston	4797523912		6/24/2016
TYPED OR PRINTED			AREA Code	NUMBER	MM/DD/YYYY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

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(PASS= 0/FAIL= 1) IF THE NOEC VALUE IS LESS THAN THE CRITICAL DILUTION, REPORT "1"; OTHERWISE, REPORT "0". SEE PART II, #10. 04- 00052

Pace Analytical, 9608 Loiret Blvd, Lenexa KS 66219

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040- 0004

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if different)*
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ATTN: JAMES BOSTON, PUBLIC WORKS DIR

AR0022292	TX1- Q
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	
MM/DD/YYYY	MM/DD/YYYY
04/01/2016	06/30/2016

DMR Mailing ZIP CODE: 72722
MAJOR

001- QUARTERLY- CHRONIC WET TESTING
External Outfall

No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
NOEC Sub- Lethal Static Renewal 7 Day Chronic Pimephales	SAMPLE MEASUREMENT	*******	*******	*******	*******	100	*******	%	0	1/90	Comps
TPP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	*******	*******	*******	*******	Req. Mon. 7 DA AVG	*******	%		Quarterly	COMPOS
Coef Of Var Statre 7Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	*******	*******	*******	*******	13,14	*******	%	0	1/90	Comps
TQP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	*******	*******	*******	*******	Req. Mon. 7 DA AVG	*******	%		Quarterly	COMPOS
Coef Of Var Statre 7Day Chronic Pimephales	SAMPLE MEASUREMENT	*******	*******	*******	*******	13.47	*******	%	0	1/90	Comps
TQP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	*******	*******	*******	*******	Req. Mon. 7 DA AVG	*******	%		Quarterly	COMPOS

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE
James A Boston Public Works Mgr	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	James A Boston	4797523912		6/24/2016
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA Code	NUMBER	MM/DD/YYYY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)
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Pace Analytical, 9608 Loiret Blvd, Lenexa KS 66219

ATTENTION

AClean@ Sampling Techniques

Water quality (WQ) standards (Based on aquatic toxicity and human health criteria) for many of the heavy metals are Aat@ analytical methods= detection levels (MDL).

It is recognized that **unclean** sampling and lab techniques can and do **cause** contamination sometimes causing measurements to be Aseen@ as **violations** of the WQ standards. Therefore, the permittee must recognize the **importance** of **eliminating** contamination.

For personnel responsible for collecting samples in answer to effluent monitoring requirements, the Department recommends following sample collection and handling in accordance with EPA=s **Method 1669: Sampling Ambient Water for Determination of Trace Metals at EPA Water Quality Criteria Levels** as closely as possible and as economically feasible. A copy of Method 1669 is available upon request.

Please convey to your contract testing laboratory the extreme importance of proper sampling techniques associated with analytical testing for heavy metals. Some of the techniques may be considered too expensive to justify implementation but it could be in the best interest of your facility to **submit the PPS Form by using common sense AClean@ Sampling Techniques.**

GENERAL INSTRUCTION

1. **Generation of a form similar to the PPS form is prohibited without expressed written permission of ADEQ, Discharge Permits Section, Water Division.**

2. All major facilities, all categorical industries, or any facility that believes there are priority pollutant(s) present in their discharge, must submit the Form PPS.

3. All facilities must monitor for **metals** and **cyanide**.

4. Testing requirements for categorical industries are listed in Attachment 1.

5. If one of the EPA approved test methods (40 CFR Part 136) is used the method detection level (MDL) **must be as low as Minimum Quantification Levels (MQL)**. MQLs are based on EPA Region 6 guidance dated April 10, 2006: "MQL = 3.3 X MDL"

6. All the units must be expressed in µg/l (Micro grams per liter).

7. **All the results less than Used Method Detection Level Achieved are reported as ND (Not Detected).**

8. The data requested for the priority pollutant scan in the enclosures shall be submitted with copies of the laboratory results, MDLs and MQLs. Certification that QA/QC procedures were implemented must be submitted with the requested information.

9. All analyses must be performed at the minimum level of sensitivity. The analyses must demonstrate that an acceptable calibration point as low as MQL was used. Test procedures must conform to approved EPA methodology listed in 40 CFR Part 136.

ATTACHMENT 1

TESTING REQUIREMENTS FOR ORGANIC TOXIC POLLUTANTS INDUSTRY CATEGORY

INDUSTRY CATEGORY	Volatile	Acid	Base/Neutral	Pesticide
Adhesives & Sealants ..	X	X	X	-
Aluminum Forming	X	X	X	-
Auto & Other Laundries	X	X	X	X
Battery Manufacturing	X	-	X	-
Coal Mining	X	X	X	X
Coil Coating	X	X	X	-
Copper Forming	X	X	X	-
Electric & Electronic Compounds	X	X	X	X
Electroplating	X	X	X	-
Explosives Manufacturing	-	X	X	-
Foundries	X	X	X	-
Gum & Wood Chemicals	X	X	X	X
Inorganic Chemicals Manufacturing	X	X	X	-
Iron & Steel Manufacturing	X	X	X	-
Leather Tanning & Finishing	X	X	X	X
Mechanical Products Manufacturing	X	X	X	-
Nonferrous Metals Manufacturing	X	X	X	X
Ore Mining	X	X	X	X
Organic Chemicals Manufacturing	X	X	X	X
Paint & Ink Formulation	X	X	X	X
Pesticides	X	X	X	X
Petroleum Refining	X	X	X	X
Pharmaceutical Preparations	X	X	X	-
Photographic Equipment & Supplies	X	X	X	X
Plastic & Synthetic Materials Manufacturing	X	X	X	X
Plastic Processing	X	-	-	-
Porcelain Enameling	X	-	X	X
Printing & Publishing	X	X	X	X
Pulp & Paperboard Mills	X	X	X	X
Rubber Processing	X	X	X	-
Soap & Detergent Manufacturing	X	X	X	-
Steam Electric Power Plants	X	X	X	-
Textile Mills	X	X	X	X
Timber Products Processing	X	X	X	X

X Testing required.
- Testing not required.

ARKANSAS Department of Environmental Quality
PPS REQUIREMENTS

1. Name of facility:

   _City of Decatur Wastewater Treatment Plant

2. Name, address and telephone number of laboratory:

   _Environmental Services Company 1107 Century Ave, Springdale, AR 72764 479-750-1170

3. Is the lab certified by the State of Arkansas? Yes _X___ No ___

4. What are the certification dates?

   Issued data __7/2013_____ Expire date ____7/2014_____

5. Is the laboratory certified for all the parameters?

   YES _X___ No ____ (Explain)

6. Date and time of samples collected:

   ___8/28/13 9:15 A.M._____

7. Date and time samples were received in the laboratory:

   ____8/28/13 10:10 A.M._____

8. Sample location (Outfall No.):

   ___001_____

9. Samples collected by:

   Name __Mike Liley/Andrew French

   Title _Operator/Lab Tech_____

   Telephone _(479) 752-3769_____

10. I certify under penalty of law that this document and all attachments were prepared under my direction of supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

James A Boston — Public Works Manager
Printed Name of person signing — Title

Jm A Boston — 11/19/2013
Signature — Date signed

List all attachments to this form:

METALS AND CYANIDE	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
1. Antimony (Total), Recoverable	<1.0000	EPA 200.8	1.000	60
2. Arsenic (Total), Recoverable	<0.5000	EPA 200.8	0.5000	0.5
3. Beryllium (Total), Recoverable	<0.5000	EPA 200.8	0.5000	0.5
4. Cadmium (Total), Recoverable	<0.1000	EPA 200.8	0.1000	0.5
5. Chromium (Total), Recoverable	<1.0000	EPA 200.8	1.0000	10
7. Chromium (6+), Dissolved	<10.00	Stdmeth 3500-CR B	10.000	10
8. Copper (Total), Recoverable	<0.5000	EPA 200.8	0.5000	0.5
9. Lead (Total), Recoverable	<0.5000	EPA 200.8	0.5000	0.5
10. Mercury (Total), Recoverable	0.0135	EPA631E	0.0005	0.005
12. Nickel (Total), Recoverable	<0.5000	EPA 200.8	0.5000	0.5
13. Selenium (Total), Recoverable	<5.0000	EPA 200.8	5.0000	5
14. Silver (Total), Recoverable	<0.5000	EPA 200.8	0.5000	0.5
15. Thallium (Total), Recoverable	<0.5000	EPA 200.8	0.5000	0.5
16. Zinc (Total), Recoverable	<1.0000	EPA 200.8	1.0000	20
129. Phenols, Total Recoverable	<0.500	EPA 420.1	0.500	5
17. Cyanide (Total), Recoverable	<0.0100	StdMeth 4500 - CN	0.0100	10

DIOXIN	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
18. 2,3,7,8-Tetrachloro-debenzo-p-dioxin (TCDD)	ND	EPA 625	0.00001	0.00001

VOLATILE COMPOUNDS	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
19. Acrolein	ND	EPA 624	10.53	50
20. Acrylonitrile	ND	EPA 624	4.82	20
21. Benzene	ND	EPA 624	0.45	10
22. Bromoform	ND	EPA 624	2.53	10
23. Carbon Tetrachloride	ND	EPA 624	0.57	2
24. Chlorobenzene	ND	EPA 624	0.58	10
25. Chlorodibromomethane	ND	EPA 624	0.71	10
26. Chloroethane	ND	EPA 624	1.24	50
27. 2-Chloroethyl vinyl ether	ND	EPA 624	8.30	10
28. Chloroform	ND	EPA 624	0.72	10
29. Dichlorobromomethane	ND	EPA 624	0.55	10
30. 1,1-Dichloroethane	ND	EPA 624	2.35	10
31. 1,2-Dichloroethane	ND	EPA 624	2.16	10
32. 1,1-Dichloroethylene	ND	EPA 624	1.73	10
33. 1,2-Dichloropropane	ND	EPA 624	2.65	10
34. 1,3-Dichloropropylene	ND	EPA 624	0.34	10
35. Ethylbenzene	ND	EPA 624	0.18	10
36. Methyl Bromide [Bromomethane]	ND	EPA 624	1.04	50
37. Methyl Chloride [Chloromethane]	ND	EPA 624	0.65	50
38. Methylene Chloride	ND	EPA 624	2.51	20
39. 1,1,2,2-Tetrachloroethane	ND	EPA 624	2.31	10
40. Tetrachloroethylene	ND	EPA 624	0.50	10
41. Toluene	ND	EPA 624	0.33	10
42. 1,2-trans-Dichloroethylene	ND	EPA 624	2.14	10
43. 1,1,1-Trichloroethane	ND	EPA 624	0.37	10
44. 1,1,2-Trichloroethane	ND	EPA 624	2.37	10
45. Trichloroethylene	ND	EPA 624	0.78	10
46. Vinyl Chloride	ND	EPA 624	0.81	10

ACID COMPOUNDS	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
47. 2-Chlorophenol	ND	EPA 625	5.28	10
48. 2,4-Dichlorophenol	ND	EPA 625	3.36	10
49. 2,4-Dimethylphenol	ND	EPA 625	0.92	10
50. 4,6-Dinitro-o-Cresol [2 methyl 4,6-dinitrophenol	ND	EPA 625	1.66	50
51. 2,4-Dinitrophenol	ND	EPA 625	2.65	50
52. 2-Nitrophenol	ND	EPA 625	1.50	20
53. 4-Nitrophenol	ND	EPA 625	7.07	50
54. P-Chloro-m-Cresol [4 chloro-3-methylpheno1]	ND	EPA 625	6.76	10
55. Pentachlorophenol	ND	EPA 625	2.70	5
56. Phenol	ND	EPA 625	5.82	10
57. 2,4,6-Trichlorophenol	ND	EPA 625	2.96	10

BASE/NEUTRAL COMPOUNDS	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
58. Acenaphthene	ND	EPA 625	1.04	10
59. Acenaphthylene	ND	EPA 625	1.01	10
60. Anthracene	ND	EPA 625	1.26	10
61. Benzidine	ND	EPA 625	3.26	50
62. Benzo(a)anthracene	ND	EPA 625	2.22	5
63. Benzo(a)pyrene	ND	EPA 625	4.33	5
64. 3,4-Benzofluoranthene	ND	EPA 625	3.05	10
65. Benzo(ghi)perylene	ND	EPA 625	2.71	20
66. Benzo(k)fluoranthene	ND	EPA 625	4.06	5
67. Bis(2-chloroethoxy) methane	ND	EPA 625	1.32	10
68. Bis(2-chloroethyl) ether	ND	EPA 625	3.96	10
69. Bis(2-chloroisopropyl) ether	ND	EPA 625	2.98	10
70. Bis(2-ethylhexyl) phthalate	ND	EPA 625	3.19	10
71. 4-Bromophenyl phenyl ether	ND	EPA 625	4.06	10
72. Butyl benzyl phthalate	ND	EPA 625	3.04	10
73. 2-Chloronapthalene	ND	EPA 625	1.69	10
74. 4-Chlorophenyl phenyl ether	ND	EPA 625	2.48	10
75. Chrysene	ND	EPA 625	2.04	5
76. Dibenzo (a,h) anthracene	ND	EPA 625	4.63	5
77. 1,2-Dichlorobenzene	ND	EPA 625	1.24	10
78. 1,3-Dichlorobenzene	ND	EPA 625	0.97	10
79. 1,4-Dichlorobenzene	ND	EPA 625	0.84	10
80. 3,3'-Dichlorobenzidine	ND	EPA 625	1.54	5
81. Diethyl Phthalate	ND	EPA 625	2.43	10
82. Dimethyl Phthalate	ND	EPA 625	1.36	10
83. Di-n-Butyl Phthalate	ND	EPA 625	2.27	10
84. 2,4-Dinitrotoluene	ND	EPA 625	3.60	10
85. 2,6-Dinitrotoluene	ND	EPA 625	1.99	10
86. Di-n-octyl Phthalate	ND	EPA 625	3.40	10

BASE/NEUTRAL COMPOUNDS	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
87. 1,2-Diphenylhydrazine	ND	EPA 625	7.30	20
89. Fluorene	ND	EPA 625	2.40	10
90. Hexachlorobenzene	ND	EPA 625	3.24	5
91. Hexachlorobutadiene	ND	EPA 625	2.56	10
92. Hexachlorocyclopentadiene	ND	EPA 625	2.75	10
93. Hexachloroethane	ND	EPA 625	1.81	20
94. Indeno (1,2,3-cd) pyrene (2,3-o-phenylene pyrene)	ND	EPA 625	3.85	5
95. Isophorone	ND	EPA 625	1.10	10
96. Naphthalene	ND	EPA 625	0.81	10
97. Nitrobenzene	ND	EPA 625	1.45	10
98. N-nitrosodimethylamine	ND	EPA 625	3.41	50
99. N-nitrosodi-n-propylamine	ND	EPA 625	2.92	20
100. N-nitrosodiphenylamine	ND	EPA 625	3.66	20
101. Phenanthrene	ND	EPA 625	0.71	10
102. Pyrene	ND	EPA 625	4.50	10
103. 1,2,4-Trichlorobenzene	ND	EPA 625	1.76	10

PESTICIDES	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
104. Aldrin	ND	EPA 608	0.01	0.01
105. Alpha-BHC	ND	EPA 608	0.03	0.05
106. Beta-BHC	ND	EPA 608	0.01	0.05
107. Gamma-BHC	ND	EPA 608	0.01	0.05
108. Delta-BHC	ND	EPA 608	0.01	0.05
109. Chlordane	ND	EPA 608	0.10	0.2
110. 4,4'-DDT	ND	EPA 608	0.02	0.02
111. 4,4'-DDE (p,p-DDX)	ND	EPA 608	0.01	0.1
112. 4,4'-DDD 9(p,p-TDE)	ND	EPA 608	0.01	0.1
113. Dieldrin	ND	EPA 608	0.01	0.02
114. Alpha-endosulfan	ND	EPA 608	0.01	0.01
115. Beta-endosulfan	ND	EPA 608	0.01	0.02
116. Endosulfan sulfate	ND	EPA 608	0.10	0.1
117. Endrin	ND	EPA 608	0.02	0.02
118. Endrin aldehyde	ND	EPA 608	0.02	0.1
119. Heptachlor	ND	EPA 608	0.01	0.01
120. Heptachlor epoxide (BHC-hexachlorocyclohexane)	ND	EPA 608	0.01	0.01
130. Chlorpyrifos	ND	EPA 608	0.04	0.07
121. PCB-1242	ND	EPA 608	0.050	0.2
122. PCB-1254	ND	EPA 608	0.050	0.2
123. PCB-1221	ND	EPA 608	0.050	0.2
124. PCB-1232	ND	EPA 608	0.050	0.2
125. PCB-1248	ND	EPA 608	0.050	0.2
126. PCB-1260	ND	EPA 608	0.050	0.2
127. PCB-1016	ND	EPA 608	0.050	0.2
128. Toxaphene	ND	EPA 608	0.25	0.3

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Control Number: 1308020003
Customer Name : DECATUR WASTEWATER-EFFLUENT
Customer/Permit No. : 1654 / AR0022292 001
Report Date : 08/07/13

Composite Date:08/01/13 -08/01/13
Sample Time : 1000-1500
Sample Type : COMP/GRAB
Sample From : EFFLUENT

Collected By: AF
Delivery By : AF
Work Order :
Purchase Order :

Laboratory Analysis

Analysis Date	Time	By	Parameter	Result	Notes	Quantity	Method	Quality Assurance Precision % RPD	Quality Assurance Accuracy % Recovery
08/05	0900	TSB	Ammonia Nitrogen	0.6 mg/L			SM 18th 4500-NH3 H	1.55	108.0 *
08/05	1500	TSB	Phosphorus, Total	< 0.05 mg/L			EPA 365.3	4.88	97.0 *
08/05	1400	KIK	Solids, Total Suspended	< 2.0 mg/L			SM 18th 2540D	0.00	N/A *
08/01	1615	WDS	Coliform, Fecal	11 /100ml			SM 18th 9222D	0.00	N/A *
08/02	0830	KIK	BOD, Carbonaceous	< 2.0 mg/L			SM 18th 5210B	0.00	86.0
08/02	0900	TSB	Nitrate + Nitrite	4.7 mg/L			SM 18th 4500-NO3 E	0.00	81.0 *

* QA data shown is from a different sample or standard on the same date.

All equipment used is checked and/or calibrated daily. All NPDES testing is conducted in accordance with 40 CFR Part 136. A minimum of 10% spiked and duplicate samples is run on each parameter where applicable for Quality Assurance purposes. Quality Assurance Plan on file with Arkansas Department of Environmental Quality. Analysis time indicates the time of the start of the analytical batch in which the specific sample was included.

Signature Nicole Morrell
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Control Number: 1309020318
Customer Name : DECATUR WASTEWATER-EFFLUENT
Customer/Permit No. : 1654 / AR0022292 001
Report Date : 10/03/13

Composite Date:09/26/13 -09/26/13
Sample Time : 1000-1500/1355
Sample Type : 6HR COMP/GRAB
Sample From : EFFLUENT

Collected By: AF
Delivery By : AF
Work Order :
Purchase Order :

Laboratory Analysis

Analysis Date	Time	By	Parameter	Result	Notes	Quantity	Method	Quality Assurance Precision % RPD	Quality Assurance Accuracy % Recovery
09/30	1200	TSB	Ammonia Nitrogen	0.3 mg/L			SM 18th 4500-NH3 H	7.55	90.0 *
09/27	0830	TSB	Oil & Grease, Total	5.6 mg/L			EPA 1664A	6.97	100.5 *
10/02	1500	TSB	Phosphorus, Total	< 0.05 mg/L			EPA 365.3	1.94	97.0 *
09/30	1415	KIK	Solids, Total Suspended	3.0 mg/L			SM 18th 2540D	66.67	N/A
09/26	1625	KIK	Coliform, Fecal	< 2 /100ml			SM 18th 9222D	0.00	N/A *
09/27	1000	KIK	BOD, Carbonaceous	< 2.0 mg/L			SM 18th 5210B	10.04	100.4 *
10/02	0800	TSB	Nitrate + Nitrite	6.6 mg/L			SM 18th 4500-NO3 E	0.00	107.4

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Control Number: 1310020312
Customer Name : DECATUR WASTEWATER-EFFLUENT
Customer/Permit No. : 1654 / AR0022292 001
Report Date : 10/30/13

Composite Date:10/24/13 -10/24/13
Sample Time : 1000-1500/1355
Sample Type : 6HR COMP/GRAB
Sample From : EFFLUENT

Collected By: AF
Delivery By : AF
Work Order :
Purchase Order :

Laboratory Analysis

Analysis Date	Time	By	Parameter	Result	Notes	Quantity	Method	Quality Assurance Precision % RPD	Quality Assurance Accuracy % Recovery
10/29	1000	TSB	Ammonia Nitrogen	0.6 mg/L			SM 18th 4500-NH3 H	4.94	97.0 *
10/29	1000	TSB	Phosphorus, Total	< 0.05 mg/L			EPA 365.3	2.67	103.0 *
10/28	1440	KIK	Solids, Total Suspended	7.0 mg/L			SM 18th 2540D	28.57	N/A
10/24	1600	KIK	Coliform, Fecal	4 /100ml			SM 18th 9222D	0.00	N/A
10/25	1000	KIK	BOD, Carbonaceous	< 2.0 mg/L			SM 18th 5210B	4.80	109.0 *
10/29	1000	KIK	Nitrate + Nitrite	5.6 mg/L			SM 18th 4500-NO3 E	0.00	102.4 *

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LABORATORY REPORT

Client:	Decatur Waste Water	Sample Date:	08/28/13
Control Number:	1308020394	Receipt Date:	08/28/13
Sample Type:	Comp/Grab – Water	Report Date:	09/18/13
Sample Identification:	Priority Pollutant Scan		

VOLATILE ORGANIC TARGET COMPOUNDS (µg/L or ppb)

ANALYTE	RESULT	DETECTION LIMIT
Acrolein	ND	10.53
Acrylonitrile	ND	4.82
Benzene	ND	0.45
Bromoform	ND	2.53
Carbon Tetrachloride	ND	0.57
Chlorobenzene	ND	0.58
Chlorodibromomethane	ND	0.71
Chloroethane	ND	1.24
2-Chloroethyl vinyl ether	ND	8.30
Chloroform	ND	0.72
Dichlorobromomethane	ND	0.55
1,1-Dichloroethane	ND	2.35
1,2-Dichloroethane	ND	2.16
1,1-Dichloroethene	ND	1.73
1,2-Dichloropropane	ND	2.65
1,3-Dichloropropene	ND	0.34
Ethylbenzene	ND	0.18
Methyl Bromide (Bromomethane)	ND	1.04

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LABORATORY REPORT

Client: Decatur Waste Water

Control Number: 1308020394

VOLATILE ORGANIC TARGET COMPOUNDS (µg/L or ppb)

ANALYTE	RESULT	DETECTION LIMIT
Methyl Chloride (Chloromethane)	ND	0.65
Methylene chloride	ND	2.51
1,1,2,2-Tetrachloroethane	ND	2.31
Tetrachloroethene	ND	0.50
Toluene	ND	0.33
1,2-trans-Dichloroethylene	ND	2.14
1,1,1-Trichloroethane	ND	0.37
1,1,2-Trichloroethane	ND	2.37
Trichloroethylene	ND	0.78
Vinyl Chloride	ND	0.81

QUALITY ASSURANCE DATA

Method: EPA 624

System Monitoring Compounds	% Recovery	% Recovery Limits
1,2 Dichloroethane-d_4	124.17	69-156
Toluene-d_8	120.07	76-127
4-Bromofluorobenzene	100.69	63-131

Analysis Date: 09/09/13

Analysis Time: 13:55

Analyst: VLP

A laboratory blank was monitored for all analytes of interest.

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LABORATORY REPORT

Client:	Decatur Waste Water	Sample Date:	08/28/13
Control Number:	1308020394	Receipt Date:	08/28/13
Sample Type:	Comp/Grab – Water	Report Date:	09/18/13
Sample Identification:	Priority Pollutant Scan		

BASE/NEUTRAL EXTRACTABLE FRACTION (µg/L or ppb)

ANALYTE	RESULT	DETECTION LIMIT
Acenaphthene	ND	1.04
Acenaphthylene	ND	1.01
Anthracene	ND	1.26
Benzidine	ND	3.26
Benzo (a) anthracene	ND	2.22
Benzo (a) pyrene	ND	4.33
Benzo (b) fluoranthene	ND	3.05
Benzo (ghi) perylene	ND	2.71
Benzo (k) fluoranthene	ND	4.06
Bis-(2-chloroethoxy) methane	ND	1.32
Bis (2-chloroethyl) ether	ND	3.96
Bis (2-chloroisopropyl) ether	ND	2.98
Bis (2-ethylhexyl) phthalate	ND	3.19
4-Bromophenyl phenyl ether	ND	4.06
Butyl benzyl phthalate	ND	3.04
2-Chloronapthalene	ND	1.69
4-Chlorophenyl phenyl ether	ND	2.48
Chrysene	ND	2.04
Dibenzo (a,h) anthracene	ND	4.63
1,2-Dichlorobenzene	ND	1.24
1,3-Dichlorobenzene	ND	0.97
1,4-Dichlorobenzene	ND	0.84

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LABORATORY REPORT

Client: Decatur Waste Water

Control Number: 1308020394

BASE/NEUTRAL EXTRACTABLE FRACTION (µg/L or ppb)

ANALYTE	RESULT	DETECTION LIMIT
3,3'-Dichlorobenzidine	ND	1.54
Diethyl phthalate	ND	2.43
Dimethyl phthalate	ND	1.36
Di-n-butyl phthalate	ND	2.27
2,4-Dinitrotoluene	ND	3.60
2,6-Dinitrotoluene	ND	1.99
Di-n-octyl phthalate	ND	3.40
1,2-Diphenylhydrazine	ND	7.30
Fluorene	ND	2.40
Hexachlorobenzene	ND	3.24
Hexachlorobutadiene	ND	2.56
Hexachlorocyclopentadiene	ND	2.75
Hexachloroethane	ND	1.81
Indeno (1,2,3-cd) pyrene	ND	3.85
Isophorone	ND	1.10
Naphthalene	ND	0.81
Nitrobenzene	ND	1.45
N-nitrosodimethylamine	ND	3.41
N-nitrosodi-n-propylamine	ND	2.92
N-nitrosodiphenylamine	ND	3.66
Phenanthrene	ND	0.71
Pyrene	ND	4.50
1,2,4-Trichlorobenzene	ND	1.76
2,3,7,8-TCDD	ND	0.00001

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LABORATORY REPORT

Client: Decatur Waste Water

Control Number: 1308020394

QUALITY ASSURANCE DATA

Method: EPA 625

System Monitoring Compounds	% Recovery	% Recovery Limits
Nitrobenzene-d_5	57.17	35-114
2-Fluorobiphenyl	43.23	43-116
p-Terphenyl-d_{14}	55.15	33-141

Analysis Date: 09/13/13

Analysis Time: 08:39

Analyst: MNM

A laboratory blank was monitored for all analytes of interest.

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LABORATORY REPORT

Client: Decatur Waste Water

Control Number: 1308020394

ACID EXTRACTABLE FRACTION (µg/L or ppb)

ANALYTE	RESULT	DETECTION LIMIT
2-Chlorophenol	ND	5.28
2,4-Dichlorophenol	ND	3.36
2,4-Dimethylphenol	ND	0.92
4,6-Dinitro-2-methyphenol	ND	1.66
2,4-Dinitrophenol	ND	2.65
2-Nitrophenol	ND	1.50
4-Nitrophenol	ND	7.07
4-Chloro-3-methylphenol	ND	6.76
Pentachlorophenol	ND	2.70
Phenol	ND	5.82
2,4,6-Trichlorophenol	ND	2.96

QUALITY ASSURANCE DATA

Method: EPA 625

System Monitoring Compounds	% Recovery	% Recovery Limits
Phenol-d_5	23.65	10-94
2-Fluorophenol	26.17	21-100
2,4,6-Tribromophenol	45.08	10-123

Analysis Date: 09/13/13

Analysis Time: 08:39

Analyst: MNM

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LABORATORY REPORT

Client: Decatur Waste Water

Control Number: 1308020394

CHLORINATED PESTICIDES (µg/L or ppb)

ANALYTE	RESULT	DETECTION LIMIT
Aldrin	ND	0.01
alpha-BHC	ND	0.03
beta-BHC	ND	0.01
gamma-BHC (Lindane)	ND	0.01
delta-BHC	ND	0.01
Chlordane	ND	0.10
Chlorpyrifos	ND	0.04
4-4'-DDT	ND	0.02
4,4'-DDE	ND	0.01
4,4'-DDD	ND	0.01
Dieldrin	ND	0.01
alpha-Endosulfan	ND	0.01
beta-Endosulfan	ND	0.01
Endosulfan Sulfate	ND	0.10
Endrin	ND	0.02
Endrin Aldehyde	ND	0.02
Heptachlor	ND	0.01
Heptachlor Epoxide	ND	0.01
Toxaphene	ND	0.25

A laboratory blank was monitored for all analytes of interest.

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LABORATORY REPORT

Client: Decatur Waste Water

Control Number: 1308020394

PCB (µg/L or ppb)

ANALYTE	RESULT	DETECTION LIMIT
PCB-1242	ND	0.050
PCB-1254	ND	0.050
PCB-1221	ND	0.050
PCB-1232	ND	0.050
PCB-1248	ND	0.050
PCB-1260	ND	0.050
PCB-1016	ND	0.050

QUALITY ASSURANCE DATA

Method: EPA 608

System Monitoring Compounds	% Recoveries
2,4,5,6-tetrachloro-*m*-xylene	82.63
Decachlorobiphenyl	78.26

Analysis Date:	09/10/1
Analysis Time:	15:47
Analyst:	MNM

A laboratory blank was monitored for all analytes of interest.

Data release authorized by :

Digitally signed by Vernon L. Pate
DN: cn=Vernon L. Pate, o=Environmental Services Company, Inc., ou=ESC-NWA Branch, email=lynnp@esclabs.com, c=US
Date: 2013.09.18 13:44:37 -05'00'

Vernon L. Pate

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Springdale, AR 72764

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CHAIN OF CUSTODY

Client Information		Project Information	
Company Name:	Decatur. Waste Water	Permit/Project #:	
Address:	310 Hope Decatur AR 72722	Purchase Order #:	
		Work order #	
Telephone:		Sampler Name(s):	Mike Riley / Andrew Fr
FAX:		and Signature(s):	
Contact:			
ESC Client Number:	1654		

Sample Identification		Sample Collection				Sample Containers				Requested Parameters							
Identification	ESC Control #	Date	Time	Type	Matrix	Type	Volume	Preservative	#	Hexavalent Cr (44.PS)	Phenolics (99.PS)	Metals* (See Comments Section)	Volatiles (82.0)	BNA (98.AA) Pests(99.P),Dioxin(1.E), PCB(99.R)	Chloropyrifos(99.PC)	Cn (9.PS)	Mercury(16.PS)
Priority Pollutant Scan	1308020394	8/28	8Am	4 Part Comp	W.Water	Plastic	1 Liter	Cool ≤ 6° C	1	X							
(PPS)		8/28	8Am	4 Part Comp	W.Water	Glass	1 Liter	Cool <6° C, H2SO4 TO PH <2	4		X						
		8/28	8Am	4 Part Comp	W.Water	Plastic	1 Liter	HNO3 to pH <2	1			X					
		8/28	8Am	4 Part Comp	W.Water	Glass	1 Liter	Cool ≤ 6° C	4					X			
		8/28/13	0910	Grab	W.Water	Plastic	1 Liter	Cool <6° C, NaOH to pH > 10	1							X	
		8/28/13	0910	Grab	W.Water	VOA	40 mls	HCL	2				X				
		8/28/13	0910	Grab	W.Water	Glass	1 L Amber	Cool ≤ 6° C	2						X		
	1308020395	8/28/13	0910	Grab	W.Water	Glass	250 ml	None	1								X
Sample Duplicate	1308020395	8/28/13	0910	Grab	W.Water	Glass	250 ml	None	1								X
Field Blank	1308020396	8/29/13	0910	Grab	W.Water	Glass	250 ml	None	1								X

	Date	Time		Date	Time
Relinquished By: (Signature and Printed Name)	8/29/13	0915	Received By: (Signature and Printed Name)	8/29/13	0915
Relinquished By: (Signature and Printed Name)	8/29/13	1010	Received By: (Signature and Printed Name)		
Relinquished By: (Signature and Printed Name)	Date	Time	Received for Lab By: (Signature and Printed Name) Wade Schmidt	8-29-13	10:10

Custody Seals: Used? ☐ Intact? ☐
Turnaround: Regular ☒ Special ☐
Were samples properly preserved: Yes ☒ No ☐

Comments:	Flow Data	Field Test	Time	Analyst	Result	Result	Units
Metals: Be (4.PS), Cr (24.PS), Ni (28.PS), Cu (29.PS),	Analyst:	pH:					S.U.
Zn (30.PS), As (33.PS), Se (34.PS), Ag (47.PS),	Time:	Temp.:					°C °F
Cd (48.PS), Sb (51.PS), Tl (81.PS), Pb (82.PS)	Reading:	DO:					mg/L
Composite from 4 Manual Grab Sample 8/27 7:30Am 11:30Am 3P	Units:	Debris:					
8/28 8Am		Fecal Start:					This Document is Page of

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Revised 4-14-99

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Control Number: 1308020394
Customer Name : DECATUR WASTEWATER-EFFLUENT
Customer/Permit No. : 1654 / AR0022292 001
Report Date : 09/18/13

Composite Date:08/28/13 -08/28/13
Sample Time : 0800, 0910
Sample Type : 4 PART COMP
Sample From : PRIORITY POLLUTANT S

Collected By: ML
Delivery By : ML
Work Order :
Purchase Order :

Laboratory Analysis

Analysis Date	Time	By	Parameter	Result	Notes	Quantity	Method	Quality Assurance Precision % RPD	Quality Assurance Accuracy % Recover
09/03	1108	RAH	Beryllium	< 0.5000 ug/L			EPA 200.8	3.73	99.8
09/05	1420	MNM	Cyanide, Total (asCN)	< 0.0100 ug/L			StdMeth 4500-CN		
09/11	1336	WWP	Mercury, Low Level	0.0135 ug/L			EPA 1631E	3.01	103.0
09/03	1108	RAH	Chromium	< 1.0000 ug/L			EPA 200.8	4.86	91.2
09/03	1108	RAH	Nickel	< 0.5000 ug/L			EPA 200.8	1.23	94.6
09/03	1108	RAH	Copper	< 0.5000 ug/L			EPA 200.8	0.74	96.1
09/03	1108	RAH	Zinc	< 1.0000 ug/L			EPA 200.8	9.87	100.0
09/03	1108	RAH	Arsenic	< 0.5000 ug/L			EPA 200.8	1.48	100.5
09/03	1108	RAH	Selenium	< 5.0000 ug/L			EPA 200.8	0.56	104.2
08/30	0830	NTR	Chromium, Hexavalent	< 10.00 ug/L			StdMeth 3500-Cr B	1.48	94.2
09/03	1108	RAH	Silver	< 0.5000 ug/L			EPA 200.8	3.46	81.6
09/03	1108	RAH	Cadmium	< 0.1000 ug/L			EPA 200.8	0.63	87.0
09/03	1108	RAH	Antimony	< 1.0000 ug/L			EPA 200.8	2.50	84.4
09/03	1108	RAH	Thallium	< 0.5000 ug/L			EPA 200.8	1.35	94.5
09/03	1108	RAH	Lead	< 0.5000 ug/L			EPA 200.8	2.56	91.2
09/13	0839	MNM	Phenolics, Low Range	< 0.500 ug/L			EPA 420.1		

CORRECTED COPY

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Signature _____
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1107 Century Avenue
Springdale, AR 72762
Tel. (479)750-1170 Fax (479)750-1172

Control Number: 1308020395
Customer Name : DECATUR WASTEWATER-EFFLUENT
Customer/Permit No. : 1654 / AR0022292 001
Report Date : 09/18/13

Sample Date : 08/28/13
Sample Time : 0910
Sample Type : GRAB
Sample From : SAMPLE DUPLICATE

Collected By: ML
Delivery By : ML
Work Order :
Purchase Order :

Laboratory Analysis

Analysis Date	Time	By	Parameter	Result	Notes	Quantity	Method	Quality Assurance Precision % RPD	Quality Assurance Accuracy % Recover
09/11	1336	WWP	Mercury, Low Level	0.0131 ug/L			EPA 1631E	3.01	103.0

CORRECTED COPY

* QA data shown is from a different sample or standard on the same date.

All equipment used is checked and/or calibrated daily. All NPDES testing is conducted in accordance with 40 CFR Part 136. A minimum of 10% spiked and duplicate samples is run on each parameter where applicable for Quality Assurance purposes. Quality Assurance Plan on file with Arkansas Department of Environmental Quality. Analysis time indicates the time of the start of the analytical batch in which the specific sample was included.

Signature _____
Environmental Services Co., Inc.

Environmental Services Company, Inc.

Corporate Office
13715 West Markham
Little Rock, AR 72211
Tel. (501)221-2565 Fax (501)221-1341

Northwest Arkansas Branch
1107 Century Avenue
Springdale, AR 72762
Tel. (479)750-1170 Fax (479)750-1172

Control Number: 1308020396
Customer Name : DECATUR WASTEWATER-EFFLUENT
Customer/Permit No. : 1654 / AR0022292 001
Report Date : 09/18/13

Sample Date : 08/28/13
Sample Time : 0910
Sample Type : GRAB
Sample From : FIELD BLANK

Collected By: ML
Delivery By : ML
Work Order :
Purchase Order :

Analysis Date	Time	By	Parameter	Result	Notes	Quantity	Method	Quality Assurance Precision % RPD	Quality Assurance Accuracy % Recover
09/11	1336	WWP	Mercury, Low Level	< 0.0002 ug/L			EPA 1631E	3.01	103.0

Laboratory Analysis

CORRECTED COPY

* QA data shown is from a different sample or standard on the same date.

All equipment used is checked and/or calibrated daily. All NPDES testing is conducted in accordance with 40 CFR Part 136. A minimum of 10% spiked and duplicate samples is run on each parameter where applicable for Quality Assurance purposes. Quality Assurance Plan on file with Arkansas Department of Environmental Quality. Analysis time indicates the time of the start of the analytical batch in which the specific sample was included.

Signature _____
Environmental Services Co., Inc.

ARKANSAS Department of Environmental Quality
PPS REQUIREMENTS

1. Name of facility:

   ____Decatur Wastewater_____

2. Name, address and telephone number of laboratory:

Environmental Services Co. 1107 Century/13715 W. Markham Springdale,AR72762/Little Rock,AR72211 479-750-1170/501-221-2565	Mercury One 2241 Pinnacle Pkw/Ste.B Twinsburg, OH 44087 330-963-0643	ETC 2790 Whitten Rd. Memphis, TN 38133 901-213-2400

3. Is the lab certified by the State of Arkansas? Yes _X___ No ___

4. What are the certification dates?

   Issued data (Spd)07/08/09 (LR)04/05/09 Expire date (Spd)07/08/10 (LR)04/05/10

5. Is the laboratory certified for all the parameters?

   YES _X___ No ____ (Explain)

   _____

   _____

6. Date and time of samples collected:

   Grab 09/04/09 @14:30; Grab 09/16/09 @14:00; Grab 09/18/09 @15:00

7. Date and time samples were received in the laboratory:

   09/04/09 @16:10; 09/16/09 @15:50; 09/18/09 @16:00

8. Sample location (Outfall No.):

   _____

9. Samples collected by:

   Name Andrew French / Sam Isaacks

   Title Wastewater Operator / Field Service Representative

   Telephone 479-752-3912 / 479-750-1170

10. I certify under penalty of law that this document and all attachments were prepared under my direction of supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

James Boston — Printed Name of person signing
Public Works Mgr — Title
Signature
10/21/2009 — Date signed

List all attachments to this form:

_____

_____

METALS AND CYANIDE	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
1. Antimony (Total), Recoverable	ND	EPA 200.7	20	60
2. Arsenic (Total), Recoverable	0.619	EPA 200.8	0.5	0.5
3. Beryllium (Total), Recoverable	ND	EPA 200.8	0.5	0.5
4. Cadmium (Total), Recoverable	ND	EPA 200.8	0.1	0.5
5. Chromium (Total), Recoverable	ND	EPA 200.7	1	10
7. Chromium (6+), Dissolved	ND	SM 3500-Cr D	10	10
8. Copper (Total), Recoverable	1.760	EPA 200.8	0.5	0.5
9. Lead (Total), Recoverable	ND	EPA 200.8	0.5	0.5
10. Mercury (Total), Recoverable	0.00407	EPA 1631E	0.0005	0.005
12. Nickel (Total), Recoverable	1.910	EPA 200.8	0.5	0.5
13. Selenium (Total), Recoverable	ND	EPA 200.7	5	5
14. Silver (Total), Recoverable	ND	EPA 200.8	0.1	0.5
15. Thallium (Total), Recoverable	ND	EPA 200.8	0.5	0.5
16. Zinc (Total), Recoverable	32	EPA 200.7	4	20
129. Phenols, Total Recoverable	21	EPA 420.1	5	5
17. Cyanide (Total), Recoverable	ND	SM 4500-CN F	10	10

DIOXIN	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
18. 2,3,7,8-Tetrachloro-debenzo-p-dioxin (TCDD)	ND	1613	0.00001	0.00001

VOLATILE COMPOUNDS	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
19. Acrolein	ND	EPA 624	10.53	50
20. Acrylonitrile	ND	EPA 624	4.82	20
21. Benzene	ND	EPA 624	0.45	10
22. Bromoform	ND	EPA 624	2.53	10
23. Carbon Tetrachloride	ND	EPA 624	0.57	2
24. Chlorobenzene	ND	EPA 624	0.58	10
25. Chlorodibromomethane	ND	EPA 624	0.71	10
26. Chloroethane	ND	EPA 624	1.24	50
27. 2-Chloroethyl vinyl ether	ND	EPA 624	8.30	10
28. Chloroform	ND	EPA 624	0.72	10
29. Dichlorobromomethane	ND	EPA 624	0.55	10
30. 1,1-Dichloroethane	ND	EPA 624	2.35	10
31. 1,2-Dichloroethane	ND	EPA 624	2.16	10
32. 1,1-Dichloroethylene	ND	EPA 624	1.73	10
33. 1,2-Dichloropropane	ND	EPA 624	2.65	10
34. 1,3-Dichloropropylene	ND	EPA 624	0.34	10
35. Ethylbenzene	ND	EPA 624	0.18	10
36. Methyl Bromide [Bromomethane]	ND	EPA 624	1.04	50
37. Methyl Chloride [Chloromethane]	ND	EPA 624	0.65	50
38. Methylene Chloride	ND	EPA 624	2.51	20
39. 1,1,2,2-Tetrachloroethane	ND	EPA 624	2.31	10
40. Tetrachloroethylene	ND	EPA 624	0.50	10
41. Toluene	ND	EPA 624	0.33	10
42. 1,2-trans-Dichloroethylene	ND	EPA 624	2.14	10
43. 1,1,1-Trichloroethane	ND	EPA 624	0.37	10
44. 1,1,2-Trichloroethane	ND	EPA 624	2.37	10
45. Trichloroethylene	ND	EPA 624	0.78	10
46. Vinyl Chloride	ND	EPA 624	0.81	10

ACID COMPOUNDS	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
47. 2-Chlorophenol	ND	EPA 625	5.28	10
48. 2,4-Dichlorophenol	ND	EPA 625	3.36	10
49. 2,4-Dimethylphenol	ND	EPA 625	0.92	10
50. 4,6-Dinitro-o-Cresol [2 methyl 4,6-dinitrophenol	ND	EPA 625	1.66	50
51. 2,4-Dinitrophenol	ND	EPA 625	2.65	50
52. 2-Nitrophenol	ND	EPA 625	1.50	20
53. 4-Nitrophenol	ND	EPA 625	7.07	50
54. P-Chloro-m-Cresol [4 chloro-3-methylphenol]	ND	EPA 625	6.76	10
55. Pentachlorophenol	ND	EPA 625	2.70	5
56. Phenol	ND	EPA 625	5.82	10
57. 2,4,6-Trichlorophenol	ND	EPA 625	2.96	10

BASE/NEUTRAL COMPOUNDS	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
58. Acenaphthene	ND	EPA 625	1.04	10
59. Acenaphthylene	ND	EPA 625	1.01	10
60. Anthracene	ND	EPA 625	1.26	10
61. Benzidine	ND	EPA 625	3.26	50
62. Benzo(a)anthracene	ND	EPA 625	2.22	5
63. Benzo(a)pyrene	ND	EPA 625	4.33	5
64. 3,4-Benzofluoranthene	ND	EPA 625	3.05	10
65. Benzo(ghi)perylene	ND	EPA 625	2.71	20
66. Benzo(k)fluoranthene	ND	EPA 625	4.06	5
67. Bis(2-chloroethoxy) methane	ND	EPA 625	1.32	10
68. Bis(2-chloroethyl) ether	ND	EPA 625	3.96	10
69. Bis(2-chloroisopropyl) ether	ND	EPA 625	2.98	10
70. Bis(2-ethylhexyl) phthalate	ND	EPA 625	3.19	10
71. 4-Bromophenyl phenyl ether	ND	EPA 625	4.06	10
72. Butyl benzyl phthalate	ND	EPA 625	3.04	10
73. 2-Chloronapthalene	ND	EPA 625	1.69	10
74. 4-Chlorophenyl phenyl ether	ND	EPA 625	2.48	10
75. Chrysene	ND	EPA 625	2.04	5
76. Dibenzo (a,h) anthracene	ND	EPA 625	4.63	5
77. 1,2-Dichlorobenzene	ND	EPA 625	1.24	10
78. 1,3-Dichlorobenzene	ND	EPA 625	0.97	10
79. 1,4-Dichlorobenzene	ND	EPA 625	0.84	10
80. 3,3'-Dichlorobenzidine	ND	EPA 625	1.54	5
81. Diethyl Phthalate	ND	EPA 625	2.43	10
82. Dimethyl Phthalate	ND	EPA 625	1.36	10
83. Di-n-Butyl Phthalate	ND	EPA 625	2.27	10
84. 2,4-Dinitrotoluene	ND	EPA 625	3.60	10
85. 2,6-Dinitrotoluene	ND	EPA 625	1.99	10
86. Di-n-octyl Phthalate	ND	EPA 625	3.40	10

BASE/NEUTRAL COMPOUNDS	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
87. 1,2-Diphenylhydrazine	ND	EPA 625	7.30	20
89. Fluorene	ND	EPA 625	2.40	10
90. Hexachlorobenzene	ND	EPA 625	3.24	5
91. Hexachlorobutadiene	ND	EPA 625	2.56	10
92. Hexachlorocyclopentadiene	ND	EPA 625	2.75	10
93. Hexachloroethane	ND	EPA 625	1.81	20
94. Indeno (1,2,3-cd) pyrene (2,3-o-phenylene pyrene)	ND	EPA 625	3.85	5
95. Isophorone	ND	EPA 625	1.10	10
96. Naphthalene	ND	EPA 625	0.81	10
97. Nitrobenzene	ND	EPA 625	1.45	10
98. N-nitrosodimethylamine	ND	EPA 625	3.41	50
99. N-nitrosodi-n-propylamine	ND	EPA 625	2.92	20
100. N-nitrosodiphenylamine	ND	EPA 625	3.66	20
101. Phenanthrene	ND	EPA 625	0.71	10
102. Pyrene	ND	EPA 625	4.50	10
103. 1,2,4-Trichlorobenzene	ND	EPA 625	1.76	10

PESTICIDES	LABORATORY ANALYSIS			REQUIRED MQL (µg/l)
	RESULTS (µg/l)	APPROVED EPA METHOD USED	DETECTION LEVEL ACHIEVED (µg/l)	
104. Aldrin	ND	EPA 608	0.01	0.01
105. Alpha-BHC	ND	EPA 608	0.03	0.05
106. Beta-BHC	ND	EPA 608	0.01	0.05
107. Gamma-BHC	ND	EPA 608	0.01	0.05
108. Delta-BHC	ND	EPA 608	0.01	0.05
109. Chlordane	ND	EPA 608	0.10	0.2
110. 4,4'-DDT	ND	EPA 608	0.02	0.02
111. 4,4'-DDE (p,p-DDX)	ND	EPA 608	0.01	0.1
112. 4,4'-DDD 9(p,p-TDE)	ND	EPA 608	0.01	0.1
113. Dieldrin	ND	EPA 608	0.01	0.02
114. Alpha-endosulfan	ND	EPA 608	0.01	0.01
115. Beta-endosulfan	ND	EPA 608	0.01	0.02
116. Endosulfan sulfate	ND	EPA 608	0.10	0.1
117. Endrin	ND	EPA 608	0.02	0.02
118. Endrin aldehyde	ND	EPA 608	0.02	0.1
119. Heptachlor	ND	EPA 608	0.01	0.01
120. Heptachlor epoxide (BHC-hexachlorocyclohexane)	ND	EPA 608	0.01	0.01
130. Chlorpyrifos	ND	EPA 608	0.07	0.07
121. PCB-1242	ND	EPA 608	0.05	0.2
122. PCB-1254	ND	EPA 608	0.05	0.2
123. PCB-1221	ND	EPA 608	0.05	0.2
124. PCB-1232	ND	EPA 608	0.05	0.2
125. PCB-1248	ND	EPA 608	0.05	0.2
126. PCB-1260	ND	EPA 608	0.05	0.2
127. PCB-1016	ND	EPA 608	0.05	0.2
128. Toxaphene	ND	EPA 608	0.25	0.3

Pace Analytical®
www.pacelabs.com

REFERENCE #60137012

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

January 23, 2013

James Boston
City of Decatur
P.O. Box 247
Decatur, AR 72722

Re: Lab Project Number: 60137012
Client Project ID: Wet Test

Dear:

Enclosed are the analytical results for sample(s) received by the laboratory. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any question concerning this report, please feel free to contact me.

Sincerely,

Tim Harrell
Tim.Harrell@pacelabs.com
Technical Director

Kansas/ NELAP Certification Number E-10116
Utah Certification Number 9135995665
Texas Certification Number T104704407-08-TX
Oklahoma Certification Number 9205/9935
Louisiana Certification Number 03055
Arkansas Certification Number 05-008-0

Enclosures

REPORT OF LABORATORY ANALYSIS

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ACCREDITED IN ACCORDANCE WITH nelac

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

January 25, 2013

Mr. James Boston
City of Decatur
PO Box 247
Decatur, AR 72722

RE: Project: CHRONIC
Pace Project No.: 60137012

Dear Mr. Boston:
Enclosed are the analytical results for sample(s) received by the laboratory on January 15, 2013. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Emily Webb for
Connie Sparks
connie.sparks@pacelabs.com
Project Manager

Enclosures

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project: CHRONIC
Pace Project No.: 60137012

Southeast Kansas Certification IDs
808 West McKay, Frontenac, KS 66763
Arkansas Certification #: 12-019-0
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116
Louisiana Certification #: 03055
Oklahoma Certification #: 2012-051
Texas Certification #: T104704407-12-3
Utah Certification #: KS000212012-2
Minnesota Certification #: 495004

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9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: CHRONIC
Pace Project No.: 60137012

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60137012001	CHRONIC BIO (1)	Water	01/15/13 08:00	01/15/13 13:30

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Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: CHRONIC
Pace Project No.: 60137012

Lab ID	Sample ID	Method	Analysts	Analytes Reported
60137012001	CHRONIC BIO (1)	EPA 821/R-02/013	TDH	1

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Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: CHRONIC
Pace Project No.: 60137012

Sample: CHRONIC BIO (1) **Lab ID: 60137012001** Collected: 01/15/13 08:00 Received: 01/15/13 13:30 Matrix: Water

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Chronic Toxicity	Analytical Method: EPA 821/R-02/013							
Toxicity, Chronic	**Complete**		1.0	1		01/22/13 13:15		

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Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: CHRONIC
Pace Project No.: 60137012

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PRL - Pace Reporting Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

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Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: CHRONIC
Pace Project No.: 60137012

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60137012001	CHRONIC BIO (1)	EPA 821/R-02/013	BIO/1593		

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REFERENCE #60137012

Pace Analytical Services, Inc.
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Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

January 23, 2013

James Boston
City of Decatur
P.O. Box 247
Decatur, AR 72722

Re: Lab Project Number: 60137012
Client Project ID: Wet Test

Dear:

Enclosed are the analytical results for sample(s) received by the laboratory. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any question concerning this report, please feel free to contact me.

Sincerely,

Tim Harrell
Tim.Harrell@pacelabs.com
Technical Director

Kansas/ NELAP Certification Number E-10116
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Texas Certification Number T104704407-08-TX
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REFERENCE #60137012

Pace Analytical Services, Inc.
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Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

CHRONIC TOXICITY TEST FOR
City of Decatur

PERMIT # AR0022292
AFIN # 04-00052

PERFORMED ON:

Pimephales promelas

and

Ceriodaphnia dubia

PREPARED FOR:

City of Decatur
Attn: James Boston
P.O. Box 247
Decatur, AR 72722
1-479-752-3912

PREPARED BY:
Pace Analytical Services, Inc.
808 West McKay
Frontenac, KS 66763
1-620-235-0003

January 23, 2013

REPORT OF LABORATORY ANALYSIS

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Pace Analytical Services, Inc.
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Lenexa, KS 66219
Phone: 913.599.5665
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SUMMARY

A Chronic Whole Effluent Toxicity Test using the 7-day chronic fathead minnows (Pimephales promelas), static renewal larval survival and growth test, and three brood 7-day chronic Cladoceran (Ceriodaphnia dubia), static renewal survival and reproduction test, was conducted on effluent discharge water collected at the City of Decatur effluent discharge from January 15, 2013 to January 18, 2013. All the test methods followed are as listed in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms."

Statistically significant ($p<0.05$) mortality is determined by Dunnet's procedure using average percent survival of each test concentration versus the average survival of the controls. If significant mortality occurs, median lethal concentrations (LC50) are calculated using effluent concentrations and their corresponding percent mortality data. The LC50's and the 95% confidence intervals are calculated where appropriate by the Spearman-Karber method. Statistical analysis is accomplished by following steps in EPA 821-R-02-013, November 2002 and by use of Toxstat version 3.4.

In minnow section of testing, it was observed that the effluent had no significant effect on the survival of the larvae at the 100% concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 100% for survival. The LC50 was estimated to be >100% effluent. No significant reduction in growth was observed in the 100% effluent concentration. The Toxic Units is <1. The IC25 is >100. The NOEC for growth in effluent was determined to be 100%. The PMSD was 13.2.

In Cladoceran section of testing, it was observed that the effluent had no significant effect on the survival of the organisms in the 100% effluent concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 100% for survival. The LC50 was estimated to be >100% effluent. No significant reduction in reproduction was observed in the 100% effluent concentrations. The Toxic Units is <1. The IC25 is >100. The NOEC for reproduction in effluent was determined to be 100%. The PMSD was 16.5.

The chronic toxicity exhibited by the fathead minnows and the Ceriodaphnia treated by the effluent sampled from January 15 to January 18 from the City of Decatur effluent discharge, is acceptable as described in EPA 821-R-02-013.

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INTRODUCTION

Pace Analytical was contracted to perform this chronic toxicity test on effluent from the City of Decatur effluent discharge. Chronic toxicity was measured using the Pimephales promelas at larval for survival and growth test and the Ceriodaphnia dubia survival and reproduction test described in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms." The raw data of the study is stored at Pace Analytical Services, INC. 808 West McKay, Frontenac, KS 66763.

TEST MATERIAL

City of Decatur personnel collected sampling of the effluent. A sample of the effluent was delivered to Pace by commercial carrier on 1-15-13. Subsequent samples followed by delivery on 1-16-13 and on 1-18-13. All samples were stored at ≤ 6° Celsius. Moderately Hard Synthetic Water was used as a control and also to make the required dilutions in the test as described in EPA 821-R-02-013.

TEST METHODS

Pace used EPA test method 1000.0 for conducting the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test. EPA test method 1002.0 was used for conducting the Cladoceran, Ceriodaphnia dubia, Survival and Reproduction Test. The tests were conducted to estimate the LC50, NOEC, and LOEC for survival, growth, and reproduction of these test species.

The Pimephales and Ceriodaphnia tests were initiated on 1-15-13 and carried out until 1-22-13. The Pimephales tests were conducted in 500 ml plastic jars with 250 ml of test solution. Eight larvae were placed in each of at least 5 replicates to make a total of 40 larvae per sample concentration. The Ceriodaphnia tests were carried out in 35ml vials containing 25 ml of test solution. One Neonate was placed in each of 10 replicates to make a total of 10 neonates per sample concentration.

TEST ORGANISMS

The organisms used in these tests were cultured at Pace under controlled temperature and photoperiod conditions and/or were purchased from an external supplier. Pace maintains records of all culture techniques used in producing organisms.

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RESULTS

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TABLE 1

Permittee: City of Decatur Effluent discharge.

Date Sampled No. 1: 1-15-13 8:00

No. 2: 1-16-13 8:00

No. 3: 1-18-13 8:00

Test Initiated: 14:00 Date: 1-15-13

Dilution Water used: Moderately Hard Synthetic Water

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL
(Pimephales promelas)

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Concentration (%)	Average Dry Weight in Milligrams in Replicate Chambers A	B	C	D	E	Mean Dry Weight (mg)	CV% *
Control 0%	0.322	0.392	0.409	0.372	0.376	0.374	5.17
Dilution 1 32%	0.311	0.373	0.401	0.362	0.388	0.367	5.58
Dilution 2 42%	0.410	0.315	0.363	0.384	0.397	0.374	5.90
Dilution 3 56%	0.394	0.409	0.352	0.412	0.405	0.394	3.74
Dilution 4 75%	0.352	0.309	0.433	0.380	0.389	0.373	7.27
Dilution 5 100%	0.399	0.393	0.426	0.401	0.371	0.398	2.89

* Coefficient of Variation = Standard Deviation X 100 / Mean

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Permittee: City of Decatur Effluent discharge

FATHEAD MINNOW SURVIVAL

Conc. %	Percent Survival in Replicate Chambers					Mean Percent Survival			CV %
	A	B	C	D	E	24hr	48hr	7 day	
Control 0%	87.5	100	100	100	100	100	100	97.5	4.79
Dilution 1 32%	87.5	100	100	100	100	100	100	97.5	4.79
Dilution 2 42%	100	100	100	100	100	100	100	100	0.00
Dilution 3 56%	100	100	100	100	100	100	100	100	0.00
Dilution 4 75%	100	100	100	100	100	100	100	100	0.00
Dilution 5 100%	100	100	100	100	100	100	100	100	0.00

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Permittee: City of Decatur Effluent discharge.

CERIODAPHNIA SURVIVAL AND REPRODUCTION

DATA TABLE FOR CERIODAPHNIA YOUNG PRODUCTION

Replicate	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
1	22	19	25	24	22	24
2	20	30	28	23	18	25
3	20	24	25	16	25	26
4	25	25	24	28	26	22
5	21	26	25	27	27	24
6	24	22	25	28	28	15
7	22	27	16	20	27	21
8	21	20	23	25	15	27
9	24	24	24	26	26	21
10	26	19	20	21	26	29
Mean	22.5	23.6	23.5	23.8	24.0	23.4
SD	2.121	3.627	3.308	3.882	4.320	3.921
CV %	9.43	15.37	14.08	16.31	18.00	16.76

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Permittee: City of Decatur Effluent discharge.

CERIODAPHNIA MEAN PERCENT SURVIVAL

	Percent Effluent (%)					
Time Elapsed	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
24 hrs	100	100	100	100	100	100
48 hrs	100	100	100	100	100	100
7-day	100	100	100	100	100	100
SD	0.000	0.000	0.000	0.000	0.000	0.000
CV %	0.00	0.00	0.00	0.00	0.000	0.000

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TABLE 2
SUMMARY OF TEST CONDITIONS FOR THE FATHEAD MINNOW (Pimephales promelas) LARVAL SURVIVAL AND GROWTH TEST

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	500 ml
7. Test solution volume	250 ml
8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	8
11. No. replicates/concentration	5
12. No. larvae/concentration	40
13. Feeding regime	Feed 0.1 ml newly hatched brine shrimp nauplii three times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None

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TABLE 2 (CONT.)

16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	7 days
19. Endpoints	Survival and growth
20. Test acceptability	80% or greater survival in the controls, Average dry weight in controls >0.25 mg, Coefficient of variation in the control must not exceed 40%.

TABLE 2 (CONT.)
SUMMARY OF TEST CONDITIONS FOR THE CLADOCERAN
(Ceriodaphnia dubia) SURVIVAL AND REPRODUCTION TEST

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	30 ml
7. Test solution volume	25 ml

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TABLE 2 (CONT.)

8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	1
11. No. replicates/concentration	10
12. No. larvae/concentration	10
13. Feeding regime	Feed 0.1 ml YCT three times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None
16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	7 days - 10 days
19. Endpoints	Survival and Reproduction
20. Test acceptability	80% or greater survival in the controls, Average reproduction rate of 15 young / adult. Coefficient of variation in the control must not exceed 40%.

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TABLE 2 (SECTION 2)

BIOMONITORING CHRONIC TOXICITY REPORT
FATHEAD MINNOW (Pimephales promelas)
CHEMICAL PARAMETERS CHART

Permittee: City of Decatur Effluent discharge.

ANALYSTS: Pace Analytical Services, Inc.
Timothy Harrell
Mike Bollin

SAMPLE NO. 1 COLLECTED: DATE: 1-15-13

SAMPLE NO. 2 COLLECTED: DATE: 1-16-13

SAMPLE NO. 3 COLLECTED: DATE: 1-18-13

TABLE 2 (SECTION 2)
INITIAL WATER QUALITY
EFFLUENT CONCENTRATION

	Control	100%
PH	7.82	7.45
D.O.	8.30	8.10
Temp	25	25
Alk	60	156
Hard	94	124
Cond	310	870
Chlorine	<0.1	<0.1

* D.O. is reported as mg/L
Alkalinity is reported as mg/L CaCO3
Hardness is reported as mg/L CaCO3
Conductance is reported as umhos
Ammonia is reported as mg/L
Chlorine is reported as mg/L

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TEST WATER QUALITY

24-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.76	7.60	25
32% Effluent	8.00	7.70	25
42% Effluent	8.07	7.70	25
56% Effluent	8.14	7.70	25
75% Effluent	8.22	7.80	25
100% Effluent	8.31	7.80	25

48-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.74	7.30	25
32% Effluent	8.06	7.20	25
42% Effluent	8.11	7.20	25
56% Effluent	8.18	7.20	25
75% Effluent	8.29	7.10	25
100% Effluent	8.35	7.00	25

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FINAL WATER QUALITY

EFFLUENT CONCENTRATION

	Control	100%
pH	7.47	8.09
D.O.	6.90	7.30
Temp	25	25
Alk	62	148
Hard	98	126
Cond	428	1034

* D.O. is reported as mg/L
Alkalinity is reported as mg/L CaCO3
Hardness is reported as mg/L CaCO3
Conductance is reported as umhos

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TEST VALIDITY

The Pimephales promelas control survival rate was 97.5%. The mean dry weight (growth) of the Pimephales promelas was determined at 0.374 mg/organism in the controls. The percent coefficient of variation (%CV) values for the fathead minnow control for survival and growth were 4.79 and 5.17. The Ceriodaphnia dubia survival rates were 100 in the control. The Ceriodaphnia in the control produced an average of 22.5 young over the seven-day exposure period. Percent CV values for Ceriodaphnia dubia control survival and reproduction was 0.00 and 9.43. Control data met or exceeded all criteria set out by EPA 821-R-02-013 for test acceptance.

CONCLUSIONS

The No Observed Effect Concentration (NOEC) for Pimephales promelas was 100% for survival and 100% for growth. The No Observed Effect Concentration (NOEC) for Ceriodaphnia dubia was 100% for Survival and 100% for Reproduction. The tests were ran using a synthetic control against effluent concentrations of 32%, 42%, 56%, 75%, and 100%. The effluent sampled on 1-15-13, 1-16-13, and 1-18-13 exhibited acceptable chronic toxicity in Pimephales promelas and in Ceriodaphnia dubia during the exposure period as described in EPA 821-R-02-013.

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APPENDIX C

REFERENCE TOXICANTS

The absence of significant control mortality during this test indicated the health of the organisms and indicated that any significant mortality in the test concentrations was not due to contaminants or variations in testing conditions.

Reference toxicity testing is routinely performed by staff members in our biomonitoring - bioassay laboratory.

Start: 12/18/12 12:30 End: 12/25/12 11:00

Reference Toxicant (NaCl) Pimephales promelas

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
10 g/l	40	7	3	0
8 g/l	40	38	31	6
6 g/l	40	39	38	24
4 g/l	40	40	40	39
2 g/l	40	40	40	39

IC25 (5.02 g/l Sodium Chloride)

Survival NOEC: 4.0 g/l

Reference Toxicant (NaCl) Ceriodaphnia Dubia

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
2.5 g/l	10	3	0	0
2.0 g/l	10	10	6	2
1.5 g/l	10	10	10	10
1.0 g/l	10	10	10	10
0.5 g/l	10	10	10	10

IC25 (1.22 g/l Sodium Chloride)

Survival NOEC: 1.5 g/l

Submitted By: Tim Harrell
Timothy Harrell, Technical Director

REPORT OF LABORATORY ANALYSIS

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nelac

60137012 Decatur FATHEAD SURVIVAL
File: 6137012A Transform: ARC SINE(SQUARE ROOT(Y))

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.010	7.260	11.460	7.260	2.010
OBSERVED	3	0	27	0	0

Calculated Chi-Square goodness of fit test statistic = 38.0902
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60137012 Decatur FATHEAD SURVIVAL
File: 6137012A Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.032

W = 0.597

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60137012 Decatur FATHEAD SURVIVAL
File: 6137012A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.991	1.107	1.084
2	32%	5	0.991	1.107	1.084
3	42%	5	1.107	1.107	1.107
4	56%	5	1.107	1.107	1.107
5	75%	5	0.991	1.107	1.084
6	100%	5	1.107	1.107	1.107

60137012 Decatur FATHEAD SURVIVAL
File: 6137012A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.003	0.052	0.023	4.79
2	32%	0.003	0.052	0.023	4.79
3	42%	0.000	0.000	0.000	0.00
4	56%	0.000	0.000	0.000	0.00
5	75%	0.003	0.052	0.023	4.79
6	100%	0.000	0.000	0.000	0.00

60137012 Decatur FATHEAD SURVIVAL
File: 6137012A Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.004	0.001	0.600
Within (Error)	24	0.032	0.001	
Total	29	0.036		

Critical F value = 2.62 (0.05,5,24)
Since F < Critical F FAIL TO REJECT Ho: All equal

60137012 Decatur FATHEAD SURVIVAL
File: 6137012A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	1.084	0.780		
2	32%	1.084	0.780	0.000	
3	42%	1.107	0.800	-1.000	
4	56%	1.107	0.800	-1.000	
5	75%	1.084	0.780	0.000	
6	100%	1.107	0.800	-1.000	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60137012 Decatur FATHEAD SURVIVAL
File: 6137012A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32%	5	0.047	6.0	0.000
3	42%	5	0.047	6.0	-0.020
4	56%	5	0.047	6.0	-0.020
5	75%	5	0.047	6.0	0.000
6	100%	5	0.047	6.0	-0.020

60137012 Decatur FATHEAD GROWTH
File: 6137012B Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.029

W = 0.933

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

60137012 Decatur FATHEAD GROWTH
File: 6137012B Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 3.27

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

60137012 Decatur FATHEAD GROWTH
File: 6137012B Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.603	0.694	0.658
2	32%	5	0.592	0.686	0.650
3	42%	5	0.596	0.695	0.657
4	56%	5	0.635	0.697	0.679
5	75%	5	0.589	0.718	0.656
6	100%	5	0.656	0.711	0.683

60137012 Decatur FATHEAD GROWTH
File: 6137012B Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.001	0.034	0.015	5.17
2	32%	0.001	0.036	0.016	5.58
3	42%	0.002	0.039	0.017	5.90
4	56%	0.001	0.025	0.011	3.74
5	75%	0.002	0.048	0.021	7.27
6	100%	0.000	0.020	0.009	2.89

60137012 Decatur FATHEAD GROWTH
File: 6137012B Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.004	0.001	0.741
Within (Error)	24	0.029	0.001	
Total	29	0.034		

Critical F value = 2.62 (0.05,5,24)
Since F < Critical F FAIL TO REJECT Ho: All equal

60137012 Decatur FATHEAD GROWTH
File: 6137012B Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.658	0.374		
2	32%	0.650	0.367	0.341	
3	42%	0.657	0.374	0.022	
4	56%	0.679	0.394	-0.948	
5	75%	0.656	0.373	0.086	
6	100%	0.683	0.398	-1.127	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60137012 Decatur FATHEAD GROWTH
File: 6137012B Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32%	5	0.050	13.2	0.007
3	42%	5	0.050	13.2	0.000
4	56%	5	0.050	13.2	-0.020
5	75%	5	0.050	13.2	0.002
6	100%	5	0.050	13.2	-0.024

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
32%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
42%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
56%	10	0	10

TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

SUMMARY OF FISHER'S EXACT TESTS

	NUMBER	NUMBER	SIG

GROUP	IDENTIFICATION	EXPOSED	DEAD	(P=.05)
	CONTROL	10	0	
1	32%	10	0	
2	42%	10	0	
3	56%	10	0	
4	75%	10	0	
5	100%	10	0	

60137012 Decatur CERIODAPHNIA DUBIA SURVIVAl
File: 6137012D Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	1.000	1.000	1.000
2	32%	10	1.000	1.000	1.000
3	42%	10	1.000	1.000	1.000
4	56%	10	1.000	1.000	1.000
5	75%	10	1.000	1.000	1.000
6	100%	10	1.000	1.000	1.000

60137012 Decatur CERIODAPHNIA DUBIA SURVIVAl
File: 6137012D Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.000	0.000	0.000	0.00
2	32%	0.000	0.000	0.000	0.00
3	42%	0.000	0.000	0.000	0.00
4	56%	0.000	0.000	0.000	0.00
5	75%	0.000	0.000	0.000	0.00
6	100%	0.000	0.000	0.000	0.00

60137012 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6137012E Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	4.020	14.520	22.920	14.520	4.020
OBSERVED	4	13	25	16	2

Calculated Chi-Square goodness of fit test statistic = 1.5139
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

60137012 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6137012E Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 4.50

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

60137012 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6137012E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	20.000	26.000	22.500
2	32%	10	19.000	30.000	23.600
3	42%	10	16.000	28.000	23.500
4	56%	10	16.000	28.000	23.800
5	75%	10	15.000	28.000	24.000
6	100%	10	15.000	29.000	23.400

60137012 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6137012E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	4.500	2.121	0.671	9.43
2	32%	13.156	3.627	1.147	15.37
3	42%	10.944	3.308	1.046	14.08
4	56%	15.067	3.882	1.227	16.31
5	75%	18.667	4.320	1.366	18.00
6	100%	15.378	3.921	1.240	16.76

60137012 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6137012E Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	13.533	2.707	0.209
Within (Error)	54	699.400	12.952	
Total	59	712.933		

Critical F value = 2.45 (0.05,5,40)
Since F < Critical F FAIL TO REJECT Ho: All equal

60137012 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6137012E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	22.500	22.500		
2	32%	23.600	23.600	-0.683	
3	42%	23.500	23.500	-0.621	
4	56%	23.800	23.800	-0.808	
5	75%	24.000	24.000	-0.932	
6	100%	23.400	23.400	-0.559	

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

60137012 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6137012E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	32%	10	3.718	16.5	-1.100
3	42%	10	3.718	16.5	-1.000
4	56%	10	3.718	16.5	-1.300
5	75%	10	3.718	16.5	-1.500
6	100%	10	3.718	16.5	-0.900

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	32	42	56	75	100
Response 1	22	19	25	24	22	24
Response 2	20	30	28	23	18	25
Response 3	20	24	25	16	25	26
Response 4	25	25	24	28	26	22
Response 5	21	26	25	27	27	24
Response 6	24	22	25	28	28	15
Response 7	22	27	16	20	27	21
Response 8	21	20	23	25	15	27
Response 9	24	24	24	26	26	21
Response 10	26	19	20	21	26	29

*** Inhibition Concentration Percentage Estimate ***
Toxicant/Effluent: Decatur
Test Start Date: 1/15/13 Test Ending Date: 1/22/13
Test Species: Dubia
Test Duration: 7 day
DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	10	0.000	22.500	2.121	23.480
2	10	32.000	23.600	3.627	23.480
3	10	42.000	23.500	3.308	23.480
4	10	56.000	23.800	3.882	23.480
5	10	75.000	24.000	4.320	23.480
6	10	100.000	23.400	3.921	23.400

*** No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	32	42	56	75	100
Response 1	.322	.311	.410	.394	.352	.399
Response 2	.392	.373	.315	.409	.309	.393
Response 3	.409	.401	.363	.352	.433	.426
Response 4	.372	.362	.384	.412	.380	.401
Response 5	.376	.388	.397	.405	.389	.372

*** Inhibition Concentration Percentage Estimate ***
Toxicant/Effluent: Decatur
Test Start Date: 1/15/13 Test Ending Date: 1/22/13
Test Species: Fathead
Test Duration: 7 day
DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	5	0.000	0.374	0.033	0.380
2	5	32.000	0.367	0.035	0.380
3	5	42.000	0.374	0.037	0.380
4	5	56.000	0.394	0.025	0.380
5	5	75.000	0.373	0.046	0.380
6	5	100.000	0.398	0.019	0.380

*** No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

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Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: City of Dexter	Report To: James Boston	Attention:
Address:	Copy To:	Company Name:
		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Requested Analysis Filtered (Y/N)

ITEM #	Section D Required Client Information — SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	Matrix Codes MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Analysis Test	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chrapla Bio (1)	WW	C	1/14	9AM	11/15	8AM	2°	1	X								X	Wet test		
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
	Mike Lilley	11/15/13	8:50 PM		11/15/13	1330	3.0

SAMPLE CONDITIONS: Temp in °C = 3.0; Received on Ice (Y/N) = Y; Custody Sealed Cooler (Y/N) = Y; Samples Intact (Y/N) = Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mike Lilley

SIGNATURE of SAMPLER: Mike Lilley

DATE Signed (MM/DD/YY): 11/15/2013

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

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Section A Required Client Information:

Company: City of Decatur	
Address:	
Email To:	
Phone:	Fax:
Requested Due Date/TAT:	

Section B Required Project Information:

Report To: James Boston	
Copy To:	
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes (MATRIX / CODE)

Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Analysis Test: Chronic w/ TIS	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chronic Bio (2)	DW	C	1/15	9am	1/16	8am	3°	1	X									X		
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	Mike Lilly	1/16/13	8:50 am	[signature]	1/16/13	1540	2.6	Y	Y	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mike Lilly

SIGNATURE of SAMPLER: Mike Lilly

DATE Signed (MM/DD/YY): 1/16/2013

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

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Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: City of Decatur	Report To: James Boston	Attention:
Address:	Copy To:	Company Name:
		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Requested Analysis Filtered (Y/N)

ITEM #	Section D Required Client Information: SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	Matrix Codes MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Y/N	Analysis Test ↓	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chronic Bio (3)				1/17	9AM	1/18	8AM	Ice	2	X							X	X Chlorine Written		
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	Mike Lily	1/18/13	8:50AM	[illegible]	1/18/13	1525	2-4	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mike Lily

SIGNATURE of SAMPLER: Mike Lily

DATE Signed (MM/DD/YY):

ORIGINAL

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Form Approved
OMB No. 2040-0004

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

NAME: DECATUR, CITY OF
ADDRESS: P.O. BOX 247
DECATUR, AR 72722

FACILITY: DECATUR, CITY OF-STP
LOCATION: 985 AUSTIN AV
DECATUR, AR 72722

ATTN: JAMES BOSTON/BILL MONTGOMERY

AR0022292	TX1-B
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD			
	MM/DD/YYYY		MM/DD/YYYY
FROM	02/01/2010	TO	02/28/2010

DMR Mailing ZIP CODE: 72722
MAJOR

001-MONTHLY-W.E.T. REPORT @ 2.2 MGD
External Outfall

No Discharge ☐

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
Whole effluent toxicity	SAMPLE MEASUREMENT	******	******	******		******	******				
22414 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	100 DLYAVMIN	******	******	%		Monthly	COMP24
Whole effluent toxicity	SAMPLE MEASUREMENT	******	******	******		******	******				
22414 1 1 Effluent Gross	PERMIT REQUIREMENT	******	******	******	100 DLYAVMIN	******	******	%		Monthly	COMP24
Pass/Fail Statre 7Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	******	******	******	******		******	0			
TGP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0/fail =1		Monthly	COMP24
Pass/Fail Statre 7Day Chronic Pimephales Promelas	SAMPLE MEASUREMENT	******	******	******	******		******	0			
TGP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0/fail =1		Monthly	COMP24
LF Pass/Fail Leth Statre 7Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	******	******	******	******		******	0			
TLP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0/fail =1		Monthly	COMP24
LF Pass/Fail Leth Statre 7Day Chronic Pimephales	SAMPLE MEASUREMENT	******	******	******	******		******	0			
TLP6C 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	pass=0/fail =1		Monthly	COMP24
Noel Lethal Statre 7Day Chronic Ceriodaphnia	SAMPLE MEASUREMENT	******	******	******	******		******	100			
TOP3B 1 0 Effluent Gross	PERMIT REQUIREMENT	******	******	******	******	Req. Mon. 7 DA AVG	******	%		Monthly	COMP24

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.		TELEPHONE		DATE
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA Code	NUMBER	MM/DD/YYYY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

DISCHARGE AT DESIGN FLOW 2.2 MGD: (PASS=0/FAIL=1) IF THE NOEC VALUE IS LESS THAN THE CRITICAL DILUTION, REPORT "1"; OTHERWISE, REPORT "0". SEE CONDITION #13 OF PART II. 04-00052
04-00052

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Sample Condition Upon Receipt

WO#: 60137012

60137012

Client Name: Decatur

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☒ Commercial ☐ Pace ☐ Other _____

Tracking #: _____ Pace Shipping Label Used? ☐ Yes ☐ No

Optional
Proj. Due Date:
Proj. Name:

Custody Seal on Cooler/Box Present: ☒ Yes ☐ No Seals intact: ☒ Yes ☐ No

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ Foam ☒ None ☐ Other _____

Thermometer Used: T-111 Type of Ice: Wet Blue None ☐ Samples on ice, cooling process has begun

Cooler Temperature: 3.0

Temperature should be above freezing to 6°C

Date and Initials of person examining contents: MB 1/15/13 1330

		Comments:
Chain of Custody present:	☒Yes ☐No ☐N/A	1.
Chain of Custody filled out:	☒Yes ☐No ☐N/A	2.
Chain of Custody relinquished:	☒Yes ☐No ☐N/A	3.
Sampler name & signature on COC:	☒Yes ☐No ☐N/A	4.
Samples arrived within holding time:	☒Yes ☐No ☐N/A	5.
Short Hold Time analyses (<72hr):	☒Yes ☐No ☐N/A	6.
Rush Turn Around Time requested:	☐Yes ☒No ☐N/A	7.
Sufficient volume:	☒Yes ☐No ☐N/A	8.
Correct containers used:	☒Yes ☐No ☐N/A	9.
-Pace containers used:	☒Yes ☐No ☐N/A	
Containers intact:	☒Yes ☐No ☐N/A	10.
Unpreserved 5035A soils frozen w/in 48hrs?	☐Yes ☐No ☒N/A	11.
Filtered volume received for dissolved tests	☐Yes ☐No ☒N/A	12.
Sample labels match COC: or 1/14/13	☒Yes ☐No ☐N/A	13.
-Includes date/time/ID/analyses Matrix: WT		
All containers needing preservation have been checked.	☐Yes ☐No ☒N/A	14. Coll 1/14 0900 - 1/15 0800 per 1-bl
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☒N/A	
Exceptions: VOA, coliform, TOC, O&G, WI-DRO (water), Phenolics	☐Yes ☒No	Initial when completed / Lot # of added preservative
Trip Blank present:	☐Yes ☐No ☒N/A	15.
Pace Trip Blank lot # (if purchased):		
Headspace in VOA vials (>6mm):	☐Yes ☐No ☒N/A	16.
Project sampled in USDA Regulated Area:	☐Yes ☐No ☒N/A	17. List State:

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: RW for CLS Date: 1/16/13

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

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Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: City of Decatur	Report To: James Boston	Attention:
Address:	Copy To:	Company Name:
		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Requested Analysis Filtered (Y/N)

ITEM #	Section D Required Client Information — SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	Matrix Codes MATRIX / CODE: Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Analysis Test	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chrapic Bio (1)		WW	C	1/14	9AM	1/15	8AM	2°	1	X								X	wet test		60137012
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	Mike Lilly	1/15/13	8:50 AM		1/15/13	1330	3.0	Y	Y	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mike Lilly

SIGNATURE of SAMPLER: Mike Lilly

DATE Signed (MM/DD/YY): 1/15/2013

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev.07, 15-May-2007

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REFERENCE #60142084

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

April 17, 2013

James Boston
City of Decatur
P.O. Box 247
Decatur, AR 72722

Re: Lab Project Number: 60142084
Client Project ID: Wet Test

Dear:

Enclosed are the analytical results for sample(s) received by the laboratory. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any question concerning this report, please feel free to contact me.

Sincerely,

Tim Harrell
Tim.Harrell@pacelabs.com
Technical Director

Kansas/ NELAP Certification Number E-10116
Utah Certification Number 9135995665
Texas Certification Number T104704407-08-TX
Oklahoma Certification Number 9205/9935
Louisiana Certification Number 03055
Arkansas Certification Number 05-008-0

Enclosures

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CHRONIC TOXICITY TEST FOR
City of Decatur

PERMIT # AR0022292
AFIN # 04-00052

PERFORMED ON:

Pimephales promelas

and

Ceriodaphnia dubia

PREPARED FOR:

City of Decatur
Attn: James Boston
P.O. Box 247
Decatur, AR 72722
1-479-752-3912

PREPARED BY:
Pace Analytical Services, Inc.
808 West McKay
Frontenac, KS 66763
1-620-235-0003

April 17, 2013

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SUMMARY

A Chronic Whole Effluent Toxicity Test using the 7-day chronic fathead minnows (Pimephales promelas), static renewal larval survival and growth test, and three brood 7-day chronic Cladoceran (Ceriodaphnia dubia), static renewal survival and reproduction test, was conducted on effluent discharge water collected at the City of Decatur effluent discharge from April 8, 2013 to April 12, 2013. All the test methods followed are as listed in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms."

Statistically significant ($p<0.05$) mortality is determined by Dunnet's procedure using average percent survival of each test concentration versus the average survival of the controls. If significant mortality occurs, median lethal concentrations (LC50) are calculated using effluent concentrations and their corresponding percent mortality data. The LC50's and the 95% confidence intervals are calculated where appropriate by the Spearman-Karber method. Statistical analysis is accomplished by following steps in EPA 821-R-02-013, November 2002 and by use of Toxstat version 3.4.

In minnow section of testing, it was observed that the effluent had no significant effect on the survival of the larvae at the 100% concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 100% for survival. The LC50 was estimated to be >100% effluent. No significant reduction in growth was observed in the 100% effluent concentration. The Toxic Units is <1. The IC25 is >100. The NOEC for growth in effluent was determined to be 100%. The PMSD was 13.8.

In Cladoceran section of testing, it was observed that the effluent had no significant effect on the survival of the organisms in the 100% effluent concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 100% for survival. The LC50 was estimated to be >100% effluent. No significant reduction in reproduction was observed in the 100% effluent concentrations. The Toxic Units is <1. The IC25 is >100. The NOEC for reproduction in effluent was determined to be 100%. The PMSD was 16.6.

The chronic toxicity exhibited by the fathead minnows and the Ceriodaphnia treated by the effluent sampled from April 8 to April 12 from the City of Decatur effluent discharge, is acceptable as described in EPA 821-R-02-013.

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INTRODUCTION

Pace Analytical was contracted to perform this chronic toxicity test on effluent from the City of Decatur effluent discharge. Chronic toxicity was measured using the Pimephales promelas at larval for survival and growth test and the Ceriodaphnia dubia survival and reproduction test described in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms." The raw data of the study is stored at Pace Analytical Services, INC. 808 West McKay, Frontenac, KS 66763.

TEST MATERIAL

City of Decatur personnel collected sampling of the effluent. A sample of the effluent was delivered to Pace by commercial carrier on 4-9-13. Subsequent samples followed by delivery on 4-10-13 and on 4-12-13. All samples were stored at ≤ 6° Celsius. Moderately Hard Synthetic Water was used as a control and also to make the required dilutions in the test as described in EPA 821-R-02-013.

TEST METHODS

Pace used EPA test method 1000.0 for conducting the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test. EPA test method 1002.0 was used for conducting the Cladoceran, Ceriodaphnia dubia, Survival and Reproduction Test. The tests were conducted to estimate the LC50, NOEC, and LOEC for survival, growth, and reproduction of these test species.

The Pimephales and Ceriodaphnia tests were initiated on 4-9-13 and carried out until 4-16-13. The Pimephales tests were conducted in 500 ml plastic jars with 250 ml of test solution. Eight larvae were placed in each of at least 5 replicates to make a total of 40 larvae per sample concentration. The Ceriodaphnia tests were carried out in 35ml vials containing 25 ml of test solution. One Neonate was placed in each of 10 replicates to make a total of 10 neonates per sample concentration.

TEST ORGANISMS

The organisms used in these tests were cultured at Pace under controlled temperature and photoperiod conditions and/or were purchased from an external supplier. Pace maintains records of all culture techniques used in producing organisms.

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RESULTS

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TABLE 1

Permittee: City of Decatur Effluent discharge

Date Sampled No. 1: 4-9-13 9:45

No. 2: 4-10-13 9:00

No. 3: 4-12-13 7:00

Test Initiated: 13:30 Date: 4-9-13

Dilution Water used: Moderately Hard Synthetic Water

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL
(Pimephales promelas)

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Concentration (%)	Average Dry Weight in Milligrams in Replicate Chambers A	B	C	D	E	Mean Dry Weight (mg)	CV% *
Control 0%	0.432	0.459	0.427	0.339	0.409	0.413	6.64
Dilution 1 32%	0.420	0.450	0.452	0.372	0.419	0.423	4.65
Dilution 2 42%	0.438	0.49	0.445	0.446	0.352	0.418	5.80
Dilution 3 56%	0.386	0.445	0.440	0.449	0.429	0.430	3.64
Dilution 4 75%	0.438	0.392	0.425	0.406	0.442	0.421	3.06
Dilution 5 100%	0.392	0.495	0.472	0.465	0.365	0.438	7.89

* Coefficient of Variation = Standard Deviation X 100 / Mean

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Permittee: City of Decatur Effluent discharge.

FATHEAD MINNOW SURVIVAL

Conc. %	Percent Survival in Replicate Chambers					Mean Percent Survival			CV %
	A	B	C	D	E	24hr	48hr	7 day	
Control 0%	100	100	100	87.5	100	100	100	97.5	4.79
Dilution 1 32%	100	100	100	87.5	100	100	100	97.5	4.79
Dilution 2 42%	100	100	100	100	87.5	100	100	97.5	4.79
Dilution 3 56%	87.5	100	100	100	100	100	100	97.5	4.79
Dilution 4 75%	100	87.5	100	100	100	100	100	97.5	4.79
Dilution 5 100%	87.5	100	100	100	87.5	100	100	95	5.99

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Permittee: City of Decatur Effluent discharge.

CERIODAPHNIA SURVIVAL AND REPRODUCTION

DATA TABLE FOR CERIODAPHNIA YOUNG PRODUCTION

Replicate	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
1	19	19	24	17	15	24
2	22	26	23	25	22	26
3	19	21	27	20	22	20
4	22	27	23	28	18	23
5	24	23	27	28	23	18
6	22	22	24	18	17	16
7	18	24	25	27	25	24
8	23	27	24	19	24	18
9	23	18	15	26	24	18
10	20	25	19	24	19	24
Mean	21.2	23.2	23.1	23.2	20.9	21.1
SD	2.044	3.190	3.635	4.290	3.414	3.479
CV %	9.64	13.75	15.73	18.49	16.34	16.49

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Permittee: City of Decatur Effluent discharge.

CERIODAPHNIA MEAN PERCENT SURVIVAL

	Percent Effluent (%)					
Time Elapsed	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
24 hrs	100	100	100	100	100	100
48 hrs	100	100	100	100	100	100
7-day	100	100	100	100	100	100
SD	0.000	0.000	0.000	0.000	0.000	0.000
CV %	0.00	0.00	0.00	0.00	0.000	0.000

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TABLE 2
SUMMARY OF TEST CONDITIONS FOR THE FATHEAD MINNOW (Pimephales promelas) LARVAL SURVIVAL AND GROWTH TEST

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	500 ml
7. Test solution volume	250 ml
8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	8
11. No. replicates/concentration	5
12. No. larvae/concentration	40
13. Feeding regime	Feed 0.1 ml newly hatched brine shrimp nauplii three times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None

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TABLE 2 (CONT.)

16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	7 days
19. Endpoints	Survival and growth
20. Test acceptability	80% or greater survival in the controls, Average dry weight in controls >0.25 mg, Coefficient of variation in the control must not exceed 40%.

TABLE 2 (CONT.)
SUMMARY OF TEST CONDITIONS FOR THE CLADOCERAN
(Ceriodaphnia dubia) SURVIVAL AND REPRODUCTION TEST

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	30 ml
7. Test solution volume	25 ml

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TABLE 2 (CONT.)

8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	1
11. No. replicates/concentration	10
12. No. larvae/concentration	10
13. Feeding regime	Feed 0.1 ml YCT three times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None
16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	7 days - 10 days
19. Endpoints	Survival and Reproduction
20. Test acceptability	80% or greater survival in the controls, Average reproduction rate of 15 young / adult. Coefficient of variation in the control must not exceed 40%.

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TABLE 2 (SECTION 2)

BIOMONITORING CHRONIC TOXICITY REPORT
FATHEAD MINNOW (Pimephales promelas)
CHEMICAL PARAMETERS CHART

Permittee: City of Decatur Effluent discharge.

ANALYSTS: Pace Analytical Services, Inc.
Timothy Harrell
Mike Bollin

SAMPLE NO. 1 COLLECTED: DATE: 4-9-13

SAMPLE NO. 2 COLLECTED: DATE: 4-10-13

SAMPLE NO. 3 COLLECTED: DATE: 4-12-13

TABLE 2 (SECTION 2)
INITIAL WATER QUALITY
EFFLUENT CONCENTRATION

	Control	100%
PH	7.50	7.89
D.O.	8.20	8.10
Temp	25	25
Alk	58	218
Hard	94	146
Cond	342	1010
Chlorine	<0.1	<0.1

* D.O. is reported as mg/L
Alkalinity is reported as mg/L CaCO3
Hardness is reported as mg/L CaCO3
Conductance is reported as umhos
Ammonia is reported as mg/L
Chlorine is reported as mg/L

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TEST WATER QUALITY

24-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.53	7.00	25
32% Effluent	8.10	7.00	25
42% Effluent	8.19	7.00	25
56% Effluent	8.26	7.00	25
75% Effluent	8.31	7.00	25
100% Effluent	8.44	7.00	25

48-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.61	6.90	25
32% Effluent	8.26	7.00	25
42% Effluent	8.29	7.00	25
56% Effluent	8.32	7.00	25
75% Effluent	8.41	7.10	25
100% Effluent	8.50	7.10	25

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FINAL WATER QUALITY

EFFLUENT CONCENTRATION

	Control	100%
pH	7.52	8.24
D.O.	7.20	7.00
Temp	25	25
Alk	60	232
Hard	90	164
Cond	399	898

* D.O. is reported as mg/L
Alkalinity is reported as mg/L CaCO3
Hardness is reported as mg/L CaCO3
Conductance is reported as umhos

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TEST VALIDITY

The Pimephales promelas control survival rate was 97.5%. The mean dry weight (growth) of the Pimephales promelas was determined at 0.413 mg/organism in the controls. The percent coefficient of variation (%CV) values for the fathead minnow control for survival and growth were 4.79 and 6.64. The Ceriodaphnia dubia survival rates were 100 in the control. The Ceriodaphnia in the control produced an average of 21.2 young over the seven-day exposure period. Percent CV values for Ceriodaphnia dubia control survival and reproduction was 0.00 and 9.64. Control data met or exceeded all criteria set out by EPA 821-R-02-013 for test acceptance.

CONCLUSIONS

The No Observed Effect Concentration (NOEC) for Pimephales promelas was 100% for survival and 100% for growth. The No Observed Effect Concentration (NOEC) for Ceriodaphnia dubia was 100% for Survival and 100% for Reproduction. The tests were ran using a synthetic control against effluent concentrations of 32%, 42%, 56%, 75%, and 100%. The effluent sampled on 4-9-13, 4-10-13, and 4-12-13 exhibited acceptable chronic toxicity in Pimephales promelas and in Ceriodaphnia dubia during the exposure period as described in EPA 821-R-02-013.

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APPENDIX C

REFERENCE TOXICANTS

The absence of significant control mortality during this test indicated the health of the organisms and indicated that any significant mortality in the test concentrations was not due to contaminants or variations in testing conditions.

Reference toxicity testing is routinely performed by staff members in our biomonitoring - bioassay laboratory.

Start: 3/12/13 14:00 End: 3/19/13 13:00

Reference Toxicant (NaCl) Pimephales promelas

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
10 g/l	40	11	2	0
8 g/l	40	38	28	7
6 g/l	40	39	36	26
4 g/l	40	40	40	40
2 g/l	40	40	40	39

IC25 (5.30 g/l Sodium Chloride)

Survival NOEC: 4.0 g/l

Reference Toxicant (NaCl) Ceriodaphnia Dubia

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
2.5 g/l	10	5	0	0
2.0 g/l	10	10	7	2
1.5 g/l	10	10	10	10
1.0 g/l	10	10	10	10
0.5 g/l	10	10	10	10

IC25 (1.21 g/l Sodium Chloride)

Survival NOEC: 1.5 g/l

Submitted By: Jim Harrell
Timothy Harrell, Technical Director

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60142084 Decatur FATHEAD SURVIVAL
File: 6142084A Transform: ARC SINE(SQUARE ROOT(Y))

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.010	7.260	11.460	7.260	2.010
OBSERVED	5	2	20	3	0

Calculated Chi-Square goodness of fit test statistic = 19.1325
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60142084 Decatur FATHEAD SURVIVAL
File: 6142084A Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.070

W = 0.628

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

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File: 6142084A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.991	1.107	1.084
2	32%	5	0.991	1.107	1.084
3	42%	5	0.991	1.107	1.084
4	56%	5	0.991	1.107	1.084
5	75%	5	0.991	1.107	1.084
6	100%	5	0.991	1.107	1.061

60142084 Decatur FATHEAD SURVIVAL
File: 6142084A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.003	0.052	0.023	4.79
2	32%	0.003	0.052	0.023	4.79
3	42%	0.003	0.052	0.023	4.79
4	56%	0.003	0.052	0.023	4.79
5	75%	0.003	0.052	0.023	4.79
6	100%	0.004	0.064	0.028	5.99

60142084 Decatur FATHEAD SURVIVAL
File: 6142084A Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.002	0.000	0.154
Within (Error)	24	0.070	0.003	
Total	29	0.072		

Critical F value = 2.62 (0.05,5,24)
Since F < Critical F FAIL TO REJECT Ho: All equal

60142084 Decatur FATHEAD SURVIVAL
File: 6142084A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	1.084	0.780		
2	32%	1.084	0.780	0.000	
3	42%	1.084	0.780	0.000	
4	56%	1.084	0.780	0.000	
5	75%	1.084	0.780	0.000	
6	100%	1.061	0.760	0.679	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60142084 Decatur FATHEAD SURVIVAL
File: 6142084A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32%	5	0.070	9.0	0.000
3	42%	5	0.070	9.0	0.000
4	56%	5	0.070	9.0	0.000
5	75%	5	0.070	9.0	0.000
6	100%	5	0.070	9.0	0.020

60142084 Decatur FATHEAD GROWTH
File: 6142084B Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.037

W = 0.908

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

60142084 Decatur FATHEAD GROWTH
File: 6142084B Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 4.51

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

60142084 Decatur FATHEAD GROWTH
File: 6142084B Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.621	0.744	0.698
2	32%	5	0.656	0.737	0.708
3	42%	5	0.635	0.731	0.703
4	56%	5	0.670	0.734	0.715
5	75%	5	0.677	0.727	0.706
6	100%	5	0.649	0.780	0.723

60142084 Decatur FATHEAD GROWTH
File: 6142084B Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.002	0.046	0.021	6.64
2	32%	0.001	0.033	0.015	4.65
3	42%	0.002	0.041	0.018	5.80
4	56%	0.001	0.026	0.012	3.64
5	75%	0.000	0.022	0.010	3.06
6	100%	0.003	0.057	0.025	7.86

60142084 Decatur FATHEAD GROWTH
File: 6142084B Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.002	0.000	0.258
Within (Error)	24	0.037	0.002	
Total	29	0.039		

Critical F value = 2.62 (0.05,5,24)
Since F < Critical F FAIL TO REJECT Ho: All equal

60142084 Decatur FATHEAD GROWTH
File: 6142084B Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.698	0.413		
2	32%	0.708	0.423	-0.392	
3	42%	0.703	0.418	-0.200	
4	56%	0.715	0.430	-0.687	
5	75%	0.706	0.421	-0.314	
6	100%	0.723	0.438	-1.001	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60142084 Decatur FATHEAD GROWTH
File: 6142084B Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32%	5	0.057	13.8	-0.009
3	42%	5	0.057	13.8	-0.005
4	56%	5	0.057	13.8	-0.017
5	75%	5	0.057	13.8	-0.007
6	100%	5	0.057	13.8	-0.025

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
32%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
42%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
56%	10	0	10

TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

SUMMARY OF FISHER'S EXACT TESTS

	NUMBER	NUMBER	SIG

GROUP	IDENTIFICATION	EXPOSED	DEAD	(P=.05)
	CONTROL	10	0	
1	32%	10	0	
2	42%	10	0	
3	56%	10	0	
4	75%	10	0	
5	100%	10	0	

60142084 Decatur CERIODAPHNIA DUBIA SURVIVAl
File: 6142084D Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	1.000	1.000	1.000
2	32%	10	1.000	1.000	1.000
3	42%	10	1.000	1.000	1.000
4	56%	10	1.000	1.000	1.000
5	75%	10	1.000	1.000	1.000
6	100%	10	1.000	1.000	1.000

60142084 Decatur CERIODAPHNIA DUBIA SURVIVAl
File: 6142084D Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.000	0.000	0.000	0.00
2	32%	0.000	0.000	0.000	0.00
3	42%	0.000	0.000	0.000	0.00
4	56%	0.000	0.000	0.000	0.00
5	75%	0.000	0.000	0.000	0.00
6	100%	0.000	0.000	0.000	0.00

60142084 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6142084E Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	4.020	14.520	22.920	14.520	4.020
OBSERVED	4	17	16	23	0

Calculated Chi-Square goodness of fit test statistic = 11.4855
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

60142084 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6142084E Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 4.52

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

60142084 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6142084E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	18.000	24.000	21.200
2	32%	10	18.000	27.000	23.200
3	42%	10	15.000	27.000	23.100
4	56%	10	17.000	28.000	23.200
5	75%	10	15.000	25.000	20.900
6	100%	10	16.000	26.000	21.100

60142084 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6142084E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	4.178	2.044	0.646	9.64
2	32%	10.178	3.190	1.009	13.75
3	42%	13.211	3.635	1.149	15.73
4	56%	18.400	4.290	1.356	18.49
5	75%	11.656	3.414	1.080	16.34
6	100%	12.100	3.479	1.100	16.49

60142084 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6142084E Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	66.683	13.337	1.148
Within (Error)	54	627.500	11.620	
Total	59	694.183		

Critical F value = 2.45 (0.05,5,40)
Since F < Critical F FAIL TO REJECT Ho: All equal

60142084 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6142084E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	21.200	21.200		
2	32%	23.200	23.200	-1.312	
3	42%	23.100	23.100	-1.246	
4	56%	23.200	23.200	-1.312	
5	75%	20.900	20.900	0.197	
6	100%	21.100	21.100	0.066	

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

60142084 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6142084E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	32%	10	3.522	16.6	-2.000
3	42%	10	3.522	16.6	-1.900
4	56%	10	3.522	16.6	-2.000
5	75%	10	3.522	16.6	0.300
6	100%	10	3.522	16.6	0.100

Conc. ID		1	2	3	4	5	6
Conc. Tested		0	32	42	56	75	100
Response	1	.432	.420	.438	.386	.438	.392
Response	2	.459	.450	.409	.445	.392	.495
Response	3	.427	.452	.445	.440	.425	.472
Response	4	.339	.372	.446	.449	.406	.465
Response	5	.409	.419	.352	.429	.442	.365

*** Inhibition Concentration Percentage Estimate ***
Toxicant/Effluent: Decatur
Test Start Date: 4/9/13 Test Ending Date: 4/16/13
Test Species: Fathead
Test Duration: 7 Day
DATA FILE:

Conc ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	5	0.000	0.413	0.045	0.424
2	5	32.000	0.423	0.032	0.424
3	5	42.000	0.418	0.040	0.424
4	5	56.000	0.430	0.026	0.424
5	5	75.000	0.421	0.021	0.424
6	5	100.000	0.438	0.056	0.424

*** No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	32	42	56	75	100
Response 1	23	19	24	17	15	24
Response 2	24	26	23	25	22	26
Response 3	13	21	27	20	22	20
Response 4	21	27	23	28	18	23
Response 5	20	23	27	28	23	18
Response 6	23	22	24	18	17	16
Response 7	23	24	25	27	25	24
Response 8	25	27	24	19	24	18
Response 9	14	18	15	26	24	18
Response 10	19	25	19	24	19	24

*** Inhibition Concentration Percentage Estimate ***
Toxicant/Effluent: Decatur
Test Start Date: 4/9/13 Test Ending Date: 4/16/13
Test Species: Dubia
Test Duration: 7 Day
DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	10	0.000	20.500	4.116	22.500
2	10	32.000	23.200	3.190	22.500
3	10	42.000	23.100	3.635	22.500
4	10	56.000	23.200	4.290	22.500
5	10	75.000	20.900	3.414	21.000
6	10	100.000	21.100	3.479	21.000

*** No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.

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The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

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1690379

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: City of Decatur	Report To: James Bostow	Attention:
Address:	Copy To:	Company Name:
		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Requested Analysis Filtered (Y/N)

ITEM #	Section D Required Client Information: SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	Matrix Codes (MATRIX / CODE): Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Chronic Wet Test	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	ChronicBio (1)	WW	C	~~1~~																	
2					4/8	10:45	4/9	9:45	2°	1	X									X	
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Mike Lilly	4/9/13	10 AM	[signature]	4/9/13	1320	3.6	Y	Y	Y

SAMPLER NAME AND SIGNATURE					
PRINT Name of SAMPLER:	Mike Lilly	DATE Signed (MM/DD/YY):	4/9/13	Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
SIGNATURE of SAMPLER:	Mike Lilly						

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

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1690381

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: City of Decatur	Report To: James Boston	Attention:
Address:	Copy To:	Company Name:
		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Requested Analysis Filtered (Y/N)

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes — MATRIX / CODE
Drinking Water DW
Water WT
Waste Water WW
Product P
Soil/Solid SL
Oil OL
Wipe WP
Air AR
Tissue TS
Other OT

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Y/N	Analysis Test	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chronic B.a (2)	WW	C	4/9	10Am	4/10	9Am	19	1	X								X	Chronic w/ TRC		
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp In °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	Mike Lily	4/10/13	9:10Am	[signature]	4/10/13	1530	2.8	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mike Lily

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 4/10/13

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1690380

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: City of Decatur	Report To: James Bostar	Attention:
Address:	Copy To:	Company Name:
		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER

Site Location STATE:

Requested Analysis Filtered (Y/N)

Section D Required Client Information

Matrix Codes — MATRIX / CODE

Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Analysis Test	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chronic Bio (3)	WW	C	4/11	8am	4/12	7am	19	2	X								X	Chronic w/TRC		
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	Mikey Lloyd	4/12/13	8:30am	[signature]	4/12/13	1430	3.4	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mikey Lloyd

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 4/12/13

ORIGINAL

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REFERENCE #60148655

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

July 18, 2013

James Boston
City of Decatur
P.O. Box 247
Decatur, AR 72722

Re: Lab Project Number: 60148655
Client Project ID: Wet Test

Dear:

Enclosed are the analytical results for sample(s) received by the laboratory. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any question concerning this report, please feel free to contact me.

Sincerely,

Tim Harrell
Tim.Harrell@pacelabs.com
Technical Director

Kansas/ NELAP Certification Number E-10116
Utah Certification Number 9135995665
Texas Certification Number T104704407-08-TX
Oklahoma Certification Number 9205/9935
Louisiana Certification Number 03055
Arkansas Certification Number 05-008-0

Enclosures

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REFERENCE #60148655

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

CHRONIC TOXICITY TEST FOR
City of Decatur

PERMIT # AR0022292
AFIN # 04-00052

PERFORMED ON:

Pimephales promelas

and

Ceriodaphnia dubia

PREPARED FOR:

City of Decatur
Attn: James Boston
P.O. Box 247
Decatur, AR 72722
1-479-752-3912

PREPARED BY:
Pace Analytical Services, Inc.
808 West McKay
Frontenac, KS 66763
1-620-235-0003

July 18, 2013

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Fax: 913.599.1759

SUMMARY

A Chronic Whole Effluent Toxicity Test using the 7-day chronic fathead minnows (Pimephales promelas), static renewal larval survival and growth test, and three brood 7-day chronic Cladoceran (Ceriodaphnia dubia), static renewal survival and reproduction test, was conducted on effluent discharge water collected at the City of Decatur effluent discharge from July 9, 2013 to July 12, 2013. All the test methods followed are as listed in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms."

Statistically significant ($p<0.05$) mortality is determined by Dunnet's procedure using average percent survival of each test concentration versus the average survival of the controls. If significant mortality occurs, median lethal concentrations (LC50) are calculated using effluent concentrations and their corresponding percent mortality data. The LC50's and the 95% confidence intervals are calculated where appropriate by the Spearman-Karber method. Statistical analysis is accomplished by following steps in EPA 821-R-02-013, November 2002 and by use of Toxstat version 3.4.

In minnow section of testing, it was observed that the effluent had no significant effect on the survival of the larvae at the 100% concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 100% for survival. The LC50 was estimated to be >100% effluent. No significant reduction in growth was observed in the 100% effluent concentration. The Toxic Units is <1. The IC25 is >100. The NOEC for growth in effluent was determined to be 100%. The PMSD was 14.4.

In Cladoceran section of testing, it was observed that the effluent had no significant effect on the survival of the organisms in the 100% effluent concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 100% for survival. The LC50 was estimated to be >100% effluent. No significant reduction in reproduction was observed in the 100% effluent concentrations. The Toxic Units is <1. The IC25 is >100. The NOEC for reproduction in effluent was determined to be 100%. The PMSD was 15.4.

The chronic toxicity exhibited by the fathead minnows and the Ceriodaphnia treated by the effluent sampled from July 9 to July 12 from the City of Decatur effluent discharge, is acceptable as described in EPA 821-R-02-013.

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INTRODUCTION

Pace Analytical was contracted to perform this chronic toxicity test on effluent from the City of Decatur effluent discharge. Chronic toxicity was measured using the Pimephales promelas at larval for survival and growth test and the Ceriodaphnia dubia survival and reproduction test described in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms." The raw data of the study is stored at Pace Analytical Services, INC. 808 West McKay, Frontenac, KS 66763.

TEST MATERIAL

City of Decatur personnel collected sampling of the effluent. A sample of the effluent was delivered to Pace by commercial carrier on 7-9-13. Subsequent samples followed by delivery on 7-10-13 and on 7-12-13. All samples were stored at ≤ 6° Celsius. Moderately Hard Synthetic Water was used as a control and also to make the required dilutions in the test as described in EPA 821-R-02-013.

TEST METHODS

Pace used EPA test method 1000.0 for conducting the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test. EPA test method 1002.0 was used for conducting the Cladoceran, Ceriodaphnia dubia, Survival and Reproduction Test. The tests were conducted to estimate the LC50, NOEC, and LOEC for survival, growth, and reproduction of these test species.

The Pimephales and Ceriodaphnia tests were initiated on 7-9-13 and carried out until 7-16-13. The Pimephales tests were conducted in 500 ml plastic jars with 250 ml of test solution. Eight larvae were placed in each of at least 5 replicates to make a total of 40 larvae per sample concentration. The Ceriodaphnia tests were carried out in 35ml vials containing 25 ml of test solution. One Neonate was placed in each of 10 replicates to make a total of 10 neonates per sample concentration.

TEST ORGANISMS

The organisms used in these tests were cultured at Pace under controlled temperature and photoperiod conditions and/or were purchased from an external supplier. Pace maintains records of all culture techniques used in producing organisms.

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RESULTS

REPORT OF LABORATORY ANALYSIS
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TABLE 1

Permittee: City of Decatur Effluent discharge.

Date Sampled No. 1: 7-9-13 8:00

No. 2: 7-10-13 7:30

No. 3: 7-12-13 7:30

Test Initiated: 16:50 Date: 7-9-13

Dilution Water used: Moderately Hard Synthetic Water

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL
(Pimephales promelas)

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Concentration (%)	Average Dry Weight in Milligrams in Replicate Chambers A	B	C	D	E	Mean Dry Weight (mg)	CV% *
Control 0%	0.399	0.362	0.425	0.384	0.411	0.396	3.67
Dilution 1 32%	0.448	0.380	0.546	0.420	0.382	0.435	9.53
Dilution 2 42%	0.375	0.392	0.459	0.450	0.421	0.419	5.21
Dilution 3 56%	0.416	0.400	0.383	0.384	0.399	0.396	2.04
Dilution 4 75%	0.389	0.375	0.408	0.426	0.422	0.404	3.22
Dilution 5 100%	0.371	0.383	0.428	0.460	0.352	0.399	6.60

* Coefficient of Variation = Standard Deviation X 100 / Mean

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Permittee: City of Decatur Effluent discharge.

FATHEAD MINNOW SURVIVAL

Conc. %	Percent Survival in Replicate Chambers					Mean Percent Survival			CV %
	A	B	C	D	E	24hr	48hr	7 day	
Control 0%	100	87.5	100	100	100	100	100	97.5	4.79
Dilution 1 32%	100	100	100	100	100	100	100	100	0.00
Dilution 2 42%	87.5	100	100	100	100	100	100	97.5	4.79
Dilution 3 56%	100	87.5	87.5	100	100	100	100	95	5.99
Dilution 4 75%	100	100	100	100	100	100	100	100	0.00
Dilution 5 100%	100	100	100	100	87.5	100	100	97.5	4.79

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Permittee: City of Decatur Effluent discharge.

CERIODAPHNIA SURVIVAL AND REPRODUCTION

DATA TABLE FOR CERIODAPHNIA YOUNG PRODUCTION

Replicate	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
1	21	31	26	24	19	25
2	21	30	20	27	22	23
3	20	25	23	21	20	26
4	23	24	19	25	23	22
5	22	24	27	23	21	24
6	18	26	24	20	21	24
7	16	22	22	21	24	28
8	22	25	17	26	23	21
9	17	20	20	30	27	23
10	25	24	23	30	25	17
Mean	20.5	25.1	22.1	24.7	22.5	23.3
SD	2.799	3.315	3.143	3.592	2.415	2.983
CV %	13.65	13.21	14.22	14.54	10.73	12.80

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Permittee: City of Decatur Effluent discharge.

CERIODAPHNIA MEAN PERCENT SURVIVAL

	Percent Effluent (%)					
Time Elapsed	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
24 hrs	100	100	100	100	100	100
48 hrs	100	100	100	100	100	100
7-day	100	100	100	100	100	100
SD	0.000	0.000	0.000	0.000	0.000	0.000
CV %	0.00	0.00	0.00	0.00	0.000	0.000

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TABLE 2
SUMMARY OF TEST CONDITIONS FOR THE FATHEAD MINNOW (Pimephales promelas) LARVAL SURVIVAL AND GROWTH TEST

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	500 ml
7. Test solution volume	250 ml
8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	8
11. No. replicates/concentration	5
12. No. larvae/concentration	40
13. Feeding regime	Feed 0.1 ml newly hatched brine shrimp nauplii three times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None

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TABLE 2 (CONT.)

16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	7 days
19. Endpoints	Survival and growth
20. Test acceptability	80% or greater survival in the controls, Average dry weight in controls >0.25 mg, Coefficient of variation in the control must not exceed 40%.

TABLE 2 (CONT.)
SUMMARY OF TEST CONDITIONS FOR THE CLADOCERAN (Ceriodaphnia dubia) SURVIVAL AND REPRODUCTION TEST

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	30 ml
7. Test solution volume	25 ml

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TABLE 2 (CONT.)

8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	1
11. No. replicates/concentration	10
12. No. larvae/concentration	10
13. Feeding regime	Feed 0.1 ml YCT three times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None
16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	7 days - 10 days
19. Endpoints	Survival and Reproduction
20. Test acceptability	80% or greater survival in the controls, Average reproduction rate of 15 young / adult. Coefficient of variation in the control must not exceed 40%.

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TABLE 2 (SECTION 2)

BIOMONITORING CHRONIC TOXICITY REPORT
FATHEAD MINNOW (Pimephales promelas)
CHEMICAL PARAMETERS CHART

Permittee: City of Decatur Effluent discharge.

ANALYSTS: Pace Analytical Services, Inc.
Timothy Harrell
Mike Bollin

SAMPLE NO. 1 COLLECTED: DATE: 7-9-13

SAMPLE NO. 2 COLLECTED: DATE: 7-10-13

SAMPLE NO. 3 COLLECTED: DATE: 7-12-13

TABLE 2 (SECTION 2)
INITIAL WATER QUALITY
EFFLUENT CONCENTRATION

	Control	100%
PH	7.43	7.32
D.O.	8.30	8.70
Temp	25	25
Alk	60	260
Hard	96	112
Cond	336	763
Chlorine	<0.1	<0.1

* D.O. is reported as mg/L
Alkalinity is reported as mg/L CaCO3
Hardness is reported as mg/L CaCO3
Conductance is reported as umhos
Ammonia is reported as mg/L
Chlorine is reported as mg/L

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TEST WATER QUALITY

24-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.45	7.30	25
32% Effluent	7.82	7.40	25
42% Effluent	7.96	7.40	25
56% Effluent	8.04	7.40	25
75% Effluent	8.12	7.50	25
100% Effluent	8.18	7.60	25

48-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.74	7.50	25
32% Effluent	8.07	7.50	25
42% Effluent	8.11	7.50	25
56% Effluent	8.16	7.50	25
75% Effluent	8.30	7.50	25
100% Effluent	8.36	7.50	25

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FINAL WATER QUALITY

EFFLUENT CONCENTRATION

	Control	100%
pH	7.65	8.56
D.O.	7.40	7.30
Temp	25	25
Alk	64	240
Hard	92	120
Cond	444	1276

* D.O. is reported as mg/L
Alkalinity is reported as mg/L CaCO3
Hardness is reported as mg/L CaCO3
Conductance is reported as umhos

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TEST VALIDITY

The Pimephales promelas control survival rate was 97.5%. The mean dry weight (growth) of the Pimephales promelas was determined at 0.396 mg/organism in the controls. The percent coefficient of variation (%CV) values for the fathead minnow control for survival and growth were 4.79 and 3.67. The Ceriodaphnia dubia survival rates were 100 in the control. The Ceriodaphnia in the control produced an average of 20.5 young over the seven-day exposure period. Percent CV values for Ceriodaphnia dubia control survival and reproduction was 0.00 and 13.65. Control data met or exceeded all criteria set out by EPA 821-R-02-013 for test acceptance.

CONCLUSIONS

The No Observed Effect Concentration (NOEC) for Pimephales promelas was 100% for survival and 100% for growth. The No Observed Effect Concentration (NOEC) for Ceriodaphnia dubia was 100% for Survival and 100% for Reproduction. The tests were ran using a synthetic control against effluent concentrations of 32%, 42%, 56%, 75%, and 100%. The effluent sampled on 7-9-13, 7-10-13, and 7-12-13 exhibited acceptable chronic toxicity in Pimephales promelas and in Ceriodaphnia dubia during the exposure period as described in EPA 821-R-02-013.

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APPENDIX C

REFERENCE TOXICANTS

The absence of significant control mortality during this test indicated the health of the organisms and indicated that any significant mortality in the test concentrations was not due to contaminants or variations in testing conditions.

Reference toxicity testing is routinely performed by staff members in our biomonitoring - bioassay laboratory.

Start: 6/18/13 11:00 End: 6/25/13 12:00

Reference Toxicant (NaCl) Pimephales promelas

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
10 g/l	40	9	2	0
8 g/l	40	38	29	5
6 g/l	40	40	38	24
4 g/l	40	40	40	39
2 g/l	40	40	40	39

IC25 (4.83 g/l Sodium Chloride)

Survival NOEC: 4.0 g/l

Reference Toxicant (NaCl) Ceriodaphnia Dubia

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
2.5 g/l	10	6	0	0
2.0 g/l	10	10	7	2
1.5 g/l	10	10	10	10
1.0 g/l	10	10	10	10
0.5 g/l	10	10	10	10

IC25 (1.21 g/l Sodium Chloride)

Survival NOEC: 1.5 g/l

Submitted By: Tim Harrell
Timothy Harrell, Technical Director

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60148655 Decatur FATHEAD SURVIVAL
File: 6148655A Transform: ARC SINE(SQUARE ROOT(Y))

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.010	7.260	11.460	7.260	2.010
OBSERVED	3	2	22	3	0

Calculated Chi-Square goodness of fit test statistic = 18.5021
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60148655 Decatur FATHEAD SURVIVAL
File: 6148655A Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.048

W = 0.752

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60148655 Decatur FATHEAD SURVIVAL
File: 6148655A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.991	1.107	1.084
2	32%	5	1.107	1.107	1.107
3	42%	5	0.991	1.107	1.084
4	56%	5	0.991	1.107	1.061
5	75%	5	1.107	1.107	1.107
6	100%	5	0.991	1.107	1.084

60148655 Decatur FATHEAD SURVIVAL
File: 6148655A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.003	0.052	0.023	4.79
2	32%	0.000	0.000	0.000	0.00
3	42%	0.003	0.052	0.023	4.79
4	56%	0.004	0.064	0.028	5.99
5	75%	0.000	0.000	0.000	0.00
6	100%	0.003	0.052	0.023	4.79

60148655 Decatur FATHEAD SURVIVAL
File: 6148655A Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.008	0.002	0.756
Within (Error)	24	0.048	0.002	
Total	29	0.056		

Critical F value = 2.62 (0.05,5,24)
Since F < Critical F FAIL TO REJECT Ho: All equal

60148655 Decatur FATHEAD SURVIVAL
File: 6148655A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	1.084	0.780		
2	32%	1.107	0.800	-0.816	
3	42%	1.084	0.780	0.000	
4	56%	1.061	0.760	0.816	
5	75%	1.107	0.800	-0.816	
6	100%	1.084	0.780	0.000	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60148655 Decatur FATHEAD SURVIVAL
File: 6148655A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32%	5	0.058	7.4	-0.020
3	42%	5	0.058	7.4	0.000
4	56%	5	0.058	7.4	0.020
5	75%	5	0.058	7.4	-0.020
6	100%	5	0.058	7.4	-0.000

60148655 Decatur FATHEAD GROWTH
File: 6148655B Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.038

W = 0.945

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

60148655 Decatur FATHEAD GROWTH
File: 6148655B Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 10.80

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

60148655 Decatur FATHEAD GROWTH
File: 6148655B Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.646	0.710	0.681
2	32%	5	0.664	0.831	0.720
3	42%	5	0.659	0.744	0.704
4	56%	5	0.667	0.701	0.681
5	75%	5	0.659	0.711	0.689
6	100%	5	0.635	0.745	0.683

60148655 Decatur FATHEAD GROWTH
File: 6148655B Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.001	0.025	0.011	3.67
2	32%	0.005	0.069	0.031	9.53
3	42%	0.001	0.037	0.016	5.21
4	56%	0.000	0.014	0.006	2.04
5	75%	0.000	0.022	0.010	3.22
6	100%	0.002	0.045	0.020	6.60

60148655 Decatur FATHEAD GROWTH
File: 6148655B Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.006	0.001	0.810
Within (Error)	24	0.038	0.002	
Total	29	0.044		

Critical F value = 2.62 (0.05,5,24)
Since F < Critical F FAIL TO REJECT Ho: All equal

60148655 Decatur FATHEAD GROWTH
File: 6148655B Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.681	0.396		
2	32%	0.720	0.435	-1.572	
3	42%	0.704	0.419	-0.941	
4	56%	0.681	0.396	-0.011	
5	75%	0.689	0.404	-0.319	
6	100%	0.683	0.399	-0.098	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60148655 Decatur FATHEAD GROWTH
File: 6148655B Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32%	5	0.057	14.4	-0.039
3	42%	5	0.057	14.4	-0.023
4	56%	5	0.057	14.4	-0.000
5	75%	5	0.057	14.4	-0.008
6	100%	5	0.057	14.4	-0.003

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
32%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
42%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
56%	10	0	10

TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

	NUMBER OF		
IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

	NUMBER OF		
IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

SUMMARY OF FISHER'S EXACT TESTS

	NUMBER	NUMBER	SIG

GROUP	IDENTIFICATION	EXPOSED	DEAD	(P=.05)
	CONTROL	10	0	
1	32%	10	0	
2	42%	10	0	
3	56%	10	0	
4	75%	10	0	
5	100%	10	0	

60148655 Decatur CERIODAPHNIA DUBIA SURVIVAl
File: 6148655D Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	1.000	1.000	1.000
2	32%	10	1.000	1.000	1.000
3	42%	10	1.000	1.000	1.000
4	56%	10	1.000	1.000	1.000
5	75%	10	1.000	1.000	1.000
6	100%	10	1.000	1.000	1.000

60148655 Decatur CERIODAPHNIA DUBIA SURVIVAl
File: 6148655D Transform: NO TRANSFORM

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.000	0.000	0.000	0.00
2	32%	0.000	0.000	0.000	0.00
3	42%	0.000	0.000	0.000	0.00
4	56%	0.000	0.000	0.000	0.00
5	75%	0.000	0.000	0.000	0.00
6	100%	0.000	0.000	0.000	0.00

60148655 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6148655E Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	4.020	14.520	22.920	14.520	4.020
OBSERVED	4	14	24	13	5

Calculated Chi-Square goodness of fit test statistic = 0.4676
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

60148655 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6148655E Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 1.59

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

60148655 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6148655E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	16.000	25.000	20.500
2	32%	10	20.000	31.000	25.100
3	42%	10	17.000	27.000	22.100
4	56%	10	20.000	30.000	24.700
5	75%	10	19.000	27.000	22.500
6	100%	10	17.000	28.000	23.300

60148655 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6148655E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	7.833	2.799	0.885	13.65
2	32%	10.989	3.315	1.048	13.21
3	42%	9.878	3.143	0.994	14.22
4	56%	12.900	3.592	1.136	14.54
5	75%	5.833	2.415	0.764	10.73
6	100%	8.900	2.983	0.943	12.80

60148655 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6148655E Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	146.933	29.387	3.130
Within (Error)	54	507.000	9.389	
Total	59	653.933		

Critical F value = 2.45 (0.05,5,40)
Since F > Critical F REJECT Ho: All equal

60148655 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6148655E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	20.500	20.500		
2	32%	25.100	25.100	-3.357	
3	42%	22.100	22.100	-1.168	
4	56%	24.700	24.700	-3.065	
5	75%	22.500	22.500	-1.460	
6	100%	23.300	23.300	-2.043	

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

60148655 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6148655E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	32%	10	3.165	15.4	-4.600
3	42%	10	3.165	15.4	-1.600
4	56%	10	3.165	15.4	-4.200
5	75%	10	3.165	15.4	-2.000
6	100%	10	3.165	15.4	-2.800

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	32	42	56	75	100
Response 1	21	31	26	24	19	25
Response 2	21	30	20	27	22	23
Response 3	20	25	23	21	20	26
Response 4	23	24	19	25	23	22
Response 5	22	24	27	23	21	24
Response 6	18	26	24	20	21	24
Response 7	16	22	22	21	24	28
Response 8	22	25	17	26	23	21
Response 9	17	20	20	30	27	23
Response 10	25	24	23	30	25	17

*** Inhibition Concentration Percentage Estimate ***
Toxicant/Effluent: Decatur
Test Start Date: 7/9/13 Test Ending Date: 7/16/13
Test Species: Dubia
Test Duration: 7 Day
DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	10	0.000	20.500	2.799	23.100
2	10	32.000	25.100	3.315	23.100
3	10	42.000	22.100	3.143	23.100
4	10	56.000	24.700	3.592	23.100
5	10	75.000	22.500	2.415	22.900
6	10	100.000	23.300	2.983	22.900

*** No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	32	42	56	75	100
Response 1	.399	.448	.375	.416	.389	.371
Response 2	.362	.380	.392	.400	.375	.383
Response 3	.425	.546	.459	.383	.408	.428
Response 4	.384	.420	.450	.384	.426	.460
Response 5	.411	.382	.421	.399	.422	.352

*** Inhibition Concentration Percentage Estimate ***
Toxicant/Effluent: Decatur
Test Start Date: 7/9/13 Test Ending Date: 7/16/13
Test Species: Fathead
Test Duration: 7 Day
DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	5	0.000	0.396	0.024	0.417
2	5	32.000	0.435	0.068	0.417
3	5	42.000	0.419	0.036	0.417
4	5	56.000	0.396	0.014	0.400
5	5	75.000	0.404	0.022	0.400
6	5	100.000	0.399	0.044	0.399

*** No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.

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1371634

Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: DWWTP	Report To: James Boston	Attention:
Address:	Copy To:	Company Name:
		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Requested Analysis Filtered (Y/N)

ITEM #	Section D Required Client Information — SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	Matrix Codes (MATRIX / CODE): Drinking Water DW, Water WT, Waste Water WW, Product P, Soil/Solid SL, Oil OL, Wipe WP, Air AR, Tissue TS, Other OT	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	Chlorine wtr test	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chlorine Bio (1)		WW	C	7/8	9AM	7/9	8AM	2C	1	X								X			16Cab
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Mike Lilley	7/9/13	8:15AM	Tim Harrell	7/9/13	16:30	3.6	Y	Y	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mike Lilley

SIGNATURE of SAMPLER: Mike Lilley

DATE Signed (MM/DD/YY): 7/9/13

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

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Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: City of Decatur	Report To: James Boston	Attention:
Address:	Copy To:	Company Name:
		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Requested Analysis Filtered (Y/N)

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes (MATRIX / CODE): Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Analysis Test	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chronic BD (2)	WW	C	7/9/13	8:30 AM	7/10	7:30 AM	3°	1	X								Y	Chronic wet test		16Cub
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	Mike Lily	7/10/13	8:30 AM	[illegible] Pace	7/10/13	1600	3.2	Y	Y	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mike Lilley

SIGNATURE of SAMPLER: Mike Lily DATE Signed (MM/DD/YY): 7/10/13

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

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Section A Required Client Information:	Section B Required Project Information:	Section C Invoice Information:
Company: City of Decatur	Report To: James Boston	Attention:
Address:	Copy To:	Company Name:
		Address:
Email To:	Purchase Order No.:	Pace Quote Reference:
Phone: Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:	Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Requested Analysis Filtered (Y/N)

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes — MATRIX / CODE

Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

ITEM #	Section D Required Client Information	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Analysis Test	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chronic wet Test (3)	WW	C	7/11	8:30	7/12	7:30	IC	2	X								Y	Chronic wet test		16Cub
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Mike Lilley	7/12/13	8:35AM	Pace	7/12/13	1530	2.4	Y	Y	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mike Lilley

SIGNATURE of SAMPLER: Mike Lilley

DATE Signed (MM/DD/YY): 7/12/13

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

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REFERENCE #60155941

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

October 31, 2013

James Boston
City of Decatur
P.O. Box 247
Decatur, AR 72722

Re: Lab Project Number: 60155941
Client Project ID: Wet Test

Dear:

Enclosed are the analytical results for sample(s) received by the laboratory. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any question concerning this report, please feel free to contact me.

Sincerely,

Tim Harrell

Tim Harrell
Tim.Harrell@pacelabs.com
Technical Director

Enclosures

REPORT OF LABORATORY ANALYSIS

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REFERENCE #60155941

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Lenexa, KS 66219
Phone: 913.599.5665
Fax: 913.599.1759

CHRONIC TOXICITY TEST FOR
City of Decatur

PERMIT # AR0022292
AFIN # 04-00052

PERFORMED ON:

Pimephales promelas

and

Ceriodaphnia dubia

PREPARED FOR:

City of Decatur
Attn: James Boston
P.O. Box 247
Decatur, AR 72722
1-479-752-3912

PREPARED BY:
Pace Analytical Services, Inc.
808 West McKay
Frontenac, KS 66763
1-620-235-0003

October 31, 2013

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SUMMARY

A Chronic Whole Effluent Toxicity Test using the 7-day chronic fathead minnows (Pimephales promelas), static renewal larval survival and growth test, and three brood 7-day chronic Cladoceran (Ceriodaphnia dubia), static renewal survival and reproduction test, was conducted on effluent discharge water collected at the City of Decatur effluent discharge from October 22, 2013 to October 25, 2013. All the test methods followed are as listed in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms."

Statistically significant ($p<0.05$) mortality is determined by Dunnet's procedure using average percent survival of each test concentration versus the average survival of the controls. If significant mortality occurs, median lethal concentrations (LC50) are calculated using effluent concentrations and their corresponding percent mortality data. The LC50's and the 95% confidence intervals are calculated where appropriate by the Spearman-Karber method. Statistical analysis is accomplished by following steps in EPA 821-R-02-013, November 2002 and by use of Toxstat version 3.4.

In minnow section of testing, it was observed that the effluent had no significant effect on the survival of the larvae at the 100% concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 100% for survival. The LC50 was estimated to be >100% effluent. No significant reduction in growth was observed in the 100% effluent concentration. The Toxic Units is <1. The IC25 is >100. The NOEC for growth in effluent was determined to be 100%. The PMSD was 16.9.

In Cladoceran section of testing, it was observed that the effluent had no significant effect on the survival of the organisms in the 100% effluent concentration. No significant mortality was observed in the other effluent concentrations after the 7-day exposure period. The No Observed Effect Concentration (NOEC) was determined to be 100% for survival. The LC50 was estimated to be >100% effluent. No significant reduction in reproduction was observed in the 100% effluent concentrations. The Toxic Units is <1. The IC25 is >100. The NOEC for reproduction in effluent was determined to be 100%. The PMSD was 12.8.

The chronic toxicity exhibited by the fathead minnows and the Ceriodaphnia treated by the effluent sampled from October 22 to October 25 from the City of Decatur effluent discharge, is acceptable as described in EPA 821-R-02-013.

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INTRODUCTION

Pace Analytical was contracted to perform this chronic toxicity test on effluent from the City of Decatur effluent discharge. Chronic toxicity was measured using the Pimephales promelas at larval for survival and growth test and the Ceriodaphnia dubia survival and reproduction test described in EPA 821-R-02-013, "Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms." The raw data of the study is stored at Pace Analytical Services, INC. 808 West McKay, Frontenac, KS 66763.

TEST MATERIAL

City of Decatur personnel collected sampling of the effluent. A sample of the effluent was delivered to Pace by commercial carrier on 10-22-13. Subsequent samples followed by delivery on 10-23-13 and on 10-25-13. All samples were stored at ≤ 6° Celsius. Moderately Hard Synthetic Water was used as a control and also to make the required dilutions in the test as described in EPA 821-R-02-013.

TEST METHODS

Pace used EPA test method 1000.0 for conducting the Fathead Minnow, Pimephales promelas, Larval Survival and Growth Test. EPA test method 1002.0 was used for conducting the Cladoceran, Ceriodaphnia dubia, Survival and Reproduction Test. The tests were conducted to estimate the LC50, NOEC, and LOEC for survival, growth, and reproduction of these test species.

The Pimephales and Ceriodaphnia tests were initiated on 10-22-13 and carried out until 10-29-13. The Pimephales tests were conducted in 500 ml plastic jars with 250 ml of test solution. Eight larvae were placed in each of at least 5 replicates to make a total of 40 larvae per sample concentration. The Ceriodaphnia tests were carried out in 35ml vials containing 25 ml of test solution. One Neonate was placed in each of 10 replicates to make a total of 10 neonates per sample concentration.

TEST ORGANISMS

The organisms used in these tests were cultured at Pace under controlled temperature and photoperiod conditions and/or were purchased from an external supplier. Pace maintains records of all culture techniques used in producing organisms.

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RESULTS

REPORT OF LABORATORY ANALYSIS

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TABLE 1

Permittee: City of Decatur Effluent discharge.

Date Sampled No. 1: 10-22-13 7:45

No. 2: 10-23-13 8:00

No. 3: 10-25-13 7:00

Test Initiated: 13:00 Date: 10-22-13

Dilution Water used: Moderately Hard Synthetic Water

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL
(Pimephales promelas)

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Concentration (%)	Average Dry Weight in Milligrams in Replicate Chambers A	B	C	D	E	Mean Dry Weight (mg)	CV% *
Control 0%	0.429	0.362	0.439	0.459	0.409	0.420	5.34
Dilution 1 32%	0.439	0.488	0.511	0.443	0.387	0.454	6.55
Dilution 2 42%	0.513	0.443	0.475	0.393	0.411	0.447	6.65
Dilution 3 56%	0.430	0.503	0.332	0.464	0.449	0.436	9.05
Dilution 4 75%	0.455	0.449	0.471	0.449	0.398	0.444	3.80
Dilution 5 100%	0.469	0.421	0.404	0.533	0.401	0.446	7.69

* Coefficient of Variation = Standard Deviation X 100 / Mean

REPORT OF LABORATORY ANALYSIS

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Permittee: City of Decatur Effluent discharge.

FATHEAD MINNOW SURVIVAL

Conc. %	Percent Survival in Replicate Chambers					Mean Percent Survival			CV %
	A	B	C	D	E	24hr	48hr	7 day	
Control 0%	100	87.5	100	100	100	100	100	97.5	4.79
Dilution 1 32%	87.5	100	100	100	87.5	100	100	95	5.99
Dilution 2 42%	100	100	100	100	100	100	100	100	0.00
Dilution 3 56%	100	100	75	100	100	100	100	95	9.30
Dilution 4 75%	100	100	100	100	87.5	100	100	97.5	4.79
Dilution 5 100%	100	100	100	100	87.5	100	100	97.5	4.79

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Permittee: City of Decatur Effluent discharge.

CERIODAPHNIA SURVIVAL AND REPRODUCTION

DATA TABLE FOR CERIODAPHNIA YOUNG PRODUCTION

Replicate	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
1	19	21	23	24	25	18
2	15	21	24	23	22	21
3	22	23	21	27	22	22
4	20	24	23	24	18	23
5	19	22	23	23	20	27
6	24	24	22	21	24	24
7	18	26	20	23	19	15
8	25	23	26	23	23	21
9	24	18	21	20	23	21
10	19	20	23	25	22	25
Mean	20.5	22.2	22.6	23.3	21.8	21.7
SD	3.171	2.300	1.713	1.947	2.201	3.433
CV %	15.47	10.36	7.58	8.35	10.10	15.82

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Permittee: City of Decatur Effluent discharge.

CERIODAPHNIA MEAN PERCENT SURVIVAL

	Percent Effluent (%)					
Time Elapsed	Control 0%	Dilution 1 32%	Dilution 2 42%	Dilution 3 56%	Dilution 4 75%	Dilution 5 100%
24 hrs	100	100	100	100	100	100
48 hrs	100	100	100	100	100	100
7-day	100	100	100	100	100	100
SD	0.000	0.000	0.000	0.000	0.000	0.000
CV %	0.00	0.00	0.00	0.00	0.000	0.000

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TABLE 2
SUMMARY OF TEST CONDITIONS FOR THE FATHEAD MINNOW (Pimephales promelas) LARVAL SURVIVAL AND GROWTH TEST

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	500 ml
7. Test solution volume	250 ml
8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	8
11. No. replicates/concentration	5
12. No. larvae/concentration	40
13. Feeding regime	Feed 0.1 ml newly hatched brine shrimp nauplii three times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None

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TABLE 2 (CONT.)

16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	7 days
19. Endpoints	Survival and growth
20. Test acceptability	80% or greater survival in the controls, Average dry weight in controls >0.25 mg, Coefficient of variation in the control must not exceed 40%.

TABLE 2 (CONT.)
SUMMARY OF TEST CONDITIONS FOR THE CLADOCERAN
(Ceriodaphnia dubia) SURVIVAL AND REPRODUCTION TEST

1. Test type	Static renewal
2. Temperature	25 degrees Celsius
3. Light quality	Ambient laboratory light
4. Light intensity	Ambient laboratory levels
5. Photoperiod	16 hr light, 8 hr dark
6. Test chamber size	30 ml
7. Test solution volume	25 ml

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TABLE 2 (CONT.)

8. Renewal of test concentrations	Daily
9. Age of test organism	< 24 hours
10. No. larvae/chamber	1
11. No. replicates/concentration	10
12. No. larvae/concentration	10
13. Feeding regime	Feed 0.1 ml YCT three times daily. Larvae are not fed 12 hours prior to termination of test.
14. Cleaning	Siphon daily, immediately before test solution renewal
15. Aeration	None
16. Dilution Water	Moderately Hard Synthetic Water prepared with MILLI-Q deionized water and reagent grade chemicals
17. Effluent concentrations	0%, 32%, 42%, 56%, 75%, 100%
18. Test duration	7 days - 10 days
19. Endpoints	Survival and Reproduction
20. Test acceptability	80% or greater survival in the controls, Average reproduction rate of 15 young / adult. Coefficient of variation in the control must not exceed 40%.

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TABLE 2 (SECTION 2)

BIOMONITORING CHRONIC TOXICITY REPORT
FATHEAD MINNOW (Pimephales promelas)
CHEMICAL PARAMETERS CHART

Permittee: City of Decatur Effluent discharge.

ANALYSTS: Pace Analytical Services, Inc.
Timothy Harrell
Mike Bollin

SAMPLE NO. 1 COLLECTED: DATE: 10-22-13

SAMPLE NO. 2 COLLECTED: DATE: 10-23-13

SAMPLE NO. 3 COLLECTED: DATE: 10-25-13

TABLE 2 (SECTION 2)
INITIAL WATER QUALITY
EFFLUENT CONCENTRATION

	Control	100%
PH	7.47	7.95
D.O.	8.20	8.40
Temp	25	25
Alk	62	226
Hard	98	120
Cond	418	893
Chlorine	<0.1	<0.1

* D.O. is reported as mg/L
Alkalinity is reported as mg/L CaCO3
Hardness is reported as mg/L CaCO3
Conductance is reported as umhos
Ammonia is reported as mg/L
Chlorine is reported as mg/L

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TEST WATER QUALITY

24-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.58	7.60	25
32% Effluent	7.82	7.40	25
42% Effluent	7.85	7.30	25
56% Effluent	7.90	7.00	25
75% Effluent	8.03	6.90	25
100% Effluent	8.10	6.90	25

48-Hour Water Quality Measurements

Effluent Concentration (%)	PH	D.O. (mg/l)	Temperature (C)
0% Control	7.47	7.20	25
32% Effluent	7.80	7.20	25
42% Effluent	7.88	7.10	25
56% Effluent	7.94	7.10	25
75% Effluent	8.06	7.00	25
100% Effluent	8.19	6.90	25

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FINAL WATER QUALITY

EFFLUENT CONCENTRATION

	Control	100%
pH	7.68	8.42
D.O.	7.10	7.10
Temp	25	25
Alk	62	186
Hard	98	100
Cond	486	1097

* D.O. is reported as mg/L
Alkalinity is reported as mg/L CaCO3
Hardness is reported as mg/L CaCO3
Conductance is reported as umhos

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TEST VALIDITY

The Pimephales promelas control survival rate was 97.5%. The mean dry weight (growth) of the Pimephales promelas was determined at 0.420 mg/organism in the controls. The percent coefficient of variation (%CV) values for the fathead minnow control for survival and growth were 4.79 and 5.34. The Ceriodaphnia dubia survival rates were 100 in the control. The Ceriodaphnia in the control produced an average of 20.5 young over the seven-day exposure period. Percent CV values for Ceriodaphnia dubia control survival and reproduction was 0.00 and 15.47. Control data met or exceeded all criteria set out by EPA 821-R-02-013 for test acceptance.

CONCLUSIONS

The No Observed Effect Concentration (NOEC) for Pimephales promelas was 100% for survival and 100% for growth. The No Observed Effect Concentration (NOEC) for Ceriodaphnia dubia was 100% for Survival and 100% for Reproduction. The tests were ran using a synthetic control against effluent concentrations of 32%, 42%, 56%, 75%, and 100%. The effluent sampled on 10-22-13, 10-23-13, and 10-25-13 exhibited acceptable chronic toxicity in Pimephales promelas and in Ceriodaphnia dubia during the exposure period as described in EPA 821-R-02-013.

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APPENDIX C

REFERENCE TOXICANTS

The absence of significant control mortality during this test indicated the health of the organisms and indicated that any significant mortality in the test concentrations was not due to contaminants or variations in testing conditions.

Reference toxicity testing is routinely performed by staff members in our biomonitoring - bioassay laboratory.

Start: 10/22/13 14:30 End: 10/29/13 14:00

Reference Toxicant (NaCl) Pimephales promelas

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
10 g/l	40	7	1	0
8 g/l	40	36	25	5
6 g/l	40	40	37	26
4 g/l	40	40	40	40
2 g/l	40	40	40	39

IC25 (5.27 g/l Sodium Chloride)

Survival NOEC: 4.0 g/l

Reference Toxicant (NaCl) Ceriodaphnia Dubia

Concentration of Toxicant	Avg. # of Live Organisms/replicate			
	0 hrs	24 hrs	48 hrs	7 days
2.5 g/l	10	4	0	0
2.0 g/l	10	10	8	2
1.5 g/l	10	10	10	10
1.0 g/l	10	10	10	10
0.5 g/l	10	10	10	10

IC25 (1.09 g/l Sodium Chloride)

Survival NOEC: 1.5 g/l

Submitted By: Tim Harrell
Timothy Harrell, Technical Director

REPORT OF LABORATORY ANALYSIS

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60155941 Decatur FATHEAD SURVIVAL
File: 6155941A Transform: ARC SINE(SQUARE ROOT(Y))

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.010	7.260	11.460	7.260	2.010
OBSERVED	4	2	21	3	0

Calculated Chi-Square goodness of fit test statistic = 18.2325
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60155941 Decatur FATHEAD SURVIVAL
File: 6155941A Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.088

W = 0.742

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

60155941 Decatur FATHEAD SURVIVAL
File: 6155941A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.991	1.107	1.084
2	32%	5	0.991	1.107	1.061
3	42%	5	1.107	1.107	1.107
4	56%	5	0.886	1.107	1.063
5	75%	5	0.991	1.107	1.084
6	100%	5	0.991	1.107	1.084

60155941 Decatur FATHEAD SURVIVAL
File: 6155941A Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.003	0.052	0.023	4.79
2	32%	0.004	0.064	0.028	5.99
3	42%	0.000	0.000	0.000	0.00
4	56%	0.010	0.099	0.044	9.30
5	75%	0.003	0.052	0.023	4.79
6	100%	0.003	0.052	0.023	4.79

60155941 Decatur FATHEAD SURVIVAL
File: 6155941A Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.007	0.001	0.396
Within (Error)	24	0.088	0.004	
Total	29	0.095		

Critical F value = 2.62 (0.05,5,24)
Since F < Critical F FAIL TO REJECT Ho: All equal

60155941 Decatur FATHEAD SURVIVAL
File: 6155941A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	1.084	0.780		
2	32%	1.061	0.760	0.607	
3	42%	1.107	0.800	-0.607	
4	56%	1.063	0.760	0.550	
5	75%	1.084	0.780	0.000	
6	100%	1.084	0.780	0.000	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60155941 Decatur FATHEAD SURVIVAL
File: 6155941A Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32%	5	0.079	10.1	0.020
3	42%	5	0.079	10.1	-0.020
4	56%	5	0.079	10.1	0.020
5	75%	5	0.079	10.1	-0.000
6	100%	5	0.079	10.1	-0.000

60155941 Decatur FATHEAD GROWTH
File: 6155941B Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.057

W = 0.987

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

60155941 Decatur FATHEAD GROWTH
File: 6155941B Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 2.98

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

60155941 Decatur FATHEAD GROWTH
File: 6155941B Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	5	0.646	0.744	0.704
2	32%	5	0.671	0.796	0.739
3	42%	5	0.678	0.798	0.732
4	56%	5	0.614	0.788	0.720
5	75%	5	0.683	0.756	0.730
6	100%	5	0.686	0.818	0.731

60155941 Decatur FATHEAD GROWTH
File: 6155941B Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	0.001	0.038	0.017	5.34
2	32%	0.002	0.048	0.022	6.55
3	42%	0.002	0.049	0.022	6.65
4	56%	0.004	0.065	0.029	9.05
5	75%	0.001	0.028	0.012	3.80
6	100%	0.003	0.056	0.025	7.69

60155941 Decatur FATHEAD GROWTH
File: 6155941B Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.004	0.001	0.307
Within (Error)	24	0.057	0.002	
Total	29	0.061		

Critical F value = 2.62 (0.05,5,24)
Since F < Critical F FAIL TO REJECT Ho: All equal

60155941 Decatur FATHEAD GROWTH
File: 6155941B Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.704	0.420		
2	32%	0.739	0.454	-1.111	
3	42%	0.732	0.447	-0.896	
4	56%	0.720	0.436	-0.512	
5	75%	0.730	0.444	-0.815	
6	100%	0.731	0.446	-0.849	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

60155941 Decatur FATHEAD GROWTH
File: 6155941B Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32%	5	0.071	16.9	-0.034
3	42%	5	0.071	16.9	-0.027
4	56%	5	0.071	16.9	-0.016
5	75%	5	0.071	16.9	-0.025
6	100%	5	0.071	16.9	-0.026

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
32%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference
between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
42%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference
between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
56%	10	0	10

TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference
between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference
between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100%	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
Since b is greater than 6 there is no significant difference
etween CONTROL and TREATMENT at the 0.05 level.

SUMMARY OF FISHER'S EXACT TESTS

	NUMBER	NUMBER	SIG

GROUP	IDENTIFICATION	EXPOSED	DEAD	(P=.05)
	CONTROL	10	0	
1	32%	10	0	
2	42%	10	0	
3	56%	10	0	
4	75%	10	0	
5	100%	10	0	

60155941 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6155941E Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	4.020	14.520	22.920	14.520	4.020
OBSERVED	6	10	27	13	4

Calculated Chi-Square goodness of fit test statistic = 3.2678
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

60155941 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6155941E Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 6.54

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

60155941 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6155941E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	CONTROL	10	15.000	25.000	20.500
2	32%	10	18.000	26.000	22.200
3	42%	10	20.000	26.000	22.600
4	56%	10	20.000	27.000	23.300
5	75%	10	18.000	25.000	21.800
6	100%	10	15.000	27.000	21.700

60155941 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6155941E Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	CONTROL	10.056	3.171	1.003	15.47
2	32%	5.289	2.300	0.727	10.36
3	42%	2.933	1.713	0.542	7.58
4	56%	3.789	1.947	0.616	8.35
5	75%	4.844	2.201	0.696	10.10
6	100%	11.789	3.433	1.086	15.82

60155941 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6155941E Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	44.683	8.937	1.386
Within (Error)	54	348.300	6.450	
Total	59	392.983		

Critical F value = 2.45 (0.05,5,40)
Since F < Critical F FAIL TO REJECT Ho: All equal

60155941 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6155941E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	20.500	20.500		
2	32%	22.200	22.200	-1.497	
3	42%	22.600	22.600	-1.849	
4	56%	23.300	23.300	-2.465	
5	75%	21.800	21.800	-1.145	
6	100%	21.700	21.700	-1.057	

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

60155941 Decatur CERIODAPHNIA DUBIA REPRODU
File: 6155941E Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	32%	10	2.624	12.8	-1.700
3	42%	10	2.624	12.8	-2.100
4	56%	10	2.624	12.8	-2.800
5	75%	10	2.624	12.8	-1.300
6	100%	10	2.624	12.8	-1.200

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	32	42	56	75	100
Response 1	19	21	23	24	25	18
Response 2	15	21	24	23	22	21
Response 3	22	23	21	27	22	22
Response 4	20	24	23	24	18	23
Response 5	19	22	23	23	20	27
Response 6	24	24	22	21	24	24
Response 7	18	26	20	23	19	15
Response 8	25	23	26	23	23	21
Response 9	24	18	21	20	23	21
Response 10	19	20	23	25	22	25

*** Inhibition Concentration Percentage Estimate ***
Toxicant/Effluent: Decatur
Test Start Date: 10/22/13 Test Ending Date: 10/29/13
Test Species: Dubia
Test Duration: 7 Day
DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	10	0.000	20.500	3.171	22.150
2	10	32.000	22.200	2.300	22.150
3	10	42.000	22.600	1.713	22.150
4	10	56.000	23.300	1.947	22.150
5	10	75.000	21.800	2.201	21.800
6	10	100.000	21.700	3.433	21.700

*** No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.

Conc. ID	1	2	3	4	5	6
Conc. Tested	0	32	42	56	75	100
Response 1	.429	.439	.513	.430	.455	.469
Response 2	.362	.488	.443	.503	.449	.421
Response 3	.439	.511	.475	.332	.471	.404
Response 4	.459	.443	.393	.464	.449	.533
Response 5	.409	.387	.411	.449	.398	.401

*** Inhibition Concentration Percentage Estimate ***
Toxicant/Effluent: Decatur
Test Start Date: 10/22/13 Test Ending Date: 10/29/13
Test Species: Fathead
Test Duration: 7 Day
DATA FILE:

Conc. ID	Number Replicates	Concentration	Response Means	Std. Dev.	Pooled Response Means
1	5	0.000	0.420	0.037	0.441
2	5	32.000	0.454	0.048	0.441
3	5	42.000	0.447	0.048	0.441
4	5	56.000	0.436	0.064	0.441
5	5	75.000	0.444	0.027	0.441
6	5	100.000	0.446	0.056	0.441

*** No Linear Interpolation Estimate can be calculated from the input data since none of the (possibly pooled) group response means were less than 75% of the control response mean.

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: of

1733389

Section A Required Client Information:

Company: City of Decatur
Address:
Email To:
Phone: Fax:
Requested Due Date/TAT:

Section B Required Project Information:

Report To: James Boston
Copy To:
Purchase Order No.:
Project Name:
Project Number:

Section C Invoice Information:

Attention:
Company Name:
Address:
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE:

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Matrix Codes (MATRIX / CODE): Drinking Water DW; Water WT; Waste Water WW; Product P; Soil/Solid SL; Oil OL; Wipe WP; Air AR; Tissue TS; Other OT

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED: COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	Requested Analysis Filtered (Y/N): Chronic wet Test	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chronic Bio (1)	WW	C	10/21	8:45	10/22	7:43	3°	1	X								Y	X		60155941
2																			X		15cu6
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
	Mike Lilly	10/22/13	8:30 am	Pace	10/22/13	1215	Y Y Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mike Lilly

SIGNATURE of SAMPLER: Mike Lilly

DATE Signed (MM/DD/YY): 10/22/13

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and

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CHAIN-OF-CUSTODY / Analytical Request Document

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1733387

Section A Required Client Information:

Company: DWWTP
Address:
Email To:
Phone: Fax:
Requested Due Date/TAT:

Section B Required Project Information:

Report To: James Boston
Copy To:
Purchase Order No.:
Project Name:
Project Number:

Section C Invoice Information:

Attention:
Company Name:
Address:
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: _____

Section D Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes MATRIX / CODE

Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Requested Analysis Filtered (Y/N) Y/N	Analysis Test	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chronic Bio (2)	WW		10/22	9Am	10/23	8Am	1C	1	X								X	Chronic Wet Test		18 Cab
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

Preservatives: Y/N

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	Mike Lily	10/23/13	8:45Am	[illegible] Pace	10/23/13	1530	3.4	Y	Y	Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mike Lily
SIGNATURE of SAMPLER: Mike Lily
DATE Signed (MM/DD/YY): 10/23/13

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

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CHAIN-OF-CUSTODY / Analytical Request Document

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Page: of

1733388

Section A
Required Client Information:

Company: City of Decatur
Address:
Email To:
Phone: Fax:
Requested Due Date/TAT:

Section B
Required Project Information:

Report To: James Boston
Copy To:
Purchase Order No.:
Project Name:
Project Number:

Section C
Invoice Information:

Attention:
Company Name:
Address:
Pace Quote Reference:
Pace Project Manager:
Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location
STATE:

Section D
Required Client Information

SAMPLE ID
(A-Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Matrix Codes
MATRIX / CODE

Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Tissue	TS
Other	OT

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N: Chronic Water	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	Chronic Bio (3)	WW	C	10/24	8AM	10/25	7AM	1C	2	X								X		10Cb
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
	Mike Lilley	10/25/13	9AM	Pace	10/25/13	1530	3.6 C / Y / Y / Y

ORIGINAL

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Mike Lilley
SIGNATURE of SAMPLER: Mike Lilley
DATE Signed (MM/DD/YY): 10/25/13

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

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From: *Expéditeur:*

CUSTOMS:

For international use affix customs declaration PS Form 2976-A using PS Form 2976-E customs form pouch.

HOW TO USE:

1. ***Complete Address Area***
   Type or Print required return address and addressee information in customer block area or on label.

2. ***Payment Method***
   Affix postage or meter strip to area indicated in upper right hand corner.

3. ***Acceptance***
   Bring your Priority Mail box to a Post Office, or to schedule pickup of your postage paid packages visit us at usps.com/pickup.

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Permits Branch, Water Division
5301 Northshore Drive
North Little Rock AR 72118

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WASTEWATER TREATMENT PLANT EXPANSION

CITY OF DECATUR, ARKANSAS

PROJECT NO. FY152150

APRIL 2017

CERTIFICATE OF AUTHORIZATION
McCLELLAND CONSULTING ENGINEERS, INC.
No. 24
ARKANSAS-ENGINEER

PRELIMINARY
FOR PERMITTING ONLY
NOT FOR CONSTRUCTION

Prepared By:

McClelland Consulting Engineers, Inc.
1810 North College, P.O. Box 1229
Fayetteville, Arkansas 72702-1229
(479) 443-2377

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APPENDICES

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B DESIGN CALCULATIONS

C H2O INNOVATIONS EQUIPMENT SUBMITTALS:

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P&IDS
MEMBRANE TANK
MEMBRANES
MEMBRANE BLOWERS
SUPPLEMENTARY BLOWERS
JET AERATION SYSTEM
MEMBRANE FEED PUMPS
PERMEATE PUMPS
PERMEATE TANK

D KSB PUMP DATA SHEET

SECTION 01000

ABBREVIATIONS

PART I GENERAL

A. Whenever in these Contract Documents the following abbreviations are used, the intent and meaning shall be interpreted as follows:

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturers' Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers' Association
AGA	American Gas Association
AGMA	American Gear Manufacturers' Association
AISC	American Institute of Steel Construction
AISI	American Institute of Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
AREA	American Railway Engineering Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWS	American Welding Society
AWPA	American Wood Preservers' Association
AWPB	American Wood Preservers Bureau
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers' Association
CBMA	Certified Ballast Manufacturers' Association
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers' Association of America
CRSI	Concrete Reinforcing Steel Institute
EPA	Environmental Protection Agency
Fed. Spec.	Federal Specifications
HI	Hydraulic Institute
HMI	Hoist Manufacturers' Institute
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers, Inc.
ICEA	Insulated Cable Engineers' Association
ISA	Instrument Society of America

JIC	Joint Industry Conferences of Hydraulic Manufacturers
MMA	Monorail Manufacturers' Association
NBHA	National Builders' Hardware Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NLMA	National Lumber Manufacturers' Association
NWMA	National Woodwork Manufacturers' Association
OECI	Overhead Electrical Crane Institute
OSHA	Occupational Safety and Health Act (both Federal and State)
PS	Product Standards Section - U.S. Department of Commerce
RLM	RLM Standards Institute, Inc.
RMA	Rubber Manufacturers' Association
SAE	Society of Automotive Engineers
SDI	Steel Door Institute
SSPC	Steel Structures Painting Council
TEMA	Tubular Exchanger Manufacturers' Association
TCA	Tile Council of America
UBC	Uniform Building Code
UL	Underwriters' Laboratories, Inc.
WWPA	Western Wood Products Association

B. Unless a particular issue is designated, all references to the above specifications, standards, or methods shall, in each instance, be understood to refer to the issue in effect (including all amendments) on the first published date of the Invitation to Bid.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SUBMITTALS

A. This Section outlines in general the items that the Contractor must prepare or assemble for submittal during the progress of the work. Costs for the work under this Section shall be included in the appropriate items of the Contractor's bid prices. There is no attempt herein to state in detail all of the procedures and requirements for each submittal. The Contractor's attention is directed to the individual Specification Sections in these Contract Documents which may contain additional and special submittal requirements. The Owner reserves the right to direct and modify the procedures and requirements for submittals as necessary to accomplish the specific purpose of each submittal. Should the Contractor be in doubt as to the procedure, purpose, or extent of any submittal, he should direct his inquiry to the Engineer.

1.02 ADMINISTRATIVE SUBMITTALS

A. The Contractor shall provide all of the submittals required by the General Conditions, Supplementary Conditions, and as may be specifically required in other parts of these Documents.

B. The Contractor is reminded of his obligation as required by law to make required submittals promptly to the applicable Federal, state, or local agency. Failure to comply with this requirement may result in the withholding or progress payments and make the Contractor liable for other prescribed action and sanctions.

PART 2 TECHNICAL SUBMITTALS

2.01 GENERAL

A. Requirements in this Section are in addition to any specific requirements for submittals specified in other Divisions and Sections of these Contract Documents.

B. Submittals shall be addressed to: Crossland Heavy Construction.; Attn: Mr. Ryan Adler, 501 S East Ave, Columbus, KS 66725.

C. Submitted data shall be fully sufficient in detail for determination of compliance with the Contract Documents.

D. Review, acceptance, or approval of substitutions, schedules, shop drawings, lists of materials, and procedures submitted or requested by the Contractor shall not add to the Contract amount, and all additional costs which may result therefrom shall be solely the obligation of the Contractor.

E. The Owner is not precluded, by virtue of review, acceptance, or approval, from obtaining a credit for construction savings resulting from allowed concessions in the work or materials therefore.

F. It shall not be the responsibility of the Owner to provide engineering or other services to protect the Contractor from additional costs accruing from such approvals.

G. No equipment or material for which listings, drawings, or descriptive material is required shall be fabricated, purchased, or installed until the Engineer has on hand copies of such approved lists and the appropriately stamped final shop drawings.

H. Submittals will be acted upon by the Engineer as promptly as possible, and returned to the Contractor not later than the time allowed for review in SHOP DRAWING SUBMITTAL PROCEDURE. Delays caused by the need for resubmittals shall not constitute reason for an extension of Contract time.

2.02 SHOP DRAWING SUBMITTAL PROCEDURE

A. The Contractor shall submit a sufficient number of copies to allow the Engineer to review, such shop drawings, electrical diagrams, and catalog cuts for fabricated items and manufactured items (including mechanical and electrical equipment) required for construction, except as noted below.

Should the Contractor fail to submit acceptable shop drawings on the second submittal, one copy will be returned to him and the cost of the Engineer's time to review subsequent submittals on the unacceptable item will be deducted from the Contractor's monthly payment invoice. Shop drawings shall be submitted in sufficient time to allow the Engineer not less than 20 regular working days per submittal for examining the shop drawings.

These shop drawings shall be accurate, distinct, and complete and shall contain all required information, including satisfactory identification of items, units, and assemblies in relation to the Contract Drawings and Specifications.

Unless otherwise approved by the Engineer, shop drawings shall be submitted only by the Contractor, who shall indicate by a signed stamp on the shop drawings, or other approved means, that he (the Contractor) has checked the shop drawings, and that the Work shown is in accordance with Contract requirements and has been checked for dimensions and relationship with Work of all other trades involved.

The practice of submitting incomplete or unchecked shop drawings for the Engineer to correct or finish will not be acceptable, and shop drawings which, in the opinion of the Engineer, clearly indicate that they have not been checked by the Contractor will be considered as not complying with the intent of the Contract Documents and will be returned to the Contractor for resubmission in the proper form.

When the shop drawings have been reviewed by the Engineer, two (2) sets of submittals will be returned to the Contractor appropriately stamped. If major changes or corrections are necessary, the shop drawing may be rejected and one (1) set will be returned to the Contractor with such changes or corrections indicated, and the Contractor shall correct and resubmit the shop drawings in quadruplicate, unless otherwise directed by the Engineer. No changes shall be made by the Contractor to resubmitted shop drawings other than those changes indicated by the Engineer, unless such changes are clearly described in a letter accompanying the resubmitted shop drawings.

The review of such shop drawings and catalog cuts by the Engineer shall not relieve the Contractor from responsibility for correctness of dimensions, fabrication details, and space requirements or for deviations from the Contract Drawings or Specifications unless the Contractor has called attention to such deviations in writing by a letter accompanying the shop drawings and the Engineer approves the change or deviation in writing at the time of submission; nor shall review by the Engineer relieve the Contractor from the responsibility for errors in the shop drawings. When the Contractor does call such deviations to the attention of the Engineer, the Contractor shall state in his letter whether or not such deviations involve any deduction or extra cost adjustment.

2.03 TRANSMITTAL OF CONTRACTOR'S SUBMITTAL FORM

A. Each shop drawing submittal shall be accomplished by a Transmittal of Contractor's Submittal form. The form shall be completely filled in with all applicable information; failure to do so shall result in immediate rejection of the submitted items.

2.04 SHOP DRAWING REQUIREMENTS

A. Shop drawings referred to herein shall include shop drawings and other submittals for both shop and field-fabricated items. The Contractor shall submit, as applicable, the following for all prefabricated or manufactured structural, mechanical, electrical, plumbing, process systems, and equipment:

1. GENERAL

a. Shop drawings or equipment drawings, including dimensions, size and location of connections to other work, and weight of equipment.

b. Catalog information and cuts.

c. Installation or placing drawings for equipment, drives, and bases.

d. Supporting calculations for equipment and associated supports, or hangers required or specified to be designed by equipment manufacturers.

e. Complete manufacturer's specifications, including materials description and paint system.

f. Performance data.

g. Suggested spare parts list with current price information.

h. List of special tools required for checking, testing, parts replacement, and maintenance. (Special tools are those which have been specially designed or adapted for use on parts of the equipment, and which are not customarily and routinely carried by maintenance mechanics.)

i. List of special tools furnished with the equipment.

j. List of materials and supplies required for the equipment prior to, and during start-up.

k. List of materials and supplied furnished with the equipment.

l. Samples of finish colors for selection.

m. Special handling instructions.

n. Requirements for storage and protection prior to installation.

o. Requirements for routine maintenance required prior to start-up.

2.05 SUBMITTALS REQUIRED FOR FOREIGN-MANUFACTURED ITEMS

A. In addition to the submittal requirements stated above, suppliers of foreign-manufactured items shall submit the names and addresses of companies within the United States that maintain technical service representatives and complete inventory of spare parts and accessories for each foreign-made item proposed for incorporation into the work. Failure to prove the foregoing capabilities shall be just cause for rejection of the foreign-manufactured items.

2.06 RECORD DRAWINGS

A. The Engineer will prepare a set of Record Drawings for the project which will include the changes made in materials, equipment, locations, and dimensions of the work. Two weeks prior to Final Inspection, the Contractor shall submit to the Engineer a current listing and description including marked-up prints of each change incorporated into the work since the preceding submittal.

2.07 SUBMITTAL OF INTERFACE INFORMATION (CONNECTION AND CORRELATION WITH OTHER WORK)

A. Where called for on the Specifications, and as determined necessary by the Engineer to provide proper correlation with other equipment, complete interface information shall be submitted. This interface information shall be accurate, and contain all information necessary to allow the completion of detail design and construction of the interfacing or connecting work. The Contractor shall include in his negotiation for subcontract work, such agreements as may be necessary to ensure the accuracy of subcontractor's interface submittal information. In the event additional costs are incurred due to subsequent changes to information given in said interface information, such additional costs shall be borne by the Contractor.

2.08 SAMPLES AND TEST SPECIMENS

A. Where required in the Specifications, test specimens or samples of materials, appliances, and fittings to be used or offered for use in connection with the Work shall be submitted to the Engineer at the Contractor's expense, with information as to their sources, with all cartage charges prepaid, and in such quantities and sizes as may be required for proper examination and tests to establish the quality or equality thereof, as applicable.

B. All samples and test specimens shall be submitted in ample time to enable the Engineer to make any tests or examinations necessary without delay to the work. The Contractor will be held responsible for any loss of time due to his neglect or failure to deliver the required samples to the Engineer, as specified.

C. The Contractor shall submit additional samples as required by the Engineer to ensure equality with the original approved sample and/or for determination of Specification compliance.

D. Laboratory tests and examinations that the Owner elects to make at its own laboratory will be made at no cost to the Contractor, except that, if a sample of any material or equipment proposed for use by the Contractor fails to meet the Specifications, the cost of testing subsequent samples shall be borne by the Contractor.

E. All tests required by the Specifications to be performed by an independent laboratory shall be made by an approved laboratory. Certified test results of all specified tests shall be submitted in duplicate to the Engineer. The samples furnished and the cost for the laboratory services shall be at the expense of the Contractor and included in the prices bid for the associated work.

2.09 CERTIFICATES OF COMPLIANCE

A. A Certificate of Compliance shall be furnished for materials specified to a recognized standard or code prior to the use of any such materials in the work. The Engineer may permit the use of certain materials or assemblies prior to sampling and testing if accompanied by a Certificate of Compliance. The certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials and shall state that the materials involved comply in all respects with the requirements of the Specifications. A Certificate of Compliance shall be furnished with each lot of material delivered to the work and the lot so certified shall be clearly identified in the certificate.

B. All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the requirements of the Contract Documents and any such material not conforming to such requirements will be subject to rejection whether in place or not.

C. The Engineer reserves the right to refuse permission for use as material on the basis of a Certificate of Compliance.

D. The form of the Certificate of Compliance and its disposition shall be as directed by the Engineer.

E. Where Certification of Compliance is required in the Technical Specifications, the Contractor shall obtain from the supplier/manufacturer a certification stating that the particular piece of equipment or system will satisfy all requirements stated in the related Specification Section(s).

2.10 PAYMENT

A. Payment for the work in this Section will be included as part of the unit price bid amounts stated in the proposal.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. General Quality Control.

B. Workmanship.

C. Manufacturer's Instructions.

D. Manufacturer's Certificates.

E. Mockups.

F. Manufacturers' Field Services.

1.02 RELATED REQUIREMENTS

A. Section 01300 - Submittals

1.03 QUALITY CONTROL, GENERAL

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

1.04 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.05 MANUFACTURERS' INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

1.06 MANUFACTURERS' CERTIFICATES

A. When required by individual Specifications Section, submit manufacturer's certificate, in duplicate, that products meet or exceed specified requirements.

1.07 MOCKUPS

Not used.

1.08 MANUFACTURERS' FIELD SERVICES

A. When specified in respective Specification Sections, require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.

B. Representative shall submit written report to Engineer listing observations and recommendations.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT SHIPMENT, HANDLING, STORAGE, AND PROTECTION

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Products.

B. Transportation and Handling.

C. Storage and Protection.

D. Product Options.

E. Products List.

F. Substitutions.

G. Systems Demonstration.

1.02 RELATED REQUIREMENTS

A. Section 01400 - Quality Control

1.03 PRODUCTS

A. Products include material, equipment, and systems.

B. Comply with Specifications and referenced standards as minimum requirements.

C. Components required to be supplied in quantity within a Specification Section shall be the same, and shall be interchangeable.

D. Do not use materials and equipment removed from existing structure.

1.04 TRANSPORTATION AND HANDLING

A. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

C. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

1.05 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

1.06 PRODUCT OPTIONS

A. Not Used.

1.07 PRODUCTS LIST

A. Not Used.

1.08 SUBSTITUTIONS

A. Document each request for substitution with complete data substantiating compliance of proposed substitution with Contract Documents.

B. Request constitutes a representation that Contractor:

1. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.

2. Will provide the same warranty for substitution as for specified product.

3. Will coordinate installation and make other changes which may be required for Work to be complete in all respects.

4. Waives claims for additional costs which may subsequently become apparent.

C. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request, or when acceptance will require substantial revision of Contract Documents, or when said substitution will not result in significant cost savings to the Owner, or result in some material advantage being gained by the Owner.

D. Engineer will determine acceptability of proposed substitution, and will notify Contractor of acceptance or rejection in writing within a reasonable time following the opening of Bids.

E. Only one request for substitution will be considered for each product. When substitution is not accepted, provide specified product.

1.09 SYSTEMS DEMONSTRATION

A. Prior to final inspection, demonstrate operation of each system to Engineer and Owner.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 02200

SITE PREPARATION

PART 1. GENERAL

1.1 SUMMARY

A. Remove interfering or objectionable material from designated areas of Work.

B. Preserve vegetation and existing objects designated to remain from injury or defacement.

C. Cut trees only at direction of Engineer.

D. Contractor shall be responsible for implementing and following a Storm Water Pollution Prevention Plan as required by the Arkansas Department of Environmental Quality.

1.2 DEFINITIONS

A. Clearing:
   1. Cutting, removing, and disposing of trees, snags, stumps, shrubs, brush, limbs, and other vegetative growth.
   2. Removing evidence of their presence from the surface, inclusive of sticks and branches greater than 2 inches in diameter or thickness.
   3. Removing and disposing of trash piles, rubbish, and fencing.

B. Grubbing:
   1. Removing and disposing of wood or root matter below the ground surface remaining after clearing.
   2. Includes stumps, trunks, roots, or root systems greater than 2 inches in diameter or thickness to a depth of 18 inches below the ground surface.

C. Stripping: Removing and disposing of organic sod, topsoil, grass and grass roots, and other objectionable material from the areas designated to be stripped that remain after clearing and grubbing.

1.3 RELATED SECTIONS

A. Section 02301 – Site Earthwork.

PART 2. MATERIALS

2.1 GENERAL

A. Provide materials, suitable and in adequate quantity, required to accomplish Work of this Section.

PART 3. EXECUTION

3.1 PREPARATION

A. Review with Engineer's representative the location, limits, and methods to be used prior to commencing Work under this Section.

3.2 CUTTING TIMBER

A. Exercise care when clearing near the clearing limits to avoid damage to existing trees, vegetation, structures, or utilities which are outside of the clearing limits.

B. Trees shall be leveled into the area to be cleared.

C. Flush cut stumps not designated for grubbing by cutting to within 2 inches of the ground surface.

D. Timber is the property of the Contractor.

E. Dispose of stumps, limbs, brush, snags, non-marketable timber, and other vegetative growth off-site.

3.3 PRESERVATION OF TREES, SHRUBS, AND OTHER VEGETATION

A. Trees, shrubbery, and other vegetation not designated for removal shall be protected from damage.

B. Cut and remove tree branches only where, in the opinion of the Engineer, cutting is necessary to effect construction operation.

C. Remove branches other than those required to effect the Work to provide a balanced appearance of any tree, as approved prior to removal.

D. Treat scars resulting from the removal of branches with an approved tree sealant.

3.4 CLEARING AND GRUBBING LIMITS

A. Clear and grub areas within the limits of construction.

B. Clear and grub in stages as the construction area is increased to avoid unnecessary clearing and grubbing.

3.5 DISPOSAL OF CLEARING AND GRUBBING DEBRIS

A. Haul the material from the Work site and dispose of in accordance with state, federal, and local laws. Off-site disposal shall be at the Contractor's sole expense.

3.6 AREAS TO BE STRIPPED

A. The exact depth of stripping shall be determined by the Engineer.

B. Topsoil requirements are specified in Section 02301.

C. Strip areas that are cleared and grubbed.

D. Strip areas in stages to avoid unnecessary stripping.

3.7 DISPOSAL OF STRIPPINGS

A. Do not mix strippings with borrow excavation.

B. Stockpile topsoil from the strippings for use in landscape grading.

C. Dispose of excess topsoil.

D. Strippings not suitable for use as topsoil shall become the property of the Contractor and shall be removed from the site.

END OF SECTION

SECTION 02220

DEMOLITION AND REMOVAL OF FACILITIES

PART 1. GENERAL

1.1 SECTION INCLUDES

A. Labor and material that is necessary for the work associated with the removal of the existing facilities as shown on the Drawings.

1.2 RELATED SECTION

A. Section 02200 - Site Preparation.

B. Section 02301 – Site Earthwork.

C. Section 02900 - Landscaping.

1.3 SAFETY REQUIREMENTS

A. Work shall be done in conformance with federal, state, and local rules and regulations pertaining to safety and as specified elsewhere in these Specifications.

1.4 SALVAGE

A. Salvageable piping, valves, and materials removed during demolition are the property of the Owner. Place on the site in an area designated by the Owner.

PART 2. PRODUCTS

Not Used.

PART 3. EXECUTION

3.1 PREPARATION

A. Make provisions to prevent the entrance of surface runoff from entering the area of excavation.

B. Coordinate any disconnect and capping of services with Owner before starting demolition.

C. Protect existing structures and underground utilities within the Work area from being damaged during demolition.

3.2 DEMOLITION AND REMOVAL

A. Excavate to the minimum extent necessary.

B. Dispose of demolition debris at a site approved by the Owner. Otherwise, to the nearest state approved landfill permitted to receive waste.

3.3 BACKFILLING

A. Begin backfilling excavated areas after receiving approval from Engineer.

B. Backfill in accordance with Section 02315.

C. Material excavated during demolition may be used as backfill.

D. Import backfill as required.

END OF SECTION

SECTION 02301

SITE EARTHWORK

PART 1. GENERAL

1.1 SUMMARY

A. Perform earthwork.

B. Meet requirements for excavation safety, or to facilitate construction due to wet conditions.

C. Perform excavation regardless of type, nature, or condition of materials encountered.

D. Contractor shall make his own estimate of the type and extent of the various materials to be excavated in order to accomplish the work.

1.2 RELATED SECTIONS

A. Section 02315 - Trench Excavation, Backfill, and Compacting.

1.3 REFERENCES

A. Arkansas State Highway and Transportation Department, Standard Specifications for Highway Construction, latest edition.
   1. AHTD Section 303 - Aggregate Base Course.

B. American Society for Testing and Materials, 1916 Race St. Philadelphia, PA 19103.
   1. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49-kg) Rammer and 12-in. (304.8-mm) Drop.
   2. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb (4.54-kg) Rammer and 18-in. (457-mm) Drop.
   4. ASTM D2216 - Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
   5. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   6. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place of Nuclear Methods (Shallow Depth).

C. Occupational Safety and Health Administration (OSHA) Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P - Excavations.

1.4 DEFINITIONS

A. Relative Compaction:
   1. The ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by the Standard Proctor Test, ASTM D698, or as determined by the Modified Proctor Test, ASTM D1557, as applicable.
   2. Corrections for oversize material may be applied to either the as-compacted field dry density or the maximum dry density, as determined by the Architect.

B. Optimum Moisture Content:
   1. Moisture content of the material for which the maximum dry density is obtained as determined by ASTM D698 or D1557.
   2. Field moisture contents shall be determined on the basis of the fraction passing the 3/4-inch sieve.

C. Completed Course: A course or layer that is ready for the next layer or the next phase of construction.

1.5 SUBMITTALS

A. Submit in accordance with the Frontend Documents.

B. Provide the following:
   1. Samples of imported material.
   2. Samples of onsite material to be used as fill.
   3. Certification that imported materials conform to the Specification requirements along with copies of the test results from a qualified commercial testing laboratory.
   4. Proctor curves on fill material as prepared by approved laboratory.

1.6 PROJECT CONDITIONS

A. Beginning work of this Section means acceptance of existing conditions.

B. Unit Prices: Measure undercut of soil and placement and compaction of fill by cubic yard. Refer to bid form.

PART 2. PRODUCTS

2.1 FILL

A. Free from roots, organic matter, trash, and debris with maximum particle size of 1-1/2 inches.

B. It is intended that structural backfill material be obtained from on site to the maximum extent possible.

2.2 IMPORTED GRANULAR FILL

A. Provide granular fill beneath structures as noted on Drawings.

B. Imported granular fill to consist of a natural or artificial mixture of gravel and soil mortar, uniformly well graded from coarse to fine.

C. Conform to the AHTD Section 303 classifications for Class 7 as designated on the Drawings.

2.3 TOPSOIL

A. Selected topsoil at the site, properly stored and protected, free from roots, sticks, hard clay, and stones which will not pass through a 2-inch square opening.

B. Provide imported topsoil of equal quality if required to accomplish the work.

2.4 COMPACTION EQUIPMENT

A. Provide compaction equipment of suitable type and adequate to obtain the densities specified.

B. Operate compaction equipment in strict accordance with the manufacturer's instructions and recommendations.

C. Hand-operated equipment shall be capable of achieving the specified densities.

2.5 MOISTURE CONTROL EQUIPMENT

A. Provide equipment for applying water of a type and quality adequate for the work; it shall not leak; and be equipped with a distributor bar or other approved device to assure uniform application.

B. Provide equipment for mixing and drying out material consisting of blades, discs, or other approved equipment.

2.6 WATER REMOVAL EQUIPMENT

A. Provide and operate equipment adequate to keep excavation and trenches free of water.

2.7 IMPORTED MATERIAL ACCEPTANCE

A. Import only if insufficient material is available on-site.

B. Locate and arrange use of a site near the construction area for obtaining borrow material.

C. Additional tests required at the borrow area:
   1. Standard Proctor.
   2. Remolded permeability.
   3. Atterberg limits.

D. Upon completion of removal of borrow material, grade the site to drain, place topsoil on disturbed areas, and establish grass as outlined in Section 02900.

E. Cost for testing and imported material shall be the responsibility of the Contractor.

2.8 SELECTED MATERIAL ACCEPTANCE

A. Provide samples for testing representative of the actual material to be installed in the work. Take samples from each 2,000 cubic yards of material stockpiled. Depending on the uniformity of the material, Architect may request more frequent samples.

B. Forward test results to the Architect at least 10 days before the material is required for use. If tests indicate that the material does not meet Specification requirements, the material shall not be installed in the work.

C. Material which is placed in the work but does not conform to the Specification requirements shall be removed and replaced at the Contractor's sole expense.

PART 3. EXECUTION

3.1 STRIPPING TOPSOIL

A. Remove existing grass and overburden before excavating topsoil.

B. Prior to beginning excavation or fill, strip the topsoil to a depth of at least 6 inches or to a depth sufficient to remove organic material and stockpile for future use.

C. In general, remove topsoil where structures are to be built, trenches dug, and roads, parking lots, walks, and similar improvements constructed within the areas presently covered with topsoil.

D. Store topsoil clear of the construction area.

E. Take reasonable care to prevent the topsoil from becoming mixed with subsoil or eroding.

3.2 STRUCTURAL EXCAVATION

A. Contractor shall be solely responsible for trench and excavation safety systems in accordance with ACT 291 of 1993 and OSHA requirements.

B. Identify required lines, levels, and grades.

C. Identify known underground utilities. Contractor will be responsible for locating utilities.

D. The method of excavation is optional, however, no equipment shall be operated in a manner that will endanger existing structures and their integrity.

E. Use excavation support system such as sheet piling where ever necessary.

F. Allow for forms, working space, granular base, and finish topsoil where shown on Drawings or required.

G. Do not carry excavation for footings and slabs deeper than the elevation shown on Drawings after allowing for base material. Excavation of material to depths below the grades indicated, unless so directed by the Architect or Owner's representative, will be deemed unauthorized excavation.

H. After required excavation, proof-roll site with minimum 20,000 lb. pneumatic-tired roller, loaded tri-axle dump truck, or similar equipment. Remove soft and organic-containing soil, miscellaneous debris, and roots. Fill and compact areas.
   1. Provide for observation of each paving area by geotechnical engineer to assess adequacy of bearing stratum. If observation indicated excessively soft and/or organic-containing soils, undercut, fill and compact areas and/or extend footing as directed by geotechnical engineer.

3.3 DEWATERING EXCAVATION

A. Remove water during periods when concrete is being deposited, pipe is being laid, and placing of backfill unless water settling is required, and at other times as required for efficient and safe execution of the work.

B. Accomplish removal of groundwater in a manner that will preserve the strength of the foundation soils, will not cause instability of the excavation slopes, and will not result in damage to existing structures.

C. Where necessary to these purposes, lower the water level in advance of excavation, utilizing wells, well points, or similar methods.

D. Maintain the water level in the gravel stratum as measured in piezometers, a minimum of 3 feet below the prevailing excavation level or as needed to prevent bottom heave of the excavation.

E. Open pumping, sumps, and ditches: If these result in boils, loss of fines, softening of the ground or instability of slopes, areas shall not be accepted.

F. Install wells and well points with suitable screens and filters so that continuous pumping of fines does not occur.

G. Operate well points continuously to prevent boils and loss of consolidation.

H. Arrange discharge to facilitate collection of samples by Architect.

I. Avoid settlement or damage to adjacent property.

J. Dispose of water in a manner that will not damage adjacent property, as approved.

3.4 GRANULAR FILL MATERIAL UNDER FACILITIES

A. Place fill granular material as specified in this Section within the influence area beneath slabs, walks, structures, roads, and parking areas, and as shown on the Drawings.

B. Do not exceed loose lifts of 6 inches.

C. Compact each lift to not less than 95 Percent Modified Proctor Density.

D. Place and compact a 6-inch layer of granular fill to at least 95 Percent Modified Proctor density immediately beneath spread footings, slabs on grade, or other concrete structures.

E. Moisten material as required to aid compaction (± 2 percent optimum moisture).

F. Place material in horizontal lifts and in a manner to avoid segregation.

G. Correct and repair subsequent damage to slabs, piping, concrete structures, facilities, or other structures caused by settlement of fill material.

3.5 BACKFILL AND STRUCTURES

A. Remove form materials and trash from excavation before placing backfill.

B. Do not operate earth-moving equipment within 5 feet of walls of concrete structures for the purpose of depositing or compacting backfill material.

C. Compact backfill adjacent to concrete walls with hand-operated tampers or similar equipment that will not damage the structure.

D. Backfill water-holding basins only after satisfactory leakage tests have been conducted.

E. Place earth fill in areas not designated to be structural fill or granular fill.

F. Deposit material in maximum 6-inch loose lifts, and compact each lift to not less than 95 Percent Modified Proctor.

3.6 FILL NOT BENEATH STRUCTURES OR FACILITIES

A. Place earth fill to the lines and grades shown.

B. Place fill material in maximum 6-inch loose lifts and compact each lift to not less than 95 Percent Modified Proctor.

C. Make proper allowance for topsoil where required.

3.7 MOISTURE CONTROL

A. During compacting operations, maintain optimum practicable moisture content required for compaction purposes in each lift of fill.

B. Maintain moisture content uniform throughout the lift.

C. Add water to the material at the site of excavation. Supplement, if required, by sprinkling the fill.

D. At the time of compaction, maintain the water content of the material at optimum moisture content, plus or minus 2 percentage points, except as otherwise specified for embankments.

E. Do not attempt to compact fill material that contains excessive moisture.

F. Aerate material by blading, discing, harrowing, or other methods, to hasten the drying process.

3.8 FIELD DENSITY TESTS

A. Test Methods: ASTM D2922, D1556, D2216, and D3017.

B. Cooperate with testing work by leveling small test areas designated by the Architect.

C. Backfill test areas.

D. Field density test shall be performed for every 3,000 cubic yards of fill material placed.

E. Architect may order testing of lift of fill at any time, location, or elevation.

3.9 SITE GRADING

A. Perform earthwork to lines and grades as shown on Drawings with proper allowance for topsoil where specified or shown on Drawings.

B. Shape, trim, and finish slopes to conform with the lines, grades, and cross sections shown.

C. Slopes shall be free of loose exposed roots and stones exceeding 3-inch diameter.

D. Round tops of banks to circular curbs, in general, not less than a 6-foot radius.

E. Neatly and smoothly trim rounded surfaces; over-excavating and backfilling to the proper grade are not acceptable.

F. Finished site grading shall be reviewed by the Architect.

3.10 DISPOSAL OF EXCESS EXCAVATION

A. Dispose of excess excavated materials, not required or suitable for use as backfill or fill, outside of the area of work.

B. Compact excess material as specified for fill, dress the completed disposal area to slopes no greater than 4:1 (horizontal:vertical), and slope to drain.

3.11 SETTLEMENT

A. Settlement in backfill, fill, or in structures built over the backfill or fill, that may occur within the 1-year guarantee period in the General Conditions shall be considered to be caused by improper compaction methods.

B. Restore structures damaged by settlement to original condition.

END OF SECTION

SECTION 02315

TRENCH EXCAVATION, BACKFILL, AND COMPACTING

PART 1. GENERAL

1.1 SUMMARY

A. Work of this Section also includes:
   1. Replacing topsoil that contains regenerative material.
   2. Disposal of trees, stumps, brush, roots, limbs, and other waste materials from clearing operations.
   3. Imported topsoil.
   4. Crush rock backfill required by over-excavation.
   5. Imported pipe zone material.
   6. Trench settlement repair, including replacing roadway surfacing, sidewalk, or other structures.
   7. Replacing damaged culverts.

B. Trench excavation is classified as common excavation and includes removal of material of whatever types encountered including rock to depths shown or as directed by Engineer.

C. Pipe zone includes full width of excavated trench from bottom of pipe to a point 6 inches above top outside surface of pipe barrel.

D. Conform to federal, state, and local codes governing safe loading of trenches with excavated material.

E. The right is reserved to modify the use, location, and quantities of the various types of backfill during construction as Engineer considers to be in the best interest of Owner.

1.2 REFERENCES

A. Arkansas Highway and Transportation Department, P.O. Box 2261, Little Rock, Arkansas 72203, latest edition.
   1. AHTD 303 - Aggregate Base Course.

B. ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959.
   1. ASTM D448 - Classifications for Standard Sizes of Aggregate and Bridge Construction.
   2. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. (2.49-kg.) Rammer and 12-inch (304.8-mm) Drop.

3. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10-lb. (4.54-kg.) Rammer and 18-inch (457-mm) Drop.
4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes.
5. ASTM D2922 - Test Methods for Density of Soils and Soil-Aggregates in Place by Nuclear Method.

C. Occupational Safety and Health Administration (OSHA) Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P = Excavations.

D. The Contractor shall be solely responsible for trench and excavation safety systems in accordance with Act 291 of 1993.

PART 2. PRODUCTS

2.1 FOUNDATION STABILIZATION

A. Crushed gravel or crushed rock, free from dirt, clay balls, or organic material, well graded from coarse to fine, containing sufficient finer material for proper compaction, and meeting ASTM D448 Size No. 67 (Concrete Aggregate).

2.2 PIPE ZONE MATERIAL

A. Select material shall consist of fine loose earth or sand free from clods or rocks larger than 3/4 inches in dimension and of proper moisture content for maximum consolidation.

B. Crushed granular material conforming to ASTM D448, Size No. 67.

C. Washed stone bedding size 1/4-inch to 3/4-inch.

2.3 COMMON FILL MATERIALS

A. Material shall not contain pieces larger than 3 inches, and shall be free of roots, debris, or organic matter.

2.4 SELECT FILL MATERIALS

A. Class 7, Class 3, and Class 4 as established by Section 303 of Arkansas Highway and Transportation Department Standard Specifications for Highway Construction.

B. ASTM Soil Classification GC as set forth in ASTM Designation D2487-92. On site material may be used, provided it is in accordance with ASTM D2487-92.

2.5 BEDDING MATERIAL

A. Pea gravel, sand, or other locally available bedding material, as approved.

2.6 TRENCH BACKFILL

A. Granular Backfill:
   1. Natural or artificial mixture of gravel and soil mortar uniformly well graded from coarse to fine.
   2. AHTD Section 303 Class 3, Class 4, or Class 7 as specified in this Section.

2.7 WATER AND SEWER PIPE TRENCH

A. See Drawings for trench details.

2.8 COMPACTION EQUIPMENT

A. Suitable type and adequate to obtain the amount of compaction specified.

B. Operate in strict accordance with manufacturer's instructions and recommendations and maintain in such condition so that it will deliver manufacturer's rated compactive effort.

2.9 IMPORTED TOPSOIL

A. Suitable sandy loam from an approved source.

B. Must possess friability and a high degree of fertility.

C. Free of clods, roots, gravel, and other inert material.

D. Free of quackgrass, horsetail, and other noxious vegetation and seed.

PART 3. EXECUTION

3.1 PREPARATION

A. Where clearing or partial clearing of right-of-way is necessary, complete prior to start of trenching.

B. Cut trees and brush as near to surface of ground as practicable, remove stumps, and pile for disposal.

C. Do not permit excavated materials to cover brush or trees prior to disposal.

3.2 PREVENT TRENCH WATER AND ANIMALS FROM ENTERING PIPE

A. When pipe laying is not in progress, including noon hours, open ends of pipe shall be closed; and no trench water, animals, or foreign material shall be permitted to enter the pipe.

3.3 DISPOSAL OF CLEARED MATERIAL

A. Dispose of material in such a manner to meet requirements of state, county, and local regulations regarding health, safety, and public welfare.

B. Dispose of nonflammable and flammable material off the construction site in an approved location.

C. Do not leave material on the Project site, shove onto abutting private properties, or bury in embankments or trenches.

3.4 REMOVAL OF OBSTRUCTIONS

A. Remove obstructions within trench area or adjacent thereto such as tree roots, stumps, abandoned piling, logs, and debris.

B. Engineer may, if requested, make changes in the trench alignment to avoid major obstructions, if such alignment changes can be made within the easement or right-of-way without adversely affecting the intended function of the facility.

C. Dispose of obstructions in accordance with this Section.

3.5 REMOVAL AND REPLACEMENT OF TOPSOIL

A. Where trenches cross lawns, garden areas, pasturelands, cultivated fields, or other areas on which reasonable topsoil conditions exist, remove topsoil for a depth of 6 inches for full width of trench to be excavated.

B. Use equipment capable of removing a uniform depth of material.

C. Stockpile removed topsoil at regular intervals, and do not mix with other excavated material.

D. Locate stockpiles so that material of one ownership is not transported and stockpiled on property of another ownership.

E. Minimum finished depth of topsoil over trenches: 5 inches.

F. Imported topsoil may be substituted for stockpiling and replacing topsoil.

G. Maintain finished grade of topsoil level with area adjacent to trench until final acceptance by Engineer.

H. Repair damage to adjacent topsoil caused by work operations.
   1. Remove rock, gravel, clay, and other foreign materials from the surface.
   2. Regrade.
   3. Add topsoil as required.

3.6 TRENCH WIDTH

A. Minimum width of unsheeted trenches where pipe is to be laid shall be 18 inches greater than the outside diameter of the pipe, or as approved.

B. Maximum width at top of trench will not be limited, except where excess width of excavation would cause damage to adjacent structures or property or cause undue stresses on the pipe.

C. Confine trench widths to dedicated rights-of-way or construction easements, unless special written agreements have been made with affected property owner.

3.7 EXCAVATION

A. Excavate trench to lines and grades shown or as established by Engineer with proper allowance for pipe thickness and for pipe base or special bedding when required.

B. If trench is excavated below required grade, correct with foundation stabilization material.

C. Place material over full width of trench in compacted layers not exceeding 6 inches deep to established grade with allowance for pipe base or special bedding.

3.8 PREPARATION OF TRENCH - LINE AND GRADE

A. Do not deviate more than ½ inch from line or ½ inch from grade. Measure for grade at the pipe invert, not at the top of the pipe, because of permissible variation in pipe wall thickness.

B. Grade the bottom of the trench by hand to the line and grade where the pipe is to be laid, with proper allowance for pipe thickness and for pipe base when specified or indicated.

C. Remove hard spots that would prevent a uniform thickness of bedding.

D. Check the grade with a straightedge and correct irregularities found.

E. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

3.9 SHORING, SHEETING, AND BRACING OF TRENCHES

A. Sheet and brace trench when necessary to prevent caving during excavation in unstable material or to protect adjacent structures, property, workers, and the public.

B. Increase trench widths accordingly by the thickness of the sheeting.

C. Maintain sheeting in place until pipe has been placed and backfilled at pipe zone.

D. Remove shoring and sheeting as backfilling is done in a manner that will not damage pipe or permit voids in backfill.

E. Conform to safety requirements of federal, state, or local public agency having jurisdiction for sheeting, shoring, and bracing of trenches; the most stringent of these requirements shall apply.

3.10 LOCATION OF EXCAVATED MATERIALS

A. Place excavated material only within construction easement, right-of-way, or approved working area.

B. Do not obstruct private or public traveled roadways or streets.

3.11 REMOVAL OF WATER

A. Provide and maintain ample means and devices to promptly remove and dispose of water entering trench during time trench is being prepared for pipe laying, during laying of pipe, and until backfill at pipe zone is completed.
   1. These provisions apply during the noon hour as well as overnight.
   2. Provide necessary means and devices, as approved, to positively prevent underwater from entering the construction area of another contractor.

B. Dispose of water in a manner to prevent damage to adjacent property.

C. Drainage of trench water through the pipeline under construction is prohibited.

3.12 FOUNDATION STABILIZATION

A. When existing material in bottom of trench is unsuitable for supporting pipe, excavate unsuitable material.

B. Backfill trench to subgrade of pipe base with foundation stabilization material specified.

C. Place foundation stabilization material over the full width of trench and compact in layers not exceeding 6 inches deep to required grade by making passes with a vibratory compactor (or equivalent).

D. Material shall be considered unsuitable when it contains more than 5 percent organic material by volumetric sampling or when it will not support a reading of 1.5 on a hand penetrometer.

3.13 ROCK IN PIPE TRENCH

A. Where rock is encountered in bottom of trench, support pipe on bedding material.

B. Minimum Bedding Thickness: Minimum of 4 inches or one eighth of the outside diameter of pipe, whichever is greater.

C. Extend bedding up pipe sides one sixth of outside diameter of the pipe, minimum.

D. Backfill over pipe according to pipe zone type.

3.14 PIPE ZONE BACKFILL

A. Depth of the pipe zone above pipe barrel varies with pipe material.

B. Particular attention must be given to area of pipe zone from flow line to centerline of pipe to ensure firm support is obtained to prevent lateral movement of pipe during final backfilling of pipe zone.

C. Backfill area of pipe zone from bottom of pipe to horizontal centerline of pipe by hand-placing material around pipe in 4-inch layers.

D. Achieve continuous support beneath pipe haunches by "walking in" and slicing with shovel.

E. Backfill area of pipe zone from horizontal centerline to top of pipe zone with pipe zone material as determined by class of backfill.

F. In lieu of selected material for pipe zone in upper portion of pipe zone, imported pipe zone material approved by Engineer for trench backfill may be substituted.

G. If the Engineer determines that the existing material is insufficient or unsuitable at trench side for selected material for pipe zone in upper portion of pipe zone, provide suitable material from other trench excavation along pipeline or imported pipe zone material.

3.15 TRENCH BACKFILL ABOVE PIPE ZONE

A. When backfill is placed mechanically, push backfill material onto slope of backfill previously placed and allow to slide down into trench.

B. Do not push backfill into trench in such a way as to permit free fall of material until at least 2 feet of cover is provided over top of pipe.

C. Under no circumstances allow sharp, heavy pieces of material to drop directly onto pipe or tamped material around pipe.

D. Do not use backfill material of consolidated masses larger than ½ cubic foot.

3.16 EXCESS EXCAVATED MATERIAL

A. Dispose of excess excavated material off project site in an approved area.

3.17 DRAINAGE CULVERTS

A. Replace drainage culverts which are removed on near right angles to pipe centerline.

B. If pipe cannot be reused or is damaged during removal, dispose of it and provide new pipe.

C. Protect culverts from damage or restore to equivalent condition.

D. Replace culverts to existing lines and grades.

E. Do not replace culverts until proposed pipeline is installed and backfill of trench has been completed to subgrade of culvert.

3.18 PIPE COVER

A. Place select material from excavation over pipe to provide minimum coverage, as shown on Drawings or as directed by Engineer.

3.19 DRAINAGE DITCH RESTORATION

A. Undercrossings of minor drainage ditches not covered in another Specification Section shall be backfilled so that upper 1 foot of material in ditch between ditch banks is clay.

B. Compact material for full ditch width by 6 passes of vibratory compactor (or equivalent).

C. Where indicated on Drawings, provide concrete arch, and/or riprap on ditch banks.

3.20 SETTLEMENT

A. Correct settlement noted in backfill, fill, or in structures built over backfill or fill within warranty period.

3.21 IMPORTED TOPSOIL

A. Should regenerative material be present in soil, remove both surface and root which appears in within 1 year following acceptance of Project in a manner satisfactory to Owner.

END OF SECTION

SECTION 02371

STORM WATER POLLUTION PREVENTION

PART 1. GENERAL

1.1 SUMMARY OF WORK

A. Work shall consist of temporary and permanent storm water pollution prevention measures through the use of berms, sediment basins, sediment dams, fiberglass roving, filter fabric, silt fences, brush barriers, baled straw erosion checks, temporary flexible pipe slope drains and temporary seeding.

B. Temporary storm water pollution prevention measures shall be performed promptly when problem conditions exist or when storm water pollution problems are anticipated in certain areas to minimize soil erosion and siltation. Temporary measures shall be properly maintained until permanent control measures are functioning properly.

C. The Contractor shall comply with all Federal, State and local laws and regulations concerning controlling pollution of the environment. He shall take all necessary precautions to prevent pollution of streams, lakes, ponds and reservoirs with fuel, oils, bitumens, chemicals, soil sedimentation or other harmful materials, and to prevent pollution of the atmosphere from particulate gaseous matter.

1.2 RELATED SECTIONS

A. Section 02200 - Site Preparation.

B. Section 02301 – Site Earthwork.

C. Section 02315 - Trench Excavation, Backfill, and Compacting.

D. Section 02900 - Landscaping.

1.3 At the Preconstruction Conference, or prior to the start of applicable construction, the Contractor shall submit his schedule for the accomplishment of temporary and permanent storm water pollution control work as applicable for clearing and grubbing, trenching and backfill to the Owner and Engineer. The location of the project, nature of the soil, topographic features and proximity to watercourses shall be considered when imposing such limitations.

PART 2. MATERIALS

2.1 SEED AND FERTILIZER

A. Refer to Section 02900.

2.2 STRAW BALES

A. Straw shall be the threshed plant residue of oats, wheat, barley, rye or rice from which the grain has been removed.

2.3 FENCE OR WIRE FABRIC

A. The fence fabric shall be a commercial grade of woven wire fence fabric. The wire fabric shall be a welded wire fabric.

2.4 FILTER FABRIC OR SILT FENCING

A. Nonwoven polypropylene or polyester fabric.

B. Manufacturer: Typar 3401, Trevira S1115, or equal.

2.5 ACCESSORIES

A. Wood or steel stakes. If using steel stakes (rebar), stakes shall have safety caps meeting OSHA requirements.

B. Rectangular hay bales shall be secured with twine or nylon rope.

C. Filter fabric shall be supported by steel or wooden posts and backed with a woven wire fabric for support.

PART 3. EXECUTION

3.1 PERMITTING

A. A Storm Water Pollution Prevention Plan is required since the area to be disturbed is more than one acre.

END OF SECTION

SECTION 02600

PLANT PIPING - GENERAL

PART 1. GENERAL

1.1 SCOPE

A. This Section covers the work necessary to furnish and install, complete, the plant piping specified herein, and as further specified in the detailed piping specifications hereinafter

1.2 GENERAL

A. Like items of material provided hereunder shall be the end products of one manufacturer.

B. See CONDITIONS OF THE CONTRACT and Division 1, GENERAL REQUIREMENTS, which contain information and requirements that apply to the work specified herein and are mandatory for this project.

1.3 PIPE FITTINGS AND COUPLING COMPATIBILITY

A. To assure uniformity and compatibility of piping components in piping systems, fittings and couplings shall be furnished by the same manufacturer.

1.4 SUBMITTALS DURING CONSTRUCTION

A. In addition to the requirements of Section 01300, SUBMITTALS DURING CONSTRUCTION, Division 1, GENERAL REQUIREMENTS, the following information shall be provided:
   1. Shop Drawings: A specific selection of pipe material and joint type for each pipeline.
   2. Drawings of each piping system to the scale shown on the Drawings, locating each support and hanger, identifying the type by catalog number or shop drawing detail number, and showing anchor locations and identifying them by shop drawing detail number.
   3. Shop Drawings shall clearly show the elevations of buried pipelines where they cross one another. Generally, pressurized pipelines must yield to gravity pipelines.
   4. Detail installation drawings, catalog information, and complete component selection list for metal framing pipe support systems in the pipe galleries, trenches, and other locations employing metal framing pipe support systems.
   5. Thrust blocking and pipe restraints shall be provided for all mechanical joint fittings. All thrust blocking shall meet or exceed the requirements shown on the Drawings. For locations where thrust ties are required, the Contractor shall submit calculations of the pipe lengths to be restrained for the Engineer's review. Restrained joints shall comply with ANSI/AWWA A21.51/C151.
   6. Submit manufacturer's written certification that the factory-applied coating system(s) is identical to the requirements specified herein. Where, in the manufacturer’s opinion, the coating system(s) exceeds the requirements specified

herein, submit complete technical literature of the proposed system(s) to the Engineer for review.

1.5 STANDARDS, SPECIFICATIONS, AND CODES

A. Piping systems shall conform to the local codes.

PART 2. PRODUCTS

2.1 GENERAL

A. The materials to be used for the piping systems are shown on the Drawings and called out on the Yard Piping Schedule.

2.2 PIPE JOINTS FOR EXPOSED PIPING

A. Flanged, weld, soldered, or screwed end pipe joints shall be used on exposed piping. Changes in pipe joints shall be submitted with the shop drawings, as specified hereinbefore, for the Engineer's approval.

2.3 PIPE ENDS FOR BURIED PIPING

A. Mechanical joint or push-on joint pipe ends shall be used for all buried ductile iron pipe and fittings. PVC pipe shall be push-on joint. Anchoring of retainer glands with setscrews is not acceptable. Megalug retainer glands are required on all mechanical joint fittings. Megalug retainer glands shall be specifically designed for use on PVC pipe or ductile iron pipe, as applicable.

B. Within the limitations noted above, all pipe materials and joints do not necessarily have to be the same for all lines in a specific service, except that the materials and joints for any particular building, or between any two buildings, or for any particular buried line, shall be the same.

2.4 PIPE MATERIALS

A. Black steel shall comply with Standard AP1-5L, Schedule 40 (standard weight) ASA B36.10. Pipe threads shall comply with standard for pipe threads, API Standard 5B. Pipe joints may be screwed, flanged, or welded. Fitting shall be malleable iron or steel and shall be copper or brass when used with copper or brass pipe or tubing.

2.5 GALLERY AND TRENCH PIPING EXPANSION PROVISIONS

A. All piping in galleries and trenches must be installed to allow for thermal expansion due to the differences between installation and operating temperatures.

2.6 BUILDING PIPING EXPANSION PROVISIONS

A. The Contractor may install additional flexible couplings to facilitate piping installation, provided that he submits complete details describing location, pipe supports, and hydraulic thrust protection. Acceptable types of flexible couplings and expansion joints shall be as follows:

2.7 METALLIC PIPING SYSTEMS

A. Flexible Couplings: Except as noted, flexible couplings for use with steel pipe shall be Dresser, Style 38; Rockwell, Style 411; or equal. Flexible couplings for use with ductile iron pipe shall be Dresser, Style 53 or 153; Rockwell, Style 431; or equal, with zinc-plated bolts and nuts. Thrust ties shall be provided as required and shown to sustain the force developed by 1-1/2 times the operating pressure specified.

B. Transition Couplings: Transition couplings used to connect pipes with small differences in outside diameter shall be Dresser, Style 162; Rockwell, 413; or equal.

C. Flanged Coupling Adapters: Flanged coupling adapters shall be Series 912 for ductile iron piping and Series 913 for steel piping, as manufactured by Rockwell International; or Style 127 for ductile iron piping and Style 128 for steel piping, as manufactured by Dresser Industries, Inc.; or equal. Couplings shall be provided with thrust ties attached to the pipe with welding lugs, cast-in-place lugs, or friction collars. Anchor studs placed perpendicular to the longitudinal axis of the pipe are unacceptable. Thrust protection shall be adequate to sustain the force developed by 1-1/2 times the operating pressures specified.

PART 3. EXECUTION

3.1 GENERAL

A. Prior to the start of the work, submit satisfactory evidence to the Engineer that all insurance coverage requirements have been complied with.

3.2 PIPE PREPARATION AND HANDLING

A. Each pipe and fitting shall be carefully inspected by the Contractor's employee(s) before the exposed pipe or fitting is installed or the buried pipe or fitting is lowered into the trench. The interior and exterior protective coating shall be inspected. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

B. Damaged or flawed pipes will be rejected and promptly removed from the site.

C. Use proper implements, tools, and facilities for the safe and proper protection of the pipe. Carefully handle pipe in such a manner as to avoid any physical damage to the pipe. Do not drop or dump pipe into trenches under any circumstances.

3.3 PREPARATION OF TRENCH - LINE AND GRADE

A. Grade the bottom of the trench by hand to the line and grade to which the pipe is to be laid, with proper allowance for pipe thickness and for pipe base when specified or indicated. Remove hard spots that would prevent a uniform thickness of bedding. Before laying each section of the pipe, check the grade with a straightedge and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

3.4 BELL (JOINT) HOLES

A. At the location of each joint, dig bell (joint) holes of ample dimensions in the bottom of the trench and at the sides where necessary to permit easy visual inspection of the entire joint.

3.5 REMOVAL OF WATER

A. Provide and maintain ample means and devices at all times to remove and dispose of all water entering the trench during the process of pipe laying. The trench shall be kept dry until the pipe laying and jointing are completed. Removal of water shall be in conformance with specifications in Section 02301, SITE EARTHWORK.

3.6 PREVENT TRENCH WATER AND ANIMALS FROM ENTERING PIPE

A. When the pipe laying is not in progress, including the noon hours, the open ends of pipe shall be closed, and no trench water, animals, or foreign material shall be permitted to enter the pipe.

3.7 PIPE COVER

A. Except as otherwise called out on the Drawings, minimum sewer main cover shall be 3 feet below natural grade; and minimum service pipe cover shall be 2.5 feet.

3.8 LAYING BURIED PIPE

A. All buried pipe shall be prepared as hereinbefore specified and shall be laid on the prepared base and bedded to ensure uniform bearing. No pipe shall be laid in water or when, the in the opinion of the Engineer, trench conditions are unsuitable. Joints shall be made as herein specified for the respective types. Take all precautions necessary to prevent uplift and floating of the pipe prior to backfilling.

B. Where the pipe is connected to concrete structures, the connection shall be made as shown. Make connection such that a standard pipe joint is located no more than 36 inches from the structure.

3.9 WALL PIPES AND PIPE SLEEVES

A. Wall pipes and pipe sleeves embedded in concrete walls, floors, and slabs shall be embedded as specified in Section 03300, CAST-IN-PLACE CONCRETE and as shown. Support all pipes embedded in concrete walls, floors, and slabs with formwork to prevent contact with the reinforcing steel. All wall pipes shall be equipped with seepage – prevention rings.

3.10 INSTALLATION OF FLEXIBLE COUPLINGS, FLANGED COUPLING ADAPTERS, AND SERVICE SADDLES

A. Prior to installation, thoroughly clean oil, scale, rust, and dirt from the pipe to provide a clean seat on the gasket. Care shall be taken that the gaskets are wiped clean before they are installed. If necessary, flexible couplings and flanged coupling adapter gaskets may be lubricated with soapy water or manufacturer's standard lubricant before installation on the pipe ends. Install in accordance with the manufacturer's

recommendations. Bolts shall be tightened progressively, drawing up bolts on opposite sides a little at a time until all bolts have a uniform tightness. Workmen tightening bolts shall use torque-limiting wrenches.

3.11 INSTALLATION OF INSULATING FLANGES, COUPLINGS, AND UNIONS

A. Install insulating flanges, couplings, or unions wherever copper and ferrous metal piping are connected, wherever cathodically protected steel lines enter buildings, wherever submerged metallic piping is connected to unsubmerged piping, and where shown on the Drawings. All submerged metallic piping shall be isolated from the concrete reinforcement.

3.12 TESTING - GENERAL

A. Representatives of the Decatur Water Department shall be present when water or sewer pipelines are tested.

B. Conduct pressure and leakage tests on all newly installed pipelines. Furnish all necessary equipment and material and make all taps in the pipe, as required. The Engineer will monitor the tests. Test pressures shall be 150% of normal operating pressures except where governing codes or regulations specify higher test pressures, or as otherwise specified.

3.13 TESTING NEW PIPE WHICH CONNECTS TO EXISTING PIPE

A. New pipelines which are to be connected to existing pipelines shall be tested by isolating the new pipe with the required valves or with grooved end pipe caps, spectacle blinds, or blind flanges.

3.14 PREPARATION AND EXECUTION - BURIED PIPING

A. Conduct final acceptance tests on buried piping that is to be hydrostatically tested after the trench has been completely backfilled. The Contractor may, if field conditions permit, as determined by the Engineer, partially backfill the trench and leave the joints open for inspection and conduct an initial service leak test. The acceptance test shall not, however, be conducted until all backfilling has been completed.

3.15 EXPOSED PIPING

A. Conduct the tests on exposed piping after the piping has been completely installed, including all supports, hangers, and anchors.

3.16 HYDROSTATIC LEAK TESTS - EQUIPMENT

A. Furnish the following equipment for the hydrostatic tests:

Amount	Description
2	Graduated containers
2	Pressure gauges
1	Hydraulic force pump
	Suitable hose and suction pipe as required.

3.17 TEST PROCEDURE FOR EXPOSED PIPING

A. Water shall be used as the hydrostatic test fluid unless otherwise specified. Test water shall be clean and shall be of such quality as to minimize corrosion of the materials in the piping system. Vents at all high points of the piping system shall be opened to purge air pockets while the piping system is filling. Venting during the filling of the system also may be provided by the loosening of flanges having a minimum of four bolts or by the use of equipment vents. All parts of the piping system shall be subjected to the test pressure specified. The hydrostatic test pressure shall be continuously maintained for a minimum time of 30 minutes and for such additional time as may be necessary to conduct examinations for leakage. Examination for leakage shall be made at all joints and connections. The piping system, exclusive of possible localized instances at pump or valve packing, shall show no visual evidence of weeping or leaking. Any visible leakage shall be corrected at the Contractor's sole expense.

3.18 TEST PROCEDURE FOR BURIED WATER AND WASTEWATER PRESSURE LINES

A. Some leakage is permissible from buried water and wastewater pressure lines. Consequently, the hydrostatic testing of these pipelines must be conducted in a different manner, as follows:

1. Where any section of pipe is provided with concrete thrust blocking, do not make the pressure test until at least 5 days have elapsed after the thrust blocking is installed. If high-early cement is used for thrust blocking, the time may be reduced to 2 days. When testing cement-mortar lined piping, slowly fill the section of pipe to be tested with water and allow to stand for 24 hours under slight pressure to allow the cement-mortar lining to absorb water.
2. Expel all air from the piping system prior to testing and apply and maintain the specified test pressure by means of the hydraulic force pump. Valve off the piping system when the test pressure is reached and conduct the pressure test for 2 hours, reopening the isolation valve only as necessary to restore the test pressure. The pump suction shall be in a barrel or similar device, or metered so that the amount of water required to maintain the test pressure may be measured accurately. This measurement represents the leakage, which is defined as the quantity of water necessary to maintain the specified test pressure for the duration of the test period. No pipe installation will be accepted if the leakage is greater than the number of gallons per hour as determined by the following formula:

$$L = \frac{ND(P)^{(1/2)}}{7400}$$

In the above formula:

L = Allowable leakage, in gallons per hour
N = Number of joints in the length of pipe tested
D = Nominal diameter of pipe, in inches
P = Average test pressure during the leakage test, in pounds per square inch

3. The Contractor shall correct any leakage greater than the allowance determined under this formula at the Contractor's sole expense.

3.19 INITIAL SERVICE LEAK TESTS - EQUIPMENT

A. Equipment used for initial service leak testing may be the same as that specified under HYDROSTATIC LEAK TESTS hereinbefore, or the pump or compressor connected to the piping system.

3.20 SERVICE LEAK TESTS - PROCEDURE

A. The initial service leak test shall be performed by gradually bringing the piping system up to normal operating pressure and holding it there continuously for a minimum time of 10 minutes. Examination for leakage shall be made at all joints and connections. The piping system, exclusive of possible localized instances at pump or valve packing, shall show no visual evidence of weeping or leaking. Any visible leakage shall be corrected at the Contractor's sole expense.

3.21 TEST RECORDS

A. The Contractor and Engineer, together, shall keep records of each piping system installation during the test. These records shall include:
    1. Date of test
    2. Description and identification of piping tested
    3. Test fluid
    4. Test pressure
    5. Remarks, to include such items as:
        a. Leaks (type, location)
        b. Repairs made on leaks
    6. Certification by Contractor and written approval by Engineer

3.22 INTERIM CLEANING

A. Care shall be exercised during fabrication to prevent the accumulation of weld rod, weld spatter, pipe cuttings and filings, gravel, cleaning rags, etc. within piping sections. All piping shall be examined to assure removal of these and other foreign objects prior to assembly. Shop cleaning may employ any conventional commercial cleaning method if it does not corrode, deform, swell, or otherwise alter the physical properties of the material being cleaned.

3.23 FINAL CLEANING

A. Following assembly and testing and prior to final acceptance, all pipelines installed under this section shall be flushed with water and all accumulated construction debris and other foreign matter removed. Flushing velocities shall be a minimum of 2.5 feet per second. Cone strainers shall be inserted in the connections to attached equipment and left there until cleaning has been accomplished to the satisfaction of the Engineer. Accumulated debris shall be removed through drains 2-inch and larger or by dropping spools and valves.

3.24 CORROSION PROTECTION FOR DUCTILE IRON PIPES - INTERIOR LININGS

A. Epoxy Linings: All ductile iron piping shall meet the requirements of AWWA C550 in regard to fusion bonded epoxy coating inside. See Section 02620.

3.25 DISINFECTION

A. Pipelines intended to carry potable water shall be disinfected before placing in service. Disinfecting procedures shall conform to AWWA C-651, latest revision as hereinafter modified or expanded.

B. Flushing: Before disinfecting, flush all foreign matter from the pipeline. Provide hoses, temporary pipes, ditches, etc. as required to dispose of flushing water without damage to adjacent properties. Flushing velocities shall be at least 2.5 fps. For large diameter pipe where it is impractical or impossible to flush the pipe at 2.5 fps velocity, clean the pipeline in place from the inside by brushing and sweeping, then flush the line at a lower velocity.

C. Disinfecting Mixture: Disinfecting mixture shall be a chlorine-water solution having a free chlorine residual of 40 to 50 ppm. The disinfecting mixture shall be prepared by injecting: (1) A liquid chlorine gas-water mixture; (2) dry chlorine gas; or (3) a calcium or sodium hypochlorite and water mixture into the pipeline at a measured rate while fresh water is allowed to flow through the pipeline at a measured rate so that the combined mixture of fresh water and chlorine solution or gas is of the specified strength.

D. The liquid chlorine gas-water mixture shall be applied by means of a standard commercial solution feed chlorinating device. Dry chlorine gas shall be fed through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine gas or the gas itself must provide means for preventing the backflow of water into the chlorine cylinder.

E. If the calcium hypochlorite procedure is used, first mix the dry powder with water to make a thick paste, then thin to approximately a 1 percent solution (10,000 ppm chlorine). If the sodium hypochlorite procedure is used, dilute the liquid with water to obtain a 1 percent solution. The following proportions of hypochlorite to water will be required:

Product	Quantity	Water
Calcium Hypochlorite (1) (65 to 70 percent Cl)	1 lb	7.5 gal.
Sodium Hypochlorite (2) (5.25 percent Cl)	1 gal	4.25 gal.

1. Comparable to commercial products known as HTH, Perchloron, and Pittchlor
2. Known as liquid laundry bleach, Clorox, Purex, etc.

3.26 POINT OF APPLICATION

A. Inject the chlorine mixture into the pipeline to be treated at the beginning of the line through a corporation stop or suitable tap in the top of the pipeline. Clean water from the existing system or another source shall be controlled so as to flow slowly into the newly installed piping during the application of chlorine. The rate of chlorine mixture flow shall be in such proportion to the rate of water entering the pipe that the combined mixture shall contain 40 to 50 ppm of free available chlorine. Valves shall be

manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Use check valves if necessary.

3.27 RETENTION PERIOD

A. Treated water shall be retained in the pipeline long enough to destroy all nonspore-forming bacteria. With proper flushing and the specified solution strength, 24 hours is adequate. At the end of the retention period, the disinfecting mixture shall have a strength of at least 10 ppm of chlorine.

B. Operate all valves, hydrants, and other appurtenances during disinfection to assure that the disinfecting mixture is dispersed into all parts of the line, including dead ends, new services, and similar areas that otherwise may not receive the disinfection solution.

C. Do not place concentrated quantities of commercial disinfectants in the line before it is filled with water.

D. After chlorination, flush the water from the permanent source of supply until the water through the line is equal chemically and bacteriologically to the permanent source of supply.

3.28 DISPOSAL OF DISINFECTING WATER

A. Dispose of disinfecting water in an acceptable manner that will protect the public and publicly used receiving waters from harmful or toxic concentrations of chlorine. Do not allow disinfecting water to flow into a waterway without adequate dilution or other satisfactory method of reducing chlorine concentrations to a safe level.

B. The Contractor shall meet all requirements of the Arkansas State Plumbing Code.

3.29 SAMPLING DISINFECTED MAINS

A. After disinfecting and flushing water mains, collect two samples (one each on successive days) from each segment of the water main. Submit samples to the Arkansas Department of Health for testing. If samples fail, resample the main on two successive days, and continue resampling until two samples taken on successive days are approved by the Health Department. When approval of these samples is obtained, the water main segment can then be put in service.

3.30 POTABLE WATER AND SEWER LINE CROSSINGS

A. Where potable water and sewer lines necessarily cross, the water line should be at least 18-inches superior, crown to invert, to the sewer line, with the pipeline initial backfill (from bedding to 12-inches above pipe), compacted with clay. Where vertical separation is less than 18-inches, steel encasement shall be installed on the water line or sewer line. The cost of the clay liner and/or steel encasement shall be included in the cost for the sewer or water pipe.

END OF SECTION

SECTION 02620

DUCTILE IRON PIPE, FITTINGS, AND VALVES

PART 1. GENERAL

1.1 SUMMARY

A. Provide epoxy-lined ductile iron pipe and cast iron or ductile iron fittings and valves as shown or called out with AWWA C550 fusion bonded epoxy coating inside. The material used for lining ductile iron pipe and fittings must have a successful history of protecting pipe lines in sewer service. The material must be a high build multi-component amine cured Novalac Epoxy lining. The standard of quality is Protecto 401 Ceramic Epoxy lining and written certification of compliance will be required with the pipe material submittal per Section 01300 of this Manual. As an alternative to the Protecto 401 standard, SuperCoat lined ductile iron pipe may be provided as manufactured by Griffin Pipe Products Company. The lining shall consist of a 0.125-inch lining of calcium aluminate cement and calcium aluminate aggregate to result in a coating with long term resistance to sanitary sewage

B. Pipe and valves shall be manufactured in the United States.

C. Service shall be for sanitary sewers and all items mentioned in this section of the manual are to be provided with coatings and finishes that are consistent with that type of application whether specifically called out, or not.

D. The specifications presented in this section of the Project Manual may be waived by the Engineer where they conflict with other sections of this manual that address particular items of equipment (examples: SBR system; disk filter; sludge press). In those cases, the types/materials of construction for piping, fittings, and valves shall be as recommended by the manufacturer of that particular item of equipment with the express understanding by the Engineer that the manufacturer is well-informed as to the intended application of the equipment and the operating conditions to be encountered (i.e. domestic-strength wastewater) and is providing the required warranties.

1.2 RELATED SECTIONS

A. Section 01300 – Submittal of pipe and lining specifications PRIOR TO ordering is absolutely required. Also, air piping gasket material must be submitted for Engineer's approval.

B. Section 02315 - Earthwork, Trench Excavation and Backfilling.

1.3 REFERENCES

A. American National Standards Institute, 1430 Broadway, New York, New York 10018.
   1. ANSI A21.11 - Standard for Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
   2. ANSI A21.14 - Ductile Iron Fittings 3 in. Through 24 in., for Gas.
   3. ANSI A21.15 - Standard for Flanged Ductile Iron Pipe with Threaded Flanges.
   4. ANSI A21.4 - Standard for Cement-Mortar Lining for Ductile Iron Pipe and Fittings.
   5. ANSI A21.5 - Standard for Polyethylene Encasement for Ductile Iron Pipe.
   6. ANSI A21.53: Ductile Iron Compact Fittings 3" thru 16" for water and other liquids.
   7. ANSI B16.1 - Standard for Cast Iron Pipe Flanges and Flanged Fittings.
   8. ANSI B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges.

B. American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.
   1. ASTM A307 - Specifications for Carbon Steel Externally Threaded Standard Fasteners.
   2. ASTM A563 - Specification for Carbon and Alloy Steel Nuts.
   3. ASTM A746 - Ductile Iron Gravity Sewer Pipe.
   4. ASTM D1248 - Specification for Polyethylene Plastic Molding and Extrusion Materials.

C. American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado 80235.
   1. AWWA C110 - Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in., for Water and Other Liquids.
   2. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
   3. AWWA C115 - Standard for Flanged Ductile-Iron Pipe with Threaded Flanges.
   4. AWWA C153 - Ductile Iron Compact Fittings 3" thru 16" for water and other liquids.
   5. AWWA C207 - Standard for Steel Pipe Flanges for Waterworks Service, Sizes 4 in. Through 144 in.
   6. AWWA C508 - Standard for Swing Check Valves for Waterworks Service.
   7. AWWA C515 - Standard for Reduced Wall, Resilient Seated Gate Valve for Water Service.
   8. AWWA C550 - Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.

PART 2. PRODUCTS

2.1 PIPE

A. Above Grade and Buried Pipe: Class 250 minimum and comply with applicable requirements of ANSI A21.50. All above-grade Ductile Iron Pipe shall be flanged pipe. Flanged pipe shall meet ANSI/AWWA C115/A21.15.

B. Pipe shall be jointed with push-on mechanical, flanged, restrained, or flexible joints meeting applicable requirements of ANSI A21.11 and ANSI 21.15. Above-grade/exposed pipe shall have flanged joints. Below-grade/buried pipe shall have either mechanical or push-on joints.

C. Ductile iron pipe shall receive standard thickness epoxy in conformance with applicable standards for ductile iron sanitary sewer pipe.

D. Buried ductile iron pipe shall be coated on the exterior with either coal tar or asphalt base material approximately 1 mil thick in accordance with ANSI / AWWA C110 / A21.10.

E. Above grade pipe shall be factory primed with high solids epoxy primers suitable for interior, exterior or immersion service and aggressive exposure. The primer shall be 3 to 8 mils dry film thickness and shall be TNEMEC Kansas City, MO or equal per ACIPCO Primer No. 2.

2.2 FITTINGS

A. Gray or ductile iron, 250 psi pressure class, epoxy-lined. Where taps are shown on fittings, tapping bosses shall be provided.
   1. Flanged Joint: ANSI/AWWA C110 / AZI.10 and ANSI B16.1, faced and drilled 125-pound ANSI standard.
   2. Mechanical Joint: ANSI/AWWA C111 or C153 and ANSI/AWWA C111.
   3. No fittings shall have push-on joints.

B. Linings: epoxy-lined in accordance with ANSI standards for ductile iron sanitary sewer pipe.

C. Fittings shall receive the same exterior coating as specified for pipe in paragraph 2.1 of this section.

D. Fittings shall have distinctly cast on them the manufacturer's identification, pressure rating, nominal diameter of openings, and the number of degrees or fraction of the circle on bends.

2.3 FLANGES

A. ANSI A21.15/AWWA C115, threaded, 250 psi working pressure, ANSI 125-pound drilling.

B. Flanged Coupling Adapter
   1. Rockwell Series 912 (cast iron) or 913 (steel)
   2. Ford Series 200 or 400 AUni-Flange@ adapter flanges.
   3. McWayne/Clow Ductile Union Flange.
   4. Viking Johnson Maxidaptor or Maxifit
   5. *Smith-Blair #913*
   6. Or equal.

C. Pipe Couplings
   1. Rockwell Series 411 (steel) or Series 431 (cast iron)
   2. Dresser Style 32
   3. Viking Johnson Maxifit
   4. Or equal.

2.4 BOLTS

A. For Class 125 FF flanges use carbon steel, ASTM A307, Grade A hex head bolts and ASTM A563, Grade A hex head nuts.

B. For mechanical joint use alloy steel tee head bolt with hexnut.

2.5 GASKETS

A. Gaskets for mechanical joints shall be rubber (SBR), conforming to ANSI A21.11, AWWA C111.

B. Gaskets for flanged joints for liquid-bearing pipelines shall be 1/8-inch thick, cloth-inserted rubber conforming to applicable parts of ANSI B16.21 and AWWA C207.

C. Gasket Material: Free from corrosive alkali or acid ingredients and suitable for use in sanitary sewer pipelines.

D. Gaskets shall be full-face type for 125-pound FF flanges.

E. Special gasket material (viton or equal) will be required for aeration piping to SBR units, etc. See information on the Drawings. A submittal for air piping gasket material is required.

2.6 LUBRICANT

A. Lubricant for push-on or mechanical joint end piping shall be manufacturer=s standard.

2.7 PIPE MANUFACTURERS

A. American

B. McWayne/Clow

C. U. S. Pipe

D. Or equal.

2.8 KNIFE GATE VALVES

A. Design: Wafer type gate valves with port areas of 100% of pipe size for use with wastewater containing abrasives. Valve shall be bonnetless with end connections suitable to match pipe flanges of the same size. Gate valves are to be used only on water line piping or wastewater piping already treated by the disk filter.

B. Materials:
   1. Body - AISI 1020/1025 steel with ANSI B16.5 class 150 drilling dimensions with epoxy coating.
   2. Gate - ASTM A240 T-316 stainless steel; Teflon coated.
   3. Valve Seat / Seals - Gum Rubber, EPDM or Buna N as recommended by manufacturer=s for use with municipal sewage.
   4. Stem - ASTM A276 - T304 stainless steel with stem nut of bronze.

C. Working Pressure: Rated at no less than 100 psi.

D. Actuator: Manually activated by handwheel.

E. Flush Port: Provide drilled flush port in the base of valve with plug.

F. Manufacturer: Red Valve Flexgate, Carnegie, PA or equal.

2.9 GATE VALVE

A. Design: Resilient wedge type gate valve in conformance with AWWA C515.

B. Materials:
   1. Body - ASTM A536 Ductile Iron, with AWWA C550 fusion bonded epoxy coating inside and out.
   2. Wedge - ASTM A536 Ductile Iron coated with nitrile rubber, symmetrical and seal equally well with flow in either direction.
   3. Stem - Manganese bronze.
   4. Bolting - ASTM A307, SAE grade 2 steel.
   5. Seals - Nitrile rubber, multiple AO@ rings around stem and replaceable with valve fully open and under pressure.

C. Working Pressure: 200 psi.

D. Connections - Per the drawings.
   1. Mechanical Joint - per ANSI/AWWA C111 / A21.11
   2. Flanged - per ANSI/AWWA C110/A21.10 (Class 125 ANSI 16.1)

E. Manufacturer:
   1. American Flow Control Series 2500
   2. Mueller A-2560-20
   3. Or equal.

2.10 PLUG VALVE

A. Design: Use PEC eccentric plug for on-off control of gravity flow for use in raw sewage or sludge. 901 rotation. Use PEF (100% full port) eccentric plug valve for shut- off on force main sewers.

B. Materials:
   1. Body - ASTM A126 Grade B Cast Iron with welded nickel seat per AWWA C507 Section 7.2.
   2. Plug - Resilient neoprene facing per AWWA C504 Section 2.2.
   3. Bearings - Corrosion resistant per AWWA C504 Section 3.6 and AWWA C507 Section 8.
   4. Shaft Seal - Multiple AV@ ring packing that are replaceable without valve disassembly per AWWA C504 Section 3.7 and C507 Section 10.2.

C. Working Pressure: 175 psi.

D. Connections: Flanged per ANSI / AWWA C110/A21.10 (Class 125; B16.1)

E. Actuator: Manual actuator with handwheel including corrosion resistant bearings not requiring continual lubrication.

F. Manufacturer:
   1. DeZurik Series 100
   2. Or equal.

2.11 CHECK VALVE

A. Design: Swing check valve for unsubmerged conditions with raw sewage and sludge service following pumps and complying with AWWA C508. For submerged pump conditions, use check valves recommended by that specific pump manufacturer.

B. Materials:
   1. Body - ASTM A126 Grade B Cast Iron with ASTM B763 bronze seating.
   2. Clapper - ASTM A536 Grade 65-45-12 Ductile Iron.

3. Shaft - ASTM A582 Type 416 stainless steel with corrosion resistant bearings at each end and double AO@ ring for shaft extended.
4. Operating Mechanism - Lever and spring type.

C. Features: The check valve shall allow the clapper and arm assembly to be removed from the body while the valve remains in line. Provide a plug in the valve body upstream of the clapper to allow installations of air release piping per the drawings.

D. Working Pressure: 200 psi

E. Connections: Flange per ANSI / AWWA C508.

F. Manufacturer:
1. American Flow Control Series 50-SC
2. Or equal.

2.12 BUTTERFLY VALVES

A. Design: For water, air or filtered wastewater piping shut-off, valves greater than 10" diameter, or where specifically shown otherwise on drawings, use resilient-seated butterfly valves, conforming to AWWA-C504.

B. Materials:
1. Body – Cast Iron
2. Seat – Buna-N; 360º seating; leak-tight.
3. Disc – Air lines material shall be aluminum or bronze; wastewater material shall be cast iron.
4. Stem – 316 SS
5. Upper Bushing – Acetal
6. Disc-Stem Connection – 316 SS

C. Working Pressure – 150 psi

D. Valves 8" and larger shall be provided with a manual gear.

E. Manufacturer: Keystone, DeZurik, Henry Pratt or equal.

2.13 FLANGED COUPLING ADAPTORS

A. The flanged coupling adaptors shall be the equal of Smith-Blair #913, epoxy-lined in accordance with the specification cited in paragraph 1.1.A for ductile iron pipe.

2.14 PINCH VALVE

A. Design: Pinch valve for use with lagoon recycle water. Buried condition. Provide with valve box, stem extension, and square nut operator for buried condition.

B. Materials:
   1. Cast iron body.
   2. Buna-N sleeves
   3. Carbon Steel mechanism
   4. ANSI Class 125/150 flanges

C. Working Pressure: 100 psi

D. Connections: Valve to be flanged on both ends with flanged coupling adaptors connected to each end to mate with plain end PVC.

E. Manufacturer: Red Valve, Series 75, or equal.

PART 3. EXECUTION

3.1 HANDLING PIPE

A. Do not damage the pipe lining when handling the pipe.

3.2 RELATION OF POTABLE WATER LINE TO SEWER LINE

A. Maintain 10-foot horizontal separation and 18-inch vertical separation in crossing when water line is encountered. Where water line is not at least 18-inches above the sewer line at crossings, install 20 ft of watertight casing pipe at the crossing. Provide watertight end seals for the casing.

3.3 CUTTING PIPE

A. Cut pipe with milling type cutter, rolling pipe cutter, or abrasive saw cutter. Do not flame cut.

3.4 DRESSING CUT ENDS

A. Dress cut ends of pipe in accordance with the type of joint to be made.

B. Dress cut ends of mechanical joint pipe to remove sharp edges or projections which may damage the gasket.

C. Dress cut ends of pipe for flexible couplings and flanged coupling adapters as recommended by the coupling or adapter manufacturer.

3.5 MECHANICAL JOINT

A. Join pipe with mechanical joints in accordance with the manufacturer's recommendations. Provide special tools and devices, special jacks, chokers, and

similar items required for proper installation. Pipe manufacturer shall provide lubricant for the pipe gaskets, no substitutes shall be permitted.

3.6 FABRICATION OF FLANGED PIPE AND FITTINGS

A. Flanged pipe and fittings shall be fabricated in the shop, not in the field, and delivered to the job site with flanges in place and properly faced. The exception to this will be at valve locations where it is desired to have the flexibility of removing valve in the event it cannot be repaired in the field. In such cases use flanged coupling adapters where indicated on the drawings.

B. Threaded flanges shall be individually fitted and machine tightened on the threaded pipe by the manufacturer.

C. Flanges shall be faced after fabrication in accordance with ANSI A21.15/AWWA C115.

3.7 JOINTING FLANGED PIPE

A. Prior to connecting flanged pipe, the faces of the flanges shall be thoroughly cleaned of oil, grease, and foreign material.

B. The gaskets shall be checked for proper fit and thoroughly cleaned. ***Note: special viton gaskets are required for air piping associated with blower lines to SBR and ASST units.***

C. Care shall be taken to assure proper seating of the flanged gasket.

D. Bolts shall be tightened so that the pressure on the gasket is uniform.

E. Torque-limiting wrenches shall be used to ensure uniform bearing.

F. If joints leak when the test is applied, the gaskets shall be removed and reset and bolts retightened.

3.8 MATCHING UP TO EXISTING PIPE

A. Where shown on drawings, new pipe will match up to existing pipe.

B. In these cases the use of flanged by plain ended pipe is acceptable.

C. Carefully field measure length and cut plain end accordingly.

D. Use flange coupling adapter or “Uni-Flange” flange adapter to match up with existing flanged pipe or fitting. Provide restraint where required.

E. Install in accordance with manufacturer's direction.

3.9 TESTING

A. Ductile Iron sewer lines shall be hydrostatically tested even though they are installed for use with wastewater. Test procedures shall be as specified in AWWA Standard C600 Installation of Ductile Iron Water Mains and their Appurtenances, Section 4: Hydrostatic Testing; or in the case of lines flowing by gravity the testing by low pressure air in accordance with UNI - B-6 (UNIBELL) Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe shall be employed.

B. Existing lines that are accidentally cut during installation of new adjacent lines shall be repaired and tested as required before backfilling.

END OF SECTION

SECTION 02630

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PART 1. GENERAL

1.1 SCOPE

A. This Section covers the work necessary to furnish and install, complete, the polyvinyl chloride pipe and fittings specified herein, and as specified further in Section 02600, PLANT PIPING – GENERAL.

B. Service shall include pressure water and sewer lines ¾ inches and larger, used at the locations designated on the Drawings. Service shall also include gravity sewer pipe ranging in size from 4 inch and larger, used at the locations designated on the Drawings.

1.2 GENERAL

A. See Section 02600, PLANT PIPEING – GENERAL, and Section 02640, GRAVITY SEWER PIPE, for additional requirements. All piping system components shall be the products of one manufacturer.

PART 2. PRODUCTS

2.1 AWWA PVC PIPE

A. PVC, AWWA C-900 pipe, with outside diameters equivalent to cast iron pipe. Sizes 4-inch through 12-inch, with pressure rating of 200 psi (DR-14), as indicated on the Drawings.

B. PVC, AWWA C-905 pipe with outside diameters equivalent to cast iron pipe. Sizes 14-inch through24-inch, with pressure rating of 235 psi (DR-18), as indicated on the Drawings.

2.2 RURAL WATER PIPE

A. PVC, ASTM D 1784, Type 1, Grade 1, with gasket joints for buried water piping.

B. Pipe class shall be Class 315, SDR 13.5, suitable for static pressures up to 215 psi.

C. Use Class 315 pipe in 2-inch size only. Larger pipe shall be AWWA C-900 or C-905.

2.3 PVC SEWER PIPE

A. PVC, SDR-26 and SDR-21 gravity sewer pipe shall conform to ASTM D1784, D3034 and F679 with gasket joint and integral bell.

2.4 JOINTS

A. For buried pipe, gasketed slip joint.

2.5 FITTINGS

A. Pressure water and sewer pipe fittings shall be epoxy coated ductile iron (unless otherwise called out), mechanical joint with megalug thrust restraints, and as otherwise specified in Section 02620, DUCTILE IRON PIPE, FITTINGS, & VALVES.

B. For junctions between PVC and brass pipe or polyethylene pipe, flexible transition couplings of stainless steel material, as specified in Section 02600.

C. Sewer pipe fittings shall be Class 200 PVC slip joint fittings, as recommended by the pipe supplier for this type of PVC pipe.

D. For junctions between PVC sewer and iron pipe of different outside diameter, flexible transition couplings specifically designed for sewer pipe transition purposes. Couplings shall be made of rubber material with stainless steel bands, as manufactured by Fernco, or approved equal. Couplings shall be of shear resistant design.

2.6 GASKETS

A. As recommended by the pipe manufacturer to conform to the pipe OD.

2.7 WATER STOPS

A. Gravity sewer pipe (PVC) shall utilize ribbed water stops at manhole walls, as recommended by the pipe manufacturer.

2.8 DETECTABLE TAPE

A. Detectable tape shall be "Detect Tape" as manufactured by Allen Systems, Inc. or approved equal, and shall consist of a minimum thickness of 0.35 mils solid aluminum foil encased in a protective inert jacket that is impervious to all known alkalis, acids, chemical reagent and solvents found in the soil. The minimum overall thickness of the tape shall be 5.5 mils and the width shall not be less than 2-inches with a medium unit weight of 2 ½ pounds / 1 inch x 1000 feet.

The tape shall be color coded and imprinted with message as follows:

Type of Utility	Color Code	Legend
Water	Safety Precaution Blue	Caution, Buried Water Line Below
Sewer	Green	Caution, Buried Sewer Line Below

PART 3. EXECUTION

3.1 GENERAL

A. All rigid PVC pipe shall be cut, made up, and installed in accordance with the pipe manufacturer's recommendations.

3.2 TRACE WIRE

A. Furnish and install a 14 gauge insulated copper trace wire with all PVC pipe. Run wire continuous from valve box to valve box, meter box or other access points. Bring wire up inside boxes in an accessible fashion. Wrap wire around, or tape wire to each pipe section. Join wire segments by soldering or by using approved wire nuts. Pipe testing shall include following trace wire. Any wire breaks or incomplete splices shall be repaired by the Contractor at no additional expense. Include trace wire in the unit price bid for pipe.

3.3 DETECTABLE TAPE

A. Install detectable tape over the center of the water and sewer pipe, approximately 18-inches above the top of the pipe.

3.4 TESTING

A. All water lines shall be hydrostatically tested at the pressures listed in Section 02600, PLANT PIPING – GENERAL.

B. Use pipe locating equipment to test continuity of trace wire. The Engineer shall observe and document trace wire test.

C. Test sewer pipe in accordance with Section 02640, GRAVITY SEWER pipe.

END OF SECTION

SECTION 02640

GRAVITY SEWER PIPE

PART 1. GENERAL

1.1 SCOPE

A. This Section covers all work necessary for the installation of gravity sewer pipe and fittings of the sizes and classes indicated.

PART 2. PRODUCTS

2.1 GENERAL

A. Sizes and types of gravity sewer pipe to be used in all locations are indicated on the Drawings.

2.2 PIPE, FITTINGS, AND JOINTS

A. Gravity sewer pipe and fittings shall be Ductile Iron Pipe or PVC sewer pipe as specified in Sections 02620 and 02630.

2.3 CONCRETE FOR ENCASEMENT

A. Concrete for thrust blocking and encasement shall have a minimum compressive strength of 2,500 psi at 28 days.

2.4 IMPORTED PIPE BASE AND IMPORTED PIPE ZONE MATERIAL

A. Imported material for gravity sewer pipe base and pipe zone backfill shall be as specified in Section 02315.

PART 3. EXECUTION

3.1 PREPARATION OF TRENCH

A. Provide bedding material under gravity sewer pipe as shown on Details on the Plans. Place base for pipe in the trench to a depth that allows excavation of bell holes. Grade the top of the base to the bottom of the pipe ahead of pipe laying for the full width of the trench. Base shall provide a firm, unyielding support along entire pipe length.

B. Excavate bell holes at each joint to permit proper assembly and inspection of entire joint. Bell holes shall be of sufficient depth to preclude direct bearing of bell on bottom of trench.

C. Provide and maintain ample means and devices to remove and dispose of water entering the trench during the laying operation to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill in the pipe zone. Pipe shall not be laid in water.

D. Conform to additional requirements of the individual pipe specifications for pipe base and pipe zone material and compaction requirements thereof.

3.2 PIPE DISTRIBUTION

A. Distribute material on the job no faster than it can be used to good advantage. Unload pipe that cannot be physically lifted by workers from the trucks, by a forklift, or other approved means. Do not drop pipe of any size from the bed of the truck to the ground. Do not distribute more than 1 day's supply of material in advance of laying. Conform to manufacturer's recommendations on unloading and handling pipe.

3.3 PIPE PREPARATION AND HANDLING

A. Inspect all pipe and fittings prior to lowering into trench to ensure no cracked, broken, or otherwise defective materials are being used. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

B. Use proper implements, tools, and facilities for the safe and proper protection of the work. Lower pipe into the trench in such a manner as to avoid any physical damage to the pipe. Remove all damaged pipe from the jobsite. Do not drop or dump pipe into trenches under any circumstances.

3.4 LINE AND GRADE

A. Do not deviate from line or grade more than 1/2 inch for line and 1/4-inch for grade, provided that such variation does not result in a level or reverse sloping invert.

B. Measure for grade at the pipe invert, not at the top of the pipe, because of permissible variation in pipe wall thickness.

C. Establish line and grade for pipe by the use of lasers or by transferring the cut from the offset stakes to batter boards set in the trench at maximum intervals of 25 feet. Maintain a minimum of three sets of batter boards with string line ahead of the pipe laying at all times. If batter boards in the trench prove impractical because of trench conditions, submit other methods of grade and alignment control to the Engineer for approval.

D. Where the Drawings show a tie for existing facilities, verify elevations of tie points sufficiently in advance of laying operations to allow adjustments as required. Any adjustments shall be approved by the Engineer **in advance**.

E. Where the Drawings show existing utilities, verify the location and grade sufficiently in advance of laying operations to allow adjustments as required. Any adjustments shall be approved by the Engineer **in advance**.

3.5 LAYING AND JOINTING GRAVITY SEWER PIPE

A. Ductile iron pipe varies slightly with different manufacturers. Install the particular pipe furnished in accordance with the particular manufacturer's recommendations, as approved by the Engineer.

B. Lay and joint ductile iron pipe with rubber gasket (except air piping must have viton gaskets) type joints, in accordance with the manufacturer's recommendations, as approved by the Engineer. Provide all special tools and devices such as special jacks, chokers, and similar items required for the installation.

C. Use wall pipe with water stop ring for connecting to manhole walls and walls of other structures.

3.6 BACKFILL AT THE PIPE ZONE

A. The pipe zone shall be considered to include the full width of the excavated trench from the bottom of the pipe to a point 12-inches above the top outside surface of the barrel of the pipe, as shown in the details on the Drawings.

B. Particular attention must be given to the area of the pipe zone from the flow line to the centerline of the pipe to ensure that firm support is obtained to prevent any lateral movement of the pipe during the final backfilling of the pipe zone.

C. Backfill the area of the pipe zone from the bottom to the horizontal centerline of the pipe by hand-placing the material around the pipe in 6-inch layers. Continuous support shall be affected beneath pipe haunches by "walking in" and slicing with a shovel. Backfill the area of the pipe zone from the horizontal centerline to the top of the pipe zone as indicated in detail on the Drawings.

3.7 AIR TESTS FOR GRAVITY SEWERS

A. Representatives of the Decatur Water and Sewer Department shall be present when sewer lines and manholes are tested.

B. All gravity sewers and appurtenances shall successfully pass an air test prior to acceptance and shall be free of visible leakage. Manholes shall be tested as specified in Section 02740, MANHOLE CONSTRUCTION.

C. Furnish all necessary testing equipment and perform the tests in a manner satisfactory to the Engineer. Any arrangement of testing equipment which will provide observable and accurate measurements of air leakage under the specified conditions will be permitted. Gauges for air testing shall be calibrated with a standardized test gauge provided by the Engineer at the start of each testing day. The calibration shall be witnessed by the Engineer.

D. Line is to be complete with all structures and fittings in place and backfilled. Testing of sections of the constructed gravity sewer for acceptance will not be performed until the Engineer approves readiness for testing. This test should be performed reach-by-reach as construction proceeds and must be completed within 30 days after installation of each reach.

E. Repair or replace, in a manner approved by the Engineer, any section of pipe not meeting the air test requirements, at no cost to the Owner.

F. Infiltration of groundwater in an amount greater than herein specified, following a successful air test as specified, shall be considered as evidence that the original test was in error or that subsequent failure of the pipeline has occurred. The Contractor shall

correct such failures in a manner approved by the Engineer and at no cost to the Owner should they occur within the warranty period.

G. The Contractor, in contracting to do this work, agrees that the leakage allowances as indicated herein are fair and practical.

3.8 AIR TESTING PROCEDURE

A. After all plugs are in place and securely blocked, introduce air slowly into the pipe section to be tested until the internal air pressure reaches 4.0 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe. Allow a minimum of 2 minutes for the air temperature to stabilize. Determine the height of the groundwater table, at the time of the test.

B. The pipe and joints shall also be considered as satisfactory when the time required in seconds for the pressure to decrease from 3.5 to 3.0 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe is not less than the applicable value from the following table:

SPECIFICATION TIME REQUIRED FOR A 0.5 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q=0.0015

1 Pipe Diameter (in.)	2 Minimum Time (min:sec)	3 Length for Minimum Time (ft)	4 Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:53	597	.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	46:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23

C. Use ***extreme caution*** in air testing large diameter pipe. **Do not** enter manholes or trenches while inflating or deflating plugs or while the pipeline is subject to any pressure. Install, block, inflate and deflate pipe plugs in strict conformance with manufacturer's safety recommendations.

3.9 DEFLECTION TEST FOR PVC SEWER PIPE

A. The Contractor shall test all laid and backfilled PVC gravity sewer pipe for deflection with a mandrel. The maximum deflection allowable shall not exceed 5 percent of the pipe's internal diameter. Deflection shall be checked on all installed pipe by the Contractor in the presence of the Engineer and a representative of the Fayetteville Sewer Department. Deflection tests shall be completed in minimum of 30 days after initial backfill of the pipe and thereafter may be checked at random by the Engineer during the construction and warranty period. All pipe deflected in excess of 5 percent shall be replaced by the Contractor for no additional compensation.

3.10 CONNECTION OF SEWERS TO EXISTING MANHOLES

Not Used.

3.11 POTABLE WATER AND SEWER LINE CROSSINGS

Not Used.

3.12 CLEANOUTS

A. Install cleanouts on 4-inch and 6-inch sewer lines at changes in line alignment or grade, and at 100 foot intervals. Cleanout to consist of a 4"x4" PVC Wye, 4" PVC riser (and 4" x 6" reducer were required) and threaded cleanout cap with recessed nut. Materials shall be SDR-26 minimum. Tops of cleanout shall be flush with the adjoining ground. Do not construct clean-outs in vehicular traffic ways.

3.13 FINAL SEWER CLEANING

A. Prior to final acceptance and final manhole-to-manhole inspection of the sewer system by the Engineer, flush and clean all parts of the system. Remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the sewer system at or near the closest downstream manhole. If necessary, use mechanical rodding or bucketing equipment.

B. Upon the Engineer's final manhole-to-manhole inspection of the sewer system, if any foreign matter is still present in the system, reflush and clean the sections and portions of the lines as required.

END OF SECTION

SECTION 02740

MANHOLE CONSTRUCTION

PART 1. GENERAL

1.1 SCOPE

A. This Section covers the work necessary for the construction of manholes, complete. Manhole details are as shown on the Drawings.

PART 2. MATERIALS

2.1 CONCRETE

A. Ready-mixed, conforming to ASTM C94. Compressive field strength for manhole bases and walls shall be not less than 3,000 psi at 28 days. Maximum size of aggregate shall be 1-1/2 inches. Slump shall be between 2 and 4 inches.

2.2 FORMS

A. Exterior exposed surfaces shall be approved material. Form all vertical surfaces. Trench walls, large rock, or earth will not be approved form material.

2.3 REINFORCING STEEL

A. Conform to ASTM A 615, Grade 60, deformed bars.

2.4 POURED-IN-PLACE MANHOLES

A. Poured-in-place type manholes must be used in accordance with details of construction approved by the Engineer. Sanitary sewer manholes must be poured-in-place. However, storm sewer inlets and junction boxes may be precast concrete structures provided that they meet or exceed AASHTO M-199 Standards and H-20 loading. The precast boxes are to be constructed with concrete that meets or exceeds a compressive strength of 4,000 psi at 28 days and reinforced according to ASTM C-478 Specifications. Precast structures must be the equal of those fabricated by Scurlock Industries of Fayetteville and the fabricator must maintain a Quality Control Department that maintains current test data on the materials used to construct the precast items.

2.5 MORTAR

A. Standard premixed mortar conforming to ASTM C 387 or proportion 1 part portland cement to 2 parts clean, well-graded sand which will pass a 1/2-inch screen. Admixtures may be used not exceeding the following percentages of weight of cement: Hydrated lime, 10 percent; diatomaceous earth or other inert materials, 5 percent. Consistency of mortar shall be such that it will readily adhere to the pipe.

2.6 MANHOLE STEPS

Not used.

2.7 MANHOLE FRAMES AND COVERS

A. All castings for manhole rings and covers may be of the best quality gray cast iron, free from cracks, holes, scale, shrinkage, distortion, and other defects which might make them unfit for their intended use. They shall be of workmanlike finish, shall be non-rocking, shall have all bearing surfaces machined smooth and shall be of such quality that a blow from a hammer will produce an indentation on a rectangular edge of the casting without flaking the metal. Material shall be ASTM A48-83 or ASTM A536, Class 35, or better, designed to support H-20 traffic loading.

B. Manhole rings and lids shall have a combined weight of not less than 270 lbs, a minimum access diameter of 22 inches, and shall be heavy duty rated for traffic. The manhole lids shall be of solid construction without any openings of any type except two (2) concealed pick holes which shall be located on direct opposite sides of the manhole lid. The concealed pick holes shall be of such design as not to allow infiltration into the manhole. Manhole lids shall have "SANITARY SEWER" cast on the lids.

C. Standard manhole rings and covers shall be Vulcan Foundry, Pattern V-1348-1 or approved equal.

D. Watertight manhole rings and covers where required on the plans shall be Vulcan Foundry, Pattern V-2350-2 or approved equal.

2.8 NON – SHRINK GROUT

A. Grout shall be non-shrink in the plastic state and show no expansion after set as tested in accordance with ASTM C 827 and shall develop compressive strength not less than 3,000 psi with a trowelable mix within 24 hours per ASTM C 109. The placement time shall be not less than 45 minutes based on initial set per ASTM C 191. Test results shall be furnished by the manufacturer and submitted to the Engineer.

PART 3. EXECUTION

3.1 EXCAVATION AND BACKFILL

A. Conform to applicable portions of Section 02315, EARTHWORK, TRENCH, EXCAVATION AND BACKFILL. Backfill around manholes shall be of same quality as trench backfill immediately adjacent.

3.2 MANHOLE BASE

A. Manhole bases shall be a minimum of 12-inches thick and shall be cast directly on compacted granular base material.

3.3 MANHOLE WALL

A. Construct manhole wall in accordance with procedures described for concrete wall construction in Section 03300, CAST-IN-PLACE CONCRETE.

B. Manhole walls are to be 8 inches thick.

3.4 MANHOLE FRAMES AND COVERS

A. Install frames and covers on top of manholes to positively prevent all infiltration of surface or groundwater into manholes. Frames shall be set in a bed of mortar with the mortar carried over the flange of the ring as shown in the Manhole Details on the Drawings. Set frames so tops of covers are flush with surface of adjoining pavement or ground surface, unless otherwise shown or directed.

3.5 COATINGS

Not used.

3.6 VACUUM TESTING

A. Plug pipe entering manholes, take care to securely brace plug from being drawn into the manhole.

B. Place test head inside top of cone section and inflate seal in accordance with manufacturer's recommendations.

C. Draw a vacuum of 10 inches of mercury and shut pump off. With valves shut, measure the time for the vacuum to drop to 9 inches. Test is satisfactory if the time is greater than the following:
   1. 48-inch diameter: 60 seconds.
   2. 60-inch diameter: 75 seconds.
   3. 72-inch diameter: 90 seconds.

D. If manhole fails initial test, make necessary repairs with non-shrink grout on the exterior of the manhole while the vacuum is still being drawn. Retest until a satisfactory test is obtained.

END OF SECTION

SECTION 02900

LANDSCAPING

PART 1. GENERAL

1.1 SUMMARY

A. Provide finish grading and grass establishment.

B. The intention of this Specification is that the Contractor establish turf on pipelines and areas damaged as a result of construction.

C. Where lawns are disturbed due to construction, restore lawns using same grass type as found in lawn prior to construction.

PART 2. MATERIALS

2.1 TOPSOIL

A. Existing topsoil shall be reused where practical.

B. Imported Topsoil:
   1. Furnished at sole expense of Contractor.
   2. Friable loam free from subsoil, roots, grass, excessive amounts of weeds, stone, and foreign matter; acidity range (pH) of 5.5 to 7.5; and containing a minimum of 4 percent and a maximum of 50 percent organic matter.

2.2 SEED

A. Certified, blue tag, clean, delivered in original, unopened packages and bearing an analysis of the contents, guaranteed 95 percent pure and to have a minimum germination rate of 85 percent, within 1 year of test.

2.3 SEED MIX

A. Mix for areas: Common Bermuda Grass. Follow the recommendations of the local Agricultural Extension Agent for requirements on coverage, fertilization, and seasons.

PART 3. EXECUTION

3.1 PROJECT SCHEDULE

A. Project Schedule shall show an anticipated time for grading and seeding to take place, so that seasonal consideration can be given attention.

3.2 SITE GRADING

A. Shape, trim, and finish slopes to conform with lines, grades, and cross sections shown.

B. Make slopes free of loose exposed roots and stones exceeding 3 inch diameter.

C. Ensure that site drains properly and there are no areas where water may pond.

D. Finished site grading will be reviewed by Engineer.

3.3 GRADING OF TOPSOIL

A. Shape the topsoil over the area to the desired shape and contour.

B. Apply commercial fertilizer at the Agricultural Extension Agent's recommended rate, distributing it uniformly with a mechanical spreader.

3.4 FINISH GRADING

A. Thoroughly mix the topsoil and fertilizer.

B. Rake the area to a uniform grade so that areas drain in the same manner as at the start of the Project.

C. Lightly compact before planting grass.

D. Remove trash and stones exceeding 2 inches in diameter from area to a depth of 2 inches prior to preparation and planting grass.

3.5 TIME OF SEEDING

A. Conduct seeding under favorable weather conditions during seasons which are normal for work as determined by accepted practice in locality of Project.

3.6 MECHANICAL SEEDING

A. Sow grassed areas evenly with a mechanical spreader at rate of 100 pounds per acre, minimum, or as otherwise recommended by the Agricultural Extension Agent. Roll with cultipacker to cover seed, and water with fine spray. Method of seeding may be varied at discretion of Contractor on his own responsibility to establish a smooth, uniformly grassed area.

3.7 HYDROSEEDING

A. Seed may be applied by hydroseeding method. Seeding shall be done within 10 days following soil preparation. Hydroseed areas at rate of 100 pounds seed and

500 pounds ammonium phosphate per acre, minimum, or as otherwise recommended by the Agricultural Extension Agent.

B. Proceed with seeding operation on moist soil, but only after free surface water has drained away.

C. Exercise care to prevent drift and displacement of mixture into other areas.

3.8 WINTER PROTECTIVE SEEDING

A. Winter barley or annual rye grass applied at a rate of 120 pounds/acre shall be used after September 15 or as recommended by the Agricultural Extension Agent.

B. Areas receiving temporary winter protective seeding shall be re-seeded when weather conditions become favorable.

3.9 MAINTENANCE

A. Begin maintenance immediately after each portion of grass is planted and continue until a reasonable stand of grass has been obtained. Water to keep surface soil moist. Repair washed out areas by filling with topsoil, fertilizing, and seeding.

3.10 GUARANTEE

A. If, at the end of a 180-day period, a satisfactory stand of grass has not been produced, the Contractor shall renovate and reseed the grass or unsatisfactory portions thereof immediately, or, if after the usual planting season, during the next planting season. If a satisfactory stand of grass develops by July 1 of the following year, it will be accepted. If it is not accepted, a complete replanting will be required during the planting season.

B. A satisfactory stand is defined as grass or section of grass that has:
   1. No bare spots larger than 1 square foot.
   2. Not more than 10 percent of total area with bare spots larger than 1 square foot.
   3. Not more than 15 percent of total area with bare spots larger than 6 inches square.

END OF SECTION

SECTION 03210

REINFORCING STEEL

PART 1. GENERAL

1.1 SUMMARY

A. Provide reinforcing steel and welded wire fabric.

B. Conform to "Placing Reinforcing Bars", Recommended Practices, Joint Effort of CRSI-WCRSI, prepared under the direction of the CRSI Committee on Engineering Practice.

C. Notify Engineer when reinforcing is ready for inspection and allow sufficient time for this inspection prior to casting concrete.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete.

1.3 REFERENCES

A. American Concrete Institute, 22400 West Seven Mile Road, Detroit, Michigan 48219.
   1. ACI-318-83 - Building Code Requirements for Reinforcing Concrete.

B. American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.
   1. ASTM A185 - Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.
   2. ASTM A497 - Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
   3. ASTM A615 - Specification for Deformed and Plain Billet-Steel for Concrete Reinforcement.

C. American Welding Society, 550 North West LeJeune Road, Miami, Florida 33126.
   1. AWS D1.4-79 - Structural Welding Code; Reinforcing Steel.

D. Concrete Reinforcing Steel Institute, 933 North Plum Grove Road, Schamburg, Illinois 60195.
   1. CRSI-MSP-1-86 - Manual of Standard Practice.

1.4 SUBMITTALS

A. Submit the following in accordance with Section 01300:
   1. Bending lists.
   2. Placing drawings.
   3. Shop drawings.

B. Shop Drawings:
   1. Bars for footings, including dowels, shall not be fabricated and shipped without prior review of Shop Drawings by the Engineer.
   2. Otherwise, Shop and Placing Drawings shall include reinforcing placing plans and details indicating size, location, arrangement, placing sequence, etc., and shall conform to ACI 315.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Steel:
   1. Deliver with suitable hauling and handling equipment.
   2. Tag for easy identification.
   3. Store to prevent contact with the ground.

B. Unloading, storing, and handling of bars shall conform to CRSI publication "Placing Reinforcing Bars".

PART 2. PRODUCTS

2.1 DEFORMED REINFORCING BARS

A. Deformed billet-steel bars conforming to ASTM A615, Grade 60.

2.2 WELDED WIRE FABRIC

A. Conform to ASTM A185 or A497.

2.3 ACCESSORIES:

A. Tie wire: 16-gage, black, soft-annealed wire.

B. Bar supports: proper type for intended use.

C. Bar supports in beams, columns, walls, and slabs exposed to view after stripping: Small rectangular concrete blocks of same color and strength of concrete that is being placed around them.

D. Concrete supports: for reinforcing concrete placed on grade.

E. Conform to requirements of "Placing Reinforcing Bars" published by CRSI.

PART 3. EXECUTION

3.1 REINFORCING STEEL

A. Clean metal reinforcement of loose mill scale, oil, earth and other contaminants.

B. Straightening and rebending reinforcing steel:
   1. Do not straighten or rebend metal reinforcement.
   2. Where construction access through reinforcing is a problem, use bundle or space bars instead of bending.
   3. Submit details and obtain Engineer's review prior to placing.

C. Protection, spacing, and positioning of reinforcing steel: Conform to the current edition of the ACI Standard Building Code Requirements for Reinforced Concrete (ACI 318), reviewed placing drawings and design drawings.

D. Location Tolerance: Conform to the current edition of "Placing Reinforcing Bars" published by Concrete Reinforcing Steel Institute and to the Details and Notes on the Drawings.

E. Splicing:
   1. Conform to Drawings and current edition of ACI Code 318.
   2. Stagger splices in adjacent bars.

F. Tying deformed reinforcing bars: Conform to current edition of "Placing Reinforcing Bars" published by Concrete Reinforcing Steel Institute and to details and notes on Drawings.

G. Field Bending:
   1. Field bending of reinforcing steel bars is not permitted when rebending will later be required to straighten bars.
   2. Consult with Engineer prior to pouring if there is a need to work out a solution to prevent field bending.

3.2 REINFORCEMENT AROUND OPENINGS

A. Place an equivalent area of steel around pipe or opening and extend on each side sufficiently to develop bond in each bar.

B. See Drawings for bar extension length each side of opening.

C. Where welded wire fabric is used, provide extra reinforcement using fabric or deformed bars.

3.3 WELDING REINFORCEMENT

A. Welding shall not be permitted unless Contractor submits detailed Shop Drawings, qualifications, and radiographic nondestructive testing procedures for review by Engineer.
   1. Obtain results of this review prior to proceeding.
   2. Basis for submittals: Structural Welding Code, Reinforcing Steel, AWS D1.4-79, published by American Welding Society, and applicable portions of ACI 318, current edition.
   3. Test 10 percent of welds using radiographic, nondestructive testing procedures in accordance to the above referenced codes.

3.4 PLACING WELDED WIRE FABRIC

A. Conform to ACI 318-77 and to current Manual of Standard Practice, Welded Wire Fabric, by Wire Reinforcement Institute regarding placement, bends, laps, and other requirements.

B. Placing:
   1. Extend fabric to within 2 inches of edges of slab.
   2. Lap splices at least 1-1/2 courses of fabric and a minimum of 6 inches.
   3. Tie laps and splices securely at ends and at least every 24 inches with 16-gage black annealed steel wire.
   4. Place welded wire fabric at the proper distance above bottom of slab.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1. GENERAL

1.1 WORK INCLUDED

A. Cast-in-place concrete, including formwork.

1.2 RELATED WORK

A. Section 03210 - Reinforcing Steel.

1.3 REFERENCES

A. American Concrete Institute, Box 19150, Redford Station, Detroit, Michigan 48219 (latest revision).
   1. ACI 211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
   2. ACI 211.2: Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
   3. ACI 211.3: Standard Practice for Selecting Proportions for No-Slump Concrete.
   4. ACI 304R: Guide for Measuring, Mixing, Transporting, and Placing Concrete.
   5. ACI 304.2R: Placing Concrete by Pumping Method.
   6. ACI 304.3R: High Density Concrete: Measuring, Mixing, Transporting and Placing.
   7. ACI 304.4R: Placing Concrete with Belt Conveyors.
   8. ACI 305R: Hot Weather Concreting.
   9. ACI 306R: Cold Weather Concreting.
   10. ACI 309: Standard Practice for Consolidating of Concrete.
   11. ACI 309.1R: Behavior of Fresh Concrete During Vibration.
   12. ACI 309.2R: Identification and Control of Consolidation-Related Surface Defects in Formed Concrete.
   13. ACI 318: Building Code Requirements for Reinforced Concrete.
   14. ACI 347: Recommended Practice for Concrete Formwork.

B. American Society of Testing For Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103 (latest revision).
   1. ASTM C31: Making and Curing Concrete Test Specimens in the Field.
   2. ASTM C33: Specification for Concrete Aggregates.
   3. ASTM C42: Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
   4. ASTM C143: Test for Slump of Portland Cement Concrete.
   5. ASTM C150: Specifications for Portland Cement.
   6. ASTM C172: Sampling Freshly Mixed Concrete.

7. ASTM C173: Test for Air Content of Freshly Mixed Concrete by the Volumetric Method.
8. ASTM C231: Test for Air Content of Freshly Mixed Concrete by the Pressure Method.
9. ASTM C260: Specification for Air-Entraining Admixtures for Concrete.
10. ASTM C309: Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
11. ASTM C494: Specification for Chemical Admixtures for Concrete.
12. ASTM E329: Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

C. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."

D. Local Codes and Ordinances: Wherever provisions of the Standard Building Code or the local current ordinances are more stringent that the above referenced Specifications and Standards, the local codes and ordinances shall govern.

1.4 SUBMITTALS

A. Submit the following in accordance with Section 01300:
1. Product Data: Submit manufacturer's product data for reinforcement and forming accessories, patching compounds, curing compounds, and other materials.
2. Shop Drawings: Submit for review prior to Installation, Shop Drawings of all reinforcing steel, including bar cutting lists, typical bar bend diagrams, construction of forms including jointing, reveals, and location and pattern of form tie placement.
3. Design Mix: Prior to placement of concrete, the Contractor shall submit a design mix showing the proportions and compressive strength obtained from the concrete at 7 and 28 days. The design mix shall include a complete list of materials including type, brand, source, and amount of; cement, fly ash, ground slag, coarse aggregate, fine aggregate, water, air content and admixtures, if applicable. The mix design shall be submitted to the Engineer at least ten (10) days prior to the start of operations. Placement of concrete shall not begin until the mix design is approved in writing by the Engineer.

1.5 QUALITY ASSURANCE/ACCEPTANCE

A. Inspection: Engineer shall have access and rights to inspect batch plants, cement mills, and facilities of suppliers, manufacturers, and subcontractors providing products specified.

B. Batch Plant:
1. Certification: Current certification that weighing scales have been tested and are within tolerances as set forth in National Bureau of Standards Handbook No. 44.
2. Equipment: Semi-automatic or fully automatic.

C. Evaluation and acceptance of concrete shall conform to ACI 318.

D. The Contractor shall engage a testing laboratory acceptable to Owner and Engineer to perform material evaluation tests and to design concrete mixes. All testing shall be paid for by the Contractor.

E. The mixing or alternate use of cement from different manufactures will not be permitted. The source of any materials shall not be changed without the written approval of the Engineer.

F. If the cement furnished produces erratic results under field conditions incident to the placing of the concrete, or in regard to the strength of the finished product, or in the time of the initial or final set, the Contractor shall, without notice from the Engineer, cease the use of that source of cement.

G. Should a change in sources be made, or admixtures added or deleted from the mix, a new design mix must be submitted to the Engineer for approval.

H. The Contractor is responsible for product quality control during handling, blending, mixing, transporting, and placement operations, and for necessary adjustments in proportioning of the materials to produce an acceptable mix. The Contractor shall perform all applicable quality control sampling and testing required to ensure that the completed concrete complies with all requirements and specifications. The Contractor shall furnish all personnel, equipment, and facilities necessary to perform the required sampling and pay for testing.

I. The Contractor shall be responsible for ensuring that all concrete cylinders, including those made for determination of quality acceptance, are properly cured while at the jobsite.

J. Field Sampling and Testing:
   1. Field samples shall be made and cured in accordance with ASTM C31 for each concrete strength, at the rate of 4 test cylinders and one slump test for each 50 cubic yards of concrete from each days pour. Make air content check for each set of test cylinders in accordance with ASTM C173 or ASTM C231. Air content and slump shall be checked and recorded at both truck discharge and point of placement for pumped concrete from the first load each day and every 50 cubic yards thereafter.
   2. Test Cylinders: One at 7 days, two at 28 days, and reserve the remaining cylinder for testing after a longer period as required by the Engineer if the 28 day tests do not meet or exceed the required strength.
   3. The taking of samples from small pours of 10 cubic yards or less may be omitted at the discretion of the Engineer.
   4. Additional Test Slumps: Every 25 cubic yards, recording location for report.
   5. When early form removal is requested, field cure cylinders will be tested at 7 days or less to determine sufficient strength.

K. Testing: Where average strength of any group of 3 cylinders falls below the minimum comprehensive strength, or an individual cylinder falls more than 500 psi below minimum compressive strength specified, the Contractor will be required to have a certified laboratory core the concrete and test it in accordance with ASTM C42. Specimens shall be selected by the Engineer from location in structure represented by test specimen or specimens which failed. At the discretion of the Engineer, Swiss hammer testing may or may not be used to aid in determination of acceptable concrete.
   1. Specimens shall be secured, prepared, and tested in accordance with ASTM C42, within a period of 60 days after placement of concrete.
   2. Concrete will be deemed approved meeting the strength requirements of this Section if it meets the strength requirements of ACI 318.
   3. The cost of cutting specimens from the structure, patching the resulting holes, and making laboratory analysis shall be at the sole expense of the Contractor.
   4. Holes from which the cored samples are taken shall be packed solid with no slump concrete proportioned in accordance with ACI 211. Patching shall have the same design strength as the specified concrete.
   5. Should laboratory analysis indicate that the proper concrete mix has not been used, all concrete poured where inappropriate mix was used shall be subject to rejection, before, during, or after the pour.
   6. If any of the specimens cut from the structure fail to meet the requirements of ACI 318, the Engineer shall have the right to require the defective concrete to be replaced, at the Contractors sole expense, and at no additional cost to the Owner.

L. Sampling: In addition the slump test specified in this Section, the Contractor shall keep a cone and rod apparatus on the Project site for random testing of batches. When concrete does not meet the specified slump requirements, and when directed by the Engineer, the Contractor will immediately perform a slump test in accordance with ASTM C143. Concrete not meeting the slump requirements shall be removed from the Project site.

M. The Contractor shall provide an opportunity for the Engineer to observe all quality control sampling and testing procedures.

PART 2. PRODUCTS

2.1 CEMENT

A. Portland cement: ASTM C150 Type I.

2.2 WATER

A. Clean and free from oil, acid, alkali, salt, organic matter, or other deleterious substances.

B. Potable.

2.3 CONCRETE AGGREGATES

A. General:
Natural aggregates, well graded, free from deleterious coatings and organic materials conforming to ASTM C33 (latest revision).
1. Import non-reactive aggregates if local aggregates are reactive. (Appendix XI-ASTM C33).
2. Wash aggregates uniformly before use.
3. Other aggregate gradations can be approved by Engineer.

B. Fine Aggregates:
1. Clean, sharp, natural or manufactured sand, free of loam, clay, lumps, or other detrimental materials and conforming to ASTM C33.
2. Less than 2 percent passing the No. 200 sieve.
3. Maximum size 1-1/2 inches.

C. Course Aggregates:
1. Natural gravel, crushed gravel, crushed stone, or combination of these materials.
2. Less than 15 percent float or elongated particles (long dimension >5 times short dimension).
3. Less than 0.5 percent passing the No. 200 sieve.

2.4 CONCRETE AIR-ENTRAINING ADMIXTURES

A. Manufacturer:
1. Air-Mix or Perma-Air by the Euclid Chemical Co.
2. Sealtight Air Entraining Admixture by W.R. Meadows of Texas.
3. Master Builders, MB-VR.
4. Or approved equal.

B. ASTM C260; nontoxic after 30 days.

C. Use only the specified non-corrosive non-chloride accelerator. Calcium chloride is not permitted.

D. Provide for concrete exposed to freezing and thawing, required to be watertight or placed during cold weather. Air Content: 5 to 6 percent.

2.5 ADMIXTURES

A. Water-Reducing Admixture: Conforming to ASTM C494, Type A:
1. Eucom WR-75 by the Euclid Chemical Company.
2. Pozzolith 200N by Master Builder.
3. Plastocrete 160 by Sika Chemical Corporation.

B. Water-Reducing Retarding Admixture: Conforming to ASTM C494, Type D:
1. Eucom Retarder-75 by the Euclid Chemical Company.

2. Pozzolith 100XR by Master Builder.
3. Plastiment by Sika Chemical Company.

C. High-Range Water-Reducing Admixture (Superplasticizer): Conforming to ASTM C494, Type F or G:
1. Eucom 37 by Euclid Chemical Company.
2. Rheobuild 1000 by Master Builders.
3. Sikament by Sika Chemical Company.

D. Non-Corrosive Non-Chloride Accelerator Admixture: Conforming to ASTM C494 Type C or E:
1. Accelguard 80 by Euclid Chemical Company.
2. Or approved equal.
3. Manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least 1 year's duration) using an acceptable accelerated corrosion test method using electrical potential measures.

E. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions.

F. Certification: Submit written conformance to the requirements and chloride ion content of the admixture to Engineer prior to mix design review.

2.6 FORMS

A. Unexposed Finish Concrete: Plywood, lumber, metal or other acceptable material approved by the Engineer. Lumber shall be dressed on at least 2 edges and 2 sides for a tight fit if used.

B. Form Coatings: Commercial formulation from coating compound with maximum VOC of 350 mg/l that will not bond, stain, or adversely affect concrete surfaces in contact with and will not impair succeeding treatments of concrete surfaces.

C. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent deflection and spalling of concrete upon removal. Units provided shall not leave any metal closer than 1-1/2 inch to exposed surface. Provide ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.7 BONDING AGENT

A. Manufacturer: Sonnebond by Sonneborn; or approved equal.

B. Submit product specifications and manufacturer's specific instructions for application on this Project for Engineer's approval.

C. Product must meet Project requirements with regard to surface, pot life, set time, vertical or horizontal application, forming restrictions, or other stated requirements.

2.8 BOND BREAKER

A. Manufacturers:
   1. Williams Tilt-Up Compound, Williams Distributors Inc., Seattle, Washington.
   2. Silcoseal 77, Superior concrete Accessories, Franklin Park, Illinois.
   3. Or Equal.

B. Nonstaining type.

C. Provide positive bond prevention.

D. Submit copies of manufacturer's data, recommendations, and instructions for specific use on this Project for review.

2.9 CURING COMPOUND

A. Liquid Membrane-Forming Curing Compound: ASTM C309, Type I, Class A. Moisture loss not more than 0.005 gr./sq. cm. applied at 200 square feet per gallon.
   1. Conspec, Conspec Cure & Seal.
   2. Sonneborn, Kure-N-Seal.
   3. Master Builders, MasterKure.
   4. Or approved equal.

2.10 BONDING AND REPAIR MATERIALS

A. Rewettable Bonding Compounds:
   1. Polyvinyl acetate type.
   2. Manufacturer:
      a. Euco Weld by the Euclid Chemical Co.
      b. Weldcrete by the Larsen Co.
      c. Sonnocrete by Sonneborn.
      d. Daraweld C by W. R. Grace.
   3. Use only in areas not subject to moisture.

B. Non-Rewettable Bonding Compounds:
   1. Polymer modified type.
   2. Manufacturer:
      a. Euco-Bond by the Euclid Chemical Co.
      b. Or approved equal.

C. Bonding Admixture:
   1. Latex, non-rewettable type.
   2. Manufacturer:
      a. SBR Latex or Flex-Con by the Euclid Chemical Co.
      b. Daraweld C by W. R. Grace.

D. Patching Mortar:
   1. Free flowing or gel consistency.
   2. Polymer modified cementitious mortar.
   3. Manufacturer:
      a. Euco Thin Coat or Concrete Coat by the Euclid Chemical Co. for horizontal repairs.
      b. Verticoat by the Euclid Chemical Co. for vertical or overhead repairs.
      c. Sikatop 121 or 122 by the Sika Chemical Co. for horizontal repairs.
      d. Sikatop 123 by the Sika Chemical Co. for vertical or overhead repairs.

E. Underlayment Compound:
   1. Free-flowing, self-leveling, pumpable cementitious base compound.
   2. Manufacturer:
      a. Flo-Top by the Euclid Chemical Co.
      b. Or approved equal.

F. Repair Topping:
   1. Self-leveling, polymer modified high strength topping.
   2. Manufacturer: Thin Top SL by the Euclid Chemical Co.

PART 3. EXECUTION

3.1 DESIGN OF CONCRETE MIX

A. Submit mix design on each class of concrete for review, include standard deviation analysis or trial mixture test data.

B. Proportion mix design in accordance with ACI 318-89, Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures".

C. If trial batches are used:
   1. Prepare mix design by independent testing laboratory.
   2. Achieve an average compressive strength 1200 psi higher than the specified strength, or 1400 psi for specified concrete strengths over 5000 psi.
   3. Certified copies of laboratory trial mix reports and cylinder tests shall be submitted to Engineer by the testing laboratory for approval.

D. Do not place concrete prior to receipt of Engineer's written approval of mixes and cylinder test results.

E. Design mix and perform tests to meet the requirements as specified.

F. Slump: 2-4"

G. Water/Cement Ratio:
   1. Watertight concrete exposed to fresh water and freeze/thaw: 0.50 max.
   2. Air entrained concrete exposed to fresh water: 0.50 max.

H. Combined Aggregate Gradings:
   1. Aggregates for concrete shall be proportioned in accordance with "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete." ACI 211.1.
   2. Maximum aggregate size: Do not exceed one-fifth the narrowest dimension between sizes of forms or 3/4 of the clear space between reinforcing bars, 1-1/2 inch maximum.

3.2 MIXES

A. Strength: Concrete minimum strength at 28 days as noted on Drawings or as specified in other Sections.

B. Mix Designs:
   1. Prepare design mixes for each type of concrete, in accordance with ACI 301 and ACI 318, except as otherwise specified.

C. Conform to ACI 304 current edition for measuring, mixing, transporting and placing concrete.

D. Concrete Mix Adjustments: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, and as approved by Engineer. Laboratory test data for revised mix design and strength results shall be submitted to and approved by Engineer prior to using in Work.

3.3 FORMS

A. Coordinate with other trades whose work may be located within or below concrete.

B. Coordinate installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

C. Notify Engineer 1 full working day prior to erection of forms for inspection.

D. Cleaning and Tightening:
   1. Clean forms thoroughly and adjacent surfaces to receive concrete.
   2. Remove chips, wood, sawdust, dirt or other debris immediately prior to concrete placement.
   3. Retighten forms after concrete placement to eliminate leaks.

E. Design:
   1. Design, erect, support, brace, and maintain formwork in accordance with:
      a. Building Codes Requirements for Reinforced Concrete (ACI 318).
      b. Recommended Practice for Concrete Formwork (ACI 347).
      c. Construction Industry Standards (OSHA 2207).
   2. Design formwork to be readily removable without impact, shock, or damage to concrete surfaces and adjacent materials.

F. Reuse of Forms: Do not reuse forms unless they are in new and undamaged condition.

G. Chamfer exposed corners and edges 3/4 inch unless otherwise specified or shown on Drawing. Use wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

H. Preparation of Form Surfaces: Coat the contact surfaces of forms with a form-coating compound where applicable prior to placement of reinforcement.

I. Other Trades: Provide openings in concrete form work to accommodate Work of other trades. Determine size and location of openings, recesses, and chases for other trades providing such ties. Accurately place and securely support items built-in to form.

J. Form Tolerances: Construct forms to sizes, shapes, lines, and dimensions shown, work in finished structures.

K. Removal of Forms:
   1. Do not disturb forms until concrete is sufficiently strong to withstand possible injury.
   2. Do not remove shoring until member has acquired sufficient strength to support its weight and the load upon it.
   3. Do not remove forms until the concrete has attained 67 percent of 28 day strength or a minimum of 4 days. Use a method of form removal which will not cause overstressing of the concrete.

3.4 FORM TIES

A. Place in uniform patterns on exposed surfaces.

B. Number and placement sufficient to withstand pressures and limit deflection of forms to acceptable limits.

3.5 PLACING CONCRETE - GENERAL

A. Do not place concrete without Engineer being present.

B. Allow other trades reasonable time to complete portions of work which must be completed before concrete is placed.

C. Notify Engineer at least 1 full working day in advance before starting to place concrete to permit inspection of forms, reinforcing, sleeves, conduits, boxes, inserts, or other work required to be installed in concrete.

D. Review curing methods with Engineer and verify curing materials and equipment are at Project site.

E. Placement shall conform to requirements and recommendations of ACI 304 and ACI 318, except as modified in these Specifications.

F. Place concrete as soon as possible after leaving mixer in layers not over 1.5 feet deep:
   1. Without segregation or loss of ingredients.
   2. Without splashing forms or steel above.

G. Do not use concrete truck chutes, pipes, finishing tools, etc., constructed of aluminum.

H. Before depositing concrete:
   1. Remove debris from space to be occupied by concrete.
   2. Dampen:
      a. Gravel fill beneath slabs on ground.
      b. Sand where vapor barrier is specified.
      c. Wood forms.
   3. Verify reinforcement is secured in position.

I. Before placing concrete, clean and inspect form work, reinforcing steel, and items to be embedded or cast-in-place. Notify other trades prior to placement of concrete to permit the installation of their Work. Coordinate the installation of joint materials and vapor barriers with placement of forms and reinforcing steel.

J. Conveying:
   1. Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent the separation or loss of materials.
   2. Conveying equipment shall be capable of providing a supply of concrete at the site of placement without interruptions sufficient to permit loss of plasticity between successive increments.
   3. Provide equipment for chuting, pumping, and pneumatically conveying concrete of proper size and design to insure a practically continuous flow of concrete at the point of delivery and without segregation of the materials.
   4. Keep open troughs and chutes clean and free from coatings of hardened concrete.
   5. Do not allow concrete to drop freely more than 10 feet. Equipment and methods used for conveying are subject to the approval of Engineer.

3.6 ADDITION OF WATER AT PROJECT SITE

A. Do not add water to concrete at Project site if slump is within specified range.

B. With the Engineer's approval, add water to concrete arriving at Project site with a slump less than the specified range, provided it can be demonstrated that the specified water-cement ratio will not be exceeded.

C. All concrete shall be 4000 psi at 28 days with a maximum cement water ratio of .45 unless noted otherwise on Design Drawings.

3.7 CONSOLIDATION AND VISUAL OBSERVATION

A. Concrete shall be consolidated with internal vibrators having a frequency of at least 800 vpm, with amplitude required to consolidate concrete in the section being placed.

B. At least one standby vibrator in operable condition shall be at the placement site prior to and during placing concrete.

C. Consolidation equipment and methods shall conform to ACI 309 "Recommended Practice for Consolidation of Concrete".

D. Vibrator operator is required to see the concrete being consolidated to ensure good quality workmanship; or Contractor shall have a person actually observe the vibration of the concrete and will advise the vibrator operator of changes needed to assure complete consolidation.

E. Do not use vibrators to transport concrete in forms.

3.8 PLACING CONCRETE IN HOT WEATHER

A. Comply with the requirements of ACI 305.

B. Do not place concrete at times when temperature is forecast to exceed 100 degrees F within 12 hours after the concrete is placed.

C. Fog spray forms, reinforcing steel, and subgrade just before placing concrete.

D. Make every effort to maintain concrete temperature:
   1. Temperature of concrete shall be below 90 degrees F at time of placement, cool the ingredients before mixing by use of chilled water.
   2. Concrete batches with temperature in excess of 90 degrees F will be rejected.

E. Place concrete promptly upon arrival at Project and vibrate immediately after placement.

F. Do not add water to retemper.

G. Consider placing concrete in late afternoon as opposed to early morning.

H. Protect and cure exposed surfaces by one of the following:
   1. Continuous water curing.
   2. Moisture-cover curing.

3.9 PLACING CONCRETE IN COLD WEATHER (ACI 306R-78)

A. Preparation:
   1. Comply with the requirements of ACI 306.

2. Additives for the sole purpose of providing freeze protection shall not be used.
3. Arrangements for covering, insulating, housing, or steam heating newly-placed concrete shall be made in advance of placement and shall be adequate to maintain temperature and moisture conditions recommended.

B. Placement:
1. Surfaces to be in contact with concrete shall be free of snow, ice, and frost and shall be above 40 degrees F.
2. Do not place concrete on frozen subgrade.
3. Placement of insulating material, tarpaulins, or other movable coverings shall follow closely the placing of concrete so that only a few feet of concrete are exposed to outside air at anytime.

C. Curing and Protection:
1. Keep concrete continuously moist and covered and maintain concrete temperature at a minimum of 50 degrees F for 7 days; temperature shall be uniform throughout concrete. If high early strength concrete is used, this temperature requirement may be reduced to 3 days.
2. It is recommended forms be left in place for the entire period of protection; use insulated blankets or other approved method on slab surfaces.
3. Limit rapid temperature changes at end of protection period to avoid thermal cracking.

3.10 PATCHING - GENERAL

A. Prior to starting patching work, except as specified, obtain Engineer's approval of proposed patching techniques and mixes.

3.11 REPAIR OF DEFECTIVE AREAS

A. Definition: Concrete in place that does not conform to specified design strength, shapes, alignments, and elevations as shown on Drawings and contains surface defects.

B. Evaluation and acceptance of concrete shall conform to ACI 318.

C. With prior approval of Engineer, as to method and procedure, repair defective areas in conformance with ACI 301, Chapter 9, except that the specified bonding compound shall be used.

D. Surface Repairs:
1. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Owner.
2. Honey-combed areas and rock pockets:
   a. Repair immediately after removal of forms.
   b. Prepare no-slump concrete mortar and test so that, when dry, patching mortar will match surrounding color and strength.
   c. Cut out to solid concrete or minimum of 1-inch depth.

d. Make edges for cuts perpendicular to the concrete surface.
e. Thoroughly clean and dampen with water.
f. Apply bonding compound.
g. Compact no-slump concrete into patch, and finish to blend with adjacent finished concrete.
h. Cure in same manner as adjacent concrete.

3. High Areas: Grind after concrete has cured at least 14 days.
4. Low Areas:
   a. Repair during or immediately after completion of surface finishing operations.
   b. Cut out low areas and replace with fresh concrete of same type and class as original concrete.
   c. Finish repaired areas to blend into adjacent concrete.
5. Defective Areas:
   a. Cut out and replace with fresh concrete of same type and class as original concrete.
   b. Finish repaired areas to blend into adjacent concrete.
6. Make structural repairs with prior approval of Engineer, as to method and procedure, using the specified epoxy adhesive or epoxy mortar. Where epoxy injection procedures must be used, use an approved low viscosity epoxy made by the manufacturers previously specified.
7. Level floors for subsequent finishes by use of specified underlayment material.
8. Where required, level exposed floors by use of the specified self-leveling repair topping.
9. Repair methods not specified above may be used, subject to approval of Engineer.

3.12 BLOCKOUTS AT PIPES OR OTHER PENETRATIONS

A. Submit proposed blockouts for review in accordance with Section 01001.

3.13 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as specified herein.
   1. Provide moisture curing by keeping concrete surface continuously wet by covering with water, by water-fog spray, or by covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and

keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4 inch lap over adjacent absorptive covers.

2. Provide moisture-cover curing by covering concrete surface with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Provide curing and sealing compound on interior slabs left exposed and to exterior slabs and walks, as follows:
    a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
    b. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

C. Curing Formed Surfaces:
1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for full curing period or until forms are removed.
2. If forms are removed, continue curing by methods specified above, as applicable.

D. Curing Unformed Surfaces:
1. Cure unformed surfaces; i.e., slabs and other flat surfaces by application of appropriate curing compound.
2. Final cure concrete surfaces to receive finish flooring by moisture-retaining cover, unless otherwise directed by Engineer.

3.14 SURFACE FINISHES

A. As-Cast Finish:
1. For formed concrete surfaces not exposed-to-view in the finished work or by other construction, unless otherwise indicated.
2. This is concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth Form Finish:
1. For formed concrete surfaces exposed-to-view, or that will be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, i.e.; waterproofing, damp-proofing, painting or other similar system.
2. This is cast-in-place concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams.

3. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise specified or shown on Drawings.

D. Float Finish: Apply float finish to slab surfaces to receive trowel finish and other finishes specified.
   1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units.
   2. Check and level surface plane to tolerances of Ff 18 - Fl 15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to uniform, smooth, granular texture.

E. Grout Cleandown Finish:
   1. After repairing defects, saturate surface thoroughly and keep saturated during grouting operations.
   2. Use a grout consisting of 1 part cement, 1-1/2 to 2 parts of fine sand and sufficient water for a thick creamy consistency.
   3. Apply by brush, trowel or rubber float to completely fill air bubbles and holes.
   4. Float vigorously with a wood, sponge-rubber or cork float immediately after applying grout. Excess grout shall be scraped off with a sponge-rubber float.
   5. After grout has been allowed to stand undisturbed to allow some loss of plasticity, but not damp appearance, the surface should be rubbed with a clean, dry burlap to remove all excess grout. All air holes shall be filled but no visible film of grout shall remain after the rubbing.

F. Trowel Finish: After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances of Ff 20 - fl 17. Grind smooth surface defects which would telegraph through applied floor covering. Apply where exposed-to-view, and where slab surfaces are to be covered other thin finish coating system.

G. Non-Slip Broom Finish:
   1. Finish concrete as specified, except only trowel the surface once.
   2. Finish surface by drawing fine-hair broom lightly across surface.

3. Brooming:
    a. Broom in same direction and parallel to expansion joints.
    b. Inclined slab: Broom perpendicular to slope. Texture shall be as approved by the Engineer from sample panels.
    c. Round Roof Slab: Broom surface in radial direction.

H. Class 2, Rubbed Finish in accordance with Standard Specifications for Highway Construction, Section 802.20, Arkansas State Highway and Transportation Department, Edition (latest edition) and this Section:
1. After removal of forms, rubbing of concrete shall be start as soon as its condition will permit.
2. Immediately before starting this Work, concrete shall be thoroughly saturated with water. Sufficient time shall have elapsed before wetting down to allow the mortar used in the pointing of rod holes and defects to thoroughly set.
3. Surfaces to be finished shall be rubbed with a medium coarse carborundum stone using a small amount of mortar on its face.
4. Mortar shall be composed of cement and fine sand mixed in proportions used in the concrete being finished.
5. Rubbing shall be continued until form marks, projections, and irregularities have been removed, voids filled, and a uniform surface has been obtained.
6. Paste produced from rubbing shall be left in place at this time.
7. After concrete above the surface being treated has been cast, the final finish shall be obtained by rubbing with a fine carborundum stone and water. Rubbing shall be continued until the entire surface is smooth texture.
8. Finish will not be acceptable if a uniform texture and color have not been achieved. Should the finish not be acceptable, the surface shall be given a sprayed finish or other approved finish that is satisfactory to the Engineer.
9. After final rubbing is completed and the surface is dried, it shall be rubbed with burlap to remove loose power and left free from all unsound patches , paste, powder, and objectable marks.

I. Class 3, Sprayed Finish in accordance with Standard Specifications for Highway Construction, Section 802.20, Arkansas State Highway and Transportation Department, Edition (latest edition) and this Section:
1. Material provided for sprayed finish shall be a commercial paint type texturing product produced specifically for this purpose, and shall consist of a synthetic non-alkyd resin containing mica, perlite, non-biodegradable fibers, and durable tinting pigments. Material shall be approved by Engineer.
2. Unless otherwise specified in the Contract, off-white in color the exact shade shall be selected by the Owner.
3. Surfaces to be coated shall be free of efflorescence, flaking, coatings, dirt, oil, and other foreign substances.
4. The sprayed finish shall not be applied over surfaces cured with membrane curing compound until 30 days has elapsed from application of the membrane.
5. Prior to application of spray finish, the surfaces shall be free of moisture, as determined by sight and touch, and in a condition consistent with manufacturer's published recommendations.

6. Sprayed finish shall be applied at a rate as recommended by the manufacturer and as approved by the Engineer.
7. Sprayed finish shall be applied with heavy duty spray equipment capable of maintaining a constant pressure as necessary for proper application.
8. Completed finish shall be tightly bonded to the structure and shall present a uniform appearance and texture equal to or better than the required for rubbed finish.
9. If necessary, an additional coat or coats shall be applied to produce the desired surface texture and uniformity.
10. Upon failure to adhere positively to the structure without chipping or cracking, or to attain the desired surface appearance, the coating shall be removed from the structure and the surface given a rubbed finish, or another approved finish satisfactory to the Engineer.

3.15 WATER LEAKAGE TESTS - WATER HOLDING STRUCTURES

A. Subject water holding structures to leakage tests after concrete has been cured and obtained its design strength and before backfill, brick facing, or other Work that will cover exposed faces of walls is begun.

B. Fill basins to be subjected to leakage tests with water to normal liquid level line.

C. After basin has been kept full for 48 hours, it will be assumed, for purposes of the test, that moisture absorption by the concrete in the basin is complete.

D. Valves and gates to the structure shall then be closed, and the change in water surface measured for a 24-hour period.

E. During test period, examine exposed portions of the structure and mark visible leaks or damp spots; such leaks or damp spots shall be later patched or corrected in a manner acceptable to Engineer.

3.16 MISCELLANEOUS ITEMS

A. Filling Holes:
1. Fill in holes and openings left in concrete for the passage of Work by other trades after their Work is in place.
2. Mix, place, and cure concrete to blend with in-place construction. Provide other miscellaneous concrete filling required to complete Work.

B. Non-Shrink Grout Application: Grout base plates, equipment bases, clarifier base, and other location indicated with specified non-shrink grout. Provide non-metallic type where grout is exposed.

3.17 PROTECTION

A. No Work or walking on finished surfaces will be allowed for 16 hours after the concrete is placed.

B. Provide plywood or other acceptable protective cover at all traffic areas throughout the job.

C. Protect exposed concrete floors, steps, and walks from paint and other materials or equipment which may blemish or damage these surfaces.

END OF SECTION

SECTION 11213

ELECTRIC MOTOR-DRIVEN DOUBLE MEMBRANE PUMP

PART 1. DESCRIPTION

1.1 SCOPE

A. This section specifies electric motor-driven, mechanically operated double membrane pumps for pumping chemical solutions with wide dosing pH ranges. Equipment supplied shall consist of the pump, suction and discharge manifolds, intermediate gear reducer, electric motor and all necessary appurtenances.

1.2 TYPE

A. The metering equipment shall be a positive displacement, a simplex double-acting electrically driven mechanical membrane type with an internal linear drive system which transfers the rotary motion of an electric motor into a linear pumping action. The pumps shall be of a seal-less design, capable of operating dry with the ability to self-prime.

1.3 DESIGN REQUIREMENTS

A. Equipment furnished shall be designed for pumping liquids, viscous, and solid particles containing media. The equipment shall be capable of handling corrosive, acidic and alkaline liquids.

1.4 PERFORMANCE REQUIREMENTS

A. The repeatable metering accuracy shall be plus or minus 1 percent of full scale, at constant hydraulic conditions, over 10:1 operating range. The feed rate shall be infinitely adjustable from 0 through 100 percent.

B. The equipment shall be able to deliver feed rate of 0.2 – 3.5 gpm.

PART 2. MANUFACTURER

Equipment supplied in relation to this specification shall be an ABEL Electro Mechanical Membrane Pump, Model EM-015Z-SG or approved equal.

2.1 MATERIALS

A. The equipment shall be manufactured using new and the best quality materials available for the purpose of commercial practice.

B. Materials of construction shall be:
   1. Pump housing, suction and discharge manifolds:
      a. Cast Iron
   2. Membranes, ball checks and valve seats with steel:
      a. EPDM/Polyurethane with core/Polyurethane
   3. Pulsation dampeners and suction stabilizers:
      a. Steel with NBR bladder, air-over-slurry style

2.2 EQUIPMENT

A. Pump:
   1. The pump shall be a simplex double-acting membrane pump consisting of two cast housings connected to common suction and discharge headers. Each housing is divided into a drive end and a membrane housing by a fabric reinforced, molded membrane. Membrane housings shall be fitted with suction and discharge check valves of ball check design.

B. Membrane:
   1. The membrane shall be a molded fabric reinforced elastomer with an integral metal core so that only the elastomer contacts the pumped media.

C. Check valves:
   1. Ball Checks:
      a. The standard pump shall be supplied with ball checks and valve seats. These check valves act to isolate the suction manifold from the membrane housing and the membrane housing from the discharge manifold. Polyurethane with steel core shall be the standard materials of construction for the ball checks. The valve seats shall be constructed of polyurethane.

D. Drive mechanism:
   1. A linear mechanical drive, located between pump housings, shall convert the rotary motion of the electric motor to a reciprocating movement through a stub crank assembly. The reciprocating movement shall move the membranes at a constant stroke rate while preventing any differential flexure of the individual membranes. This arrangement shall permit a constant discharge of fluid from one membrane housing while drawing fluid into the other.

E. Pulsation dampeners and suction stabilizers:
   1. Pulsation dampeners and suction stabilizers shall be provided for the discharge and suction of the pump as recommended by the pump manufacturer.
   2. Air-cap Style:
      a. When the system discharge pressure or inlet suction pressure varies, air-cap style dampeners and stabilizers shall be provided. Air-cap style

devices are enclosed tanks, typically constructed of steel or stainless steel, with pressure gauge, air charge and drain valve connections.

F. Electric motor:
   1. The electric motor shall be sufficiently sized for the particular application covered by this specification.

G. Gear reducer:
   1. The intermediate, constant speed gear reducer shall be properly sized as to reduce the RPMs of the electric motor to the correct RPM required to operate the pump for the particular application covered by this specification.

H. Gearmotor:
   1. Optionally, a constant speed gear motor shall be properly sized and supplied in place of the individual electric motor and gear reducer as described above.

I. Leakage detection device:
   1. A membrane leakage detection device shall be supplied with the equipment. The detention device shall consist of a capacitive moisture level sensor mounted in a plastic collection container which sets a dry contact upon the presence of liquid. The electrical switch is rated for 115 volt AC, 20 VA (max).

J. Over pressure protection devices:
   1. Pressure Switch with Diaphragm Seal and Pressure Snubber
      a. A NEMA 4, single setting, adjustable range (preset by the factory) 1 phase, 60 Hz, 120 Volt pressure switch with appropriately constructed diaphragm seal and pressure snubber shall be available as an option.

2.3 SPARE PARTS

A. The following spare parts shall be provided by the pump manufacturer:
   1. One (1) Wear Parts Kit (2 – membranes, 4 – seats, 4 – balls/flappers).

PART 3. EXECUTION

3.1 INSTALLATION

A. The pump manufacturer shall provide the pump, gear reducer and electric motor completely assembled ready for installation.

3.2 TESTING AND COMMISSIONING

A. After the installation is completed, the pump shall be field tested to ensure compliance with the performance required as detailed in the project specification.

3.3 TRAINING

A. The pump manufacturer shall provide training for the wastewater treatment superintendent.

END OF SECTION

SECTION 11352

IN-LINE PIPE FLANGED, NON-CONTACT ULTRAVIOLET DISINFECTION EQUIPMENT

PART 1. GENERAL INFORMATION

1.1 SCOPE OF SUPPLY

A. Manufacturer shall furnish a complete in-line pipe flanged, low pressure high intensity (LPHO) Ultraviolet (UV) Non-Contact disinfection system to provide required disinfection of plant effluent waters prior to ultimate plant discharge.

B. UV systems that require lamps with input power greater than 145 watts shall not be considered. Amalgam lamps shall not be considered, system with quartz sleeve surrounded lamps shall not be considered.

C. The equipment shall essentially be automatic in operation, with no automated cleaning apparatus. Separate cleaning apparatus', integrated wiper mechanisms, quartz sleeves, O-rings, or lifting cranes shall not be required as per of the non-contact UV disinfections system.

D. The system shall be complete with power enclosures, power distribution and system controls shown on the contract drawings and specified herein.

1.2 SUBMITTALS

A. The Manufacturer shall furnish electronic submittals consisting of the following information:
   1. Mechanical/ assembly drawings.
   2. Power/Control wiring single line diagrams.
   3. Manufacturer's catalog information consisting of descriptive literature, specifications and materials of construction for all components

B. After successful startup, Manufacturer shall provide certification that the ultraviolet disinfection system is commissioned and is ready for service.

C. Manufacturer shall furnish the Owner with one (1) hard copy and electronic copies of maintenance data on all machinery and equipment furnished for the system. The manuals shall include the following:
   1. Equipment operating and maintenance instructions
   2. Parts lists
   3. Assembly and disassembly instructions
   4. Equipment specifications and guaranteed performance data
   5. Recommendations for preventive maintenance
   6. Step-by-step operating and start-up procedures
   7. Lists of spare parts, tools, and supplies

8. Wiring diagrams of all control circuits
9. Software programming as updated after final acceptance
10. Troubleshooting instructions

1.3 QUALITY ASSURANCE

A. UV Design Criteria:
1. The equipment to be supplied and installed shall disinfect an effluent with characteristics as follows:

a.	Peak Hour Flow:	4.6 MGD
b.	Average Flow:	3.8 MGD
c.	Minimum Flow:	0.0 MGD
d.	Influent Maximum (CFU/MPN):	200,000/100 ml
e.	Target Pathogen:	Fecal Coliform/ E.Coli
f.	Minimum UV Transmittance:	65.0 %
g.	Maximum Influent Suspended Solids*:	30 mg/l
h.	Maximum Influent BOD*:	30 mg/l
i.	Maximum Influent Total Iron*:	0.3 mg/l
j.	Mean Particle Size*:	30 microns
k.	Maximum Influent Turbidity*:	5 NTU
l.	Annual Effluent Temperature Range*:	2° to 30°C (33° to 86°F)

Note: *: Industry standard values used for this concept level specification.

2. Redundancy: 0.00 % of UV reactors at peak hourly flow.

B. Effluent Standards to be Achieved
1. The UV reactor shall be designed to deliver a calculated dose and shall produce an effluent as follows:

UV Dose (Design/Peak Flow)	30.0 ($mW.s/cm^2$:mJ/cm^2) minimum after application of EOLL factor of .85
Effluent Geometric mean (CFU/MPN)	200/100ml Fecal Coliform (or)
Effluent Geometric mean (CFU/MPN)	126.0/100ml E.Coli

2. Effluent standards based on influent characteristics in accordance with Section 1.3-A.1.
3. Effluent pathogen quantities based on a two single day grab samples and as a 30 Geometric Mean. Grab samples shall be taken in accordance with the Microbiology Sampling Techniques found in Standard Methods for the Examination of Water and Wastewater, 19th Ed.

C. Head Loss:
1. Head loss thru the reactor shall be as follows:
a. Peak Flow: < 7.1 inches (flange to flange head loss through UV reactor)

D. Operating Conditions:
   1. Outdoor installations shall require a cover for protection against the elements. The cover of the UV unit shall be supplied by the Contractor.
   2. The UV system shall be designed to operate at a maximum pressure of less than 20 psi. Pumped flow through the UV unit shall require a pressure relief valve for protection against over pressurization/surges and appurtenances for air/vacuum release. The valve(s) to be installed shall be sized by the Manufacturer, reviewed by the engineer and supplied and installed by the Contractor.
   3. The location and placement of the valves shall be as per the engineer's direction.

1.4 EQUIPMENT

A. The Ultraviolet Disinfection (UV) system shall consist of the following components:
   1. Reactor Model No: D7t.10061
      a. Number of reactors: 1
   2. Each reactor shall consist of the following:
      a. Number of Banks per Reactor: 1
      b. Number of AFP Tubes/ Bank: 60 (In one bank length)
      c. Number of Lamp Racks per Reactor: 7
      d. Number of Lamps per Lamp Rack: 12
      e. Number of lamps per reactor: 84
      f. Total number of ballasts per reactor: 84
   3. The UV system shall include the following controls/monitoring:
      a. Ultrasonic Level Sensor 1 (per UV reactor)
      b. UV Intensity Monitor: 1 (per UV reactor)
      c. HMI Panel: 1
   4. Spare parts consisting of the following:
      a. UV Lamps: 12
      b. UV Ballasts: 12
      c. UV Sensor: 1
      d. Operator Safety Kits: 2
      e. Cleaning Kit: 1

1.5 WARRANTY

A. The equipment furnished (excluding lamps, ballasts) shall be warranted to be free of defects in material and workmanship, including damages that may be incurred during shipping for the lessor of a period of 12 months from substantial completion of the installed UV system or 18 months from receipt of all equipment supplied by the Contractor and received in good condition by Owner.
   1. UV Lamps: UV lamps shall be warranted for a minimum of 12,000 hours operating time under the conditions specified herein prorated after 9,000 hours. In the event of premature UV lamp failure, the UV system supplier shall offer the following:

a. Lamp failure before 9,000 hours – send a replacement lamp free of charge
b. Lamp failure after 9,000 hours – issue a credit proportional to the hours not used.

2. Ballasts: Electronic ballasts are fully warranted for 3 years, extended to five years with first purchase of (1:1) replacement lamps from Enaqua lamps within three years of installation.

1.6 PERFORMANCE/DISINFECTION GUARANTEE

A. Enaqua shall guarantee that the proposed UV disinfection system shall produce an effluent that meets or exceeds the requirements of this specification. The effluent quality exiting the UV system must be equal to or better than the specification requirements. The guarantee shall be applicable for a duration of twenty (20) years from the date of startup as long as the wastewater flow and quality remains in the range(s) specified in the Design Criteria.

1.7 ACCEPTABLE MANUFACTURERS

A. Basis of Design for non-contact UV disinfection system and components shall be equipment manufactured and supplied by Enaqua, 2410 Birch Street, Vista, CA. All alternate manufacturers must be pre-qualified a minimum of 30 days prior to bid and must meet all performance, warranty, control and experience criteria.

1. Alternate equipment for the Basis of Design may be accepted for consideration if Seller of alternate equipment (Seller) adequately demonstrates to Buyer, at Buyer's sole discretion, that:
   a. The proposed alternate equipment shall be equal to the Basis of Design equipment and shall meet the design and performance criteria described herein, have the same warranty, shall maintain compliance of wastewater treatment plant discharge permit(s), rules, and regulations, and not result in any adverse impacts on Owner, including, but not limited to, additional capital or operational costs.
   b. Seller shall indemnify buyer from any and all patent infringement claims that may arise from the purchase of seller's equipment.
   c. Seller shall pay all costs to Buyer to re-design and re-schedule the Project and revise the Bid and Contract Documents as necessary for the incorporation of the proposed alternate equipment.
   d. Seller shall provide documentation showing compliance with all sections of this specification at time of bid.

PART 2. PRODUCTS

2.1 DESIGN, CONSTRUCTION AND MATERIALS

A. General:
1. All module welded metal components in contact with effluent shall be Type 304 stainless steel.
2. All wetted metal components shall be Type 304 stainless steel with the exception of the Lamp Rack Assembly, which shall be constructed of aluminum and be capable of sustaining intermittent pedestrian traffic on the lamp racks.
3. All wiring exposed to UV light within the UV reactor, or electrical ballast enclosure shall be Teflon™ coated.
4. All wires connecting the lamps to the ballasts shall be enclosed inside the frame of lamp rack and not exposed to the effluent.
5. The effluent water shall be conveyed through the UV reactor via AFP_{840}™ tubes – there shall be no contact with effluent and quartz sleeves at any time during normal operation.
6. All wetted components in the UV reactor shall be: AFP_{840}™, 304SS, PVC, ABS or other non-reactive, non-corrosive material.

B. Lamp Array Configuration:
1. The lamp array configuration shall be the uniform array with all lamps parallel to each other and to the flow.
2. The UV reactor shall be designed to avoid any immersion of UV lamps in the Effluent.
3. The UV lamps shall be arranged around the outside of the AFP_{840}™ tubes in such a way that each AFP_{840}™ tube shall have no less than 6 lamps irradiating it at all times.

C. Inlet/Outlet Flow Distribution:
1. Each UV reactor shall have an inlet and outlet tank. Plant effluent piping shall connect to each of the tanks to convey effluent through the UV reactor.
2. Connection to inlet and outlet tanks of UV reactor:
   a. Diameter: 18.00” Diameter (ASME/ANSI B16.5, CL 150 Flange)
3. Each UV reactor shall have a flow distribution sheet, so as to distribute wastewater efficiently through the AFP_{840}™ tubes.
4. The tanks and inlet flow distribution sheet shall be made of 304SS material. All material which comes in contact with the wastewater shall be non-corrosive.

D. AFP_{840}™ Tube Ultraviolet Reactor:
1. Within the ultraviolet reactor, AFP_{840}™ UV transmitting tubes are arranged in a horizontal and vertical array. These AFP_{840}™ tubes are in a parallel mode and are attached at one end to the inlet flow distributor sheet and to the outlet flow distributor sheet with appropriate leak proof fittings. The AFP_{840}™ tubes shall be adequately supported.

2. In between and around the AFP_{840}™ tubes, lamp rack assemblies shall be placed in such a fashion so as to provide uniform and adequate ultraviolet light intensity. The lamp racks slide in and out between and around a row of AFP_{840}™ tube array.
3. Within the AFP_{840}™ UV reactor, all UV sensitive materials shall be protected from the UV light.
4. The flow path through the AFP_{840}™ tubes shall achieve optimized plug flow regime. The flow of wastewater should be in sufficient turbulent mode; therefore, the Reynold's number in each UV reactor would be greater than 50,000 at peak flow. A turbulent flow shall be in such a way that it scours the inner walls of the AFP_{840}™ tube to help prevent scaling or fouling.
5. The UV reactor shall be covered from five sides with either coated aluminum or stainless panels. The sixth side (top) shall have access door(s). The lamp racks shall be accessible through these doors.
6. The air temperature inside the AFP_{840}™ UV reactor shall be maintained between 32 - 49 deg C or 90-120 deg. F by means of a heat exchanger. The control of the reactor temperature shall ensure optimum UV light emissions from the UV lamp.
7. A temperature sensor shall be installed within the UV reactor for protection against heat build-up under no or low flow conditions.

E. UV Lamps: The UV lamps shall have the following characteristics:
1. A low pressure, high output (LPHO) non-amalgam mercury vapor lamp of the hot cathode type.
2. The filament shall be of the clamped design, significantly rugged to withstand shock and vibration.
3. The power consumption shall be a maximum of 138 input watts per lamp, total including ballasts losses shall not exceed 145 watts including ballast losses.
4. The rated UV output at 253.7 nanometers (nm) shall be a nominal 57 UVC Watts at 100 hours of operation.
5. The lamp shall have a minimum UV intensity of >400 microwatts/cm^2 at 1 meter.
6. Each lamp shall have a rated life of 12,000 hours.
7. Each lamp shall be single ended. Each lamp shall have a nominal arc length of 1400 millimeters.
8. Each lamp has a minimum length of 1554 mm.
9. Each lamp shall produce no measurable amount of ozone.
10. Each lamp envelope is made of fused quartz and is capable of transmitting at 90% of UV light at 253.7 nm.
11. Electrical connections shall be at one end of the lamp and have six (6) pins, dielectrically tested for 2,500 volts. Lamps that have 2-4 pins (instant start) may be considered. However to be considered as an alternate, instant start lamp systems shall supply replacement spare lamps equal to 20% of the total number of lamps in the system.

F. UV Lamp Racks:

1. The UV lamp racks shall be placed between rows of the AFP_{840}™ tubes.
2. The lamp racks shall typically slide in and out within a track that shall be attached to the main frame of the UV reactor.
3. The use of cranes, hoists or other mechanical lifting devices shall not be required.
4. The lamp rack assemblies shall be made from aluminum.
5. Electrical mounting sockets shall be attached to one end of the lamp rack.
6. The other end of the rack shall have slotted holes to slide lamps in and out during installation and removal of lamps.
7. Quick power disconnects allow quick disconnect of the lamp rack assembly to the main power at the UV reactor chassis.
8. Each lamp rack shall be equipped with its own on/off switch and fuse.
9. Each lamp rack shall be equipped with an LED indicator to identify the operating condition of each lamp on the lamp rack.
10. Lamp Racks shall be removable for service during UV operation without impacting Hydraulic flow and still maintaining plug flow regime in the reactor.
11. Each lamp shall be controlled by an individual ballast. Systems that have one ballast controlling multiple lamps shall not be considered.
12. There shall be no quartz sleeves, O rings, seals, glands or retainers required to be around the lamps when installed in the lamp racks.

G. Electronic Ballasts:
1. The ballast used to energize the UV lamps shall be high frequency electronic ballasts.
2. The electronic ballasts shall be rated at 120-277 V +/- 10% without discernible change of characteristics.
3. The electronics ballast shall have the following features:
   a. Power factor greater than or equal to 0.95.
   b. Electrical conversion efficiency greater than or equal to 90%.
   c. Ballast shall have high frequency phase returns from the UV lamps.
   d. The ballast operating frequency shall be between 40 and 150 K Hz.
   e. The ballast shall have a thermal overload protector to protect against overheating when ballast skin temperature reaches 75 deg. C.

H. Electrical:
1. The UV reactor shall be powered from its own incoming power supply (to be supplied by others).
2. All cabling, conduit runs and wiring from the plant power supply to the UV reactor shall be as shown on the construction drawings.
3. The Contractor shall be responsible for bringing main and control power to the UV reactor through a Branch Circuit protections device (disconnect) as shown on the drawings.
4. Electrical power required shall consist of the following:
   a. Main power to reactor(s): 4800 VAC, 3 phase, 4 Wire plus ground
   b. Cooling Pump Power: 480 VAC, 3 phase, 3 Wire plus ground
   c. Control power to reactor(s): 120VAC, 1 phase, 2 wire plus ground

d. Control power to HMI: 120VAC, 1 phase, 2 wire plus ground

I. UV Intensity Monitor:
1. The UV reactor shall have a minimum of one UV intensity sensor. The sensor shall not degrade after prolonged exposure to the UV light or effluent.
2. The sensor shall measure only the UV light emitted by the UV lamps as measured at 253.7 nm. It shall have sensitivity at 253.7 nm of greater than 95%. Sensors whose sensitivity to other wavelengths amounts to more than 5% of the total sensitivity shall not be allowed.

J. Control Strategy:
1. Local control (on reactor) via HOA switch.
2. Remote Start via dry contact

K. HMI Panel:
1. The HMI is installed and mounted in a UL 508-A rated enclosure to provide graphic interface for monitoring and control.
2. The HMI Panel shall be DFI-US Series with Ethernet switch, and shall show all system operational data, system operational history and shall allow access via remote internet connection for troubleshooting and system upgrades.
3. The HMI enclosure shall house the following:
   a. 19-inch color panel PC.
   b. Electronic Data Center (EDC).
   c. Digital I/O's
   d. There shall be a three way HOA control for allowing OFF, HAND, or AUTO (automatic) operation of the reactor providing control for the following;

      HAND: Shall provide local lamp control.
      OFF: Shall power off the lamps in the reactor.
      AUTO: Shall provide automatic lamp control from remote signal.

L. Electronic Data Center (EDC):
1. Each UV reactor shall be equipped with an Electronic Data Center (EDC). This system shall collect all the data from individual UV lamps, UV and other sensors in the system and shall display it via a local display and remotely to the plant operation console. The Local display panel shall show the following data:
   a. On/Off status of lamps.
   b. Error Status of lamps and sensors.
   c. An advanced signal for lamp service or replacement.
   d. UV intensity.
   e. The type and location of the alarm.
   f. The frequency of alarms shall be counted and stored.
   g. Alarms and historical operating data shall be stored in a removable storage device in comma delineated format.
2. Communication between the each bank of the rector and the EDC shall be via CAT5 Ethernet cable.

3. Communication between the reactor and HMI shall be via CAT6 Ethernet cable.

M. Remote Monitoring and Control:
   1. The UV reactor shall have the capability of providing basic remote monitoring/control via the plants main console (or other designated computer). The plant shall provide either an Internet IP address specific to the UV system, or allow access through its network and via secure website.
   2. Connection/integration to the main console (or customer SCADA system) shall be via Ethernet TCP/IP. Alarming and Controls
   3. Minor alarms shall be provided by the EDC via dry contact to indicate to plant operators that maintenance attention is required. Alarms shall include:
      a. Low UV Intensity shall be pre-set at the factory for 70% of the intensity after 100 hours. Alarm set point shall be field adjustable.
      b. Lamp Out
      c. Lamp Life
   4. Major alarms shall be provided by the EDC via dry contact to indicate an extreme alarm condition in which the disinfection performance may be jeopardized. Alarms shall include:
      a. Low UV Intensity Alarm. This alarm shall be pre-set at the factory for 25% of the intensity after 100 hours burn-in of the lamps. The alarm set point shall be field adjustable. A low intensity alarm shall not cause any bank to turn off.
      b. Over temperature alarm
      c. Lamp rack power failure

N. Level Pacing:
   1. The UV system shall employ a level pacing technique in which the lamps that are not required for maintaining the proper dosage are turned completely off in accordance with the level of the water tank. Determining water level shall be provided via an integral level sensor using a 4-20 mA signal terminated at the HMI panel.

O. Control Strategy:
   1. From HMI panel (external control): With the switches for each bank in the AUTO position, the reactor shall be controlled externally from the HMI panel.
   2. Local control (on reactor): The switches shall override the control from HMI panel.
   3. Remote Start: Each UV reactor shall have the capability of remote start via dry contact.

PART 3. INSTALLATION, TESTING AND TRAINING

3.1 INSTALLATION

A. Equipment shall be installed by Contractor in accordance the manufacturer's recommendations, drawings and specifications to provide a complete installation.

B. Installation Responsibilities of the Contractor:
   1. Provide Manufacturer with at least two (2) week notice prior to any changes in the installation date previously agreed upon by the Owner and Manufacturer.
   2. Sufficient space for moving into place and placement of all equipment supplied by Manufacturer.
   3. Equipment anchoring and grouting including anchor bolts.
   4. All required permits.
   5. Structural work such as concrete pads, mezzanines for elevating equipment items, etc.
   6. Interconnecting electrical outside of the UV Skid limits.
   7. Connection and sealing of al flanges, fittings and connections to the adjacent plan processes.
   8. All flanges, reducers, elbows, valves and other plumbing appurtenances not specified within these specifications shall be by the Contractor.
   9. All electrical outside the skid limits including, transformers and disconnect switches. Equipment electrical supply shall be detailed on the shop drawings.
   10. Protecting the UV reactor from damage between the time of delivery and installation.
   11. Analytical testing.
   12. Equipment unloading, moving and rigging into position.

C. Installation Responsibilities of Manufacturer:
   1. Equipment packaging for transportation from Manufacturer Factory to the job site.
   2. All labor to complete the tasks listed as Manufacturer’s responsibility shall be performed as straight time rates by employees of Manufacturer is a non-union company, or our designated subcontractors.
   3. Any deviations from this assumption shall require approval of a Change Order.

D. Startup Responsibilities of the Contractor:
   1. Provide Manufacturer with a two (2) week notice prior to any changes in the start-up date previously agreed upon.
   2. Availability of all required utilities.
   3. Availability of typical feed water quality and quantity.

E. Joint Responsibility of Manufacturer and Contractor:
   1. Final assembly of and loading of the UV lamps supplied by Manufacturer.

F. Startup Responsibilities of Manufacturer:
   1. Manufacturer’s representative for the equipment specified herein shall be present at the jobsite for a minimum amount of workdays for services listed below. Excluded from these time requirements shall be travel time spent, time

spent during shipping of equipment, time spent at the jobsite correcting any fabrication or manufacturing errors, and time spent preparing and operating the equipment to meet performance requirements including all performance testing. The Bid shall include all associated expenses incurred by the technical representative during the jobsite visits. The following services shall be provided:

a. Two workdays (8 hours each) for maintenance training, maintenance assistance, classroom and on-site equipment operation instructions, troubleshooting, and other post-startup services.

3.2 ELECTRICAL CONNECTIONS AND CONTROLS

A. Wiring and conduits for electrical power, controls, and instrumentation shall be provided by the Contractor.

END OF SECTION

SECTION 11353

ROTARY DRUM SCREENS AND COMPACTOR

PART 1. GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required, for new rotary drum screens, a compactor and appurtenances, as shown on the Drawings and as specified herein.

B. These Specifications are intended to give a general description of what is required, but do not cover all details that will vary in accordance with the requirements of the equipment application. It is, however, intended to cover the furnishing, delivery and field testing of all materials, equipment and all appurtenances required to complete the Work of this Section, whether specifically mentioned in these Specifications or not. It is the Bidder's responsibility to comply with all the aspects of these specifications. Costs for evaluating proposals for similar or alternate equipment will be borne by the Bidder.

1.2 RELATED WORK

A. Anchor bolts shall not be furnished under this Section.

B. Field painting is per manufacturer's standard.

1.3 SUBMITTALS

A. Submittals shall include at least the following:
   1. Shop and installation drawings showing materials, details of construction, dimensions and battery limits for other Sections.
   2. The materials list should include:
      a. Screen and compactor data including drawings
      b. Complete bill of materials for all equipment
      c. Manufacturer of all components supplied
      d. Model numbers of all component supplied
      e. Motor speeds
      f. Capacity
      g. Weights of package assemblies
      h. List of recommended spare parts for 2 years' operation.
      i. Brake horsepower required at rated capacity
      j. Motor data
      k. Accessories and other appurtenances.

B. Complete operating and maintenance instructions professionally published, hard copy and electronic copy, shall be furnished for all equipment included under these specifications.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. All equipment and appurtenances furnished under this Section shall be furnished by a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the equipment to be furnished. Manufacturer shall also provide a written warranty for the package and shall state that they have reviewed the design and application and that the equipment has not been misapplied or the package been poorly designed.
   2. Equipment manufacturer must work according to a recognized ISO quality system.
   3. The listing of any manufacturer by name shall not imply tacit approval of same. The selected manufacturer shall be required to meet the specifications.
   4. Screen and compactor shall be IPEC (JWC) model IFM 60144 and PLB 9213 respectively or approved equal.

1.5 SYSTEM DESCRIPTION

A. All of the equipment specified herein is intended to be standard equipment for use in a Membrane Bioreactor Prescreening System.

B. Design Criteria:

1.	Screen quantity	2 duty
2.	Design flow (gpm)	3194 per screen
3.	Normal TSS (mg/L)	250
4.	Peak TSS (mg/L)	450
5.	Compactor quantity	2
6.	Compactor capacity (yd^3/hr)	2.5
7.	Compactor slope (deg)	22
8.	Horizontal transport lengths	19 ft, 34 ft
9.	Motors (VAC)	480
10.	Classification	TEFC, Class 1, Div 1
11.	Environmental	100 deg F, exposed outdoors

1.6 DELIVERY, STORAGE AND HANDLING

A. All equipment shall be completely factory assembled to the maximum extent possible, practical, and safe for transport and on-site handling.

B. Factory-assembled parts and components shall not be dismantled (other than per 1.06.A).

C. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

D. No shipment shall be made until approved by the Contractor in writing.

E. All equipment delivered to the site shall be stored in accordance with the manufacturer's instructions.

1.7 MAINTENANCE

A. Spare Parts and tools
   1. Furnish a priced list of recommended spares.
   2. If purchased, spare parts shall be properly bound and labeled for easy identification without opening the packaging and suitably protected for long-term storage in a humid environment.

PART 2. PRODUCTS

2.1 SCREENS

A. The internally fed rotary screen shall consist of a screen drum, splash guard enclosure, covers, solids discharge chute, influent headbox with distribution plates, base frame, trunnions, drive system and external spray bar.

B. Rotary Screen Drum:
   1. The screen drum will consist of a cylinder shaped screen, connected on each end to solid end cylinders. The end cylinders provide structural rigidity and also form a guide track for the drum wheels.
   2. The end cylinders will be constructed from 5/16 inch thick plate with end flanges of 3/8 inch thick by 2 inch wide flat bars.
   3. The discharge end cylinder will be fully open and the inlet end cylinder will be partially closed.
   4. The screen will be formed from 16 gauge perforated plate and welded to the end cylinders. The perforated plate will have 1.5 mm round holes. The screen will have an internal support structure of spirally aligned flatbar to ensure structural integrity under dynamic and torsional load. The radial support bars will form a continuous helix that will extend along the full length of the interior of the screen. The helix will divert solids to the discharge end of the drum.
   5. All components of the screen drum will be constructed in type 304 stainless steel.

C. Screen Drum End Rings:
   1. The solid end sections of the drum on which the wheels ride shall be constructed of 5/16 inch thick stainless steel plate.
   2. The influent end plate and the splash rings shall be constructed of 3/8 inch type 304 stainless steel.

D. Base Housing: The stainless steel base shall be designed to support all equipment under operating load. The headbox, splash guards, trunnions frames and drive unit shall bolt to the base. The base shall be formed channels constructed from 5/16 inch plate.

E. Splash Guards: Splash guards are mounted on each side of the screen and are bolted to the base. Filtrate is contained by splash guards and directed into the drainage area.

The splash guards are constructed of 10 gauge type 304 stainless steel. All joints are continuously welded and polished smooth to help eliminate depositing of solids.

F. Solids Discharge Chute: The discharge chute is mounted at the discharge end of the drum and is bolted to the base. It is constructed from 10 gauge type 304 stainless steel. All joints are continuously welded and polished smooth to help eliminated depositing of solids. The discharge chute will have support plates for attachment to the headbox.

G. Hoods: The hood sections are bolted to the housing and are constructed from 11 gauge type 304 stainless steel. Each enclosure panel can be easily detached to give access to the outside of the drum. The end cover shall have a hinged inspection door with latches.

H. Influent, Headbox and Distribution: The headbox shall mount on the inlet end of the housing and extend into the interior of the drum. Internal baffles and splash plates shall distribute water evenly onto both sides of the screen drum. A clean-out port shall be installed in the headbox. The headbox shall have a 36 inch SCH 10 inlet pipe with flange connection. The complete headbox assembly shall be constructed in 3/16 inch 304 stainless steel.

I. Rotation System:
   1. Wheels: The screen drum shall rotate on four trunnions. Each wheel shall be made from UHMW polyurethane. The wheels shall be mounted on a shaft. The 10 inch diameter by 3 inch wide wheels are trunnions mounted on two 1-1/2 inch spherical pillow block bearings.
   2. Each trunnions assembly will have a guard cover. The grease ports on the pillow blocks shall be connected to stainless steel tubing which shall terminate at a manifold plate bolted on the frame. Tubing connection will be compression type.

J. Drive Assembly:
   1. The motor and a helical gear reducer will drive the screen drum. The motor shall have a service factor of 1.15 and the gear reducer shall have a 1.6 service factor.
   2. The drive chain shall be #80 stainless steel roller chain. The full ring driven sprocket shall be 3 inches wide by 3/4 inch thick constructed in type 304 stainless steel. The drive and driven sprocket shall be constructed of stainless steel.
   3. The chain and sprockets shall have a guard cover constructed in 12 gauge 304 stainless steel. The drum shall rotate at 4.2 rpm.

K. Spray Bars:
   1. External Spray Bar: An external spray bar, constructed of 2 inch SCH 40 type 304 stainless steel pipe, shall be mounted on the splash guard. The spray bar shall have 47 stainless steel fan jet spray nozzles. Each nozzle is rated at a hydraulic capacity of 1 USGPM @ 40 psi. A hinged cover shall enclose the spray bar.

2. Spray Collection: The drum will have an internally mounted spray collection trough to contain the shower water on exit of passage through the screen. Collected water shall be directed away from the dewatered sludge to prevent rewetting. The spray collection trough shall be constructed from 11 gauge type 304 stainless steel.

L. Piping Connection: Connection for the inlet and filtrate outlet shall be of type 304 stainless steel stub ends with 150# ANSI stainless steel back-up flanges.

M. Surface Finish:
1. Surface Treatment of Stainless Steel Components: Welds shall be acid passivated with pickling paste by brushing on all welds and overlapping into heat affected zones. Paste shall be left on for 1 to 2 hours before water flush and neutralization with soda ash solution.
2. All surface blemishes and weld tacks shall be blended smooth and the complete surface shall be glass bead polished to a uniform finish. After polishing the surface shall be rinsed then passivated using citric acid solution. Solution shall be sprayed onto screens and left for 30 minutes before water flushing the complete surface.
3. After drying, all surfaces shall be coated with a thin film for superior corrosion resistance.

N. OEM Components:
1. The motor, gear reducer and all unit-mounted electrical devices will have the manufacturer's standard finish.

2.2 COMPACTOR

A. The screw conveyor unit will consist of a spiral assembly, transport housing with drainage screen, drain outlet and discharge fitting, covers with one (1) inlet fitting, drive system, mounting legs and controls.

B. Spiral Assembly: The spiral assembly will consist of a spiral, brush and drive shaft. The unit will be shaftless except at the drive end and at the discharge end.
1. Spiral: The inlet spiral will be constructed of carbon steel, with an OD of 8-1/2 inches. The spiral will be constructed of concentric flights formed from plate stock and welded together. The outer will be 3/4 inches wide by 2 inches high. The inner spiral will be 5/8 inch wide by 1-1/2 inches high. The inner will have an ID of 1-3/4 inches. The total height will be 3-3/8 inches. The flights shall be carbon steel of Brinell hardness 225.
2. Brush: The spiral will be fitted with a water resistant brush that will clean the drainage screen basket openings and be fastened to the outer edge in the screening section only. The brush will be attached to the spiral with stainless steel cap screws.
3. Shaft: The drive shaft will be welded directly to the spiral. The shaft will be stainless steel and keyed to mate with the hollow drive of the gear motor.

C. Transport Housing: The transport housing shall be a U-shaped trough, with a detachable cover top. The trough shall be constructed in 10 gauge plate of type 304 stainless steel. The covers shall be constructed in 11 gauge plate, type 304 stainless steel. The housing shall have a 3/8 inch, UHMW polyethylene liner clipped to the inside surface to prevent the spiral from wearing on the surface of the tube.

D. Press Zone Assembly:
   1. The press zone will consist of an open topped housing containing a slotted screen dewatering cylinder and a spray wash system.
   2. Press Zone Housing: The housing will be an open topped enclosure 11 gauge, type 304 stainless steel, sides and bottom and 1/2 inch type 304 stainless steel end plates. The end plates will have circular seats for axial positioning of the press screen. The top cover will have neoprene gaskets and be attached with 3/8 inch fasteners. The housing will have a 2 inch FNPT drain port.
   3. Press Zone Screen: The press screen will be a cylinder constructed from heavy duty, type 304 stainless steel wedgewire. The wedgewire shall have face dimension of 0.130 inch and a height of 0.182 inch. The wedgewire backing rods will be 0.156 inch diameter. The slot between the wedgewires will be 0.020 inch, axially directed. The press cylinder will have end flanges constructed from 1/2" plate.
   4. Press Zone Spray Wash System: A shower bar will be installed within the press housing to flush solids from the screen surfaces. The shower bar will be constructed from 1/2 inch SCH 40, type 304 stainless steel pipe and will contain 8 nozzles of various spray patterns and spray capacities. The nozzles near the inlet side will have a higher capacity. One nozzle will be positioned on the bottom of the press housing to flush residue solids. Total water flow rate will be 6 USGPM @ 40 psi. Shower water shall be applied on a cycle basis with maximum duty less than 10% of the drive operation period.

E. Discharge Section: The discharge section will be made of 10 inch SCH 10 pipe, 1/8 inch type 304 stainless steel pipe. The pipe shall extend above the top of the press zone in order to apply pressure for solids plug information. The discharge sections shall be a maximum of 36 inches in length.

F. Drive System: The spiral drive system will consist of a single speed, dual voltage motor, direct coupled to a Eurodrive, FA type helical gear reducer. The gear reducer will be rated for AGMA, Class II. The drive shall mount onto the inlet end of the housing and will mate to the shaft of the spiral. The spiral shall be secured to the drive with a key and cap screw fitted on the end of the shaft.

G. Pedestal Legs: The unit will have support legs constructed from 3 inch by 3 inch by 3/4 inch angle iron. The structural members will be constructed of type 304 stainless steel.

H. Surface Finish:
   1. Surface Treatment of Stainless Steel Components: Welds shall be acid passivated with pickling paste by brushing on all welds and overlapping into

heat affected zones. Paste shall be left on for 1 to 2 hours before water flush and neutralization with soda ash solution.

2. All surface blemishes and weld tacks shall be blended smooth and the complete surface shall be glass bead polished to a uniform finish. After polishing the surface shall be rinsed then passivated using citric acid solution. Solution shall be sprayed onto screens and left for 30 minutes before water flushing the complete surface. After drying, all surfaces shall be coated with a thin film for superior corrosion resistance.

I. OEM Components: The motor, gear reducer and all unit-mounted electrical devices will have the manufacturer's standard finish.

PART 3. NOT USED

END OF SECTION

SECTION 11356

SCREW PRESS

PART 1. GENERAL

1.1 SCOPE

A. There shall be furnished and installed a screw press dewatering system, complete with screw press, reaction tank, control panel, and polymer system complete, in the Solids Handling Building as shown on the Drawings.

B. It shall be the responsibility of the Contractor to coordinate all the details required for a complete dewatering installation. The Contractor shall provide all work to properly install, adjust, and place in operation a complete working system.

C. If the process equipment requires additional space, utilities and/or equipment which are not specified herein or shown on the Drawings, the Contractor shall be responsible for all costs associated with modifications, additions, and construction changes required to place the proposed equipment into service.

1.2 GUARANTEED PERFORMANCE REQUIREMENTS

A. The Equipment shall be capable of operating as a Sludge Dewatering System, as shown on the Drawings to meet the following guaranteed performance requirements:

1. The System shall receive, flocculate, condition, and dewater the feed sludge specified herein, and neatly discharge the dewatered sludge cake into the shaftless screw conveyor as shown on the Plans.

2. The System shall operate continuously or intermittently on demand. The System shall be suitable for dewatering the specified sludge, and shall perform the required dewatering operations at the loading and operating conditions specified herein.

3. The System shall achieve the following minimum Guaranteed Performance Requirements on sludge produced at the Wastewater Treatment Plant. The System furnished and operated by the Contractor shall perform at the operating conditions and meet the performance requirements specified below:

Operating Conditions for Guaranteed Performance Requirements

	Parameter	Description
1.	Operating days per work week	5 days
2.	Operating hours per work day	8 hours

3.	Type of sludge	Anaerobic Digested
4.	Feed sludge dry solids concentration (TS)	1.5 % to 2.5 %
5.	Conditioning Flocculant	Emulsion polymer
6.	Wash Water	Potable water or plant utility water

System Guaranteed Performance Requirements

	Item	Description
1.	Total solids loading capacity, pounds sludge feed (dry solids), per hour	1125
2.	Minimum cake solids concentration, dry weight, percent total solids	17%
3.	Minimum system solids capture, percent	90%

For the purpose of this specification, "Solids Capture (SC)" will be defined as:

Solids Capture (SC) = [(C/F) x (F-T)/(C-T)] x 100

Where:C = Cake TS (mg/kg)

F = Feed TS (mg/kg) – where feed is defined as the sludge stream, excluding any dilution due to polymer solution addition

T = Filtrate TS (mg/kg) – where filtrate is defined as the stream attributable to the screw press dewatering of the sludge feed only, excluding any dilution due to polymer solution dilution and/or screw press washwater

4.	Maximum Polymer Dosage Rate	40 lbs of active polymer per dry ton of sludge

PART 2. PRODUCTS

2.1 APPROVED MANUFACTURERS

A. The equipment specified in this section shall be Schwing Bioset, Model FSP 802 Screw Press or approved equal. All of the equipment described herein shall be supplied by one supplier in order to assure unit responsibility.

B. The structural, mechanical, electrical and instrumentation designs for screw press are specific to the equipment manufactured by Schwing Bioset or approved equal, as specified herein. Any structural, mechanical, electrical or instrumentation modifications required to utilize the equipment actually furnished shall be made by the Contractor at no additional cost to the Owner. All redesign information prepared by the Contractor shall be submitted for review prior to incorporating the redesign into the work.

2.2 GENERAL

A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only. All equipment and associated materials shall be new and without imperfections.

B. The Equipment for the System shall be designed to extract water (dewater) from the anaerobic digested sludge specified herein after conditioning of the sludge with a solution of emulsion polymer. Dewatering by a screw press shall be accomplished by slowly squeezing the flocculated sludge and allowing the liquid to escape through perforated screens surrounding the screw while retaining the solids inside the press. The function of the screw press shall be to generate dewatered sludge such that the discharged cake solids concentration, polymer usage, and solids capture comply with the Guaranteed Performance Requirements specified herein.

C. One (1) system shall be furnished. The equipment shall be fully assembled and factory tested as far as practical prior to shipment. The Owner may elect to inspect the System prior to shipment at own cost.

D. The System equipment shall be oriented and configured as the manufacturer's standard unit as shown on the Drawings.

E. All parts of the mechanisms shall be amply proportioned for all stresses that may occur during fabrication, shipment, erection, and operation.

2.3 CONSTRUCTION AND MATERIALS

All wetted elements of the equipment shall be fabricated from 304 stainless steel, or equally corrosion-resistant material. The principal elements of the equipment shall be fully assembled for simplified movement and installation.

A. Reaction tank
   1. The reaction tank will be designed with a volume of 344 gallons. The inlet pipe is fitted with a 4 inch ANSI flange and located at the bottom of the tank.
   2. Conditioned sludge will discharge from the outlet pipe and 6 inch ANSI flange located near the top of the tank. Tank drain with valve shall be provided.
   3. The reaction tank shall be supplied complete with an agitator and fixed flow breakers. The agitator drive shall include electric motor and speed reducer.

Agitator speed shall be controlled by a VFD mounted on the screw press control panel.

4. The reaction tank mixer motor shall be manufacturer's standard 2 hp, 1800 rpm, 480V/3Ø/60Hz, TEFC Frame, suitable for variable speed operation with PWM constant torque inverter, per manufacturer's standard supply.
5. Reaction tank shall include Pressure sensor with integral local display. Device shall have a 4-20mA analog output for process control to control feed pump speed.

B. Screw press

The screw press shall be a horizontal screw press and shall include the following components and features.

1. Screw press with screw
2. Removable press screen basket
3. Screen spray cover with hinged inspection doors
4. Speed reducer
5. Direct mounted drive motor
6. Washdown mechanism
7. Structural steel base
8. Flanged filtrate outlets
9. Adjustable back pressure cone

Screw press shall consist of a cylindrical perforated screen basket with two longitudinal flanges to permit disassembly for service. Wedgewire cylinders shall not be permitted. Internal screw shall generate increasing pressure on the sludge during the axial passage of the sludge through the press to achieve dewatering. An elastomer seal on the tip of the screw flight ("sealing lip") shall create seal between screw and screen to generate pressure. Screw press without sealing element between screw flights and screen shall not be permitted.

A pneumatically actuated cone at the discharge of the screw adjusts degree of dewatering. Pressure on the cone adjusted manually via air pressure regulator pre-installed on screw press.

Screw press "wetted" parts shall be constructed of 304 stainless steel throughout. Screw press structural base and other "non-wetted" parts may be constructed of carbon steel with the manufacturer's standard corrosion resistant coating.

The screw press drive motor shall be furnished as follows: 7.5 hp, 1800 rpm, 480V/3Ø/60Hz, TEFC Frame, suitable for variable speed operation with PWM constant torque inverter, per manufacturer's standard supply.

The press shall be supplied with a geared speed reducer direct coupled/mounted to drive motor on input and screw press shaft on output. Reduction through chain or belt drive shall not be allowed. The press shall be driven from the discharge end of the screw press.

Any couplings and other high speed rotating parts shall be provided with OSHA approved guards, unless otherwise enclosed by design (e.g., direct coupled).

The screw press shall be provided with removeable lightweight stainless steel spray cover for the top and sides of the screw press for sanitation and personnel protection.

All piping connections shall be either ANSI, class 150, standard raised face flanges or NPT threaded.

Washdown mechanism shall be a circular pipe manifold with an array of spray nozzles to clean the exterior of the screw screen. The manifold transits along the cylinder axis and is actuated by a pneumatic positioner. Washwater shall be potable water or plant utility water. Frequency of wash cycle shall be approximately once per 8-hour operating shift, configurable and controlled at the press control panel. Wash cycle shall not interrupt dewatering operations.

C. Control panel

Equipment manufacturer shall supply a control panel to control the dewatering system. Features shall include:

1. NEMA 4X 304SS, free standing enclosure
2. Circuit Breaker disconnect for 480V/3Ø/60Hz power feed
3. Variable Frequency drives shall be provided for the screw press and reaction tank agitator.
4. Programmable Logic Controller (PLC). PLC shall be Allen-Bradley Compactlogix. Equipment supplier shall include all necessary I/O modules for integration of the system components.
5. Operator Controls shall include Allen Bradley Panelview 10" color touch screen HMI for all operator functions.
6. Interface with the plant control shall be via Ethernet.

D. Sludge feed pump

1. To be provided by others.

E. Magnetic flow meter

1. To be provided by others.

F. Polymer system

1. The equipment supplier shall provide a liquid polymer preparation system suitably sized for operation with the screw press dewatering system. Polymer flow rate shall be 0.5 to 10 gph, with a dilution water flow of 60 to 600 gph and a post-dilution water flow of 60 to 600 gph. Polymer System shall be supplied as a single unit with all components assembled, wired, and plumbed together on
2. 304SS skid by manufacturer. Polymer System shall be Polyblend M1200-P10AA manufactured by UGSI Chemical Feed or equal by Velodyne.
3. Polymer system shall include a hydrodynamic mixing chamber with constant

speed impeller and a progressive cavity polymer dosing pump to control the polymer flow rate. Dilution water flow shall be controlled by ON/OFF solenoid valve.

4. Polymer system shall have a dedicated control panel factory mounted on the skid. Control panel shall be NEMA 4X FRP enclosure, with proportional control via the Screw Press Panel. Polymer control panel shall include pushbuttons, switches, and indicators for configuration and local control of polymer system.
5. Inputs:
    a. Start/Stop (discrete dry contact)
    b. Pacing signal based on process flow (4-20mA)
6. Outputs:
    a. Remote mode status (discrete dry contact)
    b. Run status (discrete dry contact)
    c. Common alarm (discrete dry contact)
    d. Polymer pump rate (4-20mA)

G. Air compressor

1. The equipment supplier shall provide an air compressor to operate back pressure cone and washdown mechanism. Air compressor shall be off-the-shelf portable, oil-lubricated reciprocating type with 2 HP electric motor and 4 gallon twin-tank reservoir. Compressor will be supplied with plug for connection to 120V/1Ø/60Hz standard power receptacle. Compressor will not be integrated into Screw Press controls.

H. Solids Analyzer

1. The solids analyzer shall measure the concentration of the solids pumped through the process pipeline. Each analyzer shall utilize a flow-through style in-line sensor, remote transmitter display with LCD, and 33-ft. interconnecting cable. The analyzer shall use microwave “time of flight” measurement, utilizing microwave propagation time to calculate the concentration of the solids flowing in the pipeline independent of flow velocity. Solids measurement shall be provided to Screw Press Control Panel for optimized dewatering process control and optimized polymer consumption.
2. The flow-through, in-line sensor body shall be 316 stainless steel. The pipeline sensor shall be a wafer-style, flangeless body and have a working pressure rating of 232 psig. Sensor shall be provided for wafer-style installation between 4 inch ANSI flanges by others in pipeline. The internals shall be glass lined coated. The sensor housing and remote transmitter display unit shall both meet IP 65 (NEMA type 4).
3. The transmitter shall have no moving parts. The transmitter shall include both internal process and ambient temperature compensation sensors. The transmitter shall have internal conductivity compensation – no external conductivity probe required.
4. The analyzer shall be Valmet TSTM, or equal.
5. Analysis of samples for calibration of solids analyzer shall be provided by

Owner.

6. When Solids analyzer is used, polymer system shall be modified to include water flow meter, with two modulating water valves to vary water flow in response to signal from Screw Press panel.

2.4 ELECTRICAL DEVICES

A. Motors shall be constructed and tested for performance in accordance with applicable NEMA, ANSI, and IEEE standards.

2.5 ANCHORAGE AND FASTENERS

A. Anchor bolts
   1. All anchor bolts shall be made of type 316 stainless steel. The Contractor shall furnish all anchor bolts, nuts, and washers required for the equipment. Anchor bolts shall be either adhesive epoxy type or expansion type.

B. Fasteners
   1. All fasteners shall be made of type 316 stainless steel. The equipment supplier shall furnish fasteners required for the assembly of the equipment.

2.6 PAINTING

A. Screw Press shall be painted according to the manufacturer's standard system for the application: Polyamide Epoxy Basecoat, Polyurethane Topcoat. Stainless steel surfaces shall be unpainted.

2.7 SAFETY ITEMS

A. All equipment furnished shall be manufactured to comply with the most recent safety standards of the Federal Occupational Safety Health Act and all other applicable safety codes.

2.8 TESTING

A. Factory testing
   1. All major system components shall be factory tested for proper function, and a certification of the results of these tests shall be submitted to the Engineer prior to shipment.

B. Performance testing
   1. Performance testing will occur at such time as the installation work is complete and available for operations.
   2. During the performance testing, the Contractor, with the assistance of the Owner's trained personnel, shall startup and operate the equipment; for the

purpose of demonstrating conformance to the Guaranteed Performance Requirements specified herein. Performance test shall be 8 hours in duration of continuous dewatering. The performance test shall be run to determine the actual system operating conditions and verify that the systems meet the Guaranteed Performance Requirements of this Specification.

3. In the case of non-acceptable performance, the manufacturer shall have 30 days in which to perform, at the manufacturer's sole expense, all equipment modifications to meet the Guaranteed Performance Requirements and request a retest performance testing. If the modified equipment does not meet the Guaranteed Performance Requirements, the manufacturer shall have 30 days in which to perform, at the manufacturer's sole expense, all equipment modifications to meet the Guaranteed Performance Requirements. This process shall continue until retest performance testing shows compliance with the Guaranteed Performance Requirements.
4. Proposed test procedures shall be developed and submitted by the equipment manufacturer and approved by the Engineer. A qualified representative of the equipment manufacturer shall supervise equipment operation during the test.
5. The Owner will provide all sludge feed, water, electrical power, and sludge disposal necessary to conduct the performance testing, at no cost to the Contractor.
6. Contractor shall provide polymer as recommended by the screw press manufacturer.
7. All laboratory tests for the performance testing shall be performed by the Owner in conformance with the applicable portions of the most recent edition of the Standard Methods.
8. The warranty period shall begin after successful completion of the performance test and continue as provided for in the manufacturer's affidavit.

PART 3. EXECUTION

3.01 GENERAL

A. The equipment shall be manufactured and tested in accordance with the best applicable trade practices and in compliance with state, OSHA, and other governing code requirements.

B. The equipment shall be installed to provide a complete working system. Installation shall follow the manufacturer's recommendations and as shown on the Drawings.

3.02 DELIVERY, STORAGE AND HANDLING

A. All equipment shall be factory assembled, skid mounted, crated and delivered to protect against damage during shipment as practical to suit shipment and installation requirements.

B. All exposed flanges shall be covered and sealed with shrink-wrap to prevent the

entrance of moisture. Finished iron or steel surfaces not painted shall be properly protected with factory applied corrosion inhibiting coating, CRC SP-400 or equal.

C. All equipment delivered to the site shall be stored as specified in accordance with the manufacturer's instructions.

3.03 INSTALLATION

A. Equipment shall be installed as shown on the Plans and in strict accordance with manufacturer's recommendations.

3.04 FIELD TESTING

A. The Contractor shall perform the field testing described in Section 2.8B of this specification.

B. Any defects in the equipment or failure to meet requirements of the Specification shall be promptly corrected by the Contractor.

3.05 MANUFACTURER'S REPRESENTATIVE

A. In addition to the performance testing requirements (Section 2.8(B)), the manufacturer shall include the services of a factory-trained field engineer for the purposes of installation inspection, making field adjustments necessary to ensure proper system operation, equipment start-up, polymer selection, and training of plant personnel regarding proper operation and maintenance of the equipment.

B. A manufacturer's representative (factory trained) for the equipment specified herein shall be present at the jobsite for the minimum days (eight-hour day) listed for the services hereunder, travel time excluded.
   1. Eight (8) days, Two (2) trips for installation, inspection, certification and testing;
   2. Training of the Owner's personnel shall be completed with the commissioning service noted above.

C. The Owner and Engineer shall be notified two weeks in advance of the manufacturer's representative's scheduled visits on site. Cost of these services shall be included in the lump sum price.

END OF SECTION

SECTION 11373

ROTARY POSITIVE DISPLACEMENT BLOWERS

PART 1. GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required, for new rotary positive displacement blowers and appurtenances, as shown on the Drawings and as specified herein.

B. These Specifications are intended to give a general description of what is required, but do not cover all details that will vary in accordance with the requirements of the equipment application. It is, however, intended to cover the furnishing, delivery and field testing of all materials, equipment and all appurtenances required to complete the Work of this Section, whether specifically mentioned in these Specifications or not. It is the Bidder's responsibility to comply with all the aspects of these specifications. Costs for evaluating proposals for similar or alternate equipment will be borne by the Bidder.

1.2 RELATED WORK

A. Anchor bolts shall not be furnished under this Section.

B. Field painting is per manufacturer's standard.

C. Scope of supply for these blowers to include provision of one Ethernet capable VFD per blower. Coordinate with Controls and Electrical Specifications.

1.3 SUBMITTALS

A. Submittals shall include at least the following:
   1. Shop and installation drawings showing materials, details of construction, dimensions and battery limits for other Sections.
   2. The materials list should include:
      a. Blower data including acoustical hood information
      b. Complete bill of materials for all equipment
      c. Manufacturer of all components supplied
      d. Model numbers of all component supplied
      e. Motor and blower speeds
      f. Capacity
      g. Discharge pressure
      h. Weight of package assembly, blower stage and motor
      i. Free field sound pressure level of complete package at 1m distance, +/- 2 dB(A)
      j. List of recommended spare parts for 2 years' operation.

k. Brake horsepower required at rated capacity and pressure
l. Rated maximum pressure rise of blowers
m. Motor data
n. Accessories and other appurtenances.
o. Test report upon request, per DIN EN 10204, in accordance with ISO 1217.

B. Complete blower package operating and maintenance instructions professionally published, hard copy and electronic copy, shall be furnished for all equipment included under these specifications.

1.4 QUALITY ASSURANCE

A. Qualifications
1. All blowers and appurtenances furnished under this Section shall be furnished by a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the equipment to be furnished. Blower manufacturer shall also provide a written warranty for the blower package and shall state that they have reviewed the design and application and that the equipment has not been misapplied or the package been poorly designed.
2. Equipment manufacturer must work according to a recognized ISO quality system.
3. The listing of any manufacturer by name shall not imply tacit approval of same. The selected manufacturer shall be required to meet the specifications.
4. Blower shall be Aerzen Model GM 150S or approved equal.

1.5 SYSTEM DESCRIPTION

A. All of the equipment specified herein is intended to be standard equipment for use in a Membrane Bioreactor Process Air Supply System.

B. Design Criteria:

1.	Quantity of Blowers	3 duty
2.	Design flow (cfm)	4000 per blower
3.	Minimum required flow (cfm)	900 per blower
4.	Discharge Pressure Rise (psig)	9
5.	Inlet Pressure (psia)	Atmospheric
6.	Motor (HP) - Nominal	250 maximum
7.	Ambient/Inlet Temperature (°F)	95
8.	Barometric Pressure (psia)	14.1
9.	Ambient Relative Humidity (%)	60
10.	Free Field Sound Pressure @ 1m (dB(A))	84 maximum

1.6 DELIVERY, STORAGE AND HANDLING

A. All equipment shall be completely factory assembled to the extent possible, practical, and safe for transport and on-site handling.

B. Factory-assembled parts and components shall not be dismantled (other than per 1.06.A). Contractor shall not be required to do any jobsite assembly of the blower package and shall not disassemble any factory-assembled component without the blower manufacturer's written approval.

C. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

D. No shipment shall be made until approved by the Contractor in writing.

E. All equipment delivered to the site shall be stored in accordance with the manufacturer's instructions.

1.7 MAINTENANCE

A. Spare Parts and tools
   1. Furnish a priced list for the following minimum spare parts in accordance with the requirements of these specifications:
      a. One complete set of V-belts, as required for each blower.
      b. One additional set of filter elements for each air inlet filter for each blower.
      c. First change of oil.
      d. One set of tools required for changing oil and performing belt maintenance.
   2. If purchased, spare parts shall be properly bound and labeled for easy identification without opening the packaging and suitably protected for long-term storage in a humid environment.

PART 2. PRODUCTS

2.1 GENERAL

A. Blower packages shall be designed to minimize the life-cycle costs and maximize plant reliability. In addition, sound emission within and from the plant shall be minimized: at the machine location, at the air intake and at the discharge piping system through the use of an acoustical hood. The design and the selection of the components shall be based on a useful life of at least 20 years. The components of the package shall be of a fully engineered, standard design.

B. No special foundations shall be required to handle dynamic loads. The blower packages will be installed directly on a concrete slab without grouting the base frame. There shall be 4 easily accessible anchor points.

C. The blower casing shall be of one piece construction, with separate side plates that are bolted and pinned to the housing. Materials shall be close-grained cast iron EN-GJL-200 (GG-20) equivalent to ASTM A48 class 30 suitably ribbed to prevent distortion under the specified operating conditions. Inlet and outlet shall be flanged connections. The casing shall incorporate an internal pulsation cancellation to reduce transmitted vibration. Blowers that do not incorporate pulsation cancellation shall provide design and sizing calculations for discharge silencer to comply with this requirement for the entire range of operation of the blower. The vibration level as measured at the blower casing, in the X/Y planes of the bearings, shall meet VDI 3836 in addition to DIN ISO 10816-3 for Roots-type blowers.

D. Each blower shall be factory tested per DIN EN 10204, in accordance with ISO 1217 performance test to verify flow and BHP at maximum blower capacity. Slip test only shall not be acceptable. The acceptance criteria are +5% tolerance on power and –5% tolerance on flow regardless of the size of the machine.

E. Each impeller shall be of the "stiff" design with first lateral critical speed at least 120% of the maximum allowable operating speed. The impellers shall be of the straight, three-lobe type, and shall operate without rubbing or liquid seals or lubrication. Rotor/shaft shall be drop forged in one single piece of C45N (AISI 1043 equivalent) for blowers with under 10" nominal flange size. A single-piece shaft passing through the rotor is acceptable. Material at this larger size shall be EN-G75-500-7 (ASTM 65-45-12 equivalent). Cast, hollow rotors shall be capped, dust tight. Open rotors are not acceptable. The impellers shall be statically and dynamically balanced per DIN ISO 1940. Each impeller/shaft shall be supported by anti-friction bearings, and fixed to control the axial location of the impeller/shaft in the unit. A double sealing arrangement shall be provided to prevent lubricant from contaminating the air stream but may not use any type of lip type seal.\

F. The impeller shall be timed by a pair of single helical gears with hardened and ground teeth. Gear material shall be 16MnCr5E comparable with AISI 5115. Gears shall be mounted on the shafts with a tapered interference fit, and secured by a locknut.

G. Seal shall be designed to prevent lubricant from leaking into the air stream as well as to prevent oil from leaking out of the machine. Four rotary piston ring shaft seals, an oil slinger and an O-ring seal shall be provided at the point where the shaft passes through the sideplate. Further provision shall be made to vent the impeller side of the oil seal to atmosphere to eliminate any possible carry-over of lubricant into the air stream.

H. The timing gears and the bearings shall be splash lubricated. Grease lubrication shall be not acceptable.

I. A recessed oil sight glass must be provided on each oil sump. Protruding sight glasses are not acceptable.

J. The blower(s) shall be covered by a warranty for 18 months from date of shipment or 12 months from date of commissioning, minimum.

K. Painting shall be per supplier's standard meeting the following criteria. Aluminum, stainless steel, and brass shall not be painted. The supplied motor shall not be over sprayed and will be supplied with the motor manufacturer's standard protection and paint color. Painted Cast Iron and Carbon Steel shall be Alkyd Resin Primer and Final coat with a total dry film thickness of 70□m. Galvanized components may only be painted with appropriate surface preparation

2.2 BLOWER ACCESSORIES

A. The package layout must minimize the space requirement including the space required for accessing all accessories of the package (including but not limited to: belt drive, pressure safety valve, check valve, flexible connectors and lubrication points on motor and blower) for regular maintenance and periodic checking. The sound enclosure shall not interfere with this requirement and shall not require disassembly of the piping or the use of tools to meet the aforementioned requirements. Operator shall not be required to reach over any component of the blower package to perform oil filling and draining.

B. Each blower shall be supplied with one combination inlet filter silencer. The filter media efficiency must meet the requirements of Filter class G4 acc. to DIN EN 779. The inlet filter silencer shall be suitable for indoor installation and mounted directly to the inlet flange of the blower. Silencer shall be located upstream of the inlet filter. Filter and silencer performance losses shall be included by the blower vendor in the blower performance calculation. The inlet silencer shall be a combination chamber and absorptive design for maximum sound attenuation.

C. Each blower shall be supplied with one combination base frame and discharge silencer. The silencer shall be a chamber type design for maximum sound attenuation and shall not use fibrous materials or any absorption materials or internal diffusers. The silencer shall feature a single shell made from EN: S235JR, DIN: St 37-2, US: equivalent to ASTM A283 Grade B. The silencer must be designed per Pressure Devise Guideline PED 97/23/EG (AD 2000). The temperature rating shall be 150ºC. The design of the silencer must accommodate being bolted directly to the blower discharge flange with no intermediary pieces and to insure that there will be no disturbing pipe beating sound or pipe harmonics whether one blower or multiple blowers are running. Discharge silencer performance losses shall be included by the blower vendor in the blower performance calculation. The discharge silencer shall be designed to reduce the pressure sound level by an average of 20dB across the blower performance range. The blower manufacturer shall supply a stainless steel grounding lug fully welded to the base. The base frame shall be designed to maintain alignment of both the blower internal components and the drive during operation. The base frame and discharge silencer combination shall be designed to resist distortion while being installed on vibration isolating mounts.

D. Each blower package shall be connected to the process piping via flexible connector(s) located downstream of the discharge silencer. The flexible connectors shall be sized for a standard, schedule 40 pipe diameter and shall prevent the transmission of sound and vibrations from the blower package into the piping. The flexible connectors shall be suitable for the maximum operating temperature and pressure ratings of the equipment in the air stream. Pipe supplier must ensure no pipe load is applied to the flexible sleeve.

E. Each blower shall be supplied with a motor that shall operate on 480 Volts, 3 Phase, 60 Hertz current, 1800 RPM Totally Enclosed Fan Cooled. All frame sizes shall be NEMA standard suitable for overhung belt drive. The motor will be mounted on a pivoting base to provide automatic tensioning of the belts. The motor nominal rating after any corrections for ambient conditions shall be at least 10% above the maximum operating brake horsepower. The motor shall have a minimum 1.15 service factor. Should an unloading valve be required due to a Soft-start or Wye-Delta starter, the valve shall be supplied by the blower manufacturer. It shall be an automatic type mechanically operated valve requiring no electrical connections mounted upstream of the check valve and be fully integrated to the blower package.

F. Each blower shall be supplied with a V-belt drive of the high capacity type, oil and heat resistant. Drive shall be designed for a minimum service factor of 1.3 times nominal power (HP). Belt tensioning shall be automatic, without the use of any devices or interaction on the part of the operator. Neither slide rails nor load-adjusting springs shall be used. Sheaves shall be dynamically balanced.

G. The accessories such as V-belt drive, motor, inlet filter, inlet silencer, discharge silencer, relief valve, check valve, vibration isolation feet, inlet and discharge flex connectors, and instrumentation shall be factory assembled. V-belts and flexible connections may be shipped loose for transportation considerations. The only connections required by the contractor shall be piping and the electric power.

H. Each blower shall be supplied with vibration isolating feet directly underneath the base frame. The feet are for attenuating vibration such that no special installation base or additional measures shall be required to further reduce vibrations transmitted to the piping.

I. The belt drive shall be guarded in compliance with OSHA regulations. Portions of the guard shall be easily removable allowing for belt inspection and replacement.

J. Each blower shall be supplied with a single pressure safety valve on the discharge side of the blower mounted downstream of the discharge silencer and upstream of the check valve. The safety valve shall be set to protect the blower from exceeding its maximum pressure rating. The materials selected for the valve internals shall enable safe and reliable operation at the site conditions. The valving shall be suitably sized for the unit it is protecting. The valve shall be field adjustable and spring loaded. If the blower package is supplied with a sound enclosure, the pressure relief valve shall

also be housed by the sound enclosure and shall relieve into a segmented section of the sound enclosure.

K. Each blower shall be supplied with one check valve that shall be installed on the discharge line. For blower sizes above nominal size of DN80, check valve shall be of the full-bore low pressure-drop, flapper type design with a steel body, and steel flap embedded in EPDM with full-contact seal. The valve shall be removable without disturbing the piping. For nominal DN50 size blowers, the check valve shall be of Viton material. The vendor shall include the pressure losses produced by the check valve in the blower performance calculation. The check valve shall be factory-assembled.

L. Each blower shall be supplied with the following instrumentation: one pressure gauge that shall be supplied to measure the discharge pressure, with an isolation ball valve. The scale shall be appropriately selected for the application pressure range. The pressure gauge shall have a stainless steel case and be glycerin-filled for pulsation dampening. Minimum dial diameters shall be 63mm. A filter maintenance indicator shall be provided. Minimum dial diameters shall be 63mm. The scale shall be appropriately selected for the filter vacuum range.

M. Blowers shall be shipped filled with oil from factory.

N. Each blower shall be supplied with a sound enclosure covering the entire blower package including the drive motor, the inlet silencer, and the discharge silencer. The sound enclosure must be designed for easy inspection and maintenance of all blower package components. The enclosure shall be designed to allow side-by-side installation for neighboring blowers, with all maintenance possible from the front and rear only. An oil level indicator must be installed on the enclosure, allowing oil level monitoring without opening the enclosure. The enclosure shall provide suitable protection for outdoor installation. Additional protection from the elements may be required. Details are as follows:
   1. Panels shall be made of galvanized steel sheet, powder coated.
   2. The enclosure and the blower package must be both mounted on a skid / oil-drip pan designed for meeting environmental protection standards and for easy transportation and installation.
   3. A grounding strap shall be installed between the blower base and the package skid to bypass any vibration isolating mounts.
   4. Quick release panels, each less than 50 lbs must provide easy and quick access for routine maintenance of the blower and the package components. Should the panels be heavier than 50 lbs, hinged doors must be supplied, with the appropriate frame, reinforcements and supporting elements.
   5. A mechanical, shaft-driven ventilation fan - integral to the sound enclosure - shall provide ventilation and cooling. Motor-driven fans shall not be permitted. Cooling fan shall be sized for sufficient heat removal from the sound enclosure under all operating conditions.

6. Electrical components, instrumentation and instrument connections shall not be mounted or interface with moving panels of the sound enclosure.

END OF SECTION

SECTION 11611

FABRICATED STAINLESS STEEL SLIDE & WEIR GATES

PART 1. GENERAL

1.1 SUMMARY

A. The fabricated stainless steel gates shall be Series 7500 type as manufactured by WACO Products, Inc., Baltimore, Maryland or approved equal. Gates shall be furnished with all necessary accessories and parts for a complete installation and shall be the latest standard product of a manufacturer regularly engaged in the production of equipment of this type. All gates shall be furnished by the same manufacturer. Upward opening gates shall be designated “slide gates” and downward opening gates shall be designated as “weir gates”.

PART 2. PRODUCTS

2.1 DESIGN

A. Gates shall be fabricated from 304 or 316 stainless steel alloys as required. All gates are to be designed and manufactured to meet or exceed all AWWA C561 “Standard for Fabricated Stainless Steel Slide Gates” specifications, including those defining allowable leakage, head and loading calculations, structural strength and deflection requirements, and material specifications and minimum dimensions.

2.2 SLIDE/WIER PLATE

A. The slide/weir plate is fabricated from minimum 1/4” thickness stainless steel plate and reinforced as required. Deflection under full design head will be no more than 1/360 of the span width of the gate.

2.3 GUIDE FRAME & BENCH

A. The guide frame is fabricated from minimum 1/4” thickness stainless steel structural members to resist loads imposed by the design head. Additionally, any self-contained frame will require no additional reinforcing where it extends above the operating floor to support the operator. The guide frame shall be a one-piece leak-proof formed section without through holes, reinforced with welded gussets as required to meet loading conditions. Guide frames with bolted or sandwich

construction or otherwise requiring through holes for frame assembly or seal attachment shall not be allowed.

B. The frame is fabricated to accommodate a one-piece Ultra High Molecular Weight Polyethylene (UHMW) bearing bar/seal. This bearing bar/seal is supplied mounted in the frame to reduce friction and wear between the slide/weir plate and frame faces, as well as to form the side seal seats to prevent leakage.

C. On self-contained frames the bench (yoke) to support the operator is formed by two back to back structural shapes, angles or channels as loading requires, which are welded or bolted to the guide frame to provide a rigid one-piece frame assembly. The bench shall be capable of supporting all loads imparted by the operator, and shall have a deflection under full design head operation of no more than 1/360 of the span width of the gate.

D. For non-self-contained frames, a fabricated pedestal of the same alloy as the frame is mounted on the operating floor or over-hung off of a wall at the operating level by means of an offset wall bracket. The pedestal shall be capable of supporting all loads imparted by the operator.

2.4 INVERT

A. Slide gate: The frame bottom, or invert, is a flush-bottom design formed by a neoprene block sandwiched between two structural members with a welded bottom member to form a seating surface for the edge of the plate bottom and to retain the neoprene. The flush-bottom design maximizes flow to that of the channel, port, or pipe opening.

B. Weir gate: UHMW self-adjusting seals are attached to the invert frame which is welded to the guide frame sides across the bottom to form a continuous frame and seal assembly. The frame is mounted so that the gate invert is flush with the channel or port bottom. The flush-bottom design maximizes flow to that of the channel, or port opening.

2.5 SEALS

A. All gate side frames, slide gate upper seals, and weir gate invert seals shall prevent leakage using a UHMW bearing bar/seal that requires no adjustment. Seal pressure shall be made constant automatically by means of an integrated round section nitrile member within a continuous extruded slot in the bearing bar/seal. The cord shall

exert pressure on the UHMW away from the frame face and compressing the seal against the plate face. Seal systems that require pressure pads, p-seals, j-bulbs, or adjustable wedge systems to seal the gate shall not be permitted.

B. UHMW polymer shall be extruded from black virgin resins with an ultraviolet inhibiting formula and shall have integral flex reliefs. UHMW seals that are saw cut or otherwise machined to shape, or which do not have integral extruded flex reliefs to prevent fatigue shall not be allowed. The bearing bar/seal and cord can be replaced without dismantling or loosening any portion of the frame. Bearing bar/seal shall be held in place laterally by the frame construction and requires no bolts or fastened retainers. Access to seals shall be by means of a securing cap at the bench, allowing for service at the gate operating elevation.

C. All gates shall meet the referenced AWWA standards for allowable leakage. Additionally, gate shall limit leakage to half of the AWWA standard with a design rating of 0.05 gpm/wfp in either the seated or unseated condition.

2.6 ELECTRIC ACTUATOR

A. The slide/weir gate will be provided with an electric multi-turn operator incorporating integral limit switches to stop the gate plate in the desired open and closed positions. The operator will also have a torque limit switch to prevent damage to an obstructed gate. Operators can be specified for modulating function where required to maximize level or flow control. Electric operators shall be in accordance with ANSI/AWWA C542 “Electric actuators for Valves and Slide Gates”.

2.7 DUAL STEM OPERATOR

A. When the plate width exceeds twice the height or 60 inches, interconnected operators and stems are to be used. Operators for multiple stems will be linked with stainless steel shafts and couplings and can be manually or electrically powered.

2.8 OFFSET OR EXTENDED OPERATOR

A. When the height of the self-contained gate bench (yoke) is higher than 42” above the operating floor elevation, the operator or actuator system shall incorporate an offset operator system. Offset operator system shall be comprised of additional bevel gears and interconnecting shafting and couplings connected to the gate primary stem drive gearbox so that the centerline of the manual hand wheel or

crank of the operator or actuator is approximately 36" above the operating floor elevation. The offset system will locate the manual input on the front, rear, or either side of the gate frame as indicated in the project plans to make the manual drive input accessible and to give unobstructed access to electric actuator manual clutch lever and controls and indication where applicable. Chain drives or other interconnecting systems that do not place the electric actuator clutch lever at the required 36" elevation shall not be allowed. Electric actuator remote operating stations are not an acceptable substitute for offset operators as they do not give operating grade elevation access to the manual operator or clutch lever in the event of a power failure

B. Where operators or actuators for any gate are not accessible due to distance from structure access points, extended shaft systems with interconnecting shafts and couplings and/or intermediate support bearings shall be incorporated in the gate design and supplied as an integral part of the gate system.

C. Offset and extended shaft options can be combined as required and are suitable for either manual or electric operation.

2.9 STEMS

A. Stem shall be of 1½" diameter stainless steel rod with accurately machined Acme stub threads. Stem shall be designed for a safety factor of 2 based on a critical buckling compressive load calculated by the Euler Column formula where C=2 and assuming a 50 lb torque on the AWWA nut. A stem pocket shall be welded to the face of the stiffened side of the plate and to the uppermost stiffener. The stem shall fit within the slide plate stem pocket and be attached to the pocket by means of a stainless steel bolt capable of withstanding the full force of the operator stem under full design head.

B. Stem guides will be supplied to support the stem as required to meet the stem design criteria and shall be fabricated of the same alloy material as the gate and frame. Stem guides shall have bronze or UHMW bushings to reduce stem friction and wear as required by the installation. Stem guides shall be adjustable in multiple dimensions to allow for alignment with operator and gate stem nut. Guides will be mounted on the gate frame or installation wall as required to support and align the stem(s) properly.

2.10 DRAWING FOR APPROVAL

A. Drawings showing dimensions and essential details required to locate and install the gate, stem, lift and accessories shell be submitted for the Engineer's approval.

PART 3. EXECUTION

3.1 INSTALLATION

A. Installation of all parts shall be done by the construction Contractor in a workmanlike manner and in accordance with detailed technical installation procedures supplied by the gate manufacturer. It shall be the Contractor's responsibility to handle, store and install the gate operating mechanism and accessories in strict accordance with the manufacturer's drawings and recommendations.

END OF SECTION

SECTION 14100

SLUDGE SHAFTLESS SCREW CONVEYOR

PART 1. GENERAL

1.01 SUMMARY

A. This section covers the supply and delivery of one (1) shaftless screw conveyor for the conveyance of screenings.

B. Screw Conveyors with shafts and intermediate hanger bearings will not be acceptable for this project.

1.02 PERFORMANCE REQUIREMENTS

A. Design the shaftless screw conveyor system to meet the performance and design requirements per the attached "Table A". Conveyor selection design standards to be based on the operational experience of the manufacturer with shaftless screw conveyors, and not shafted screw conveyors.

B. Conveyor rotational speeds shall not be greater than herein specified, unless availability of the reducer ratio requires slight adjustment (+/- 3 rpm) or if shown by the conveyor manufacturer calculations to be required to meet design load. Deviations from specified speed can not be utilized to reduce the conveyor trough and spiral size. Faster speeds are utilized to reduce liner and spiral wear from abrasive material.

1.03 SUBMITTALS

A. The equipment Supplier shall, as a minimum, submit the following information for review and approval by the Engineer:
   1. Descriptive literature regarding the conveying equipment to be supplied.
   2. Reference information and certifications as required under subsection 3.
   3. Detailed specifications for the Equipment proposed
   4. Manufacturer's certification, signed by a corporate officer, confirming that the proposed Equipment fully complies with these specifications, including paragraph 2.3.2 of this section.
   5. General arrangement drawing(s) for the proposed Equipment.
   6. Cut sheets for electric motors and ancillary items manufactured by others.
   7. Conveyor torque requirement calculations.
   8. Torque calculations for the gear reducer and reducer motor.
   9. Horsepower calculations for the drive motor(s).
   10. Utilize spiral strength calculations for spring (spiral) compression and elongation showing the supplied spiral meets or exceeds spring effect intent of 9.1.2 herein (for conveyors 40' or longer).
   11. Complete schematic diagrams for electrical control panel(s) if applicable.

B. Operations & Maintenance Manual (generic sample with submittal, complete and specific O&M six weeks from submittal approval).

1.04 QUALITY ASSURANCE

A. Fabricate and assemble all equipment under this section in full conformity with this specification and as shown in the contract drawings.

B. Furnish equipment complete with all supports; all mechanical equipment required for proper operation, including complete drive units; all steel and other metal construction specified herein; and all additional materials or fabrication as required by the supplier's design.

C. Unless otherwise noted;
   1. All equipment included in this section shall be furnished by a single supplier who shall be responsible for the design, coordination, and the satisfactory operation of the system.
   2. For optimum quality control, spirals furnished with the shaftless conveyor(s) shall be produced from spiral manufacturing equipment actually owned by the conveyor supplier.

1.05 WARRANTY

A. The manufacturer shall warranty the equipment furnished under this section to be free from defects in material and workmanship for a period of twelve (12) months after the equipment was first placed into operation at the jobsite or eighteen (18) months after the equipment was first delivered to site, whichever date occurs first. Any warranted material defects found to exist shall be corrected (repaired or replaced) at no cost to the Owner.

B. The shaftless screw liner and spiral shall be warranted for a period of three years from factory start-up against wear.

C. Liner: For a wear indicator (two color) liner, excessive wear shall be indicated by appearance of the bottom indicator layer (second color) along more than 30% of the conveyor length during the first three years of service. If these wear indications occur the conveyor supplier shall provide new formed and banded liner to replace all the liner in the conveyor that has excessive wear.
   1. If a one color liner is used the excessive wear shall be indicated if the thickness of the liner, at three points over a 30% long section of the conveyor, is a ¼" thick or less at the thinnest point of the liner, during the first three years of service. Since one color liners prohibit a simple visual inspection confirmation for the liner thickness status at the spiral-liner contact point, the conveyor manufacturer shall supply a field technician to the jobsite on the annual acceptance date for three consecutive years, to remove a minimum 30% of all liners and demonstrate to the owner that at a minimum of ¼" of liner is remaining. If excessive liner wear is found the conveyor supplier shall

provide new formed and banded liner to replace all the liner in the conveyor that has excessive wear.

2. Screw: Excessive wear on the screw shall be indicated by loss of more than 50% of the height of the main outer screw section over 30% of the total length of the screw. If excessive screw wear is found the conveyor supplier shall provide new screw to replace the screw in the conveyor that has excessive wear.

PART 2. PRODUCTS

2.01 MANUFACTURERS

A. The system shall be of the shaftless type as manufactured by SPIRAC (USA) INC., Newnan, Georgia or approved equal.

1. The Contractor shall submit pricing for the system as part of the base bid. Alternate manufacturers may be submitted in the bid but shall be listed as an alternate in the bid submittal, including any "add" or "deduct" associated with such alternate offer. Any alternate bid system shall meet or exceed the specified operating conditions, materials, and experience. The alternate manufacturer must submit to the engineer all requirements of section 1.4, 1.5 AND 1.6 herein at least 15 days prior to bid date in order for consideration. The OWNER shall make the sole determination if the alternate bid shaftless conveyor system will be acceptable.
2. Any re-design costs required to accommodate alternate equipment approved by the Owner shall be borne entirely by the Contractor and/or equipment manufacturer.

2.02 MATERIALS

A. Materials used in the fabrication of the equipment under this section shall conform to the following and attached "Table A":

1.	Chutes, Troughs, End Plates, Covers, Hoppers and Supports	AISI 304 Stainless Steel
2.	Spiral Flighting	Special Chrome-Alloy Steel with minimum 225 Brinnell Hardness
3.	Wear Liner	UHMW Polyethylene, Duraflo® SPX™
4.	Hardware	AISI 304 Stainless Steel

2.03 FABRICATION

A. The shaftless screw conveyor equipment shall include the following:

1. Troughs, Liners & Covers
2. Spiral Flighting
3. Chutes
4. End Shaft

5. Electric Motor & Gear Reducer
6. Mounting and Support Structure
7. Slide Gates
8. Electrical Control Panel
9. Safety Accessories
10. Spare Parts

B. All welds to be continuous unless otherwise specified. Facing surfaces of field-welded components shall be beveled and match marked.

C. Sharp corners of all cut and sheared edges shall be made smooth by edge grinding.

2.04 POWER SUPPLY

A. Power supply to the equipment will be 230/460 volts, 60 Hz, 3 ph. Power supply for electrical controls shall be 120 volts, 60 Hz, single phase.

2.05 SURFACE PREPARATION

A. All iron and mild steel surfaces to be painted shall be dry abrasive blasted in accordance with SSPC-SP6, and in accordance with the painting section of these specifications. Surfaces shall be painted or hot dip galvanized within 24 hours to prevent rusting and surface discoloration.

B. Stainless steel shall be cleaned with mild abrasive wheels and/or nonferrous blast media to remove heavy scale and welding carbon and/or passivated with stainless steel cleaner then rinsed.

C. After surface preparation, ferrous metal surfaces, if any, except for the spiral flighting shall receive a minimum of one (1) coat of epoxy primer. Provide a total minimum dry film thickness of 3 mils prior to shipment to jobsite. Primer shall be compatible with the paint system specified for the equipment under "Painting" section of these specifications. Finish coats shall be applied at the jobsite by the General Contractor.
1. The spiral shall be furnished with one coat of shop primer only.
2. Electric motors, gear reducers, electrical control panels, and other purchased sub-components shall be furnished with the manufacturer's standard finish.
3. Stainless steel surfaces do not require painting.

2.06 SPIRAL

A. Spiral flighting for the shaftless screw conveyors shall be designed to convey material without a center shaft or hanger bearings.

B. Spiral flights shall be cold-formed high strength chrome alloy steel with a minimum hardness of 225 Brinnell. The spiral flights shall be designed with adequate stability to prevent distortion and jumping in the trough. A second, inner spiral, concentric with the outside spiral shall also be provided. The torsional rating of the auger flighting shall exceed the torque rating of the drive motor at 150% of its nameplate horsepower.

The "spring effect" of the spiral shall not exceed + 1.0 mm per 100 mm of length at maximum load conditions. The minimum outer spiral thickness shall be 0.75" for spiral diameters up to 9" and 1" for spirals diameters exceeding 9".

C. The spiral flighting shall be formed in sections from one continuous flat bar and shall be concentric to within ±2mm. Sectional flighting formed from plate shall not be permitted.

D. Spiral flighting shall have full penetration welds at all splice connections. The flights shall be aligned to assure true alignment when assembled in the field and shall be made in accordance with the supplier's requirements. The spiral flights shall be coupled to the end shaft by a flanged, bolted connection.

E. Field welds at the jobsite by the Contractor for installation may be necessary when any overall conveyor length presents shipping or handling constraints.

2.07 SPIRAL MOUNTING

A. A gland packing ring consisting of two Teflon fiber packing rings shall seal the drive shaft at its penetration through the end plate, along with a greased labyrinth sealing system.

B. The connection of the spiral to the drive system shall be through a flanged connection plate that is welded to the spiral forming a smooth and continuous transformation from the flange plate to the spiral. The drive shaft shall have a mating flange and shall be bolted to the spiral connection plate. Additionally, a grease lubricated labyrinth seal shall be shaft mounted internally in the conveyor between the back plate and spiral coupling connection.

2.08 HORIZONTAL AND INCLINED TROUGHS

A. Troughs shall be U-shaped and similar to the dimensional standards of CEMA 350 and enclosure classification IIE.
   1. A flanged drain outlet shall be provided with each conveyor to facilitate cleaning if required by contract drawings. The drain outlet shall be piped to a drain as shown on the drawings, with adequate cleaning facilities. Drain flushing connections are to be provided if and where specified by the contract drawings. The Contractor shall furnish all labor and materials to connect the conveyor flush water and/or drains with the plant water and drain system.
   2. Each trough shall be equipped with inlet and/or discharge openings as shown on the contract drawings. If required, each inlet and discharge opening shall be flanged suitable for interconnection to other devices. Any interconnecting devices such as chutes and hoppers shall be fabricated from the same grade of material as the troughs and with a gauge thickness to suit the application requirements.

B. Bolted covers shall be furnished for any portion of each trough that is not covered by the filling chute. Covers shall be manufactured in maximum five (5) foot length section to allow for easy access and ease of liner replacement. To prevent unsafe access to the conveyors, quick opening covers will not be allowed unless they are also bolted to prevent access during operation. Each conveyor shall be fixed with the appropriate warning labels to call for lock out – tag out of the electrical system before the covers are removed. If required, inspection hatches or sample ports with finger guards will be supplied as indicated on the contract drawings.

C. In order to avoid excessive wear and increased maintenance the conveyors shall be designed without the use of steel hold down bars. Proprietary hold-down guide liners mounted under the lids will be accepted that do not interfere with the flow of conveyed product.

2.09 WEAR LINERS

A. Liner - The inside trough surfaces of the conveyors shall be lined with a layer of ultra high molecular weight polyethylene UHMW-PE. The wear liner shall be SPIRAC Duraflo SPX or Xylethon by Durawear or approved equal. The liner shall be a single piece, formed and bonded with two (2) layers of the same material, each of a different color, to provide a visible indication when the liner is nearing the end of its useful life. Liners with a second layer of different material are not acceptable. The liner shall be supplied in maximum 3.3 foot long sections to provide ease of replacement. The liner shall be held in place with stainless steel clips; no fasteners will be allowed. Liner thickness shall be at a minimum 3/8" for vertical conveyors; 1/2" thick for spirals up to 14" diameter, and 5/8" thick for larger spirals. Liners less than the specified minimum thickness and molecular weight shall not be acceptable.

B. The liner material shall have the following physical properties, as a minimum:

Property	**Value/Unit**	**Testing Method**
Density	61.2 lbs/ft^3	DIN53479
Molecular Weight	9.2x10^6 g/mol	Margolies
Ball Indentation Hardness	5,946 lbs/in^2	DIN53456
Shore Hardness D	64	DIN53505
Crystalline Melting Range	278º F	
Dynamic Coefficient of friction	0.1-0.12 ratio of tension/load	Plastic to steel

2.10 CONVEYOR SUPPORTS

A. Each conveyor shall be furnished complete with supports suitable for mounting as shown on the contract drawings and as required by the supplier's design of 304 stainless steel structural angle, minimum 0.25" thick. The supports shall be shop fabricated from structural steel shapes and plates, and shall be assembled and fitted to

the conveyor prior to its delivery to the jobsite. Supports and conveyor segments shall be match marked and shipped to the jobsite for assembly by the contraction others. The manufacturer shall allow for 1 inch of grout beneath each support foot pad for the Contractor to compensate for uneven floor elevation. At a minimum, each conveyor shall be provided with supports at the inlet and discharge end, with intermediate supports as required.

B. All shop welding shall conform to the latest standards of the American Welding Society (AWS). The supports shall be designed to avoid interference with other equipment or equipment supports.

C. All hanging supports furnished by the conveyor manufacturer shall be one (1) foot longer than required for field fit by the Contractor, who shall supply connections approved by the Engineer. The Contractor shall be responsible for all fasteners both for hanging and floor anchors.

2.11 HOPPERS AND DISCHARGE CHUTES

A. Furnish inlet and discharge hoppers of the same gauge and construction material as the conveyor troughs, at locations as shown on the drawings. Flanges shall be a minimum 3/16 inch thick.

2.12 DRIVE UNITS

A. Each spiral conveyor shall be driven by a constant-speed gear reducer motor drive unit mounted to a bellhousing adapter flange mounted to the end plate of the conveyor.

B. The adapter flange shall allow the leakage of any material from the conveyor trough to atmosphere rather than into the gear reducer/ motor drive unit. Direct coupling of the gear reducer/motor drive unit to the end flange of the conveyor will not be acceptable.

C. The drive unit shall be rigidly supported so there is no visible "wobble" movement under any operating condition. In the event of a prolonged power failure or emergency system shutdown the drive system shall be designed, at a minimum, to start the conveyor from a dead stop with the trough filled at 2 X the design load for loads designed up to 67% fill rate and 1.5 X for loads designed exceeding 67% fill rate.

D. All motors shall be of energy efficient design meeting or exceeding NEMA MG1-table 12-10 and EP Act guidelines. The motors shall be 230/460 volt, 60 Hz, 3 phase conforming to the General Equipment specifications, except as modified herein. Each motor shall be 40ºC ambient rated, 3300 feet (1000m) altitude or lower operation, with a maximum temperature rise of 80 degree C by resistance at 1.0 service factor (95 degree C rise at 1.15 s.f.) The motors have Class B insulation with Design B speed/torque characteristics in accordance with NEMA MG1-12.35 and 12.38, and be C face type, with NEMA frame sizes.

E. Motors shall have a 1.15 service factor and an explosion proof enclosure.

F. Gear Reducers
   1. All gears shall be AGMA Class II, single or double reduction, helical gear units with high capacity roller bearings. Bearings shall be designed for the thrust loads from the fully loaded startup condition and shall have an AFBMA B-10 life of 30,000 hours.
   2. The reducer will be air-cooled unit with no auxiliary cooling requirement. The gear reducer shall be sized with a torque service factor of 1.5 times the absorbed power or 1.1 times the motor nameplate, at the driven shaft speed, whichever is greater.

2.13 ELECTRICAL EQUIPMENT

A. All electrical equipment shall conform to applicable standard of the National Electrical Manufactures Association (NEMA) and the National Electrical Code (NEC). Both power and control equipment shall be insulated for not less than 600 volts even though operating voltages may be lower.

B. Motion Failure Alarm Unit: An external conveyor mounted motion failure alarm (alternately known as "zero speed" or "under-speed" switch) to detect spiral or drive shaft failure shall be utilized in this design.

C. Emergency Shutdown: Each conveyor shall be furnished with an emergency trip cord and safety switch. The cord shall run the full length of each conveyor. The trip switch shall immediately stop all conveyors when the switch is actuated. The switch shall be RS type by Conveyor Components Corporation or approved equal. Explosion Proof.

2.14 SPARE PARTS

A. Furnish the following spare parts (if applicable to scope of supply) as a minimum;
   1. One (1) Packing gland set, for each conveyor supplied
   2. One (1) complete set of liners for all conveyors if the second color of the liner is not the same material as the base liner.

B. All spare parts except electrical shall be boxed in substantial wooden crates for storage.

2.15 LUBRICANTS

A. Furnish lubricants of the type and quantity as recommended by the conveyor manufacturer for (start-up) operation.

PART 3. EXECUTION

3.01 FIELD SERVICES

A. The conveyor system supplier shall furnish the services at site of a factory-trained representative for a period of no more than 1 trips to the jobsite. Service shall be

provided as necessary after the Contractor has installed the equipment. These services shall be furnished for the purposes of;

B. The equipment manufacturer's inspection of the equipment following installation by others, and to certify that the equipment has been properly installed and is ready to operate, to train the Owner's personnel in the operation, maintenance of the equipment, and to observe and supervise the initial operation of the equipment.

C. Field services at the jobsite shall be performed during normal daylight working hours from Monday – Friday; legal holidays accepted. The Supplier's personnel shall not be expected to work overtime.

D. The Contractor shall coordinate the manufacturer's technical services in a timely professional manner. At a minimum, two weeks notice must be given to the manufacturer for travel planning purposes unless previously agreed by manufacturer. To avoid project delays, every effort should be made to coordinate inspection, training and start up of the equipment in one trip. If the manufacturer is asked to make trips in excess to the stated contract document requirements due to lack of coordination, planning or efforts of the contractor, then the contractor is responsible for additional costs incurred by the manufacturer.

E. After inspection of the installed equipment the Supplier shall furnish a written report certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchorage, has been operated under full load conditions and that it operates satisfactorily.

Table A – Conveyor Design Table

(Site-Specific Example Below)

	CONVEYOR Performance & Design	
	Conveyor Position	**Cake**
	PERFORMANCE	
1	Material conveyed	Dewatered Sludge
2	Density, average, lbs/cu.ft.	65
3	Volume, ft3/hr.	102
4	Max. screw speed, rpm	20
5	Trough fill rate @ Design load, %	15
6	**SYSTEM DESIGN**	
7	Length, approx. ft	As Show on Plan Sheet
8	Degrees Incline, approx.	See Drawing
9	Feed Inlet From	Screw Press
10	Discharge outlet to	Truck/Dumpster
11	No. Discharges:	1
12	Discharge Type (axial or vertical)	Axial
13	Conveyor size, U or OK trough	U250
14	Trough width, ID inches, min.	9.84
15	Trough thickness, min.	11 ga.
16	Minimum lid thickness	11 ga.
17	Lid length, inches max.	60
18	Chute thickness, min.	11 ga.
19	Spiral OD, inches min.	8.46
20	Spiral, outer thickness, min.	1.0”
21	Spiral pitch (full or 2/3)	Full
22	Spiral insert/outsert	Yes/No
23	Liner type	SPX
24	Liner length, ft, max	4'
25	Liner thickness, inch, min.	½”
26	Location of drives	Push
27	Drive Hp, min.	1.5
28	Motion failure probes, # per conv	1
29	NEMA rating at probe	7
32	**Materials of Construction**	
33	U Trough, lids, end plates & flanges	304
34	Hardware	304
35	Supports, vertical, less than 6'	304
36	Drive shafts	1045
37	Bell-housings	HDG
38	Liners	UHMW
39	Spiral	HTMAS

END OF SECTION

SECTION 15007

ELECTRIC MOTOR OPERATORS

PART 1. GENERAL

1.1 SUMMARY

A. The actuators shall be suitable for use on a nominal 460 volt 3 phase power supply and are to incorporate motor, integral reversing starter, local control facilities, and terminals for remote control and indication connections.

B. The actuator shall include a phase discriminator: a device to ensure that the motor runs with the correct rotation for the required direction of valve travel with either phase sequence of the three-phase power supply connected to the actuator.

C. As a minimum the actuators should meet the requirements set out in EN15714-2 and ISA SP96.02

D. In order to maintain the integrity of the enclosure, setting of the torque levels, position limits and configuration of the indication contacts etc. shall be carried out without the removal of any actuator covers and without mains power over an Infra red or Bluetooth® wireless interface. Sufficient commissioning tools shall be provided with the actuators and must meet the enclosure protection and certification levels of the actuators. Commissioning tools shall not form an integral part of the actuator and must be removable for secure storage / authorized release. In addition, provision shall be made for the protection of configured actuator settings by a means independent of access to the commissioning tool. Provision shall be made to disable Bluetooth® communications or only allow a Bluetooth® connection initiated by an Infra-Red command for maximum security.

E. The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel irrespective of the connection sequence of the power supply

1.2 ACTUATOR SIZING

A. The actuator shall be sized to guarantee valve closure at the specified differential pressure. The safety margin of motor power available for seating and unseating the valve shall be sufficient to ensure torque switch trip at maximum valve torque with the supply voltage 10% below nominal. The operating speed shall be such as to give valve closing and opening at 12 inches per minute unless otherwise stated in the job specification.

1.3 ENVIRONMENTAL

A. Actuators shall be suitable for indoor and outdoor use. The actuator shall be capable of functioning in an ambient temperature ranging from -33°C (22°F) to 70°C (140°F), up to 100% relative humidity. Actuators for hazardous area applications shall meet the area classification, gas group and surface temperature requirements specified in data sheet.

PART 2. PRODUCTS

2.1 MOTOR

A. The electric motor shall be Class F insulated with a time rating of at least 15 minutes at 104°F (40°C) or twice the valve stroking time, whichever is the longer, at an average load of at least 33% of maximum valve torque. Electrical and mechanical disconnection of the motor should be possible without draining the lubricant from the actuator gear case. Plugs and sockets are not acceptable as a means of electrical connection for the motor.

2.2 MOTOR PROTECTION

A. Protection shall be provided for the motor as follows:
   1. The motor shall be de-energized in the event of stall when attempting to unseat a jammed valve
   2. Motor temperature shall be sensed by a thermostat to protect against overheating
   3. Single phasing protection

2.3 GEARING

A. The actuator gearing shall be totally enclosed in an oil-filled gear-case suitable for operation at any angle. All main drive gearing must be of metal construction. Where the actuator operates gate valves or large diameter ball or plug valves, the drive shall incorporate a lost-motion hammer-blow feature. For rising spindle valves, the output shaft shall be hollow to accept a rising stem and incorporate thrust bearings of the ball or roller type at the base of the actuator, and the design should be such as to permit the gear-case to be opened for inspection or disassembled without releasing the stem thrust or taking the valve out of service. Note: For full Modulating applications, “hammer-blow” feature should be removed to increase accuracy and reduce wear.

B. Standard SAE80EP gear oil shall be used to lubricate the gear-case. Special or exotic lubricants shall not be used, as they may be difficult to source in remote locations.

2.4 HAND OPERATION

A. A hand-wheel shall be provided for emergency operation engaged when the motor is declutched by a lever or similar means; the drive being restored to power automatically by starting the motor. The hand/auto selection lever should be pad-lockable in both "Hand" and "Auto" positions. It should be possible to select hand operation while the actuator is running or start the actuator motor while the hand/auto selection lever is locked in "Hand" without damage to the drive train.

B. The hand-wheel drive must be mechanically independent of the motor drive, and any gearing should be such as to permit emergency manual operation in a reasonable time. Clockwise operation of the hand-wheel shall give closing movement of the valve unless otherwise stated in the job specification.

2.5 DRIVE BUSHING

A. The actuator shall be furnished with a drive bushing easily detachable for machining to suit the valve stem or gearbox input shaft. Normally the drive bush shall be positioned in a detachable base of the actuator. Thrust bearings, when housed in a separate thrust base, should be of the sealed-for-life type.

2.6 TORQUE AND TURNS LIMITATIONS

A. Torque and turns limitation to be adjustable as follows:
   1. Position setting range: 2.5 to 8,000 turns, with resolution to 7.5° of actuator output.
   2. Torque setting: 40% to 100% rated torque.
   3. Torque sensing must be affected purely electrically or electronically. Extrapolating torque from mechanically measured motor speed is not acceptable due to response time.
   4. “Latching" to be provided for the torque sensing system to inhibit torque off during unseating or during starting in mid-travel against high inertia loads.

B. The electric circuit diagram of the actuator should not vary with valve type remaining identical regardless of whether the valve is to open or close on torque or position limit. An inexpensive setting tool is required for non-intrusive calibration and interrogation of the actuator. This setting tool will provide speedy interrogation capabilities as well as security in a non-intrusive intrinsically safe watertight casing.

2.7 REMOTE VALVE POSITION/ACTUATOR STATUS INDICATION

A. The actuator must provide a local display of the position of the valve, even when the power supply is not present. In the event of a (main) power (supply) loss or failure, the position contacts must continue to be able to supply remote position feedback and maintain interlock capabilities.

B. A backup power source must be provided in the actuator to ensure correct remote indication should the actuator be moved manually when the power supply is interrupted. The position of the actuator and valve must be updated contemporaneously, even when the power supply is not present.

C. Four latching volt free contacts shall be provided which can be selected to indicate any position of the valve with each contact selectable as normally open or normally closed. Each contact can be configured to either -normally open- or -normally closed- and rated at 5mA to 5A, 120V AC, 30V DC.

D. Any of the four above contacts shall be independently configurable to signal one of the following:
   1. Valve Position - fully open, fully closed or intermediate positions (0-99% open).
   2. Status - Valve opening, closing, moving (continuous or pulsing signal), local stop selected, local selected, remote selected, open or close interlock active, ESD active.
   3. Valve Alarms - Motor tripped on torque in mid travel, motor tripped on torque going open, going closed, valve jammed, actuator being operated by hand-wheel.
   4. Actuator alarms - Lost phase, customer 24V DC (120V AC) supply lost, battery low, internal failure detected, thermostat tripped.

E. An additional (4) configurable contacts, totaling (8) shall be optionally available, with these additional contacts also be configurable to the same possible settings listed above.

2.8 LOCAL POSITION INDICATION

A. The actuator shall include a digital position indicator with a display from fully open to fully closed in 1% increments. Red, green, and yellow lights corresponding to Open, Closed, and Intermediate positions shall be included on the actuator. The digital display shall be maintained even when the power to the actuator is isolated. The local display should be large enough to be viewed from a distance of six feet (6') when the actuator is powered up. Provision shall be made in the design for the addition of a transmitter without contacts to give a 4-20mA analog signal corresponding to valve travel for remote indication when required.

2.9 INTEGRAL STARTER AND TRANSFORMER

A. The reversing starter, control transformer, and local controls shall be integral with the valve actuator, suitably housed to prevent breathing and condensation buildup. For ON/OFF service, this starter shall be an electromechanical type suitable for 60 starts per hour and of rating appropriate to motor size. For MODULATING duty, the starter shall be solid state and suitable for up to a maximum of 1,200 starts per hour. The controls supply transformer shall be fed from two of the incoming three

phases. It shall have the necessary tapping and be adequately rated to provide power for the following functions:

1. 120V AC energizing of the contactor coils
2. 24V DC output where required for remote controls
3. Supply for all the internal electrical circuits
4. The primary and secondary windings shall be protected by easily replaceable fuses

2.10 INTEGRAL PUSH BUTTONS AND SELECTOR

A. Integral to the actuator shall be local controls for Open, Close, and Stop, and an local/remote selector switch pad-lockable in any one of the following three positions:
   1. Local Control Only
   2. Off (No Electrical Operation)
   3. Remote Control plus Local Stop Only.

B. It shall be possible to select maintained or non-maintained local control. The local controls shall be arranged so that the direction of valve travel can be reversed without the necessity of stopping the actuator.

2.11 CONTROL FACILITIES

A. The necessary wiring and terminals shall be provided in the actuator for the following control functions:
   1. Removable links for substitution by external interlocks to inhibit valve opening and/or closing
   2. Connections for external remote controls fed from an internal 24V DC supply and/or from an external supply of (min. 12V, max. 120V) to be suitable for any one or more of the following methods of control:
      a. Open, Close, and Stop
      b. Open and Close
      c. Overriding Emergency, Shutdown to Close (or Open) Valve from a "Make" Contact.
      d. Two-Wire Control, Energize to Close (or Open), De-Energize to Open (or Close)

B. Selection of maintained or push-to-run control for modes (A) and (B) above shall be provided and it shall be possible to reverse valve travel without the necessity of stopping the actuator. The starter contactors shall be protected from excessive current surges during travel reversal by an automatic time delay upon energizing of approximately 300 ms.

C. The internal circuits associated with the remote control and monitoring functions are to be designed to withstand simulated lightning impulses of up to 1.1 kV.

2.12 MONITORING & DIAGNOSTICS FACILITIES

A. Facilities shall be provided for monitoring actuator operation and availability as follows:
   1. Monitor (availability) relay, having one change-over contact, the relay being energized from the control transformer only when the Local/Off/Remote selector is in the "Remote" position to indicate that the actuator is available for remote (control room) operation.

B. Where required, it shall be possible to provide indication of thermostat trip and "Remote" selected as discreet signals.

C. Actuators shall include a diagnostic module, which will store and enable download of historical actuator data to permit analysis of changes in actuator or valve performance. A software tool shall be provided to allow configuration and diagnostic information to be reviewed and analyzed and reconfigured. Additionally, diagnostic data shall be available over an IrDA™ port, which can be relayed to a remote facility by an IrDA™ compatible device (laptop PC, PDA, cell-phone, etc.). After remote analysis, changes to the actuator configuration can be relayed back to the actuator via the device.

D. Diagnostic status screens must be provided to show multiple functions simultaneously so troubleshooting can be affected rapidly and efficiently. All diagnostic information should be contained on no more than eight (8) screens so multiple functions can be checked simultaneously.

E. Provision shall be made to graphically display valve torque demand as a percent of rated actuator torque vs. position simultaneously in 1% increments so as to facilitate valve troubleshooting and diagnostics.

2.13 WIRING AND TERMINALS

A. Internal wiring shall be of tropical grade PVC insulated stranded cable of appropriate size for the control and three- phase power. Each wire shall be clearly identified at each end. The terminals shall be embedded in a terminal block of high tracking resistance compound. The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal. The terminal compartment of the actuator shall be provided with a minimum of three threaded cable entries. All wiring supplied as part of the actuator to be contained within the main enclosure for physical and environmental protection. External conduit connections between components are not acceptable. Control logic circuit boards and relay boards must be mounted on plastic mounts to comply with double insulated standards. No more than a single primary size fuse shall be provided to minimize the need to remove single covers for replacement.

B. A durable terminal identification card showing plan of terminals shall be provided attached to the inside of the terminal box cover indicating:
   1. Serial Number
   2. External Voltage Values
   3. Wiring Diagram Number
   4. Terminal Layout

C. This must be suitable for the contractor to inscribe cable core identification beside terminal numbers.

2.14 ENCLOSURE

A. Actuators shall be 'O' ring sealed, watertight to NEMA 6, IP68 during operation and shall at the same time have an inner watertight and dustproof 'O' ring seal between the terminal compartment and the internal electrical elements of the actuator fully protecting the motor and all other internal electrical elements of the actuator from ingress of moisture and dust when the terminal cover is removed on site for cabling.

B. Enclosure must allow for temporary site storage without the need for electrical supply connection. A space shall not be required due to the enclosure design.

C. All external fasteners should be of stainless steel.

D. Actuators for explosion/hazardous applications shall in addition be certified flameproof for Zones 1 and 2 (Divisions 1 and 2) Group gases.

2.15 STARTUP KIT

A. Each actuator shall be supplied with a startup kit comprising installation instruction, electrical wiring diagram, and sufficient spare cover screws and seals to make good any site losses during the commissioning period.

PART 3. EXECUTION

3.1 PERFORMANCE TEST CERTIFICATE

A. Each actuator must be performance tested and individual test certificates shall be supplied free-of-charge.

B. The test equipment should simulate a typical valve load and the following parameters should be recorded:
   1. Current at maximum torque setting
   2. Torque at maximum torque setting
   3. Flash Test Voltage
   4. Actuator Output Speed or Operating Time

C. In addition, the test certificate should record details of specification, such as gear ratios for both manual and automatic drive, closing direction, and wiring diagram code number.

3.2 WARRANTY

A. Each actuator shall be warranted for a minimum of 12 months from shipment up to a maximum of 24 months from commissioning (if commissioning is performed by a Certified Factory Technician).

3.3 EXPERIENCE

A. All technologies and devices used in the actuator must have a minimum of five years commercial operating experience for that specific manufacturer. This is to include torque and position sensing, lubrication, and electrical compartment design.

3.4 APPROVED MANUFACTURER

A. Rotork IQ Series

END OF SECTION

SECTION 15010

GENERAL MECHANICAL REQUIREMENTS

PART 1. GENERAL

1.1 RELATED DOCUMENTS

A. Comply with the Conditions of the Contract, General and Supplementary Conditions, and any other applicable requirements contained herein or issued under separate cover.

B. Perform other work related to or necessary for the mechanical installation in accordance with the applicable Specification Division or Section contained herein.

C. In Mechanical Specification Sections, items under "RELATED WORK" are listed for convenience only and are not guaranteed to be a complete listing of all applicable work.

1.2 CODES, REGULATIONS AND STANDARDS

A. Comply with the latest edition of applicable codes including the following:
1. Standard Building Code
2. Arkansas State Plumbing Code
3. Arkansas Stae Gas Code
4. Life Safety Code (NFPA 101)
5. National Electrical Code (NFPA 70)
6. Arkansas State Fire Prevention Code
7. Arkansas Gas Pipeline Code

B. Comply with applicable Regulations as amended, including the following:
1. Arkansas State Department of Health Regulations
2. 1994 Arkansas Rules and regulations for Energy Efficiency Standards for New Building Construction
3. Arkansas Department of Labor Regulations
4. Occupational Safety and Health Act (OSHA)
5. Utility Company Regulations and Requirements
6. Other State and Federal Laws and Regulations
7. Local Ordinances

C. Furnish products and perform installation conforming to the latest accepted Standards published by the following organizations:
1. Underwriter's Laboratories, Inc. (UL)
2. National Fire Protection Association (NFPA)
3. National Electrical Manufacturer's Association (NEMA)
4. American Society of Testing Materials (ASTM)
5. American National Standards Institute (ANSI)
6. Air Movement and Control Association (AMCA)

7. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
8. American Society of Mechanical Engineers (ASME)
9. American Water Works Association (AWWA)
10. American Refrigeration Institute (ARI)
11. American Gas Association (AGA)
12. Cast Iron Soil Pipe Institute (CISPI)
13. Midwest Insulation Contractors Association (MICA)
14. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
15. Insurance Service Office (ISO)
16. Factory Insurance Association (FIA)
17. Factory Mutual (FM)
18. Institute of Boiler and Radiator Manufacturers (IBR)
19. National Environmental Balancing Bureau (NEBB)
20. Associated Air Balance Council (AABC)
21. American Society of Sanitary Engineers (ASSE)
22. Plumbing and Drainage Institute (PDI)
23. National Sanitation Foundation (NSF)

D. In case of discrepancy or conflict between Codes, Regulations, Standards, Drawings and/or Specifications, the requirement yielding the higher(est) quality of work shall govern.

1.3 ADMINISTRATIVE FEES

A. Obtain and maintain all necessary licenses, permits and inspections and pay all fees including taxes and penalties, if any, required by the Administrative Authority. Refundable deposits will be paid by the Owner.

1.4 PRE-CONSTRUCTION SUBMITTALS

A. Submit for approval, Manufacturer's technical data sheets including performance specifications for all equipment and air devices shown on the schedules. Also provide data on all system accessories and all materials. Include all piping, ductwork and insulation materials. Accessories to be submitted on shall include valves and all piping accessories, and all duct accessories including extractors, turning vanes, control dampers and balancing dampers.

B. Submit for approval, Contractor's original Shop Drawings of all assemblies of manufactured items including control diagrams. Submit all items called out in individual sections, in addition to those called for in this section.

C. Indicate all pertinent dimensions on scale drawings necessary for clarity and or coordination of the installation between trades.

D. Provide complete electrical data and wiring diagrams.

E. Make Submittals on all work contained in Division 15, Mechanical at one time except by special permission.

F. Bind Submittals in durable cover(s) with contents conveniently organized and properly indexed with index tabs.

G. Obtain approval on product manufacturers not specifically named prior to making submittals.

H. Each Mechanical Section contains a listing of required Submittals only for convenience.

I. Submit for approval a schedule of nameplates and manufacturer's data sheets and Shop Drawings on special supports and seals.

J. Provide performance data on all substituted items to demonstrate equality to those scheduled. Include all sound level, rpm, velocity and other data as it is applicable.

K. Submit proposed changes in ducts, pipes or equipment lay out before ordering or fabrication as stated below under "Intent".

1.5 INTENT

A. It is intended that the Contractor provide a complete and operating mechanical system including all incidental items, and connections necessary for proper operation or customarily included even though each and every item may not be indicated.

B. The Drawings indicate the general layout requirements for equipment, fixtures, piping, ductwork, etc. Final layout will be governed by actual field conditions with all measurements verified at the site. Contractor shall verify that all equipment, ducts, pipes and all other components will fit in the space provided before fabrication or ordering. Contractor shall submit any proposed changes to the Engineer for approval before ordering or fabrication.

C. It is intended that the mechanical installation be safe, reliable, energy efficient, and easily maintained with adequate provisions allowed for access to equipment.

D. It is intended that the mechanical system operate quietly with noise level below the criteria recommended for the application by ASHRAE. Provide corrective action as required to reduce objectionable noise or vibration.

PART 2. PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Furnish only new standard products of a manufacturer regularly engaged in the production of said products.

B. Support all products by service organizations with adequate spare parts inventory and personnel located reasonably close to the site.

C. Where multiple units of the same type or class of products are required, provide all units of the same manufacturer.

2.2 PRODUCT HANDLING

A. Store products in the original containers and shelter in a suitable environment at an approved location. Make readily accessible for inspections and inventory accounting.

2.3 PRODUCT SUBSTITUTIONS

A. For products specified by generic reference standard, select any product meeting such standard.

B. For products specified by naming one or more products or manufacturer's, select any named. Submit request, in writing, for substitution of any product or manufacturer not specifically named and obtain approval at least five working days prior to bid date.

C. Provide all information required to support claim of "equality" of product proposed for substitution. Substitutions will be considered only if equivalent in quality, efficiency, performance, size, weight, reliability, appearance, and ease of maintenance to the specified product or manufacturer.

D. Where approved product substitutions after the design, space requirements, electrical requirements, connections, or etc., include all work necessary to provide a complete installation of quality equal to or better than that which would have been achieved with products or manufacturers as specified.

2.4 MECHANICAL IDENTIFICATION

A. Identify each major component as to manufacturer's name, address, model number, serial number, and pertinent ratings on a durable plate attached to the component in a conspicuous place.

B. Identify each major component as it is named on the Drawings or referred to herein with engraved nameplates made from laminated plastic sheets.
   1. Furnish with white letters on the black background except for other color coded requirements.
   2. Provide appropriate size nameplates with information easily readable.
   3. Submit for approval, a schedule of nameplates to be affixed to each major component.
   4. Attach nameplates with approved adhesive on factory baked enameled surface only. Attach nameplates with proper screws on field painted and all other surfaces.

C. Identify outdoor underground lines with continuous strip of plastic utility marker tape as manufactured by Seton stating at regular intervals “CAUTION (state utility) PIPE BELOW.” Install one foot directly above pipe before backfilling to grade.

2.5 ANCHORS

A. Size anchors for minimum safety factor of two times recommended load. Use only corrosion resistant materials.

B. In new concrete, use malleable iron inserts set prior to pouring concrete.

C. In existing concrete or solid masonry, use Phillips “Redhead” expansion shields or Elcen self drilling expansion shields. Use power driven fasteners only for light loads and with specific approval.

D. In hollow masonry, use steel toggle bolts.

E. On structural steel, use approved beam clamps or direct weld.

F. In wood, use wood screws or lag screws or through bolt with nuts and washers.

G. In sheet metal, use self tapping sheet metal screws or machine bolts with washers and nuts.

H. In bar joists, use hanger rod between bottom angles secured with washers and nuts.

2.6 HANGARS AND SUPPORTS

A. Generally, support piping in accordance with ANSI B31.1 and support ducts in accordance with SMACNA duct construction standards.

B. Support horizontal steel and copper pipe as follows:
   1. For pipe sizes 2” and smaller, use adjustable wrought steel ring or clevis hangar spaced at 5 feet on center with 3/8” steel hangar rod.
   2. For pipe sizes 2-1/2” through 4”, use adjustable wrought steel clevis spaced at 10 feet on center with 5/8” steel hanger rod.
   3. Support high temperature pipe with pipe roller hangers to allow for expansion.

C. Support cast iron soil pipe 4” and smaller with adjustable wrought steel ring or clevis hanger spaced at 5 feet on center with 5/8” steel hanger rod.

D. Support PVC pipe with approved hangers at 4 feet on center.

E. Provide trapeze hangers consisting of steel angles or channels with spacers and steel hanger rods for multiple piping or duct runs.

F. Provide copper plated hangers if in contact with copper piping.

G. Provide 18 gauge galvanized saddles for insulated pipe and size hangar to accommodate pipe and insulation.

H. Use steel riser clamps for vertical piping support through floors. Provide steel bracket and wrought steel clamp for support from walls.

I. Support ducts with steel bands, steel angles, or steel channels near each transverse joint.

J. Support piping and ductwork on roof with pipe hangars that do not require roof penetrations, supplemental flashing or damage to roofing material. The system shall consist of high-density polyethylene plastic bases, structural steel frame and pipe hangars and supports as indicated below:
   1. Gas lines:
      a. Up to 2-1/2" model PP10 with roller
      b. 3" to 8" model-PS-1-2 with roller
   2. Water lines (OD with insulation):
      a. Up to 2-1/2" model PP10 with strut and hanger
   3. Gas and water:
      a. Above 8" use model PSE-2-2 with clevis hanger.
   4. Ductwork: All ductwork is to be mounted on model PPH-D supports.

2.7 EQUIPMENT SUPPORTS

A. All roof mounted equipment where support is not specified elsewhere shall use model RTU-20 equipment supports.

B. All roof supports shall be manufactured by Portable Pipe Hangers.

2.8 FLASHING AND SEALS

A. Where piping penetrates roof membrane, provide 30 inch square sheet of 5lb/sq. ft. lead or 18 gauge copper. Extend flashing into top of open vent pipes one inch or provide flashing assembly or pitch pan as recommended by roofing manufacturer.

B. Flash floor drains, except in slab on grade, with copper sheet flashing. Extend flashing under tile or floor finish to 6 inches up wall in showers or 2 feet from floor drain. Clamp flashing to auxiliary drain collar on floor drain.

C. Provide curbs for all roof mounted equipment. Make curbs minimum of 4 inches above flood level of roof. Flash and counter flash with galvanized sheet metal, soldered and properly waterproofed.

D. Where piping penetrates outside walls, make watertight with approved sealant or provide modular rubber seal designed for the purpose.

PART 3. EXECUTION

3.1 MANUFACTURER'S DIRECTIONS

A. Handle, install, connect, test, and operate all products, assemblies, and systems in accordance with manufacturer's recommendations.

B. In case of conflicting requirements between the manufacturer's directions and the Contract Documents, obtain instructions before proceeding with the work.

3.2 INSPECTIONS

A. Arrange with the Administrative Authority for inspections of all work required and obtain approval prior to concealing or proceeding with the work.

B. Give adequate notice before concealing any work for inspections by the Architect or Owner's representatives. Obtain instructions to proceed before concealing the work.

3.3 CLEANING

A. Keep the premises clean and free from debris, dirt, etc.

B. Upon completion of the work, clean and polish all fixtures, equipment, etc.

C. All ductwork shall be sealed during construction to prevent construction dust from entering ductwork.

3.4 WORKMANSHIP

A. Perform all work in accordance with the best practices of the trade and provide a "neat" installation by mechanics skilled in their respective trades and properly licensed.

B. Accurately install piping, ductwork, and other equipment, plumb, level, and true to line with runs parallel or perpendicular to building lines. Make bends or offsets uniform.

C. Carefully perform all cutting, drilling, digging, etc., and patch of refinish the disturbed area to the condition of adjoining or similar surfaces in an approved manner. Do not cut any structural member without specific approval. Do not cut any electrical or mechanical lines that may be concealed.

D. Conceal piping, ductwork, etc. in chases, furrings, or above ceilings unless indicated otherwise. Flush mount equipment required in finished walls where possible.

E. Coordinate with other trades work and install all work so that all systems and components can be easily maintained and can be removed for replacement in the future.

F. Provide access to all equipment. Do not locate components that must be serviced, maintained, or replaced above hard ceilings. Where these components absolutely must be above hard ceilings or in side walls, provide access doors equal to Acudor 5050. Provide fire rated access doors equal to Acudor FW5050 in fire rated ceilings or walls.

3.5 FLAME AND SMOKE CONSIDERATIONS

A. In ducts or other enclosures used for transporting environmental air, including return air plenums above ceilings, use only products conforming to NFPA and UL composite classifications not exceeding 25 for flame spread and 50 for smoke developed ratings. This requirement applies to all materials including adhesives, finishes, etc.

B. Completely seal penetrations through fire and/or smoke rated walls, ceilings, floors, or other barriers for the passage of piping, ductwork, etc. with a UL listed material to preserve the fire/smoke rating of the barrier.

C. Provide approved fire dampers in air ducts penetrating fire barriers requiring a fire construction rating one hour or greater. Maintain access to fire damper fusible link.

3.6 FAN SHUTDOWN CONTROLS

A. In exhaust only systems, the smoke detectors shall not be required.

3.7 COORDINATION

A. Coordinate the mechanical work with the work of related trades to avoid interference's. Determine the exact route of piping and ductwork prior to fabrication and the exact location of each outlet and equipment connection prior to installation.

B. Study the Architectural, Structural, Mechanical and Electrical Drawings, and Specifications including Shop Drawings and manufacturer's technical data sheets, and compare to actual site conditions and constraints. In case of conflicts or interference, obtain clarification or instructions before performing any work.

C. Piping or equipment requiring slope or specific mounting elevations will generally have right of way over products whose elevations can be changed.

D. Carefully plan the sequence of work as required to minimize disruptions and installation time

3.8 EQUIPMENT CONNECTIONS

A. Make all required utility connections to each item of equipment shown or specified including equipment furnished by Owner, and make operational.

B. Connect overflows, relief discharges, blowdowns, drain valves, etc. with approved piping and extend to floor drains or other approved discharge points.

C. Make all electrical connections to equipment including power supply and control wiring in accordance with Division 16, Electrical.

3.9 PROTECTION REQUIREMENTS

A. Locate existing utility lines and adequately identify and protect during the execution of the work.

B. Protect public and private property against damage.

C. Protect all work including finished against damage due to dirt, water, chemicals, frost, heat handling, theft, etc. Keep openings in piping and ductwork and equipment closed with suitable plugs or caps during installation.

D. Provide necessary warning devices, barricades, or coverings required for safety around moving parts, sharp objects or high temperature surfaces.

3.10 TRENCHING AND BACKFILLING

A. Excavate bottoms of trenches to required depth and grade for proper slope with uniform and solid bearing for piping. Do not lay pipe on mud, rocks, or unstable soil. Remove unsuitable bearing material and backfill to proper depth with sand or other approved material. If limestone products are used, protect all copper piping from contact with the limestone using sealed insulation or approved sleeving material.

B. After piping has been satisfactorily leak tested and approved, backfill trench to a depth of one foot above top of pipe with sand or fine pea gravel.. Install continuous strip of plastic “CAUTION” tape over pipe and sand. Use suitable material for remaining backfill to finished grade, tamped to 95% compaction.

C. Before beginning any trenching, locate and determine elevation of all affected piping. Verify that drain lines to be connected to are deep enough to allow sufficient slope before starting trenching.

3.11 PIPING INSTALLATION

A. Erect piping without forcing or springing and allow for proper clearance and headroom.

B. Provide for expansion and contraction with piped loops, changes in direction, or approved expansion couplings.

C. Install all piping in a manner to prevent freezing. If necessary to install water piping in unheated spaces or outdoors above the frost line, provide electric heat tracing around pipe prior to insulating.

3.12 PAINTING

A. Paint ductwork, piping, equipment, etc. exposed in finished areas to match adjacent surfaces as directed. Paint items flat black or as directed if visible through grilles or other openings.

B. Paint all exposed piping and equipment in mechanical spaces for uniform appearance or identification as directed.

C. Paint ferrous piping, equipment, hangars, etc. exposed outdoors or subject to rusting, with one coat primer and two coats of approved exterior enamel based paint.

D. Paint roof mounted and other outdoor equipment to uniformly match background or adjacent surfaces as directed.

E. Paint plywood backboards used for mounting equipment.

3.13 LABELING

A. For any fresh air vents located on the roofs, the vents shall be properly marked with the word “intake” permanently attached to the vent.

3.14 TESTING, ADJUSTING, AND BALANCING

A. After systems are completed and fully operational, perform Testing, Adjusting, and Balancing (TAB) in accordance with procedures recommended in ASHRAE Systems volume, AABC Standards, and NEBB Standards on the following systems:
   1. Exhaust Air System

B. Furnish all test equipment, tools and instrumentation required for TAB. Submit proof of calibration when required.

C. Before beginning TAB, submit forms to be used to the Engineer for approval or use the attached forms.

D. Adjust fan speeds, dampers, valves, and other controls to achieve design ratings. Balance each air device or valve to within plus or minus 10 percent of indicated flow rates. Perform TAB for each possible mode of operation.

E. Notify Engineer 24 hours prior to taking final readings and arrange for Engineer to be present for final readings.

F. Obtain and record all measurements required for final TAB report. Include at least the following data:
   1. Running amperes and voltage at each motor ¾ horsepower or larger. Indicate rpm and direction of rotation.
   2. Air flow rates (cfm) at each supply air outlet, return and outside air intake.
   3. Dry bulb air temperatures in each conditioned space and at entrance and exit of all coils with corresponding outside air temperature. Record refrigerant pressures at the same time.
   4. Static pressures in each control zone relative to outdoors and across each fan, air filter, major component, and major duct run.

G. TAB shall be performed by a qualified TAB specialist approved by the Engineer.

3.15 POST CONSTRUCTION SUBMITTALS

A. Deliver special tools, lubricants, and other products necessary for proper operation and maintenance of the mechanical systems.

B. Deliver spare parts as called for under other Mechanical Sections contained herein or on the Drawings.

C. Submit Project Record Documents indicating all changes from the Contract Documents made during construction.

D. Submit Certificates of Final Inspections from the Administrative Authority.

E. Submit Operation and Maintenance Manuals covering all phases of equipment and systems provided. Include complete spare parts data with current prices and sources of supply. Include copy of manufacturing data sheets and shop drawings required in pre-construction submittals.

F. Submit extended warranties in excess of the standard one year warranty where required by other Mechanical Sections contained herein or on the Drawings.

G. Submit TAB report on approved record forms.

3.16 INSTRUCTIONS TO OWNER

A. Provide competent instruction to Owner's personnel covering operation and maintenance of all mechanical systems. Provide specialized instruction by manufacturer's technical representatives when required.

END OF SECTION

SECTION 15012

MISCELLANEOUS TUBING

PART 1. GENERAL

1.1 SCOPE

A. This Section covers the work necessary for furnishing and installing the miscellaneous hoses, tubing, and accessories, complete.

1.2 GENERAL

A. Like items of equipment specified herein shall be the end products of one manufacturer in order to achieve standardization of maintenance and spare parts.

B. See CONDITIONS OF THE CONTRACT and Division 1, GENERAL REQUIREMENTS, which contain information and requirements that apply to the work specified herein and are mandatory for this project.

C. Conform to Fayetteville's Standard Specifications.

PART 2. PRODUCTS

2.1 GENERAL

A. All items shall be complete with all necessary end connections, fittings, and couplings which are required for the proper completion of the work included under this Section.

2.2 HOUSE SERVICE TUBING

A. Service tubing shall be 1" Drisco Pipe 5100, SDR-9, 200 psi, ASTM D2737, AWWA C-901.

2.3 LARGE METER SERVICE TUBING

A. The 1 1/2-inch and 2-inch service tubing shall be Drisco Pipe 5100, SDR-9, 200 psi, ASTM D2737, AWWA C-901.

2.4 TRACE WIRE

A. Trace wire shall be 14 gauge insulated copper wire.

PART 3. EXECUTION

3.1 GENERAL

A. All tubing shall be cut, made up, and installed in strict accordance with the manufacturer's written recommendations, as approved and as further specified herein under.

3.2 INSTALLATION

A. Install 1" polyethylene service tubing in accordance with the Detail for meter settings.

B. Install 1½" and 2" polyethylene tubing at meter settings requiring service tubing larger than one inch in size.

C. Polyethylene tubing shall be installed with a minimum earth cover of 30 inches over the top of the pipeline. Consideration for thermal contraction shall be given by "snaking" the pipeline in the trench. Tracer wire shall be installed on all polyethylene tubing from the corporation stop on the main to the branch piece on the meter setting by either taping or wrapping the tracer wire around the PE tubing at least every 6'. The wire shall be spliced to the water main trace wire, and shall be accessible in the meter box.

3.3 TESTING

A. Prior to startup, all miscellaneous hoses, tubing, and accessories shall be inspected for proper connection and satisfactory performance. Each item shall be tested at the same time that the adjacent pipeline is tested. Joints shall show no visible leakage under test. Repair joints that show signs of leakage prior to final acceptance. If there are any special parts of control systems or operators that might be damaged by the pipeline test, they shall be properly protected. The Contractor will be held responsible for any damage caused by the testing.

END OF SECTION

APPENDIX A

Design Narrative

Decatur WWTP Expansion
Design Narrative
MCE Project No. FY152150
4/7/17

General Description

The City of Decatur's Wastewater Treatment Plant (WWTP) currently consists of three (3) parallel sequencing batch reactors (SBRs) with a design flow of 2.2 million gallons per day (MGD). The City intends to construct improvements to the WWTP to increase the design flow to 3.8 MGD and convert to 3 parallel membrane bioreactors (MBRs). The WWTP will be able to handle up to 4.6 MGD hydraulically, with equipment installed to process up to 3.8 MGD with the ability to expand to 4.6 MGD in the future if required. Following is a summary of the proposed improvements, starting upstream and working downstream.

HEADWORKS AREA (SHEET HW-01)

1. Influent Diversion Structure
    a. Install actuators on both influent slide gate (20" W x 18" H) and diversion weir gate to equalization pond (48" w x 24" H).
    b. Actuators will be tied to SCADA to allow for automation in case of lift station fault (in which case slide gate would close and all flow would be diverted to equalization pond).
    c. Per Spec Section 15007, minimum opening/closing rate for actuators shall be 12" per minute. Therefore, opening/closing time for the influent slide gate and diversion weir gate will be 90 seconds and 120 seconds, respectively.
    d. Under normal operating conditions, influent slide gate will remain wide open, with diversion weir gate set such that flows in excess of 3.8 MGD will be diverted to the equalization pond.

2. Equalization Pond and Pump Station
    a. Install pressure transducer in equalization pond in a stilling well. Level reading will be tied to SCADA system. New walkway will be constructed to provide access to pressure transducer.
    b. Modify the 6" pump station discharge piping such that flowmeter remains flooded and provides an accurate flow measurement.

3. Chemical Feed Building
    a. Replace existing peristaltic pumps with diaphragm pumps. See Spec Section 11213.
    b. Place chemical feed system on flow pacing from SCADA.

LIFT STATION AREA (SHEETS WW-01, FS-01, and FS-02)

1. Wet Well Expansion (Sheet WW-01)
    a. Based on survey, the existing 16" DIP influent line has a minimum slope of 0.72%, which is adequate to convey up to 4.6 MGD without surcharging.
    b. Existing lift station wet well has limited capacity: approximately 71 seconds of retention time before overflow at 3.8 MGD and approximately 1 minute of retention time at 4.6 MGD. See Appendix B for calculations.

c. An expansion to the wet well is proposed which will add storage capacity and allow ample time for influent diversion gate to close in case of lift station fault.
    i. Adds approx. 5.7 minutes of retention time at 3.8 MGD (total retention time of 6.9 minutes) and approx. 4.7 minutes of retention time at 4.6 MGD (total retention time of 5.7 minutes). See Appendix B for calculations.
    ii. Ties into existing 16" influent line upstream of MH #7.
    iii. Bottom of vault is above the normal operating level for the lift station.

2. New Rotary Drum Screens (Sheet FS-01)
    a. Two (2) new rotary drum screens will be installed on top of the existing anaerobic tanks. Each screen will have a capacity of 4.6 MGD. See Spec Section 11353.
    b. Conveyor to be provided for each screen, with discharge to a common dumpster.
    c. New 16" DIP feed line for the screens will be tied into the existing 14" DIP pump station discharge line as shown on Sheet FS-01. The WWTP can remain in operation while the modifications are being constructed.
    d. 16" DIP discharge line from screens to splitter box, which can handle up to 4.6 MGD without backing up into bottom of screens. See Appendix B for calculations.

3. Splitter Box (Sheet FS-02)
    a. Splitter box to be installed downstream of screens to allow control of flow to each of the 3 treatment trains.
    b. Actuated weir gates to be provided. See Spec Sections 11611 and 15007.
    c. Weir openings sized to allow up to 4.6 MGD of flow to a single treatment train with adequate freeboard. See Appendix B for calculations.
    d. 16" DIP discharge piping from each splitter box outlet to be added, which tie into the respective existing wall pipes into the anaerobic tanks. Minimum slope of each discharge line to be 0.67% which allows for up to 4.6 MGD hydraulic capacity.
    e. Under normal flow conditions, weir gate heights will be set to divide flow equally amongst the 3 treatment trains.

3. Lift Station Modifications (Sheet WW-01)
    a. Based on new head condition created by screens and new piping, existing Flygt pumps will have a firm capacity (2 pumps running, 1 in standby) of 1,900 gpm (2.7 MGD). Thus the existing pumps must be replaced to meet the 3.8 MGD design flow and 4.6 MGD future flow. See Appendix B for pump and system curves.
    b. The existing pumps will be replaced with KSB pumps – the City has 2 of these pumps on hand, and third KSB pump will be ordered and installed. The firm capacity with 2 KSB pumps is 3,050 gpm (4.4 MGD), which meets the current capacity requirements. See Appendix B for pump and system curves. See Appendix D for pump performance data.

PROCESS IMPROVEMENTS (SHEETS TP-01 THROUGH TP-08)

1. Jet aeration (Sheet TP-08)
    a. Three (3) new jet motive pumps to be installed (1 in each treatment train). See Appendix C for pump submittal information.
    b. Three (3) new jet aeration headers to be installed (1 in each treatment train). See Appendix C for jet aeration header submittal information.

2. MBRs (Sheets TP-02 through TP-07)
    a. Three (3) total MBRs to be installed on top of existing post equalization basins. Each MBR will be fed by two (2) membrane feed pumps installed in aeration basin. Membranes to be installed for 3.8 MGD treatment capacity with space to expand to 4.6 MGD. See Appendix C for membrane tank, membrane, and feed pump submittal information.
    b. 24" DIP RAS return line from each MBR will be installed top of existing walls/walkways. Pipe designed to remain flooded at all times.
    c. Process Blowers
        i. Four (4) existing 100 hp blowers for SBR process. 1 blower functions as backup/spare.
        ii. Currently evaluating options for additional process air requirements to convert to MBRs.
        iii. Option #1 – replace 3 existing 100 hp blowers with 3 new blowers (up to 250 hp each required). See Spec Section 11373.
        iv. Option #2 – provide 3 new 75 HP blowers to supplement existing blowers.
    d. Membrane Blowers
        i. Three (3) new 100 hp blowers to be installed to supply air to each MBR tank for air scouring purposes. See Appendix C for blower submittal information.

FILTER BUILDING AREA (SHEETS FB-01 THROUGH FB-04)

1. Demolition Required (Sheet FB-01)
    a. Existing disk filter currently not in operation and will be removed from building.
    b. Install blind flanges on influent and effluent lines from disk filter.

2. Permeate Pumps and Tank
    a. Three (3) 50 hp permeate pumps to be installed.
    b. 8,700 gal permeate tank to be installed.
    c. Anti-siphon valves to be provided on piping between MBRs and pumps to allow flow between MBRs and permeate tank to occur based on head; therefore, pumps will not be required to operate during majority of the time.
3. UV System
    a. Existing Aquonics UV system has insufficient capacity to handle design flows.
    b. Install new UV system with 4.6 MGD capacity. Can be installed while existing UV system remains in operation. See Spec Section 11352.
    c. Adequate space to provide temporary connection to new UV system prior to permeate pumps and tank being placed on-line.
    d. Existing UV system to be removed once system is fully operational.

SLUDGE BUILDING AREA (SHEETS SP-01 AND SP-02)

1. Remove existing sludge press and replace with new screw press. See Spec Section 11356.
2. Repair and close up existing wall penetration, and create a new wall penetration for new shaftless screw conveyor, so that trailers can be loaded properly. See Spec Section 14100 for conveyor spec.
3. New building to be constructed over existing sludge loading area.

APPENDIX B

Design Calculations

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE
P.O. Box 34087 • Little Rock, Arkansas 72203-4087
501-371-0272 • FAX 501-371-9932

Job No._____ Sheet_____/_____

Project Decatur WWTP

Prepared By_____ Date: _____

Checked By _____ Date: _____

Wet Well Sizing Calculations

L = 28.0'
W = 18.0'
D = 4.0'

V = 28 x 18 x 4 = 2016 ft³
V = 2016 x 7.481 = 15,082 gallons

Flow = 4.6 MGD
Flow = 3194 gpm

$\frac{15082 \text{ gallons}}{3194 \text{ gpm}}$ = 4.722 minutes retention

Additional Storage Available in Pump Station Vault

L = 17'
W = 7'
D = 3.5' +/-

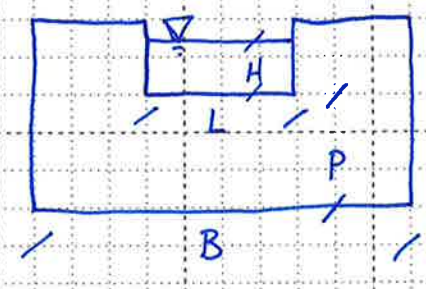
V = 17 x 7 x 3.5 = 416.5 ft³
V = 416.5 x 7.481 = 3115 gallons

$\frac{3115 \text{ gallons}}{3194 \text{ gpm}}$ = .975 minutes retention

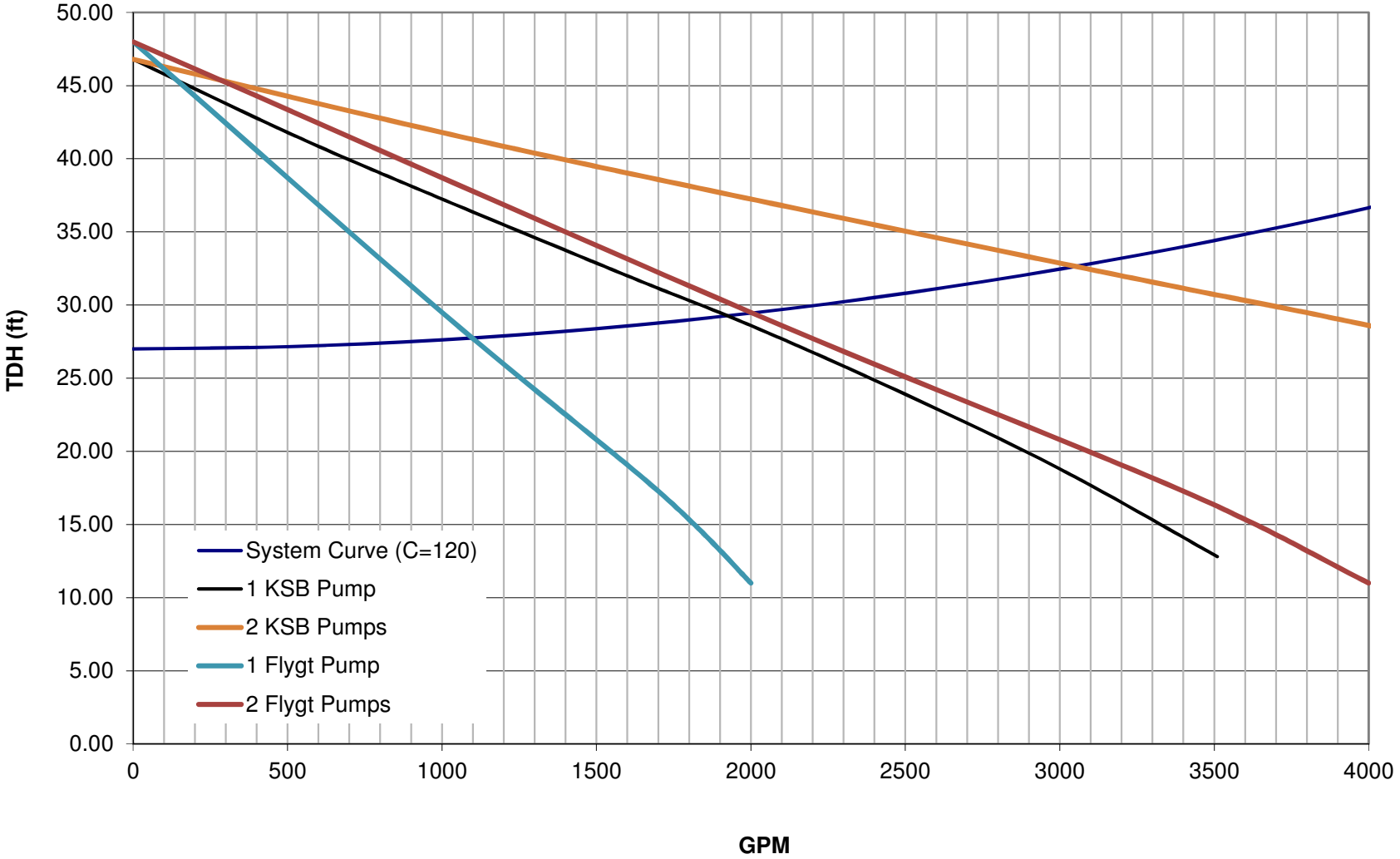
Splitter Box Sizing Calculations

Flow = 4.6 MGD
Flow = 3194 gpm
Flow = 7.117 cfs

$Q = 3.33(L - 0.2H)(H^{3/2})$
$Q = 3.33(2.5 - 0.2(1)(1^{3/2}) = 7.659$ cfs
P = 1.5
B = 4.25
L = 2.5
H = 1.0



Decatur WWTP Expansion
System and Pump Curves
Influent Lift Station



Job Decatur WWTP Improvements - System Head Curve Calculations
Project # FY152150
4/7/2017

Pump Station

Target Flow (gpm) =	5500	
Flow Increment =	500	
Discharge Elev =	1212.50	12" discharge into drum screen (top of pipe)
Wet Well Elev =	1185.50	Constant level per Sheet WW-01
Static Head (ft) =	27.00	
Pipe Length (ft) =	36	14" Pipe - Pump to 16"x14" reducer
	71	16" Pipe - 16"x14" reducer to 16"x12" reducer
	7	12" Pipe - 16"x12" reducer to screen
C Value =	120	
Pipe Dia. (in) =	14.64	14" DIP Class 50
	16.72	16" DIP Class 50
	12.58	12" DIP Class 50
Sum K Values =	6.03	14" DIP Class 50
	1.32	16" DIP Class 50
	1.34	12" DIP Class 50

Q			V (ft/s)			$HL_{(static)}$	$HL_{(friction)}$				$hl_{(minor)}$				TDH
gpm	MGD	cfs	14"	16"	12"	(ft)	14"	16"	12"	TOTAL	14"	16"	12"	TOTAL	
0	0.00	0.00	0.00	0.00	0.00	27.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.00
500	0.72	1.11	0.95	0.73	1.29	27.00	0.01	0.01	0.00	0.03	0.09	0.01	0.03	0.13	27.16
1000	1.44	2.23	1.91	1.46	2.58	27.00	0.04	0.04	0.02	0.10	0.34	0.04	0.14	0.52	27.62
1500	2.16	3.34	2.86	2.19	3.87	27.00	0.09	0.09	0.03	0.21	0.77	0.10	0.31	1.18	28.39
2000	2.88	4.46	3.81	2.92	5.16	27.00	0.15	0.15	0.06	0.36	1.36	0.18	0.55	2.09	29.45
2500	3.60	5.57	4.77	3.65	6.45	27.00	0.22	0.23	0.09	0.54	2.13	0.27	0.87	3.27	30.80
3000	4.32	6.68	5.72	4.38	7.74	27.00	0.31	0.32	0.13	0.75	3.06	0.39	1.25	4.70	32.46
3500	5.04	7.80	6.67	5.11	9.03	27.00	0.41	0.42	0.17	1.00	4.17	0.54	1.70	6.40	34.41
4000	5.76	8.91	7.62	5.85	10.33	27.00	0.53	0.54	0.21	1.28	5.44	0.70	2.22	8.36	36.65
4500	6.48	10.03	8.58	6.58	11.62	27.00	0.65	0.68	0.27	1.60	6.89	0.89	2.81	10.58	39.18
5000	7.20	11.14	9.53	7.31	12.91	27.00	0.80	0.82	0.32	1.94	8.50	1.09	3.47	13.07	42.01
5500	7.92	12.25	10.48	8.04	14.20	**27.00**	0.95	0.98	0.39	2.32	10.29	1.32	4.19	15.81	45.12
6000	8.64	13.37	11.44	8.77	15.49	27.00	1.11	1.15	0.45	2.72	12.25	1.58	4.99	18.81	48.53
6500	9.36	14.48	12.39	9.50	16.78	27.00	1.29	1.34	0.53	3.15	14.37	1.85	5.86	22.08	52.23
7000	10.08	15.60	13.34	10.23	18.07	27.00	1.48	1.53	0.60	3.62	16.67	2.14	6.79	25.61	56.23
7500	10.80	16.71	14.30	10.96	19.36	27.00	1.68	1.74	0.68	4.11	19.14	2.46	7.80	29.40	60.51
8000	11.52	17.83	15.25	11.69	20.65	27.00	1.90	1.96	0.77	4.63	21.77	2.80	8.87	33.45	65.08

K Values for Minor Losses

Fittings	K_m	Qty 14"	Qty 16"	Qty 12"	Subtotal 14"	Subtotal 16"	Subtotal 12"
Valves:							
Globe, fully open	10	0			0	0	0
Angle, fully open	2	0			0	0	0
Gate, fully open	0.15	0			0	0	0
Gate 1/4 closed	0.26	0			0	0	0
Gate, 1/2 closed	2.1	0			0	0	0
Gate, 3/4 closed	17	0			0	0	0
Swing check, forward flow	2	1			2	0	0
Swing check, backward flow	infinity	0					
Butterfly valve, fully open	0.3	0			0	0	0
Plug valve, fully open	0.34	2		1	0.68	0	0.34
180° return bends:		0					
a) Flanged	0.2				0	0	0
b) Threaded	1.5				0	0	0
Elbows:							
a) Regular 90°, flanged	0.3	1	3		0.3	0.9	0
b) Regular 90°, threaded	1.5	0			0	0	0
Long radius 90°, flanged	0.2	0			0	0	0
Long radius 90°, threaded	0.7	0			0	0	0
Long radius 45°, threaded	0.2	0			0	0	0
Regular 45°, threaded	0.4	0			0	0	0
Tees:							
a) Line flow, flanged	0.2	2	1		0.4	0.2	0
b) Line flow, threaded	0.9	0			0	0	0
c) Branch flow, flanged	1	2			2	0	0
d) Branch flow, threaded	2	0			0	0	0
Pipe Entrance (Reservoir to Pipe):							
a) Square Connection	0.5	0			0	0	0
b) Rounded Connection	0.2	1			0.2	0	0
c) Re-entrant (pipe juts into tank)	1	0			0	0	0
Subtotals					5.58	1.1	0.34

Fittings	K_m	Qty 14"	Qty 16"	Qty 12"	Subtotal 14"	Subtotal 16"	Subtotal 12"
Pipe Exit (Pipe to Reservoir):							
a) Square Connection	1	0	0	0	0	0	0
b) Rounded Connection	1	0	0	1	0	0	1
c) Re-entrant (pipe juts into tank)	1	0	0	0	0	0	0
Sudden Contraction ($h_m = K*V_2^2/2g$)							
a) $d_2/d_1 = 0.2$	0.48	0	0	0	0	0	0
b) $d_2/d_1 = 0.4$	0.42	0	0	0	0	0	0
c) $d_2/d_1 = 0.6$	0.32	0	0	0	0	0	0
d) $d_2/d_1 = 0.8$	0.22	0	1	0	0	0.22	0
e) $d_2/d_1 = 0.9$	0.05	0	0	0	0	0	0
Sudden Enlargement ($hm = K*V_1^2/2g$)							
a) $d_1/d_2 = 0.9$	0.04	1	0	0	0.04	0	0
b) $d_1/d_2 = 0.8$	0.13	0	0	0	0	0	0
c) $d_1/d_2 = 0.6$	0.41	1	0	0	0.41	0	0
d) $d_1/d_2 = 0.4$	0.71	0	0	0	0	0	0
e) $d_1/d_2 = 0.2$	0.92	0	0	0	0	0	0
Subtotals					0.45	0.22	1.00

APPENDIX C

H2O Innovations Equipment Submittals

Submittal Form

Document title	*Process Flow Diagram*
Name	*Decatur – Wastewater Treatment Plant*
Address	*PO Box 247, Decatur, AR, 72722*

Document #, revision #	Submitted by	Pages	Peer reviewer	Prepared by
U18535-C11-0001,01	*H_2O Innovation*	*5*	*FK*	*D'ON*

Information	Review	Fabrication / procurement	As built
☐	☒	☐	☐

Package description	*MBR System*	
Tags	*N/A*	
Project #	Purchase order #	Submittal # *N/A*
U18535	*Agreement, 13 Dec 2016*	*N/A*

Customer Checklist

☐ 1. Reviewed and no comments. Approved as submitted and no need to resubmit.	Authorized by:
☐ 2. Reviewed, proceed with work and approved once comments are incorporated. No need to resubmit.	Title:
☐ 3. Not accepted, work may not proceed. Revise and resubmit.	Signature:
☐ 4. For information only – No approval required	Date:

Revision Tracking History

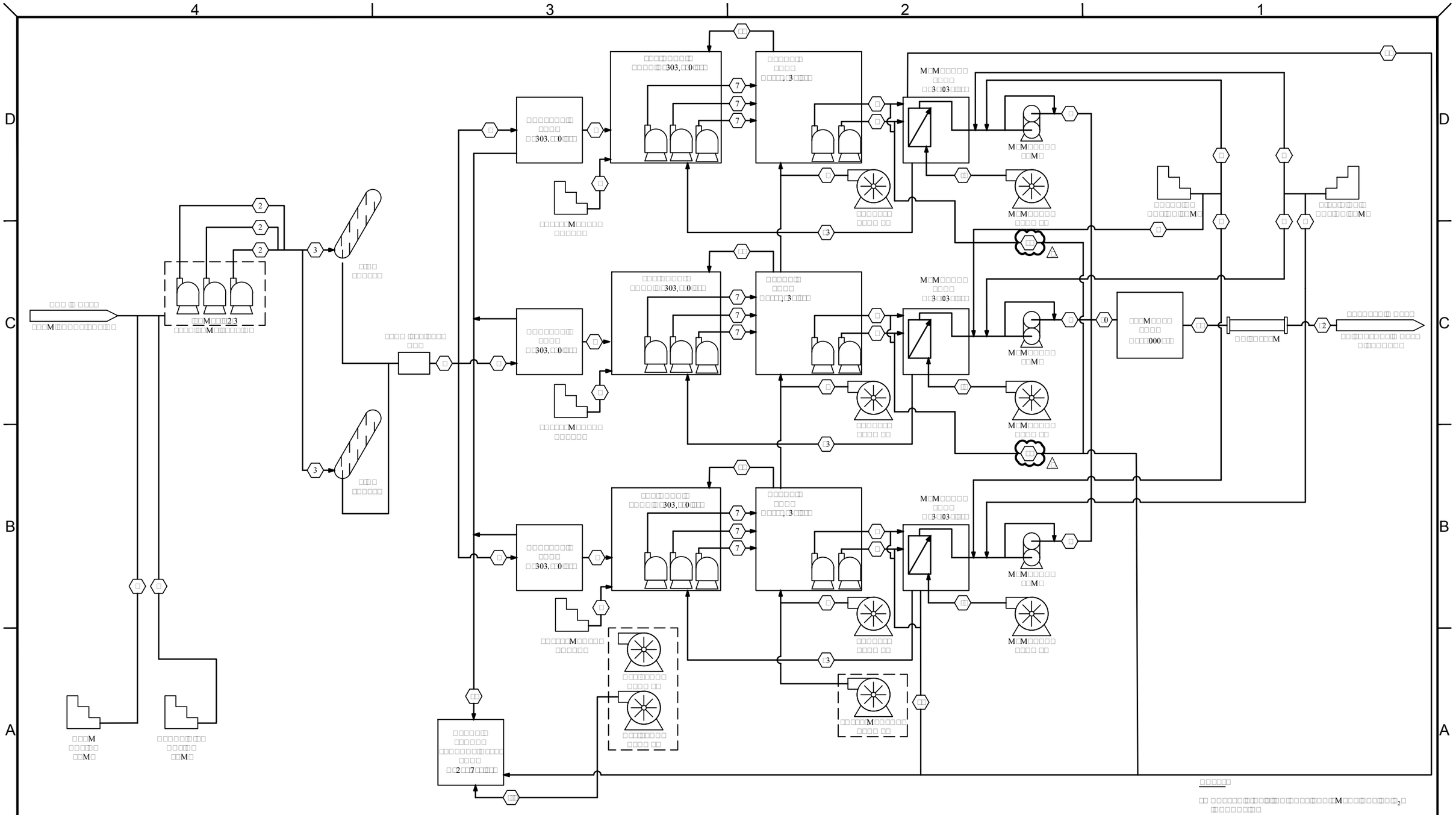
H_2O Innovation document #			Customer Document #	Date
Document #	Sequence #	Revision #		
C11	*0001*	*0*		*25-Jan-2017*
C11	*0001*	*1*		*14-Mar-2017*

Submittal Form

Submittal Modification Tracking List

#	Customer request	H_2O comments	Status *
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

* Status should be “Accepted”, “Info” or “No Change”



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01	03/14/2017	REVISED	M.P.	A.M.	D.O.N.	F.K.
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TOLERANCES
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DECIMALS: 0.X: ±0.030
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SI: ES: ±1/64"
HOLE CENTERS: ±1/64"
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DECATUR MBR RETROFIT

4.6 MGD

TITLE:
PROCESS FLOW DIAGRAM

SCALE: N/A

DRAWING NUMBER: U18535-C11-0001

SHEET: 1 of 3

REVISION 01

DECATUR MBR RETROFIT FLOW TABLE

FLOW TABLE

			FLOW RATE (GPM)			FLOW RATE (M^3/DAY)		
LINE	DESCRIPTION	FLUID	DESIGN	MAX	MIN	DESIGN	MAX	MIN
1	FEED	WW	3194	3194	1528	17413	32297	8328
2	FEED FROM PUMP STATION	WW	3194	1065	1528	17413	32297	8358
3	FEED TO SCREENS	WW	1597	3194	764	8705	16151	4164
4	SCREENED FEED	WW	3194	3194	1528	17413	32297	8328
5	SCREENED FEED	WW	1065	1597	509	5804	10765	2774
6	MIXED LIQUOR	MLSS	1065	1597	509	5804	10765	2774
7	MIXED LIQUOR	MLSS	2886	2886	2546	29021	32786	13878
8	MIXED LIQUOR	MLSS	2732	2732	1273	14510	19896	6939
9	PERMEATE	WATER	1065	1597	509	5804	10765	2774
10	COMBINED PERMEATE	WATER	3194	3194	1528	17413	32297	8328
11	COMBINED PERMEATE	WATER	3194	3194	1528	17413	32297	8328
12	POST UV WATER	WATER	3194	3194	1528	17413	32297	8328
13	RETURN ACTIVATED SLUDGE	MLSS	4400	4400	2037	23215	29021	11103
14	INTERNAL RECIRCULATION	MLSS	3194	3194	509	5804	10765	2774
15	SLUDGE WASTING (BY OTHERS)	MLSS	N/A	N/A	N/A	N/A	N/A	N/A
16	SLUDGE WASTING	MLSS	△ 137	N/A	N/A	747	N/A	N/A
			FLOW RATE (GPH)			FLOW RATE (LPH)		
			DESIGN	MAX	MIN	DESIGN	MAX	MIN
A	MEMBRANE CLEANING 1	CITRIC ACID	△ 109	109	73	412	412	275
B	MEMBRANE CLEANING 2	CHLORINE	562	562	37	2125	2125	142
C	ALUM DOSING	ALUM	N/A	N/A	N/A	N/A	N/A	N/A
D	ALKALINITY	SODIUM HYDROXIDE	△ N/A	N/A	N/A	N/A	N/A	N/A
E	CARBON DOSING	METHANOL	5.1	5.1	4.2	19.2	19.2	15.8

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DECATUR MBR RETROFIT

4.6 MGD

TITLE:
PROCESS FLOW DIAGRAM

SCALE: N/A
DRAWING NUMBER: U18535-C11-0001
SHEET: 2 o 3
REVISION: 01

DECATUR MBR RETROFIT FLOW TABLE								
FLOW TABLE								
			FLOW RATE (SCFM)			FLOW RATE (NM^3/H)		
LINE	DESCRIPTION	FLUID	DESIGN	MAX	MIN	DESIGN	MAX	MIN
1	FEED PROCESS AIR	AIR	3021	3021	2535	5133	5133	5133
2	FEED MEMBRANE AIR	AIR	1620	1866	1080	2752	3170	1835
3	FEED SLUDGE AIR (BY OTHERS)	AIR	N/A	N/A	N/A	N/A	N/A	N/A

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DECATUR MBR RETROFIT

4.6 MGD

TITLE:
PROCESS FLOW DIAGRAM

SCALE: N/A

DRAWING NUMBER: U18535-C11-0001
SHEET: 3 o 3

REVISION 01

Submittal Form

Document title	*P&IDs*
Name	*Decatur – Wastewater Treatment Plant*
Address	*PO Box 247, Decatur, AR, 72722*

Document #, revision #	Submitted by	Pages	Peer reviewer	Prepared by
U18535-C01-0001,01	*H_2O Innovation*	*18*	*MB*	*D'ON*
Information ☐	Review ☒	Fabrication / procurement ☐		As built ☐
Package description	*MBR System*			
Tags	*N/A*			
Project #	Purchase order #		Submittal # *N/A*	
U18535	*Agreement, 13 Dec 2016*		*N/A*	

Customer Checklist

☐ 1. Reviewed and no comments. Approved as submitted and no need to resubmit.	Authorized by:
☐ 2. Reviewed, proceed with work and approved once comments are incorporated. No need to resubmit.	Title:
☐ 3. Not accepted, work may not proceed. Revise and resubmit.	Signature:
☐ 4. For information only – No approval required	Date:

Revision Tracking History

H_2O Innovation document #			Customer Document #	Date
Document #	Sequence #	Revision #		
C01	*0001*	*0*		*10-Feb-2017*
C01	*0001*	*1*		*31-Mar-2017*

Submittal Form

Submittal Modification Tracking List

#	Customer request	H_2O comments	Status *
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3			
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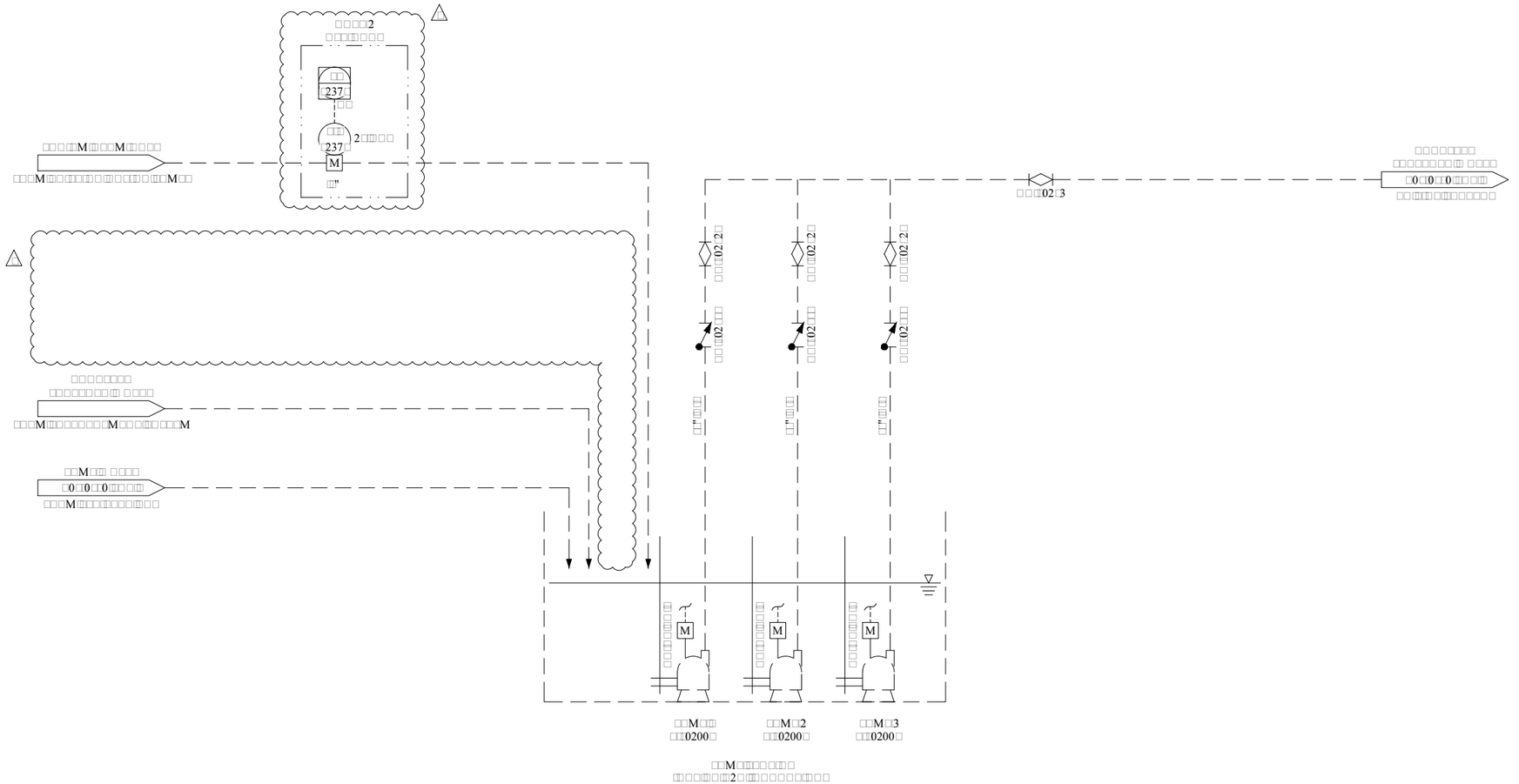

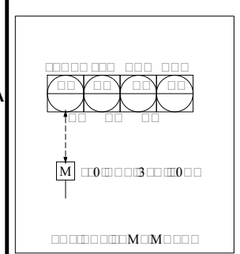

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0.XX: ±0.015
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DECATUR MBR RETROFIT

4.6 MGD

TITLE:
FEED PUMP STATION AND SPLITTER BOX
PROCESS □ INSTRUMENTATION DIAGRAM

SCALE:	DRAWING NUMBER:	REVISION
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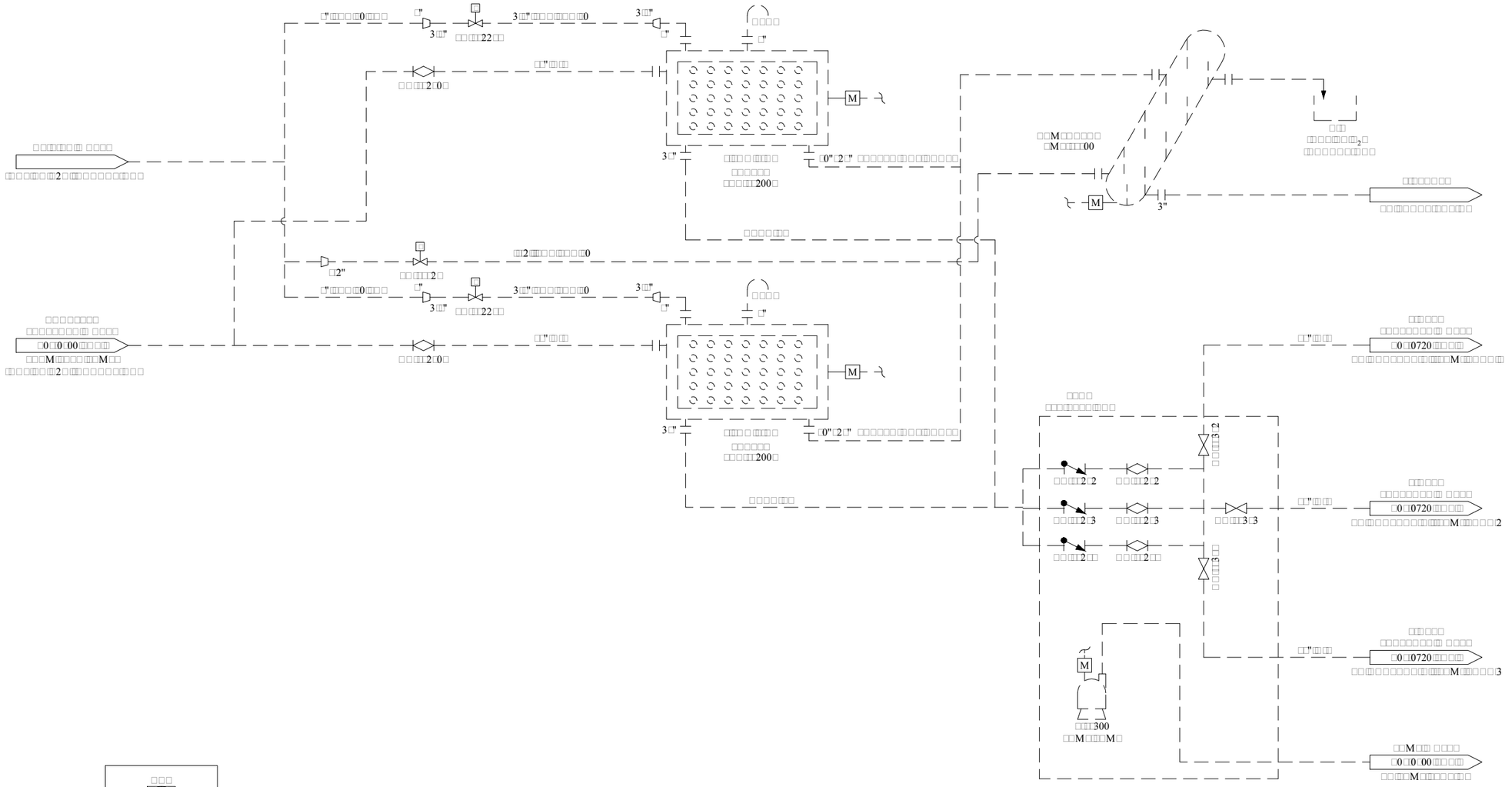
	SHEET: 1 o□1	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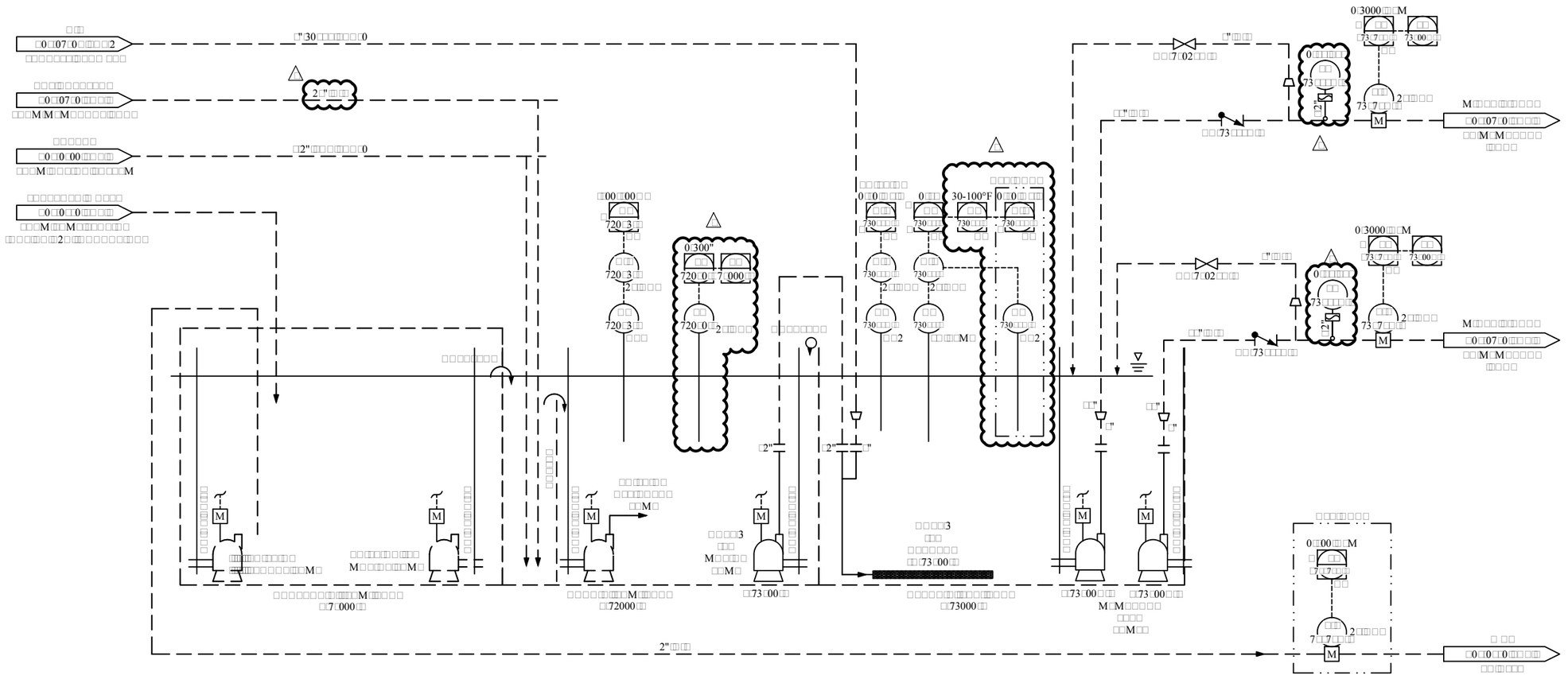
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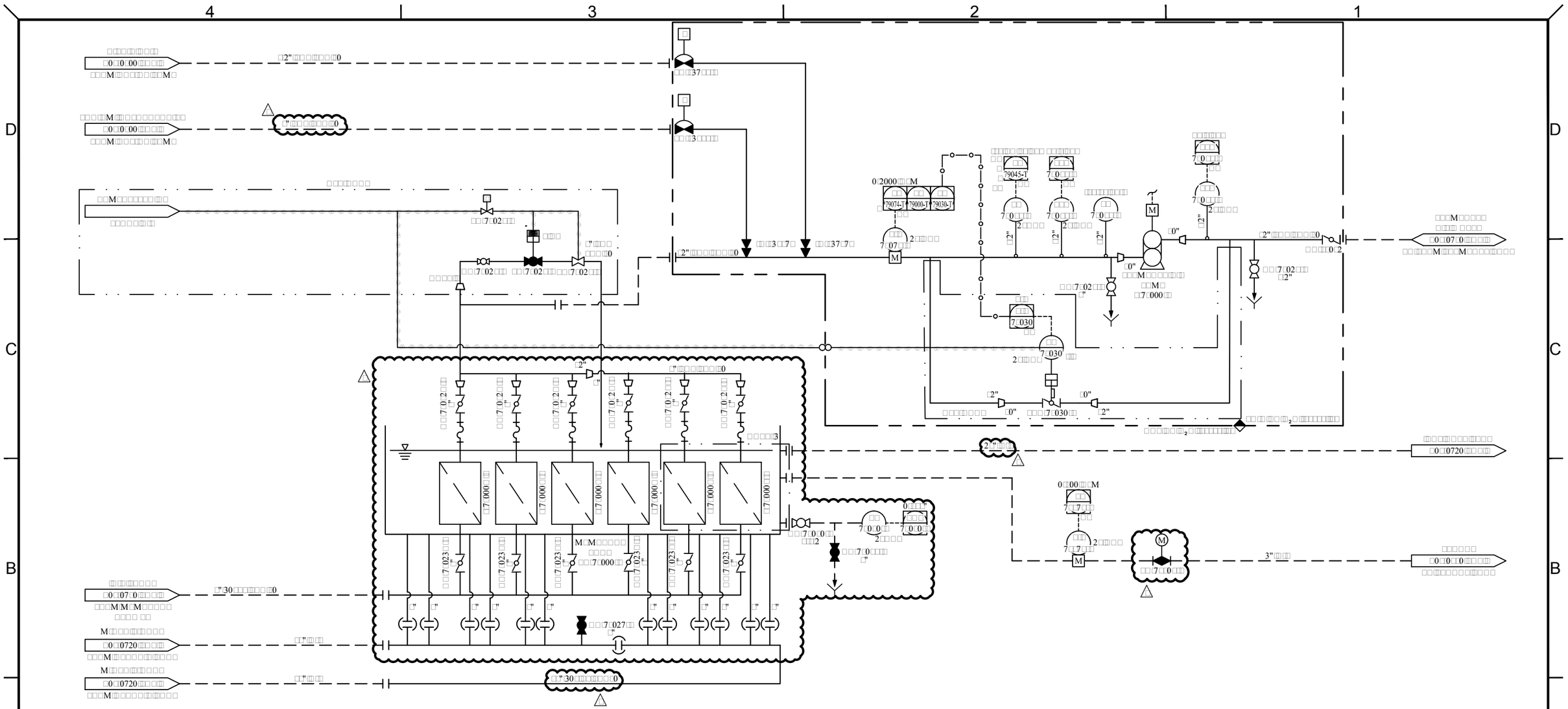

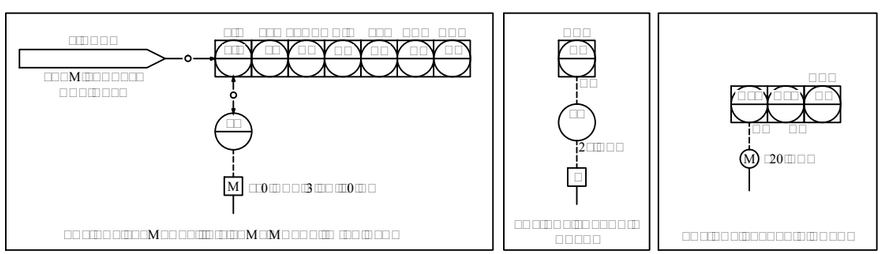

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DECIMALS 0.X: ±0.030
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SI: ES: ±0.2"
HOLE CENTERS: ±0.2"
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DECATUR MBR RETROFIT

4.6 MGD

TITLE:
MEMBRANE FILTRATION
PROCESS □ INSTRUMENTATION DIAGRAM

SCALE: N/A

DRAWING NUMBER: U18535-C01-0740

SHEET: 1 o□1

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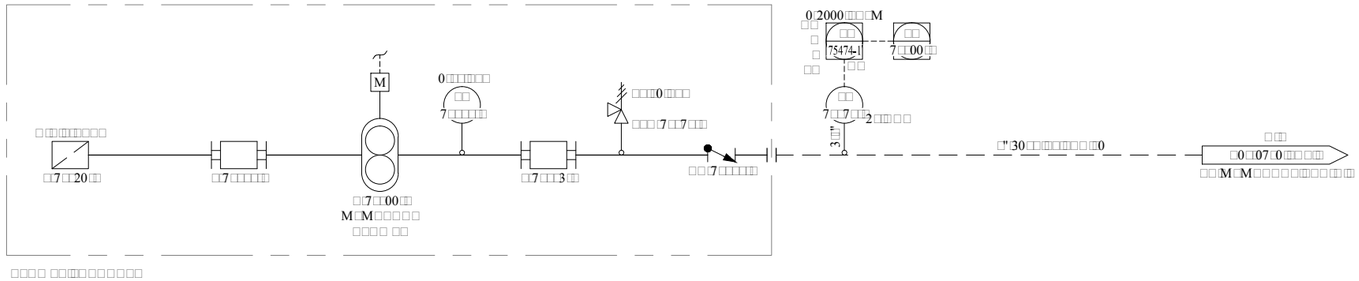

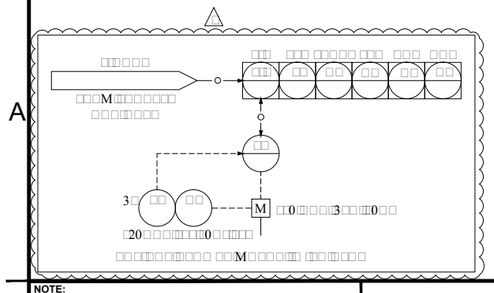

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	REV	DATE (DD/MM/YYYY)	REVISION DESCRIPTION	DRAWN	CHKD	ENG	APPVD			
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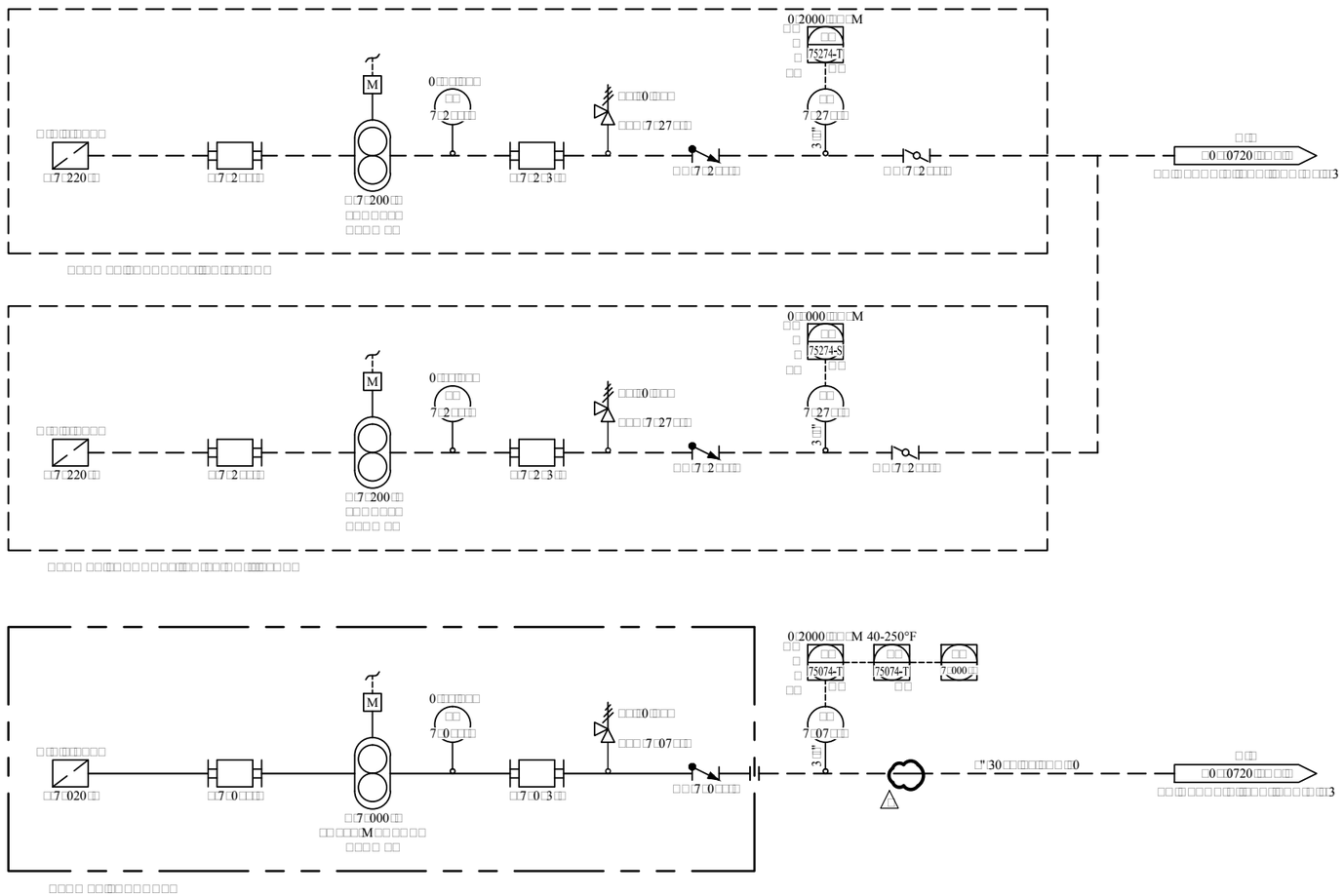

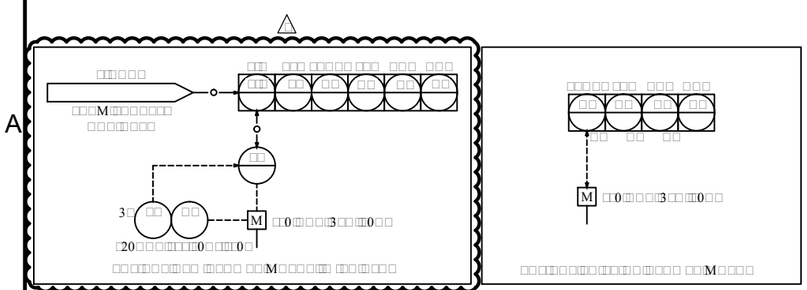

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X.XX: ±0.015
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4.6 MGD

TITLE:
PROCESS BLOWERS
PROCESS □ INSTRUMENTATION DIAGRAM

SCALE: N/A
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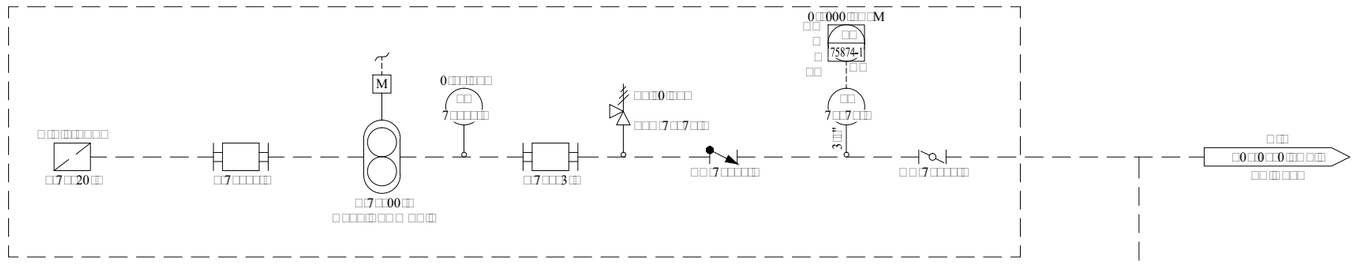
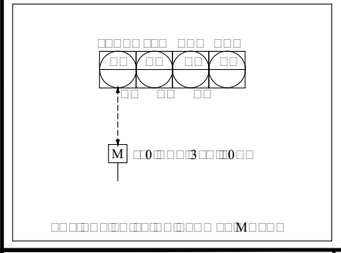
REVISION 01





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DECATUR MBR RETROFIT

4.6 MGD

TITLE:
ASST BLOWERS
PROCESS □ INSTRUMENTATION DIAGRAM

SCALE:	DRAWING NUMBER:	REVISION
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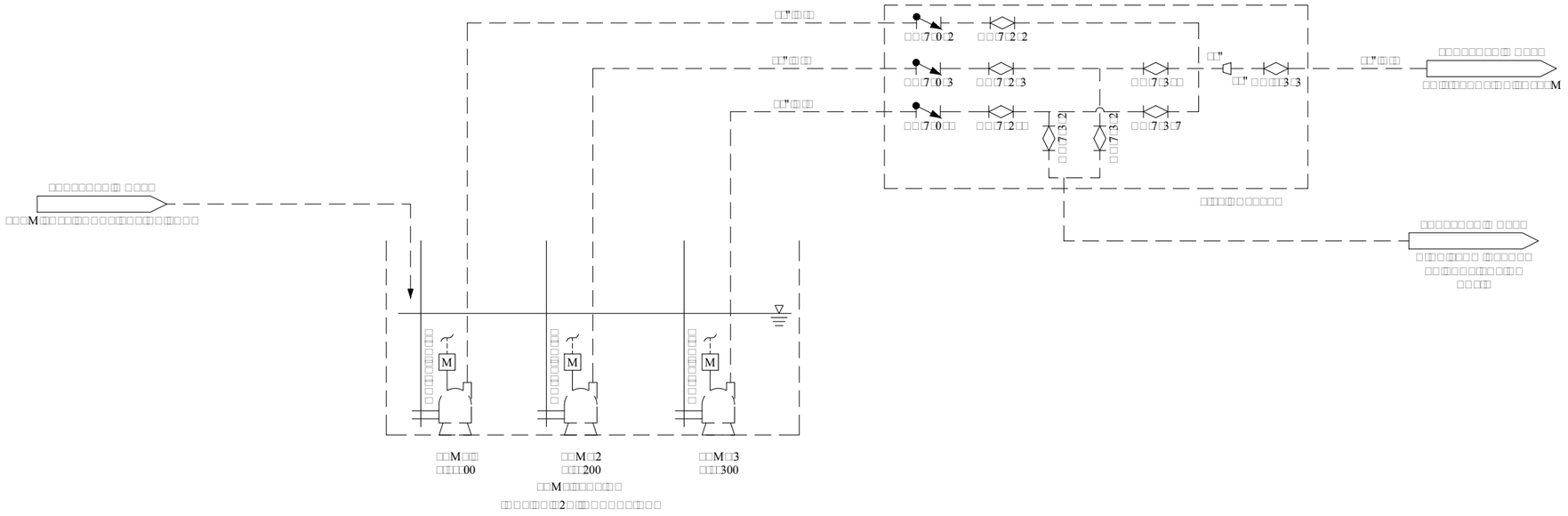

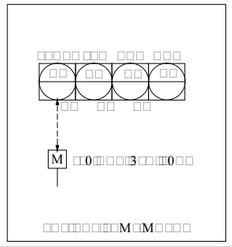

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DECATUR MBR RETROFIT

4.6 MGD

TITLE:
FILTER FEED PUMP STATION AND PIPE GALLERY
PROCESS □ INSTRUMENTATION DIAGRAM

SCALE:	DRAWING NUMBER:	REVISION
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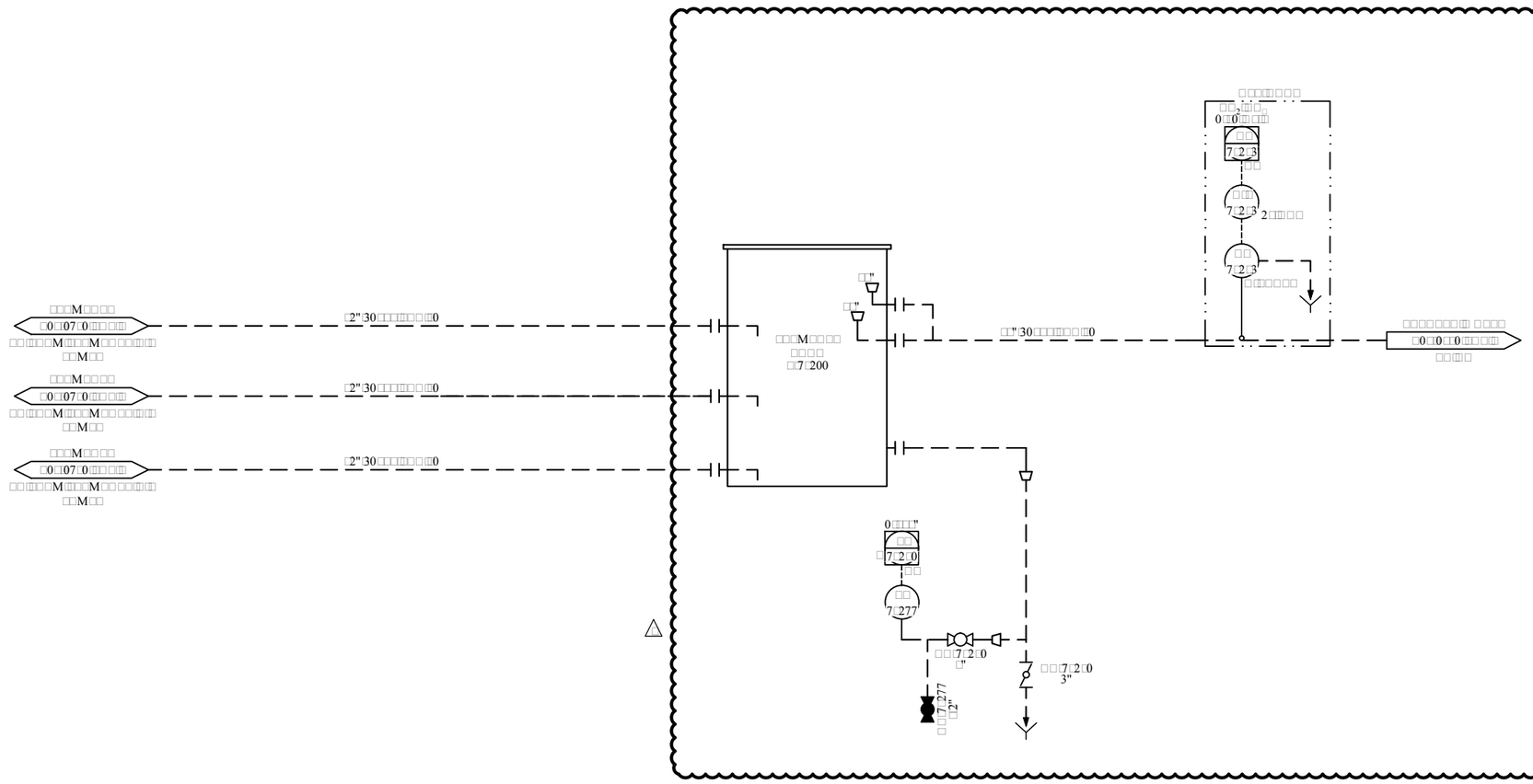

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HOLE CENTERS: ±1/64"
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DECATUR MBR RETROFIT

4.6 MGD

TITLE:
PERMEATE TANK
PROCESS □ INSTRUMENTATION DIAGRAM

SCALE:	DRAWING NUMBER:	REVISION
N/A	U18535-C01-0790	01
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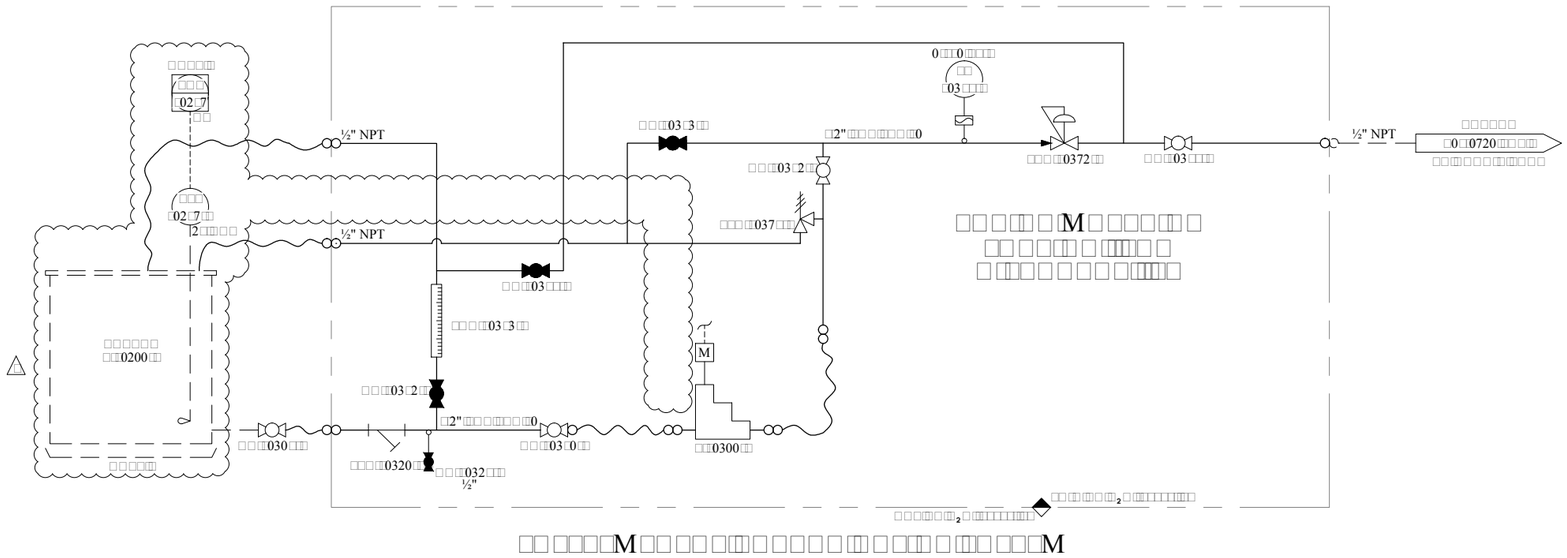

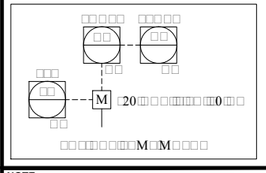

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01	30/03/2017	REVISED AS NOTED	M.P.	--	D.O.N.	M.B.
00	10/02/2017	INITIAL RELEASE	M.P.	--	D.O.N.	M.B.

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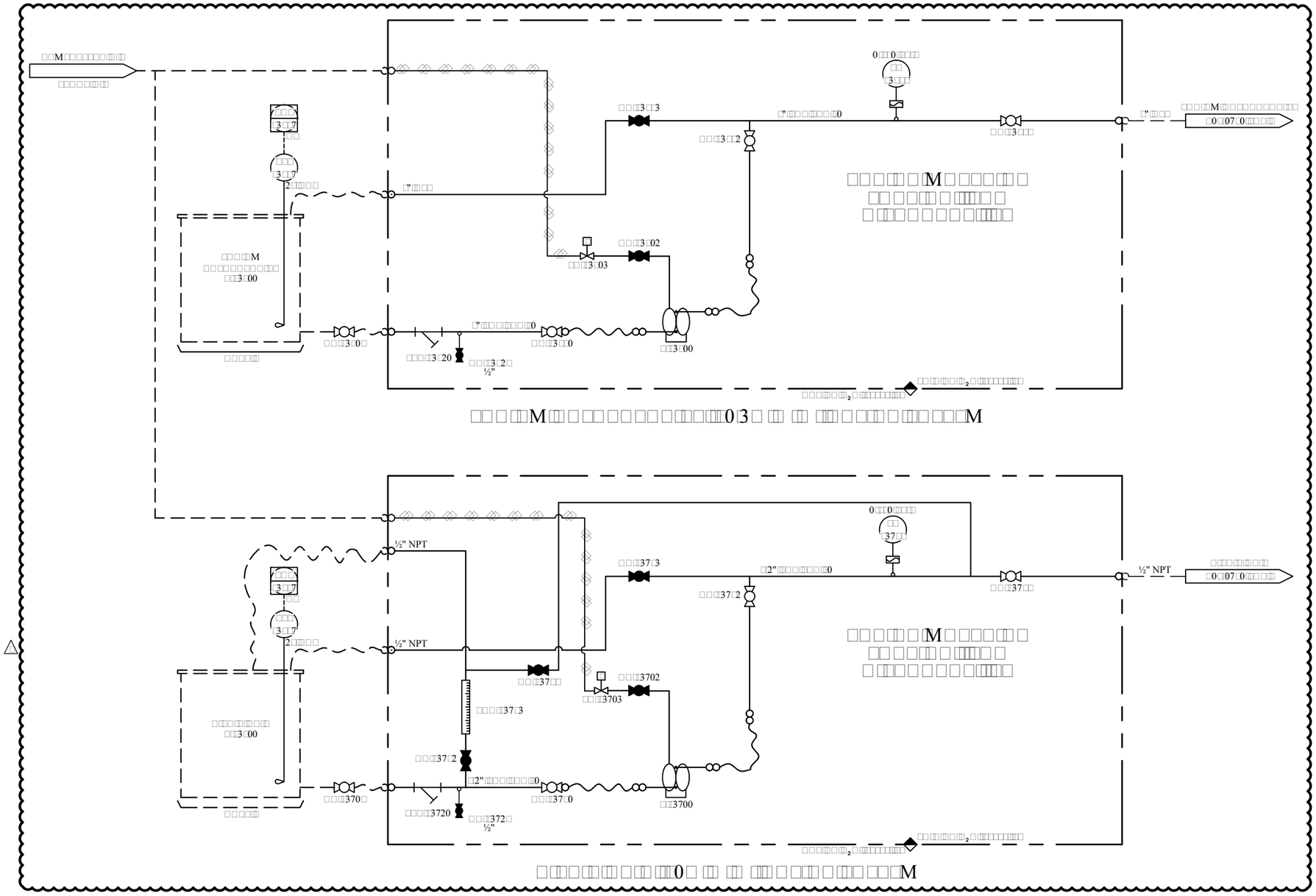
INTERPRETATION: ANSI Y14.5
TOLERANCES
FRACTIONS: ±1/2"
DECIMALS 0.X: ±0.030
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SI ES: ±1/2"
HOLE CENTERS: ±1/2"
DO NOT SCALE PRINTS

DECATUR MBR RETROFIT

4.6 MGD

TITLE:
DOSING SKID - CARBON
PROCESS □ INSTRUMENTATION DIAGRAM

SCALE: N/A
DRAWING NUMBER: U18535-C01-0800
SHEET: 1 of 1
REVISION 01



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INTERPRETATION: ANSI Y14.5
TOLERANCES:
FRACTIONS: ±1/64"
DECIMALS 0.X: ±0.030
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SI ES: ±1/64"
HOLE CENTERS: ±1/32"
DO NOT SCALE PRINTS

DECATUR MBR RETROFIT

4.6 MGD

TITLE:
DOSING SKIDS - CLEANING CHEMICALS
PROCESS □ INSTRUMENTATION DIAGRAM

SCALE:	DRAWING NUMBER:	REVISION
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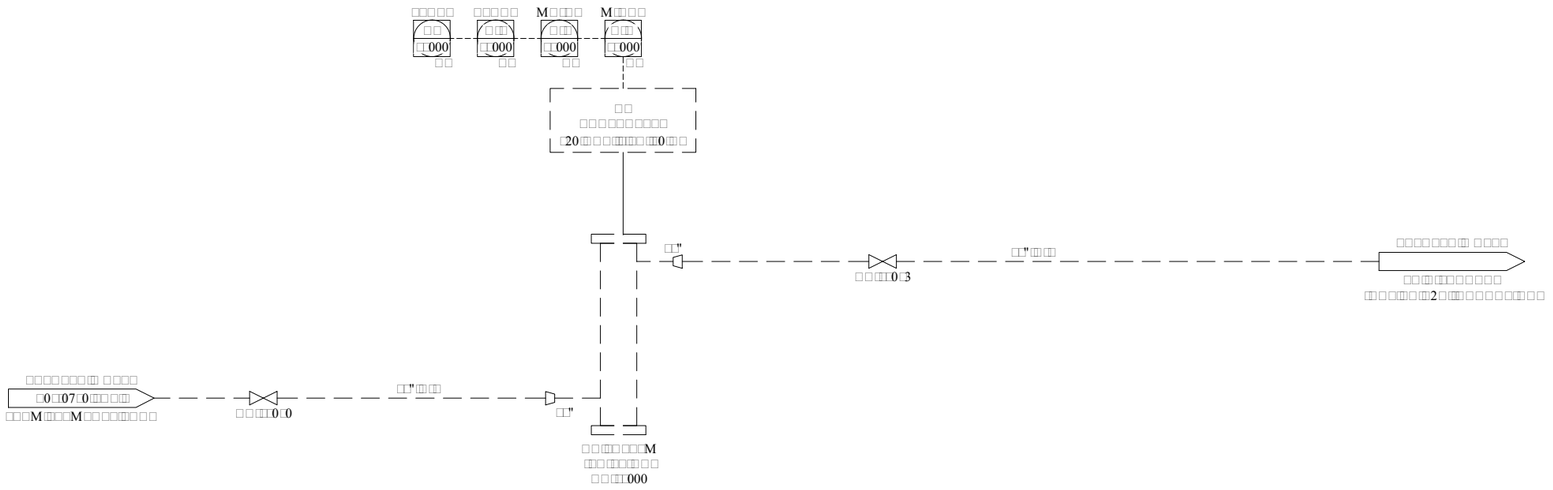
	SHEET: 1 o□1	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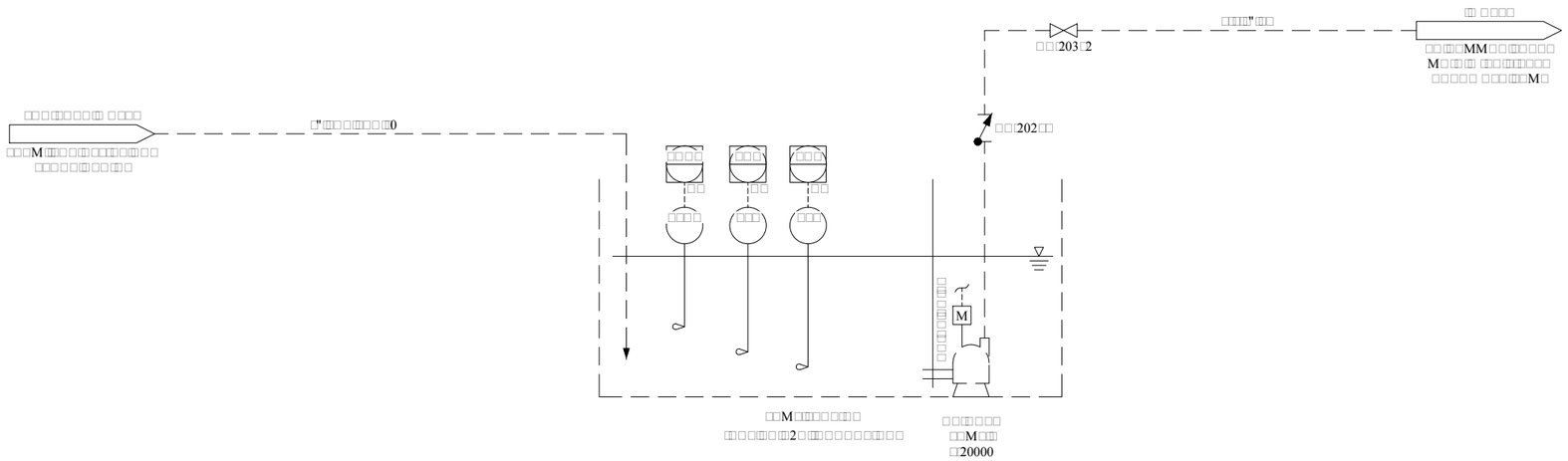

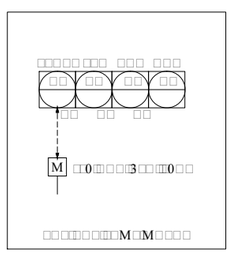

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0.XX: ±0.015
ANGLES: ±0.5°
HOLE SI: ES: ±1/64"
HOLE CENTERS: ±1/32"
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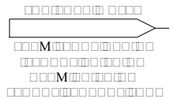
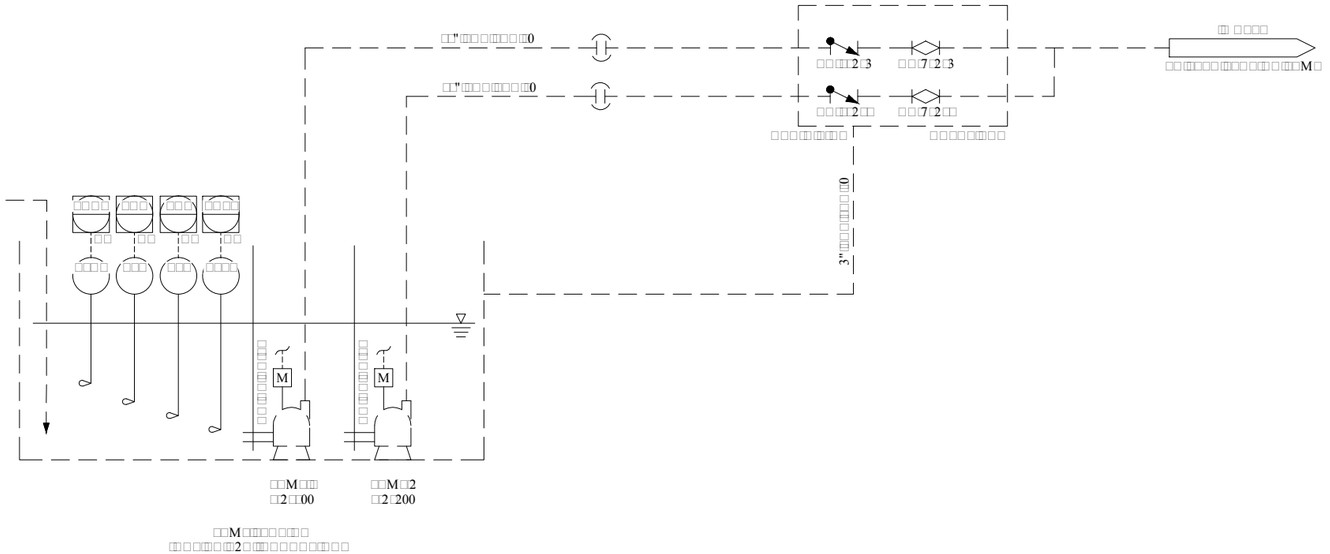
DECATUR MBR RETROFIT

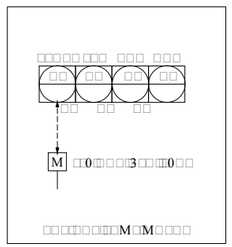
4.6 MGD

TITLE:
GRINDER PUMP STATION
PROCESS □ INSTRUMENTATION DIAGRAM

SCALE: N/A
DRAWING NUMBER: U18535-C01-0920
SHEET: 1 o: 2
REVISION 01







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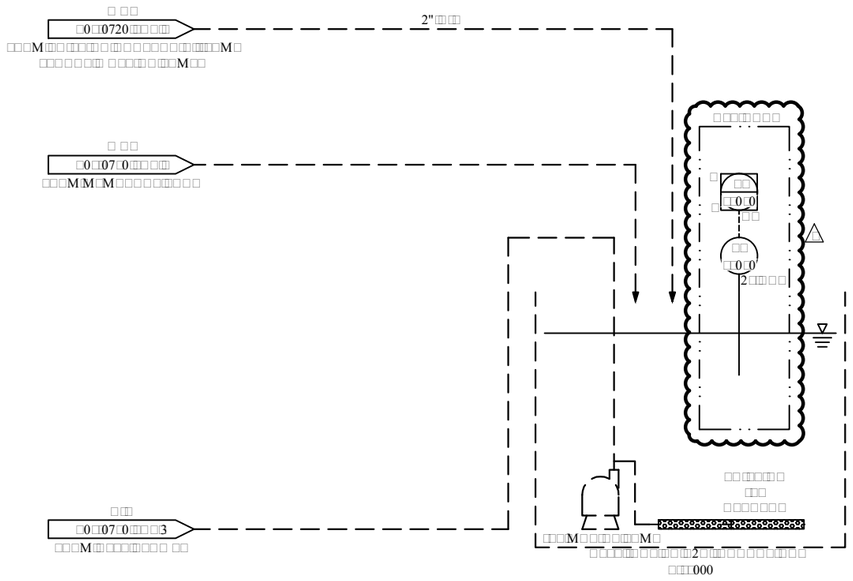
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SI: ES: ±1/64"
HOLE CENTERS: ±1/64"
DO NOT SCALE PRINTS

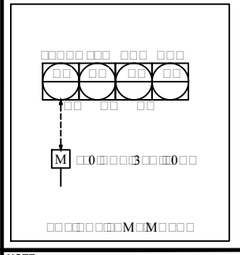
DECATUR MBR RETROFIT

4.6 MGD

TITLE:
FILTRATE RETURN PUMP STATION
PROCESS □ INSTRUMENTATION DIAGRAM

SCALE:	DRAWING NUMBER:	REVISION
N/A	U18535-C01-0920	01
	SHEET: 2 o:2	





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TOLERANCES
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0.XX: ±0.015
ANGLES: ±0.5°
HOLE SI: ES: ±1/64"
HOLE CENTERS: ±1/64"
DO NOT SCALE PRINTS

DECATUR MBR RETROFIT

4.6 MGD

TITLE:
AEROBIC SLUDGE HOLDING TANK
PROCESS □ INSTRUMENTATION DIAGRAM

SCALE: N/A
DRAWING NUMBER: U18535-C01-0960
SHEET: 1 of 1
REVISION 01

Submittal Form

Document title	*General Arrangement - Membrane Tank*
Name	*Decatur – Wastewater Treatment Plant*
Address	*PO Box 247, Decatur, AR, 72722*

Document #, revision #	Submitted by	Pages	Peer reviewer	Prepared by
U18535-B01-0740,02	*H_2O Innovation*	*6*		*D'ON*

Information	Review	Fabrication / procurement	As built
☐	☒	☐	☐

Package description	*MBR System*	
Tags	*N/A*	
Project #	Purchase order #	Submittal # *N/A*
U18535	*Agreement, 13 Dec 2016*	*N/A*

Customer Checklist

☐ 1. Reviewed and no comments. Approved as submitted and no need to resubmit.	Authorized by:
☐ 2. Reviewed, proceed with work and approved once comments are incorporated. No need to resubmit.	Title:
☐ 3. Not accepted, work may not proceed. Revise and resubmit.	Signature:
☐ 4. For information only – No approval required	Date:

Revision Tracking History

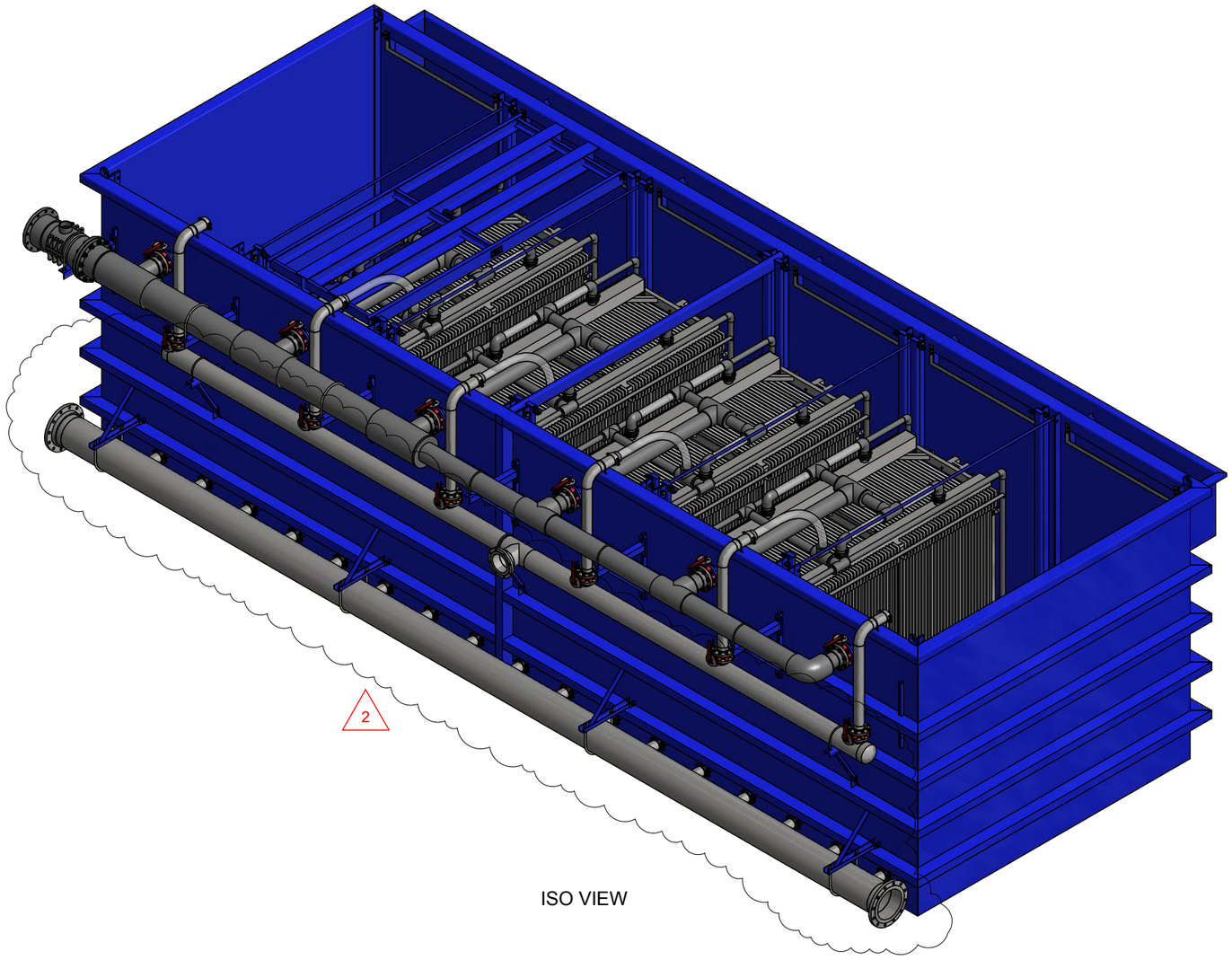
H_2O Innovation document #			Customer Document #	Date
Document #	Sequence #	Revision #		
B01	*0740*	*0*		*10-Feb-2017*
B01	*0740*	*1*		*21-Mar-2017*
B01	*0740*	*2*		*24-Mar-2017*

Submittal Form

Submittal Modification Tracking List

#	Customer request	H_2O comments	Status *
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

* Status should be “Accepted”, “Info” or “No Change”



ISO VIEW

NOTES:

1. REFERENCE P&ID #U18535-C01-0740.
2. NON-STRUCTURAL BOLTS AND NUTS ARE STAINLESS STEEL TYPE 316. WASHERS AND LOCK WASHERS ARE STAINLESS STEEL TYPE 316 PER ASTM F436 AND F844.
   MECHANICAL PROPERTIES PER CONDITION CW OF ASTM F593.
   DIMENSION PER ASME B18.2.1.
   THREADS PER ANSI B1.1 CLASS 2A.
3. STRUCTURAL BOLTS TO CONFORM TO ASTM F3125 GRADE A325, HOT DIPPED GALVANIZED.
4. STRUCTURAL STEEL WELDING AS PER CODE OF STANDARD PRACTICE, AWS D1.1.
5. NO VERTICAL DOWN WELDS ARE ALLOWED UNLESS CERTIFIED PER AWS D1.1 AND APPROVED BY H_2O INNOVATION.
6. STITCH WELDS ARE NOT ALLOWED UNLESS APPROVED BY H_2O INNOVATION.
7. HOLLOW STRUCTURAL STEEL SECTIONS PER ASTM A500, GRADE B.
8. STRUCTURAL CHANNEL, ANGLES, AND PLATE PER ASTM A36.
9. THE MINIMUM YIELD STRENGTH REQUIRED FOR ALL MATERIAL IS 36 KSI.
10. FOR INTERIOR SURFACES REFER TO IMMERSION PAINT AND SURFACE PREPARATION PROCEDURE H35-0003.
    FOR EXTERNAL SURFACES REFER TO PAINT AND SURFACE PREPARATION PROCEDURE H35-0002.
11. FINISHED FABRICATION OF STAINLESS STEEL SPOOLS MUST BE HYDROSTATICALLY TESTED TO 1.5 TIMES OPERATING PRESSURE.
    OPERATING PRESSURE SHALL BE 10 PSIG.
12. ALL PVC PIPE TO BE SCHEDULE 80, GRAY, U.N.O.
    PIPE MATERIAL TO CONFORM TO ASTM D1784.
    PHYSICAL DIMENSIONS, SCHEDULES, AND TOLERANCES TO CONFORM TO ASTM D1785.
13. ALL PVC FITTINGS TO BE SCHEDULE 80, GRAY.
    SOCKET FITTINGS TO CONFORM TO ASTM D2467.
14. PVC/CPVC FLANGES 3" AND LARGER TO BE VAN STONE STYLE WITH GLASS FILLED PVC RING, U.N.O.
    PVC/CPVC FLANGES 2-½" AND SMALLER TO BE VAN STONE STYLE WITH PVC RING, UNO
    PVC/CPVC FLANGES TO MEET CLASS 150 BOLT HOLE PATTERN PER ANSI B16.5.
15. ALL CPVC PIPE TO BE SCHEDULE 80, GRAY.
    PIPE MATERIAL TO CONFORM TO ASTM D1784.
    PHYSICAL DIMENSIONS, SCHEDULES, AND TOLERANCES TO CONFORM TO ASTM D441.
16. ALL CPVC FITTINGS TO BE SCHEDULE 80, GRAY.
    SOCKET FITTINGS TO CONFORM TO ASTM F439.
    THREADED FITTINGS TO CONFORM TO ASTM F437.
17. PVC/CPVC PRIMER TO CONFORM TO ASTM F656.
    PVC/CPVC SOLVENT CEMENT TO CONFORM TO ASTM D2564.
18. EXPOSED PVC PIPING REQUIRES SUITABLE UV PROTECTIVE COATING ON SITE. NOT BY H_2O INNOVATION.
19. ALL GASKETS TO CONFORM TO ASTM F477.
20. FINISHED FABRICATION OF PVC/CPVC SPOOLS MUST BE HYDROSTATICALLY TESTED TO 50 PSI.
21. MATERIAL TEST REPORTS (MTR) TO BE PROVIDED FOR ALL MATERIAL.
22. APPROXIMATE SHIPPING WEIGHT:
    MAIN TANK: 26,890 LBS.
    OVERFLOW TROUGH: 3,520 LBS.

TOTAL QUANTITY REQUIRED FOR THE PROJECT:	3

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1	21/03/2017	REVISED AS PER STRUCTURAL DESIGN COMMENTS	G.B.	-	D.O'N.	M.B.
0	10/02/2017	INITIAL RELEASE	G.B.	-	D.O'N.	M.B.

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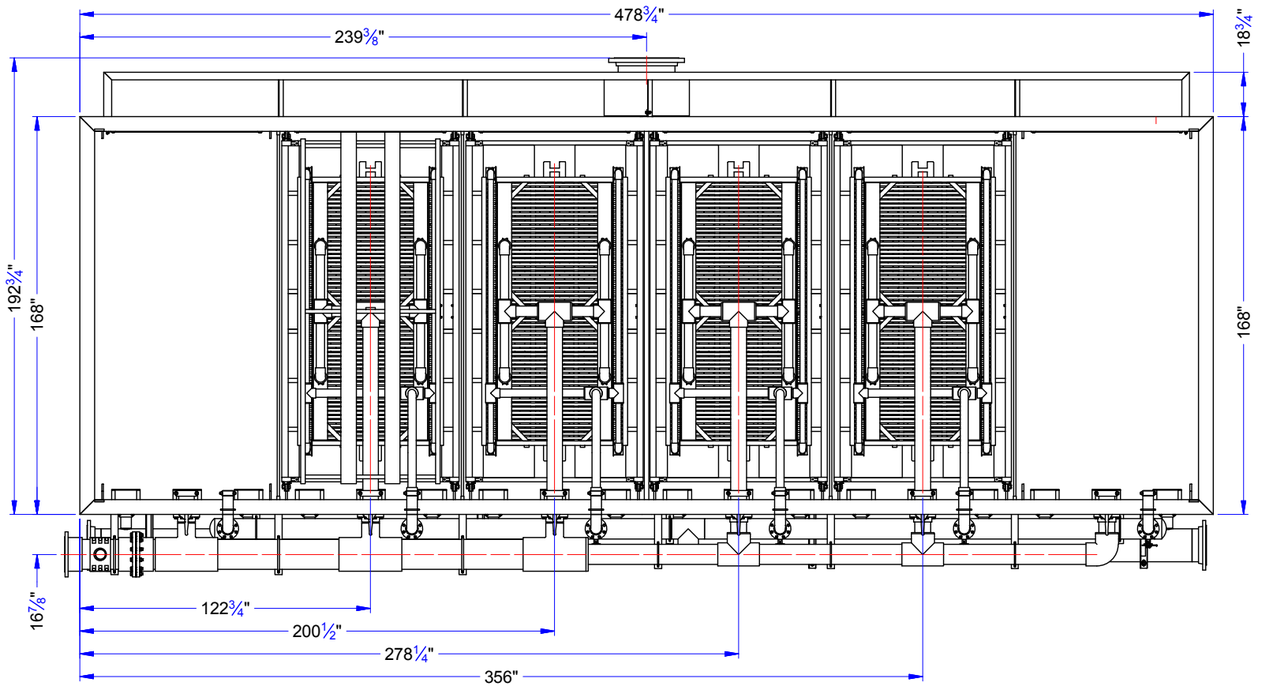
TOLERANCES:
FRACTIONS: ±1/64"
DECIMALS 0.X: ±0.030
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±1/64"
HOLE CENTERS: ±1/64"
DO NOT SCALE PRINTS

DECATUR MBR RETROFIT

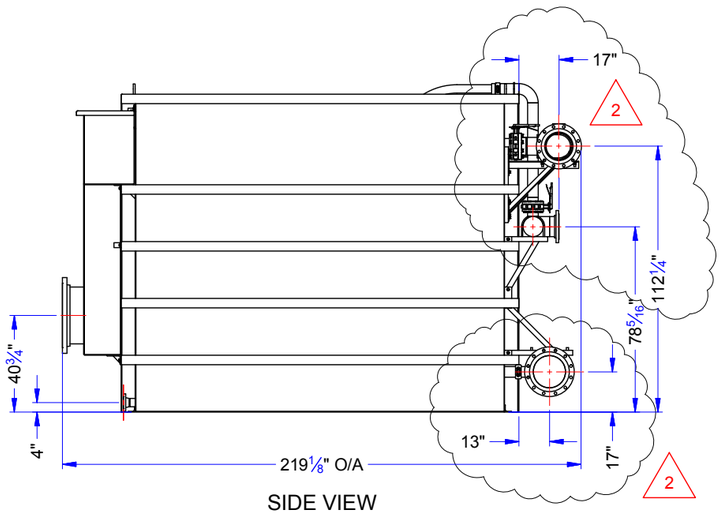
4.6 MGD

TITLE:
MEMBRANE TANK
GENERAL ARRANGEMENT

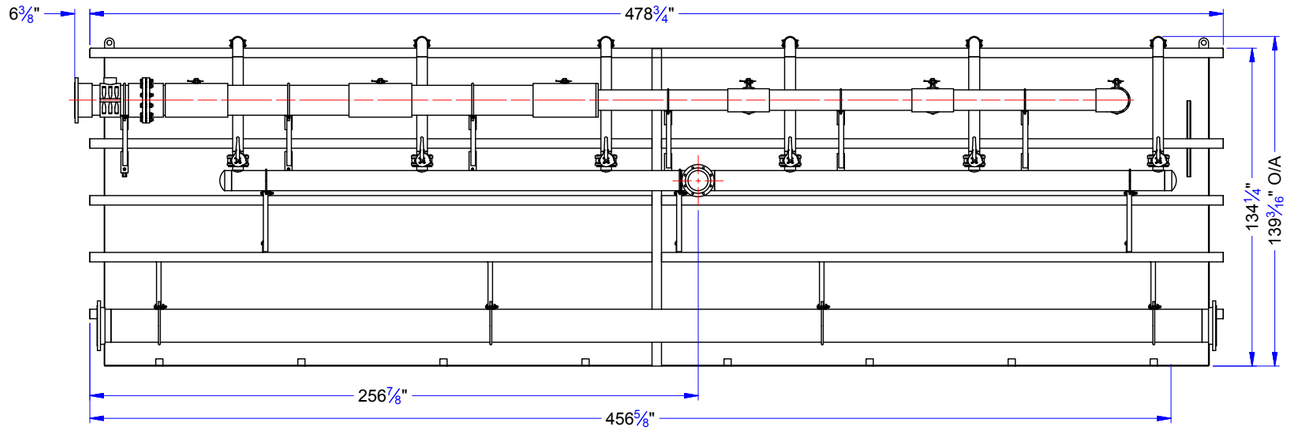
SCALE:	DRAWING NUMBER:	REVISION
N/A	U18535-B01-0740 SHEET: 1 OF 4	2



PLAN VIEW



SIDE VIEW



FRONT VIEW

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ANGLES: ±0.5°
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HOLE CENTERS: ±1/64"
DO NOT SCALE PRINTS

DECATUR MBR RETROFIT

4.6 MGD

TITLE:
MEMBRANE TANK
GENERAL ARRANGEMENT

SCALE: 3/16"=1'

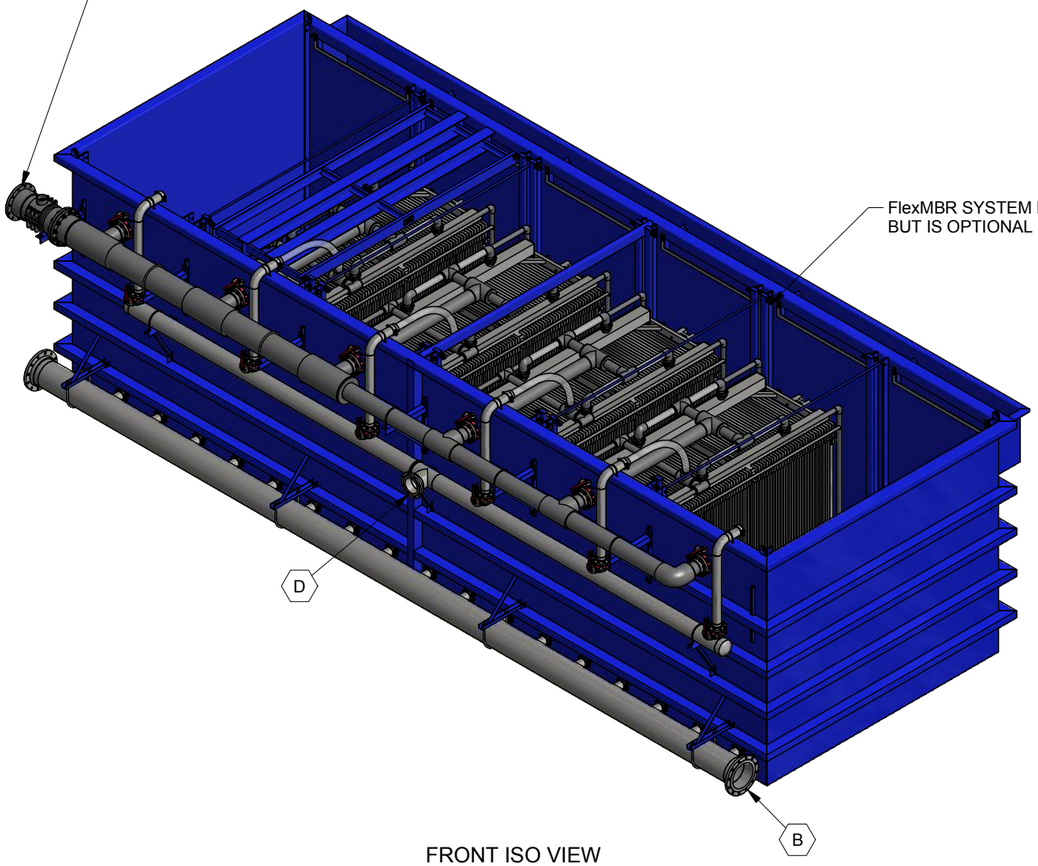
DRAWING NUMBER: U18535-B01-0740
SHEET: 2 OF 4

REVISION 2

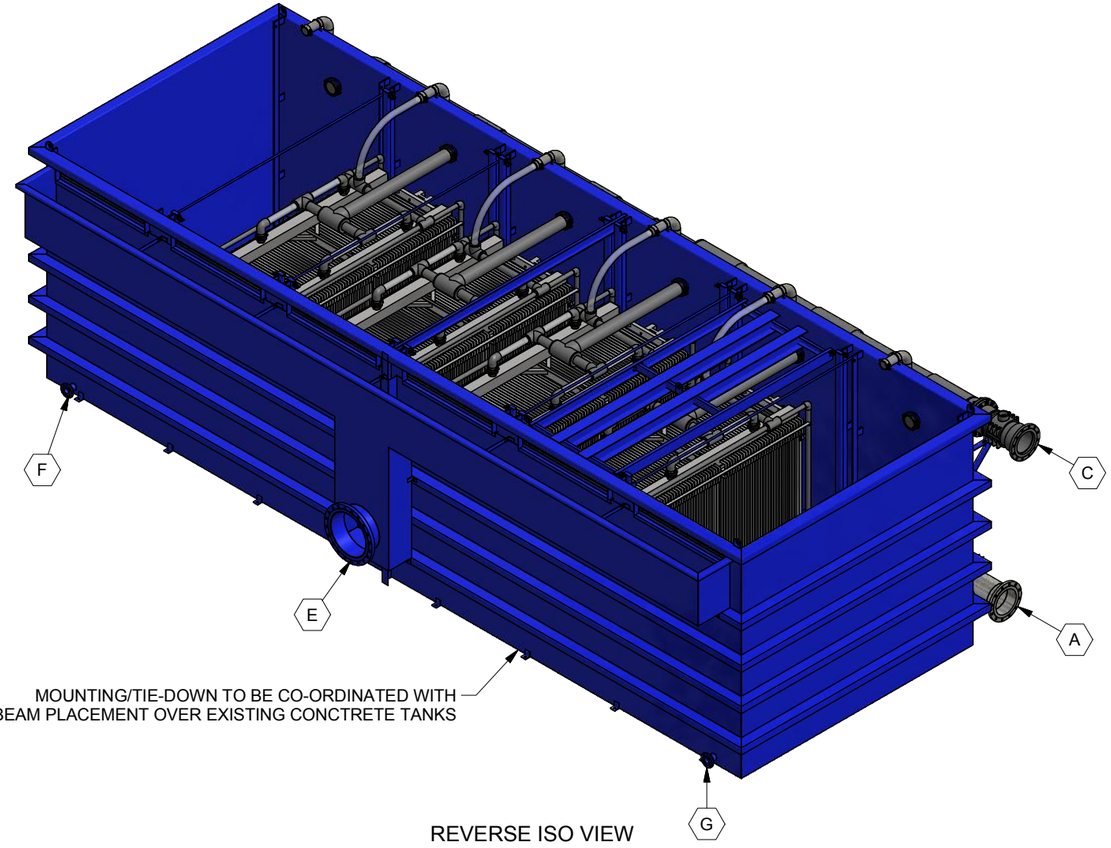
NOZZLE#	DESCRIPTION	MATERIAL	DIAMETER	CONNECTION
A	FEED	304 SS	14"	FLANGE ANSI CLASS 150
B	FEED	304 SS	14"	FLANGE ANSI CLASS 150
C	PERMEATE	PVC, SCH.80	12"	FLANGE ANSI CLASS 150
D	AIR	304 SS	8"	FLANGE ANSI CLASS 150
E	OVERFLOW	CS	24"	FLANGE ANSI CLASS 150
F	SLUDGE	CS	3"	FLANGE ANSI CLASS 150
G	LEVEL TRANSMITTER	CS	3"	FLANGE ANSI CLASS 150

NOTE:
ON (1) OF THE (3) SUPPLIED TANKS
THE PERMEATE HEADER WILL BE SUPPLIED
FOR INSTALLATION IN A MIRRORED ORIENTATION.

FlexMBR SYSTEM IS SHOWN
BUT IS OPTIONAL



FRONT ISO VIEW



MOUNTING/TIE-DOWN TO BE CO-ORDINATED WITH
BEAM PLACEMENT OVER EXISTING CONCTRETE TANKS

REVERSE ISO VIEW

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.0.XX: ±0.015
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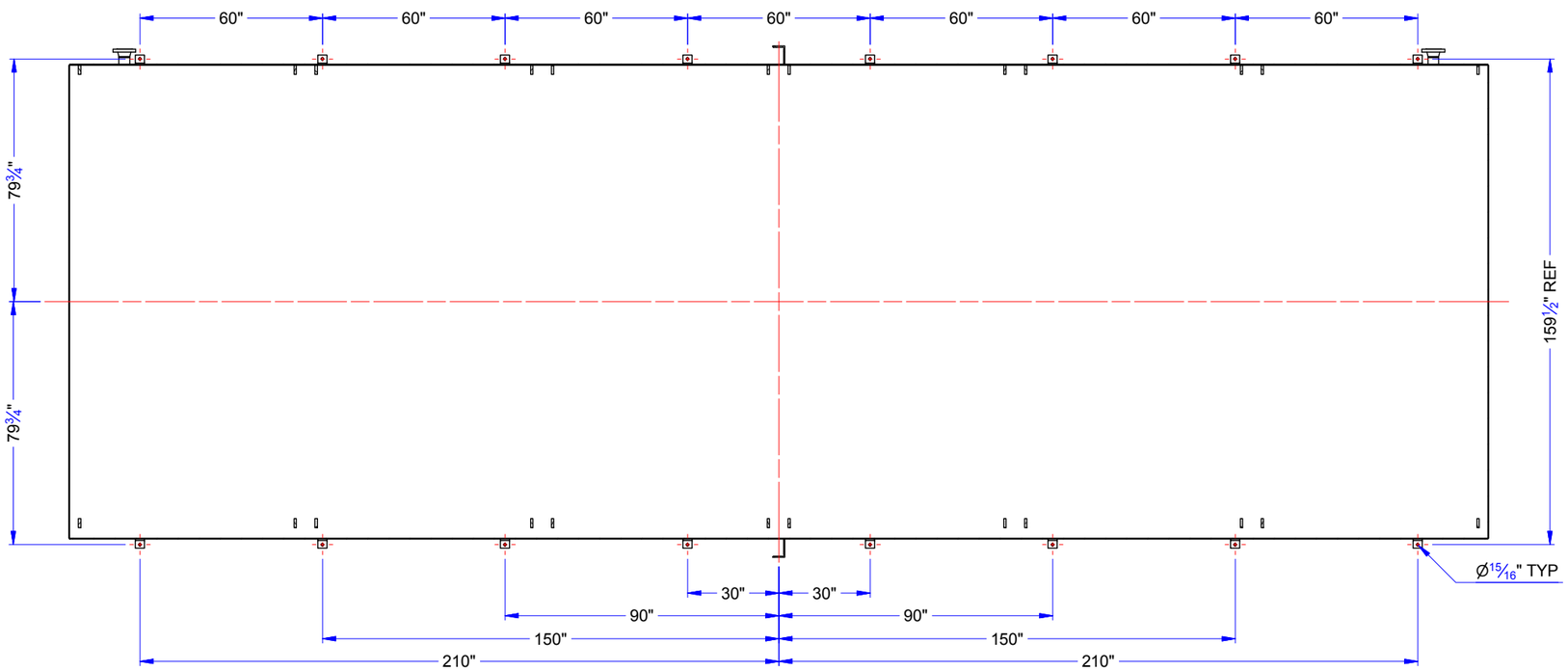
DECATUR MBR RETROFIT

4.6 MGD

TITLE:
MEMBRANE TANK
GENERAL ARRANGEMENT

SCALE:	DRAWING NUMBER:	REVISION
N/A	U18535-B01-0740 SHEET: 3 OF 4	2



MOUNTING LOCATIONS

NOTE:
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DRAWING REVISION

REV	DATE (DD/MM/YYYY)	REVISION DESCRIPTION	DRAWN	PEER	ENG	APPVD
2	24/03/2017	REVISED AS NOTED	G.B.	-	D.O'N.	M.B.
1	21/03/2017	REVISED AS PER STRUCTURAL DESIGN COMMENTS	G.B.	-	D.O'N.	M.B.
0	10/02/2017	INITIAL RELEASE	G.B.	-	D.O'N.	M.B.

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UNLESS NOTED OTHERWISE
INTERPRETATION: ANSI:Y14.5
TOLERANCES:
FRACTIONS: ±1/64"
DECIMALS 0.X: ±0.030
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±1/64"
HOLE CENTERS: ±1/64"
DO NOT SCALE PRINTS

DECATUR MBR RETROFIT

4.6 MGD

TITLE:
MEMBRANE TANK
GENERAL ARRANGEMENT

SCALE:	DRAWING NUMBER:	REVISION
1/4"=1'	U18535-B01-0740 SHEET: 4 OF 4	2

Submittal Form

Document title	*Membranes*
Name	*Decatur – Wastewater Treatment Plant*
Address	*PO Box 247, Decatur, AR, 72722*

Document #, revision #	Submitted by	Pages	Peer reviewer	Prepared by
U18535-C06-0007,00	*H_2O Innovation*	*9*		*D'ON*

Information	Review	Fabrication / procurement	As built
☐	☒	☐	☐

Package description	*MBR System*	
Tags	*N/A*	
Project #	Purchase order #	Submittal # *N/A*
U18535	*Agreement, 13 Dec 2016*	*N/A*

Customer Checklist

☐ 1. Reviewed and no comments. Approved as submitted and no need to resubmit.	Authorized by:
☐ 2. Reviewed, proceed with work and approved once comments are incorporated. No need to resubmit.	Title:
☐ 3. Not accepted, work may not proceed. Revise and resubmit.	Signature:
☐ 4. For information only – No approval required	Date:

Revision Tracking History

H_2O Innovation document #			Customer Document #	Date
Document #	Sequence #	Revision #		
C06	*0007*	*0*		*7-Mar-2017*

Submittal Form

Submittal Modification Tracking List

#	Customer request	H_2O comments	Status *
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

* Status should be “Accepted”, “Info” or “No Change”

Submittal Form

Selection Details

Description	Membranes
Model	HSME40 (membranes) HSMM2400-ES (modules)
Manufacturer	Hydranautics & H_2O Innovation
Connections	See drawings on following pages
Membrane Material	PVDF
Membranes / Module	60
Modules / Train	4
Pore Size	0.05 um

HYDRAsub®-MBR

Membrane Bio Reactor vs Conventional Activated Sludge systems:

MBR is a hybrid wastewater treatment technology that combines biological treatment by activated sludge and physical treatment by membrane filtration. Compared to conventional activated sludge treatment, MBR and particularly HYDRAsub® produces high quality permeate water suitable for RO treatment and reduces drastically footprint by elimination of sedimentation tank and operation at higher MLSS.

Key Applications

- **Domestic waste water:**
  - Municipalities
  - Hotels, apartment complexes
  - Grey waters
- **Industrial waste water:**
  - Food and Beverage Industry - Beer, Dairy, etc.
  - Automobile Industry
  - Oil Refineries
  - Chemical Industry

Key Features

- **High operating flux** -> Minimized membrane area -> Lower CAPEX and OPEX.
- **Lower footprint :** Energy savings cage design with reduced height -> Minimized energy consumption.
- **Simple operating process:** No backwash, membrane cleaned with air scouring.
- **Durable construction:** Supported PVDF hollow fiber, highly resistant to chlorine.

HYDRAsub® product offering:

HYDRAsub® modules are comprised of PVDF hollow fiber elements,permeate adaptors, stainless steel cages (SS304 or SS316) and a unique air diffuser design.
The modules are available in a wide range of sizes from 15 to 2400 m^2 membrane area, covering all ranges of flow.

HYDRAsub® elements can be provided in two formats:

- **HYDRAsub technology:** elements size of 25 m^2 using a microfiltration fiber with a pore size of 0.4 µm
- **HYDRAsubMAX technology:** elements size of 40 m^2 using an ultrafiltration fiber with a pore size of 0.05 µm

HYDRAsub® goes to MAX with an optimized footprint and lower aeration requirement rates.

Module portfolio with HYDRAsub® and HYDRAsubMAX® elements:

Module	Technology	Element	Membrane area (m^2)	Module typical flow - Sewage (m^3/day)	Module typical flow - Industrial (m^3/day)
HSM125-ES to HSM1500-ES	HYDRAsub®	HSE25	125 to 1500	90 to 1080	60 to 720
HSMM200-ES to HSMM2400-ES	HYDRAsubMAX®	HSME40	200 to 2400	150 to 1750	100 to 1200

HYDRAsub® modules are available in following sizes: HSM125-ES, HSM250-ES, HSM375-ES,HSM500-ES,HSM750-ES, HSM1000-ES and HSM1500-ES.

HYDRAsubMAX® modules are available in following sizes: HSMM200-ES, HSMM400-ES, HSMM600-ES, HSMM800-ES, HSMM1200-ES, HSMM1600-ES and HSMM2400-ES.

For containerized compact systems,

Shorter elements HSE15 are available

Module portfolio with HYDRAsub® and HYDRAsubMAX® elements:

Module	Technology	Element	Membrane area (m^2)	Typical flow - Sewage (m^3/day)	Typical flow - Industrial (m^3/day)	Module height (mm)	Module width (mm)	Module length (mm)
HSM15-ES to HSM75-ES	HYDRAsub®	HSE15	15 to 75	10 to 55	5 to 40	1722	461	1473

More than 360 references along with MRC for sewage and industrial application including 45 MLD and 25 MLD plants in Singapore and Mexico.

Solutions You Need.

Technologies You Trust!

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Email: info@hydranautics.com Website: www.membranes.com

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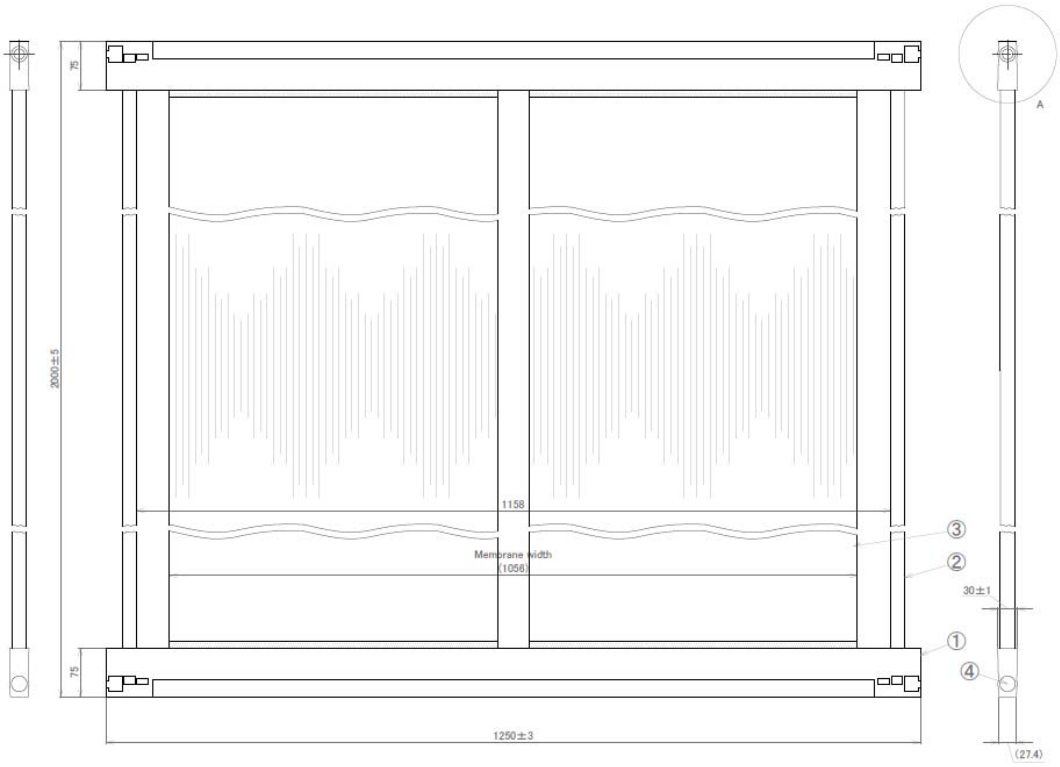
Submerged Membrane Ultrafiltration Element
HYDRAsub® MAX MBR HSME40

Element Specifications	Configuration:	Submerged Membrane
	Fiber Orientation:	Vertical
	Filtrate Flow :	Bi-directional
	Membrane Polymer:	Polyvinylidene Flouride (PVDF)
	Pore Size (nominal):	0.05 µm
	Fiber Dimensions:	OD 0.065" (1.65 mm)
	Fiber Length:	2 m
	Number of Fibers per Element:	4200
	Nominal Membrane Area per Element:	430 ft^2 (40 m^2)
	Typical Element Dry Weight:	30.9 lb (14 kg)
Operating Specifications	Maximum Trans Membrane Pressure (Vacuum):	-6 psig (-0.41 bar)
	Maximum Backwash Trans Membrane Pressure :	2 psig (0.14 bar)
	Instantaneous Chlorine Tolerance:	5000 ppm[a]
	Maximum Chlorine Exposure:	742,000 ppm-hrs[b]
	MLSS Range:	8,000 - 12,000 mg/L[c]
	Operating Temperature Range:	41 - 104ºF (5 - 40º C)
	Feed Water pH Range:	6.0 - 8.0
	Cleaning pH Range:	1.0 - 11.0
	Operating Mode:	Outside to Inside
Typical Process Conditions	Operating Filtrate Flux†:	6-20 gfd (10-33 lmh)
	Chemically Enhanced Backwash (CEB) Flux:	2.4 gfd (4 lmh)
	CEB Chemicals:	NaOCl[d]
	Clean-In-Place (CIP) Flux:	2.4 gfd (4 lmh)
	CIP Chemicals:	NaOCl or Citric Acid[d]

† -Depends on temperature and application
a -For a maximum of 2 hours
b- Maximum chemical tolerance for estimated life span of membrane
c -In membrane tank at steady state
d- Refer to operating manual for chemical concentrations and cleaning frequencies

Hydranautics believes that the information and data contained herein to be accurate and useful. The information and data are offered in good faith, but without guarantee, as conditions and methods of use of our products are beyond our control. Hydranautics assumes no liability for results obtained or damages incurred through the application of the presented information and data. It is the user's responsibility to determine the appropriateness of Hydranautics' products for the user's specific end uses.

HSME40



No.	Part	Material	Qty.
1	Permeate header	ABS	2
2	Permeate carrier	SUS304	2
3	Permeate adapter connection	ABS	2
3	Hollow fiber membrane	PVDF	-

*All dimensions given in millimeters.

Submerged Ultrafiltration Membrane Module

	HYDRAsub® MAX- MBR	HSMM2400-ES
Module Specifications	Configuration:	Submerged Membrane
	Fiber Orientation:	Vertical
	Filtrate Flow :	Bi-directional
	Membrane Polymer:	Polyvinylidene Flouride (PVDF)
	Pore Size (nominal):	0.05 µm
	Number of Elements in Module:	60 (40 m² each)
	Nominal Membrane Area per Module:	25824 ft^2 (2400 m²)
	Permeate Connections:	(4)- 3" MNPT
	Air Connections:	(4)- 2" MNPT
	Guide Pipe Connections:	(2)- To fit 3" pipe
	Typical Module Dry Weight:	3517 lbs (1595 kg)
	Typical Module Wet Weight:	5634 lbs (2555 kg)
Operating Specifications	Maximum Transmembrane Pressure (Vacuum):	-6 psig (-0.41 bar)
	Maximum Backwash Pressure :	2 psig (0.14 bar)
	Maximum Instantaneous Chlorine Concentration:	5,000 ppm[a]
	Maximum Chlorine Tolerance:	742,000 ppm-hrs[b]
	MLSS Range:	8,000 - 12,000 mg/L[c]
	Operating Temperature Range:	41 - 104ºF (5 - 40º C)
	Feed Water pH Range:	6.0 - 8.0
	Cleaning pH Range:	1.0 - 11.0
	Operating Mode:	Outside to Inside
Typical Process Conditions	Operating Filtrate Flux†:	4-20 gfd (7-34 lmh)
	Peak Operating Flux†:	30 gfd (51 lmh)
	Chemically Enhanced Backwash (CEB) Flux:	2.4 gfd (4 lmh)
	CEB Chemicals:	NaOCl [d]
	Clean In Place (CIP) Flux:	2.4 gfd (4 lmh)
	CIP Chemicals:	NaOCl or Citric Acid[d]

† -Depends on temperature and application
a -For a maximum of 2 hours
b- Maximum chemical tolerance for estimated life span of membrane
c -In membrane tank at steady state for municipal wastewater
d- Refer to operating manual for chemical concentrations and cleaning frequencies

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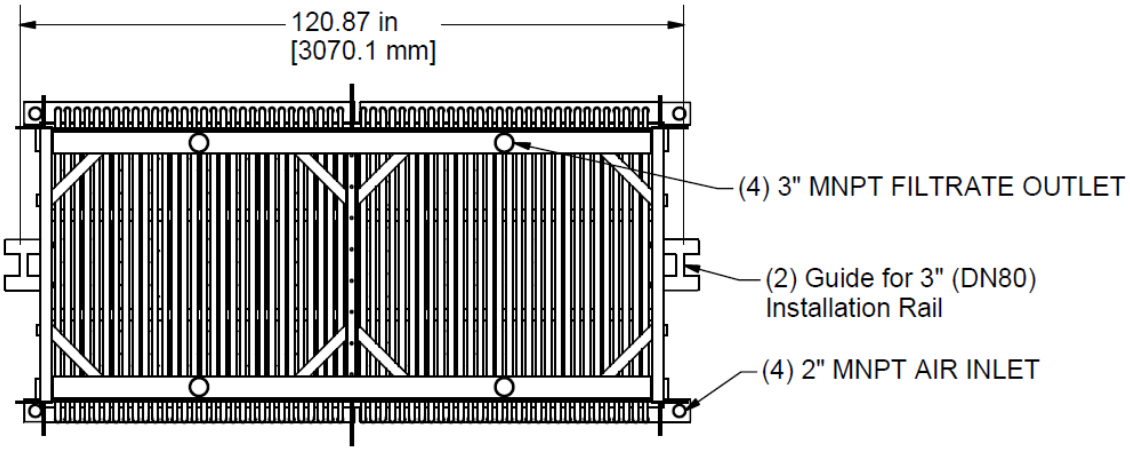
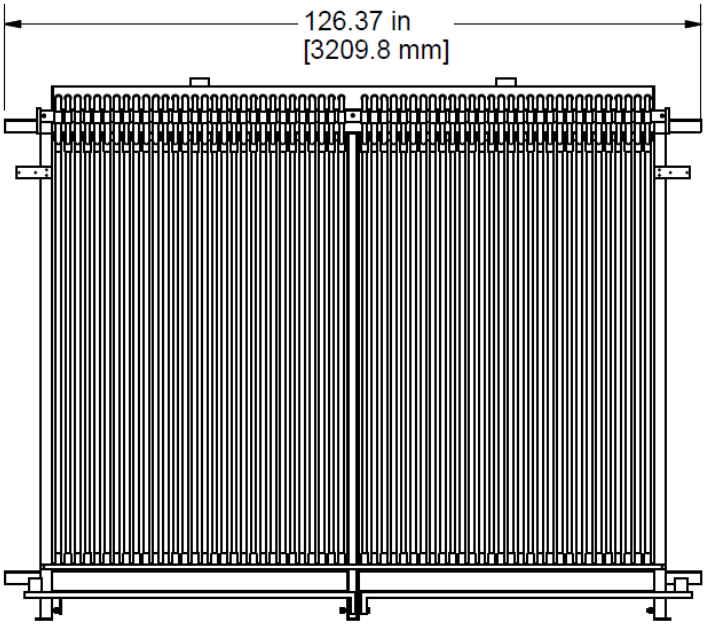
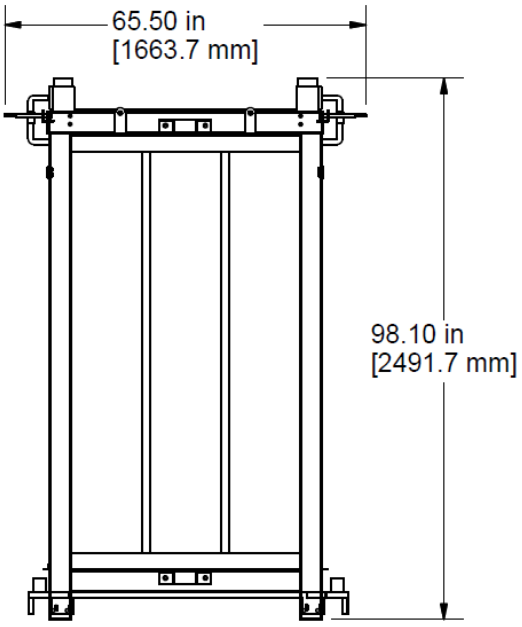
HSMM2400-ES



Top View



Side View



Front View

Note: Cage is made of stainless steel 304, unless otherwise specified. Connections are in ANSI units.

8/28/14

Hydranautics Corporate: 401 Jones Road, Oceanside, CA 92058
1-800-CPA-PURE Phone: 760-901-2500 Fax: 760-901-2578 info@Hydranautics.com

Submittal Form

Document title	*Membrane Blowers*
Name	*Decatur – Wastewater Treatment Plant*
Address	*PO Box 247, Decatur, AR, 72722*

Document #, revision #	Submitted by	Pages	Peer reviewer	Prepared by
U18535-C06-0003,00	*H_2O Innovation*	*7*		*D'ON*

Information	Review	Fabrication / procurement	As built
☐	☒	☐	☐

Package description	*MBR System*	
Tags	*N/A*	
Project #	Purchase order #	Submittal # *N/A*
U18535	*Agreement, 13 Dec 2016*	*N/A*

Customer Checklist

☐ 1. Reviewed and no comments. Approved as submitted and no need to resubmit.	Authorized by:
☐ 2. Reviewed, proceed with work and approved once comments are incorporated. No need to resubmit.	Title:
☐ 3. Not accepted, work may not proceed. Revise and resubmit.	Signature:
☐ 4. For information only – No approval required	Date:

Revision Tracking History

H_2O Innovation document #			Customer Document #	Date
Document #	Sequence #	Revision #		
C06	*0003*	*0*		*10-Feb-2017*

Submittal Form

Submittal Modification Tracking List

#	Customer request	H_2O comments	Status *
1			
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* Status should be “Accepted”, “Info” or “No Change”

Submittal Form

Selection Details

Description	Membrane Blowers
Manufacturer	Aerzen
Model	GM 60S with hood
Motor	100 HP, 480 VAC, 3 Ph, 60 Hz, TEFC, 1800 rpm
Duty Point	1700 scfm, 5.9 psig
Connection	8” Flexible Sleeve
Notes	Includes acoustic hood, silencer, silencer/filter combo, safety valve, check valve, and pressure gauge

SCOPE OF SUPPLY - MEMBRANE

3x Aerzen Generation 5 Blower Package - GM 60S DN 200 - Pressure - including:

Aerzen GM 60S - filled with oil
Drive Motor - 100hp, 1800rpm, TEFC, 460V/60Hz
Thermistors - 1/Ph , Space Heater (110-127V-56 W)
Base with integrated reactive type discharge silencer
Intake filter silencer
Hinged motor support as automatic belt tensioning device
Set of vibration isolation mounts
Narrow v-belt drive with guard - 1 set
Spring loaded relief valve preset to: 1050 mbar
Discharge manifold with exernally accessable integrated check valve
Flexible connector with clamps for schedule 40 pipe, discharge

Instruments
Pressure gauge c/w isolation ball valve (3x)
Dirty filter indicator (3x)

NOTE: Motor space heater supplied for outdoor installation

Acoustic Enclosure - Indoor/Outdoor
Inlet flexible sleeve - DN 200 (8")

Connection Points:
Intake Connection: Local
Discharge Connection: DN 200 - 8"

PERFORMANCE DATA

Aerzen Blower Package - GM 60S DN 200 - Pressure - MEMBRANE

Configuration: **G5**

Conditions:		**1700 scfm**	**MIN**		
Flow at inlet conditions	m³/min	54.4	9.3		
	Icfm	1921	329		
Inlet pressure (abs.)	bar	0.970	0.970		
	Psi	14.1	14.1		
Pressure differential	mbar(g)	410	410		
	Psig	5.9	5.9		
Inlet temperature	°C	35	35		
Discharge temperature	°C	77	97		
Blower speed	RPM	2795	706		
Blower maximum speed	RPM	3000	3000		
% of maximum blower speed		93%	24%		
Power required at shaft (with accessories) **	kW	50.9	10.9		
	HP	68.3	14.6		
Total Power (Wire to Air):	HP	74.8	16.7		
Motor rating	HP	100			
Motor speed	RPM	1775	448		
Motor frequency	Hz	60	15		

Noise level without acoustic hood	dB(A)	98
Noise level with acoustic hood	dB(A)	75

Tolerances as per EN 10204, in accordance with standa
Flow at inlet conditions / Power required at shaft +/- 5%

Blower package noise level:
Free field measurement at 1m from the complete blower package (tolerance +/- 2 dB(A))

Tests and measurements:
Blower stage: 1.5 hour flow test at the factory (Germany) on a calibrated test bed, at maximum operating conditions and according to DIN 1945. acceptance tolerance: +/- 5%.
A complete test report is available upon request.

** Power at shaft excludes drive motor and belt drive

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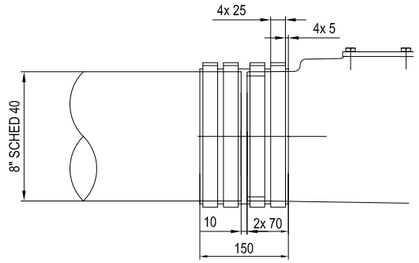
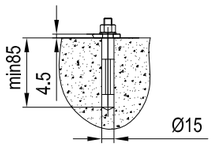
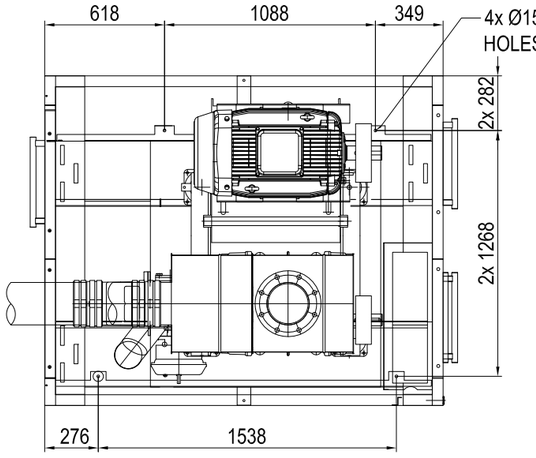
NOTE	QTY.	POS	DESCRIPTION
	1	1	BLOWER - GM 60 S - 480 KG
D	1	2	ELECTRIC MOTOR
	1	3	BASEFRAME / DISCHARGE SILENCER - DN 200
	1	4	CONNECTION HOUSING WITH CHECK VALVE - DN 200
	1	5	SET OF 4 VIBRATION ISOLATORS - DN 200
	1	6	DISCHARGE FLEXIBLE SLEEVE - WITH 4 CLAMPS - DN 200
	1	7	PRESSURE RELIEF VALVE - DN 125
	1	8	INLET FILTER / SILENCER - DN 200
	1	9	INLET FILTER ELEMENT - DN 200
E	1	10	BELT GUARD - DN 200
	1	11	DRIVER SHEAVE
E	1	12	DRIVER BUSHING
	1	13	DRIVEN SHEAVE
E	1	14	DRIVEN BUSHING
	1	15	V-BELT SET
	1	16	FILTER MAINTENANCE INDICATOR - WIKA
	1	17	DISCHARGE PRESSURE GAUGE WITH BALL VALVE - WIKA
	1	18	ACOUSTIC ENCLOSURE - DN 200
	1	19	FAN - MOUNTED ON BLOWER SHAFT - DN 200
E	1	20	FAN ADAPTOR - GM 60S
G	1	21	INLET FLEXIBLE SLEEVE - WITH 4 CLAMPS - DN 200
G	1	22	UNLOADING VALVE

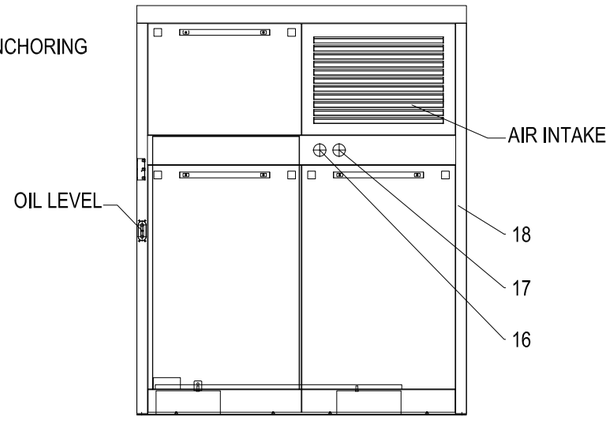


PIPING CONNECTION DETAILS

for straddling dowels A/B 15/15 - Liebig - dowel
(not included in Aerzen's scope of supply)



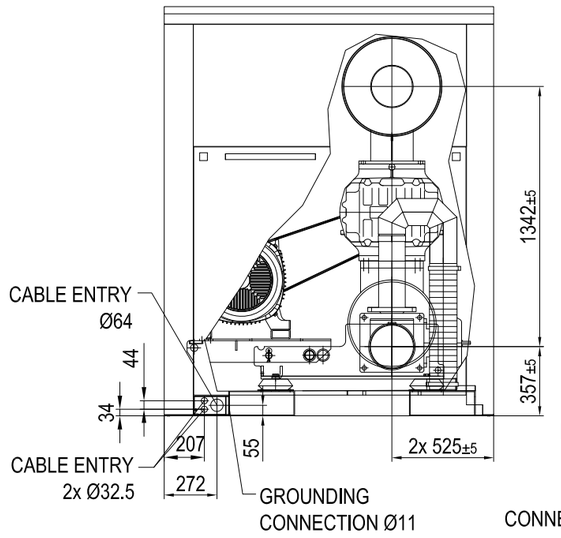


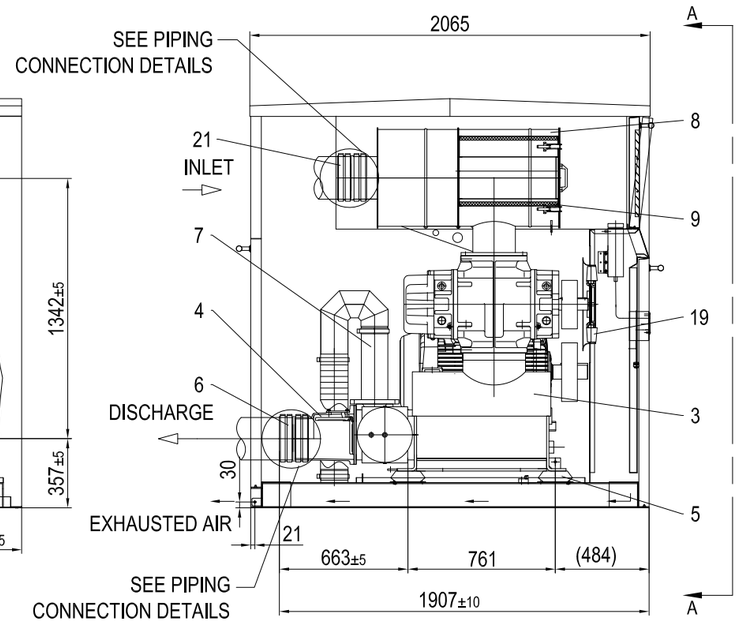


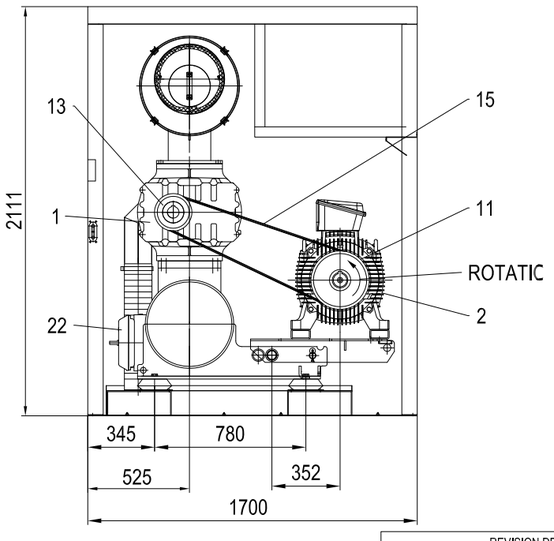
VIEW 'A-A' FRONT OF PACKAGE

NOTES:

A. ASSEMBLY WEIGHT WITHOUT MOTOR: 1460 KG
B. PAINT: AERZEN STANDARD BLUE
C. 1M CLEARANCE IS RECOMMENDED AT THE FRONT OF THE PACKAGE FOR MAINTENANCE ACCESS
D. ELECTRIC MOTOR - INVERTER DUTY RATED - WEG 405T REPRESENTED (OTHER SIZE AND MANUFACTURER AVAILABLE)
E. INCLUDED BUT NOT SHOWN ON DRAWING
F. FOR VARIABLE SPEED APPLICATIONS, CONSTANT TORQUE VFD ARE REQUIRED
G. OPTIONAL







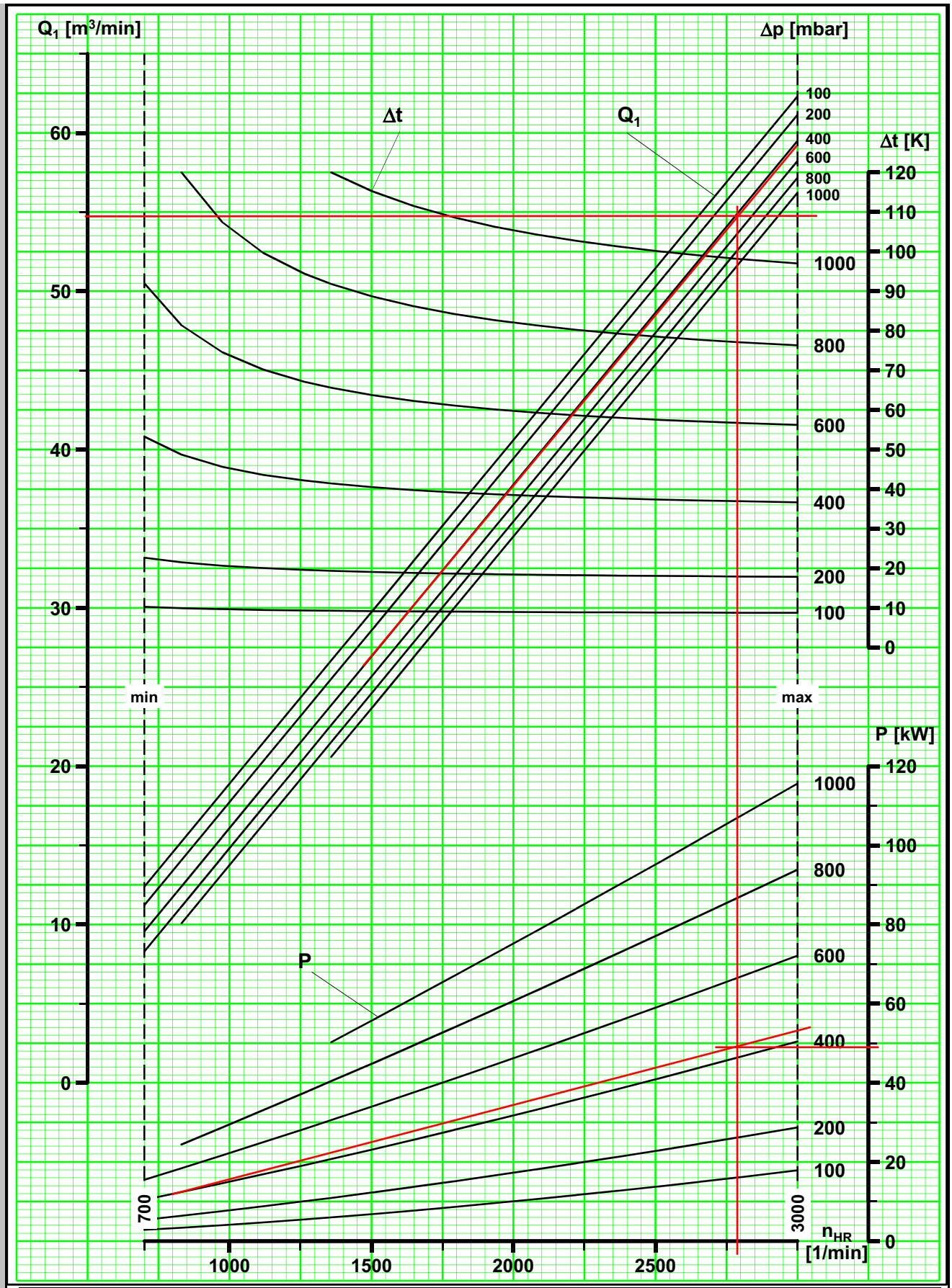
REVISION DETAILS						
REV	DRAWN BY	DATE	REVIEWED	DATE	DETAILS	AREA
B	LPM	18-10-12	LPM	18-10-12	UPDATE ON GENERAL ARRANGMENT DRAWING	
A	D.L.	29/05/12	D.L.	29/05/12	RELEASE	-

AERZEN
AERZEN CANADA INC
1995 MONTEE LABOSSIERE, VAUDREUIL QC J7V 8P2
(450) 424-3966 PH, (450) 424-3985 FX

THIRD ANGLE PROJECTION

GEN 5 - GM 60S
DN 200 - PRESSURE

DWG NO. 1ZG-5445
DRAWN BY D. LEVESQUE
REVIEWED BY D. LEVESQUE
DATE 29 MAY 2012
REV B
SCALE: NONE
SIZE: B
SHEET: 1 OF 1



Q_1 : Ansaugvolumenstrom (Luft) bei p_1 = 1,0 bar und t_1 = 20°C	intake volume flow (air) at p_1 = 1.0 bar and t_1 = 20°C	débit aspiré (air) pour p_1 = 1,0 bar et t_1 = 20°C
n_{HR} : Hauptrotordrehzahl	main rotor speed	vitesse du rotor principal
n_V : Antriebswellendrehzahl	drive shaft speed	vitesse de l'arbre d'entraînement
P : Leistungsbedarf an der Kupplung	power required at the coupling	puissance absorbée à l'accouplement
Δt : Temperaturerhöhung	temperature rise	élévation de température
Δp : Druckerhöhung	pressure difference	pression différentielle

Leistungsdiagramm - Überdruck - für Drehkolbengebläsestufe
performance diagram - overpressure - for stage of rotary piston blower
courbes de fonctionnement - fonctionnement en pression - pour étage de surpresseur à pistons rotatifs

GM 60 S

nV / nHR = 1	04/2016 TRD / Hallemann	G2-420 - XL SAP 4000323948 - 00

Aerzener Maschinenfabrik GmbH
Reherweg 28 - D-31855 Aerzen - Telefon (0 51 54) 81 0 - info@aerzener.de - www.aerzener.com

4000323948 | ZTD | 00

AERZEN

Submittal Form

Document title	*Supplementary Blowers*
Name	*Decatur – Wastewater Treatment Plant*
Address	*PO Box 247, Decatur, AR, 72722*

Document #, revision #	Submitted by	Pages	Peer reviewer	Prepared by
U18535-C06-0004,00	*H_2O Innovation*	*7*		*D'ON*

Information	Review	Fabrication / procurement	As built
☐	☒	☐	☐

Package description	*MBR System*	
Tags	*N/A*	
Project #	Purchase order #	Submittal # *N/A*
U18535	*Agreement, 13 Dec 2016*	*N/A*

Customer Checklist

☐ 1. Reviewed and no comments. Approved as submitted and no need to resubmit.	Authorized by:
☐ 2. Reviewed, proceed with work and approved once comments are incorporated. No need to resubmit.	Title:
☐ 3. Not accepted, work may not proceed. Revise and resubmit.	Signature:
☐ 4. For information only – No approval required	Date:

Revision Tracking History

H_2O Innovation document #			Customer Document #	Date
Document #	Sequence #	Revision #		
C06	*0004*	*0*		*10-Feb-2017*

Submittal Form

Submittal Modification Tracking List

#	Customer request	H_2O comments	Status *
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

* Status should be “Accepted”, “Info” or “No Change”

Submittal Form

Selection Details

Description	Supplementary Blowers
Manufacturer	Aerzen
Model	GM 35S with hood
Motor	75 HP, 480 VAC, 3 Ph, 60 Hz, TEFC, 1800 rpm
Duty Point	1000 scfm, 9 psig
Connection	6” Flexible Sleeve
Notes	Includes acoustic hood, silencer, silencer/filter combo, safety valve, check valve, and pressure gauge

SCOPE OF SUPPLY - PROCESS (SMALLER)

3x Aerzen Generation 5 Blower Package - GM 35S DN 150 - Pressure - including:

Aerzen GM 35S
Drive Motor: 75hp, 1800rpm, TEFC, 460V/60Hz
Thermistors - 1/Ph , Space Heater (110-127V-56 W)
Base with integrated reactive type discharge silencer
Intake filter silencer
Hinged motor support as automatic belt tensioning device
Set of vibration isolation mounts
Narrow v-belt drive with guard - 1 set
Spring loaded relief valve preset to: 1050 mbar
Discharge manifold with exernally accessable integrated check valve
Flexible connector with clamps for schedule 40 pipe, discharge

Instruments
Pressure gauge c/w isolation ball valve (3x)
Dirty filter indicator (3x)

NOTE: Motor space heater supplied for outdoor installation

Acoustic Enclosure - Indoor/Outdoor
Inlet flexible sleeve - DN 150 (6")

Connection Points:
Intake Connection: Local
Discharge Connection: DN 150 - 6"

PERFORMANCE DATA - PROCESS (SMALLER)

Aerzen Blower Package - GM 35S DN 150 - Pressure

Configuration: **G5**

Conditions:		**1000 scfm**	**MIN**		
Flow at inlet conditions	m³/min	32.0	4.7		
	Icfm	1130	166		
Inlet pressure (abs.)	bar	0.970	0.970		
	Psi	14.1	14.1		
Pressure differential	mbar(g)	620	620		
	Psig	9.0	9.0		
Inlet temperature	°C	35	35		
Discharge temperature	°C	99	144		
Blower speed	RPM	3213	799		
Blower maximum speed	RPM	3800	3800		
% of maximum blower speed		85%	21%		
Power required at shaft (with accessories) **	kW	42.9	9.7		
	HP	57.5	12.9		
Total Power (Wire to Air):	HP	62.9	14.8		
Motor rating	HP	75			
Motor speed	RPM	1775	441		
Motor frequency	Hz	60	15		

Noise level without acoustic hood	dB(A)	103
Noise level with acoustic hood	dB(A)	72

Tolerances as per EN 10204, in accordance v
Flow at inlet conditions / Power required at shaf +/- 5%

Blower package noise level:
Free field measurement at 1m from the complete blower package (tolerance +/- 2 dB(A))

Tests and measurements:
Blower stage: 1.5 hour flow test at the factory (Germany) on a calibrated test bed, at maximum operating conditions and according to DIN 1945. acceptance tolerance: +/- 5%.
A complete test report is available upon request.

** Power at shaft excludes drive motor and belt drive

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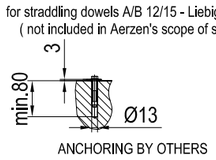
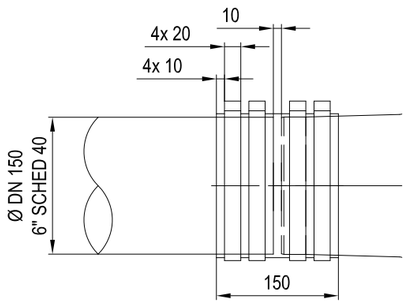
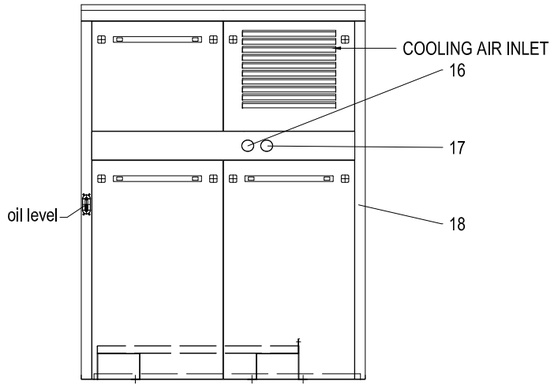


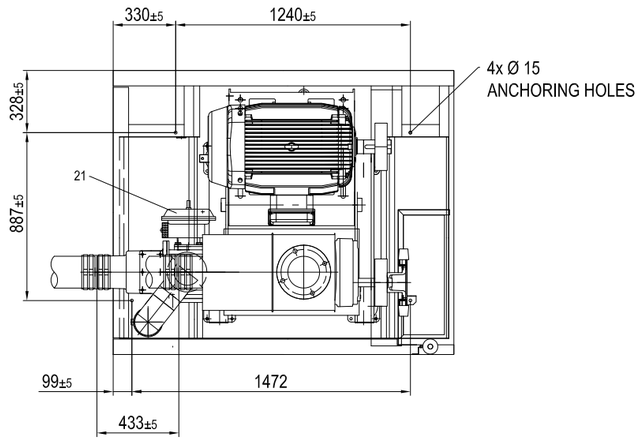
ANCHORING DETAILS

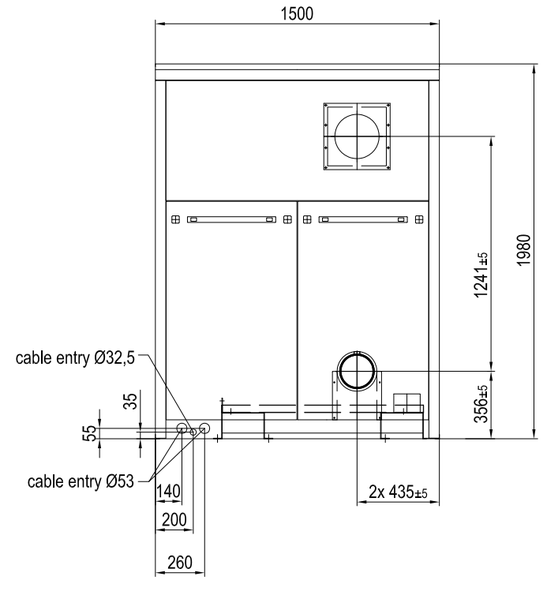


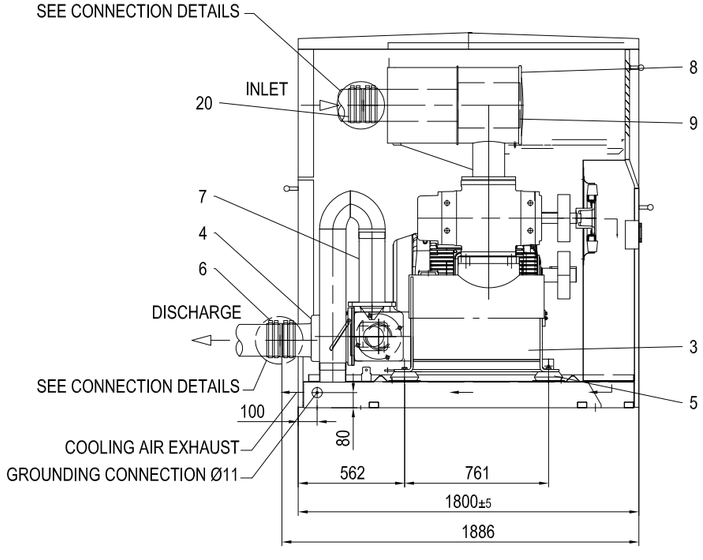
CONNECTION DETAILS

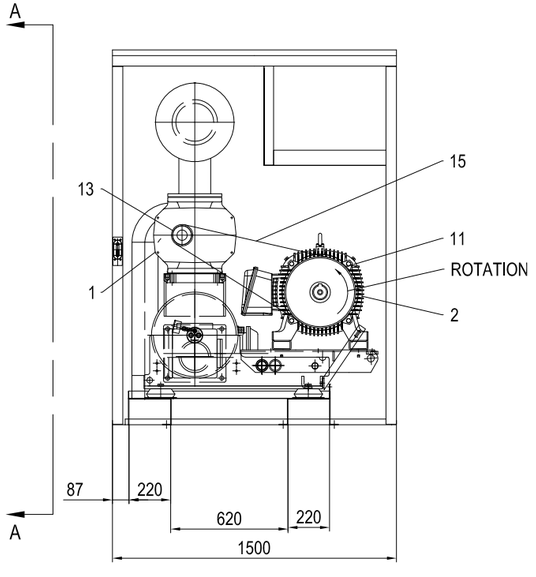


VIEW 'A-A' - FRONT OF UNIT









NOTE	QTY.	POS	DESCRIPTION
	1	1	BLOWER - GM 35S - 280 KG
D	1	2	ELECTRIC MOTOR - WEG 400T REPRESENTED
	1	3	BASE FRAME / DISCHARGE SILENCER - DN 150
	1	4	CONNECTION HOUSING WITH CHECK VALVE - DN 150
	4	5	VIBRATION ISOLATORS - DN 150
	1	6	DISCHARGE FLEXIBLE SLEEVE - DN 150 / 6" SCHED. 40
	1	7	PRESSURE RELIEF VALVE - DN 125 - SET TO 1050 mbar
	1	8	INLET FILTER / SILENCER ASSEMBLY - DN 150
	1	9	INLET FILTER ELEMENT
E	1	10	BELT GUARD - DN 150
	1	11	DRIVER SHEAVE
E	1	12	DRIVER BUSHING
	1	13	DRIVEN SHEAVE
E	1	14	DRIVEN BUSHING
	1	15	V-BELT SET
	1	16	FILTER MAINTENANCE INDICATOR - MANN
	1	17	DISCHARGE PRESSURE GAUGE WITH BALL VALVE - WIKA
	1	18	ACOUSTIC ENCLOSURE - G5 DN 150 - INDOOR INSTALLATION
	1	19	MECHANICAL FAN - MOUNTED ON THE BLOWER SHAFT - GM 35S
G	1	20	INLET FLEXIBLE SLEEVE - DN 150 / 6" SCHED. 40
G	1	21	UNLOADING VALVE

NOTES:

A. UNIT ASSEMBLY WEIGHT WITHOUT MOTOR: 1040KG
B. PAINT: AERZEN STANDARD BLUE
C. 1M CLEARANCE IS RECOMMENDED AT THE FRONT OF THE UNIT FOR MAINTENANCE ACCESS
D. MOTOR: WEG 400T REPRESENTED
E. NOT SHOWN ON DRAWING
F. FOR VARIABLE SPEED APPLICATIONS, CONSTANT TORQUE VFD ARE REQUIRED
G. OPTIONAL

REVISION DETAILS

REV	DRAWN BY	DATE	REVIEWED	DATE	DETAILS	AREA
B	LPM	15-10-12	LPM	15-10-12	UPDATE ON GENERAL ARRANGMENT DRAWING	
A	D.L.	09/02/11	D.L.	09/02/11	RELEASE	-

AERZEN
AERZEN CANADA INC
1995 MONTEE LABOSSIERE, VAUDREUIL QC J7V 8P2
(450) 424-3966 PH. (450) 424-3685 FX

GEN 5 - GM 35S DN 150 - PRESSURE

DWG NO. ZG-00771

DRAWN BY D. LEVESQUE | REVIEWED BY D. LEVESQUE

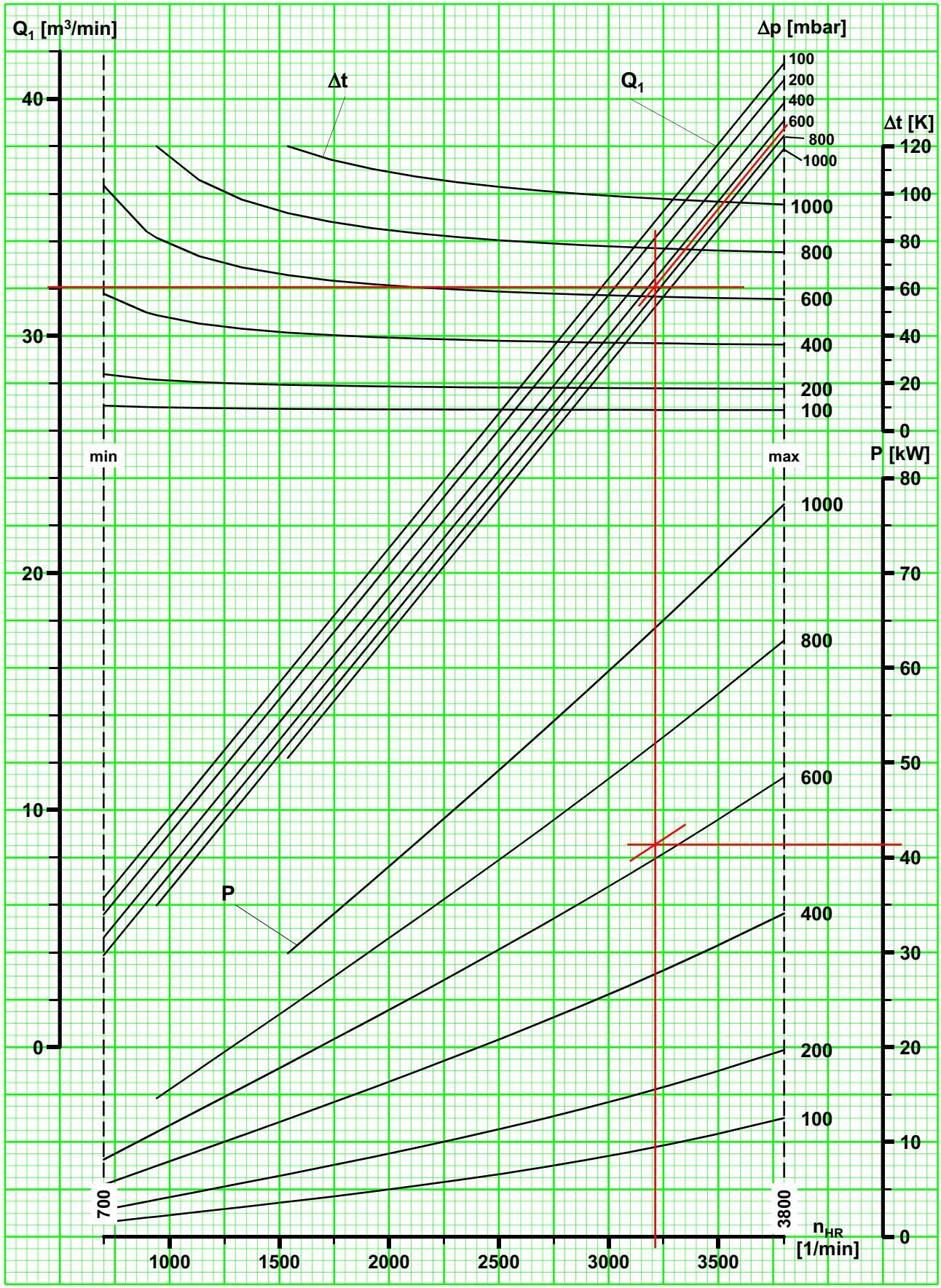
THIRD ANGLE PROJECTION

DATE FEBRUARY 08, 2011 | REV B

SCALE: NONE | SIZE: B | SHEET: 1 OF 1

Aerzener Maschinenfabrik GmbH
Reherweg 28 - D-31855 Aerzen - Telefon (0 51 54) 81 0 - info@aerzener.de - www.aerzener.com

4000323946 | ZTD | 00



Q_1 : Ansaugvolumenstrom (Luft) bei p_1 = 1,0 bar und t_1 = 20°C	intake volume flow (air) at p_1 = 1.0 bar and t_1 = 20°C	débit aspiré (air) pour p_1 = 1,0 bar et t_1 = 20°C
n_{HR} : Hauptrotordrehzahl	main rotor speed	vitesse du rotor principal
n_V : Antriebswellendrehzahl	drive shaft speed	vitesse de l'arbre d'entraînement
P : Leistungsbedarf an der Kupplung	power required at the coupling	puissance absorbée à l'accouplement
Δt : Temperaturerhöhung	temperature rise	élévation de température
Δp : Druckerhöhung	pressure difference	pression différentielle

Leistungsdiagramm - Überdruck - für Drehkolbengebläsestufe
performance diagram - overpressure - for stage of rotary piston blower
courbes de fonctionnement - fonctionnement en pression - pour étage de surpresseur à pistons rotatifs

GM 35 S

nV / nHR = 1	04/2016 TRD / Hallemann	G2-416 - XL SAP 4000323946 - 00

Submittal Form

Document title	*Jet Aeration System*
Name	*Decatur – Wastewater Treatment Plant*
Address	*PO Box 247, Decatur, AR, 72722*

Document #, revision #	Submitted by	Pages	Peer reviewer	Prepared by
U18535-C06-0001,00	*H_2O Innovation*	*14*	*MB*	*D'ON*

Information	Review	Fabrication / procurement	As built
☐	☒	☐	☐

Package description	*MBR System*	
Tags	*N/A*	
Project #	Purchase order #	Submittal # *N/A*
U18535	*Agreement, 13 Dec 2016*	*N/A*

Customer Checklist

☐ 1. Reviewed and no comments. Approved as submitted and no need to resubmit.	Authorized by:
☐ 2. Reviewed, proceed with work and approved once comments are incorporated. No need to resubmit.	Title:
☐ 3. Not accepted, work may not proceed. Revise and resubmit.	Signature:
☐ 4. For information only – No approval required	Date:

Revision Tracking History

H_2O Innovation document #			Customer Document #	Date
Document #	Sequence #	Revision #		
C06	*0001*	*0*		*23-Jan-2017*

Submittal Form

Submittal Modification Tracking List

#	Customer request	H_2O comments	Status *
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* Status should be “Accepted”, “Info” or “No Change”

Submittal Form

Selection Details

Description	Jet Aeration Header System
Model	DD12/44A-18 VariOx
Manufacturer	Parkson
Connections	6’’ air connection, 12” header
Notes	Each manifold contains eighteen (18) jet aerator nozzles Each flush connection contains three (3) 6” manual plug valves Required blower flow per basin 977 scfm, estimated backpressure 8.5 psig

Description	Jet Aeration Recirculation Pumps
Model	KRT K 300-400/218XG-S
Manufacturer	KSB
Connections	Discharge : 12’’ 125# flange
Electrical	3Ph / 60Hz / 480VAC / Class 1 Div 1
Motor	25 HP
Design point	3300 GPM @ 20 ft
Accessories	30 ft of cable included, 304 SS lifting cable

Parkson VariOx™ Jet Aeration

The VariOx™ jet aeration system is an aeration and mixing device used in numerous water and wastewater treatment applications. Jet aeration combines many of the benefits and efficiencies of both mechanical and diffused air type systems. The jet aerator consists of an inner liquid nozzle and an outer air nozzle. Liquid from the basin is re-circulated through a jet motive pump and discharged through the inner liquid nozzle at a high velocity. Concurrently, air is fed into the outer air nozzle where it is mixed with the motive liquid and discharged as a high energy jet plume.

The cross flow of motive liquid through the air entering the outer nozzle creates a shearing action which generates a medium to fine air bubble. The air bubbles are entrained within the jet plume and discharged in a horizontal plane into the lower portions of the basin.

The jets can be operated with or without air being fed through the outer air nozzle. This provides the functionality of both a mixer and an aeration device. Air rates can also be varied through the outer nozzle which provides the ability to maintain a complete mix condition while adjusting air rates to satisfy process requirements.

The efficiency of the jet system is comparable to fine bubble diffuser systems. The main benefit is that, unlike membrane diffusers, the jets do not lose efficiency over time. Oxygen transfer efficiencies remain constant over the life of the equipment. This is a key advantage when considering both the long term operating cost and the operational sustainability since no scheduled down time for equipment replacement is required.

The motive liquid used to deliver oxygen provides a highly turbulent environment which results in a high alpha value, similar to mechanical type aerators. Alpha values of 0.85 are commonly used for typical municipal wastewater. The jets produce a medium to fine air bubble which is delivered in a high velocity horizontal flow pattern. This flow pattern provides a longer bubble residence time versus standard diffuser designs that create only a vertical path of air bubble travel.

Two (2) jet models are available from Parkson. Characteristics of each nozzle are outlined in the following table.

Jet Aeration systems are ideal for:

- BNR / ENR Applications
- Covered Tanks
- Deep Basins
- Sequencing Batch Reactors
- Oxidation Ditches
- Equalization Basins
- Aerobic Digesters

Screening of the raw wastewater is generally provided in most applications. Parkson recommends that screens be sized with openings <1/2" (12 mm). Two methods are available to flush out the jet nozzles – pumped flushout and pneumatic flushout.

Pumped Flushout

The pumped flushout nozzle cleaning system utilizes the jet motive pump in conjunction with a crossover pipe and valve arrangement. The pipe and valve arrangement is configured to allow the flow from the pump to move in a reverse direction compared to the normal mode of operation. Crossover valves are opened which allows the pump to take suction from the jet manifold, creating a reverse flow path of liquid through the nozzle. This high velocity reverse flow will dislodge any potential fouling material within the nozzles. The liquid is discharged back into the basin through the suction bell.

Pneumatic Flushout

The pneumatic flushout system uses air from the blower to create an air lift to move water in a reverse direction through the nozzle assembly. A riser pipe is provided on the liquid line which extends to the top of the basin. The riser is provided with a valve and discharge fitting that directs the flushout liquid back into the basin. With the valve closed, the jet motive pump is turned off so that no liquid is moving through the manifold. The air blower is turned on which moves air into the outer nozzle where it travels into the inner nozzle and begins to accumulate in the liquid piping. The valve on the flushout riser is then opened. The accumulated air in the liquid line moves up the riser, carrying liquid with it. As air continues to be fed into the system, the air moves up the riser pipe and operates as an air lift pump. This continued movement of water up the riser creates a reverse flow through the inner nozzle, dislodging any potential fouling material.

Parkson™ Treating Water Right

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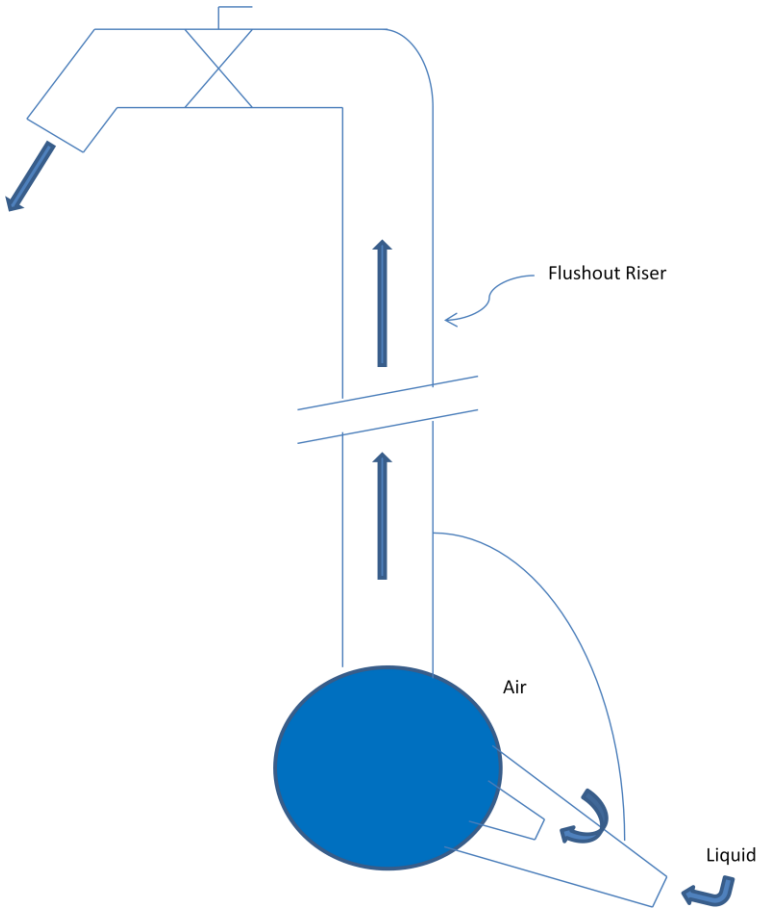
www.parkson.com

Pnuematic Flushout

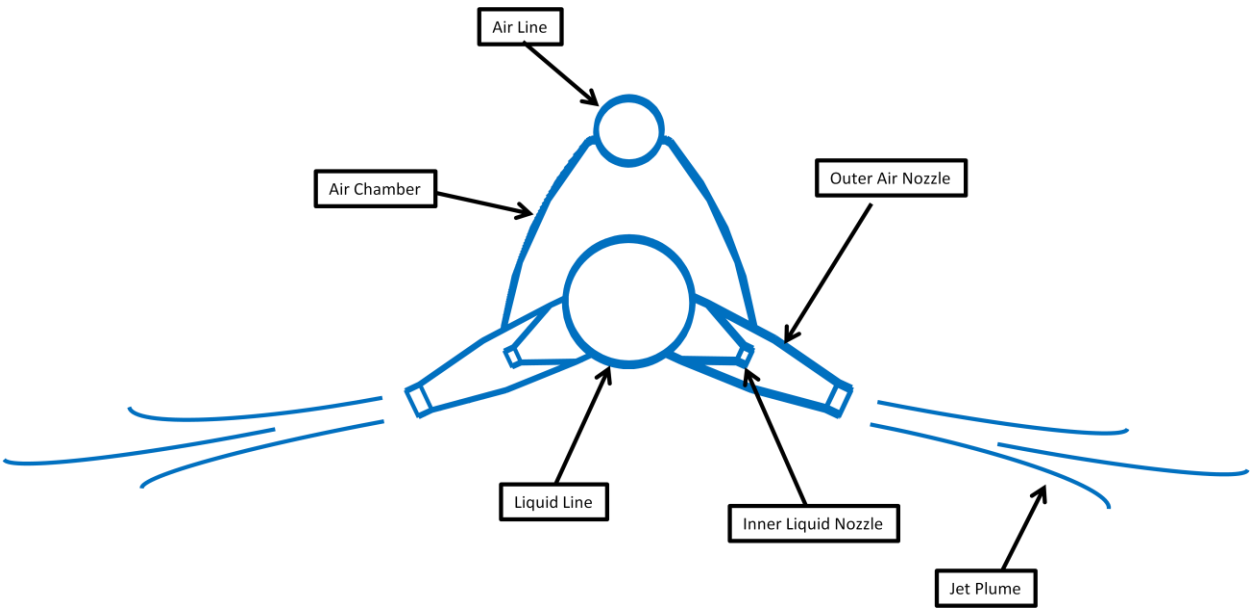
The pneumatic flushout system uses air from the blower to create an air lift to move water in a reverse direction through the nozzle assembly. A riser pipe is provided on the liquid line which extends to the top of the basin. The riser is provided with a valve and discharge fitting that directs the flushout liquid back into the basin. With the valve closed, the jet motive pump is turned off so that no liquid is moving through the manifold. The air blower is turned on which moves air into the outer nozzle where it travels into the inner nozzle and begins to accumulate in the liquid piping. The valve on the flushout riser is then opened. The accumulated air in the liquid line moves up the riser, carrying liquid with it. As air continues to be fed into the system, the air moves up the riser pipe and operates as an air lift pump. This continued movement of water up the riser creates a reverse flow through the inner nozzle, dislodging any potential fouling material.



Parkson
VariOx™ Jet Aeration Operational Description

The ***VariOx™*** jet aeration system is an aeration and mixing device used in numerous water and wastewater treatment applications. Jet aeration combines many of the benefits and efficiencies of both mechanical and diffused air type systems. The jet aerator consists of an inner liquid nozzle and an outer air nozzle. Liquid from the basin is re-circulated through a jet motive pump and discharged through the inner liquid nozzle at a high velocity. Concurrently, air is fed into the outer air nozzle where it is mixed with the motive liquid and discharged as a high energy jet plume. The main components are shown in the illustration below.

The cross flow of motive liquid through the air entering the outer nozzle creates a shearing action which generates a medium to fine air bubble. The air bubbles are entrained within the jet plume and discharged in a horizontal plane into the lower portions of the basin.



The jets can be operated with or without air being fed through the outer air nozzle. This provides the functionality of both a mixer and an aeration device. Air rates can also be varied through the outer nozzle which provides the ability to maintain a complete mix condition while adjusting air rates to satisfy process requirements.

The efficiency of the jet system is comparable to fine bubble diffuser systems. The main benefit is that, unlike membrane diffusers, the jets do not lose efficiency over time. Oxygen transfer efficiencies remain constant over the life of the equipment. This is a key advantage when considering both the long term operating cost and the operational sustainability since no scheduled down time for equipment replacement is required.

As mentioned previously, jet aeration provides benefits of both mechanical and forced air type systems. The motive liquid used to deliver oxygen provides a highly turbulent environment which results in a high alpha value, similar to mechanical type aerators. Alpha values of 0.85 are commonly used for typical municipal wastewater. The jets produce a medium to fine air bubble which is delivered in a high velocity horizontal flow pattern. This flow pattern provides a longer bubble residence time versus standard diffuser designs that create only a vertical path of air bubble travel. Typical clean water OTE values are shown in the attached charts.

Two (2) jet models are available from Parkson. Characteristics of each nozzle are outlined in the following table.

Jet Model	Model 44A	Model 88A
Liquid Recirculation Rate GPM (l/s)	183 (11.5)	366 (23)
Head pressure at nozzle ft (m)	17 (5.2)	17 (5.2)
Normal gassing rate scfm (m3/hr)	44 (75)	88 (150)
Gassing rate range scfm (m3/hr)	22-88 (37-150)	44-176 (75-300)
OTE at 18’ (5.5m) submergence %	27	25.7
AOR lb/hr per BHP	2.25	2.2
Inner nozzle orifice size inch (mm)	1.5 (38)	2-1/8 (54)

Screening of the raw wastewater is generally provided in most applications. Parkson recommends that screens be sized with openings <1/2” (12 mm). Two methods are available to flush out the jet nozzles – pneumatic flushout and pumped flushout.

NOTE:

1) ALL INFORMATION AND DIMENSIONS GIVEN ARE PRELIMINARY IN NATURE AND INTENDED FOR INFORMATIONAL AND PLANNING PURPOSES ONLY.

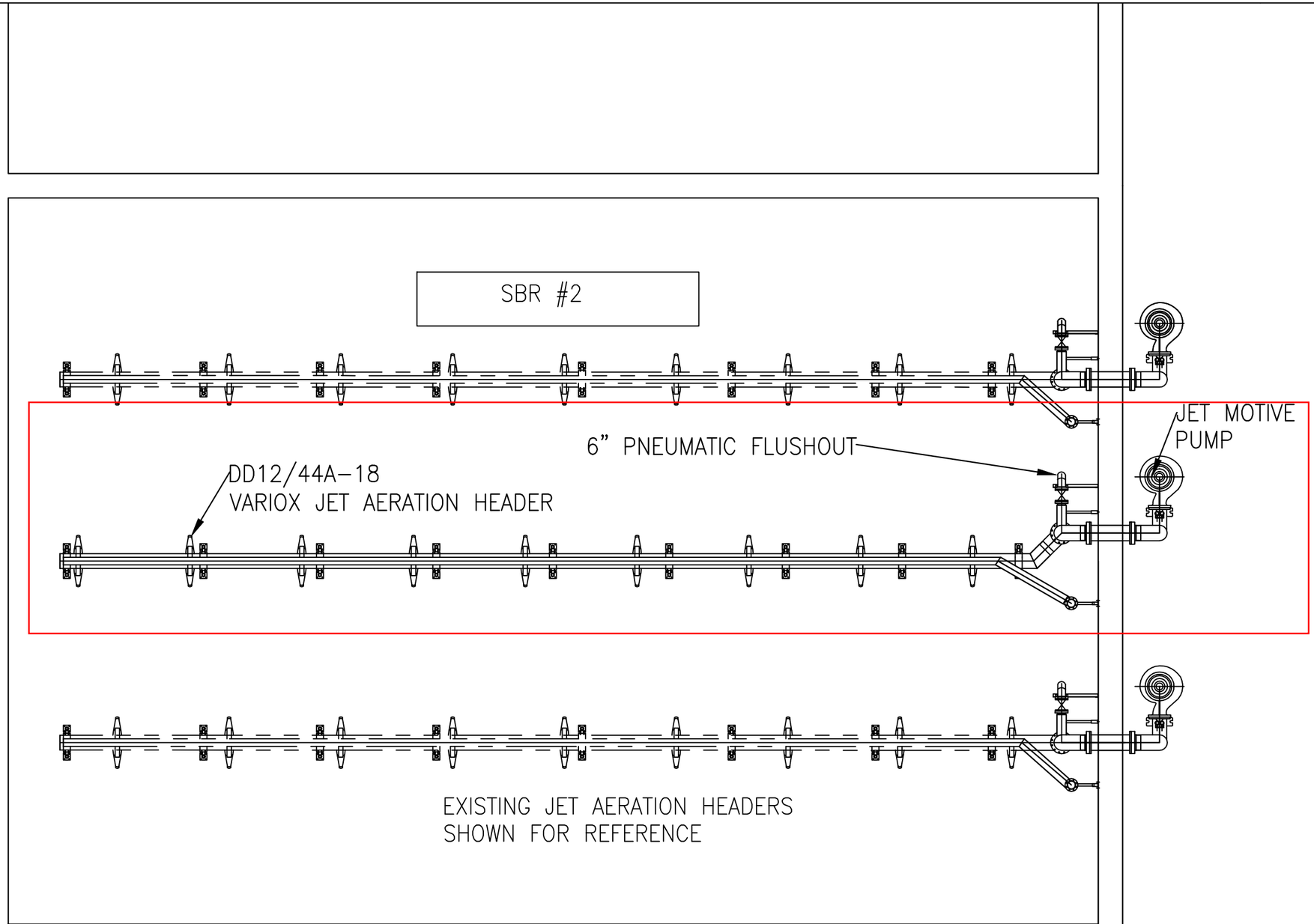
2) ALL FLANGES SHALL MEET OUTSIDE DIAMETER, BOLT CIRCLE DIAMETER, NUMBER AND SIZE OF HOLES PER ANSI B.16.1 125 LB. CAST IRON, AND ANSI B16.5 150 LB. STEEL FLANGE SPECIFICATIONS.

3) CONTRACTOR TO SUPPLY ALL INTERCONNECTING HARDWARE AND GASKETS.

4.) SBR BASIN #2 EQUIPMENT IS TYPICAL FOR ALL THREE BASINS

5.) EXISTING EQUIPMENT IS SHOWN ONLY FOR REFERENCE AND IS NOT EXACT

N



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REV	DESCRIPTION	DATE	BY

X PRELIMINARY __ APPROVAL

X INFORMATION __ CERTIFIED

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AT	1/23/17
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SCALE 1/8"=1'	SIZE B

Parkson™

PROJECT NAME
P112-XXXX
WWTP IMPROVEMENTS
DECATUR, AR

TITLE
EXISTING SBR RETROFIT
Vari-Ox™ JET AERATION EQUIPMENT

REFERENCE INFORMATION
SPECIFICATION SECTION
REFERENCE INFORMATION

DRAWING NO

REV

SHEET 1 OF 1

Data sheet

Pump type KRT K 300-400/218XG-S

Operating data

Flow	3300	US g.p.m.	Fluid			
Head	20	ft	Density of fluid	62.3	lb/ft³	
Operating speed	875	rpm	Viscosity	1.08E-5	ft²/s	
Shaft power	21.8	hp	Temperature	68	°F	
Efficiency	76.7	%				
Required pump NPSH	9.37	ft				
Head H(Q=0)	32.2	ft				
Application range	Head		Flow			
From	27.2	ft	1590	US g.p.m.		
To	7.76	ft	5530	US g.p.m.		

Design

Make	KSB	Impeller type	Multi channel impeller		
Design	Submersible pump		Closed		
Series	KRT K	Impeller size	(350)	$13^{3}/_{4}$	inch
Frame size	300-400		Max. (408)	$16^{1}/_{16}$	inch
Stages	1		Min. (332)	$13^{1}/_{16}$	inch
Curve number	K41683/4	Free passage		$3^{15}/_{16}$	inch
		Weight		1858.5	lb
Type of bearings	Antifriction				
Nos. of bearings	1 / 1				
Lubrication	Grease lubrication. lubricated for lifetime				

Suction port	Pressure rating		--
	Flange size	DN0	---
	Flange size	DN1	12"
	Norm		--
Discharge port	Pressure rating		CLASS 125
	Flange size	DN2	12 inch
	Flange size	DN3	12 inch
	Norm		ASME/ANSI B16.1

Suction port: pump (DN1)
Discharge port: discharge elbow (DN3)

Materials

Pump casing	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Discharge cover	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Impeller	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Shaft	Stainless steel EN-1.4021+QT800 (A 276 Type 420)
Bearing bracket	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Motor casing	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Bolts. nuts	Stainless steel A4 (EN-1.4571) (A 276 Type 316)
Shaft protection sleeve	---
Casing wear ring	Grey cast iron EN-JL1030 (A 48 Class 30B)
Impeller wear ring	---
O-Rings	Nitrile rubber (NBR)

Data sheet

Pump type

KRT K 300-400/218XG-S

Shaft seal

Type of seal	Double mechanical seal
Arrangement:	Tandem
Seal on medium side	with elastomer bellows
Mechanical seal. pump-side	Silicon carbide / Silicon carbide
Mechanical seal. bearing-side	Carbon / Silicon carbide

Monitoring

Thermal winding protection	By temperature sensitive switches
Explosion proof protection	By PTC (Explosion proof models only)
Motor housing monitoring	By conductive moisture sensor electrode
Mechanical seal leakage detection	---
Bearing temperature monitoring	---

Coating

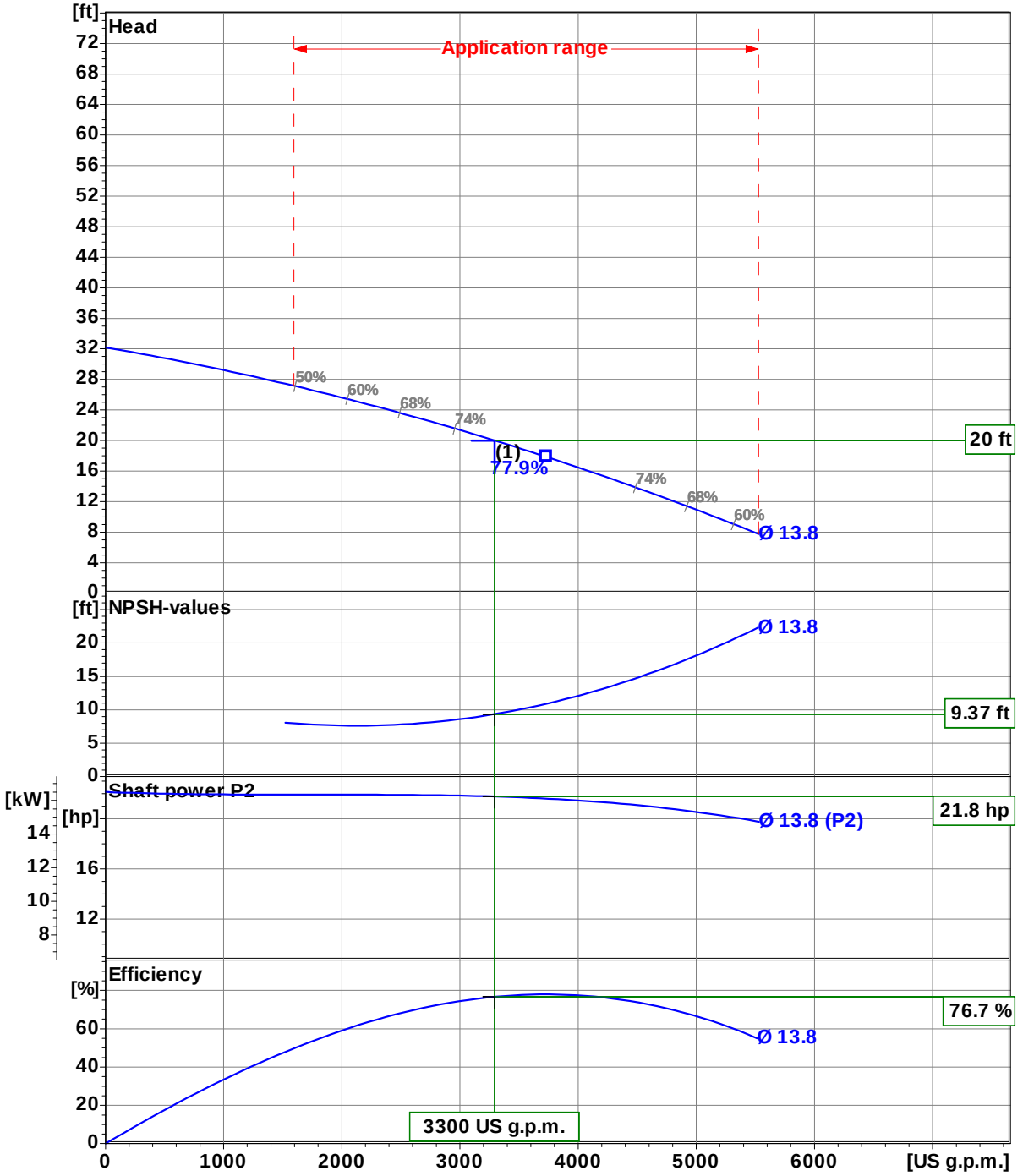
Preparatory treatment	SSPC near white SP 10
Blasting method	Steel grit blasting
Primer	Zinc phosphate or Zinc dust
Dry film thickness primer	> 1 1/2 mils (35 microns)
Top coat	2-component epoxy resin
Solids content	> 82 %
Dry film thickness top coat	> 6 mils (150 microns)
Color	Ultramarine Blue

Installation

INSTALLATION	
Type of installation:	Wet well installation designed for automatic connection to a permanently installed discharge elbow
Discharge elbow size (DN2/DN3):	12 inch / 12 inch
Flange to suit:	ASME/ANSI B16.1, CLASS 125
Claw:	Bolted to the pump
Guide system:	Double guide bars, by contractor
Guide bar dimension:	3" diameter pipes
Installation depth:	15 ft (4.5 m)
Lifting device:	stainless steel lifting chain
Length of lifting device:	33 ft (10 m)
Lifting loops:	Every 8 ft (2.5 m)
Installation accessories:	Discharge elbow, 12 inch / 12 inch fasteners, claw, bracket, lifting chain, but without guide bars
Materials:	
Discharge elbow:	Grey cast iron EN-GJL-250 (A48 Class 35B)
Claw:	Grey cast iron EN-GJL-250 (A48 Class 35B)
Bracket:	Stainless steel EN-1.4571 (A276 Type 316 Ti)
Lifting device:	Stainless steel EN-1.4404 (A276 Type 316L)

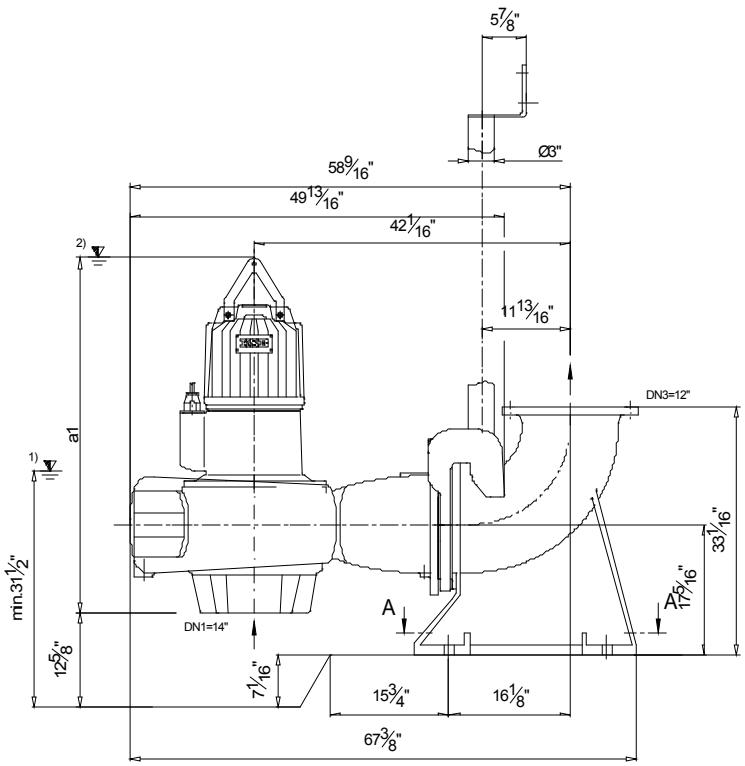
Performance curve

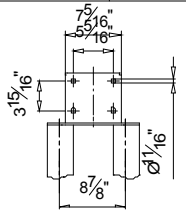
Pump type **KRT K 300-400/218XG-S**

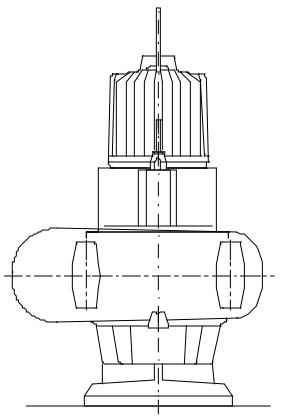


Impeller type	Multi channel impeller	Closed		Curve number	K41683/4
Free passage	$3^{15}/_{16}$"		Density of fluid	62.322 lb/ft³	Frequency	60 Hz
Impeller size	$13^{3}/_{4}$"	(350)	Viscosity	1.082E-5 ft²/s	Speed	875 1/min

KSB Inc., Richmond, VA. / KSB Pumps Inc., Mississauga, Ontario / KSB AG, Halle (Germany)

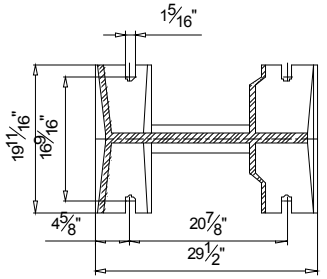


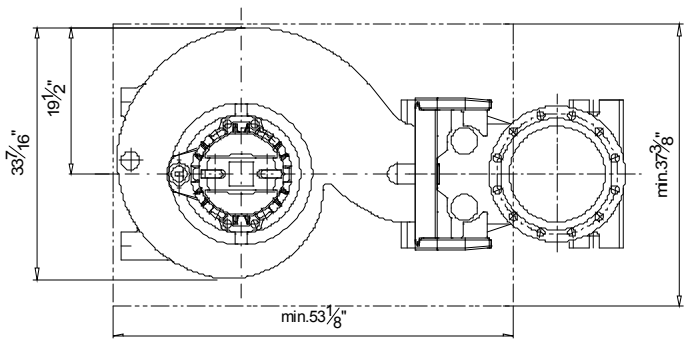




Hydraulik Hydraulics Hydraulique	KSB-Motor KSB-Engine KSB-Moteur	a1 50 Hz	a1 60 Hz		Gewicht/Weight/Poids G		H		C1, C2	
		mm	mm	inch	kg	lbs	kg	lbs	kg	lbs
K	20 6	1222	---	---	777	1714	---	---	---	---
	26 6	1201	---	---	799	1763	---	---	---	---
	10 8	1222	---	---	760	1677	---	---	---	---
	17 8	1222	1222	48 1/8	776	1712	---	---	---	---
	21 8	1197	1197	47 1/8	798	1761	---	---	---	---

A-A





NUR FÜR ANFRAGE/ANGEBOT
technische Änderungen vorbehalten

FOR INQUIRY/OFFER ONLY
technical modifications reserved

SEULEMENT POUR LES DEMANDES/LES OFFRES
sous réserve de modifications techniques

1) Tiefster Ausschaltpunkt bei Automatikbetrieb
1) Lowest shut-off point for automatic operation
1) Point d'arrêt le plus bas en service automatique

2) Mindestüberdeckung bei Dauerbetrieb
2) Minimum submergence for continuous operation
2) Recouvrement minimal pour service continu

Zeichnungs-Nr./Drawing No./N° Plan				Betreiber-Nr./Customer No./N° Client
Maßstab/Scale/Echelle 1:10 A2	2010-03-01 Datum/Date	S-E-A 153 Name/Nom	0 Änderung/Revision Modification	KSB Auftrags-Nr./KSB Order No./N° commande KSB
	Baureihe-Größe-Type-Série KRT 300-401/26 6			KSB Werk-Nr./KSB Work No./N° de fabrication KSB
	stationäre Aufstellung stationary installation installation stationnaire			
	Bitte grundsätzlich bei Schriftverkehr angeben / Should always be stated in correspondence / A indiquer dans toute correspondance			
KSB	KSB Aktiengesellschaft Geschäftsbereich Pumpen Rheinhafenstraße 151	D-67227 Frankenthal Postanschrift/Mail address D-67019 Frankenthal	Tel.: (06233) 86-0 Fax: (06233) 86-3029 Telex: 0623814 ksbfd	

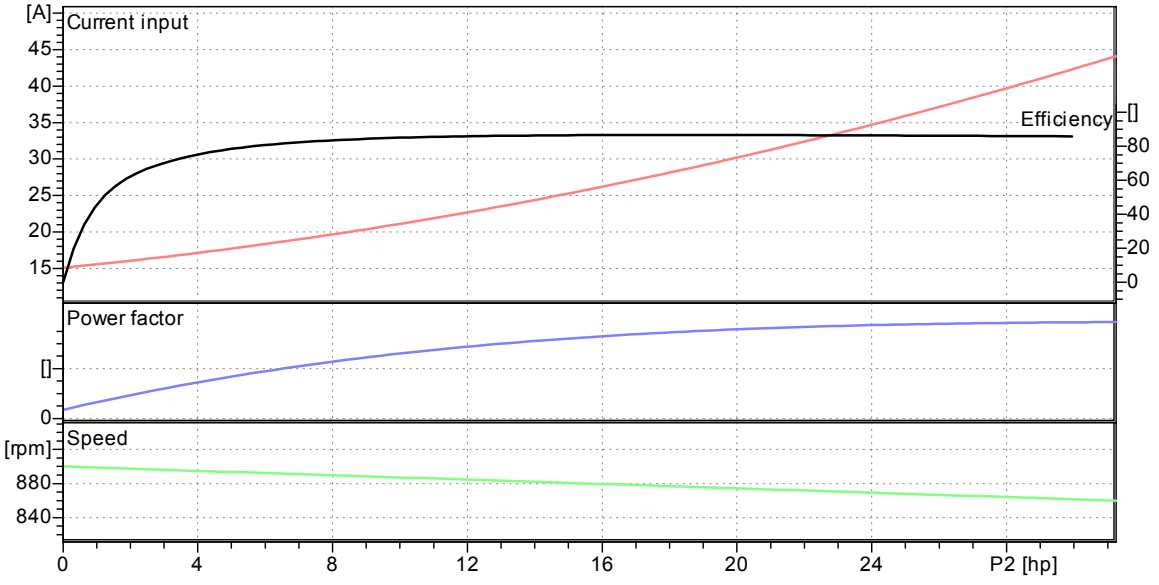
Data sheet: Motor data

Motor type 218XG

Motor manufacturer	KSB Aktiengesellschaft	Rated voltage	460	V
Design acc. standard	-	Rated frequency	60	Hz
Service factor	1.15	Rated HP (D.O.L) or VFD	25	hp
Degree of protection	IP68	Rated current	35.9	A
Insulation class	F	Nominal speed	868	rpm
Starting mode	Direct	NEMA code letter	D	
No. starts / h	20	Starting to rated current	3.6	
Coolant temperature	< / = 104 °F (40 °C)	Starting current	129	A
Motor casing	Grey cast iron EN-GJL-250 (A 48 Class 35B)			
Explosion protection	Class I, Div. 1, Groups C,D, T3			
Pump type	KRT K 300-400/218XG-S			

Load	P1 kW	P2 hp	eta %	cos phi	I A
4/4	21.60	25.0	86.3	0.76	35.9
3/4	16.13	18.7	86.7	0.7	28.9
2/4	10.84	12.5	86.0	0.59	23.1
1/4	5.74	6.2	81.2	0.39	18.5

Main cable	1 x AWG 9-7+15-5	Diameter	0.94..1.06 inch
Control cable	---	Diameter	
Cable. outer sheath	Waterproof synthetic rubber compound		
Cable length	10 m		



KSB Inc., 4415 Sarellen Road, Richmond, Virginia 23231, Phone: 001-804-222-1818, Fax: 001-804-226-6961

KSB Pumps Inc, 5885 Kennedy Road, Mississauga, Ontario L4Z 2G3 (Canada), Phone: (0905) 568-9200, Fax: (0905) 568-9120

KSB Aktiengesellschaft, Turmstrasse 92, 06110 Halle (Germany), Phone +49 (345) 48260, Fax +49 (345) 4826 4699, www.ksb.com

Submittal Form

Document title	*Membrane Feed Pumps*
Name	*Decatur – Wastewater Treatment Plant*
Address	*PO Box 247, Decatur, AR, 72722*

Document #, revision #	Submitted by	Pages	Peer reviewer	Prepared by
U18535-C06-0006,00	*H_2O Innovation*	*10*		*D'ON*

Information	Review	Fabrication / procurement	As built
☐	☒	☐	☐

Package description	*MBR System*	
Tags	*N/A*	
Project #	Purchase order #	Submittal # *N/A*
U18535	*Agreement, 13 Dec 2016*	*N/A*

Customer Checklist

☐ 1. Reviewed and no comments. Approved as submitted and no need to resubmit.	Authorized by:
☐ 2. Reviewed, proceed with work and approved once comments are incorporated. No need to resubmit.	Title:
☐ 3. Not accepted, work may not proceed. Revise and resubmit.	Signature:
☐ 4. For information only – No approval required	Date:

Revision Tracking History

H_2O Innovation document #			Customer Document #	Date
Document #	Sequence #	Revision #		
C06	*0006*	*0*		*24-Feb-2017*

Submittal Form

Submittal Modification Tracking List

#	Customer request	H_2O comments	Status *
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

* Status should be “Accepted”, “Info” or “No Change”

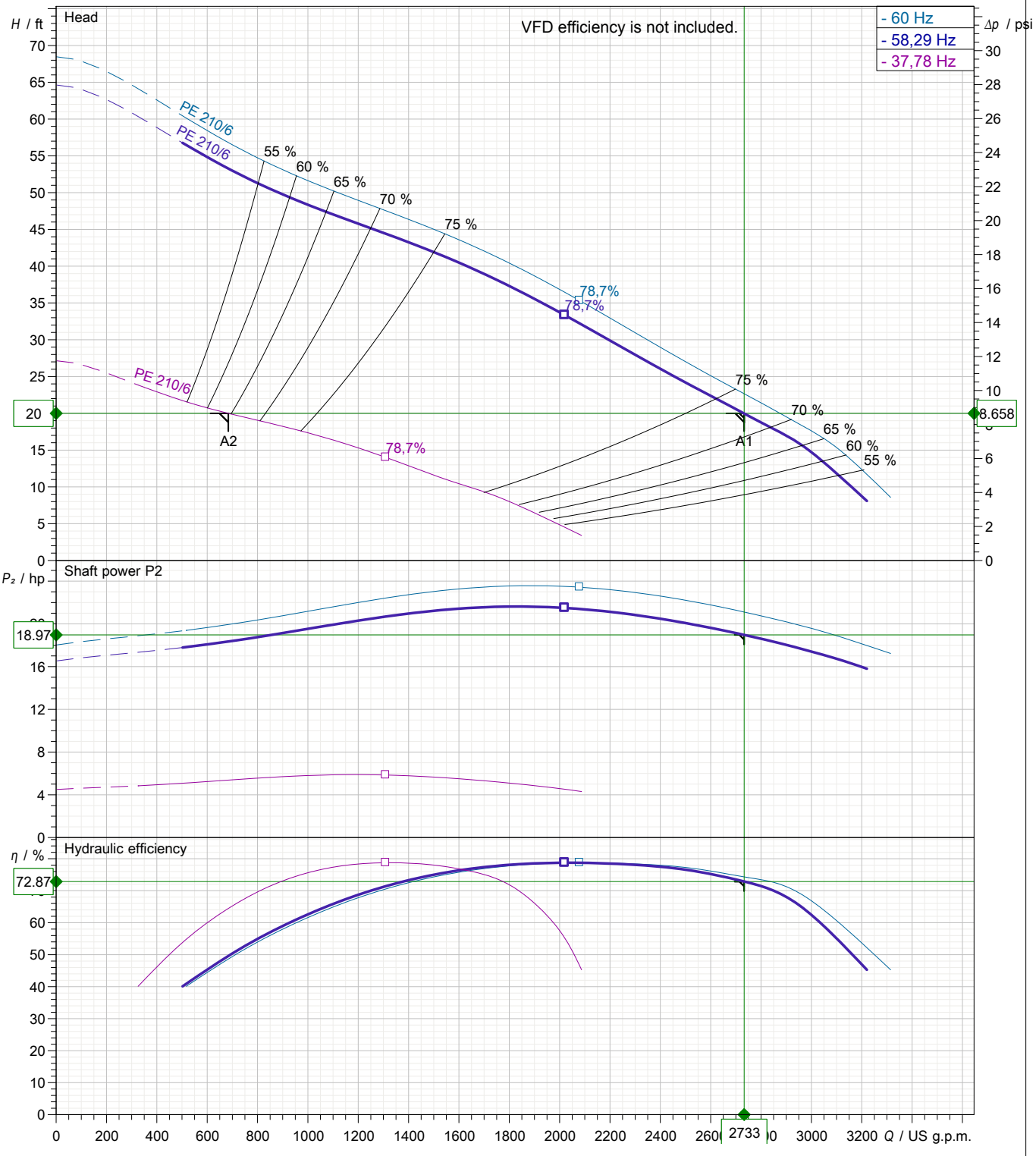
Submittal Form

Selection Details

Description	Membrane Feed Pumps
Model	XFP206J-CB2-PE210/6
Manufacturer	Sulzer
Connections	Discharge : 8’
Electrical	3Ph / 60Hz / 480VAC, class 1 div 1
Motor	28 HP premium efficiency
Design point	2732 GPM @ 20 ft
Notes	Bimetal switch in each phase and moisture detection probe in seal sensing chamber. Includes: Guide rail assembly w/ discharge elbow Hardware Kit {pump to slide bracket} Lifting chain, galvanised, 25ft Electronic Heat & Seal Relay, 115V

Curve number	Pump performance curves	SULZER
Reference curve XFP 206J-CB2 60 HZ	**XFP 206J-CB2 60 HZ**	

			Discharge	Frequency
			DN200	60 Hz
Density	Viscosity	Testnorm	Rated speed	Date
62,32 lb/ft³	1,077E-5 ft²/s	ISO 9906: 2012, HI 11.6/14.6 Gr 2B	1154 rpm	2017-02-06
Flow	Head	Rated power	Hydraulic efficiency	NPSH
2730 US g.p.m.	20 ft	19 hp	72,9 %	18,3 ft



Impeller size	N° of vanes	Impeller	Solid size	Revision
12,6 inch	2	Contrablock Plus impeller	3,54 x 4,33 inch	

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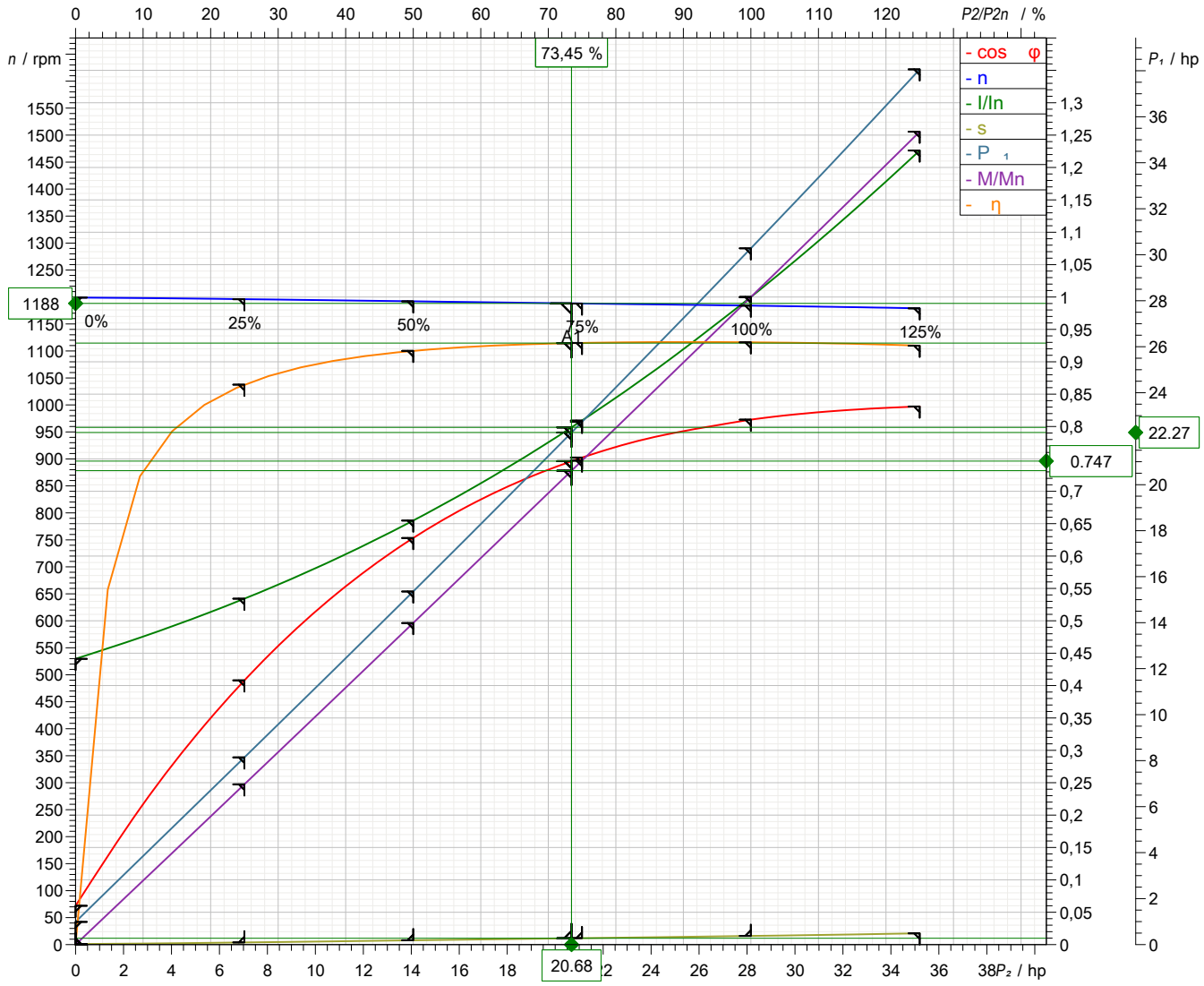
and can not be held responsible for the use of information contained in this software.

Frequency 60 Hz	**Motor performance curve** PE 210/6	SULZER

Rated power	Service factor	Nominal Speed	Number of poles	Rated voltage	Date
28,2 hp	1,3	1180 rpm	6	480 V	2017-02-06



Symbol	No loac	25 %	50 %	75 %	100 %	125 %
P_2 / hp	0	7,04	14,08	21,12	28,16	35,2
P_1 / hp	0,9888	8,141	15,36	22,73	30,28	38,06
η / %	0	86,48	91,69	92,91	93	92,48
n / rpm	1199	1196	1192	1188	1184	1179
cos φ	0,05999	0,4081	0,6279	0,7521	0,8107	0,831
I / A	14,78	17,9	21,94	27,11	33,5	41,08
s / %	0,08333	0,3333	0,6667	1	1,333	1,75
M / lbf ft	0	30,92	62,04	93,38	124,9	156,8

Tolerance according to VDE 0530 T1 12.84 for rated power

Starting current	Starting torque	Moment of inertia	No. starts per hour
221 A	300 lbf ft	8,94 lb ft²	10

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and can not be held responsible for the use of information contained in this software.

Version 2016/11/07 - Data version Oct-2016

SULZER

Submersible Sewage Pump Type ABS XFP

XFP 206J-CB2 | 8", 6 Pole, 3-Phase, 60 Hz, PE4

Submersible Motor Specifications, PE4 Frame

Motor Design			NEMA design B, squirrel cage induction
Motor Type			Fully enclosed Premium Efficiency submersible, IP68 protection rating
Motor Efficiency Standard and Rating			IEC 60034-30, IE3 rating
Motor Efficiency Test Protocol			IEC 60034-2-1
Insulation Material			Class H, 180ºC (356ºF), copper windings
Motor Filling Medium			Air
Temperature Rise			Class A
Maximum Fluid Temperature			40ºC (104ºF) continuous, 50ºC (122ºF) intermittent
Cooling System		**OPT**	Closed-loop, non-toxic glycol/water mixture (⅓ / ⅔)
Motor Protection	**Thermal**	**STD**	Normally closed bimetallic switch in each phase, connected in series, 140ºC (284ºF) +/- 5ºC (41ºF) opening temperature
		OPT	STD plus: upper and lower bearing bimetallic switches **or** 100Ω RTD (PT100) in winding (option of one RTD or three RTDs in stator) and RTDs in lieu of upper and lower bearing bimetallic switches
	Leakage	**STD**	Moisture detection probe in seal sensing chamber (for use with appropriate relay)
		OPT	STD plus: probes in motor housing and junction chamber
Sensing Chamber Filling Medium			Oil
Bearing Type	**Upper**		Cylindrical roller, permanently lubricated
	Lower		Dual angular contact ball bearings plus single cylindrical roller bearing, permanently lubricated
Motor Starter Types			Suitable for use with electronic soft starters, and PWM type Variable Frequency Drives [1]
Maximum Starts per Hour			15, evenly spaced
Inverter Duty Rating			Motors meet NEMA MG1, part 31 requirements
Maximum Submergence			20 meters (65 feet)
Available Voltages			230, 460, 600 (consult factory for other voltages)
Voltage Tolerance from Rated			+/-10%
Agency Approvals			Factory Mutual, CSA
Explosion Proof Rating			NEC 500 Class 1, Division 1, Group C & D, Class T3C max surface temp

The picture above may differ from the actual product.
For illustrative purposes only.

[1] Output filters may be required on VFDs. See document **DS-E00-001** for details.

Motor Ratings, PE4 Frame

Motor Model	Input Power (P1)	Rated Power Output (P2)	Nominal RPM	Rated Voltage	Full Load Amps	Locked Rotor Amps	NEMA Code Letter	NEMA Service Factor	Motor Efficiency at % Load			Power Factor at % Load		
									100	75	50	100	75	50
PE 210/6	22.6 kW	21 kW 28 HP	1180	230	70.8	467	H	1.3	93.0	92.9	91.7	.811	.752	.628
				460	35.4	234								
				600	27.1	179								
PE 250/6	26.9 kW	25 kW 33.5 HP	1190	230	86.6	650	J	1.3	93.0	92.5	90.9	.794	.727	.597
				460	43.3	325								
				600	33.2	249								
PE 350/6	37.2 kW	35 kW 47 HP	1180	230	118.7	855	J	1.3	94.1	94.0	93.2	.786	.712	.576
				460	59.4	428								
				600	45.5	328								
PE 430/6	45.7 kW	43 kW 58 HP	1180	230	141.7	921	H	1.3	94.2	94.4	93.8	.808	.744	.618
				460	70.9	461								
				600	54.3	353								

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Submersible Sewage Pump Type ABS XFP

XFP 206J-CB2 | 8", 6 Pole, 3-Phase, 60 Hz, PE4

Cable Data, PE4 Frame

	Motor	Motor Voltage	Cable Qty	Cable Type	Cable Nominal Outside Diameter +/- .5mm (.02")	
					Power	Ground
Power Cable	PE 210/6	230	1	G-GC 4-3	30.2mm (1.19")	Integrated w/ Power
		460	1	G-GC 8-3	24.6mm (0.97")	Integrated w/ Power
		600	1	G-GC 8-3	24.6mm (0.97")	Integrated w/ Power
	PE 250/6	230	1	G-GC 2-3	34.1mm (1.34")	Integrated w/ Power
		460	1	G-GC 8-3	24.6mm (0.97")	Integrated w/ Power
		600	1	G-GC 8-3	24.6mm (0.97")	Integrated w/ Power
	PE 350/6	230	1	G-GC 1-3	38.4mm (1.51")	Integrated w/ Power
		460	1	G-GC 6-3	26.6mm (1.05")	Integrated w/ Power
		600	1	G-GC 8-3	24.6mm (0.97")	Integrated w/ Power
	PE 430/6	230	1	G-GC 1/0-3	41.9mm (1.65")	Integrated w/ Power
		460	1	G-GC 4-3	30.2mm (1.19")	Integrated w/ Power
		600	1	G-GC 6-3	26.6mm (1.05")	Integrated w/ Power

	Motor Monitoring Type [3]	Cable Qty	Cable Type	Cable Nominal Outside Diameter +/- .5mm (.02")
Control Cable	Std monitoring	1	SOOW 16/4	10.7mm (0.42")
	Opt full monitoring	1	SOOW 16/8	14.6mm (0.57")
	Opt full monitoring w/ 3 RTDs	1	SOOW 16/12	17.3mm (0.68")
	Opt full monitoring w/ 5 RTDs	2	SOOW 16/10	16.5mm (0.65")
Cable Length	Standard: 15m (49 feet)	Optional: 5m (16 feet) increments up to 30m (98 feet), Consult Factory for longer lengths		

[3] See motor protection on page 1. Optional full monitoring systems with RTD options do not include bearing bi-metallic switches.

Pump Data

Discharge Size	8" flanged, compatible with 8" class 125 ANSI flanges									
Suction Size (Wet-Pit / Dry-Pit) [5]	8" undrilled / 8" flanged, compatible with 8" class 125 ANSI flanges, threaded for 8x3/4-10 UNC screws, 30mm (1.2") deep									
Volute Pressure Rating	10 bar (145 psi)									
Impeller Type	Semi-open, 2-vane, ContraBlock Plus w/ Seal Protection System									
Impeller Code	-	-	-	-	-	-	-			
Impeller Diameter, mm (in.)	320 (12.6)	330 (13.0)	340 (13.4)	350 (13.8)	360 (14.2)	370 (14.6)	375 (14.8)			
Solids Passage Size, mm (in.)	90x110 (3.5x4.3)	90x110 (3.5x4.3)	90x110 (3.5x4.3)	90x110 (3.5x4.3)	90x110 (3.5x4.3)	90x110 (3.5x4.3)	90x110 (3.5x4.3)			
Min. Recommended Flow, GPM [6]	1000	1100	1200	1200	1300	1300	1400			

[5] Wet-pit version can be drilled to dry-pit specifications upon request. Consult factory for details. [6] Recommend minimum continuous flow. Consult factory for applications below this flow rate.

Materials of Construction

		Standard	Optional
Power/Control Cable Jacket		Chlorinated Polyethylene (CPE)	
Lifting Hoop		Ductile Iron EN-GJS-400-18 (ASTM A-536; 60-40-18)	Duplex Stainless Steel 1.4470 (ASTM A890, CD3MN Grade 4A)
Cable Connection Chamber		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Motor Housing		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Cooling Jacket		Steel 1.0036 (ASTM A-570, Grade D)	
Intermediate Housing		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Seal Plate/Cooling Chamber		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
Pump and Motor Shaft		Stainless Steel 1.4021 (AISI 420)	Duplex Stainless Steel 1.4462 (UNS S31803)
Impeller		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B) [7]	Duplex Stainless Steel 1.4470 (ASTM A890, CD3MN Grade 4A)
Wear Parts	Impeller Wear Ring	N/A	
	Volute Wear Ring	N/A	
	Bottom/Wear Plate	Cast Iron EN-GJL-250 (ASTM A-48, Class 35B) [7]	Duplex Stainless Steel 1.4470 (ASTM A890, CD3MN Grade 4A)
Volute		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	
External Hardware		Stainless Steel 1.4401 (AISI 316)	
O-Rings and Cable Glands		Nitrile (Buna-N)	Viton®
Mechanical Seals	Lower	Silicon Carbide / Silicon Carbide, Nitrile, 316 SS	Silicon Carbide / Silicon Carbide, Viton®, 316 SS
	Upper	Silicon Carbide / Silicon Carbide, Nitrile, 316 SS	
Lower Bearing Lip Seal		Nitrile (Buna-N)	
Coating/Protection		Two-part epoxy, blue, 120µm (4.7 mil) DFT	Two-part epoxy, blue, 400µm (15.7 mil); Zinc Anodes

[7] Hardening of bottom edge of impeller vane and wear plate surface available. Consult factory for details.

General Data

	PE 210/6	PE 250/6	PE 350/6	PE 430/6
Overall Height	1457mm (57.4")	1457mm (57.4")	1537mm (60.5")	1537mm (60.5")
Pump Weight (Non-Cooled)	560 kg (1235 lb)	590 kg (1301 lb)	625 kg (1378 lb)	640 kg (1411 lb)

DS-E02-149 REV: 0 DATE: 05/15 Specifications Subject to Change Without Notice

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No: M-02.2811 - 00	**XFP 206J-CB2**
Dat/Nam.: 03.11.2014 / K. Srb	
Cad Code: M_022811	Dimension sheet PE4 WET WELL Installation
Technical changes reserved Änderungen vorbehalten Sous réserve de modifications	Maßblatt PE4 Nassinstallation
	Plan d'encombrement PE4 installation submersible

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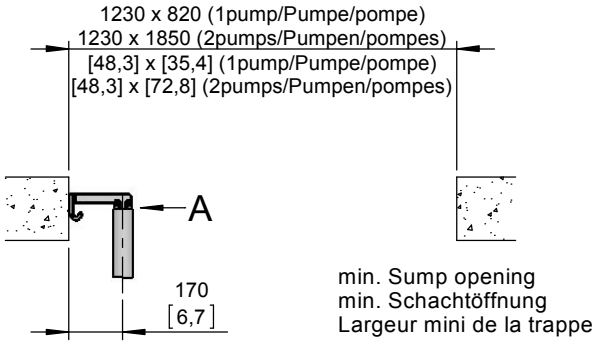
Type Typ Type 50Hz	Type Typ Type 60Hz	Weight Gewicht Poids **OK**		Weight Gewicht Poids **MK**		H	
		(~kg)	(~lb)	(~kg)	(~lb)	(mm)	(inch)
PE 300/4-J		585	1290	645	1422	1475	58.1
PE 370/4-J		615	1356	680	1499	1537	60.5
PE 450/4-J		635	1400	700	1544		
PE 185/6-J	PE 210/6-J-60	560	1235	620	1367	1457	57.4
PE 220/6-J	PE 250/6-J-60	590	1301	650	1433		
PE 300/6-J	PE 350/6-J-60	625	1378	690	1521	1537	60.5
PE 370/6-J	PE 430/6-J-60	640	1411	705	1555		



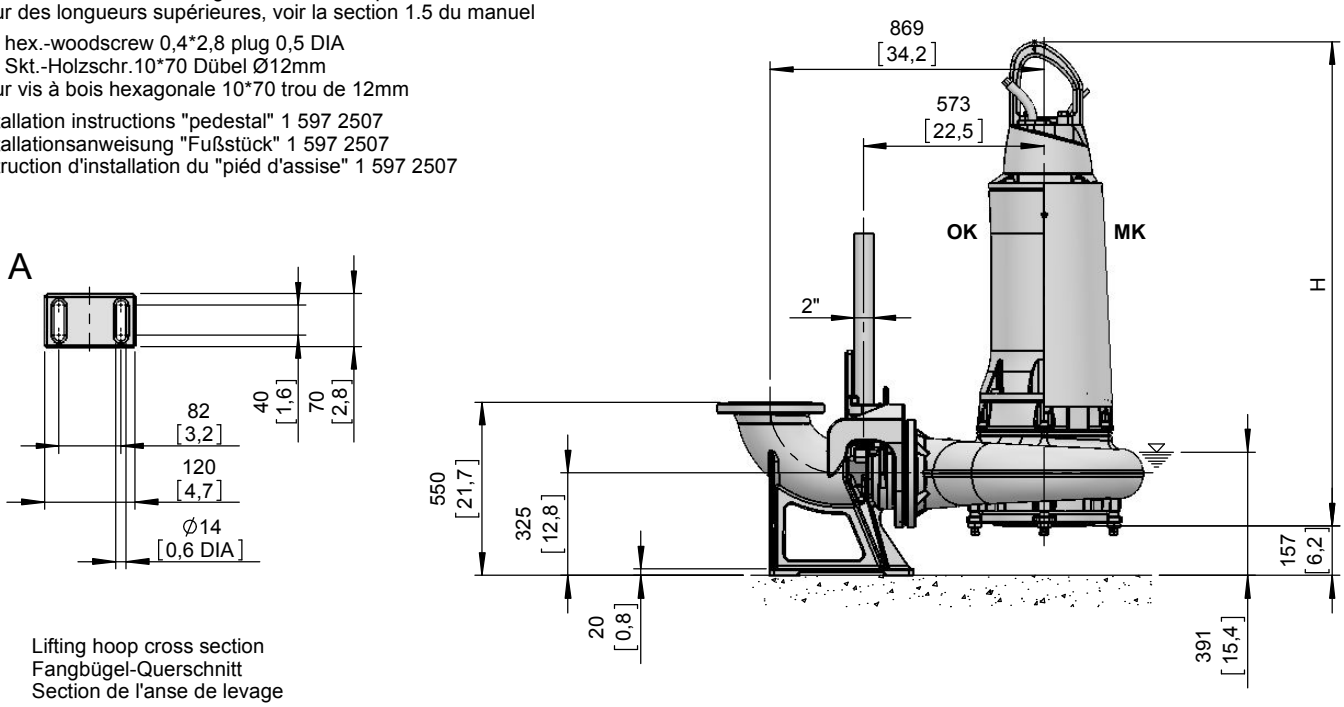
min. Sump opening
min. Schachtöffnung
Largeur mini de la trappe

Weight: Includes pump, skirt base and 10m cable
Gewicht: Beinhaltet Pumpe, Pumpenständer und 10m Kabel
Poids: Pompe, coulisseau et 10m de câble

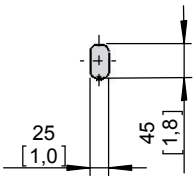
For different cable length see IOM, chapter 1.5
Für abweichende Kabellänge siehe EBA, Kapitel 1.5
Pour des longueurs supérieures, voir la section 1.5 du manuel

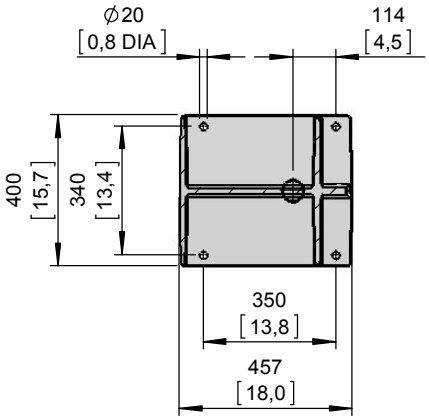
For hex.-woodscrew 0,4*2,8 plug 0,5 DIA
Für Skt.-Holzschr.10*70 Dübel Ø12mm
Pour vis à bois hexagonale 10*70 trou de 12mm

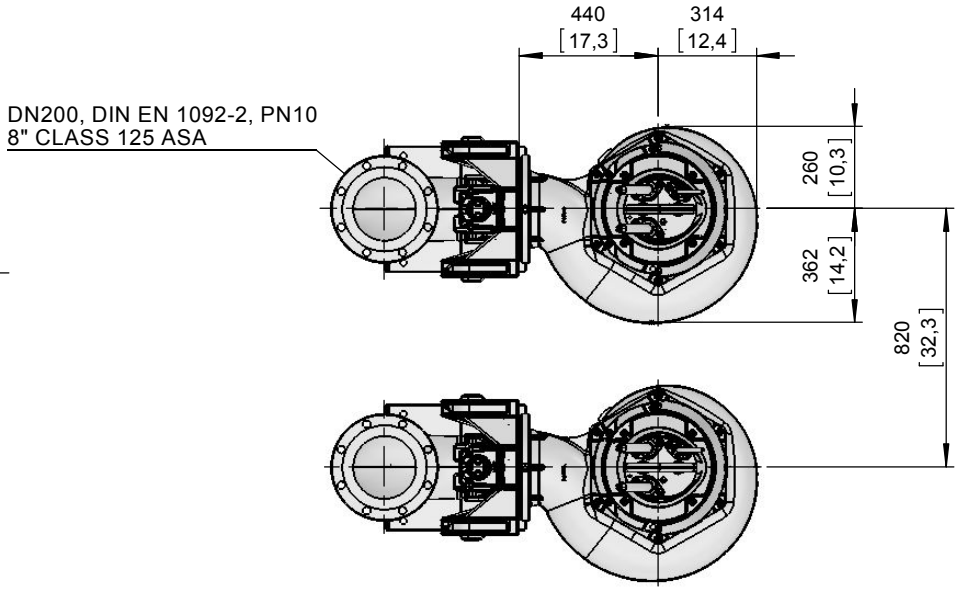
Installation instructions "pedestal" 1 597 2507
Installationsanweisung "Fußstück" 1 597 2507
Instruction d'installation du "piéd d'assise" 1 597 2507



Lifting hoop cross section
Fangbügel-Querschnitt
Section de l'anse de levage







[mm [inch]]

OK = Ohne Kühlmantel
Without cooling jacket
Sans enveloppe de refroidissement

MK = Mit Kühlmantel
With cooling jacket
Avec enveloppe de refroidissement

ABS temperature and leakage relay CA 462

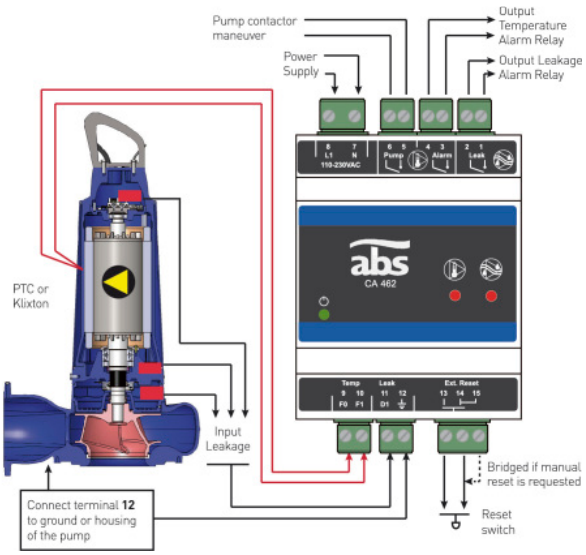
CA 462 is designed to spy and detect leakage and temperature in pumps and mixers.
The amplifier is housed in a norm enclosure fitted for DIN-rail mounting.
The unit is available in two executions, 24 VDC or 110-230 VAC supply.
To minimize the risk of false alarms the leakage failure has to be detected for time duration of approximately 10 seconds.
To simplify the mounting the unit is fitted with plug-in type of connectors.
The unit has separate alarm outputs for temperature and leakage.
CA 462 also has main contactor relay output energized depending on alarm/s with manual reset option.
Included in the kit is also a Zylem MiniCas adaptor.

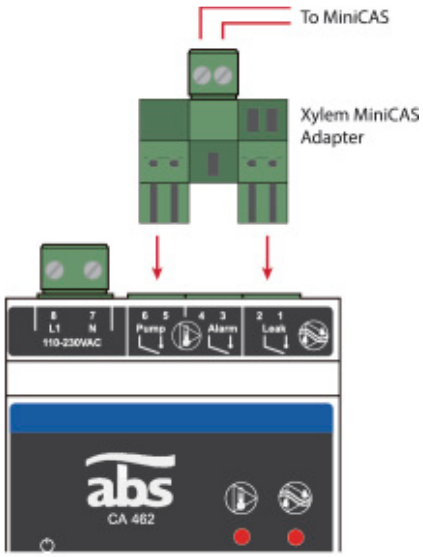
Features

- Leakage monitoring with 10 sec alarm delay
- Wide resistance range, 0-10 kOhm
- Temperature monitoring
- Relay output 250 VAC 3 Ampere
- Connection via plug in connectors
- DIN-rail mounted

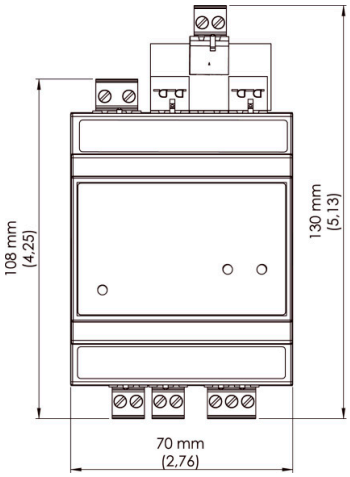
Technical specifications

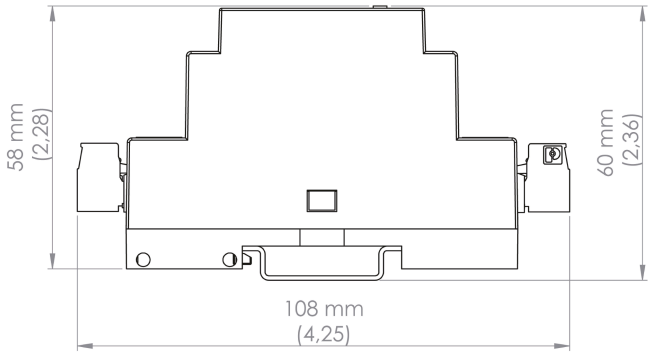
Leakage detection threshold (+/-10%)	< 100 kohm
Temp. input threshold (+/-10%)	> 3.3 kohm (PTC / Klixon)
Alarm delay (Leakage / Temp.)	10 seconds
Ambient operating temperature	-20 to +70 °C (-4 to +158 °F)
Ambient storage temperature	-30 to +80 °C (-22 to +176 °F)
Degree of protection	IP 20, NEMA: Type 1
Housing material	PPO and PC
Mounting	DIN Rail 35 mm
Installation category	CAT II
Pollution degree	2
Flame rate	V0 (E45329)
Humidity	0-95% RH non-condensing
Dimensions	H x W x D: 108 x 70 x 58 mm (4.25 x 2.76 x 2.28 in.)
Power supply	**16907006**: 110-230 VAC / **16907007**: 18-36 VDC SELV or Class 2
Fuse	Max 10 A
Terminal wire size	Use copper (Cu) wire only. 0.2 - 2.5 mm^2 flexible core, stripped length 8 mm.
Terminal tightening torque	0.56 - 0.79 Nm (5-7 lbs-in)
Power consumption	< 5 W
Max load output relay	250 VAC 3 Ampere
Altitude	Max 2000 MASL or 6562 ft. AMSL
Max load output Pump blocking relay	250 VAC 6 Ampere





Dimensions





Alarm and relay function table:

LEDS	LEDS	Relay	Relay	Relay
Leakage	Temp	Pump	Temp	Leak
Alarm		Closed	Open	Closed
Alarm	Alarm	Open	Closed	Closed
		Closed	Open	Open
	Alarm	Open	Closed	Open

ABS leakage relay CA 462 2013-11-08 | We reserve the rights to alter specifications due to technical developments.

Submittal Form

Document title	*Permeate Pumps*
Name	*Decatur – Wastewater Treatment Plant*
Address	*PO Box 247, Decatur, AR, 72722*

Document #, revision #	Submitted by	Pages	Peer reviewer	Prepared by
U18535-C06-0005,00	*H_2O Innovation*	*31*		*D'ON*

Information	Review	Fabrication / procurement	As built
☐	☒	☐	☐

Package description	*MBR System*	
Tags	*N/A*	
Project #	Purchase order #	Submittal # *N/A*
U18535	*Agreement, 13 Dec 2016*	*N/A*

Customer Checklist

☐ 1. Reviewed and no comments. Approved as submitted and no need to resubmit.	Authorized by:
☐ 2. Reviewed, proceed with work and approved once comments are incorporated. No need to resubmit.	Title:
☐ 3. Not accepted, work may not proceed. Revise and resubmit.	Signature:
☐ 4. For information only – No approval required	Date:

Revision Tracking History

H_2O Innovation document #			Customer Document #	Date
Document #	Sequence #	Revision #		
C06	*0005*	*0*		*14-Feb-2017*

Submittal Form

Submittal Modification Tracking List

#	Customer request	H_2O comments	Status *
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

* Status should be “Accepted”, “Info” or “No Change”

Submittal Form

Selection Details

Description	Permeate Pumps
Model	VX186-368Q
Manufacturer	Vogelsang
Connections	Suction and Discharge : 10''
Electrical	3Ph / 60Hz / 480VAC / TEFC
Motor	50 HP
Design point	1826 GPM @ 37 ft

VOGELSANG
ENGINEERED TO WORK

PUMPING & GRINDING PRODUCTS DESIGNED FOR WASTEWATER APPLICATIONS

Wastewater Treatment

Robust Products designed for viscous sludge.

Industry | Mining | Biogas | Agriculture | Wastewater

ROBUST, RESILIENT, RELIABLE!

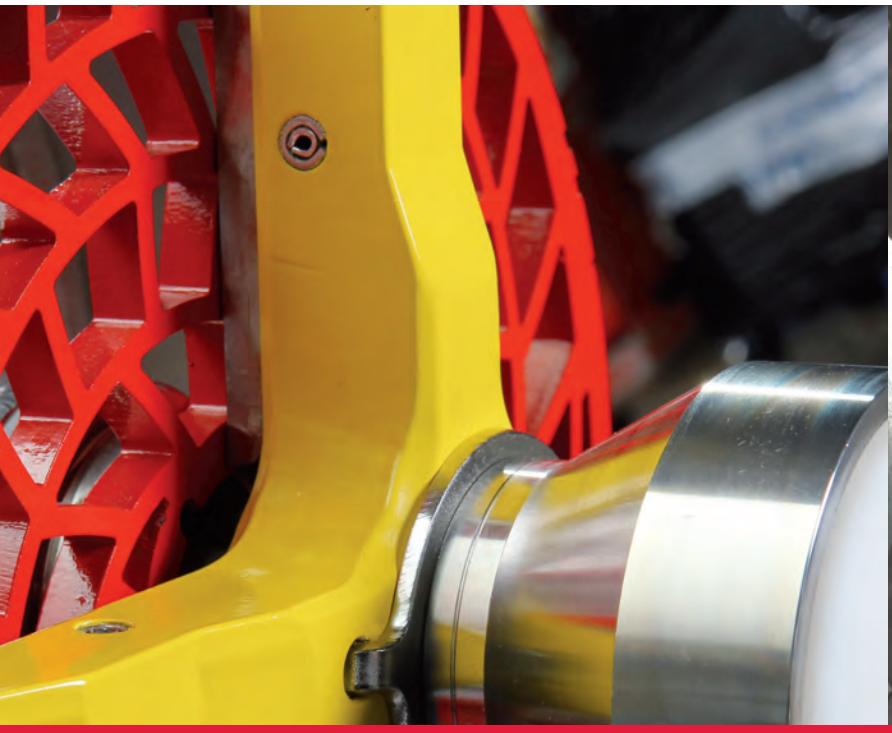
Robust products for tough wastewater applications

Vogelsang has been a leader in the design and manufacture of wastewater pumping and processing products for over 80 years. During this time, we've been responsible for most of the major innovations in positive displacement rotary lobe pump design and the invention and development of the RotaCut Inline Grinder. Additionally we offer the X-Ripper twin shaft grinder for large wet or dry solids grinding. Vogelsang is proud to build its products in the US and also to service thousands of installations and satisfied customers all over the world.

VX series Rotary Lobe Pumps

RotaCut Inline Grinders

X-Ripper Inline Grinders



WORKING WITH VOGELSANG

Cutting Edge Materials

Every application of our products requires ideal material choices to optimize performance and minimize wear. Wherever there is contact or friction between moving parts, we have developed combinations of materials that will optimize the equipment for your specific needs. This benefits you both in equipment life and in product performance. Our wear parts come in several material options to get you the best possible life.

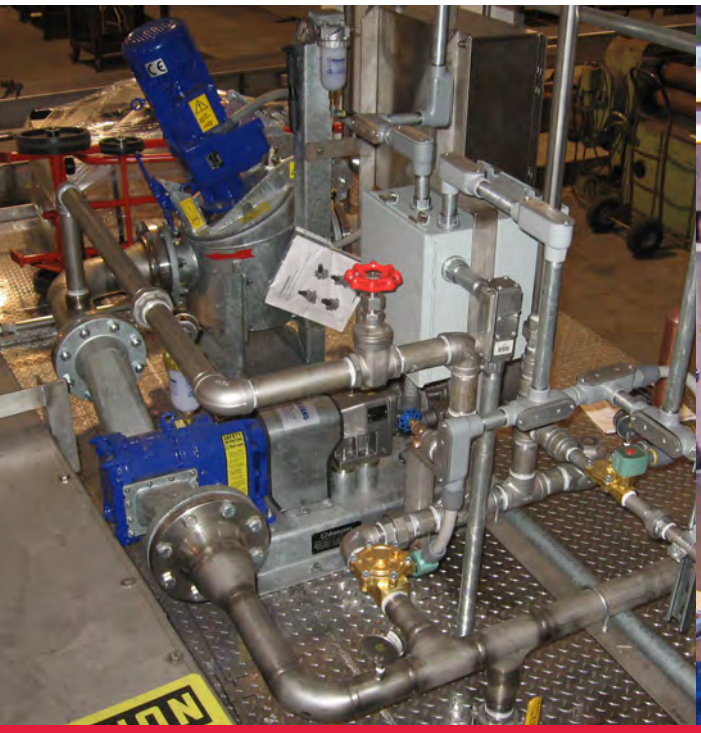
Quality Custom Construction

Our production team will design your equipment to the most effective size and configuration for your application. We can build a compact unit to fit tight installation areas or a special flange design to allow a precise fit into and existing system. Our products are available in many sizes and capacities that will suit many wastewater application requirements. We offer the highest standard of construction and materials to ensure you get the highest quality product possible.

Service & Warranty

Our relationship doesn't end with the sale. Expect quick and expert advice and troubleshooting about our products once they're installed. When you need service or maintenance, we'll be there on time to get your system back up and running fast.

We offer 1-year manufacturers defect warranty to our industrial customers.



ROBUST, RESILIENT, RELIABLE!

High Solids, Heavy Grit & Abrasives

Vogelsang offers the premier positive displacement pump in the wastewater market. Due to the nature of our rotary lobe pump, our exclusive lobe design, most types of wastewater sludge can be pumped throughout your system with ease as compared to progressing cavity, centrifugal and other rotary lobe pumps. Our products are built to pump thick and abrasive sludge with no pulsation. Vogelsang pumps offer quick and easy access to the wet end for inline repair without disturbing connected piping.

HiFlo VX Q series VX100, VX136 & VX186

The VX HiFlo Rotary Lobe Pump Product Line.

Vogelsang offers a full line of Rotary Lobe Pump models to suit various applications and operating conditions. The VX HiFlo Q series is our standard design and works well in most wastewater applications requiring a positive displacement pump. For increased flow and medium pressure, we offer the VX HiFlo QD series which features a much larger wet end and outboard bearing configuration to eliminate deflection. For high flow and high pressure applications, the Marathon QDM2 series handles pressures to over 200psi in a two stage outboard configuration.

All Vogelsang pumps can run dry without damage, self prime and run in forward or reverse. Vogelsang pumps are great for suction lift applications up to 25'. Due to our convoluted HiFlo Lobe design, the pump delivers pulsation free pumping action making it ideal for applications such as dewatering feed.

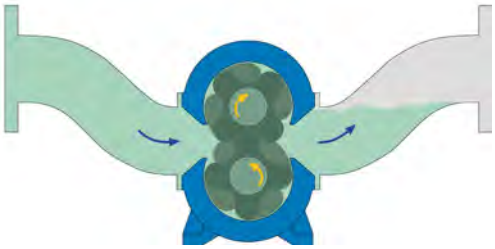
HiFlo VXQ series VX136

HiFlo VXQD series VX186

HiFlo VXQDM2 series

How the Rotary Lobe Pump Works

Two intermeshed lobes are affixed each to gear driven shaft. The shafts rotate in opposite directions. The rotating motion of the lobes creates an expanding cavity on the suction side. This allows fluid to enter and fill the suction side of the pump. The rotors carry the fluid around the housing to the discharge side where it is expelled out of the pump by the closing cavity.



Hard solids are passed through the pump within the cavities between the lobe and outer housing. The Vogelsang pump can pass most any solid that can fit in the cavity. Maximum non-compressible solid size varies by pump model up to 2.5".

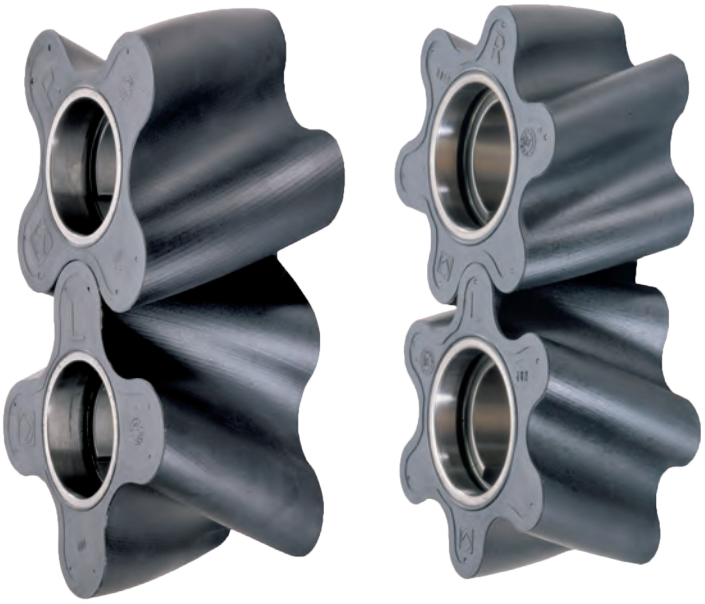
IT'S ALL ABOUT THE LOBES

Pulsation Free, High Abrasives & Low Shear

The state of the art in positive displacement pumps. The HiFlo Lobe has increased capacity compared with former lobe designs while eliminating pulsation. The convoluted design of the HiFlo Lobe provides a large cavity that's perfect for harsh and abrasive sludge. This design also makes it possible to achieve a required pressure at a slower rpm which results in less damage to lobes and minimal wear to the rest of the pump.

The gentle pumping action of the HiFlo Lobe is also friendly to shear sensitive liquids. This also applies to applications where large amounts of entrained air is present in the liquid.

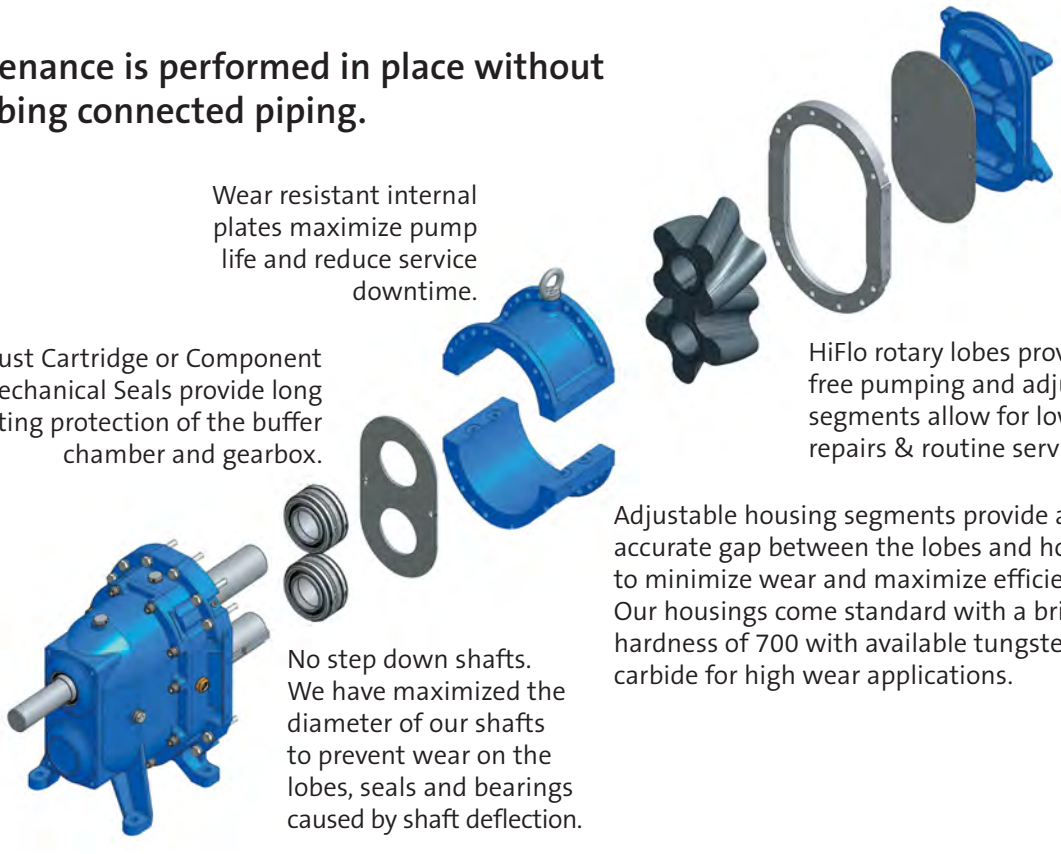
Vogelsang offers six wing lobe options in the VX100 series and four wing for the VX136 & VX186 series. There are several elastomer options for maximum chemical compatibility, abrasiveness and temperature requirements.



Maintenance is performed in place without disturbing connected piping.

Wear resistant internal plates maximize pump life and reduce service downtime.

Robust Cartridge or Component Mechanical Seals provide long lasting protection of the buffer chamber and gearbox.



HiFlo rotary lobes provide pulsation-free pumping and adjustable housing segments allow for low cost wetend repairs & routine service.

Adjustable housing segments provide an accurate gap between the lobes and housing to minimize wear and maximize efficiency. Our housings come standard with a brinnell hardness of 700 with available tungsten carbide for high wear applications.

No step down shafts. We have maximized the diameter of our shafts to prevent wear on the lobes, seals and bearings caused by shaft deflection.

QUICK & EASY INLINE MAINTENANCE

VX Pump Series Performance Specifications:

Model		Capacity gpm	m3/h	Displacement gal/100rev	l/100rev	Max. Solids in	mm	Flange Size in	mm	Max Pressure Q: psi	bar	QD: psi	bar	Max. Speed rpm 1/min
VX100	45	13-60	3-13	7.7	29	.75	20	2.5	65	145	10			1000
	64	22-85	5-19	11.1	42	.75	20	3.0	80	131	9			1000
	90	26-120	6-26	15.6	59	.75	20	4.0	100	102	7			1000
	128	40-170	9-38	22.2	84	.75	20	4.0	100	58	4			1000
VX136	70	45-200	10-45	33.5	127	1.50	40	4.0	100	145	10	174	12	800
	105	65-310	15-70	50.0	190	1.50	40	4.0	125	145	10	174	12	800
	140	90-400	20-90	67.0	253	1.50	40	6.0	125	116	8	174	12	800
	210	130-610	30-140	100.0	380	1.50	40	6.0	150	73	5	145	10	800
	280	180-800	40-180	134.0	506	1.50	40	6.0	150			116	8	800
	420	260-1220	60-280	200.0	759	1.50	40	6.0	150			87	6	800
	140M2	45-200	10-45	33.5	127	1.50	40	6.0	125			232	16	650
	210M2	65-310	15-70	50.0	190	1.50	40	6.0	150			232	16	650
	280M2	90-400	20-90	67.0	253	1.50	40	6.0	150			203	14	650
	420M2	130-610	30-140	100.0	380	1.50	40	6.0	150			174	12	650
VX186	92	90-440	20-100	94.0	356	2.50	61	6.0	125	145	10			600
	130	130-640	30-145	133.0	503	2.50	61	6.0	150	145	10	174	12	600
	184	180-880	40-200	188.0	712	2.50	61	6.0	150	116	8	174	12	600
	260	260-1280	60-290	266.0	1006	2.50	61	8.0	200	73	5	145	10	600
	368	360-1760	80-400	376.0	1424	2.50	61	10.0	250	44	3	116	8	600
	390	390-1920	90-435	399.0	1509	2.50	61	10.0	250	44	3	102	7	600
	520	520-2560	120-580	532.0	2012	2.50	61	10.0	250			87	6	600
	736	720-3520	160-800	752.0	2848	2.50	61	14.0	350			44	3	600
	184M2	90-440	20-100	94.0	356	2.50	61	6.0	150			232	16	600
	260M2	130-640	30-145	133.0	503	2.50	61	8.0	250			232	16	600
	368M2	180-880	40-200	188.0	712	2.50	61	10.0	250			203	14	600
	520M2	260-1280	60-290	266.0	1006	2.50	61	10.0	250			174	12	600

APPLICATIONS

Dewatering Feed Pumps

Our pumps have been widely chosen for to feed dewatering equipment such as Belt Press, Centrifuge and Gravity Belt Thickeners. This is largely due to the pumps ability to deliver sludge to the equipment evenly with no pulsation. An even flow of sludge to the dewatering equipment helps the equipment run as efficiently as possible and with less polymer.

Additionally, it's compact and easy to fit or retrofit onto the same skid as the detwatering unit itself.

Primary & Secondary Sludge

Primary & Secondary Sludge are typically where we find the heaviest concentration of grit and floatable non-organic debris in the wastewater plant. The solids content is usually low; typically 1%-3% solids.

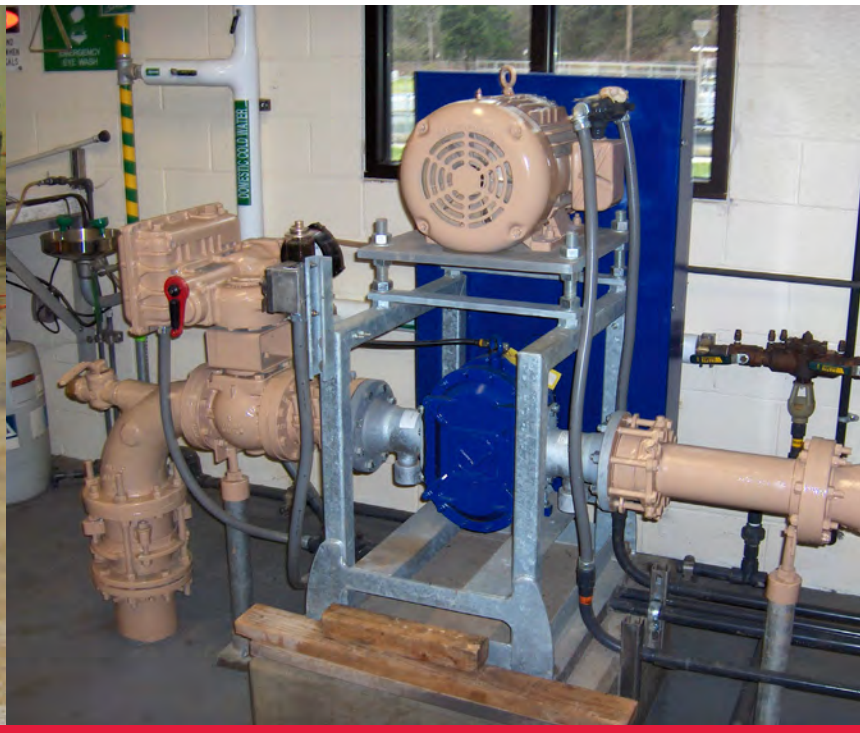
In this application, harder materials of construction are often chosen for the wet end along with abrasive-friendly elastomers for the lobes.

Typical operation of a lobe pump in Primary Sludge is best if the pump pulls a constant low flow of sludge versus intermittent off-on operation.

Digested & Thickened Sludge

Digested & Thickened Sludge applications are very common in wastewater plants that have use either anaerobic or aerobic digestion. These applications are normally between 3-8% solids and mostly very homogeneous in nature. In these applications the operating pump can see light to medium abrasive so the right material of lobes are very critical.

Digested sludge applications require low pulsation in their flow, as they typically feed to dewatering equipment. The lower the pulsation, the more accurate polymer dosage can be applied. Additionally, the pumps can encounter solids like hair and rags that may be difficult to pass by pumps not designed for solids handling.



WAS & RAS

Waste Activated Sludge requires the ability to pump varying viscosity sludge. Due to our HiFlo lobe design, we give you the most efficient positive displacement pump on the market.

WAS & RAS sludge is typically mild as the majority of the grit has settled out. Some grit will remain but it is usually in lower concentration.

The main challenge in pumping WAS or RAS is that it often contains high amounts of entrained air which can cause cavitation if the wrong flanges are installed. We overcome this using our gooseneck flanges, that keeps the pump primed and able to move the sludge through the pump without air locking. Standard materials of construction are sufficient for most applications including NBR lobes and standard wet end with either cast iron or Astempered Ductile Iron (ADI).

Scum & Septage

Scum is usually saturated with air and loaded with inorganics (floatables). Additionally, pumping high concentrations of floatables without sufficient water to move the solids is difficult due to the lack of conveyance. Even though flows are typically pretty low, we often prefer to oversize the pump and run it slower to allow the pump to pass larger solids.

Septage pumping can sometimes be the most difficult application in a wastewater plant, and normally ranges from .5-1% solids. Due to the way it's collected it can contain grease, hard solids, hair, rags, and other solid wastes. The pumps need to pass the solids without damage. Vogelsang pumps are able to pass large solids due to the large cavities in the lobe design.

DAFT

DAFT applications are difficult not only because of the entrained air, but also the thickness of the sludge. Vogelsang pumps are designed for pumping viscous liquids containing heavy solids. A slower operating pump coupled with a wide range of available elastomers is critical. These applications require low speed in order to keep the pump from excess cavitation due to air pockets building in the cavities of the pump. Additionally, you can encounter floating solids, hair and rags that can build-up over time.

SOLIDS REDUCTION, SOLIDS SEPARATION, SLUDGE CONDITIONING

High Performance Grinding, Easy Inline Maintenance

The RotaCut inline grinder effectively reduces solids to specific size requirements, and reduces the costs associated with the operation of downstream equipment. Objects and debris suspended in liquid such as plastic fragments, rubber, hair, rags, applicators, plastic pens, string, wood, bones, etc. are drawn through the cutting screen and cut by the self-sharpening rotary blades into an acceptable size for the downstream equipment to pass.

Standard features include Auto Reverse, Auto Cut Control, self sharpening blades, and reversible cutter screens. RotaCut is 100% rebuildable inline, which eliminates the need to send out cutter cartridges for reconditioning.

Placed on the suction or discharge side of any manufacturer's pump, the RotaCut will eliminate ragging, reduce solids and protect downstream equipment. Protect pumps and dewatering equipment from clogging, prevent damage to belt press and plate and frame press applications, and more efficiently balance your centrifuge feed.

RotaCut RC 3000, RC 5000 & RC 10000 Series

NUMEROUS SIZE & CONFIGURATION OPTIONS

The RotaCut Product Line.

Vogelsang offers a full line of RotaCut models to suit various applications and operating conditions. The RotaCut RC series is our standard design and works will in most wastewater applications suitable for an inline grinder. For increased solids reduction we offer the Pro, Pro Compact & Cyclone series which features a larger collection basin and horizontal head orientation. For more extreme solids handling, the RCX series is available and offers higher pressure, lower headloss and maximum solids reduction at even the highest flows.

RotaCut RCX48 & RCX58

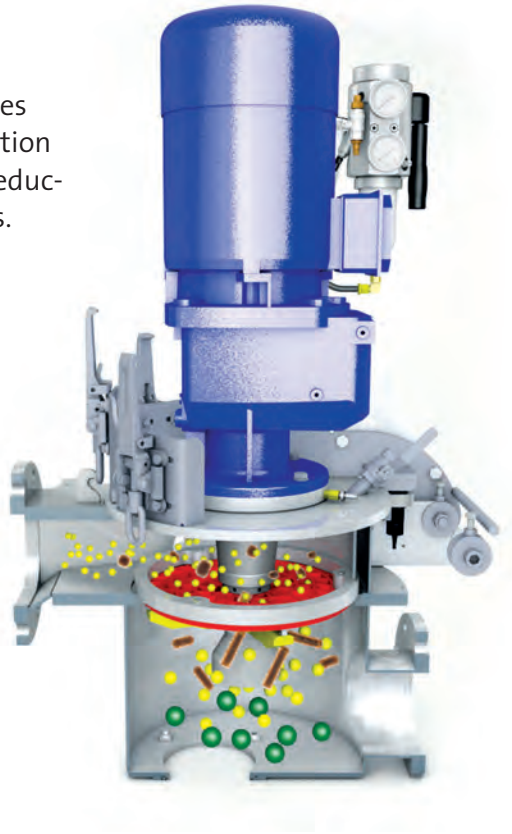
RotaCut Pro Compact

RotaCut Cyclone

RotaCut RCQ

How the RotaCut Works

When placed on the suction side of a pump, the RotaCut effectively reduces floating solids in the liquid stream. Heavy solids are captured in the collection basin and eliminated entirely from the liquid. The combination of solids reduction and separation provides true protection for downstream components.

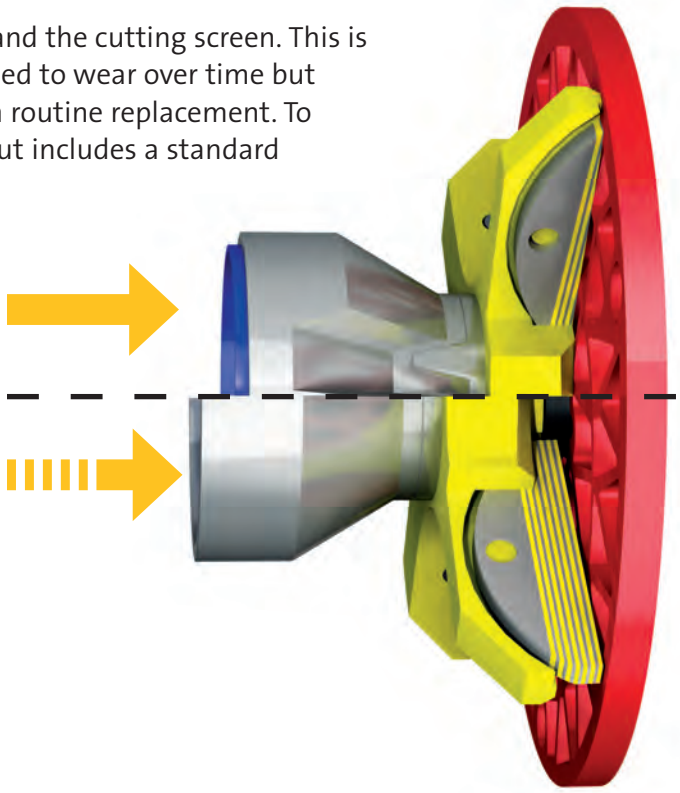


AutoReverse is how the RotaCut handles large objects by reversing the rotation of the blades until the object is cleared, reduced and passed through the screen. AutoReverse engages at preset intervals which keeps the blades wearing evenly. The trailing edge of the blade is sharpened as a natural effect of the cutting process. When the rotation is reversed a fresh edge enhances the cutting quality.

INCREDIBLE SOLIDS HANDLING & MAXIMUM LIFE CYCLE

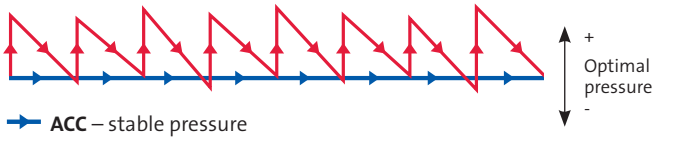
Quality Performance & Control

The RotaCut requires direct contact between the blades and the cutting screen. This is how it achieves the scissor-like cut. The blades are designed to wear over time but must wear evenly to achieve maximum lifecycle between routine replacement. To ensure that the blades last as long as possible, the RotaCut includes a standard feature know as Auto Cut Control or ACC.



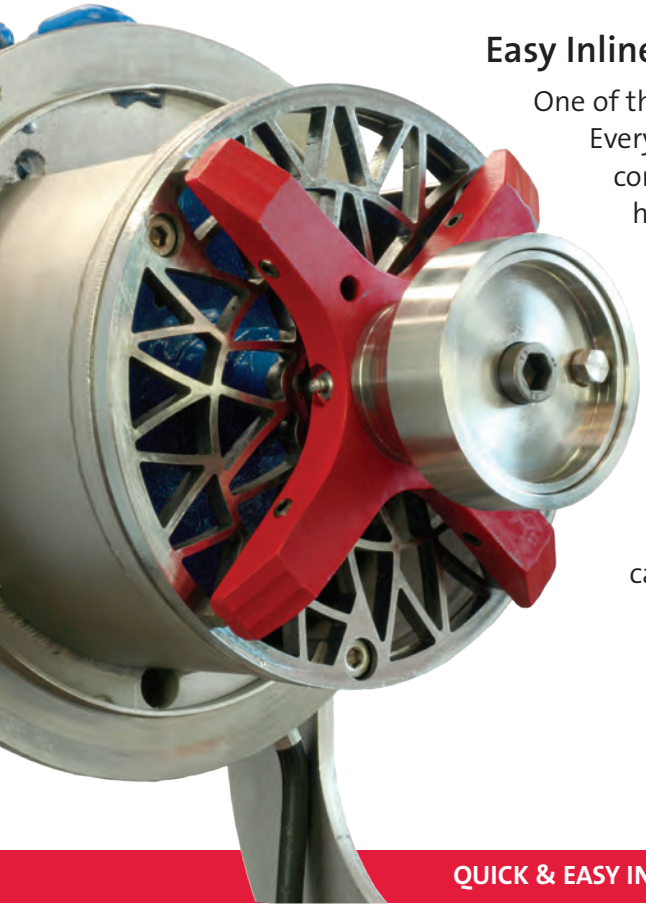
ACC ensures high cutting performance at all times by automatically adjusting the blades as normal wear progresses. ACC completely eliminates manual maintenance of the cutting head tension. The entire process is controlled externally which minimizes the need to open the unit.

The diagram below demonstrates the difference between manual adjustment versus real time automatic pressure optimization.



ACC – stable pressure

Manual preloading system: fluctuating pressure; excessive pressure causes unnecessary wear



Easy Inline Maintenance

One of the best features of the RotaCut is how easy it is to maintain. Everything can be done inline in minutes without removing any connected piping. The RC series are all designed with a hinged cutting head that can be accessed by disengaging one or more hand latches. The head is disassembled by removing the allen bolt that holds the entire assembly together. At this point routine service such as blade or screen changes can be performed quickly.

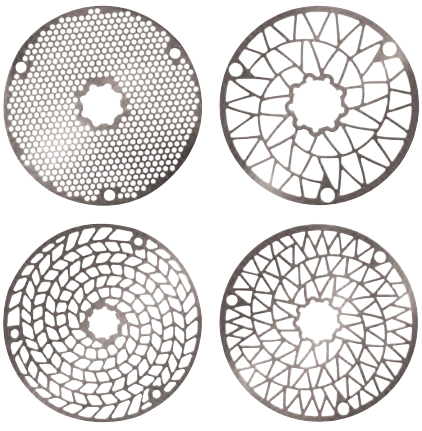
The RCX model features a quick release door allowing access to the cutting head.

Typical routine service such as changing blades or flipping the reversible cutting screen takes only a fraction of the time required to service a typical twin shaft grinder. In addition there are no cartridge style parts that require factory refurbishment.

QUICK & EASY INLINE MAINTENANCE

RotaCut Grinder Performance Specifications:

Model	Capacity gpm	Capacity m3/h	Motor Power hp	Motor Power kW	Cut Solids in	Cut Solids mm	Flange Size in	Flange Size mm	Max Pressure psi	Max Pressure bar	Motor Gear	Motor Hyd	Speed Options rpm 1/min
RCQ 20 Inline	396	90	1.5-3.0	1.1-2.2	.39-0.78	9-20	4	100	30	2	Yes	No	87-320
RC 3000 Inline	792	180	2.0-5.0	1.5-4.0	.31-1.10	8-28	6	150	30	2	Yes	Yes	76-326
RC 3000 Cyclone	792	180	2.0-5.0	1.5-4.0	.31-1.10	8-28	6	150	6	.5	Yes	Yes	76-326
RC 5000 Inline	1320	300	2.0-10.0	1.5-7.5	.15-1.18	4-30	6	150	30	2	Yes	Yes	73-330
RC 5000 Cyclone	1320	300	2.0-10.0	1.5-7.5	.15-1.18	4-30	6	150	6	.5	Yes	Yes	73-330
RC 5000 Compact	1320	300	2.0-10.0	1.5-7.5	.15-1.18	4-30	6	150	44	3	Yes	Yes	73-330
RC 10000 Inline	2640	600	3.0-10.0	2.2-7.5	.15-1.50	4-38	8	200	30	2	Yes	Yes	66-319
RC 10000 Cyclone	2640	600	3.0-10.0	2.2-7.5	.15-1.50	4-38	8	200	6	.5	Yes	Yes	66-319
RC 10000 Compact	2640	600	3.0-10.0	2.2-7.5	.15-1.50	4-38	8	200	44	3	Yes	Yes	66-319
RC 10000 Compact XL	2640	600	3.0-10.0	2.2-7.5	.15-1.50	4-38	8	200	44	3	Yes	Yes	66-319
RCX 48 Inline	2640	600	7.5-15.0	5.5-11.0	.15-1.50	4-38	8	200	87	6	Yes	No	114-311
RCX 58 Inline	3300	750	10.0-20.0	7.5-15.0	.31-1.33	8-34	10	254	87	6	Yes	Yes	94-276



Specify a required cut size using one of several pattern cutting screens.

Screens come several patterns that will produce a designated size solid. The rotational speed of the cutting head also influences the solid size. The examples shown will produce a different solid size and are easily interchangeable should operating conditions change. Screens are available in several material options for high wear applications. All RotaCut screens are reversible to allow for a fresh cutting surface without buying a new spare part.

HEAVY WET & DRY SOLIDS REDUCTION

Heavy Solids Grinding

The X-Ripper twin shaft grinder effectively reduces large solids to manageable size for further solids reduction or for downstream pumps and equipment to process without clogging or damage.

What sets the X-Ripper apart from other twin shaft grinders is its unique cutting elements. Traditional twin shaft grinder cutters are stacked up along the shaft using smaller individual blades and components. The main disadvantages of the traditional design is the complexity of maintenance and high cost of repair. Periodic factory service is required to keep a traditional twin shaft grinder operating efficiently which affects maintenance costs and increases downtime.

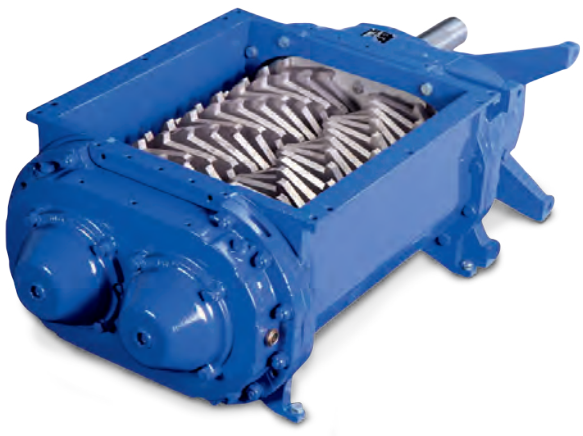
The X-Ripper features solid ripper rotors that are precision machined out of high quality hardened alloy. They are not built up out of several smaller pieces like typical twin-shaft grinders. Our cutters provide long lasting grinding performance and are easy to replace without removing any connected piping or sending parts back to the factory.

X-Ripper XRSQ

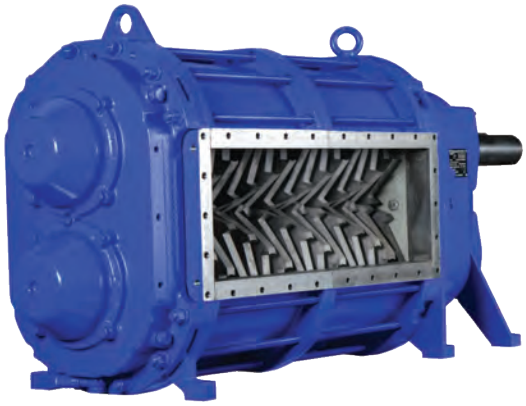
WET OR DRY GRINDING CONFIGURATIONS

The X-Ripper Product Line.

Vogelsang offers two main configurations, the XRS Q and QD, designed to operate in an inline fluid stream condition. There is also one configuration, the XRL QD, designed to operate in a wet or dry feed condition. The XRS comes in several housing sizes and wet-end options to suit numerous flow rates and solids handling conditions. The XRL is designed to work with a hopper feed and an adjustable frame. This allows it to be worked into an existing system with minimal retrofitting.



X-Ripper XRL QD

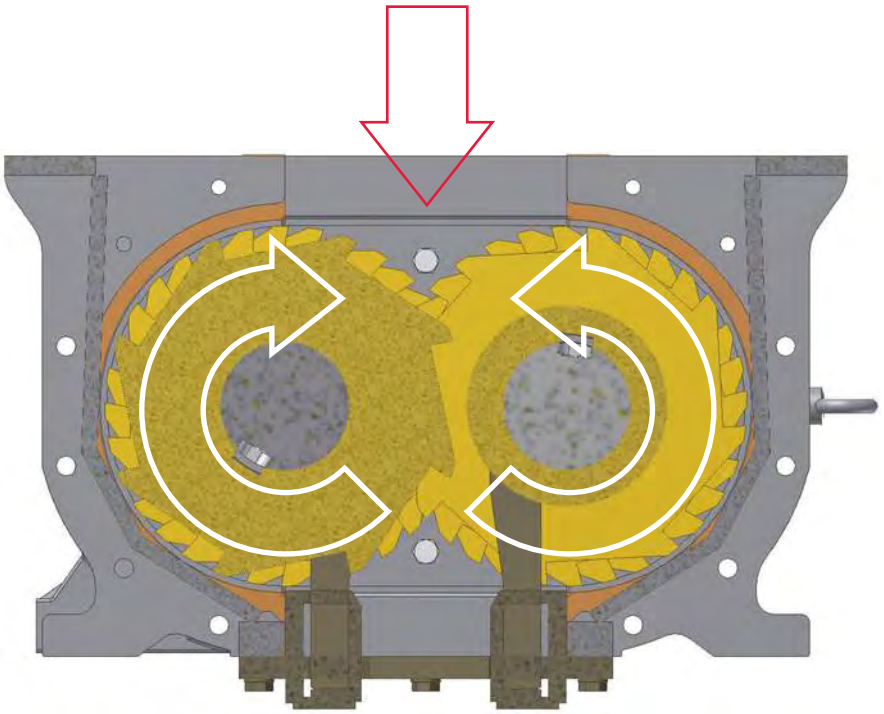


X-Ripper XRS QD

How the X-Ripper Works

The X-Ripper grinds and reduces solids by means of two rotating ripper rotors. Each rotates in the opposite direction towards the center of the device. This draws solids between the ripper rotors which effectively grinds the solids as they pass through.

To enhance the grinding effect, one of the cutting elements is rotating faster than the other. The difference in rotational speed enhances the overall ripping effect of the device.



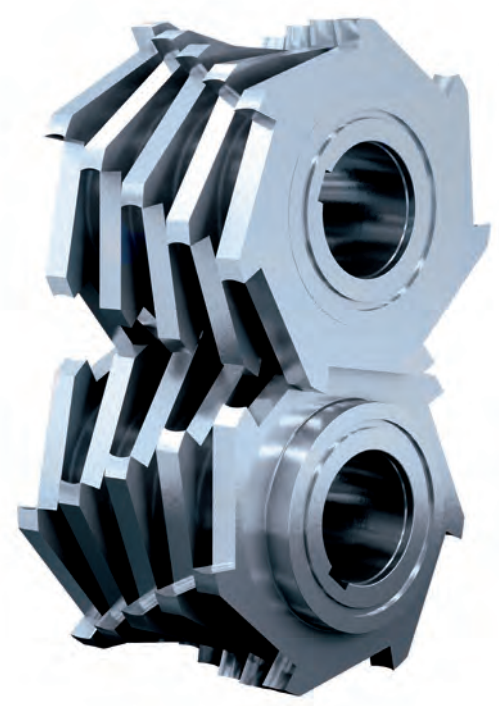
INCREDIBLE SOLIDS HANDLING & MAXIMUM LIFE CYCLE

Quality Performance & Control

The X-Ripper's cutting performance can be controlled in two ways. The first method is by the width of the blades. The XRS 100, 136 & XRS 186 allow for optional blade widths which generate different cuts. Finer blade width results in a more reduced solid.

The other way to influence cut size is by rotation. Higher RPM also produces a finer cut.

The cutters are precision machined from as a single piece. They are made from specially processed steel that is formulated to be ductile inside with an incredibly hard surface. This creates a cutting element that is highly resistant to impact while retaining sharp edges.



Easy Inline Maintenance

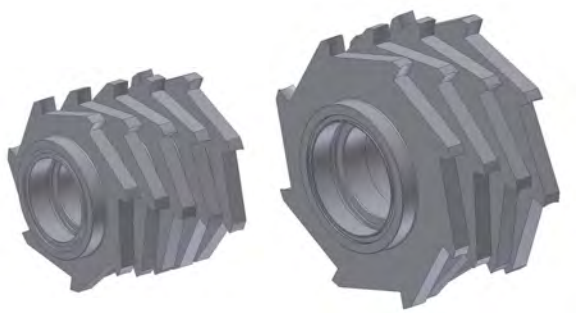
By comparison to a traditional twin shaft grinder, the X-Ripper is easy to maintain. Everything can be done inline in without removing any connected piping. The front cover is removed for easy access to the wet end or cutting area. The X-Ripper's ripper rotors are both removed at the same time and come off in solids sections versus individual pieces.

Typical routine service such as changing rotors takes only a fraction of the time required to service a typical twin shaft grinder. In addition there are no cartridge style parts that require factory refurbishment.

QUICK & EASY INLINE MAINTENANCE

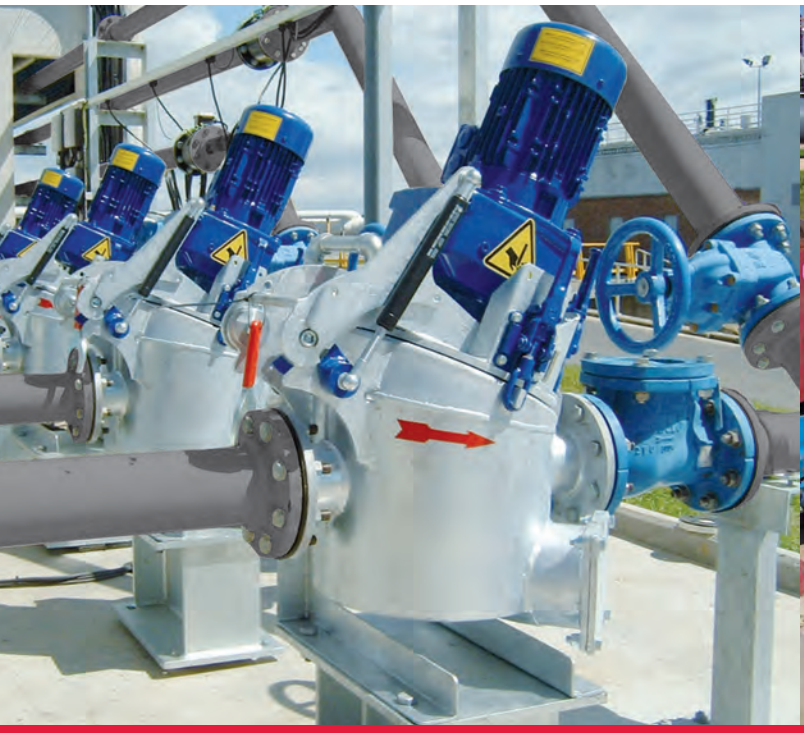
X-Ripper Grinder Performance Specifications:

Model	Capacity gpm	m3/h	Operating Torque in. lbs.	Nm	Cut Solids in	mm	Flange Size in	mm	Max Pressure psi	bar	Solids Wet	Dry	Speed rpm 1/min
XRS100-64Q	176	40	2655	300	.32	8	3	80	131	9	Yes	No	800
XRS100-90Q	242	55	2655	300	.32	8	4	100	131	9	Yes	No	800
XRS136-140Q	484	110	10620	1200	.47	12	6	150	174	12	Yes	No	650
XRS136-140QD	484	110	10620	1200	.47	12	6	150	174	12	Yes	No	650
XRS186-130Q	748	170	21240	2400	.59	15	6	150	174	12	Yes	No	500
XRS186-130QD	748	170	21240	2400	.59	15	6	150	174	12	Yes	No	500
XRS186-260QD	1584	360	21240	2400	.59	15	8	200	145	10	Yes	No	500
XRS186-520QD	2994	680	21240	2400	.59	15	10	250	87	6	Yes	No	500
XRL186-260QD	88	20	21240	2400	.59	15	n/a	n/a	29	2	Yes	Yes	500
XRS186-520QD	176	40	21240	2400	.59	15	n/a	n/a	29	2	Yes	Yes	500



Specify a required cut size using one of several cutting elements.

X-Ripper models 100, 136 & 186 have optional blade widths. The XRS 136 features optional cutting elements in .38" or .54" widths. The XRS 186 or XRL 186 features optional cutting elements in .31", .41" or .63". A width is selected based on the application, solid type and operating conditions.



APPLICATIONS

Our grinders have been widely chosen for handling solids and conditioning sludge in a variety of applications throughout a wastewater treatment plant.

RotaCuts are generally placed in front of pumps and process equipment that are vulnerable to damage by liquids containing hard solids, fragments and debris commonly found in wastewater sludge streams.

In many cases, a RotaCut can replace an inline twin shaft grinder in common wastewater applications.

Primary Sludge

Primary Sludge is a tough application for most any grinder. The typically heavy concentration of grit and floatable non-organic debris creates the need for a grinder that can perform and last in these operating conditions.

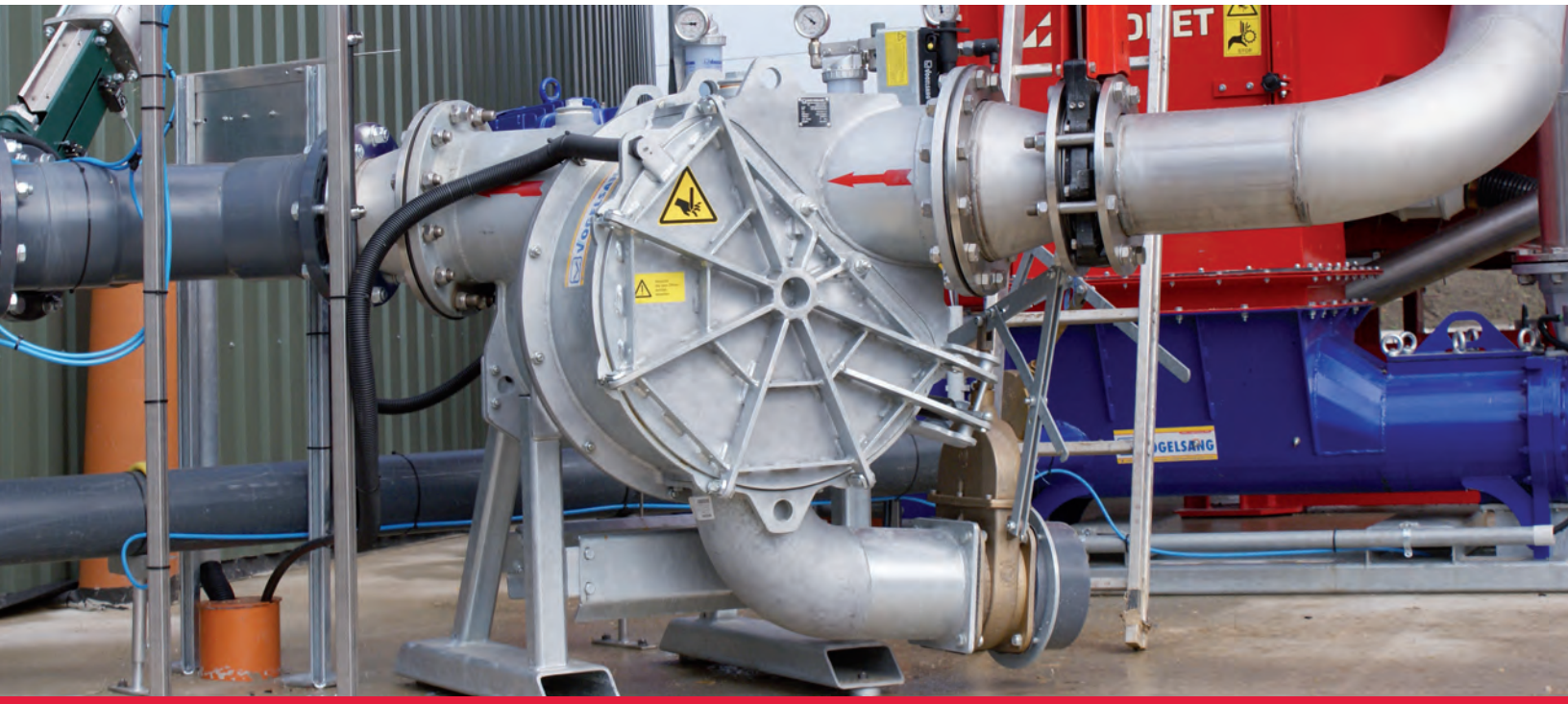
In this application, The RCX Series is recommended due to its high flow range, low head loss and overall robust construction. The RCX has a very large cutting area for its footprint and can be retrofitted into an existing system in a variety of ways.

Sludge Transfer

Moving sludge from one process to the next creates an opportunity for damaging debris to find its way into process equipment where it doesn't belong.

Adding a RotaCut in key locations throughout the overall system, eliminates solids from the stream before they can cause harm to potentially sensitive components.

A RotaCut model will be recommended based on the flow range, fluid type and operating conditions. Vogelsang offers the largest range of inline rotary style single shaft grinders in the wastewater market and will recommend the right model for your specific requirements.



Dewatering Feed

Adding a RotaCut in front of a Belt Press, Centrifuge, Gravity Belt Thickener or most any other dewatering device protects it from harmful solids, excess grit and floatables.

Additionally, the rotating action of the cutting head conditions the sludge into a homogenous suspension that flows evenly into the device. Combined with the pulsation free flow provided by our pumps, the dewatering equipment is fed fully conditioned sludge free of potentially damaging elements.

Digester Feed

Much like feeding dewatering equipment, the RotaCut is also well suited to prevent heavy objects from entering the digester. In the process, the sludge is also conditioned to a homogenous suspension ready for digestion.

The RotaCut offers a distinct advantage over twin shaft grinders in feeding applications. The scissor-like cutting action reduces rags, hair and other fibrous objects into fine particles. Twin shaft grinders tend to rip these solids into longer shredded pieces. The presence of larger solids in the liquid interferes with the process and can cause blockages.

Digester Cleaning

Digester cleaning is a particularly harsh application. Depending on the solids handling performed on the inbound sludge stream, evacuating heavy residual sludge can be a high-wear application for most inline grinders.

As with Primary Sludge, we often recommend our RCX series RotaCut due to it's powerful design and robust construction. The RCX powers through thick sludge containing high amounts of heavy solids, grit and other debris that is known to settle in the bottom of digesters used for municipal, industrial or agricultural wastewater.

VOGELSANG
ENGINEERED TO WORK

Our company

Innovation and progress have been hallmarks of Vogelsang for over 80 years and have made us a leading designer and manufacturer of pumping, solids handling and process products. Time and time again we have achieved significant milestones of innovation and product development. Today, we manufacture some of the most innovative and reliable products for municipalities, industry and agriculture.

Our products are proudly made and assembled in Ravenna, Ohio, USA.

Our product range

We offer solutions for the following areas:

- Industry & Processing
- Wastewater treatment
- Biogas
- Railway wastewater disposal
- Agriculture

We offer a broad range of products:

- Rotary lobe pumps
- Grinding technology
- Distributors
- Spreading technology
- Supply and disposal systems
- Complete solutions

We also offer customized solutions for your specialized applications.

How to reach us

Vogelsang is present worldwide. Visit us online for more information about our company and wide range of services:

Vogelsang
7966 State Route 44 • P.O. Box 751
Ravenna, Ohio 44266, USA

Toll Free: 800.984.9400
Tel: 330.296.3820
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vogelsangusa.com

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Specification Sheet (1/2)

VOGELSANG

PROCESS CONDITIONS

Customer Number	131713	Abrasion	None
Customer Name	H2o Innovation	Abrasiveness (1-10)	1- not Abrasive like Water, Juice
Project	U18535	Suction Condition	0.0 ft. flooded
Quote Number		Requested Capacity	1826 gpm
Quote Position Number	1	Discharge Pressure	16.0 psi
Number of Pumps	3	Discharge Head	37 ft
Pumping Temperature	100 °F	Inlet Pressure	0.0 psi
Viscosity	not Provided	Differential Pressure	16.0 psi
Density	not Provided	Actual Capacity	1904.3 gpm
Specific Gravity	not Provided	Motor HP Reserve %	10%
Liquid PH	7	Rated Power	39.5 BHP
Chloride Content	not Provided	Pump Speed	530 RPM
% Solids	not Provided	Rated Volumetric Efficiency %	95.20%
Solid Size		Starting Torque	4301 in.lbs.
NPSH-Available	31.14 ft.	Running Torque	4703 in.lbs.
NPSH-Required	11.98 ft.	Tag Number 1	Not Specified
Medium	Permeate		

POSITIVE DISPLACEMENT PUMP INFORMATION

Pump Part Number	PPK0567	Mechanical Seal Type	Cartridge
Pump Model	VX186-368Q	Mechanical Seal Single/Double	Single Mechanical Seal
Material of Construction	Grey Cast Iron	Seal Carrier Material	Mild Steel
Cover Type		Material Block Ring 1	304 Stainless Steel (1.4301)
Housing Segment Material	0.6025 (Grey Cast Iron)	Material Block Ring 2	None
Housing Segment Coating	None	Material Mechanical Seal 1	Duronit
Housing Segment Form	Straight	Material Mechanical Seal 2	None
Direction of Flow	Bi-Directional	Thrust Washer Material	Mild Steel
Rotary Lobe Material	NBR	Strain Bolt Material	Galvanized
Rotary Lobe Coating		Pump Shaft Top	Motor Shaft Long Ø60
Rotary Lobe Form	HiFlo®	Pump Shaft Bottom	Motor Shaft Short
Rotary Lobe # of Wings	4	Pump Length	35.8 inch
O-Ring Material	NBR	Pump Width	13.0 inch
Lip Seal Material	HNBR	Pump Weight	333 lbs
Wear Plate Material	High Wear Resistant Special Steel	Pump Shaft Diameter	85 mm
Wear Plate Coating	Galvanized	Pump Shaft Diameter (Flange)	60 mm
Oil Bottle	Standard Pressurized Oil Bottle	Pump Shaft Length	5.5 inch
Buffer Chamber Fluid	Titan Gear MP90 Gear Oil	Maximum Shaft Deflection	0.0156 inch

TESTING INFORMATION

Performance Test - Level A	Yes

PERFORMANCE DATA

	Pump	15 Hz	50 Hz	60 Hz	
Pump Speed	509	133	442	530	RPM
Flow Rate (new)	1826	408.3	1571.9	1904.3	gpm
Flow Rate (used)	1743.2	320.9	1488.2	1821.8	gpm
Starting Torque	4301	4301	4301	4301	in.lbs.
Running Torque	4610	3571	4335	4703	in.lbs.
Starting Power	34.7	7	23.2	27.8	BHP
Running Power	37.2	7.5	30.4	39.5	BHP
Efficiency (Volume)	95	81.6	94.3	95.2	%
Efficiency (Total)	45.8	50.8	48.3	44.9	%
Dynamic Pressure Reduction	3.15	0.21	2.37	3.41	psi
NPSH-r	11.38	6.56	9.58	11.98	ft

Specification Sheet (2/2)

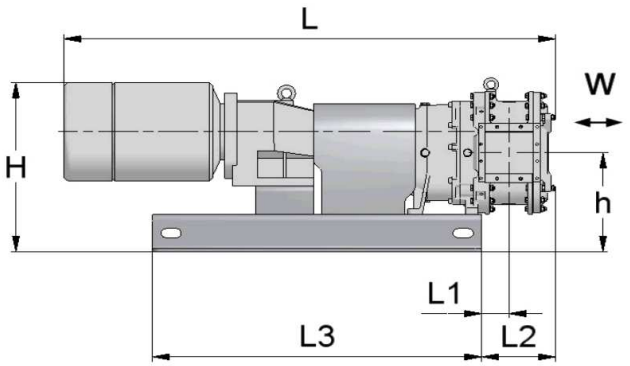
VOGELSANG

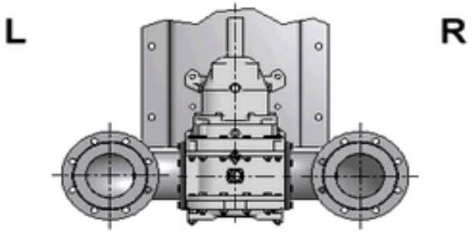
GEARED MOTOR INFORMATION			
Manufacturer	NORD Gear Corp.	Insulation Class	F
Vendor Part Number	SK972.1-225SP/4-530	AGMA Class	III
Voltage	460	KVA Code	J
Frequency	60 Hz	VFD Turndown	10:01 Ratio
Phase	3	Duty	Continuous
HP	50 HP	Thermistors	No
Efficiency %	94.6	Thermostats	No
Motor Speed	1800 RPM	Weight	713 lbs
RPM (Output)	530 RPM	230V Full Load Amps	
Output Torque	5948 in.lbs.	460V Full Load Amps	59.7 A
Gear Ratio	3.33	575V Full Load Amps	
Frame Size	225S	Speed at 9 Hz	
Enclosure	IP 55, TEFC	Speed at 90 Hz	
Gearbox Service Factor	2.50	Temp Rise	Class B
Motor Service Factor	1.15		
COUPLING INFORMATION			
Coupling Manufacturer	TB Woods	Coupling Flange Drive	9S238
Coupling Sleeve	9HS	Coupling Flange Pump	9S60MM
FLANGE CONFIGURATION			
Flange Size	10.0 inch	Right Flange Type	Mild Steel Galvanized, 90° Bend
Left Flange Part Number	GPA.132.T1	Right Flange Material	Hot Dipped Galvanized Steel
Left Flange Type	Mild Steel Galvanized, 90° Bend	Marathon Flange Part Number	N/A
Left Flange Material	Hot Dipped Galvanized Steel	Marathon Flange Material	N/A
Right Flange Part Number	GPA.132.T1	Marathon Flange Configuration	N/A

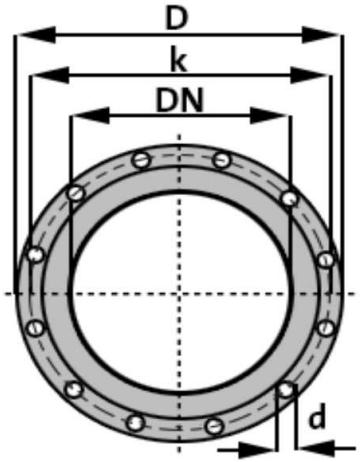
Work Space minimum:
W = 20.63 inch required, 32.44 inch recommended

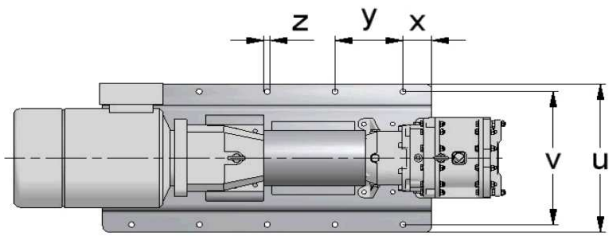
Recommended Anchor Bolts:
Bolt Size: 5/8" Thread UNC / Length min.2.25"

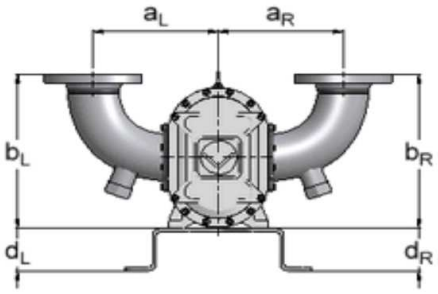
Raised-Face Flange Data Inches	
Norm	ANSI (ASA) B 16.5 "
DN	10 "
D	16 "
k	14.25 "
d	1 "
Hole number	12 "











	inches
L	85.33
H	25.79
L 1	8.35
L 2	18.46
L 3	55.12
L 4	0.00
L 5	0.00
h	14.84
u	22.05
v	20.08
x	7.87
y	9.84
y2	0.00
y3	0.00
z	0.71

dimensions shown in inches
dimensional changes reserved
general tolerances acc to ANSI Std.
created with CAPSlogik

Connector left L	
a_L	16.42
b_L	21.46
c_L	0.00
d_L	4.72
90° Bend	

Connector right R	
a_R	16.42
b_R	21.46
c_R	0.00
d_R	4.72
90° Bend	

Vogelsang Data	
Customer	H2o Innovation
Quote ID	8437401
Sales Order No	
Position No	1

Pump Type	VX186-368Q
Motor	SK972.1-225SP/4-530
Drive Type	In-Line Geared Motor
Guard Type	Coupling Guard, Galvanized
Base Plate	US.GBO.006.TV1.0056
Total Weight	1840 lbs

Vogelsang USA
7966 SR 44, Ravenna, OH 44266
www.vogelsangusa.com

Date 2/13/2017

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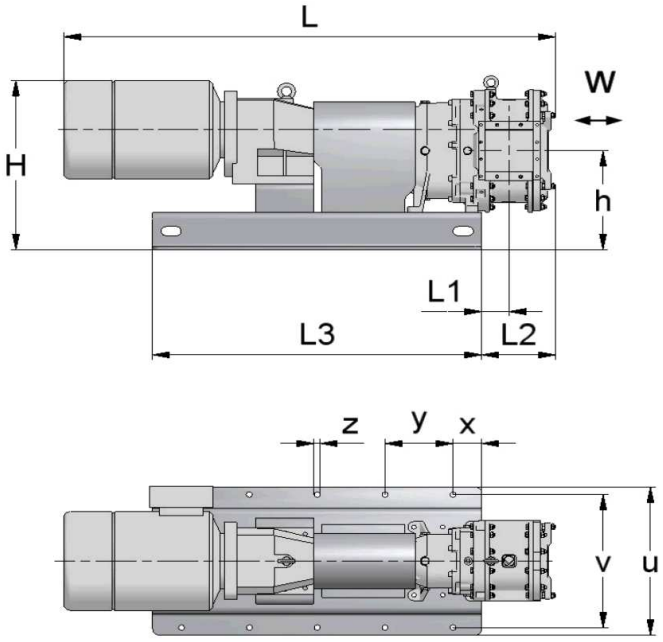
VOGELSANG

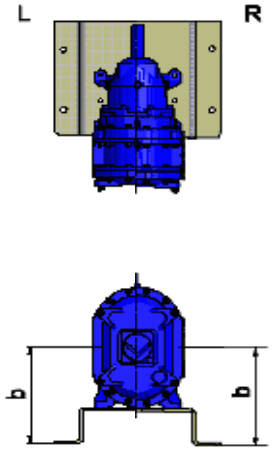
SPARE PUMP

Work Space minimum:
W = 20.63 inch required, 32.44 inch recommended

Recommended Anchor Bolts:
Bolt Size: 5/8" Thread UNC / Length min.2.25"

Raised-Face Flange Data Inches	
Norm	
DN	
D	
k	
d	
Hole number	





	inches
L	85.33
H	25.79
L 1	8.35
L 2	18.46
L 3	55.12
L 4	0.00
L 5	0.00
h	14.84
u	22.05
v	20.08
x	7.87
y	9.84
y2	0.00
y3	0.00
z	0.71

dimensions shown in inches
dimensional changes reserved
general tolerances acc to ANSI Std.
created with CAPSlogik

Tag: SPARE

Connector left L	
a_L	0.00
b_L	0.00
c_L	0.00
d_L	0.00

Connector right R	
a_R	0.00
b_R	0.00
c_R	0.00
d_R	0.00

Vogelsang Data	
Customer	H2o Innovation
Quote ID	8437401
Sales Order No	
Position No	2

Pump Type	VX186-368Q
Motor	SK972.1-225SP/4-530
Drive Type	In-Line Geared Motor
Guard Type	Coupling Guard, Galvanized
Base Plate	US.GBO.006.TV1.0056
Total Weight	1637 lbs

Vogelsang USA
7966 SR 44, Ravenna, OH 44266
www.vogelsangusa.com

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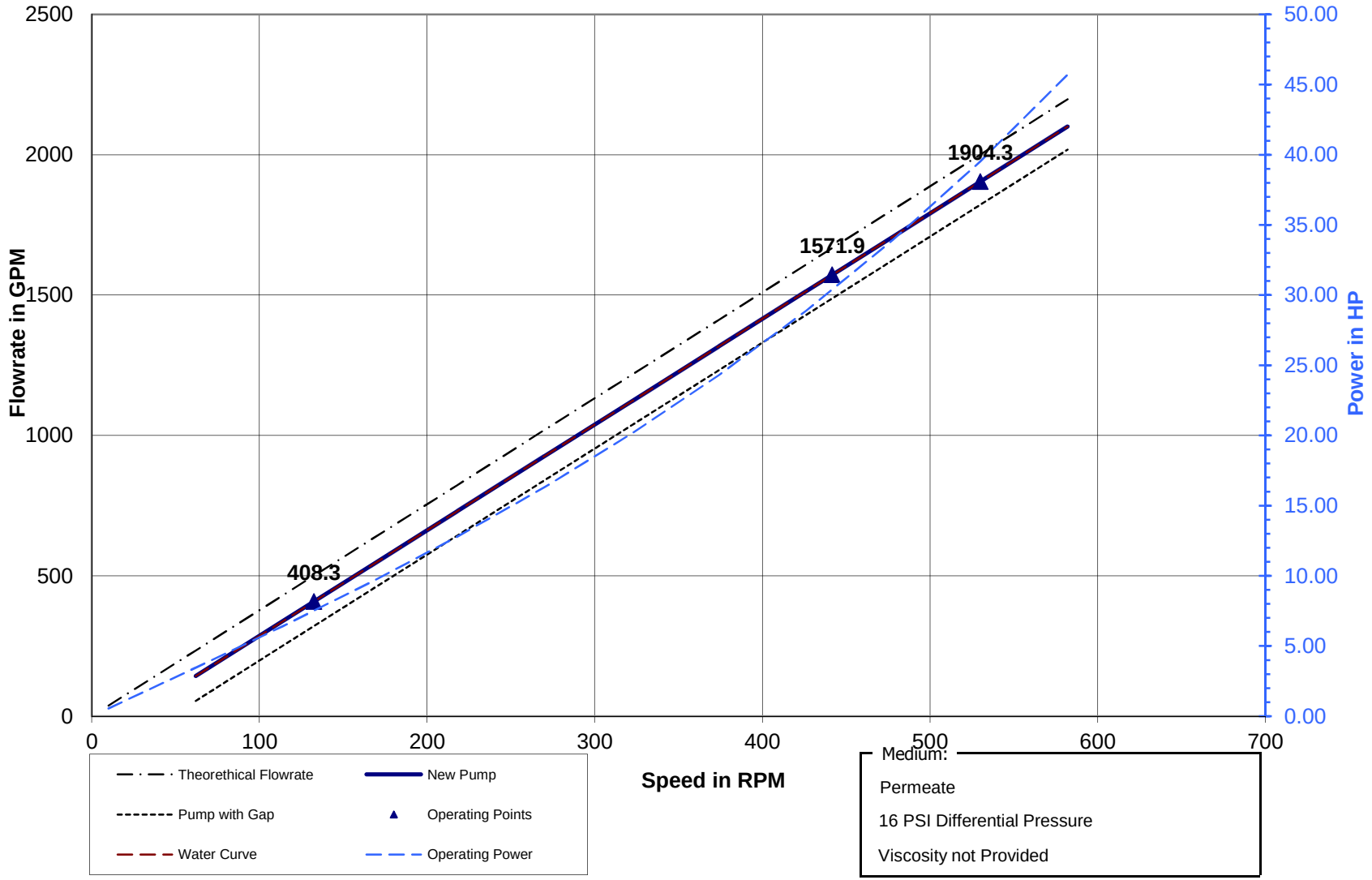
VOGELSANG

VOGELSANG

Flowrate / Speed at Constant Pressure
VX186-368Q

Project: U18535
Quote No.: 8437401
NPSH-R: 11.38 ft.



Submittal Form

Document title	*Permeate Tank*
Name	*Decatur – Wastewater Treatment Plant*
Address	*PO Box 247, Decatur, AR, 72722*

Document #, revision #	Submitted by	Pages	Peer reviewer	Prepared by
U18535-C06-0008,00	*H_2O Innovation*	*6*		*D'ON*

Information	Review	Fabrication / procurement	As built
☐	☒	☐	☐

Package description	*MBR System*	
Tags	*N/A*	
Project #	Purchase order #	Submittal # *N/A*
U18535	*Agreement, 13 Dec 2016*	*N/A*

Customer Checklist

☐ 1. Reviewed and no comments. Approved as submitted and no need to resubmit.	Authorized by:
☐ 2. Reviewed, proceed with work and approved once comments are incorporated. No need to resubmit.	Title:
☐ 3. Not accepted, work may not proceed. Revise and resubmit.	Signature:
☐ 4. For information only – No approval required	Date:

Revision Tracking History

H_2O Innovation document #			Customer Document #	Date
Document #	Sequence #	Revision #		
C06	*0008*	*0*		*8-Mar-2017*

Submittal Form

Submittal Modification Tracking List

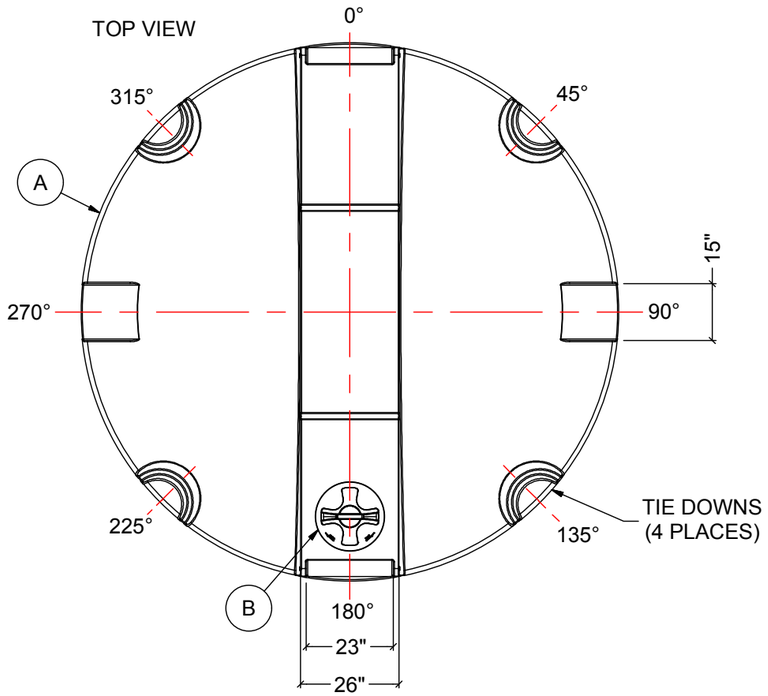
#	Customer request	H_2O comments	Status *
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

* Status should be “Accepted”, “Info” or “No Change”

Submittal Form

Selection Details

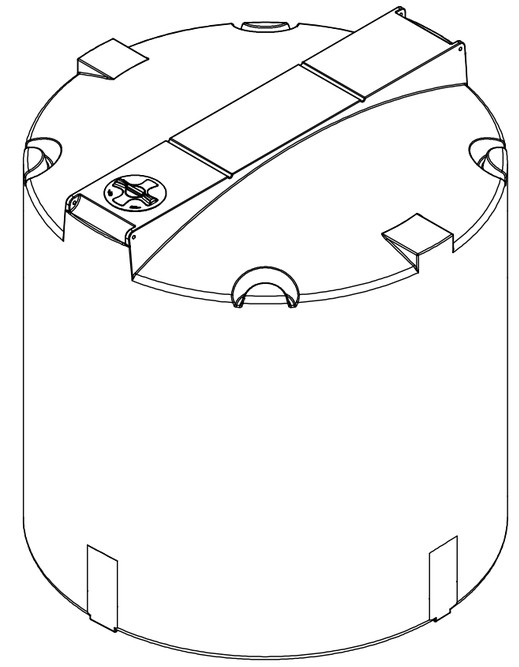
Description	Permeate Tank
Model	CT-7340
Manufacturer	ACO
Connections	See drawings on following pages
Material	HDPE
Size	142” Diameter, 146” High
Volume	8700 gal

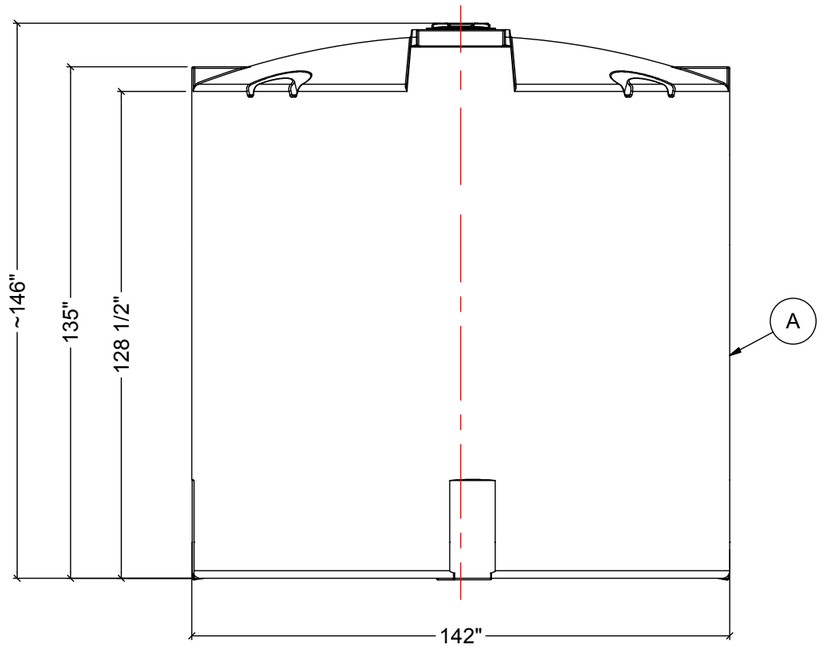


NOTES:

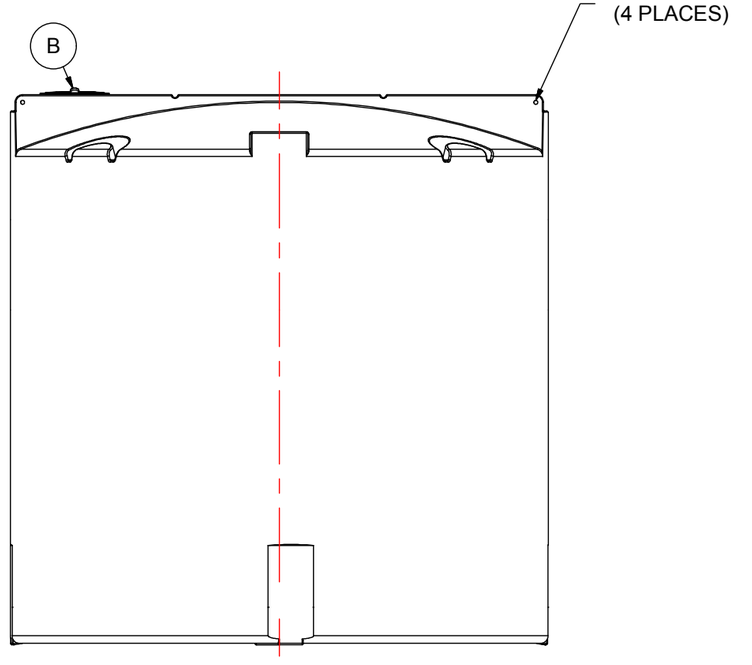
1. TANK IS MANUFACTURED TO ASTM-D-1998 STANDARD.
2. ALL DIMENSIONS ARE APPROXIMATE.
3. TANK CAPACITY APPROX. 33,200 L / 7,300 IG

MATERIALS LIST		
ITEMS	DESCRIPTION	NOTES
A	CT-7340 CLOSED TOP TANK	
B	15" THREADED LID	





FRONT VIEW



SIDE VIEW

REV	DATE	DESCRIPTION	BY	APPD	REVD

REVISIONS

CUSTOMER

TITLE
7300 IG CLOSED TOP TANK

ACO JOB NO:
PURCHASE ORDER NO:
PURCHASER'S EQUIP. NO:

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AND SHALL NOT BE COPIED OR TRANSFERRED WITHOUT THE
WRITTEN CONSENT OF ROTOPLAST INC.

ENGINEERS SEAL

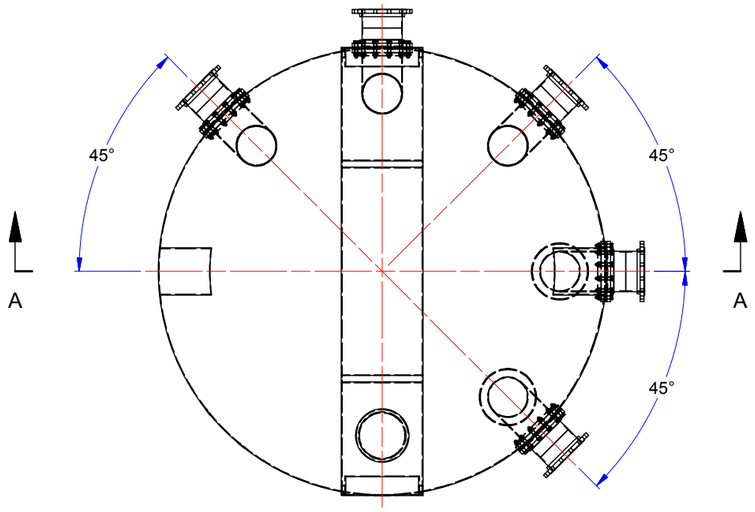
ACO CONTAINER SYSTEMS
DIVISION OF ROTOPLAST INC.
PICKERING - ONTARIO - CANADA

ACO CONTAINER SYSTEMS
DIVISON OF ROTOPLAST INC.
794 MCKAY RD.
PICKERING, ONTARIO, CANADA
TEL. 905-683-8222
FAX 905-683-2969

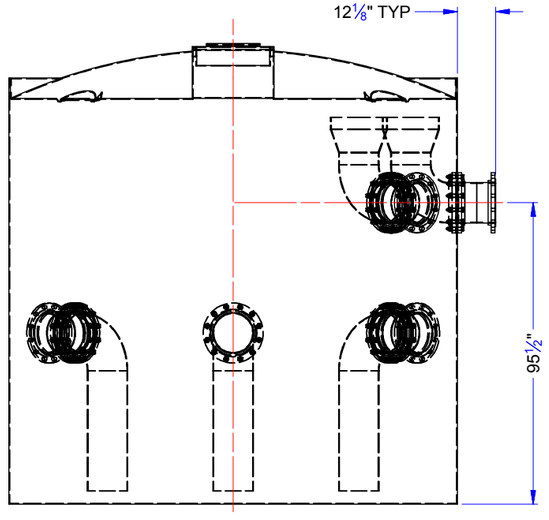
DESIGNED	
DRAWN	WM
CHECKED	
APPROVED	
SCALE	N.T.S.
DATE	02-03-16

DWG No CT-7340

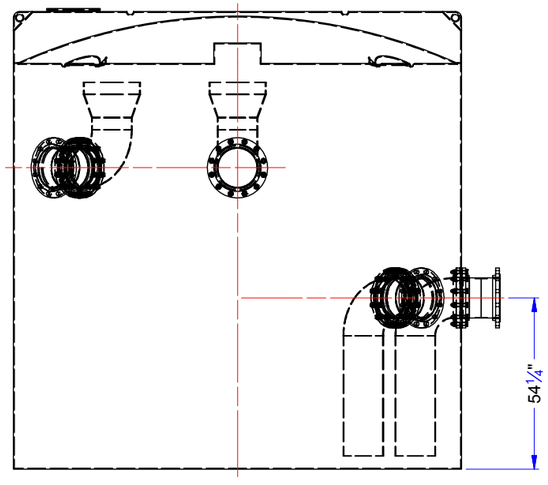
REV 0



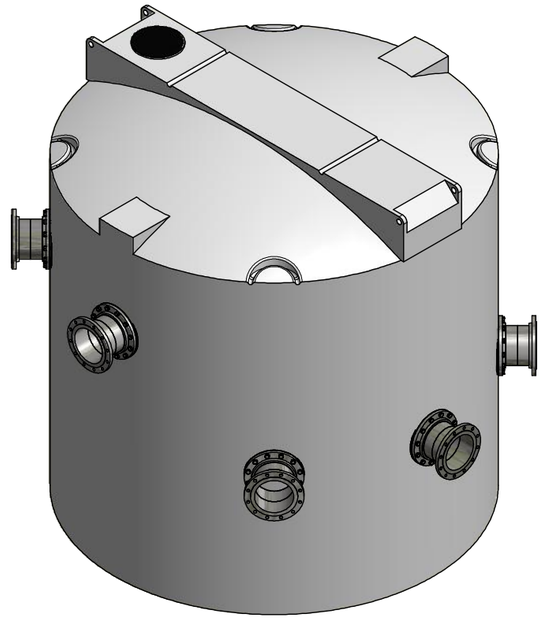
TOP VIEW



FRONT VIEW



SIDE VIEW



ISO VIEW

Preliminary
(CO Pending)

NOTE:
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DRAWING REVISION

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A	02/03/2017	PRELIMINARY	G.B.		D.O'N.	

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UNLESS NOTED OTHERWISE
INTERPRETATION: ANSI Y14.5
TOLERANCES:
FRACTIONS: ±1/64"
DECIMALS .0.X: ±0.030
.0.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±1/64"
HOLE CENTERS: ±1/64"
DO NOT SCALE PRINTS

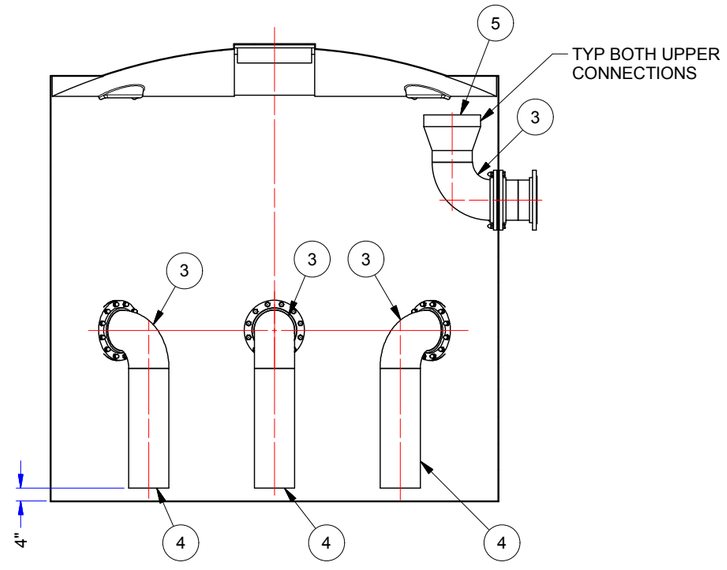
DECATUR MBR RETROFIT
4.6 MGD

TITLE:
PERMEATE TANK
GENERAL ASSEMBLY

SCALE:	DRAWING NUMBER:	REVISION
1/4"=1'	U18535-C06-0790 SHEET: 1 OF 2	A

PARTS LIST FOR ONE (1) ASSEMBLY

ITEM	QTY	PART NUMBER	DESCRIPTION	TOTAL QTY
1	1	ACOCT-7340	ACO CLOSED TOP TANK,7300 GALLONS, 142" DIA X 146" H, ACO CT-7340, HDPE	1



Preliminary
(CO Pending)

NOTE:
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DRAWING REVISION

REV	DATE (DD/MM/YYYY)	REVISION DESCRIPTION	DRAWN	PEER	ENG	APPVD
A	02/03/2017	PRELIMINARY	G.B.		D.O'N.	

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UNLESS NOTED OTHERWISE
INTERPRETATION: ANSI Y14.5
TOLERANCES:
FRACTIONS: ±1/16"
DECIMALS 0.X: ±0.030
0.XX: ±0.015
ANGLES: ±0.5°
HOLE SIZES: ±1/16"
HOLE CENTERS: ±1/8"
DO NOT SCALE PRINTS

DECATUR MBR RETROFIT

4.6 MGD

TITLE:
PERMEATE TANK
GENERAL ASSEMBLY

SCALE:	DRAWING NUMBER:	REVISION
1/4"=1'	U18535-C06-0790 SHEET: 2 OF 2	A

APPENDIX D

KSB Pump Data Sheet

Data sheet

Pump type KRT K 250-400/178XG-S

Operating data

Flow			US g.p.m.	Fluid		
Head			ft	Density of fluid	62.3	lb/ft³
Operating speed		875	rpm	Viscosity	1.08E-5	ft²/s
Shaft power			hp	Temperature	68	°F
Efficiency			%			
Required pump NPSH			ft			
Head H(Q=0)		45.1	ft			
Application range		Head		Flow		
	From	36.6	ft	895	US g.p.m.	
	To	12	ft	3450	US g.p.m.	

Design

Make	KSB			Impeller type	Multi channel impeller	
Design	Submersible pump				Closed	
Series	KRT K			Impeller size	(340) 340	mm
Frame size	250-400				Max. (370) 370	mm
Stages	1				Min. (290) 290	mm
Curve number	K42020/2			Free passage	85	mm
				Weight	1556.4	lb
Type of bearings	Antifriction					
Nos. of bearings	1 / 1					
Lubrication	Grease lubrication. lubricated for lifetime					
Suction port	Pressure rating		--			
	Flange size	DN0	---			
	Flange size	DN1	10"			
	Norm		--			
Discharge port	Pressure rating		CLASS 125			
	Flange size	DN2	10 inch			
	Flange size	DN3	10 inch			
	Norm		ASME/ANSI B16.1			

Suction port: pump (DN1)
Discharge port: discharge elbow (DN3)

Materials

Pump casing	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Discharge cover	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Impeller	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Shaft	Stainless steel EN-1.4021+QT800 (A 276 Type 420)
Bearing bracket	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Motor casing	Grey cast iron EN-GJL-250 (A 48 Class 35B)
Bolts. nuts	Stainless steel A4 (EN-1.4571) (A 276 Type 316)
Shaft protection sleeve	---
Casing wear ring	Grey cast iron EN-JL1030 (A 48 Class 30B)
Impeller wear ring	---
O-Rings	Nitrile rubber (NBR)

Data sheet

Pump type

KRT K 250-400/178XG-S

Shaft seal

Type of seal	Double mechanical seal
Arrangement:	Tandem
Seal on medium side	with elastomer bellows
Mechanical seal. pump-side	Silicon carbide / Silicon carbide
Mechanical seal. bearing-side	Carbon / Silicon carbide

Monitoring

Thermal winding protection	By temperature sensitive switches
Explosion proof protection	By PTC (Explosion proof models only)
Motor housing monitoring	By conductive moisture sensor electrode
Mechanical seal leakage detection	---
Bearing temperature monitoring	---

Coating

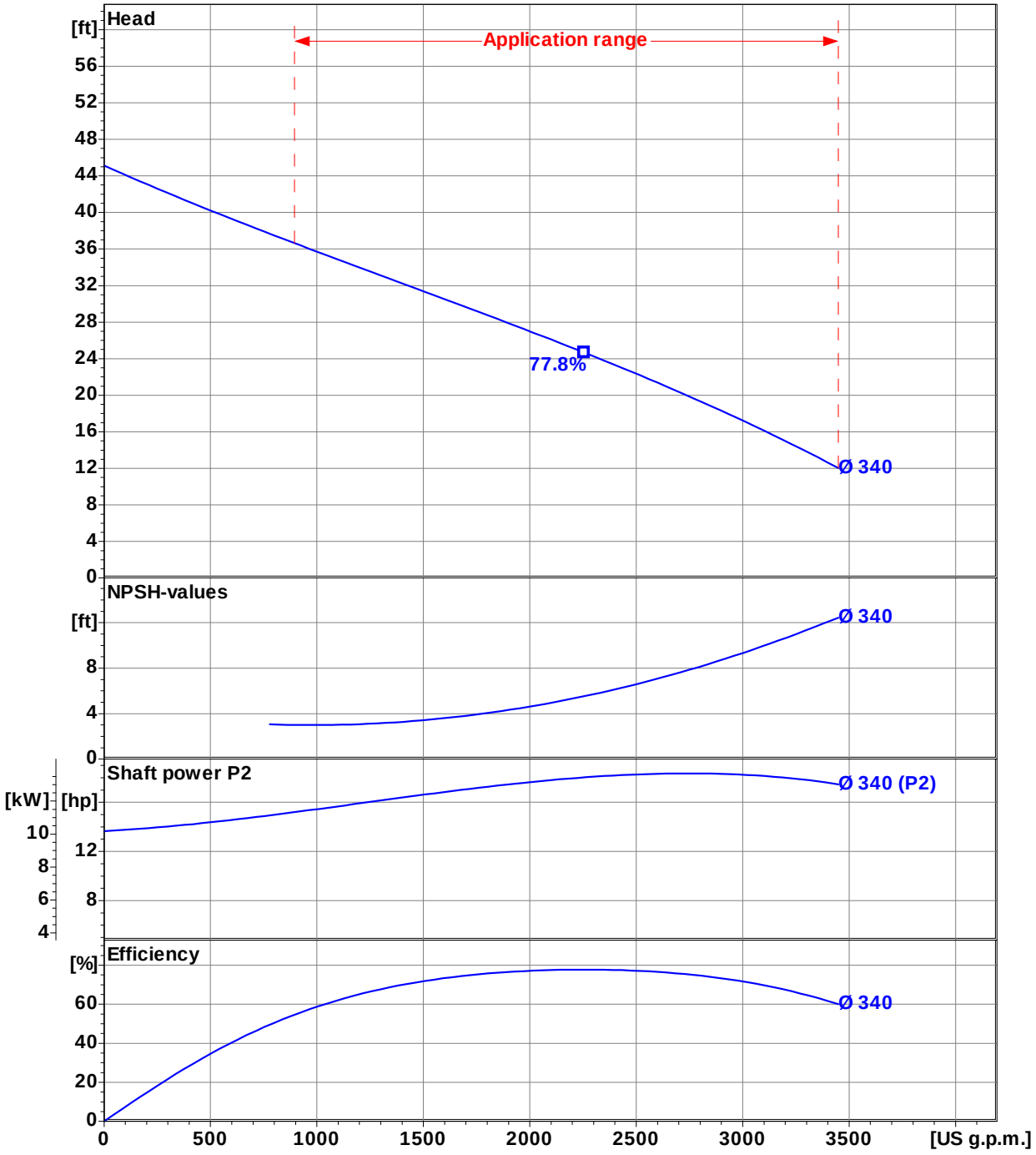
Preparatory treatment	SSPC near white SP 10
Blasting method	Steel grit blasting
Primer	Zinc phosphate or Zinc dust
Dry film thickness primer	> 1 1/2 mils (35 microns)
Top coat	2-component epoxy resin
Solids content	> 82 %
Dry film thickness top coat	> 6 mils (150 microns)
Color	Ultramarine Blue

Installation

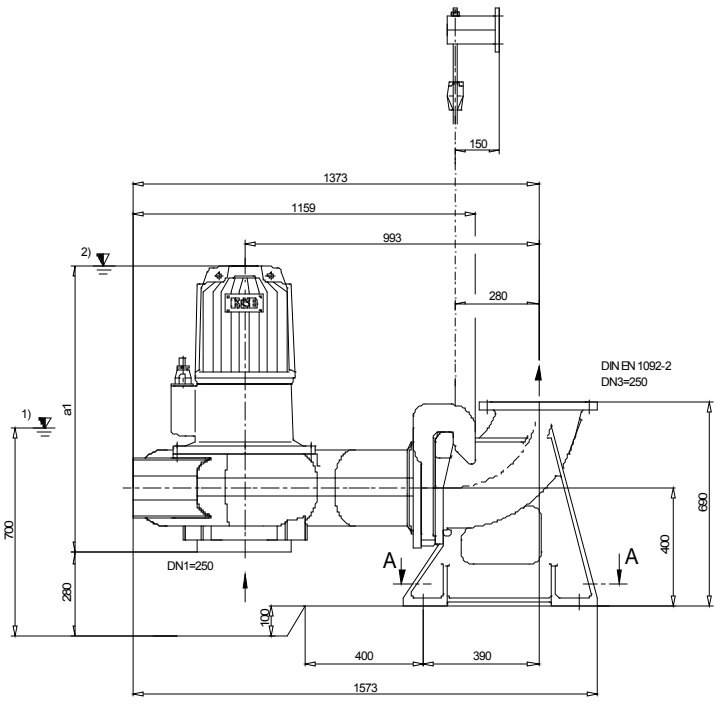
INSTALLATION	
Type of installation:	Wet well installation designed for automatic connection to a permanently installed discharge elbow
Discharge elbow size (DN2/DN3):	10 inch / 10 inch
Flange to suit:	ASME/ANSI B16.1, CLASS 125
Claw:	Bolted to the pump
Installation depth:	15 ft (4.5 m)
Guide system:	Double pre-stressed guides
Guide max. deviation:	+/- 5 degree from the vertical
Lifting device:	stainless steel lifting chain
Length of lifting device:	33 ft (10 m)
Lifting loops:	Every 8 ft (2.5 m)
Installation accessories:	Discharge elbow, 10 inch / 10 inch fasteners, claw, bracket, lifting chain stainless steel guides
Materials:	
Discharge elbow:	Grey cast iron EN-GJL-250 (A48 Class 35B)
Claw:	Grey cast iron EN-GJL-250 (A48 Class 35B)
Bracket:	Stainless steel EN-1.4571 (A276 Type 316 Ti)
Guides:	Stainless steel EN-1.4401 (A276 Type 316)
Lifting device:	Stainless steel EN-1.4404 (A276 Type 316L)

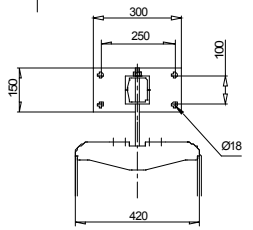
Performance curve

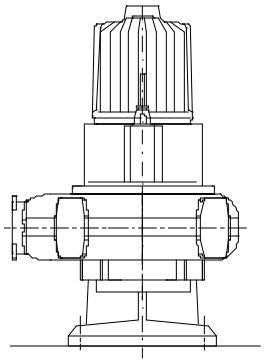
Pump type **KRT K 250-400/178XG-S**



Impeller type	Multi channel impeller	Closed		Curve number	K42020/2
Free passage	85 mm	Density of fluid	62.322 lb/ft³	Frequency	60 Hz
Impeller size	340 mm (340)	Viscosity	1.082E-5 ft²/s	Speed	875 1/min

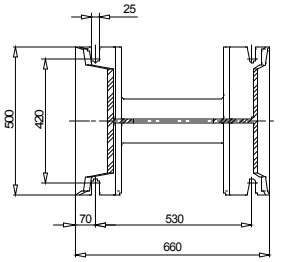


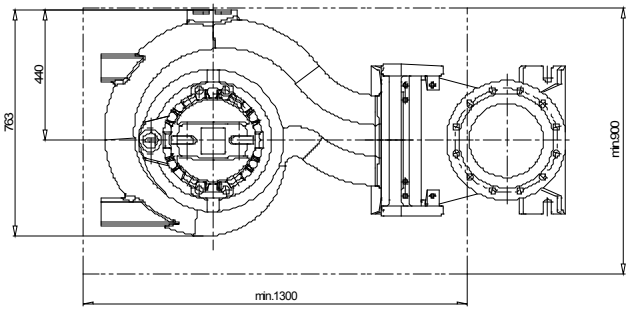




Hydraulik Hydraulics Hydraulique	KSB-Motor KSB-Engine KSB-Moteur	a1 50 Hz	60 Hz		Gewicht/Weight/Poids G		H		C1, C2	
		mm	mm	inch	kg	lbs	kg	lbs	kg	lbs
K	206	931	---	---	684	1509	764	1686	---	---
	266	910	910	35 13/16	716	1580	796	1756	---	---
	108	---	970	38 3/16	648	1430	728	1606	---	---
	178	---	931	36 11/16	684	1509	764	1686	---	---
	218	---	910	35 13/16	706	1558	786	1558	---	---

A-A





NUR FÜR ANFRAGE/ANGEBOT
technische Änderungen vorbehalten
FOR INQUIRY/OFFER ONLY
technical modifications reserved
SEULEMENT POUR LES DEMANDES LES OFFRES
sous réserve de modifications techniques

1) Tiefster Ausschaltpunkt bei Automatikbetrieb
1) Lowest shut-off point for automatic operation
1) Point d'arrêt le plus bas en service automatique

2) Mindestüberdeckung bei Dauerbetrieb
2) Minimum submergence for continuous operation
2) Recouvrement minimal pour service continu

Zeichnungs-Nr. / Drawing No. / N° Plan				Bestell-Nr. / Customer No. / N° Client
Maßstab / Scale / Echelle 1:10 A2	2010-03-01 Datum / Date	S-E-A 133 Name / Nom	0 Änderungsindex / Modification	KSB Auftrags-Nr. / KSB Order No. / N° commande KSB
	Baureihe Größe / Type / Série KRT 250-400/266			KSB Werk-Nr. / KSB Work No. / N° de fabrication KSB
	stationäre Aufstellung stationary installation installation stationnaire Bitte grundsätzlich bei Schriftverkehr angeben / Should always be stated in correspondence / A indiquer dans toute correspondance			
	KSB Aktiengesellschaft Geschäftsbereich Pumpen Wissenschaftliche Str. 1	Postfach 20 07 43 D-66008 Halle (Saale) Johannr. 58 u. 59 D-66119 Halle (Saale)	Tel. (0345) 48 28-0 Fax (0345) 48 28 488 Telex 178284 ksbha	

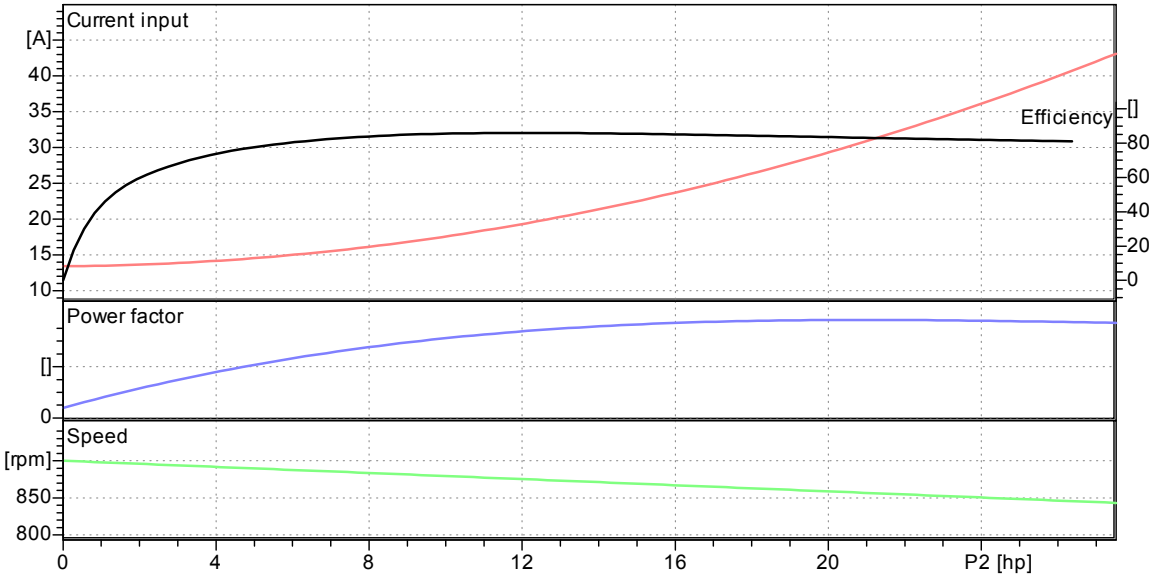
Data sheet: Motor data

Motor type **178XG**

Motor manufacturer	KSB Aktiengesellschaft	Rated voltage	460	V
Design acc. standard	-	Rated frequency	60	Hz
Service factor	1.15	Rated HP (D.O.L) or VFD	22	hp
Degree of protection	IP68	Rated current	32.5	A
Insulation class	F	Nominal speed	855	rpm
Starting mode	Direct	NEMA code letter	C	
No. starts / h	20	Starting to rated current	3.1	
Coolant temperature	< / = 104 °F (40 °C)	Starting current	101	A
Motor casing	Grey cast iron EN-GJL-250 (A 48 Class 35B)			
Explosion protection	Class I, Div. 1, Groups C,D, T3			
Pump type	KRT K 250-400/178XG-S			

Load	P1 kW	P2 hp	eta %	cos phi	I A
4/4	19.84	22.0	82.7	0.77	32.5
3/4	14.51	16.5	84.8	0.74	24.5
2/4	9.60	11.0	85.4	0.66	18.4
1/4	5.10	5.5	80.4	0.44	14.6

Main cable	1 x AWG 11-7+15-5	Diameter	21.00..23.00 mm
Control cable	---	Diameter	
Cable. outer sheath	Waterproof synthetic rubber compound		
Cable length	10 m		



KSB Inc., 4415 Sarellen Road, Richmond, Virginia 23231, Phone: 001-804-222-1818, Fax: 001-804-226-6961

KSB Pumps Inc, 5885 Kennedy Road, Mississauga, Ontario L4Z 2G3 (Canada), Phone: (0905) 568-9200, Fax: (0905) 568-9120

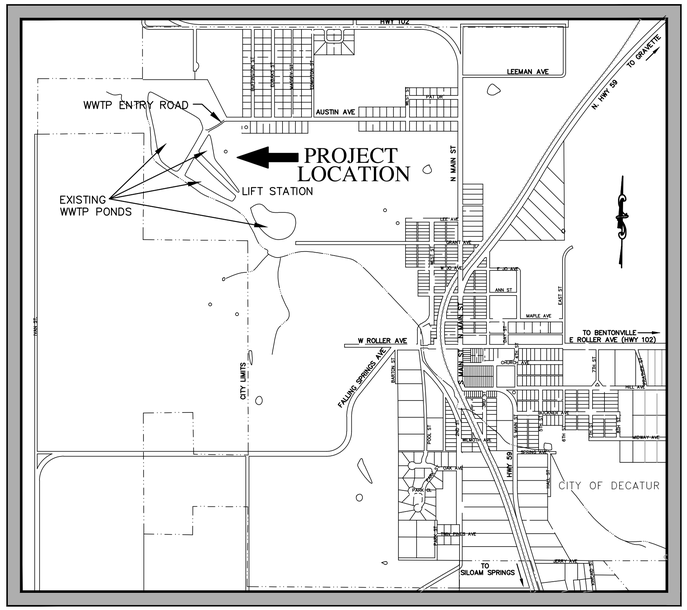
KSB Aktiengesellschaft, Turmstrasse 92, 06110 Halle (Germany), Phone +49 (345) 48260, Fax +49 (345) 4826 4699, www.ksb.com

WASTE WATER TREATMENT PLANT EXPANSION

DECATUR , ARKANSAS

CITY OF Decatur, Arkansas

LOCATION MAP



VICINITY MAP

APRIL, 2017
MCE PROJECT NO. FY152150

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE

1810 N. College
Fayetteville, Arkansas 72703
PH# 479.443.2377

7302 Kanis Road
Little Rock, Ar. 72204
PH# 501.371.0272

4606 S. Garnett Rd, Ste 401
Tulsa, Ok. 74146
PH# 918.619.6803

http://www.mce.us.com

PRELIMINARY
FOR PERMITTING ONLY
NOT FOR CONSTRUCTION

811 Know what's below. Call before you dig.

McCLELLAND CONSULTING ENGINEERS No. 24 — CERTIFICATE OF AUTHORIZATION

ORIGINAL SIGNATURE ON FILE

REVISIONS

NO.	DATE	DRN:	APPV'D:	DESCRIPTION

WASTE WATER TREATMENT PLANT EXPANSION & DECATUR, ARKANSAS FY152150, APRIL 2017

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET G-01 COVER.dwg 4/4/17 at 9:00am

GENERAL NOTES

1. CONTRACTOR SHALL RETAIN A FULL SET OF LATEST APPROVED CONSTRUCTION PLANS ON SITE DURING CONSTRUCTION ACTIVITIES.

2. CLOSELY COORDINATE START□UP AND ALL CONSTRUCTION ACTIVITIES WITH THE CITY OF DECATUR. CONTRACTOR'S PLAN FOR CHANGE□OVER FROM "EXISTING" TO "NEW" TREATMENT FACILITIES MUST BE APPROVED WELL IN ADVANCE OF IMPLEMENTATION.

3. CONSTRUCTION MATERIALS NOT OTHERWISE SPECIFIED IN THESE PLANS ARE TO MEET OR EXCEED ACCEPTED INDUSTRY STANDARDS FOR THEIR INTENDED USE.

4. ANY CONSTRUCTION WOR□OUTSIDE OF PRO□ECT BOUNDARIES SHALL BE PERFORMED ONLY WITH PERMISSION OF THE PROPERTY OWNER.

5. PUBLIC CONVENIENCE AND SAFETY: THE CONTRACTOR SHALL CONDUCT THE WOR□IN A MANNER THAT WILL INSURE□AS FAR AS PRACTICABLE□THE LEAST OBSTRUCTION TO TRAFFIC AND SHALL PROVIDE FOR THE CONVENIENCE AND SAFETY OF THE GENERAL PUBLIC AND RESIDENTS ALONG AND AD□ACENT TO HIGHWAYS NEAR THE CONSTRUCTION AREA IN ACCORDANCE WITH THE AR□ANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.

6. GRADING NOTES:

A. THE CONSTRUCTION AREA SHALL BE CLEARED□GRUBBED□AND STRIPPED OF TOPSOIL AND ORGANIC MATTER FROM ALL AREAS TO BE OCCUPIED BY BUILDINGS AND PAVING. TOPSOIL FOR REPLACEMENT MAY BE STOC□PILED ON SITE. EXCESS TOPSOIL MAY BE WASTED IN FILL AREAS EXCEPT THAT NO TOPSOIL WILL BE WASTED WITHIN 1□FEET OF THE EDGE OF A BUILDING OR PAVED AREA. BURNING OF TIMBER AND DEBRIS SHALL COMPLY WITH CITY REGULATIONS OR ORDINANCES.

B. AREAS TO RECEIVE FILL SHALL BE SCARIFIED AND THE TOP 8□INCH DEPTH COMPACTED TO 95% OF THE MAXIMUM STANDARD PROCTOR DENSITY. ANY UNSUITABLE AREAS SHALL BE UNDERCUT AND REPLACED WITH SUITABLE COMPACTED MATERIAL BEFORE ANY FILL MATERIAL CAN BE APPLIED.

C. IMPORTED FILL MATERIAL □GRAVELLY CLAY□□SHALL HAVE A PLASTICITY INDEX OF 3□OR LESS□A CBR VALUE GREATER THAN 8□AND CONTAIN NO ROC□LARGER THAN 4 INCHES.

D. AREAS THAT ARE TO BE CUT TO SUBGRADE LEVELS SHALL BE PROOF□ROLLED WITH A FULLY LOADED TANDEM□AXLE DUMP TRUC□OR SIMILAR APPROVED CONSTRUCTION EQUIPMENT TO DETECT UNSUITABLE SOILS. CUT AREAS ARE TO BE SCARIFIED AND RECOMPACTED TO 95% STANDARD PROCTOR DENSITY AND TESTED BY AN APPROVED GEOTECHNICAL TECHNICIAN PRIOR TO PLACEMENT OF BASE MATERIAL.

E. IN ANY AREA OF EXCAVATION□IF UNSUITABLE SOILS ARE ENCOUNTERED□THE ENGINEER'S REPRESENTATIVE SHALL RECOMMEND TO THE CITY THE METHODS OF UNDERCUTTING AND REPLACEMENT OF PROPERLY COMPACTED□APPROVED FILL MATERIAL. ALL PROOF□ROLLING AND UNDERCUTTING SHALL BE PERFORMED DURING A SUFFICIENT DURATION OF DRY WEATHER.

F. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONTROL OF DUST AND DIRT DURING CONSTRUCTION AND SHALL PROVIDE WATER SPRIN□LING OR OTHER SUITABLE METHODS OF CONTROL. THE CONTRACTOR SHALL COMPLY WITH ALL GOVERNING REGULATIONS PERTAINING TO ENVIRONMENTAL PROTECTION.

G. A TESTING LABORATORY SELECTED BY THE CITY SHALL BE RETAINED TO PERFORM CONSTRUCTION TESTING OF THE SUBGRADE AND CLASS 7 BASE MATERIAL FOR COMPLIANCE WITH THE MINIMUM REQUIREMENTS FOR COMPACTION.

H. ALL FINISHED SLOPES ARE TO BE 3H:1V OR FLATTER UNLESS OTHERWISE INDICATED. USE OF SLOPES STEEPER THAN 3H:1V□BUT NOT MORE THAN 2H:1V□IF APPROVED BY THE CITY□SHALL BE STABILIZED BY AN APPROVED VEGETATIVE LAYER OR OTHER APPROVED METHODS.

I. ALL PERMANENT SLOPES EXCEEDING 2H:1V SHALL BE PROTECTED BY RIP□RAP□CONCRETE PAVING□OR OTHER METHODS THAT WILL PREVENT EROSION□AND PLACED SUCH THAT THE SURFACE IS FLUSH WITH SURROUNDING GROUND AND SHAPED TO CHANNEL WATER APPROPRIATELY.

□ CONTRACTOR SHALL PREPARE THE STORMWATER POLLUTION PREVENTION PLAN AND REPORT FOR STORMWATER QUALITY CONTROL INCLUDING EROSION AND SEDIMENT CONTROL. PROPER MEASURES SHALL BE PRACTICED TO PREVENT EROSION ALONG THE EDGE OF PROPERTY□TOE OF SLOPE□AND ALONG DITCHES. MUD AND DEBRIS SHALL NOT BE ALLOWED TO FLOW ONTO AD□ACENT PROPERTIES OR PUBLIC ROADWAYS.

□ CONTRACTOR IS TO REMOVE AND DISPOSE OF ALL DEBRIS□RUBBISH AND OTHER MATERIALS RESULTING FROM DEMOLITION OPERATIONS.

7. PAVING NOTES:

CLASS 7 BASE COURSE MATERIALS SHOULD BE COMPACTED TO MEET THE REQUIREMENTS SET FORTH IN THE PRO□ECT MANUAL.

8. CONCRETE NOTES:

A. TESTING LABORATORY SELECTED BY CITY SHALL BE RETAINED TO PERFORM CONSTRUCTION TESTING OF CONCRETE FOR COMPLIANCE WITH REQUIREMENTS OF THE CONSTRUCTION SPECIFICATIONS.

B. VERTICAL CONCRETE SURFACES EXPOSED TO VIEW SHALL BE WET□RUBBED TO A SMOOTH FINISH AFTER FORMS HAVE BEEN REMOVED. HORIZONTAL SURFACES SHALL BE FINISHED AS REQUIRED IN THE CONSTRUCTION SPECIFICATIONS. ALL EXPOSED CORNERS SHALL BE CHAMFERED □3□4"□

C. CONTRACTOR IS TO PROVIDE WEA□ENED□PLANE □CONSTRUCTION□□DINTS□SECTIONING CONCRETE INTO AREAS AT A MAXIMUM OF PAVING RECOMMENDED BY THE AMERICAN CONCRETE INSTITUTE. CONSTRUCT WEA□ENED□PLANE □DINTS FOR A DEPTH EQUAL TO AT LEAST 1□4 CONCRETE THIC□NESS. CONTRACTOR IS TO FURNISH □DINT FILLER APPROVED BY THE CITY OR AS DETAILED IN THE CONSTRUCTION DOCUMENTS.

9. UTILITY NOTES:

A. CONSTRUCTION SHALL NOT START ON ANY PUBLIC UTILITY SYSTEM UNTIL WRITTEN APPROVAL HAS BEEN RECEIVED FROM THE APPROPRIATE UTILITY AUTHORITIES AND THE CITY AND THE CONTRACTOR HAS BEEN NOTIFIED BY M□CLELLAND CONSULTING ENGINEERS□INC.

B. CONTRACTOR SHALL NOT OPEN□TURN OFF□INTERFERE WITH□OR ATTACH ANY PIPE OR HOSE TO OR TAP ANY UTILITY MAIN BELONGING TO THE CITY UNLESS DULY AUTHORIZED TO DO SO BY THE CITY. ANY ADVERSE CONSEQUENCES OF ANY UNSCHEDULED DISRUPTIONS OF SERVICE AS A RESULT OF THE CONTRACTOR'S ACTIONS ARE TO BE THE SOLE LIABILITY OF THE CONTRACTOR.

1□ MISCELLANEOUS NOTES

A. THE CONTRACTOR SHALL TA□E ALL PRECAUTIONS NECESSARY TO AVOID PROPERTY DAMAGE TO AD□ACENT PROPERTIES DURING THE CONSTRUCTION PHASES OF THIS PRO□ECT. THE CONTRACTOR WILL BE HELD SOLELY RESPONSIBLE FOR ANY DAMAGES TO THE AD□ACENT PROPERTIES OCCURRING DURING THE CONSTRUCTION PHASES OF THIS PRO□ECT.

B. ALL PLANT GRATING TO BE GALVANIZED STEEL AND TO BE PROVIDED WITH FRAMES. GRATING TO BE PROVIDED IN SECTIONS SMALL ENOUGH TO BE READILY REMOVABLE BY HAND.

C. ALL □DINTS IN CONCRETE□MASONRY WOR□□WHETHER FORMED OR SAWED□ SHALL BE CAUL□ED WITH A PLIABLE MATERIAL MANUFACTURED FOR THAT SPECIFIC PURPOSE AND APPROVED BEFOREHAND BY THE ENGINEER.

D. INTERIOR SURFACES OF THE UPPERMOST THREE FEET □3□□OF THE WALL□AND THE ENTIRE UNDERSIDE OF THE ROOF DEC□□IN THE ISAM TAN□ARE TO BE CLEANED AND COATED WITH TNEMEC COAL TAR EPOXY PER MANUFACTURER'S RECOMMENDATIONS.

E. CONSTRUCTION MATERIALS AND CONTAINERS SHOULD BE STORED IN A SPECIFICALLY DESIGNATED MATERIAL STORAGE AREA.

F. PUBLIC STREETS AND SIDEWAL□S SHALL NOT BE USED FOR MATERIAL STORAGE UNDER ANY CIRCUMSTANCES.

G. ALL LIABILITY FOR ACCIDENTS AND□OR DAMAGES DUE TO IMPROPER STORAGE WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.

H. CONTRACTOR WILL BE RESPONSIBLE FOR ALL TAP AND TIE□IN FEES REQUIRED□AS WELL AS COST OF UNDERGROUND SERVICE CONNECTIONS TO THE BUILDINGS.

I. CONTRACTOR SHALL FURNISH A 4" TELEPHONE CONDUIT. COORDINATE WITH PHONE COMPANY REGARDING THEIR REQUIREMENTS FOR THE LOCATION OF TIE□IN FOR TELEPHONE COMPANY SERVICE LINE TO THE NEW OFFICE□AB BUILDING.. PROVIDE NYLON PULL CORD INSIDE CONDUIT.

□ ALL ELECTRIC AND TELEPHONE EXTENSIONS INCLUDING SERVICE LINES SHALL BE CONSTRUCTED TO THE APPROPRIATE UTILITY COMPANY SPECIFICATIONS. ALL UTILITY DISCONNECTIONS SHALL BE COORDINATED WITH THE DESIGNATED UTILITY COMPANIES.

□ A PRE□CONSTRUCTION MEETING MUST BE CONDUCTED AND A FORMAL WRITTEN NOTICE TO PROCEED ISSUED PRIOR TO STARTING ANY WOR□ON THIS PRO□ECT. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS.

L. GENERAL CONTRACTOR SHALL COORDINATE AND COMPLY WITH ALL UTILITY COMPANIES INVOLVED IN PRO□ECT AND PAY ALL REQUIRED FEES AND COSTS.

INDEX TO DRAWINGS

G-01	COVER SHEET
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C-01	OVERALL SITE PLAN
HW-01	HEADWORKS LAYOUT PLAN
WW-01	WET WELL LAYOUT
FS-01	ROTARY DRUM SCREENS LAYOUT
FS-02	SPLITTER BOX
TP-01	HANDRAIL DEMOLITION LAYOUT
TP-02	MBR LAYOUT
TP-03	MBR SECTIONS
TP-04	MBR SECTIONS
TP-05	MBR SECTIONS & DETAILS
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FB-01	FILTER BUILDING DEMOLITION PLAN
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SP-01	SLUDGE SCREW PRESS BUILDING DEMOLITION
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D-1	EROSION CONTROL DETAILS
D-2	GRADING AND DRAINAGE DETAILS
D-3	YARD PIPING DETAILS
D-4	MBR BLOWERS AND DETAILS
D-5	MISC. DETAILS

STRUCTURAL DRAWINGS - NOT INCLUDED

S0.1	GENERAL NOTES
S1.1	WET WELL PLANS & SECTIONS
S3.1	MBR SUPPORT & WALKWAY PLAN
S4.1	FRAMING SECTIONS
S4.2	FRAMING SECTIONS

ELECTRICAL DRAWINGS - NOT INCLUDED

E2	ELECTRICAL ONE-LINE DIAGRAM
E3	ELECTRICAL PANEL SCHEDULE

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GENERAL NOTES AND INDEX

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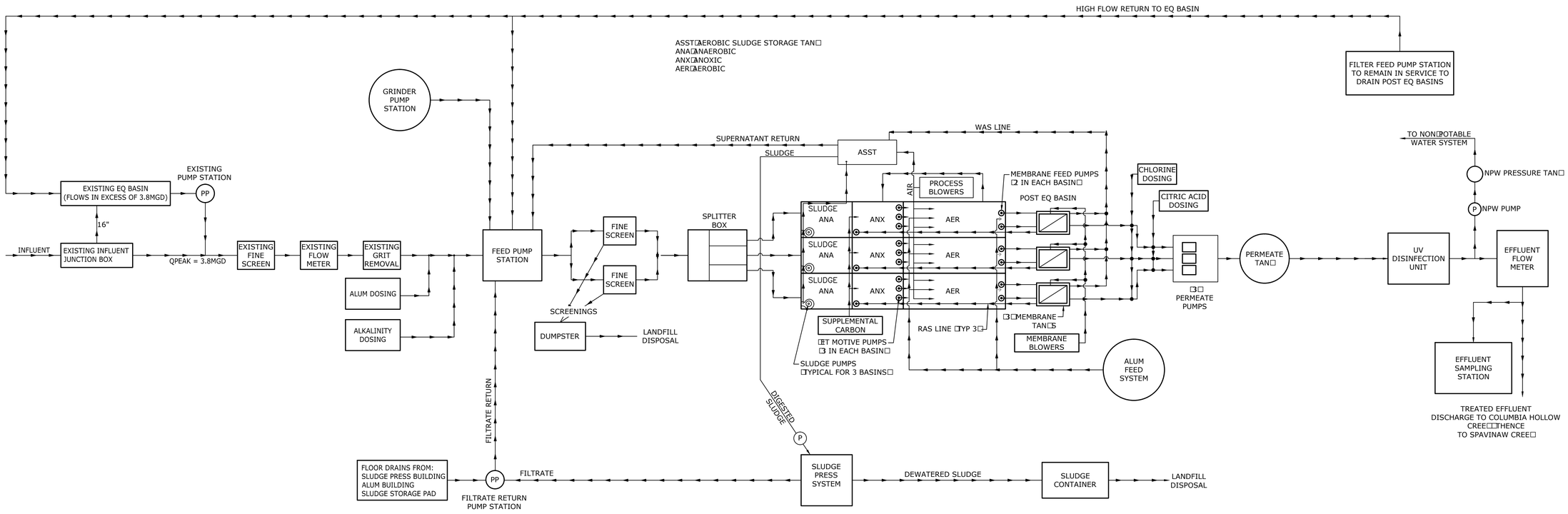
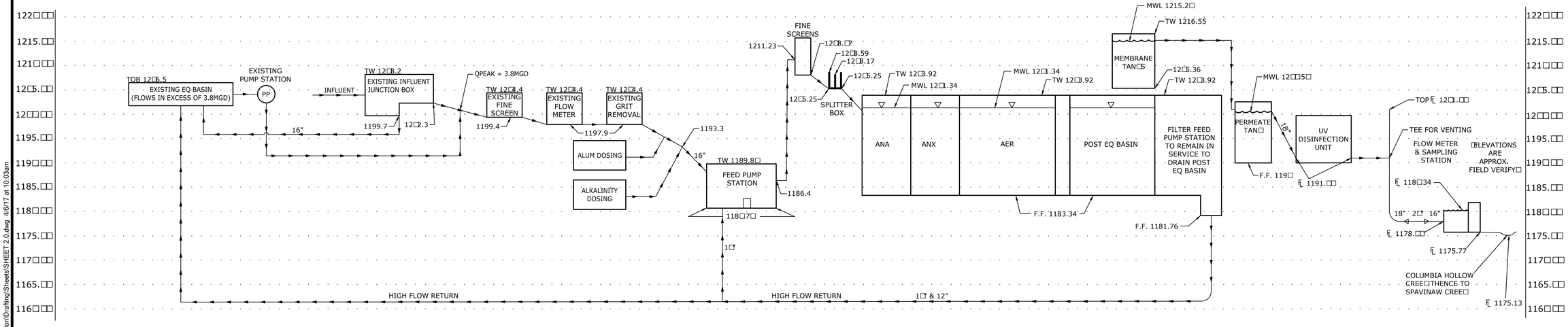
N.R.B.	L.E.W.
DATE: APRIL, 2017	
SCALE:	JOB NUMBER: FY152150

G-02

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET G-02 GENERAL NOTES, INDEX & MISC DETAILS.dwg 4/6/17 at 12:23am



DECATUR WWTP FLOW SCHEMATIC



TW □ TOP OF WALL
MWL □ MAXIMUM WATER LEVEL
FF □ FINISHED FLOOR
TD □ TOP OF DEC□
TOP □ TOP OF PIPE
TOB □ TOP OF BAN□

DECATUR WWTP HYDRAULIC PROFILE

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FLOW SCHEMATIC AND HYDRAULIC PROFILE

PROJECT ENGR:	DRAWN BY:
AST	BRIN SR
DATE: APRIL 2017	
SCALE: NTS	JOB NUMBER: FY152150

HP-01

W:\2015\FY15-2150 Decatur WWTP Expansion\Drafting\Sheets\SHEET 2.0.dwg 4/6/17 at 10:03am

SEE SHEETS FB-01 THROUGH FB-04

ABANDON EXISTING ACTIFLOW SYSTEM

PROPOSED PERMEATE TANK

PROPOSED PERMEATE PUMP, TYP. (3 TOTAL)

SEE SHEETS SP-01 & SP-02

REPLACE EXISTING UV EQUIPMENT

SEE SHEETS TP-01 THROUGH TP-08

SEE SHEET WW-01 FOR PROPOSED WET WELL EXPANSION AND PUMP REPLACEMENT.
SEE SHEETS FS-01 & FS-02 FOR PROPOSED DRUM SCREENS AND SPLITTER BOX.

SEE SHEET HW-01

PROPOSED SLUDGE LOADING BLDG (BY OTHERS)

PROPOSED MBR UNIT, TYP. (3 TOTAL)

PROPOSED WET WELL EXPANSION

REPLACE EXISTING SCREW PRESS

PROPOSED MBR BLOWER, TYP. 3 TOTAL

EXISTING 16" GRAVITY INFLUENT LINE TO LIFT STATION

2 DRUM SCREENS W/SPLITTER BOX

REPLACE 3 EXISTING BLOWERS, INSTALL VFD ON BLOWER TO REMAIN.

REPLACE EXISTING PUMPS IN LIFT STATION

INSTALL 75 LF OF 10" FM CONNECT TO EXIST MH SEE SHEET WW-01

INSTALL ACTUATORS ON SLIDE GATE AND WEIR GATE AT INFLUENT DIVERSION STRUCTURE

EXISTING GENERATOR AND SWITCHGEAR TO REMAIN

REPLACE EXISTING CHEMICAL FEED PUMPS

EXISTING 10" FM TO EQ POND

PROPOSED ELECTRICAL BUILDING (APPROX. 6,000 SF)

INSTALL: 10"X10" TEE 2~10" GV's W/BOXES 10" SOLID SLEEVE

EXISTING 16" OVERFLOW LINE TO EQ POND

FEMA 100-YR FLOODPLAIN

EXISTING 18" FORCE MAIN FROM CENTERTON

INSTALL PRESSURE TRANSDUCER IN EQ POND FOR LEVEL MONITORING

GRAPHIC SCALE

5□ □ 25 5□ 1□□ 2□□

□IN FEET □
1 INCH □5□ FT.

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OVERALL SITE PLAN

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DATE: APRIL 2017	
SCALE:	JOB NUMBER: FY152150

C-01

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET C-01 AND HW-01 OVERALL AND HEADWORKS LAYOUT PLANS.dwg 4/6/17 at 11:23am

NFLUENT LINE TO LIFT

ANIMAL SHELTER
NEW METAL BLD.

5' CHAIN LINK FENCE IN BAD CONDITION

NO CLEANOUT FOUND. APPROX. CL OF
6" PVC DRAIN FROM ANIMAL SHELTER

CP #502

RIM ELEV. 1196.30
18" DIP OUT NW 1187.30
18" DIP IN SE 1187.35 HEAVY FLOW
6" PVC IN E 1193.16

EXISTING 16" GRAVITY INFLUENT
LINE TO LIFT STATION

RIM ELEV. 1200.57
18" DIP OUT NW 1192.57
18" DIP IN SW 1192.92
SO MUCH FLOW OUTFALL TO PLANT THAT IT
SWIRLS AROUND HEAVILY BEFORE FLOWING OUT

RIM=1205.79'
FL 18" OUT NW=1200.28'
FL 24" IN SE=1201.52'
PIPE SIZES PER HEAD OF SEWER DEPT

MH#2

EXISTING 18" FORCE MAIN
FROM CENTERTON

NON-POTABLE
WATER

SPIRAL SCREEN WITH 6"
CONC. WALLS

STEEL LP ON 2' DIA
CONC.BASE.

HEADWORKS

FL 18" IN=1200.21

MH#1

FL. 20" DIP IN FROM E 1201.38
TOP 1204.94
DISAPPEARS INTO GROUND

REPLACE EXISTING
CHEMICAL FEED PUMPS
SEE SPEC 11213

TOP 6" WALL 1204.99
ABANDONED BAR SCREEN
18" OUT S 1199.54
LEVEL OF GATE 1200.99

PUMPS

FF=1204.49'

STEEL STEPS WITH LANDING

CHEMICAL TANK ON SLAB

1'X2' ELEC. BOX

CP #301

FF=1204.56'

CHEMICAL BLDG.

CONC. VAULT WITH 6" WALLS. EXTREMELY
HEAVY INFLUENT FLOW. APPROX INV FROM
SOUTH TAKEN FROM PREVIOUS WORK
FL 24" PIPE OUT NW=1201.52
FL 20"? PIPE IN S=1201.38?

PROBED BOTTOM N&S 1184.84
PROBED BOTTOM AT MIDDLE 1183.34
IN EAST 1186.19
PROBED PIPE SE 1187.34

8" CONC. WALL

TOP WALL 1196.30
BOTTOM WEST 1186.43
BOTTOM NE 1185.95
20" DIP IN E 1191.26

TBM ELEV. 1192.34
CHISELED SQUARE
ON 6" CONC. WALL

8" CONC WALL
ABANDONED STRUCTURE

ABANDONED SSMH
RIM ELEV. 1203.19
18" OUT W 1197.07
18" IN N 1197.39

CHEMICAL
TANK

CP #3002

TOP 8" CONC. WALL 1192.93

CTS&Y 915 CAPPED REBAR YOUNG

CP #453

REMOVE EX. 90° EL
INSTALL TEE
INSTALL BLIND FLANGE
w/2" THREADED TAP
2" LONG
SEE PHOTO THIS SHEET

ABANDONED VAULT 8" CONC.
EXTERIOR WALLS 11" CONC.
WALL SUPPORTING SLUICE GATE
BOTTOM ON SOUTH 1201.69
BOTTOM AT GATE 1201.49
BOTTOM ON N
BOTTOM FULL
ALL INVERTS

INSTALL PRESSURE TRANSDUCER
IN EQ POND FOR LEVEL
MONITORING

REMOVE EX. 90° EL.
INSTALL TEE
INSTALL BLIND FLANGE w/2"
THREADED TAP
4" LONG
INSTALL VALMATIC 202C

INSTALL ACTUATORS ON SLIDE GATE
AND WEIR GATE AT INFLUENT
DIVERSION STRUCTURE
SEE SPEC 15007

SMALL SHED WITH PARTIALLY
ENCLOSED ADJOINING ROOF,
OPEN TO SOUTHEAST

TOP OLD CONC. BOX 1206.1 WITH RUSTY
VALVE STEM, PROBED BOTTOM 1202.07 WITH
CONC. POST USED TO DIFFUSE FLOW MH
RUNNING NEAR FULL, CANNOT SEE DETAILS

10" CONC. WALL

6' CHAIN LINK WITH SECURITY TOP

TOP WALLS 1208.15
18"? OUT NW 1202.30
18" PVC IN SE 1202.29
SOUTH SIDE FLOOR OF BOX 1199.67
16" OVERFLOW OUT S? NOT VISIBLE
FLOW CONTROL BOX TV

EXISTING 16" OVERFLOW LINE TO EQ POND

EXISTING 16" OVERFLOW
LINE TO EQ POND

RIM=1207.42'
FL OF MH=1202.20'

TOP CL OF 7"
PIPE=1210.12'

TOP CL OF 5"
PIPE=1209.78'

TBM ELEV. 1207.84
CHISELED SQUARE
ON CONC. WALL

CP #202 +

TOP 8" WIDE CONC. ANCHOR FOR PVC PIPE 1204.82

TOP 12" PVC INTO POND 1203.94

GRAPHIC SCALE

2□ □ 1□ 2□ 4□ 8□

□IN FEET □
1 INCH □2□ FT.

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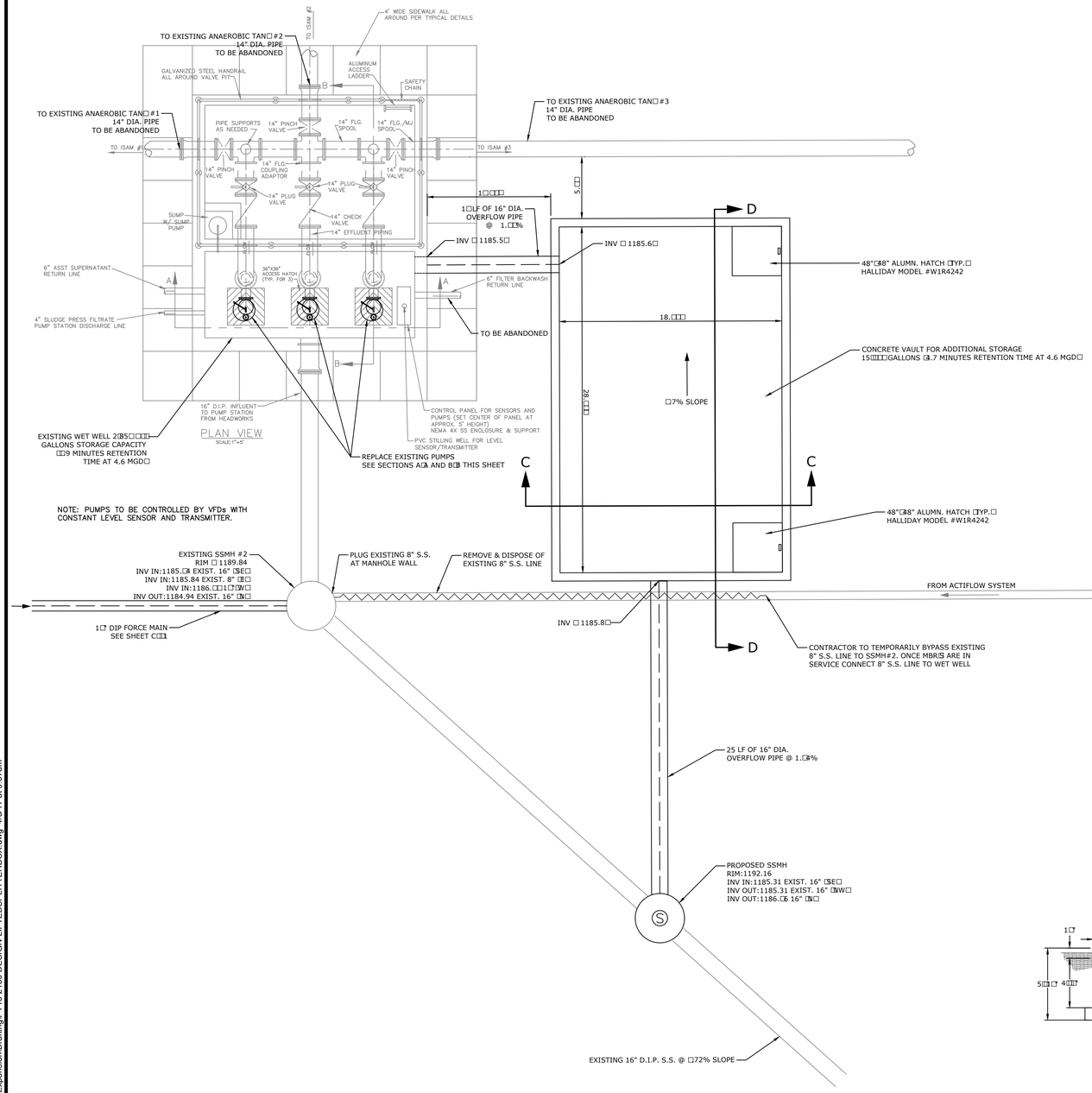
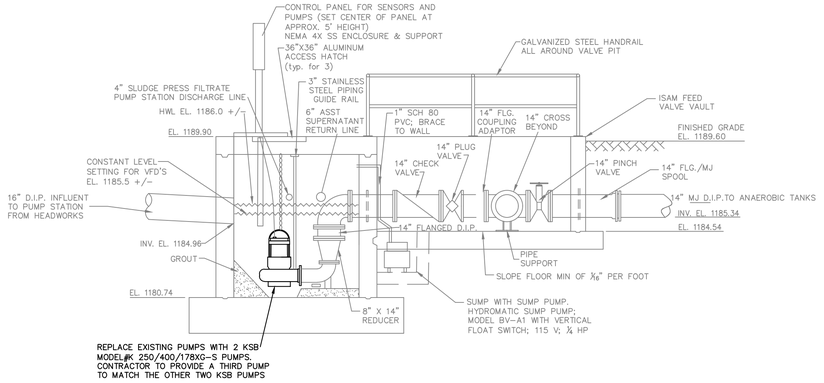
HEADWORKS
LAYOUT PLAN

PROJECT ENGR:	DRAWN BY :
N.R.B.	L.E.W.
DATE: APRIL 2017	
SCALE:	JOB NUMBER: FY152150

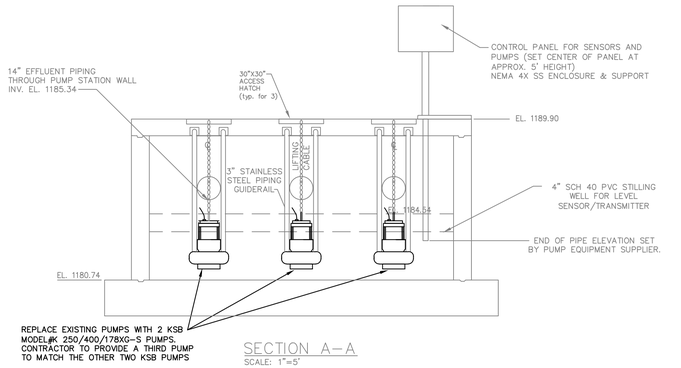
HW-01

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET C-01 AND HW-01 OVERALL AND HEADWORKS LAYOUT PLANS.dwg 4/5/17 at 9:23am





SECTION B-B
SCALE: 1"=5'



SECTION A-A
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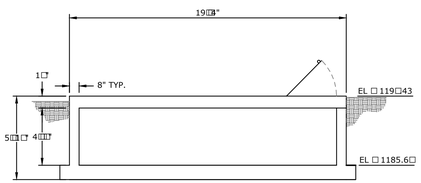
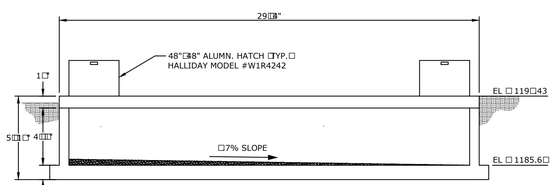


SECTION C□□
1"□5□



SECTION D□D
1"□5□

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WET WELL LAYOUT

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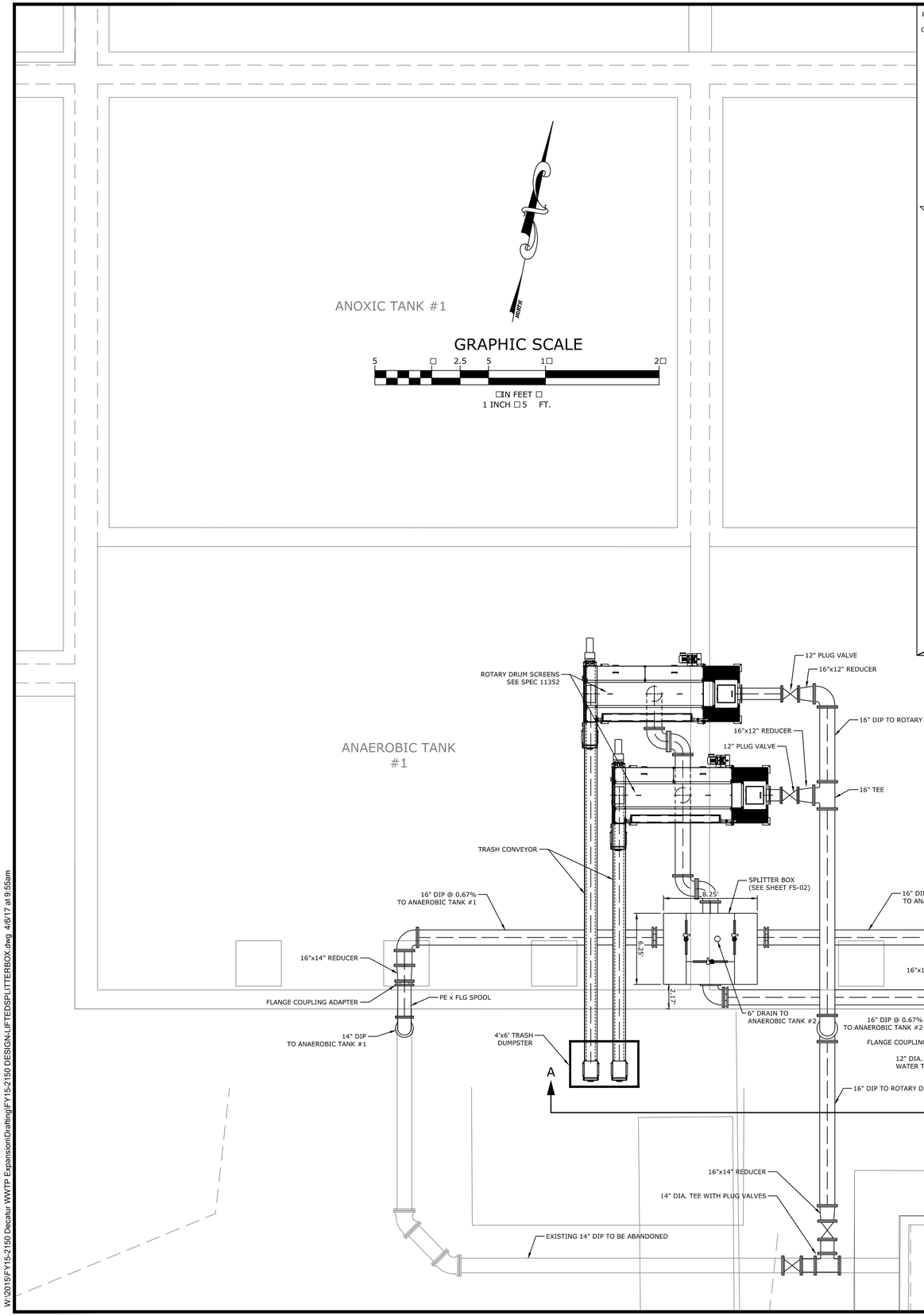
DATE:	
APRIL 2017	
SCALE:	JOB NUMBER:
AS SHOWN	FY152150

WW-01

W:\2015\FY15-2150 Decatur WWTP Expansion\Drafting\FY15-2150 DESIGN-LIFTEDSPLITTERBOX.dwg 4/6/17 at 9:57am



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ROTARY DRUM SCREENS LAYOUT

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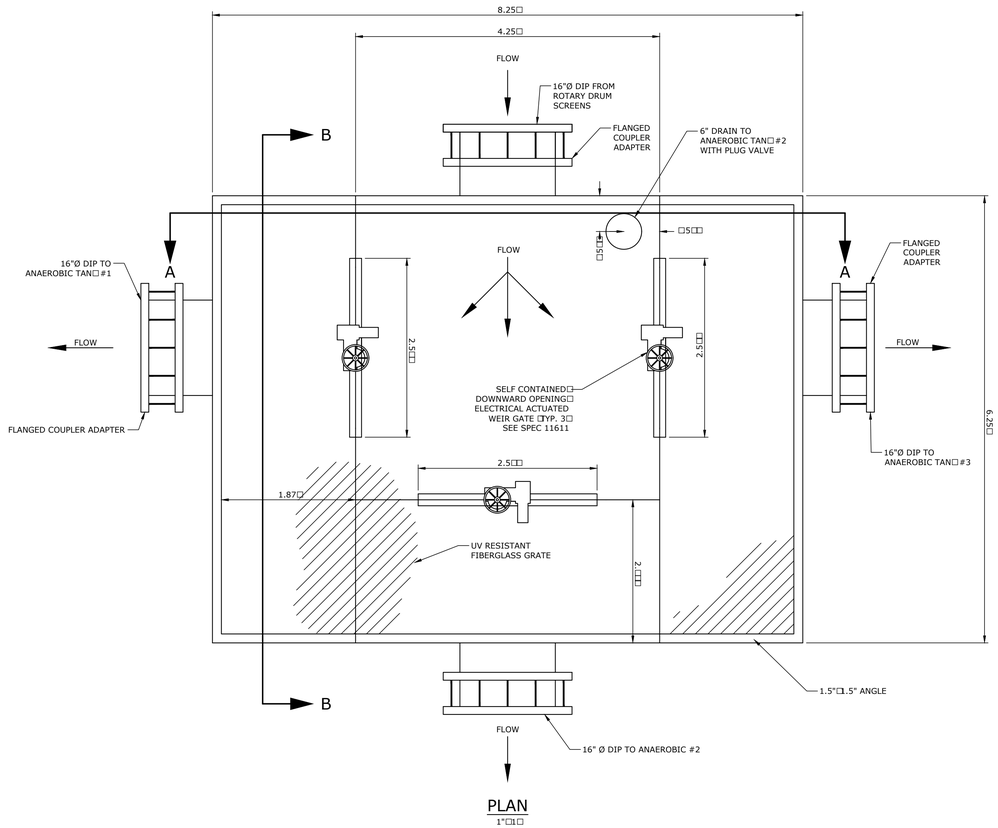
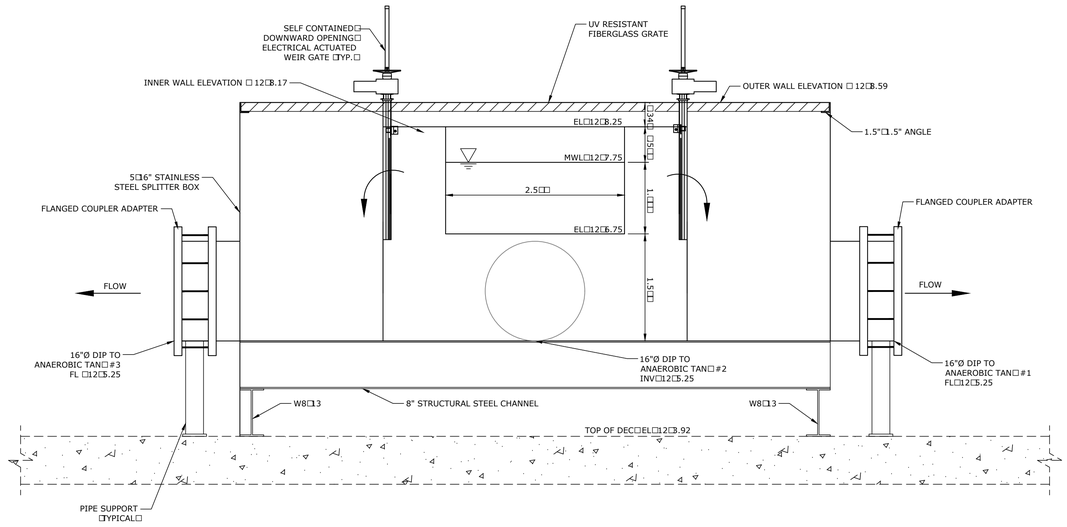
SCALE: 1"=5'	JOB NUMBER: FY152150

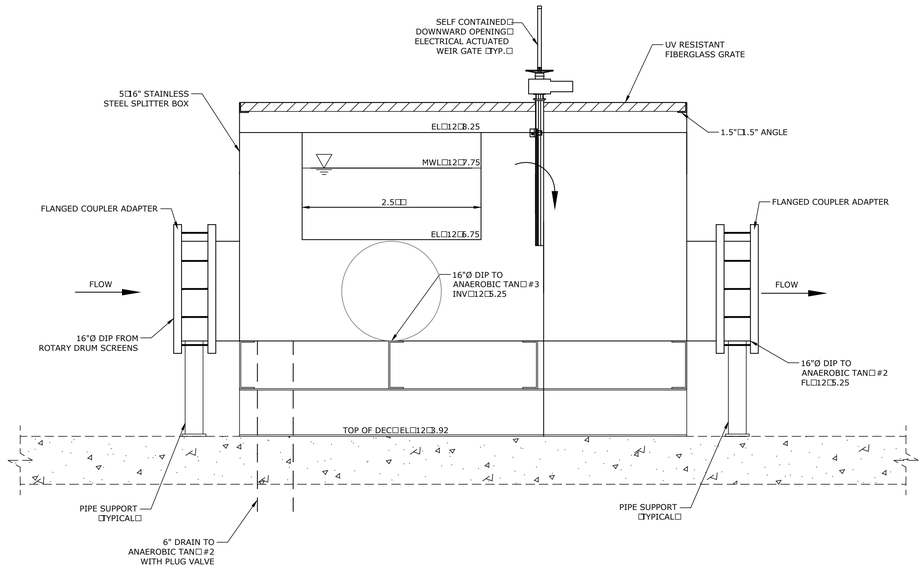
FS-01



PLAN
1"□1□



SECTION A□A
1"□1□



SECTION B□B
1"□1□

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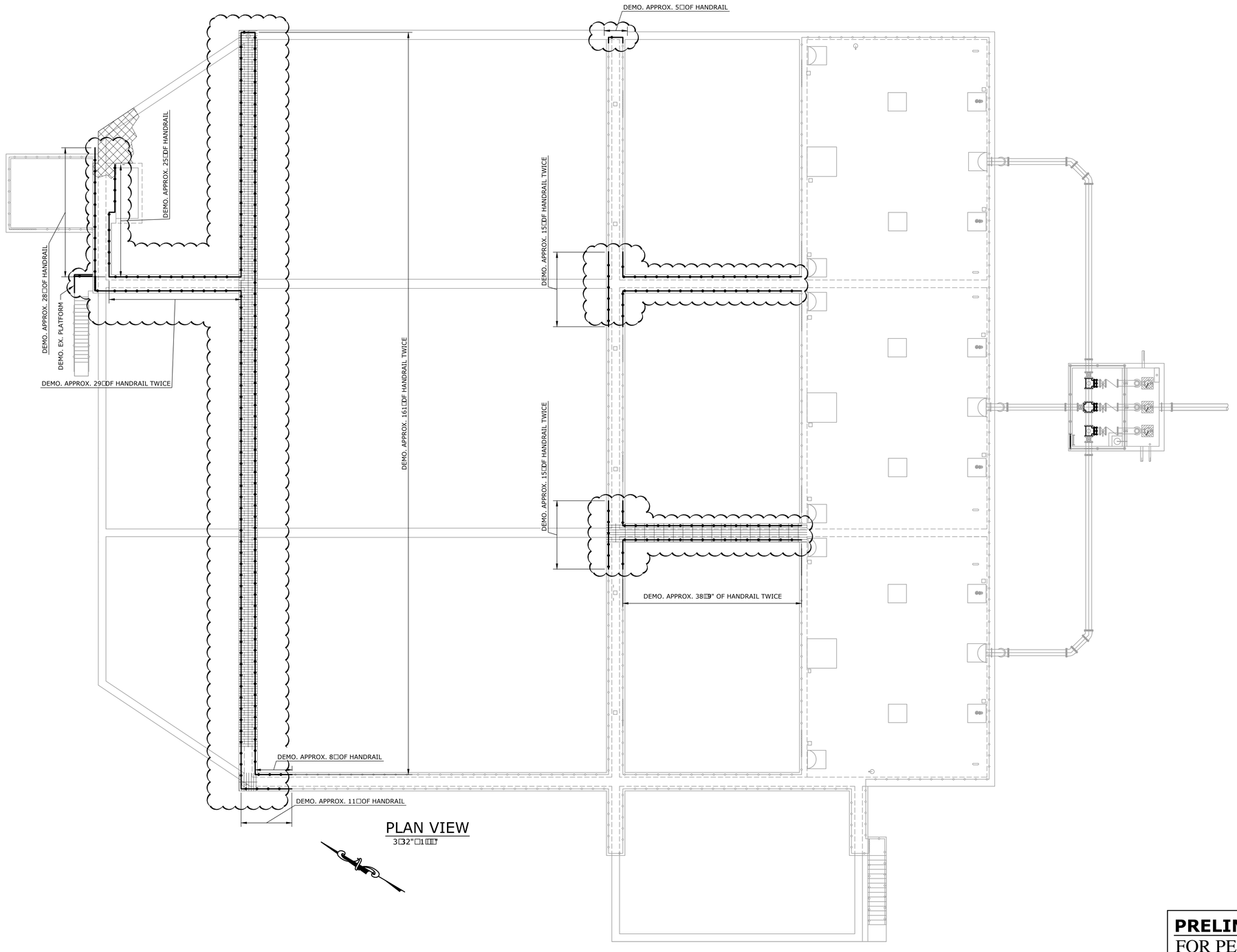
NO.	DATE	REVISIONS DESCRIPTION

SPLITTER BOX

PROJECT ENGR:	DRAWN BY :
AST	DLR
DATE:	
APRIL 2017	
SCALE:	JOB NUMBER:
AS SHOWN	FY152150

FS-02

W:\2015\FY15-2150 Decatur WWTP Expansion\Drafting\FY15-2150 DESIGN-LIFTEDSPLITTERBOX.dwg 4/6/17 at 4:05pm



PLAN VIEW

3□2"□1□□

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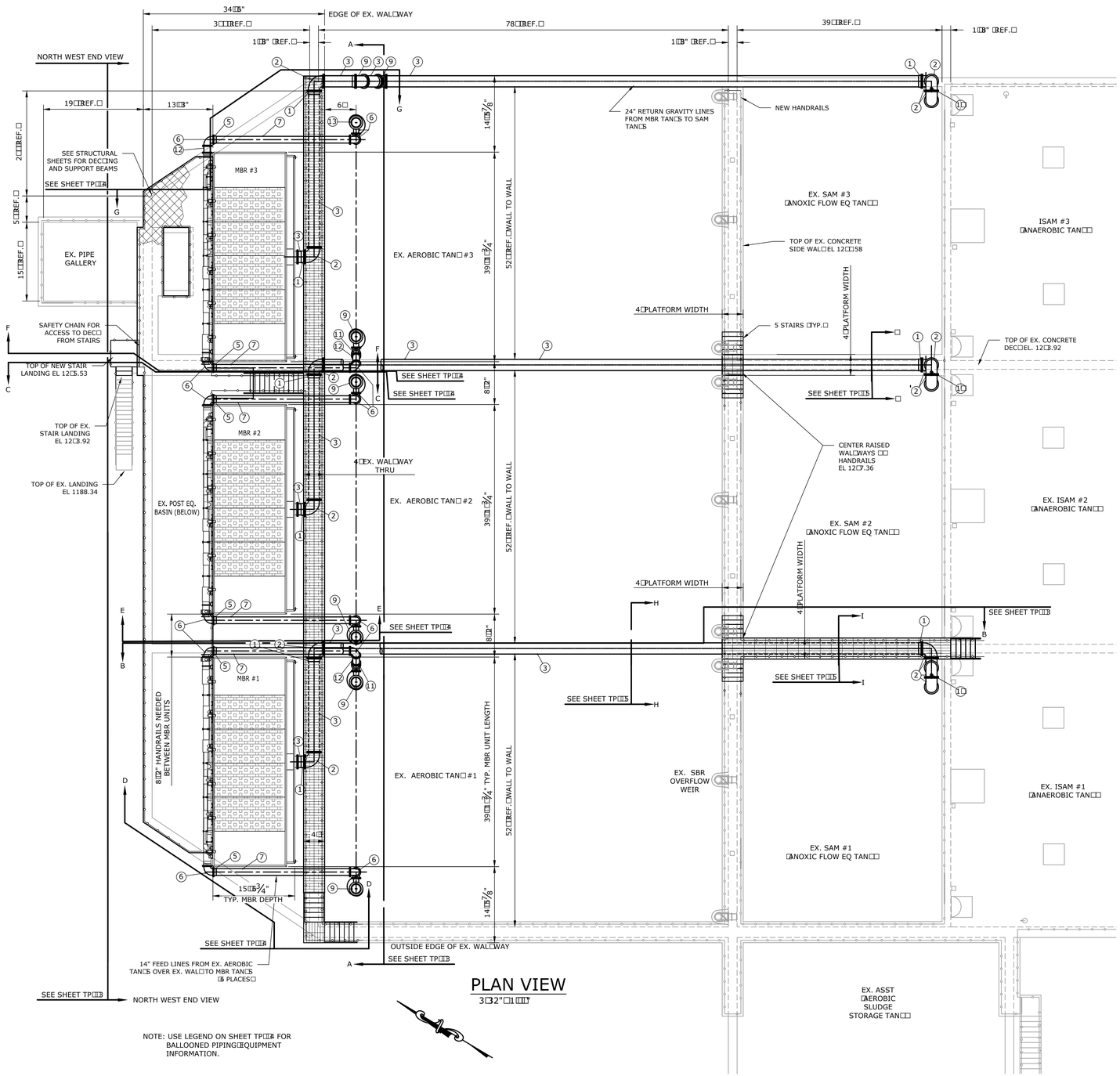
HANDRAIL DEMOLITION LAYOUT

PROJECT ENGR:	DRAWN BY :
N.R.B.	L.E.W.
DATE: APRIL, 2017	
SCALE: AS SHOWN	JOB NUMBER: FY152150

TP-01

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET MBR TP-01. THRU TP-07 & SBR-01.dwg 4/5/17 at 9:27am



NOTE: USE LEGEND ON SHEET TP-04 FOR BALLOONED PIPING/EQUIPMENT INFORMATION.

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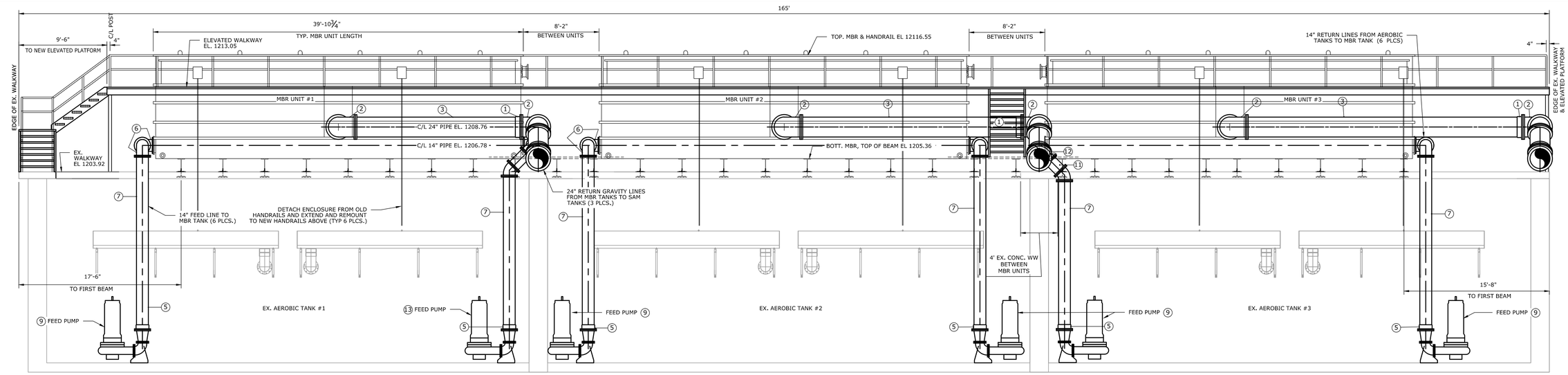
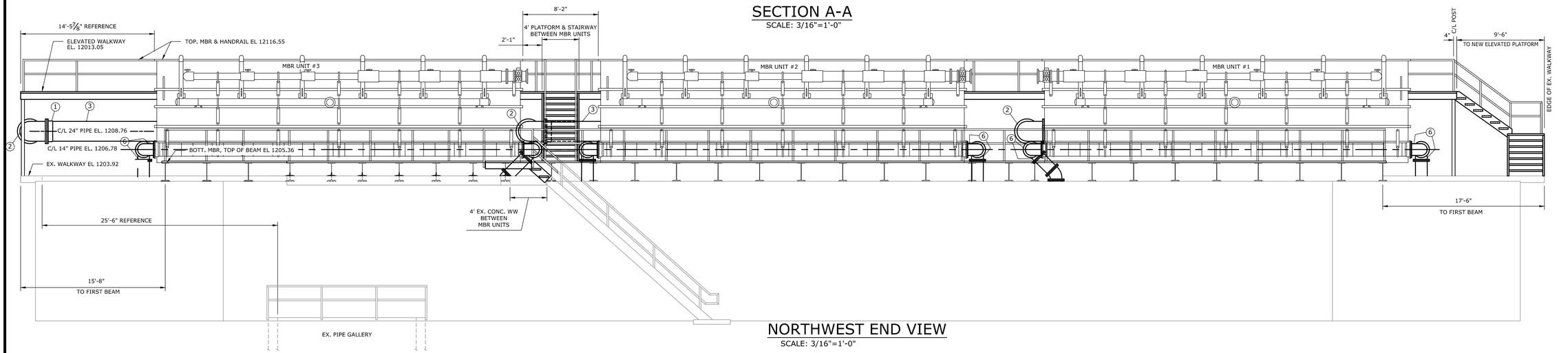
SCALE:	JOB NUMBER:
AS SHOWN	FY152150

TP-02

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET MBR TP-01, THRU TP-08.dwg 4/6/17 at 2:46pm

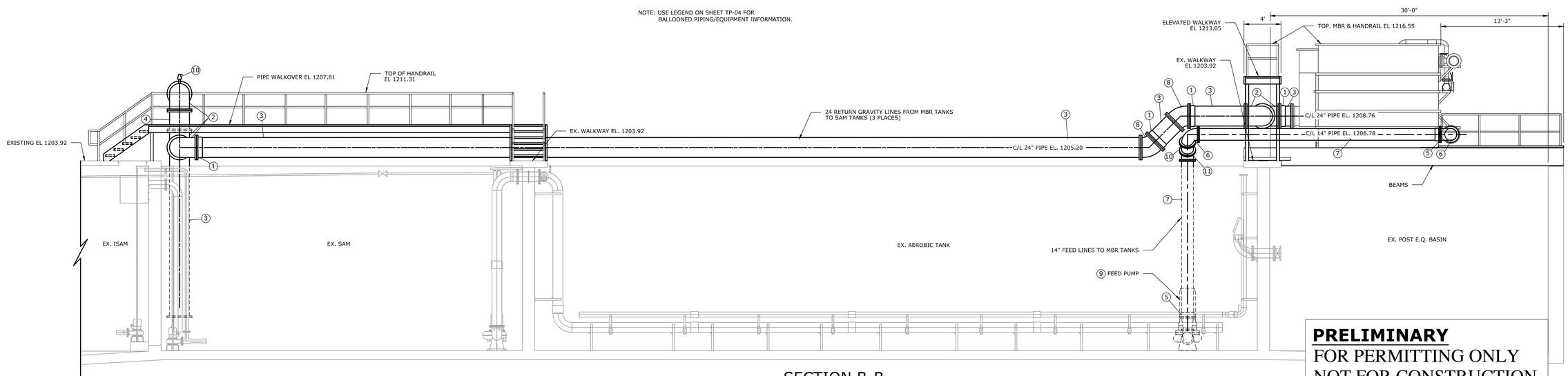


SECTION A-A
SCALE: 3/16"=1'-0"



NORTHWEST END VIEW
SCALE: 3/16"=1'-0"

NOTE: USE LEGEND ON SHEET TP-04 FOR
BALLOONED PIPING/EQUIPMENT INFORMATION.



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

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TP-03

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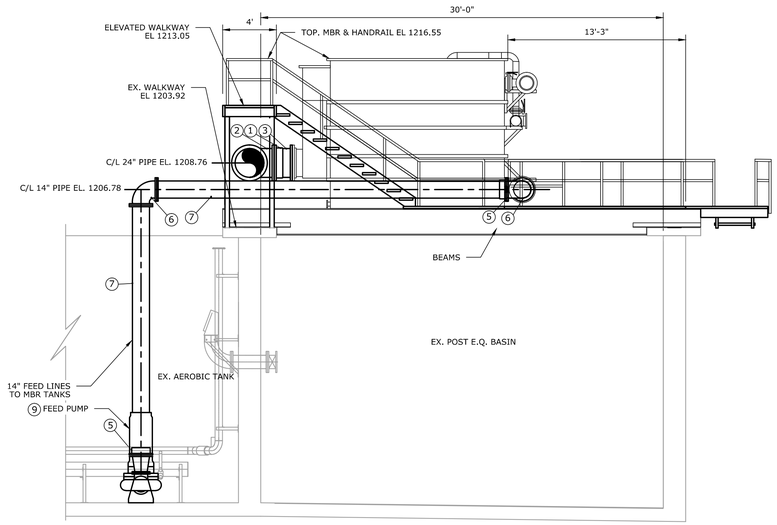
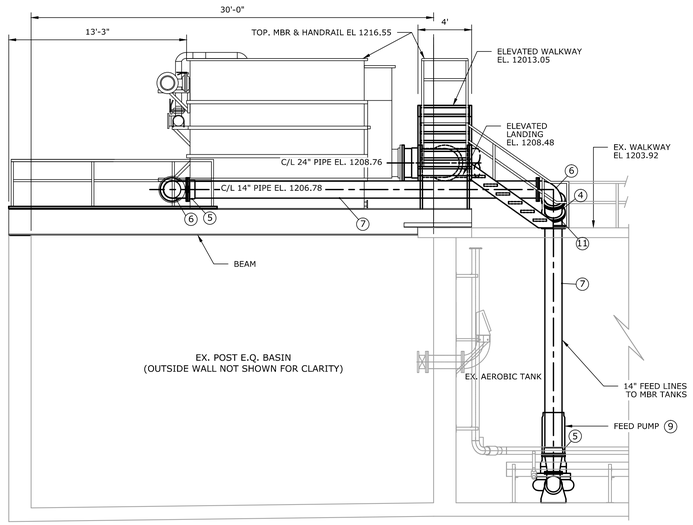
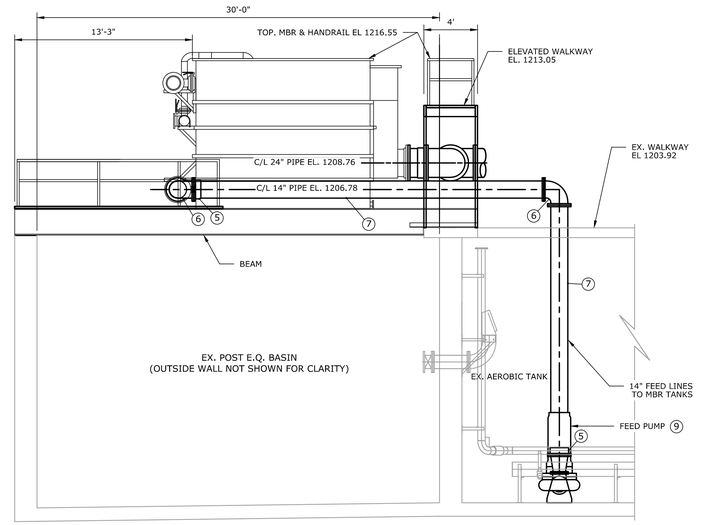


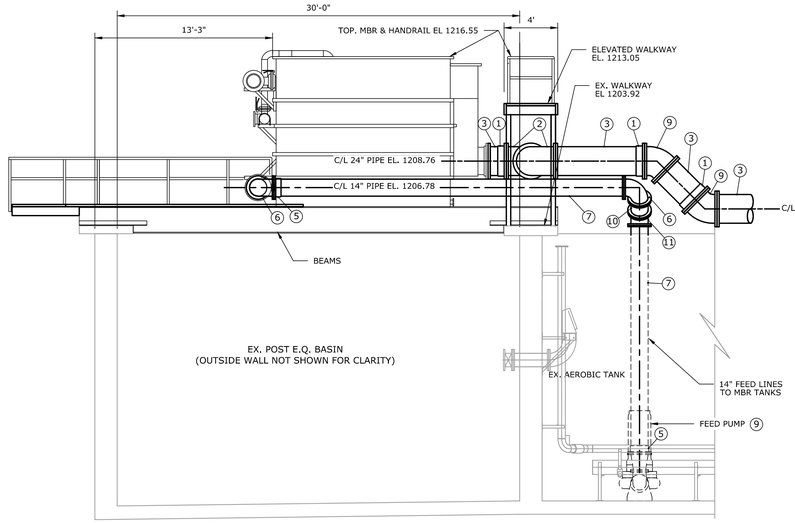
SECTION C-C
SCALE: 3/16"=1'-0"



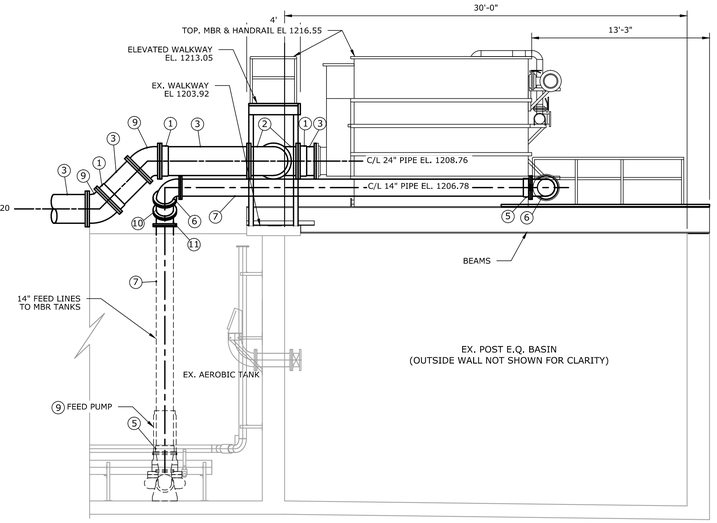
SECTION D-D
SCALE: 3/16"-1'-0"



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



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



SECTION G-G
SCALE: 3/16"-1'-0"

PIPING/EQUIPMENT LEGEND	
1	24" RFCA
2	24" FLG 90° BEND
3	24" FLG x PE PIPE
4	24" FLG SPOOL 2'-2" LG
5	14" RFCA
6	14" FLG 90° BEND
7	14" FLG x PE PIPE
8	24" FLG 45° BEND
9	FEED PUMP
10	2" THREADED AIR/VACUUM RELEASE VALVE
11	14" FLG 45° BEND
12	14" x 1'-4" FLG SPOOL

NOTE:
1. THIS LEGEND IS FOR SHEETS TP-02, TP-03, TP-04 & TP-05.
2. ALL PIPING, FITTINGS, AND APPURTENANCES SHALL BE DI CLASS 50.
3. FLANGES SHALL BE MINIMUM OF CLASS 150.
4. CONTRACTOR SHALL SUPPORT ALL PIPING AND APPURTENANCES ASSOCIATED WITH THE TREATMENT SYSTEM IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

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MBR SECTIONS

PROJECT ENGR:	DRAWN BY:
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DATE: APRIL, 2017	
SCALE: AS SHOWN	JOB NUMBER: FY152150

TP-04

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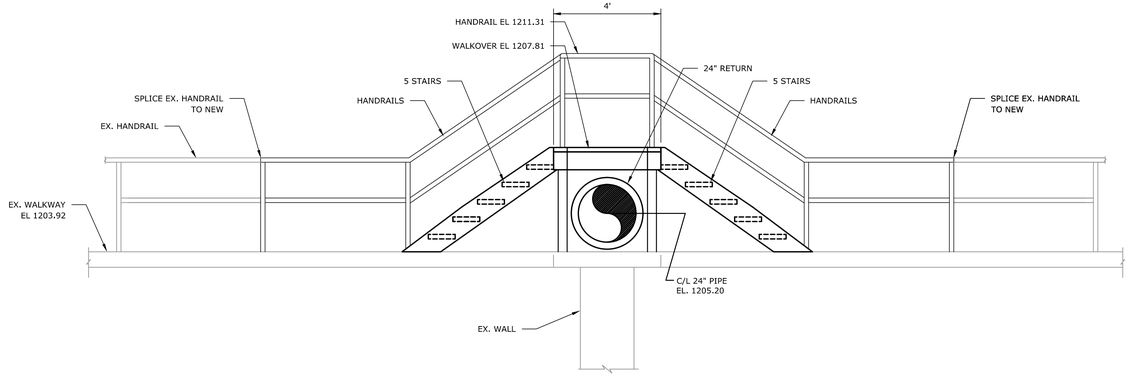
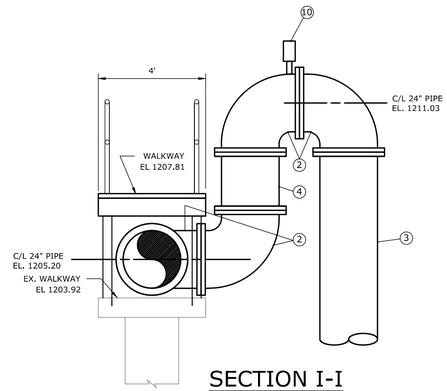
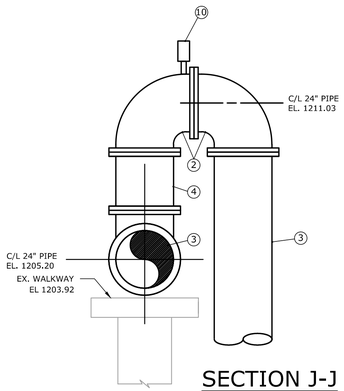


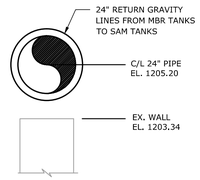
SECTION H-H
SCALE: 3/8"=1'-0"



SECTION I-I
SCALE: 3/8"=1'-0"



SECTION J-J
SCALE: 3/8"=1'-0"



PIPE/WALL RELATIONSHIP
SCALE: 3/8"=1'-0"

NOTE: USE LEGEND ON SHEET TP-04 FOR BALLOONED PIPING/EQUIPMENT INFORMATION.

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MBR SECTIONS & DETAILS

PROJECT ENGR:	DRAWN BY :
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DATE: APRIL, 2017	
SCALE: AS SHOWN	JOB NUMBER: FY152150

TP-05

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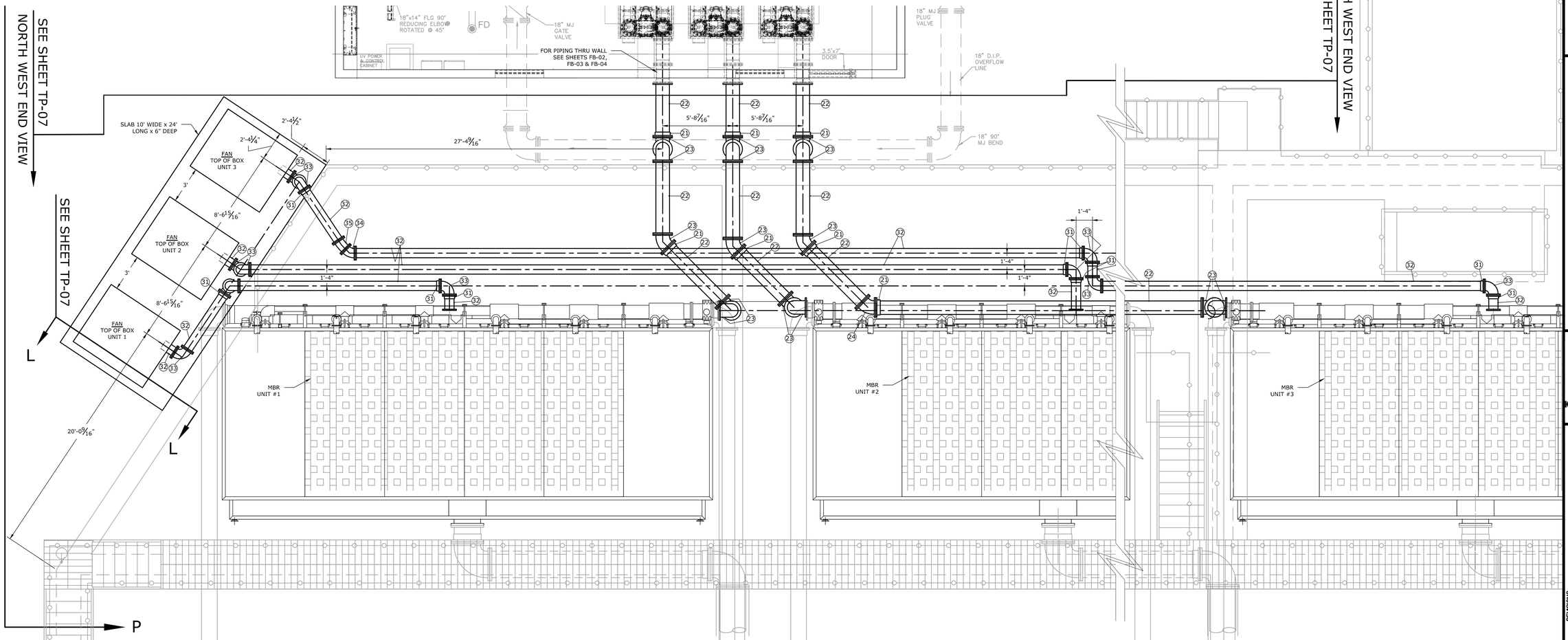

EXISTING FILTER BUILDING - PLAN
w/ PIPING PLAN FROM MBR UNITS

SCALE: 1/4"=1'-0"

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NO.	DATE	REVISIONS DESCRIPTION

PERMEATE & AIR LINES PIPING PLAN

PROJECT ENGR:	DRAWN BY:
N.R.B.	L.E.W.
DATE: APRIL, 2017	
SCALE: AS SHOWN	JOB NUMBER: FY152150

TP-06

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET MBR TP-01, THRU TP-08.dwg, 4/6/2017 at 3:39:34 PM

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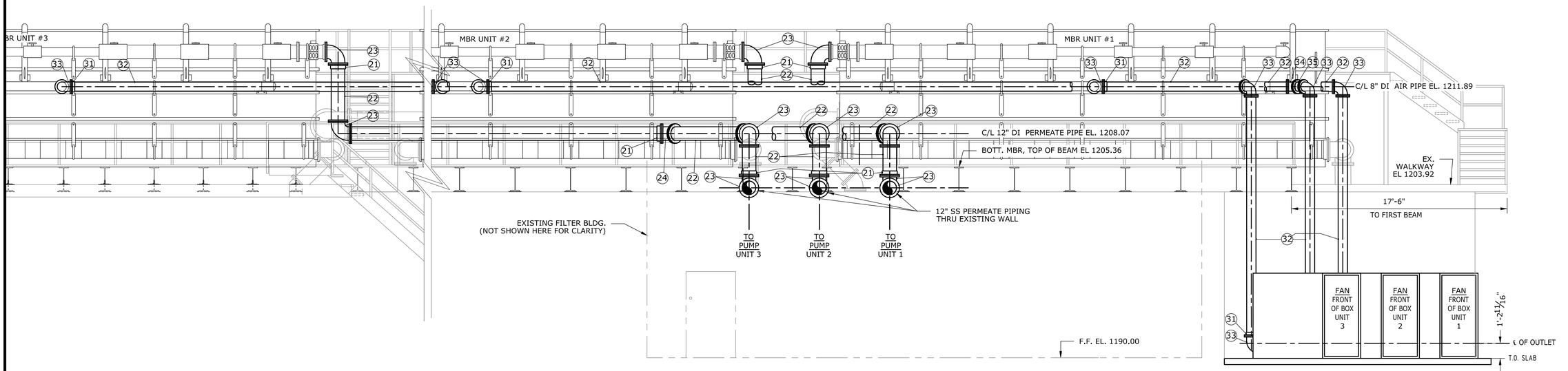


NORTHWEST END VIEW FROM SHEET TP-06

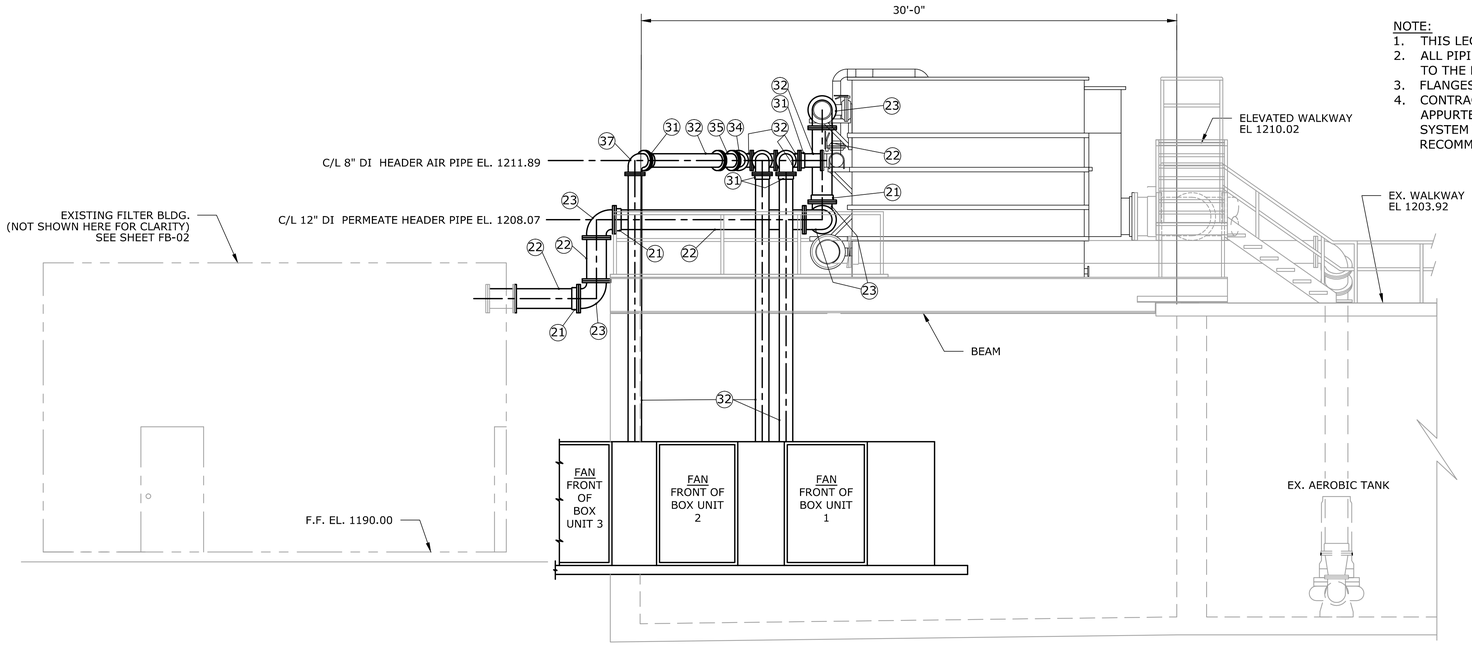
SCALE: 3/16"=1'-0"

PIPING/EQUIPMENT LEGEND FOR PERMEATE PIPING	
21	12" RFCA
22	12" FLG x PE PIPE
23	12" FLG 90° BEND
24	12" FLG 45° BEND
25	12" FLG SPOOL 1'-6" LG
26	12" FLG 22 1/2° BEND

PIPING/EQUIPMENT LEGEND FOR AIR PIPING	
31	8" RFCA
32	8" FLG x PE PIPE
33	8" FLG 90° BEND
34	8" FLG 45° BEND
35	8" FLG 11 1/4° BEND

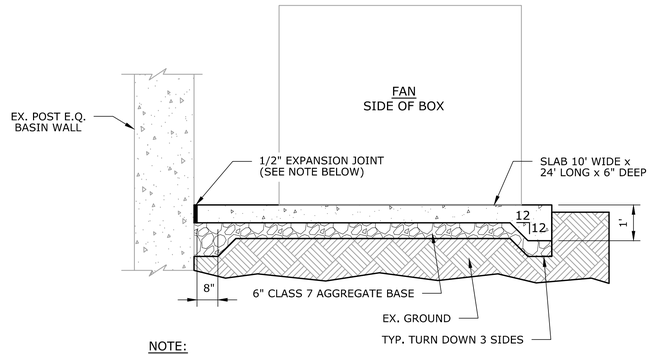
NOTE:
1. THIS LEGEND IS FOR SHEETS TP-06 & TP-07.
2. ALL PIPING, FITTINGS, AND APPURTENANCES RELATIVE TO THE PERMEATE PIPING SHALL BE DI CLASS 50.
3. FLANGES SHALL BE MINIMUM OF CLASS 150.
4. CONTRACTOR SHALL SUPPORT ALL PIPING AND APPURTENANCES ASSOCIATED WITH THE TREATMENT SYSTEM IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

NOTE:
1. THIS LEGEND IS FOR SHEETS TP-06 & TP-07.
2. ALL PIPING, FITTINGS, AND APPURTENANCES RELATIVE TO THE AIR PIPING CONNECTING TO THE MBR UNITS SHALL BE DI CLASS 50.
3. FLANGES SHALL BE MINIMUM OF CLASS 150.
4. CONTRACTOR SHALL SUPPORT ALL PIPING AND APPURTENANCES ASSOCIATED WITH THE TREATMENT SYSTEM IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.



SECTION K-K

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



NOTE:
PROVIDE 1/2" PREFORMED EXPANSION JOINT MATERIAL (ASPHALT IMPREGNATED FIBERBOARD OR OTHER APPROVED MATERIAL).

SECTION L-L

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

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PERMEATE & AIR LINES PIPING PLAN

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N.R.B.	L.E.W.
DATE: APRIL, 2017	
SCALE: AS SHOWN	JOB NUMBER: FY152150

TP-07

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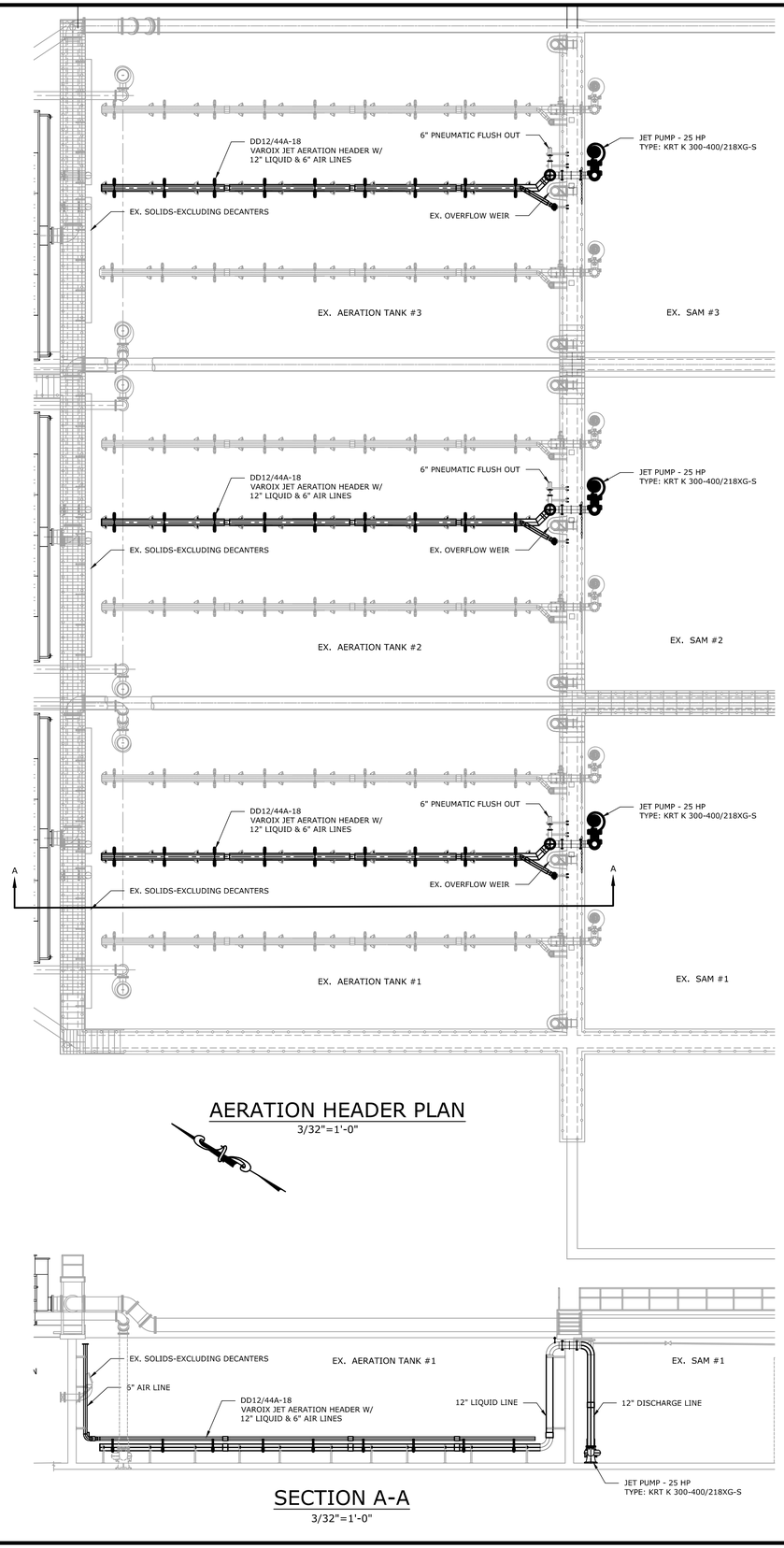

AERATION HEADER PLAN

3/32"=1'-0"

SECTION A-A

3/32"=1'-0"

IMPORTANT NOTES:

1. ALL FLANGES SHALL MEET OUTSIDE DIAMETER, BOLT CIRCLE DIAMETER, NUMBER AND SIZE OF HOLES PER ANSI B.16.1 125 LB. CAST IRON, AND ANSI B16.5 150 LB. STEEL FLANGE SPECIFICATIONS.
2. CONTRACTOR TO PROVIDE ALL INTERCONNECTING HARDWARE AND GASKETS.
3. EXISTING EQUIPMENT IS SHOWN ONLY FOR REFERENCE AND IS NOT EXACT.
4. CONTRACTOR MUST COORDINATE CLOSELY WITH MBR EQUIPMENT MANUFACTURER TO BE CERTAIN THAT HE IS FULLY AWARE OF ALL LIQUID, SLUDGE, AIR, AND ELECTRICAL LINES ASSOCIATED WITH THIS UNIT. COMPLETE CONVEYANCE AND RETURN PIPING SYSTEM MUST BE PROVIDED/INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS TO CONSTITUTE A COMPLETE SYSTEM.
5. THREE NEW AIR HEADER PIPES MUST BE PROVIDED TO THE AEROBIC TANKS. SEE STRUCTURAL DRAWINGS FOR AIR HEADER SUPPORT DETAIL.
6. CONTRACTOR SHALL SUPPORT ALL PIPING AND APPURTENANCES ASSOCIATED WITH THE TREATMENT SYSTEM IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
7. TWO-INCH BALL VALVES SHALL BE SCHEDULE 80 PVC.
8. DETAILS FOR DROP PIPING FROM AIR HEADER TO 6" CONNECTION TO JET AERATION HEADER MUST BE SUBMITTED TO AND APPROVED BY THE ENGINEER.
9. AIR HEADER LINES INSIDE THE SBR TANKS ARE TO BE 6" DIAMETER UNLINED CLASS 53 DUCTILE IRON PIPE WITH FLANGED JOINTS AND FITTINGS AND VITON GASKETS. CONTRACTOR MUST SUBMIT PIPE ROUTING PLANS FOR ENGINEER'S APPROVAL.
10. WHEREVER PIPES PENETRATE CONCRETE WALLS IN THESE BASINS, THEY SHALL DO SO PENDICULARLY TO SAID WALL AND THROUGH THE USE OF A WALL PIPE WITH SEEPAGE RING.

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AERATION HEADERS PLAN & SECTION

PROJECT ENGR:	DRAWN BY :
N.R.B.	L.E.W.
DATE: APRIL, 2017	
SCALE: AS SHOWN	JOB NUMBER: FY152150

TP-08

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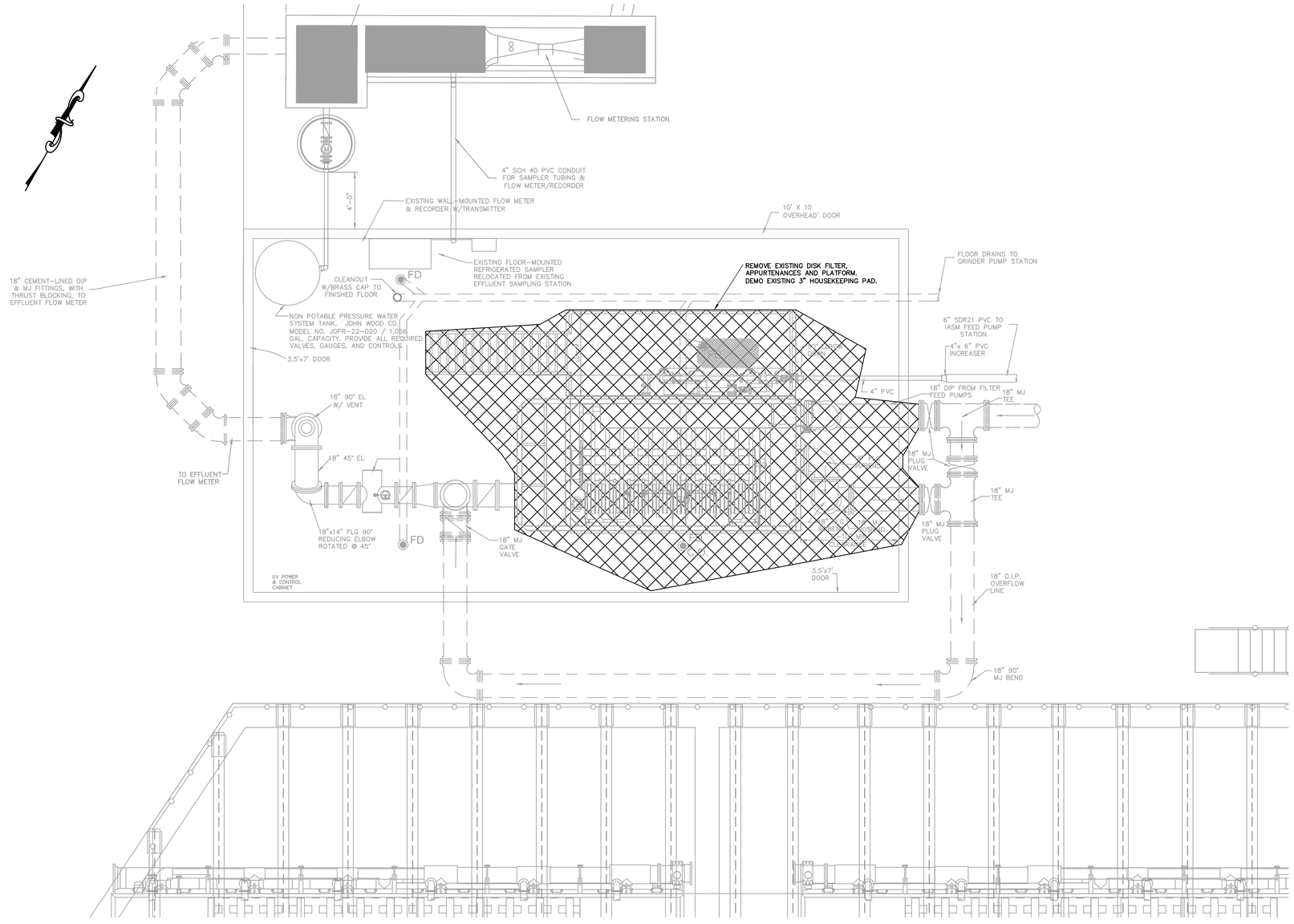

FILTER BUILDING DEMOLITION PLAN

SCALE: 1/4"=1'-0"

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REVISIONS NO.	DESCRIPTION	DATE

FILTER BUILDING DEMOLITION PLAN

PROJECT ENGR:	DRAWN BY :
N.R.B.	L.E.W.
DATE: APRIL, 2017	
SCALE:	JOB NUMBER: FY152150

FB-01

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\FB-01 THRU FB-04.dwg 4/6/17 at 4:40pm
K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\FB-01 THRU FB-04.dwg 4/6/2017 4:40:05 PM

4" SCH 40 PVC CONDUIT FOR SAMPLER TUBING & FLOW METER/RECORDER

EXISTING WALL-MOUNTED FLOW METER & RECORDER W/TRANSMITTER

4'-0"

46'-4"

10' X 10 OVERHEAD' DOOR

C

D

A

A

EXISTING FLOOR-MOUNTED REFRIGERATED SAMPLER RELOCATED FROM EXISTING EFFLUENT SAMPLING STATION

FLOOR DRAINS TO GRINDER PUMP STATION

PROP CHEMICAL TOTE

FD

CLEANOUT W/BRASS CAP TO FINISHED FLOOR

NON POTABLE PRESSURE WATER SYSTEM TANK. JOHN WOOD CO. MODEL NO. JOPR-22-020 / 1,056 GAL. CAPACITY. PROVIDE ALL REQUIRED VALVES, GAUGES, AND CONTROLS.

3.5'x7' DOOR

PROP PERMEATE TAN□

PROP CHEMICAL TOTE

6" SDR21 PVC TO IASM FEED PUMP STATION

4"x 6" PVC INCREASER

4" PVC

27 18" BLIND FLG

18" MJ TEE

18" MJ PLUG VALVE

THIS IS ALL EXISTING PIPING

18" 90° W/ VEN

18" 45°

PROP PERMEATE TAN□DISCHARGE PIPING 18" DIP

26'-0"

TO EFFLUENT FLOW METER

18"x14" FLG 90° REDUCING ELBO ROTATED @ 45°

FD

18" MJ GATE VALVE

B

B

EXISTING PIPE□VALVES AND UV SYSTEM TO REMAIN IN OPERATION DURING CONSTRUCTION UNTIL NEW UV SYSTEM CAN BE PLACED INTO SERVICE

UV POWER & CONTROL CABINET

FOR PIPING THRU WALL SEE ALSO SHEETS FB-03 & FB-04

3.5'x7' DOOR

18" D.I.P. OVERFLOW LINE

PROP PERMEATE PIPING FROM MBR 12" PVC SCH 8□ □YP. 3 TOTAL□

PROP PERMEATE PUMP □YP□3 TOTAL□

C

D

5'-8 1/16"

5'-8 1/16"

27'-4 9/16"

18" 90° MJ BEND

FILTER BUILDING - PLAN

SCALE: 1/2"=1'-0"

PRELIMINARY
FOR PERMITTING ONLY
NOT FOR CONSTRUCTION

McCLELLAND CONSULTING ENGINEERS, INC.
DESIGNED TO SERVE
4608 S. Gessner Rd. Ste 401
Houston, TX 77063
PH# 713.783.3600
7300 Kanis Road
Little Rock, Ar. 72204
PH# 501.771.0272
1810 N. College
Fayetteville, Arkansas 72703
PH# 479.443.3377
HTTP://WWW.MCE-US.COM

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DECATUR WWTP EXPANSION
DECATUR, ARKANSAS

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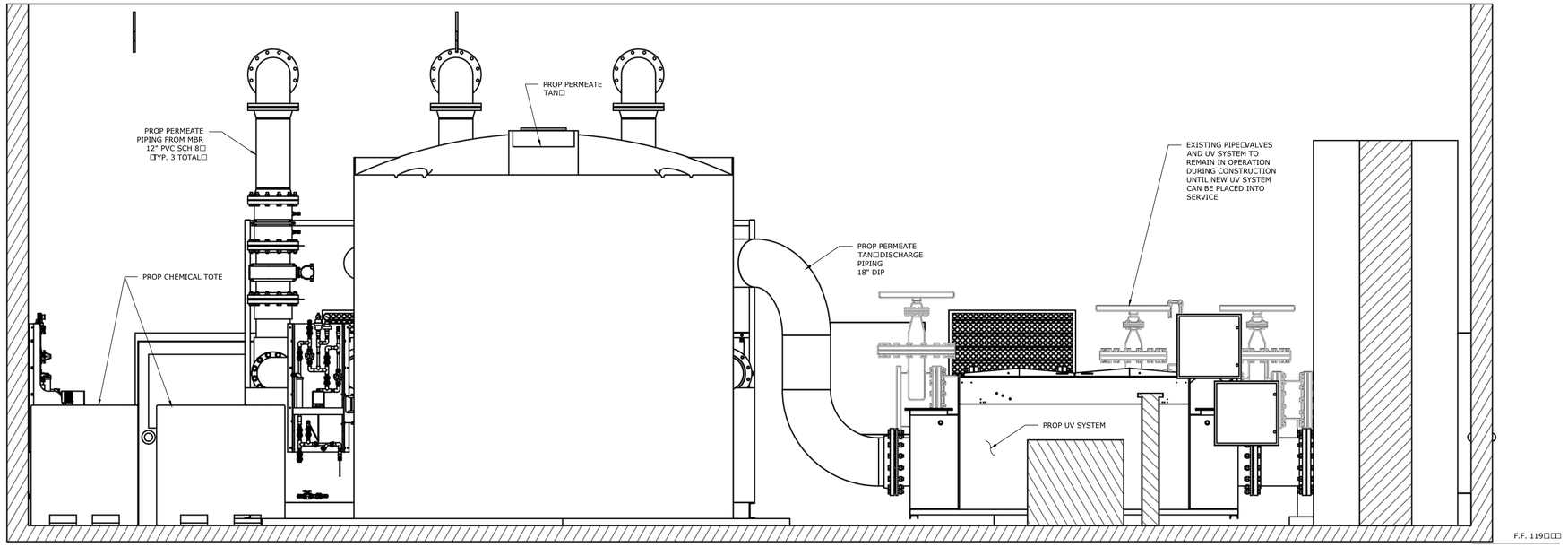
NO.	DATE	REVISIONS DESCRIPTION

FILTER BUILDING PLAN

PROJECT ENGR:	DRAWN BY:
N.R.B.	L.E.W.
DATE: APRIL, 2017	
SCALE:	JOB NUMBER: FY152150

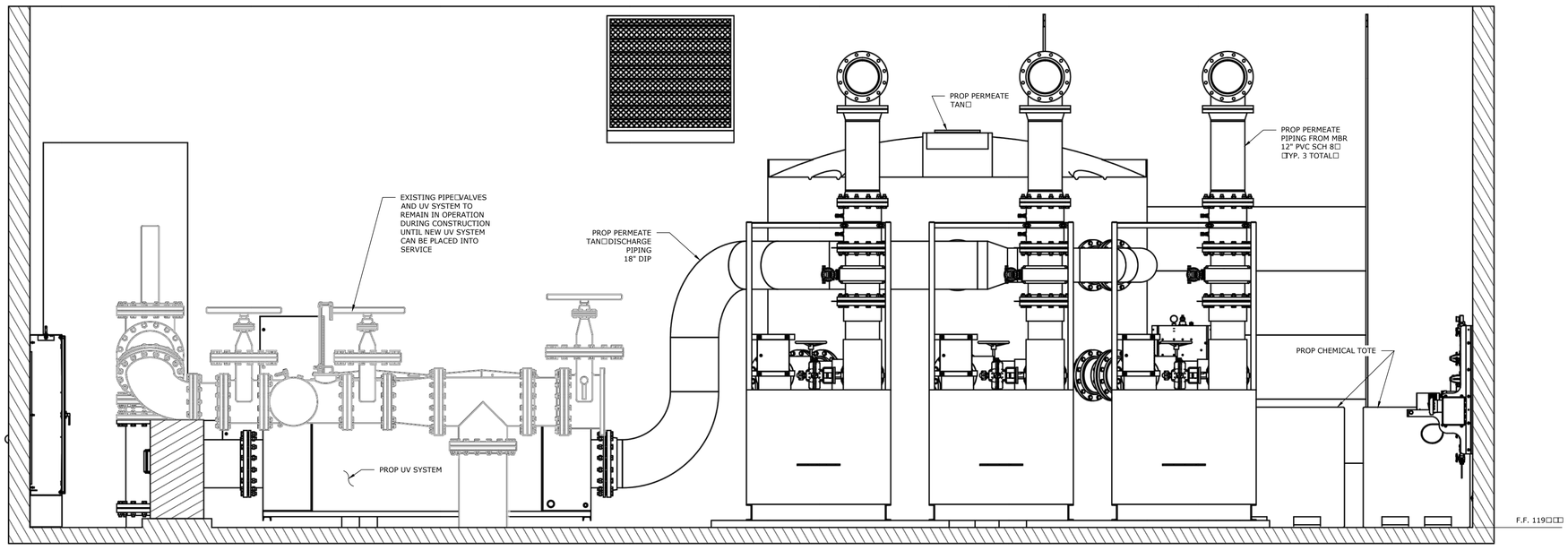
FB-02

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\FB-01 THRU FB-04.dwg, 4/6/2017 4:40:08 PM



SECTION A-A

SCALE: 1/2"=1'-0"



SECTION B-B

SCALE: 1/2"=1'-0"

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McCLELLAND CONSULTING ENGINEERS, INC.
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Tulsa, Ok. 74146
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7300 Kanis Road
Little Rock, Ar. 72204
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1810 N. College
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FILTER BUILDING PLAN

PROJECT ENGR:	DRAWN BY :
N.R.B.	L.E.W.
DATE: APRIL, 2017	
SCALE:	JOB NUMBER: FY152150

FB-03

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\FB-01 THRU FB-04.dwg, 4/6/2017 4:40:19 PM
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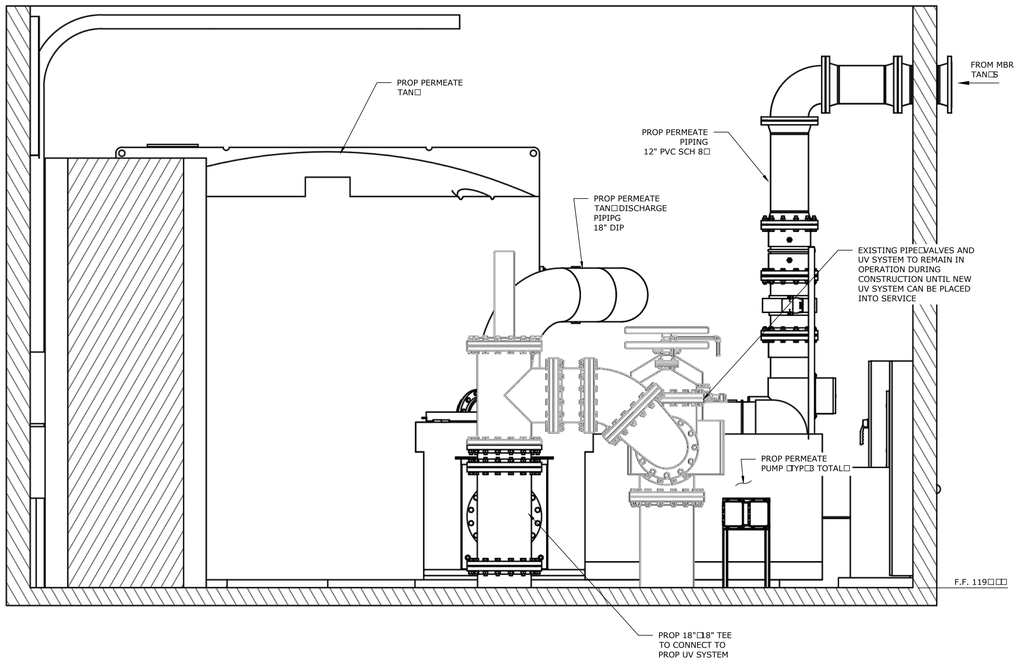
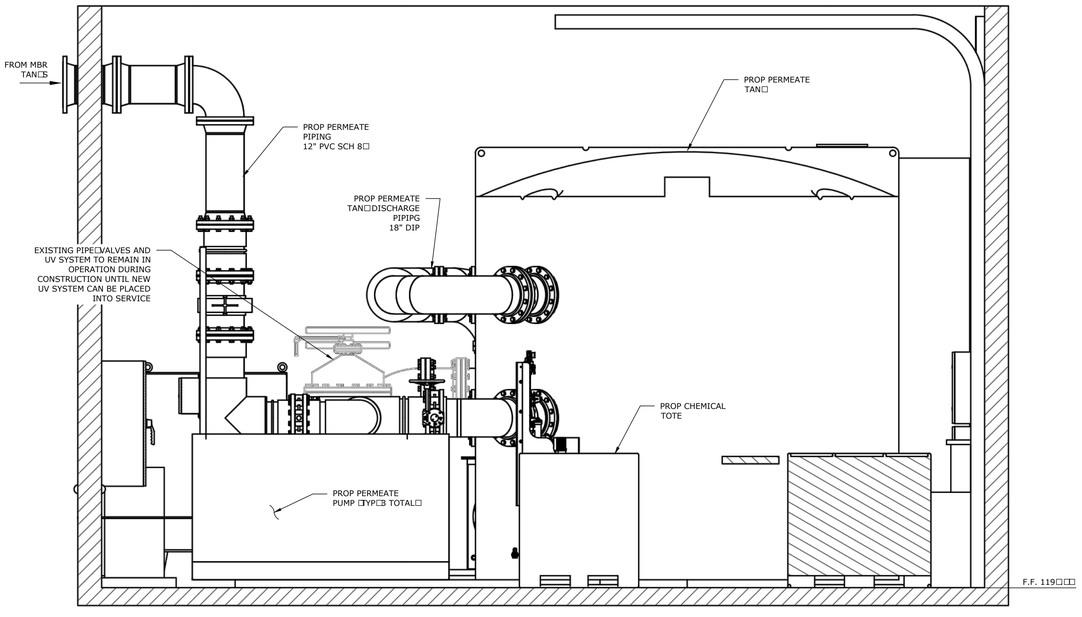


SECTION C-C

SCALE: 1/2"=1'-0"



SECTION D-D

SCALE: 1/2"=1'-0"

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Tulsa, Ok. 74146
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REVISIONS

NO.	DATE	DESCRIPTION

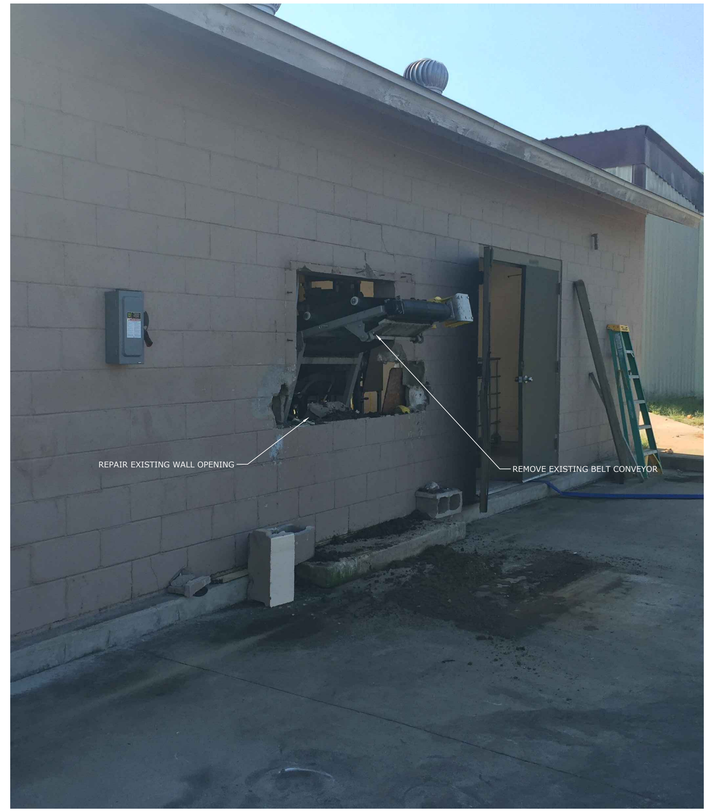
FILTER BUILDING SECTIONS

PROJECT ENGR:	DRAWN BY :
N.R.B.	L.E.W.
DATE:	
APRIL, 2017	
SCALE:	JOB NUMBER:
	FY152150

FB-04

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\FB-01 THRU FB-04.dwg 4/6/17 at 4:40pm
K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\FB-01 THRU FB-04.dwg 4/6/2017 4:40:28 PM

EXISTING SLUDGE PRESS BUILDING LOOKING SOUTH



OUTSIDE EXISTING SLUDGE PRESS BUILDING LOOKING EAST

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DESIGNED TO SERVE!
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900 West Markham, Little Rock, Ar. 72201, PH# 501.371.0272
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NO.	DATE	REVISIONS DESCRIPTION

SLUDGE SCREW PRESS BUILDING DEMOLITION

PROJECT ENGR:	DRAWN BY :
AST	DLR
DATE: APRIL 2017	
SCALE: N/A	JOB NUMBER: FY152150

SP-01

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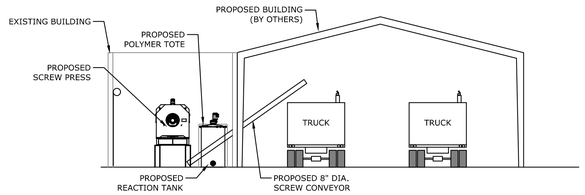
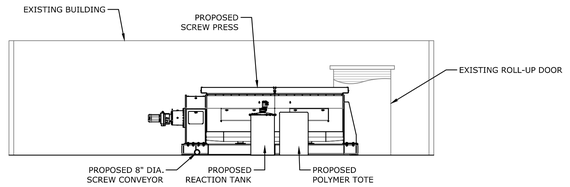


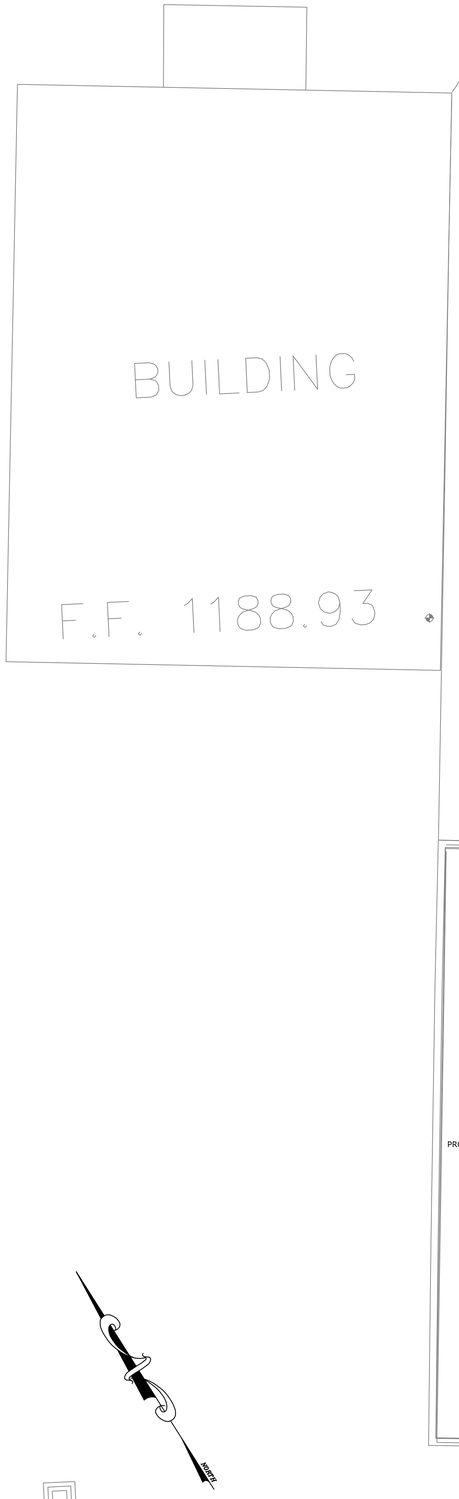
SECTION A A

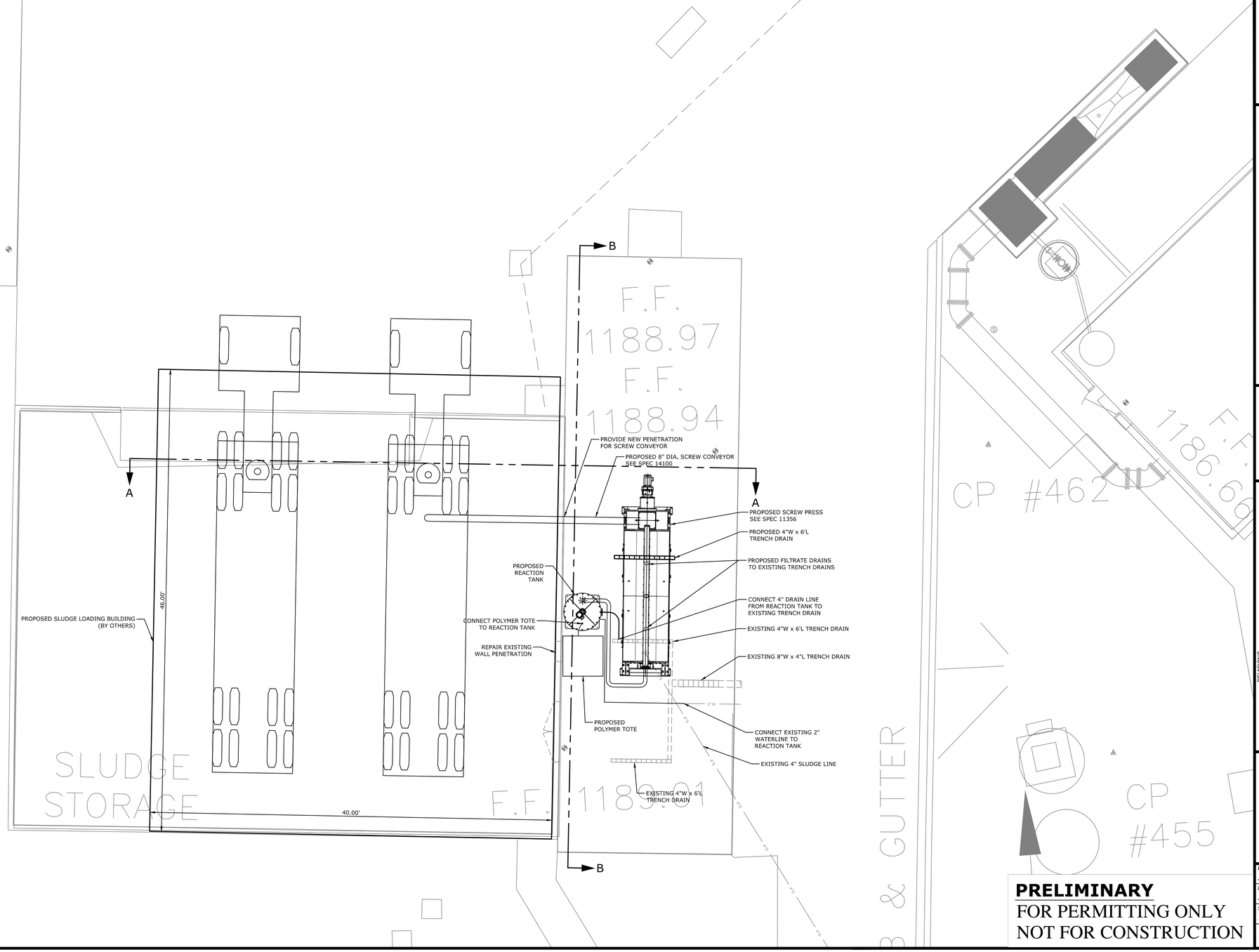
1"

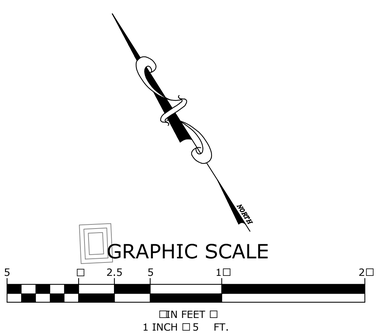


SECTION B B

1"







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PH# 479.443.2377
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NO.	DATE	REVISIONS DESCRIPTION

SLUDGE SCREW PRESS BUILDING LAYOUT

PROJECT ENGR:	DRAWN BY:
AST	DLR

DATE: APRIL 2017

SCALE:	JOB NUMBER:
AS SHOWN	FY152150

PRELIMINARY
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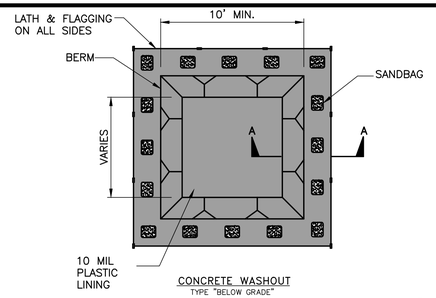
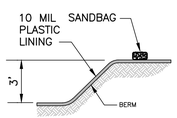
SP-02

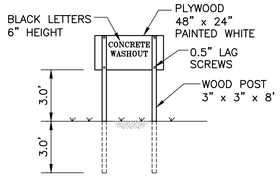
W:\2015\FY15-2150 Decatur WWTP Expansion\Drafting\FY15-2150 DESIGN-LIFTEDSPLITTERBOX.dwg 4/6/17 at 9:52am



CONCRETE WASHOUT
TYPE "BELOW GRADE"



SECTION A–A

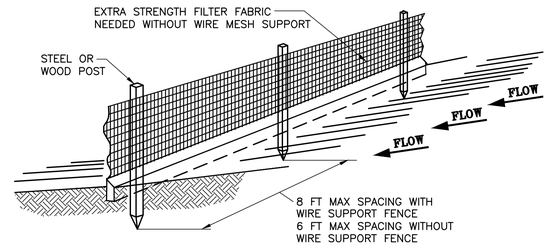


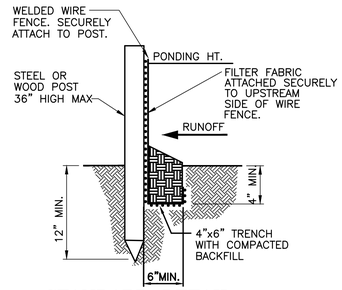
SIGN DETAIL

NOTES

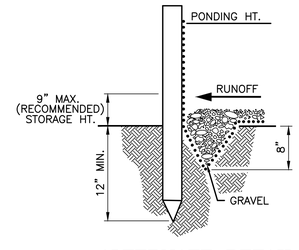
1. NO WASHING OUT OF CONCRETE TRUCKS OR WASHING OF SWEEPINGS FROM EXPOSED AGGREGATE CONCRETE INTO STORM DRAINS, OPEN DITCHES, STREETS, OR STREAMS IS ALLOWED.
2. EXCESS CONCRETE IS NOT ALLOWED TO BE DUMPED ON–SITE, EXCEPT IN DESIGNATED TEMPORARY CONCRETE WASHOUT PIT AREAS.
3. ON–SITE TEMPORARY CONCRETE WASHOUT AREAS WILL BE LOCATED AT LEAST 50 FEET FROM STORM DRAINS, OPEN DITCHES, OR WATER BODIES AS DETERMINED IN THE FIELD.
4. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.
5. TEMPORARY CONCRETE WASHOUT FACILITIES WILL BE CONSTRUCTED AND MAINTAINED IN SUFFICIENT QUANTITY AND SIZE TO CONTAIN ALL LIQUID AND CONCRETE WASTE GENERATED BY WASHOUT OPERATIONS.
6. WASHOUT FACILITIES WILL BE CLEANED OUT ONCE THE WASHOUT IS 75% FULL.
7. PLASTIC LINING MATERIAL WILL BE MINIMUM OF 10 MIL POLYETHYLENE SHEETING AND WILL BE FREE OF HOLES, TEARS, OR OTHER DEFECTS.
8. WHEN WASHOUT FACILITIES ARE NO LONGER REQUIRED FOR WORK, THE HARDENED CONCRETE WILL BE REMOVED AND DISPOSED OF. MATERIALS USED TO CONSTRUCT TEMPORARY CONCRETE WASHOUT FACILITIES WILL BE REMOVED FROM THE SITE AND DISPOSED OF.

CONCRETE WASTE MANAGEMENT
NTS





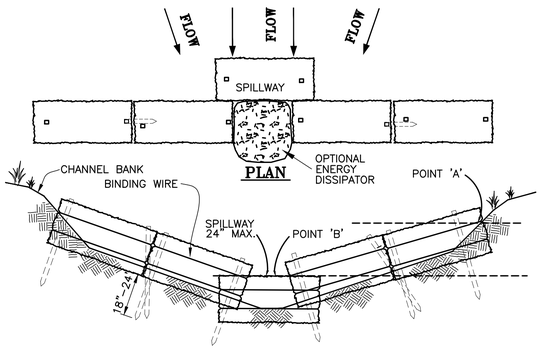
STANDARD DETAIL
TRENCH WITH NATIVE BACKFILL



ALTERNATE DETAIL
TRENCH WITH GRAVEL

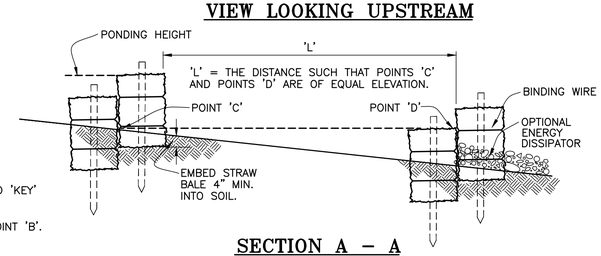
NOTES:
1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.
2. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF–SITE AND CAN BE PERMANENTLY STABILIZED.
3. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS WHERE FEASIBLE TO MAXIMIZE PONDING EFFICIENCY.

SILT FENCE
NTS



PLAN

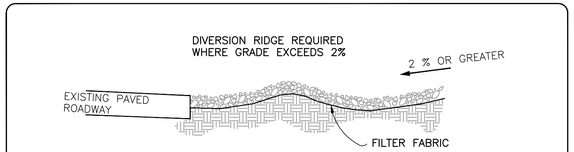
VIEW LOOKING UPSTREAM



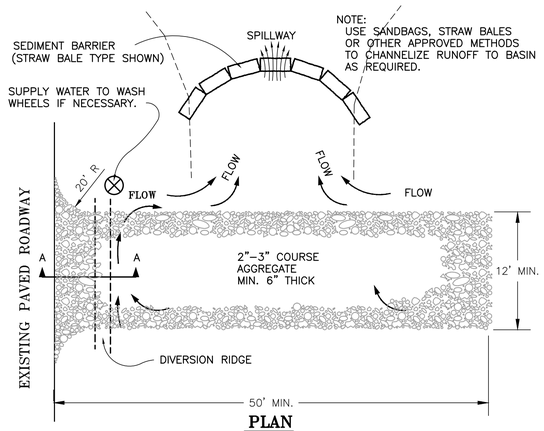
SECTION A – A
SPACING BETWEEN CHECK DAMS

NOTES:
1. EMBED BALES 4" INTO THE SOIL AND 'KEY' BALES INTO THE CHANNEL BANKS.
2. POINT 'A' MUST BE HIGHER THAN POINT 'B'. (SPILLWAY HEIGHT)
3. PLACE BALES PERPENDICULAR TO THE FLOW WITH ENDS TIGHTLY ABUTTING. USE STRAW, ROCKS OR FILTER FABRIC TO FILL ANY GAPS AND TAMP BACKFILL MATERIAL TO PREVENT EROSION OR FLOW AROUND THE BALES.
4. SPILLWAY HEIGHT SHALL NOT EXCEED 24".
5. INSPECT AFTER EACH SIGNIFICANT STORM, MAINTAIN AND REPAIR PROMPTLY.

STRAW BALE CHECK DAM
NTS



SECTION A – A



PLAN

NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT–OF–WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABLIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE/EXIT

PRELIMINARY
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NOT FOR CONSTRUCTION

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REVISIONS

NO.	DESCRIPTION	DATE

EROSION CONTROL DETAILS

PROJECT ENGR:	DRAWN BY:
N.R.B.	L.E.W.
DATE: APRIL, 2017	
SCALE:	JOB NUMBER: FY152150

D-1

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET C-02 GENERAL NOTES, INDEX & MISC DETAILS.dwg 4/5/17 at 3:15pm

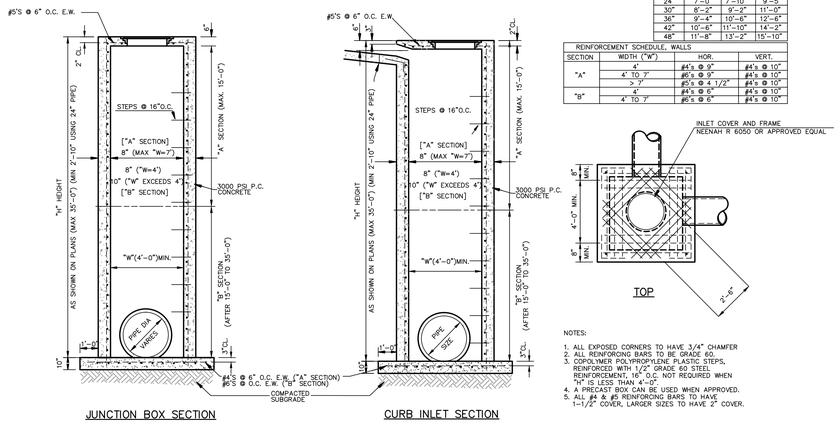


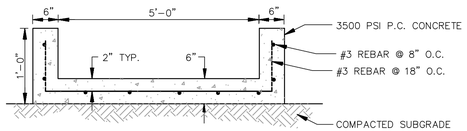
TABLE OF 'W' DIMENSIONS			
I.D. PIPE	SKEW OF CROSS DRAIN		
SINGLE	STRAIGHT	30°	45°
24"	4'-0"	4'-0"	4'-10"
30"	4'-0"	4'-7"	5'-8"
36"	4'-0"	5'-3"	6'-5"
42"	5'-3"	5'-11"	7'-3"
48"	5'-10"	6'-7"	8'-0"
60"	7'-0"	7'-10"	9'-8"
DOUBLE	FOR "A" SECTION ONLY		
24"	7'-0"	7'-10"	9'-5"
30"	8'-2"	9'-2"	11'-0"
36"	9'-4"	10'-6"	12'-6"
42"	10'-6"	11'-10"	14'-2"
48"	11'-8"	13'-2"	15'-10"

REINFORCEMENT SCHEDULE, WALLS			
SECTION	WIDTH ("W")	HOR.	VERT.
"A"	4'-	#4's @ 9"	#4's @ 10"
	4' TO 7'	#5's @ 9"	#4's @ 10"
	> 7'	#5's @ 4 1/2"	#4's @ 10"
"B"	4'	#4's @ 6"	#4's @ 10"
	4' TO 7'	#5's @ 6"	#4's @ 10"

NOTES:
1. ALL EXPOSED CORNERS TO HAVE 3/4" CHAMFER
2. ALL REINFORCING BARS TO BE GRADE 60.
3. CORCONNER POLYPROPYLENE PLASTIC STEPS, REINFORCED WITH 1/2" GRADE 60 STEEL REINFORCEMENT, 16" O.C. NOT REQUIRED WHEN "H" IS LESS THAN 4'-0".
4. A PRECAST BOX CAN BE USED WHEN APPROVED.
5. ALL #4 & #5 REINFORCING BARS TO HAVE 1-1/2" COVER, LARGER SIZES TO HAVE 2" COVER.

STANDARD JUNCTION BOX AND CURB INLET

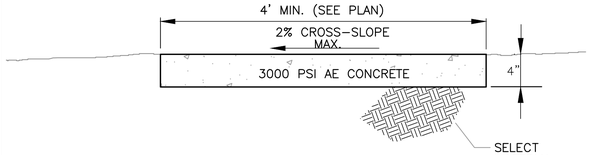
N.T.S.



SECTION A-A

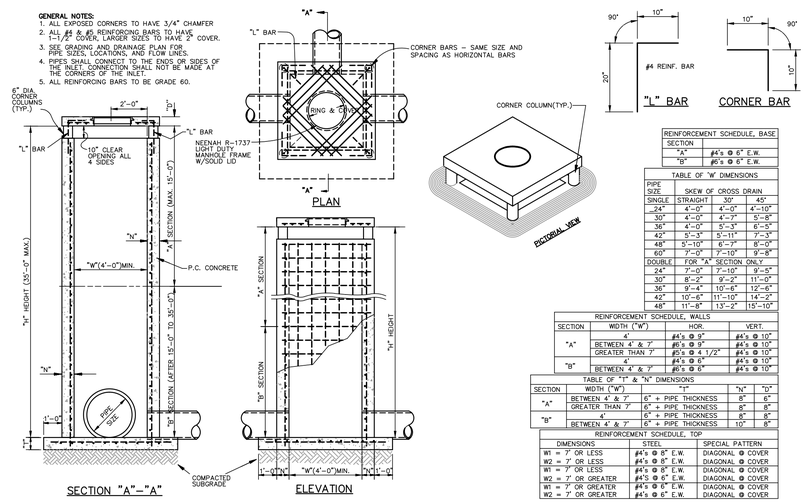
DRAINAGE CHANNEL

N.T.S.



SIDEWALK DETAIL

NTS



REINFORCEMENT SCHEDULE, BASE	
SECTION	
"A"	#4's @ 6" E.W.
"B"	#5's @ 6" E.W.

TABLE OF 'W' DIMENSIONS			
PIPE SIZE	SKEW OF CROSS DRAIN		
SINGLE	STRAIGHT	30°	45°
24"	4'-0"	4'-0"	4'-10"
30"	4'-0"	4'-7"	5'-8"
36"	4'-0"	5'-3"	6'-5"
42"	5'-3"	5'-11"	7'-3"
48"	5'-10"	6'-7"	8'-0"
60"	7'-0"	7'-10"	9'-8"
DOUBLE	FOR "A" SECTION ONLY		
24"	7'-0"	7'-10"	9'-5"
30"	8'-2"	9'-2"	11'-0"
36"	9'-4"	10'-6"	12'-6"
42"	10'-6"	11'-10"	14'-2"
48"	11'-8"	13'-2"	15'-10"

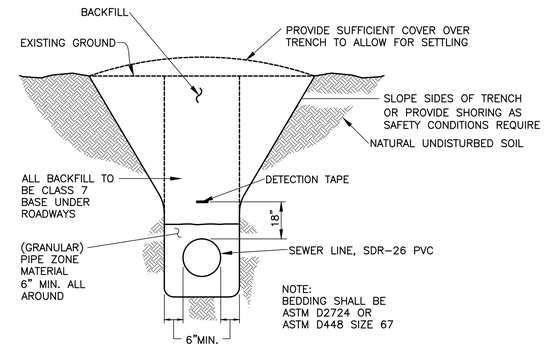
REINFORCEMENT SCHEDULE, WALLS			
SECTION	WIDTH ("W")	HOR.	VERT.
"A"	4'-	#4's @ 9"	#4's @ 10"
	BETWEEN 4' & 7'	#5's @ 9"	#4's @ 10"
	GREATER THAN 7'	#5's @ 4 1/2"	#4's @ 10"
"B"	4'	#4's @ 6"	#4's @ 10"
	BETWEEN 4' & 7'	#5's @ 6"	#4's @ 10"

TABLE OF "T" & "N" DIMENSIONS				
SECTION	WIDTH ("W")	"T"	"N"	"D"
"A"	BETWEEN 4' & 7'	6" + PIPE THICKNESS	8"	6"
	GREATER THAN 7'	6" + PIPE THICKNESS	8"	8"
"B"	4'	6" + PIPE THICKNESS	8"	8"
	BETWEEN 4' & 7'	6" + PIPE THICKNESS	10"	8"

REINFORCEMENT SCHEDULE, TOP		
DIMENSIONS	STEEL	SPECIAL PATTERN
W1 = 7' OR LESS	#4's @ 8" E.W.	DIAGONAL @ COVER
W2 = 7' OR LESS	#4's @ 8" E.W.	DIAGONAL @ COVER
W1 = 7' OR LESS	#4's @ 6" E.W.	DIAGONAL @ COVER
W2 = 7' OR GREATER	#4's @ 6" E.W.	DIAGONAL @ COVER
W1 = 7' OR GREATER	#4's @ 6" E.W.	DIAGONAL @ COVER
W2 = 7' OR GREATER	#4's @ 6" E.W.	DIAGONAL @ COVER

AREA INLET

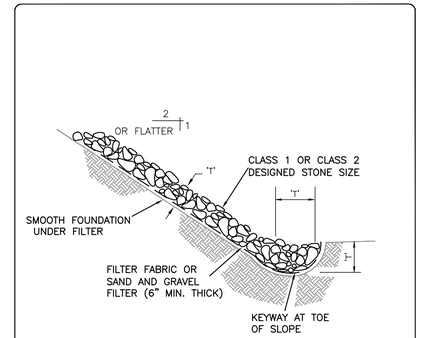
N.T.S.



TYPICAL SEWER TRENCH DETAIL

NTS

RIPRAP



TYPICAL SECTION

NOTE:
"T" = THICKNESS : THICKNESS SHALL BE DETERMINED BY THE ENGINEER.

MINIMUM THICKNESS SHALL BE 1.5x THE MAXIMUM STONE DIAMETER, NEVER LESS THAN 6 INCHES.

Construction Specifications
Before laying riprap and filter, prepare the subgrade to the required lines and grades shown on the plans. Compact any fill required in the subgrade to a density approximating that of the surrounding undisturbed material. Overfill depressions with riprap.

Remove brush, trees, stumps, and other objectionable material. Cut the subgrade sufficiently deep so that the finished grade of the riprap will be at the elevation of the surrounding area. Channels should be excavated sufficiently to allow placement of the riprap in a manner such that the finished inside dimensions and grade of the riprap meet design specifications.

Place the sand and gravel filter blanket immediately after the ground foundation is prepared. For gravel, spread filter stone in a uniform layer to the specified depth. Where more than one layer of filter material is used, spread the layers with minimal mixing.

Place the filter fabric directly on the prepared foundation. Overlap the edges by at least 12 inches, and space anchor pins every 3 feet along the overlap. Bury the upper and lower ends of the cloth a minimum of 12 inches below ground.

Take care not to damage the cloth when placing riprap. Where large stones are used or machine placement is difficult, a 4-inch layer of fine gravel or sand may be needed to protect the filter fabric.

Placement of riprap should follow immediately after placement of the filter.

Place riprap so that it forms a dense, well-graded mass of stone with a minimum of voids. Place riprap to its full thickness in one operation.

Do not place riprap by dumping through chutes or other methods that cause segregation of stone sizes.

Take care not to dislodge the underlying base or filter when placing the stones.

The finished slope should be free of pockets of small stone or clusters of large stones.

Maintenance
Riprap should be inspected periodically for scour or dislodged stones. Control of weed and brush growth may be needed in some locations.

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NO.	DATE	REVISIONS DESCRIPTION

811 Know what's below. Call before you dig.

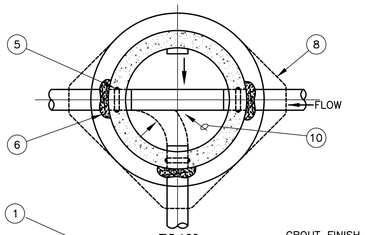
GRADING AND DRAINAGE DETAILS

PROJECT ENGR:	DRAWN BY:
N.R.B.	L.E.W.
DATE: APRIL, 2017	
SCALE:	JOB NUMBER: FY152150

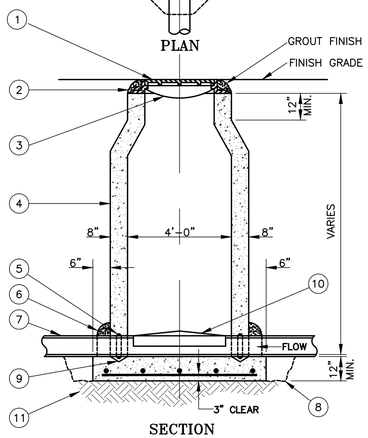
D-2

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET C-02 GENERAL NOTES, INDEX & MISC DETAILS.dwg 4/5/17 at 3:16pm

1. MANHOLE RING FRAME AND COVER SHALL BE STANDARD SIZE, 270 LB. SOLID CONSTRUCTION.
2. IF CAST IN PLACE CONCRETE IS POURED BELOW ELEVATION REQUIRED FOR TOP OF RING FRAME TO BE AT GROUND LEVEL, PROVIDE A MAXIMUM OF 3 COURSE OF PRECAST CONC. GRADE ADJUSTMENT RINGS, OR GROUT AS DIRECTED BY FIELD ENGINEER TO ATTAIN PROPER ELEVATION.
3. RAIN CATCHER
4. MANHOLE WALLS AND BASE SHALL BE CAST IN PLACE CONCRETE, CLASS A, REINFORCE BASE WITH #5's @ 12" O.C. EACH WAY. COAT INTERIOR AND EXTERIOR WALLS AS SPECIFIED.
5. WATER STOP AS PER MANUFACTURER'S SPECIFICATIONS.
6. SEAL OUTSIDE OF PIPE WITH MORTAR, AS DIRECTED BY FIELD ENGINEER.
7. SEE PLAN AND PROFILE FOR SEWER LINE AND SIZE AND INVERT ELEVATION.
8. BUILD UP CONCRETE CRADLE UNDER PIPE IN OVER-EXCAVATED AREAS.
9. PROVIDE "V" SHAPED KEYWAY IN MANHOLE BASE.
10. GROUT INVERT AS REQUIRED.
11. NATURAL UNDISTURBED SOIL.

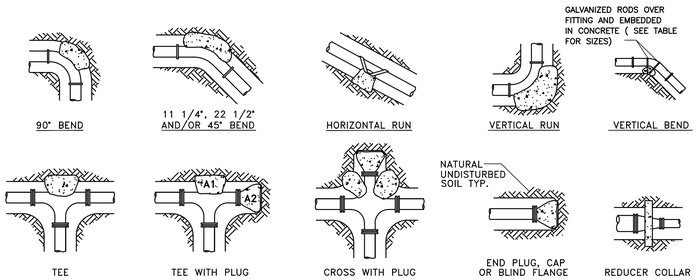


PLAN



SECTION

TYPICAL MANHOLE DETAIL



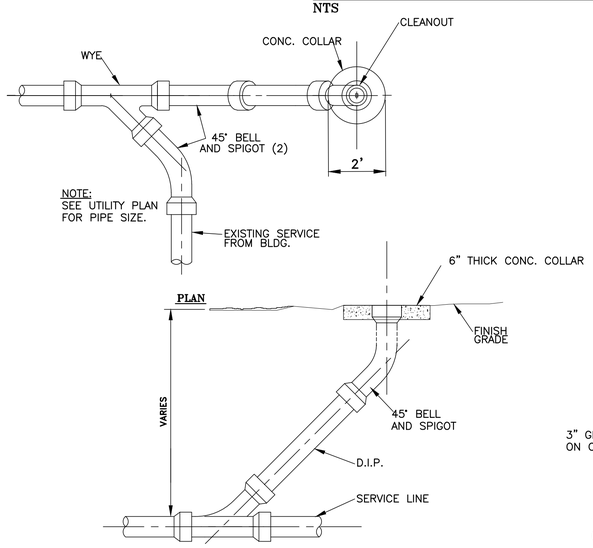
THRUST BLOCK SCHEDULE

(2000 PSF SOIL, 250 PSI WATER PRESSURE)

BEARING AREA OF THRUST BLOCKS IN SQ. FT. (HORIZONTAL BENDS)									VOLUME OF THRUST BLOCK IN CU. YDS. (VERTICAL BENDS)							
FITTING SIZE	TEE, WYE PLUG OR CAP	90° BEND, PLUGGED CROSS	TEE PLUGGED ON RUN (A1)	TEE PLUGGED ON RUN (A2)	BEND ANGLE 45°	22 1/2°	11 1/4°	5 5/8°	FITTING SIZE	BEND ANGLE 45°	22 1/2°	11 1/4°	5 5/8°	ROD SIZE	EMBED-MENT	CUBIC YARDS
2, 3, & 4	1.3	1.8	1.3	1.8	1.0	1.0	–	–	2, 3, & 4	1.5	0.5	0.3	–	#6	30"	–
6	2.8	4.0	2.8	4.0	2.2	1.1	1.0	–	6	3.6	1.3	0.5	–	#6	30"	–
8	5.0	7.1	5.0	7.1	3.8	2.0	1.0	–	8	5.3	2.0	0.8	–	#6	30"	0.6
10	7.9	11.1	7.9	11.1	6.0	3.1	1.6	–	10	8.0	3.1	1.2	–	#6	30"	–
12	11.3	16.0	11.3	16.0	8.7	4.4	2.3	–	12	11.3	4.3	1.7	–	#6	30"	1.3
14	15.4	21.8	15.4	21.8	11.8	6.0	3.1	–	14	15.3	5.7	2.4	–	#8	36"	–
16	20.1	28.4	20.1	28.4	15.4	7.8	4.0	–	16	19.7	7.5	3.1	–	#8	36"	2.3
18	25.4	36.0	25.4	36.0	19.5	9.9	5.1	–	18	25.0	12.7	6.4	–	#8	36"	–

THRUST BLOCK DETAILS

NTS

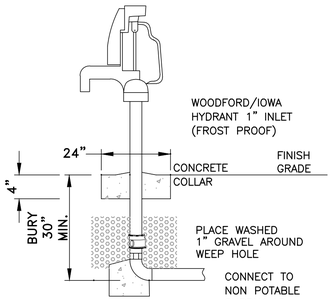


CLEANOUT DETAIL

NTS

THRUST BLOCK NOTES

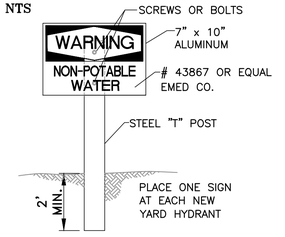
1. CONCRETE FOR THRUST BLOCKS SHALL DEVELOP NOT LESS THAN 2500 P.S.I. COMPRESSIVE STRENGTH AT 28 DAYS AND BE PLACED AGAINST UNDISTURBED SOIL.
2. ALL BENDS, BOTH HORIZONTAL AND VERTICAL, SHALL BE BACKED WITH CONCRETE. VERTICAL BENDS SHALL BE PLACED ON CONCRETE PADS WHERE BENDS TURN UP, OR LOADED WHERE BENDS TURN DOWN.
3. WRAP PIPE JOINTS IN 8 MIL POLYETHYLENE BEFORE PLACING CONCRETE.
4. BEARING AREA SHOWN IN TABLE, IS BASED UPON A 2000 LB/SF. SOIL BEARING, AND UPON A PIPELINE PRESSURE OF 200 psi PLUS WATER HAMMER.



YARD HYDRANT

NTS

7" x 10" PLASTIC



SPIGOT OR WALL-MOUNTED SIGN

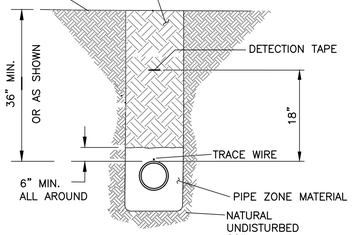
NTS

TO BE POSTED WITH STAINLESS STEEL SCREWS AT ALL INTERIOR HOSE BIBBS.

POST-MOUNTED SIGN

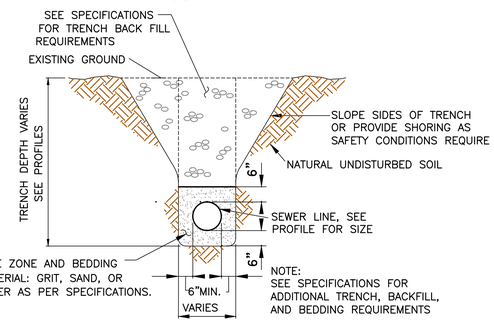
NTS

TO BE POSTED AT ALL EXTERIOR YARD HYDRANT LOCATIONS



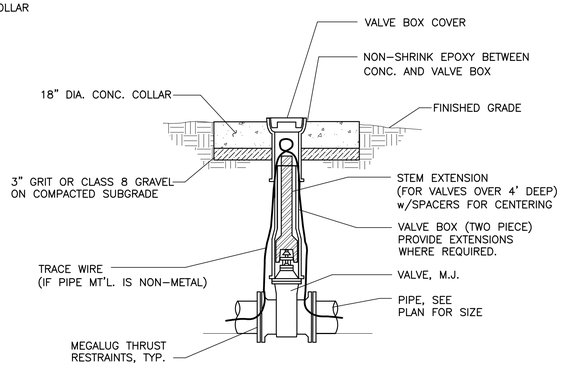
TYPICAL TRENCH DETAIL FOR PVC PIPE

NTS



TYPICAL TRENCH DETAIL FOR DUCTILE IRON PIPE

NTS



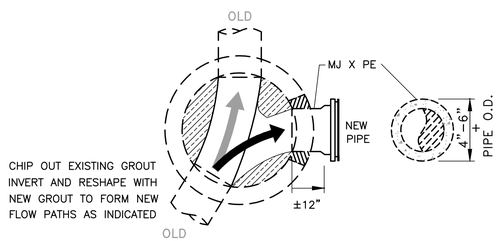
VALVE BOX DETAIL

NTS

COLOR CODING OF EXPOSED PIPING

THE CONTRACTOR SHALL MARK ALL ABOVE-GROUND PIPING WITH WEATHER-RESISTANT PLASTIC TAPE, COLOR-CODED AS SHOWN BELOW:

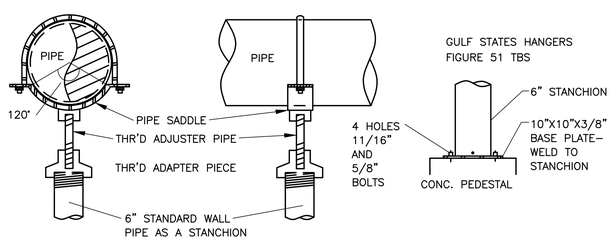
1. COMPRESSED AIR – GREEN
2. NON-POTABLE WATER – BLUE W/BLACK BANDS
3. RAW SLUDGE – BROWN W/BLACK BANDS
4. SEWAGE – GRAY
5. SLUDGE DRAW-OFF – BROWN W/ORANGE BANDS
6. SLUDGE RECIRCULATION – BROWN



MAKE HOLE IN EXISTING MANHOLE WALL APPROXIMATELY 4"-6" LARGER IN DIAMETER THAN O.D. OF PIPE.. WRAP PIPE WITH WATER STOP STRIP SUCH AS WATER STOP RX OR SYNKOFLEX AND POSITION SO THAT IT IS IN THE MIDDLE OF MANHOLE WALL. SEAL ANNULAR SPACE WITH NONSHRINK GROUT OR OTHER SUITABLE PRODUCT MADE FOR THE PURPOSE.

CONNECTION OF PIPE TO EXISTING MANHOLE

NTS



PIPE STAND DETAILS

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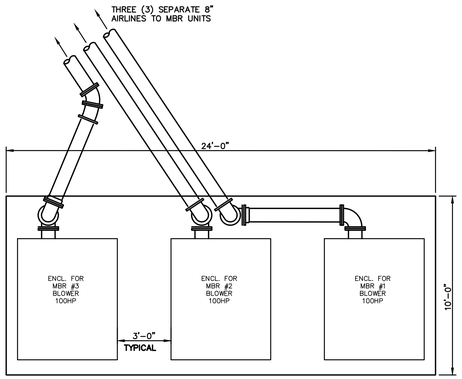
YARD PIPING DETAILS

PROJECT ENGR: N.R.B.	DRAWN BY: L.E.W.
DATE: APRIL, 2017	
SCALE:	JOB NUMBER: FY152150

D-3

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET G-02 GENERAL NOTES, INDEX & MISC DETAILS.dwg 4/5/17 at 3:17pm

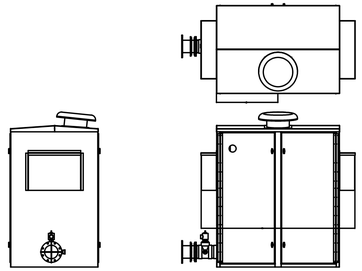


THE MBR BLOWER SLAB IS TO BE 24'Wx10'Lx6"THK
AND IS TO BE REINFORCED WITH WELDED WIRE FABRIC.
ADDITIONALLY, THE BLOWER "PADS" ARE TO BE GROUTED
IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

MBR BLOWER SLAB

NOTES:

1.) THE BLOWER SLAB DIMENSIONS PROVIDED HERE IN AFTER ARE PRELIMINARY AND ARE TO BE VERIFIED IN ACCORDANCE WITH THE EQUIPMENT MANUFACTURER'S RECOMMENDATIONS FOR THE PARTICULAR EQUIPMENT PROVIDED. BOTH BLOWER SLABS ARE TO BE CONSTRUCTED ON TOP OF 6" OF CLASS 7 BASE COMPACTED TO 95% MPD. THE MBR BLOWER SLAB WILL REQUIRE A CRACK CONTROL JOINT/SAW CUT AT THE APPROXIMATE MID-POINT OF ITS LONGEST DIMENSION.
2.) ENCLOSURES ARE TO BE WEATHER PROOF AND NOISE ATTENUATING. SEE SPECIFICATIONS.
3.) ENCLOSURES TO BE SIZED TO SPECIFICALLY FIT EACH SIZE OF BLOWER AS PROVIDED WITH SBR SYSTEM.
4.) PROVIDE ALL VALVES, FITTINGS, GUAGES & CONTROLS FOR A COMPLETE SYSTEM.



BLOWER ENCLOSURES

(SEE SPECIFICATIONS)

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MBR BLOWERS AND DETAILS

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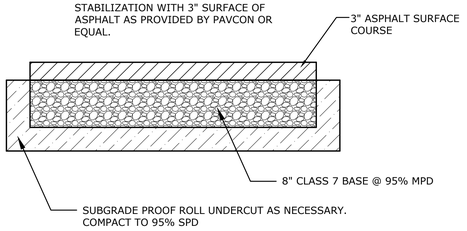
N.R.B.	L.E.W.
DATE: APRIL, 2017	
SCALE:	JOB NUMBER: FY152150

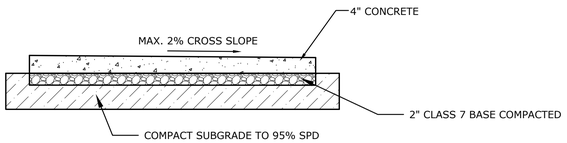
D-4

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET G-02 GENERAL NOTES, INDEX & MISC DETAILS.dwg 4/6/17 at 11:09am

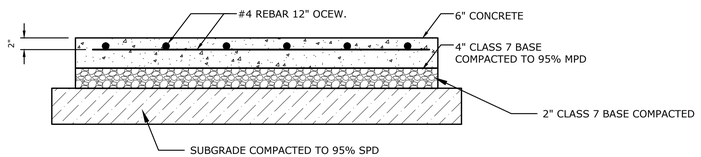
NOTE:
1. REMOVE EXISTING ASPHALT MATERIAL FROM SITE
2. ALTERNATIVELY PROVIDE DETAILS FOR FULL DEPTH RECLAMATION & CEMENT STABILIZATION WITH 3" SURFACE OF ASPHALT AS PROVIDED BY PAVCON OR EQUAL.



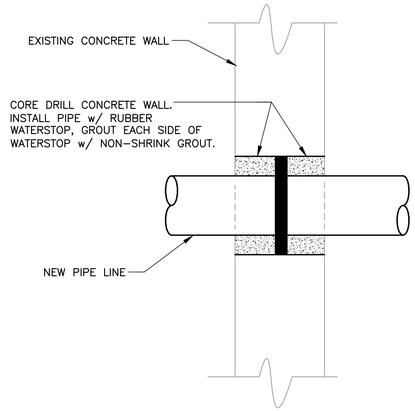
ASPHALT DETAIL
N.T.S.



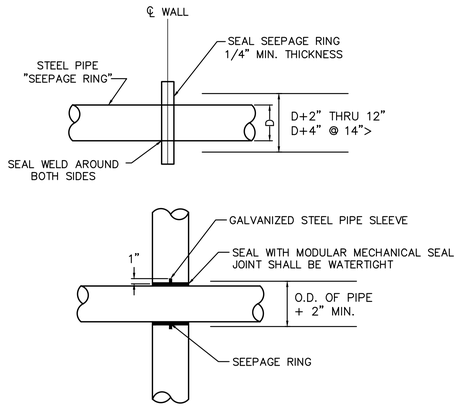
SIDEWALK DETAIL
N.T.S.



CONCRETE APRON DETAIL
N.T.S.



TYP. DETAIL
NEW PIPING THRU EXISTING CONCRETE WALLS
SCALE: NOT TO SCALE



NEW PIPING THRU NEW WALL
NTS

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DATE: APRIL, 2017	
SCALE:	JOB NUMBER: FY152150

D-5

K:\2015\152150- Decatur WWTP Expansion\Drafting\Sheets\SHEET G-02 GENERAL NOTES, INDEX & MISC DETAILS.dwg 4/5/17 at 3:19pm