TECHNICAL MEMORANDUM

TO:	Rana Moore, City of Roseville, Environmental Utilities
CC:	Bryan Buchanan, Jason Fick, Eric Robarge (Roseville Environmental Utilities)
PREPARED BY:	Jon Himlan and Tony Elberti
REVIEWED BY:	Jim Graydon and Paul Dombrowski
DATE:	April 25, 2023
RE:	Dry Creek Wastewater Treatment Plant (DCWWTP) Capacity Capital Analysis Draft Technical Memorandum

1. INTRODUCTION

This memorandum is written to describe Woodard & Curran's evaluations and recommendations for capital improvements at the Dry Creek plant that pertain to providing increased plant capacity. This evaluation is part of the Agreement for Engineering Services for Dry Creek and Pleasant Grove WWTP Capacity Evaluation and is also intended to support the South Placer Wastewater Authority (SPWA) Capacity Fee Analysis. For the analysis, Woodard & Curran considered near-term improvements that were identified through the Desktop Capacity analysis and Stress Testing phases of the project. We also evaluated capacity needs for the 20-year planning horizon and future buildout condition. The following description of the analysis is organized in the following Sections: Background and Analysis Approach, Design Flows and Loads, Design Effluent Quality, Near-Term Capacity Improvements, Long-Term Capacity Improvements, and the 20-Year and Buildout Capital Cost Estimates.

2. BACKGROUND AND ANALYSIS APPROACH

2.1 Existing Facility Summary

The City of Roseville (City) owns and operates the Dry Creek Wastewater Treatment Plant (DCWWTP), which provides wastewater treatment service for the southeast portion of the City of Roseville, portions of Placer County, and the South Placer Municipal Utility District. The Facility provides full nitrification and denitrification for nitrogen removal and uses tertiary filtration followed by UV disinfection. Tertiary treated wastewater from the Facility may be recycled in the City's reclaimed water distribution system or discharged to Dry Creek. Biosolids from the Facility are land applied at the Silva Ranch application site in Sacramento County by the contractor Synagro Technologies, Inc. (Synagro). The use of reclaimed water is regulated under Master Reclamation Permit for Roseville Regional Wastewater Treatment Plant, Order No. 97-147 (Master Reclamation Permit), which was adopted by the California Regional Water Quality Control Board, Central Valley Region (Regional Water Board) in 1997. Facility effluent discharges to Dry Creek are regulated under Waste Discharge Requirements for Municipal Wastewater Dischargers that meet Objectives/Criteria at the Point of Discharge to Surface Water, Order R5-2017-0085-01, NPDES No. CAG585001 (Municipal General Order), which was adopted by the Regional Water Board in 2017. The Regional Water Board issued

the City a Notice of Applicability (NOA) authorizing coverage under the Municipal General Order, effective August 1, 2019. The City's Municipal General Order enrollee number is R5-2017-0085-004. Biosolids handling and disposal specifications for the Facility are described in the 2019 Synagro contract with the City.

2.2 Conceptual Capital Cost Estimates

Opinions of probable cost were developed for the alternatives presented in this TM. This section provides the procedures and methodology used for developing planning-level capital cost estimates for the analysis.

2.2.1 Cost Estimation Approach

The cost estimates provided in this TM include improvements that would increase the plant capacity to treat the projected flows and loadings but does not include repair and replacement (R&R) projects or discretionary projects.

The estimated construction costs are based on a Class 4 estimate as defined by the Association for the Advancement of Cost Engineering (AACE) International cost estimate classification system. **Table 2.0** provides a summary of the estimate classes and expected accuracy range. For Class 4 estimates, the expected accuracy range is -15% to -30% on the low end and +20% to +50% on the high end.

Table 2.0: Cost Estimate Classification Matrix (AACE International)

Estimate Class	Level of Project Definition	Purpose of Estimate	Methodology	Expected Accuracy Range
Class 5	0% to 2%	Concept screening	Capacity factored, parametric models, judgement, or analogy	Low: -20% to -50% High: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	Low: -15% to -30% High: +20% to +50%
Class 3	10% to 40%	Budget authorization or control	Semi-detailed unit costs with assembly level line items	Low: -10% to -20% High: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	Low: -5% to -15% High: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-cost	Low: -3% to -10% High: +3% to +15%

Source: AACE International Recommended Practice No. 18R-97

Based on the level of detail available for Class 4 estimates, cost estimates were developed as follows:

- Equipment costs were based primarily on proposals provided by equipment vendors. In a few cases Woodard & Curran estimated the equipment cost from similar projects without receiving vendor quotes.
- New tankage was calculated based on conceptual level quantity takeoffs for concrete volumes.
- Allowances are used for some of the direct and indirect construction elements. Allowance estimates are made using the percentages listed in **Table 2.1.**

Table 2.1: Construction Cost Allowances

Construction Cost Allowance Types	Percent
Mechanical Installation	40%
New Equipment Installation	40%
Process Mechanical Allowance (%)	25%
Electrical and I&C Costs	15%
General Conditions	10%
Taxes	0%
Contractors Overhead	10%
Contractors Profit	10%
Detailed Engineering/ Design	10%
Home Office Engineering Services during Construction	5%
Construction Administration/Observation	4%
Permitting	1.0%
Contingency	30%

3. DESIGN FLOWS AND LOADS

Influent flows and loadings for the DCWWTP were established by analyzing daily plant influent data provided by the City of Roseville for the period from January 1, 2016 through February 29, 2020. This data set represents conditions prior to Covid which has affected/reduced influent flows during 2020-2022.

Projected flows for the DCWWTP were calculated based on population and non-residential growth, as described in the SPWA 2020 Systems Evaluation Report. The projected flows were developed by multiplying the projected EDUs by an ADWF contribution of 190 gallons per day (gpd) per EDU, in accordance with the estimate developed in the 2009 Systems Evaluation and confirmed through discussions with Roseville staff.

It is important to note that we evaluated the loading to the DCWWTP using a different data set from that used for the 2020 Systems Evaluation Report. The Systems Evaluation Report was based on influent loading data from January 2013 through September 2019. The results for projected BOD loadings are similar and, in Woodard & Curran's opinion, "validated" the estimates from the 2020 Systems Evaluation Report.

Future plant flows were projected over the planning horizon to fiscal year 2044-2045 (FY 44-45) and to ultimate buildout conditions as described in the following **Table 3.0**.

Note that DCWWTP has the ability send peak hourly flows to two Diversion Ponds. Roseville typically diverts flow when sustained flows are above 27-30 million gallons per day (MGD). The DCWWTP does not have the ability to measure the flow volume that is diverted, but for purposes of this evaluation, Woodard & Curran understands that it can be conservatively estimated that 9 MGD can be diverted and stored in the two Diversion Ponds which have volumes of approximately 5 million gallons (MG) and 49 MG. Therefore, for evaluation of unit process capacity, for unit processes downstream of the flow diversion (starting with grit removal), Woodard & Curran used a peak hour wet weather flow of 55 MGD.

Table 3.0: Projected Flows and Loadings

Parameters	Current	FY 44-45 Projected	Projected Buildout	Projected Buildout to Current Peaking Factors
Flow (mgd)				
Average Dry Weather Flow (ADWF)1	8.60	14.71	18.36	2.13
Average Annual Flow (AA)	10.32	17.65	21.80	2.11
Peak Month Flow (PMF)	19.30	27.60	34.40	1.78
Peak Day Wet Weather Flow (PDWWF)	23.52	40.23	50.20	2.13
Peak Hour Wet Weather Flow (PHWWF)	36.00	51.36	64.10	1.78
PHWWF Downstream of Flow Diversion	27.00	42.00	55.00	
Minimum Month Temperature (deg C)	18	18	18	
Primary Clarifier Effluent BOD Loading				
Average Concentration (mg/L)	205	205	205	
Average Loading (lb/day)	14,465	25,314	31,341	2.17
Maximum Month (lb/day)	22,300	34,957	43,395	1.95

Parameters	Current	FY 44-45 Projected	Projected Buildout	Projected Buildout to Current Peaking Factors
Primary Clarifier Effluent TSS Loading				
Average Concentration (mg/L)	154	154	154	
Average Loading (lb/day)	13,434	22,916	28,053	2.09
Maximum Month (lb/day)	20,546	35,560	43,462	2.12
Primary Clarifier Effluent NH3 Loading				
Average Concentration (mg/L)	34	34	34	
Average Loading (lb/day)	2,267	4,533	5,667	2.50
Maximum Month (lb/day)	3,400	5,667	7,934	2.33

4. DESIGN EFFLUENT QUALITY

This section describes the current and anticipated future effluent quality requirement utilized for the purpose of the Capacity Capital Evaluation. As part of the overall Capacity Assessment and Facilities Planning Project, Woodard & Curran prepared a Technical Memorandum dated March 24, 2023 that describes the existing facility effluent limitations and discussed potential new or modified effluent limitations based on trends in recent permits issued by the Regional Water Board that might apply to the Roseville Facility in the future. A summary of the findings described in the Effluent Limitations Technical Memorandum is provided below. It is also noted that for this Capacity Capital Evaluation, Woodard & Curran understands that Roseville anticipates that all future additional effluent from the DCWWTP will be used as reclaimed water for irrigation subject to Title 22 of the California Code of Regulations (no direct or indirect potable reuse is anticipated).

- The use of reclaimed water is regulated under Master Reclamation Permit for Roseville Regional Wastewater Treatment Plant, Order No. 97-147 (Master Reclamation Permit), which was adopted by the California Regional Water Quality Control Board, Central Valley Region (Regional Water Board) in 1997. Facility effluent discharges to Dry Creek are regulated under Waste Discharge Requirements for Municipal Wastewater Dischargers that meet Objectives/Criteria at the Point of Discharge to Surface Water, Order R5-2017-0085-01, NPDES No. CAG585001 (Municipal General Order), which was adopted by the Regional Water Board in 2017.

- The City's Master Reclamation Permit allows the use of reclaimed wastewater for a variety of non-potable applications. Section B of the Master Reclamation Permit contains the Reclaimed Water Limitations summarized as follows:

    - The reclaimed water discharge shall, at a minimum, be an adequately oxidized, coagulated, filtered, and disinfected water.

    - The coagulation system shall be used whenever the Facility is producing tertiary-treated wastewater for unrestricted use.

- Disinfected tertiary treated wastewater for unrestricted use shall be continuously sampled for turbidity using a continuous turbidity meter and recorder at a point prior to filtration and again following filtration.
- The use of reclaimed water shall not cause a statistically significant increase of nitrate or salt concentrations in underlying groundwater.
- The use of reclaimed water shall not cause concentrations of chemicals and radionuclides in groundwater to exceed limitations set forth in Title 22, Chapter 15, Articles 4 and 5 of the California Code of Regulations.

- Although the Municipal General Order specifies effluent limitations for a long list of constituents, the flow limit is 18 MGD average dry weather (Municipal General Order section (V.A.1.a.iii) with effluent limitations applicable to Facility effluent discharge to Dry Creek from EFF-001 (immediately downstream of UV disinfection) are noted in the NOA, summarized as in **Table 4.0**.

Table 4.0: Facility Effluent Limitations

Parameter	Effluent Limitations (mg/L)		Municipal General Order Section
	Average Monthly	Average Weekly	
BOD	10	15	V.A.1.a.ii.(a)
TSS	10	15	V.A.1.a.ii.(a)
Ammonia Nitrogen, Total (as N)	1.6	5.3	V.A.1.c.v.(B)
Nitrate plus Nitrite, Total (as N)	10	13	V.A.1.c.vi

- **Potential Future Effluent Limitations:** Based on the information Woodard & Curran reviewed, there are some minor regulatory policy changes that are expected to have a minor impact on future Facility effluent limitations. None of these minor changes are expected to result in any compliance issues for the Facility. No major regulatory changes related to Facility effluent limitations have been identified or are anticipated in the foreseeable future. Below is a summary of considerations identified in the effluent limitations Technical Memorandum:
  - Although no significant impacts are projected, should the Master Reclamation Permit enter the renewal phase, whether initiated by the Regional Water Board or the City, any proposed new terms and conditions and effluent limitations should be evaluated to determine impacts on Facility compliance, operations, or capacity.
  - The City should track the renewal process of the Municipal General Order, and once adopted, the renewed Municipal General Order should be reviewed closely to identify any new effluent limitations that would be applicable to the Facility.

- Following adoption of the new Municipal General Order and issuance of a new NOA, any new or revised effluent limitations should be evaluated to determine potential impacts on Facility compliance, operations, or capacity.
- Continue contracting biosolids removal and disposal. Disposal costs may be impacted by the roll-out of SB 1383 regulations.

5. NEAR-TERM CAPACITY IMPROVEMENTS

This section describes the Near-Term Improvements for capacity. These improvements are important for consideration by Roseville because they are the "low hanging fruit" that would provide increased capacity with modest capital cost (i.e. no major structural additions/expansion). The improvements were identified by Woodard & Curran through the Desktop Capacity Analysis and the Stress Testing Field Work performed in August 2022. The Near-Term Improvements are summarized as follows:

- New blowers
- New aeration control system
- Outfit the existing mechanical aeration reactors with hyperbolic mixer/aerators
- Providing mixers in the last aerobic zone of the fine bubble reactor tanks (ABs 500-800)
- Clarifier baffling improvements
- Associated electrical improvements

The following further describes the existing activated sludge process, the proposed near-term improvements, associated capacity increase and the estimated capital cost.

5.1 Existing Activated Sludge Process and Limitations

The Dry Creek WWTP has two different types of aeration basins that comprise the secondary treatment process: Aeration Basins (ABs) 100 – 400 and 500 - 800. Currently, primary effluent can be distributed to all eight (8) basins. See the Existing Site Plan in the Appendix A.

Aeration Basins (ABs) 100 – 400 were constructed in the 1970's as mechanical surface mixing conventional activated sludge (CAS) basins. The initial section of each basin was originally a small primary clarifier. As part of the 1991 DCWWTP Expansion Project, ABs 100 – 400 were converted to a Modified Ludzack-Ettinger (MLE) process configuration to improve nitrate and total nitrogen removal. As part of that project, the effluent weir elevations on ABs 100 – 400 were increased from 138.5' EL to 139.5' EL. This increased the overall side water depth of these basins from 11.5' to 12.5'. The initial primary clarifier section of ABs 100-400 was also retrofitted to operate as an anoxic zone with a sidewater depth of 7.5 feet and volume of 160,000 gallons in each train. The effluent weirs for these modified primary clarifiers were also removed in 1991; therefore, the anoxic zone water level in these tanks is controlled by the downstream aerobic zone effluent weir elevation. The downstream mechanically aerated zones (3) were upgraded with Invent Mixer Aerators and have a volume of 811,000 gallons per train. Additional equipment includes submersible

internal mixed liquor recycle pumps, anoxic mixers and aeration piping, control valving, instrumentation and included provisions to add a supplemental carbon source to the primary effluent for enhanced nitrogen removal in all operating basins. Currently ABs 300 – 400 have the original mechanical aerators, are not able to significantly reduce nitrate, and are normally not in service and only brought online in case of emergency.

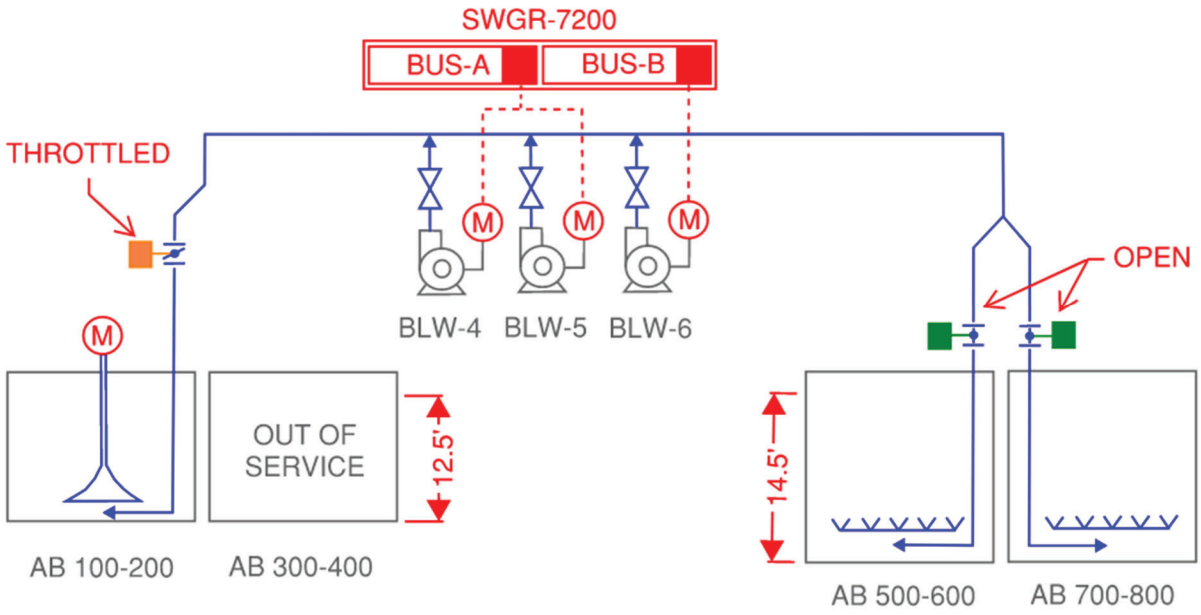
AB's 500 – 800 were constructed in the 1990's and operate at a side water depth of 14.5 feet based on a top-of-slab elevation of 124.75' and a weir elevation of 139.25'. These basins are also operating as an MLE process. Each basin has 206,000 gallons of anoxic volume followed by 788,000 gallons of aerobic volume. Similar to ABs 100 – 200, the aerobic volume is partitioned into three (3) aerobic zones in series. Supporting equipment for ABs 500 – 800 also includes submersible internal mixed liquor recycle pumps, anoxic mixers and aeration piping, control valving and instrumentation. However, unlike ABs 100 – 200, aeration to ABs 500 – 800 is provided by fixed floor fine bubble diffusers.

The aeration to ABs 100 – 200 and 500 – 800 is provided by three (3) large multistage centrifugal blowers on a common header. The blowers are housed in the Blower and Electrical Building located between the different sets of Aeration Basins. Each blower (Units 4, 5 and 6) is driven by a 500 hp electric motor. Under normal conditions only one blower is required to provide the aeration needs to the DCWWTP. Additional blowers are engaged as loadings increase.

There are currently three limitations with respect to the blower system:

1. Inefficiency due to the back-pressure difference between the two different AB depths and head loss differences between Invent and fine bubble diffuser trains,
2. Blowers cannot vary speed or airflow effectively, and
3. Capacity limitation due to how the blowers are powered.
4. **Figure 5.0** illustrates the current CAS system including power and control valve limitations.

Figure 5.0: Existing Aeration System Configuration



ABs 100 – 200 and ABs 500 – 800 are operating with approximately two (2) feet of water depth difference. In addition, the Invent Mixer Aerators in ABs 100 – 200 have a lower pressure headloss than the fine bubble diffusers in ABs 500 – 800. These two factors require a higher operating blower pressure to deliver air to ABs 500 – 800. As a result, the current configuration requires the system operate in a pressure-based control mode with significant valve throttling at the AB 100 – 200 side of the header due to the higher pressure required to drive the airflow into ABs 500-800. Blower energy demand is a function of both air flow and pressure, and the increased operating pressure results in unnecessary energy consumption.

Blower 6 is connected to Bus B within Switchgear (SWGR-7200), however; Blowers 4 and 5 are connected to the same motor starter on Bus A therefore only one of those blowers can be operating at the same time. All three electric blowers are operating at 4,160 volts and do not have variable frequency drives. Blower output is managed by throttling the motor actuated inlet valve which in an inefficient control mechanism and has limited turndown capability. Each AB has a motor actuated control valve and air flow meter to control air into each basin. Downstream of each air control valve are three (3) drops one for each section of aeration zones 1-3.

5.2 Near-Term Improvements

The following describes the proposed Near-Term improvements and the associated capacity increase these improvements are estimated to provide. A site plan of the Near-Term Improvements is included in Appendix A to show the physical locations of the associated improvements.

- **ABs 300 – 400:** Retrofit the basins to be consistent with ABs 100 – 200 from the 2018 Nitrate Reduction Improvements Project. Surface mixers will be replaced with Invent Mixer Aerators in the

aerobic zones. Additional equipment will include aeration piping, control valving and instrumentation.

- **ABs 500 – 800:** In order to help DCWWTP address its current challenge of denitrification, Invent Mixers will be installed in the last aerobic zone of all four (4) of these AB's. This will allow better turndown of aeration without sacrificing mixing. The speed of the mixers can be adjusted to help control the aeration. Aeration will continue to be provided by the fixed fine bubble diffusers, but the diffuser manifolds will need to be modified to accommodate the Invent Mixers.

- **Blowers:** The current blower configuration is inefficient and does not provide the current standard in aeration control due to the difference in operating pressures throughout the header. The aeration system can be optimized by sectionalizing the aeration header into two sides. Two new blower systems are proposed to allow optimization and improved control for the two aeration tank configurations. Blowers for the deeper ABs 500 – 800 side can be dedicated to the higher operating pressure and vice versa for the shallower ABs 100 – 400 side. Consideration will be given to different blower types and is described in further detail in the next section.

- **Power Distribution:** A new motor control center is required to provide power to the additional Invent Mixer Aerators for ABs 300 – 400 and Mixers in the final aerobic zones of ABs 500 – 800. This new motor control center can be sized appropriately to accommodate all the new Invent Mixer Aerators, Mixers and new blowers on dedicated circuits. This will allow operations to have the flexibility to run all the blowers as necessary. Depending on the blower equipment selected, additional modifications may be necessary to step the power down from 4,160V to 480V.

- **Cooling:** The DCWWTP is required to discharge 4 MGD of tertiary treated final effluent to Dry Creek to satisfy the effluent permit. Currently the entire effluent of the DCWWTP passes through effluent cooling between the secondary clarifiers and the tertiary filters. It is anticipated that in the future this volume of flow to the creek will be constant and that the remainder of the treated effluent from the Dry Creek WWTP will be diverted to reuse applications. In order to dedicate 4 MGD of cooled effluent for discharge to Dry Creek and maintain hydraulics through the plant, modifications are necessary to direct a portion of the reclaimed water through the cooling system and return to the existing plant outfall. The upgrades are included in the Near-Term Improvements to feed the cooling system with Dry Creek final effluent rather than plant secondary effluent.

5.3 Blowers

The DCWWTP has three (3) multi-stage centrifugal blowers. According to the Basis of Design Report for the Nitrate Reduction Project (Brown and Caldwell, 2018), the blower output was summarized from the SCADA system and was found to be essentially wasting approximately 27% of the air due to the system configuration. **Table 5.0** summarizes the existing blower system.

Table 5.0: Existing Blower System Summary

Parameter	Quantity / Value	Design Details
Number of Units	3	
Type	Multistage Centrifugal	Constant Speed (No VFD's)
Manufacturer and Model	Lamson 1400 Series	
Unit Output Condition 1	9,815 CFM at 8 PSIG	At 115 F
Unit Output Condition 2	10,600 CFM at 8 PSIG	At 70 F
Firm Capacity (Name Plate)	31,800 CFM	with one unit out of service
Firm Capacity (Actual)	23,200 CFM	Based on measured air flow
Turndown Capacity	30%	
Drive Type	3 - motor driven	
Power	500 hp	4,160 V, 3 phase, 60 Hz

Three proposals for blowers were solicited as part of the Near-Term Improvements including one similar to the existing technology and two others for the higher efficiency turbo style blowers that are common in the market. The existing multistage centrifugal blowers operate at constant speed. The air volume is varied by inlet valve position which can be a challenge to optimize operations with when the influent loading conditions change throughout the day. By including a control system that utilize variable frequency drives, the power consumption of the system can be reduced using multistage centrifugal blowers.

Single stage centrifugal, high-speed turbo blower offerings were also considered. These blowers operate at much higher rotational speeds and improved efficiencies with the advent of better bearings such as air or magnet bearings. Turbo blowers are more complex than conventional multistage centrifugal blowers and are packaged with integral VFD's and control systems. These systems in general have a higher capital cost than multistage centrifugal blowers but offer significantly higher efficiency and control which translates to better life cycle costs. Because of the higher sophistication of the machines, most turbo blower end users have long term maintenance contracts with specialty service providers to help ensure long-term operability. This will be included in the life cycle cost evaluation. **Table 5.1** summarizes the blower submittals considered for the Near-Term Improvements. Additional blower information is included in the Appendix B.

Table 5.1: Near-Term Capacity Improvements Blower Equipment

Parameter	Multistage Centrifugal with VFD's	Single Stage Centrifugal High-Speed Turbo	
Manufacturer	Lamson	Lonestar	Inovair
Number of Blowers	6 - 350 hp	6 (5 Duty, 1 Common Spare)	5 (4 Duty, 1 Common Spare)
Capacity	5,867 SCFM at 8.5 PSIG	3 – 5,868 SCFM at 8.5 PSIG 3 – 5,646 SCFM at 7.85 PSIG	3 – 8,4,70 SCFM at 7.85 PSIG 2 – 5,870 SCFM at 8.5 PSIG
Firm Capacity	35,202 SCFM	34,540 SCFM	37,150 SCFM
Turndown Capacity	2,934 SCFM	2,823 SCFM	2,935 SCFM
Motor Size	350 hp Ea	3 – 250 HP, 3 – 300 HP	3 – 400 HP, 2 – 300 HP
Voltage	4,160 V, 3 pH 60Hz	480 V, 3 pH 60Hz	4,160 V, 3 pH 60Hz
Capital Cost	$2.58 M	$0.87 M	$1.68 M

Additional analysis is required to determine the most economical selection and will be performed in the subsequent Facility Planning Phase. Based on the preliminary evaluation, it appears that the single stage centrifugal, high-speed turbo blowers will be more economical than the existing multistage centrifugal blower system.

The following **Table 5.2** summarizes the conceptual design criteria for the near-term improvements.

Table 5.2: Near-Term Capacity Improvements Conceptual Design Criteria

Parameter	Quantity	Design Criteria
Existing Reactor Tanks ABs 100 - 400	0.971 MG	4 Trains, 0.160 MG Anoxic 0.811 MG Aerobic
Existing Reactor Tanks ABs 500 - 800	0.994 MG	4 Trains, 0.206 MG Anoxic 0.788 MG Aerobic
Mixer Aerators ABs 300 – 400	6	HyperClassic Mixer Aerators, Zone 1 – (2) 50 hp, Zone 2- (2) 40 hp, Zone 3 – (2) 15 hp for each of the 2 basins.
Mixers AB's 500 – 800	4	HyperClassic Mixers, 5 hp each
Fine Bubble Diffuser Equipment, ABs 500 – 800	4	Modify existing diffusers in last stage of AB's 500 – 800
Blowers (support both ABs 100 – 400 and ABs 500 – 800)	6	Based on Lonestar submittal (see Appendix B)
Aeration Control Valving/Metering	10	6 at ABs 300 – 400, 4 at ABs 500 - 800
Clarifier Energy Dissipating Inlet (EDI) and Baffling	6	2 – 125' Diameter, 4 – 80' Diameter adding energy dissipating inlets and Stamford baffles

5.4 Near-Term Capacity Improvements Cost

Woodard & Curran's opinions of probable cost for the Near-Term Capacity Improvements are presented in the **Table 5.3** below. This cost estimate is based on the following:

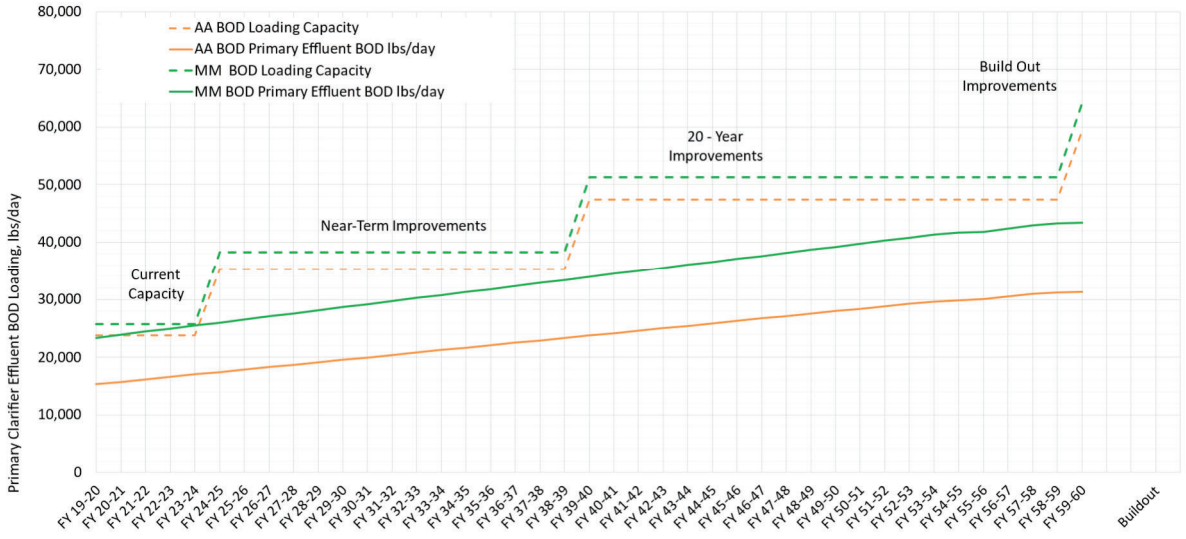
- **Equipment:** Woodard & Curran requested vendor proposals for the blowers, hyperbolic mixers, and modifications for the last stage of fine bubble reactor tanks (ABs 500 - 800) and secondary clarifier baffling improvements
- **Construction:** Woodard & Curran estimated the cost for construction using the cost factors described in Section 2 of this TM.
- **Services and Contingency:** were calculated as described in Section 2 of this TM.

Table 5.3: Near-Term Capacity Improvements Cost

Description	Cost
Equipment	$ 2,877,000
Construction	$ 7,229,000
Services	$ 2,021,000
Contingency	$ 3,638,000
Total	**$ 15,765,000**

Woodard & Curran estimates that these improvements would provide an increase in capacity that is equivalent to an additional 24% capacity based on volume. Based on the City of Roseville's growth projections, discussion in Section 2, the additional flow would provide the additional capacity required for approximately the next 5 – 10 years. Although the graph shows that the Near-Term Improvements can provide treatment capacity for Roseville's projected flows and loadings beyond 5 – 10 years, the projection is simply linear and may not be representative to Roseville's actual service area projection needs. **Figure 5.1** shows the projected Primary Effluent Loadings over time with the anticipated organic capacities associated with current conditions, the Near-Term, 20 – Year and Buildout Improvement conditions. Woodard & Curran also recommends that Roseville considers implementation of the Near-Term improvements in the next two years because the plant is approaching being at over 80% of the current oxidation capacity limitation.

Figure 5.1: Projected Primary Effluent Loadings and Organic Capacity vs. Time.



6. LONG-TERM CAPACITY IMPROVEMENTS

This section describes the long-term capacity improvements that Woodard & Curran evaluated. Evaluation of the long-term improvements and the associated opinion of budgetary costs are important to support the Roseville Capacity Fee Analysis. The long-term capacity improvements considered two time horizons as were requested by Roseville: (1) 20-Years (FY 44-45) and (2) Buildout. The description of Woodard & Curran's analysis of the long-term improvements is organized as follows:

- **Common Unit Processes** (the DC liquid and solids stream unit processes other than secondary treatment): described in **Section 6.1** for the Buildout time horizon (note discussion of what is needed for the 20-year is provided in **Section 7.1**)
- **Secondary Treatment System:** described in **Section 6.2** and based on an evaluation of alternatives including life cycle cost analysis.

6.1 Common Unit Processes

This section describes our evaluation of the common unit process capacity needs at the Buildout time horizons. The capacity needs and associated cost at the 20-year horizon are described in **Section 7.1**. The unit process consider for the evaluation includes:

- Liquid Stream
    - Influent Screening – there are 2 rake style mechanical screens with one manual bypass screen. These screens are sufficient to achieve the post-equalized Buildout flow of 55 MGD. These screens however, will not be sufficient alone for the more stringent screening

required for the Biomag and MBR options, therefore additional rotary perforated drum screens are anticipated to be installed after the primary clarifiers for those alternatives.

- Influent Pump Station – The current Influent Pumping Station is rated for 44.4 MGD with 4 of the 5 pumps of 185 hp operating with 41.4′ of static and 60′ of total dynamic head. According to the IPS Hydraulic Analysis in March 2018 by WaterWorks Engineers, the IPS cannot pump more than 30 MGD due to several bottlenecks within the piping system. Improvements have been estimated to eliminate the hydraulic bottlenecks and replace the existing pumps with 6 (5 operating, 1 standby) at 44,000 gpm (8,800 gpm per pump) operating at 45′ of static and 114′ total dynamic head.

- Grit Removal – the existing grit removal capacity is 46.1 MGD. It is anticipated that one more grit system will be required to meet the post-equalized Buildout flow capacity of 55 MGD. The system includes one additional grit chamber, one additional grit classifier, two more grit pumps, blowers and a grit auger.

- Primary Clarifiers – there are four existing rectangular primary clarifiers with a total surface area of 18,000 square feet. At the post-equalized Buildout flow of 55 MGD, the overflow rate is 3,060 gallons per day per square foot which compared to typical design range of 2,000-3,000, in Woodard & Curran's opinion is sufficient for purposes of this capacity evaluation.

- Secondary Treatment – refer to **Section 6.2** of this TM for our analysis findings and recommendations.

- Filters – there are three (3) mixed media filters at 1,388 SF per filter. Each filter is equally divided into four (4) cells that can be backwashed independently. The Title 22 Water Reuse criterion used to evaluate the capacity of these filters was 5 GPM/SF. The current hydraulic throughput capacity of the filters is 28 MGD (all units on). To meet the post equalized build out flow of 55 MGD, a total of 7,639 SF of area is required or 2.5x more filters. 3 additional filters will be provided for a total of 8,328 SF. Filters are required for both the MLE and BioMag alternatives, but would not be required for the MBR alternative.

- UV Disinfection – The DCWWTP currently has 5 channels each with 4 banks of Trojan UV 3000 equipment. Based on turbidity issues, the current effective ultraviolet transmissivity (UVT) is only 55% which translates to an effective UV Disinfection capacity of only 27 MGD (all units in service). Two different proposals were solicited from the UV disinfection vendors to expand capacity to the post-equalized peak flow of 55 MGD: 1). Based on the current UVT of 55% (for the CAS and BioMag alternatives), and UVT 90% (for the MBR alternative).

    - CAS and BioMag UV Disinfection – 3 Channels, 9 Banks/Channel

    - MBR UV Disinfection – 3 Channels, 7 Banks/Channel

- Cooling – Following the Near-Term Improvements discussed in **Section 5** to provide cooling to only the effluent fraction being discharged to Dry Creek**,** additional DCWWTP cooling capacity is not anticipated to be required.

- Solids Stream
    - Gravity Belt Thickening – The existing plant houses two 2-meter GBTs and the building has room for a third. Operations has indicated that one GBT is operating approximately 24 hrs/day, 7 days per week. Two operating GBTs are anticipated to be necessary for the Buildout conditions, therefore one more GBT will is recommended for additional redundancy needed at Buildout conditions.
    - Digesters – 2 existing, 1 more being added for redundancy at the capacity needed for Buildout conditions.
    - Belt Filter Presses – There are currently two belt filter presses that dewater the digested sludge. Operations has indicated that these units have capacity and can simply be operated longer during the day (by adding a second shift) to provide the necessary dewatering capacity at build out.

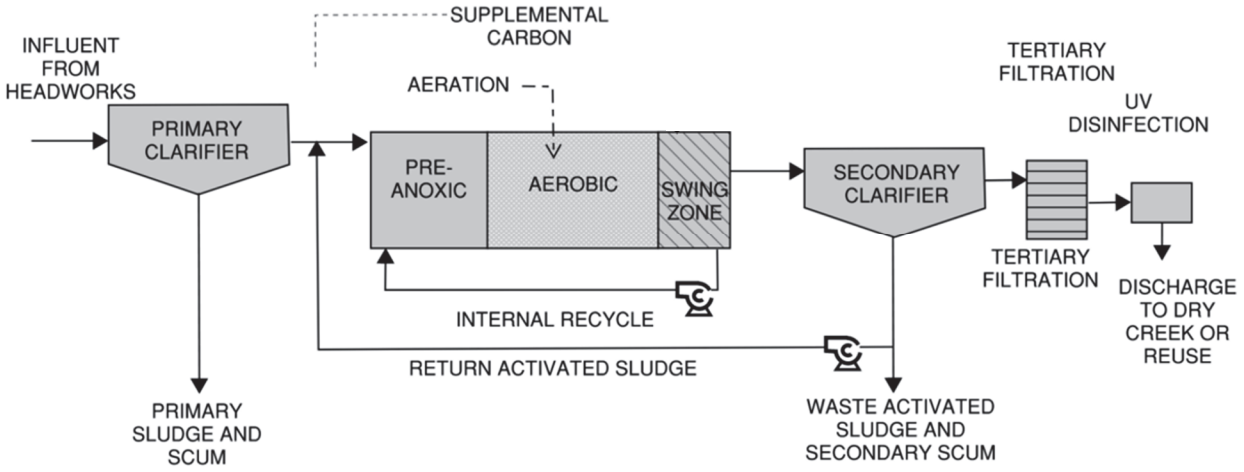
6.2 Evaluation of Alternatives for Secondary Treatment

This section describes the three secondary treatment alternatives that were considered for the DCWWTP. All of these alternatives are based on the fundamental aspects of the Modified Ludzack Ettinger (MLE) process. The relative cost and technical advantages and disadvantages of these options were analyzed to recommend the preferred alternative. The alternatives evaluated included: (1) Conventional Activated Sludge, (2) Biomag, and (3) Membrane Bioreactors (MBRs). Woodard & Curran performed a life cycle cost at the Buildout time horizon to recommend the alternative. Based on our suggestion and concurrence from Roseville, it was determined to be a given that the preferred alternative at the Buildout time horizon would also be the preferred alternative at the 20-year time horizon, therefore performing life-cycle cost for the alternatives at the 20-year conditions was not necessary.

6.2.1 Conventional Activated Sludge

The conventional activated sludge process is the current process at the DCWWTP where it is configured in the MLE process (refer to process flow diagram **Figure 6.0** below). In this conventional activated sludge MLE process, an anoxic zone is located upstream of the aeration zone. Nitrate that is created in the aeration zone of the system is recycled back upstream to the anoxic zone. The amount of nitrate removed in the anoxic zone depends on the recycle flow rate, primary effluent BOD_5. And the time the biomass is metabolizing under anoxic (low or no dissolved oxygen) conditions. In the conventional activated sludge MLE process, the mixed liquor solids concentration (MLSS) are typically in the 2,000 to 5,000 milligrams per liter (mg/L) range. Solids separation of the MLSS from the MLE bioreactors occurs in secondary clarifiers downstream of the MLE bioreactors. The MLE Site Plan is included in Appendix A.

Figure 6.0: Conventional Activated Sludge Process Flow Diagram



The following lists the typical advantages/disadvantages for the process and **Table 6.0** provides the conceptual design criteria.

- Advantages:
    - Flexible and reliable
    - Operation staff are experienced with this process
    - Relatively simple operations
    - No proprietary equipment required
- Disadvantages:
    - Largest footprint in terms of new tank volumes of all the alternatives
    - Conventional activated sludge MLE process is typically limited to 75% to 90% removal of total nitrogen (TN), resulting in effluent TN values from 5 to 10 mg/l.
    - Additional processes required if reuse quality/needs change

Table 6.0: Conventional Activated Sludge Conceptual Design Basis at Buildout

Proposed Equipment	Value	Details
Existing Reactor Tanks ABs 100 - 400	0.971 MG	4 Trains, 0.160 MG Anoxic 0.811 MG Aerobic
Existing Reactor Tanks ABs 500 - 800	0.994 MG	4 Trains, 0.206 MG Anoxic 0.788 MG Aerobic
Proposed Reactor Tanks ABs 900 - 1200	5.25 MG	4 Trains, 0.33 MG Anoxic 0.98 MG Aerobic
Replace Anoxic Mixers ABs 100 - 400	16	Top mounted vertical mixers, 3 hp
Replace Anoxic Mixers ABs 500 - 800	16	Top mounted vertical mixers, 3 hp
Proposed Anoxic Mixers ABs 900 - 1200	4	HyperClassic Mixers, 5 hp each

Proposed Equipment	Value	Details
Replace Mixer Aerators ABs 100 - 400	12	HyperClassic Mixer Aerators, Zone 1 – (4) 50 hp, Zone 2- (4) 40 hp, Zone 3 – (4) 15 hp for each of the 2 basins.
Replace Post Air Mixers ABs 500 - 800	4	HyperClassic Mixers, 5 hp each
Replace Carbon Feed System	1	Includes additional tanks, pumps and controls
Replace Final Clarifier Mechanisms	6	2 – 125' Diameter, 4 – 80' Diameter adding energy dissipating inlets and Stamford baffles
Proposed Final Clarifiers and Mechanisms	2	125' Diameter with energy dissipating inlets and Stamford baffles
Replace RAS Pumps	11, (10 Duty, 1 Standby)	Dry Pit Submersible Centrifugal Pumps with VFD's. 8 rated for 2,100 gpm at 20 ft, 25 HP each, 3 rated for 4,400 gpm at 15 ft, 25 HP each.
Proposed RAS Pumps	3 (2 Duty, 1 Standby)	Dry Pit Submersible Centrifugal Pumps with VFD's, 3 rated for 4,400 gpm at 15 ft, 25 HP each.
Proposed Mixer Aerators AB's 900 - 1200	12	HyperClassic Mixer Aerators, Zone 1 – (4) 50 hp, Zone 2- (4) 40 hp, Zone 3 – (4) 15 hp for each of the 2 basins.
Proposed Blowers	10 (9 Operating, 1 Standby)	Single Stage Centrifugal High-Speed Turbo Blowers: (7) – 5,868 SCFM at 8.5 PSIG, 300 hp (3) – 5,646 SCFM at 7.85 PSIG, 250 hp
Proposed Internal Mixed Liquor Recycle Pumps, ABs 900 - 1200	12	Submersible IMLR Pumps, 4,800 gpm at 8 ft TDH (35 hp)
Proposed Aeration Control Valving/Metering	36	3 drops at each Basin

Woodard & Curran's opinion of probable cost for the Long-Term Capacity Improvements for the Conventional Activated Sludge alternative are presented in the **Table 6.1** below.

Table 6.1: Long-Term Capacity Improvements Cost – Conventional Activated Sludge

Description	Cost
Equipment	$ 37,242,000
Construction	$ 83,457,000
Services	$ 24,140,000
Contingency	$ 43,452,000
Total	$ 188,291,000

The long-term capacity improvements costs for the CAS alternative represents the highest degree of cost certainty out of all three of the process alternatives considered. Modifications are anticipated to be able to

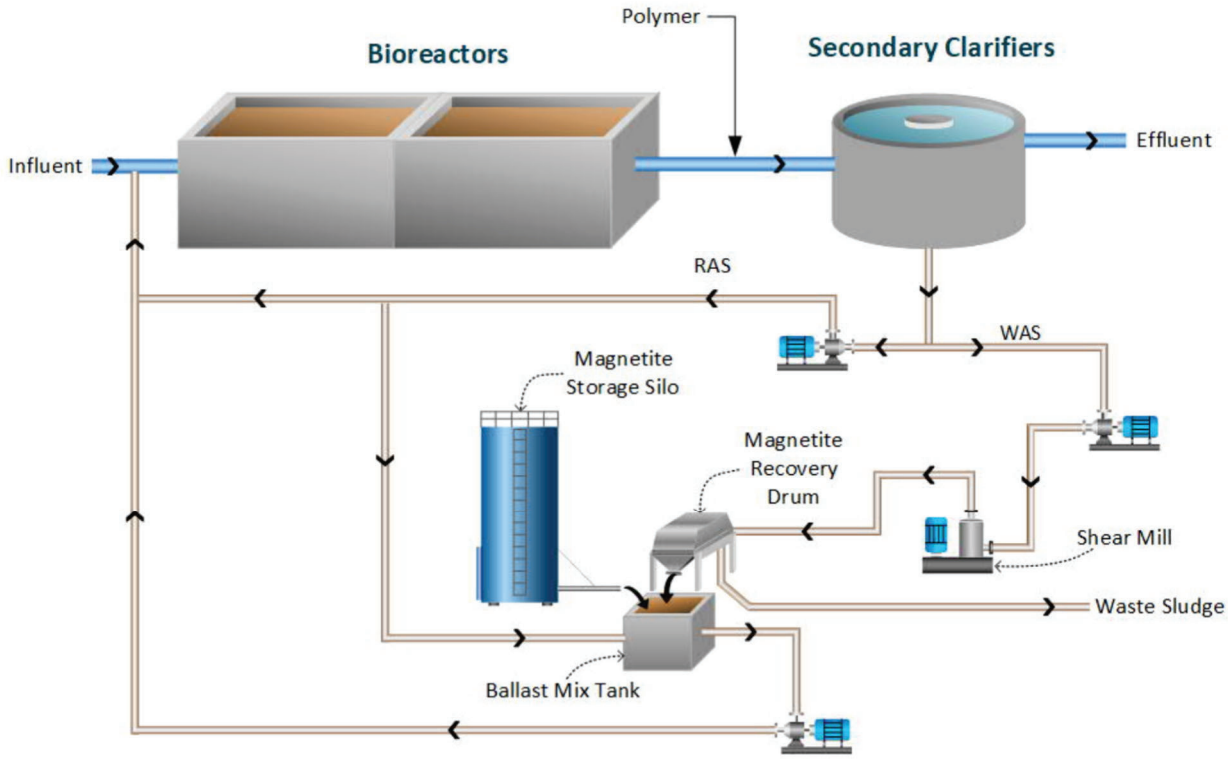
effectively split flow from the primary effluent to the proposed CAS system, but no significant changes to the hydraulic profile are expected. Recent stress testing has been conducted with this system and the limitations are known. Existing infrastructure such as the RAS Pumping Station has already been designed to accommodate two (2) new 125' diameter clarifiers.

6.2.2 Ballasted Floc (BioMag)

Evoqua's BioMag process is configured with the MLE process for the bioreactors followed by a high-rate clarification process that involves incorporating a high specific gravity ballast into the MLSS that increases the rate of gravity settling. The higher-rate settling increases the solids loading capacity of the secondary settling tanks and allows the MLE biological process in the reactors to operate at a higher MLSS concentration (8,000 to 10,000 mg/l range) and therefore reduces the required reactor volume.

The BioMag process (illustrated in the **Figure 6.1** below) utilizes Magnetite (Fe_3O_4), an inert iron ore product with a very high specific gravity (5.2), as ballast. Magnetite is blended and incorporated into the mixed liquor or Return Activated Sludge (RAS) in the Ballast Feed Tank. The ballasted mixed liquor then flows through the aeration tanks and would continue to operate in the MLE configuration to achieve total nitrogen removal. The anoxic tanks would stay in suspension with new Invent mixers in each anoxic zone. New Invent mixer-aerators would be installed for the aerobic zones. The difference between the CAS process and the BioMag process is that the same technology can be employed, but it will required higher horsepower motors to account for the additional ballasted flocculation., The mixed liquor would then flow into the secondary settling tanks where the solids settle out and thicken. The majority of the sludge containing magnetite is returned to the Aeration Basins via the RAS system. Magnetite is recovered from the Waste Activated Sludge (WAS) by pumping it through an in-line shear mixer which mechanically breaks up and separates the floc/ballast particles. From there, the WAS goes to a Recovery Magnet, where the ballast is captured and re-blended with the mixed liquor in the Ballast Feed Tank. The excess biological solids (minus the magnetite) are wasted similar to other activated sludge processes. The BioMag site plan is included in the Appendix A.

Figure 6.1: BioMag Process Flow Diagram



The following lists the typical advantages/disadvantages for the process and **Table 6.2** provides the conceptual design criteria.

- Advantages:
    - No additional tankage required
    - Low effluent TSS
    - Meets lower TN limits (if required in the future)
    - Reliable control of clarifier effluent and sludge blanket due to increased settling rate
- Disadvantages:
    - Proprietary equipment
    - Limited installations at this scale
    - More complex operation
    - Not compatible with fine bubble diffusers

- Not compatible with existing "organ pipe" style secondary clarifiers
- Requires fine screening
- Additional building required to house magnetite handling equipment
- Requires magnetite and polymer addition

Table 6.2: Biomag Conceptual Design Basis

Proposed Equipment	Value	Details
Existing Reactor Tanks ABs 100 - 400	0.971 MG	4 Trains, 0.160 MG Anoxic 0.811 MG Aerobic
Existing Reactor Tanks ABs 500 - 800	0.994 MG	4 Trains, 0.206 MG Anoxic 0.788 MG Aerobic
Fine Screens	3 (30 MGD each)	Rotary fine screens with perforated drums
Proposed Blowers	5 (4 Duty, 1 Standby)	Single Stage Centrifugal High-Speed Turbo Blowers
Proposed Invent Mixers	8	One unit in each Anoxic Zone
Proposed Invent Mixer-Aerators	24	3 Units in each Aerobic Zone per Train
Proposed Polymer Feed System	1	1.5 mg/L at peak
Existing Carbon Feed System	1	Remain in place
Proposed Final Clarifiers and Mechanism Replacements	6	Replace 2 – 125' Diameter and 4 – 85' Diameter Clarifier Mechanisms with Spiral Scraper Mechanisms suitable for BioMag with energy dissipating inlets and Stamford baffles
Replace RAS Pumps	11, (10 Duty, 1 Standby)	Dry Pit Submersible Centrifugal Pumps with VFD's. Pump selections will likely need higher capacity and hp to account for more solids and wasting.
Existing Internal Mixed Liquor Recycle Pumps, ABs 100 - 800	8	Submersible IMLR Pumps, 4,800 gpm at 8 ft TDH (35 hp)
Existing Aeration Control Valving/Metering	24	3 at each Basin, 8 basins total

For specific BioMag equipment scope of supply for ballast storage and feed system, ballast recovery system and BioMag Control System; see Appendix C for the BioMag proposal.

Woodard & Curran's opinion of probable cost for the Long-Term Capacity Improvement for the ballasted flocculation, BioMag alternative are presented in the **Table 6.3** below.

Table 6.3: Long-Term Capacity Improvements Cost – BioMag

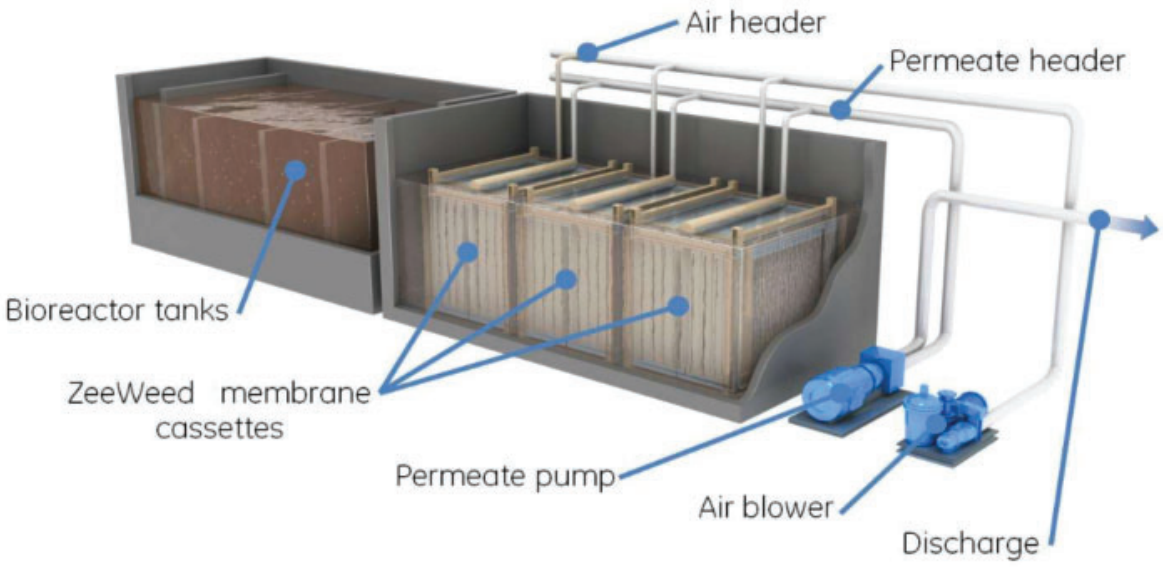
Description	Cost
Equipment	$ 40,820,000
Construction	$ 67,928,000
Services	$ 21,749,000
Contingency	$ 39,148,000
Hydraulic Improvement Allowance	$ 2,500,000
Total	$ 172,145,000

The long-term capacity improvements cost for the BioMag process is not as certain as the CAS alternative. Typically, there are a number of additional modifications that need to be addressed once the project is in detailed design. For example, the effluent channels and flow splitter boxes between the primary clarifiers and the filters would need to be adjusted to accommodate the post-equalized peak flow of 55 MGD. The clarifiers were originally designed for lower surface overflow rates and solids loading rates. The WAS and RAS pumping rates typically need to be increased to account for the higher throughput capacity which can have ripple effects throughout the design. For instance, it may be possible to accommodate pumps with larger capacities within the existing RAS Pumping Station, but the existing piping may not be optimal to accept the higher flow ranges and therefore may need to be replaced. Therefore a Hydraulic Improvement Allowance line item has been added after the contingency. In addition, BioMag is a proprietary process that can carry a premium to implement.

6.2.3 Membrane Bioreactors

The Membrane Bioreactor (MBR) (refer to the **Figure 6.2** below) also consists of the MLE configuration in the bioreactors followed by membranes. The membranes have small pores that filter solids from the mixed liquor and provide the solids-liquid separation that replaces the gravity secondary clarifier tanks used for the other alternatives. Because membrane filtration is more effective at particulate separation than gravity settling, the MBRs can operate at higher MLSS concentrations (8,000 to 10,000 mg/l range) and therefore require smaller reactor volumes than conventional activated sludge systems. Typically, wastewater must be pulled through the membranes by permeate pumps. The membranes require routine cleaning due to biofouling and scale formation. MBR processes also require upstream fine screening of 2mm or less to protect the membranes. The MBR site plan is included in Appendix A.

Figure 6.2: Membrane Bioreactor Process Flow Rendering



The following lists the typical advantage/disadvantage for the process and **Table 6.4** provides the conceptual design criteria.

- Advantages:
    - No new reactor volume required
    - Filter and secondary clarifier tanks not required (although this then likely results in "stranded assets")
    - Offers better ultraviolet transmissivity (UVT) which translates to reduced capital costs for UV equipment and reduced disinfection power requirements
    - Higher effluent quality for reuse
- Disadvantages:
    - Added complexity and operations and maintenance costs
    - Added mechanical equipment
    - Abandon/demolish existing clarifiers and filters
    - Requires 2 millimeter fine screen ahead of MBR

Table 6.4: Membrane Bioreactor Conceptual Design Basis

Proposed Equipment	Value	Details
Existing Reactor Tanks ABs 100 - 400	0.971 MG	4 Trains, 0.160 MG Anoxic 0.811 MG Aerobic
Existing Reactor Tanks ABs 500 - 800	0.994 MG	4 Trains, 0.206 MG Anoxic 0.788 MG Aerobic
Fine Screens	3 (30 MGD each)	Rotary fine screens with perforated drums
Proposed Membrane Cassette Tanks 100 - 600	0.38 MG	6 Tanks, 68.3' x 60' x 13' SWD
Cassettes Per Train	10	8 x (64/64) + 2 x (40/64)
Type of Cassette Configuration	530 ft^2	ZeeWeed 500 EV
Replace Anoxic Mixers ABs 100 - 400	16	Top mounted vertical mixers, 3 hp
Replace Anoxic Mixers ABs 500 - 800	16	Top mounted vertical mixers, 3 hp
Replace Mixer Aerators ABs 100 - 400	12	HyperClassic Mixer Aerators, Zone 1 – (4) 50 hp, Zone 2- (4) 40 hp, Zone 3 – (4) 15 hp for each of the 2 basins.
Replace Post Air Mixers ABs 500 - 800	4	HyperClassic Mixers, 5 hp each
Replace Carbon Feed System	1	Includes additional tanks, pumps and controls
Proposed Blowers	10 (9 Operating, 1 Standby)	Single Stage Centrifugal High-Speed Turbo Blowers:
		(7) – 5,868 SCFM at 8.5 PSIG, 300 hp
		(3) – 5,646 SCFM at 7.85 PSIG, 250 hp
Proposed Internal Mixed Liquor Recycle Pumps, ABs 900 - 1200	12	Submersible IMLR Pumps, 4,800 gpm at 8 ft TDH (35 hp)
Proposed Aeration Control Valving/Metering	36	3 drops at each Basin
Proposed Scour Blowers	6 (5+1)	Positive Displacement, Reversible Rotary Lobe Process Pumps
Proposed Permate Pumps	7 (6+1)	Positive Displacement, Rotary Lobe Blowers
Membrane Cleaning System	1 + 1	Sodium Hypo and Citric Acid Chemical Feed Systems

For specific MBR equipment scope of supply; see Appendix D for the MBR proposal.

Woodard & Curran's opinions of probable cost for the Long-Term Capacity Improvement for the Membrane Bioreactor alternative are presented in the **Table 6.5** below.

Table 6.5: Long-Term Capacity Improvements Cost – MBR

Description	Cost	
Equipment	$	46,270,000
Construction	$	75,550,000
Services	$	24,364,000
Contingency	$	43,855,000
Hydraulic Improvement Allowance	$	5,000,000
Total	$	195,039,000

Similar to the BioMag process, the long-term capacity improvements cost for the MBR process is not as certain as the CAS alternative. This process includes even more substantial hydraulic considerations to maintain treatment continuity. Therefore, a Hydraulic Improvement Allowance line item has also been added after the contingency. Fine screening will be required between the primary clarifiers and the process tankage to protect the membranes. Refer to Appendix D for MBR proposal.

6.2.4 Life Cycle Cost Analysis and Recommended Alternative

Table 6.6 provides the 20-year life cycle cost analysis for the three Alternatives. Refer to Appendix E for additional details Woodard & Curran's estimation of the capital and annual costs. The analysis is important for comparing the Alternatives on an equivalent basis over the project life. As previously discussed the life cycle cost was performed for the full build out time horizon. The life cycle cost analysis is based on estimated capital and present worth of annual costs for the three alternatives as follows.

- Present Worth is used to account for the time value of money. The present worth calculation allows costs occurring at different times to be compared as if they occurred at the same time. The present worth is determined using a present worth factor that is based on the interest rate and term. For this analysis the present worth factor was 12.46 based on a discount rate of 5 percent over a 20 year period.

- Equivalent Uniform Annual Cost considers the project's value over the expected life. The calculation allows comparison of non-uniform costs as a uniform annual expenditure. For this analysis the annual equivalent factor was 0.0802 based on a discount rate of 5 percent over a 20-year period.

- Power for operating equipment was estimated based on Buildout Annual Average Daily Flow conditions.

- Only unit processes and equipment that would be different between the three Alternatives was included in the analysis. Common equipment operations were not included unless the Alternative extended to a change in their operations such as the filters and UV disinfection for the MBR alternative. Filtration was included for the CAS and BioMag alternatives but would not be necessary for the MBR alternative. Similarly, UV disinfection operations for the CAS and BioMag alternatives was based on the lower UVT associated with the filter effluent quality. The UVT for the MBR alternative was higher which translates to a savings of approximately 30%.

- Replacement costs were included in the analysis; particularly for the additional magnetite required for the BioMag alternative and an annual membrane replacement cost associated with the MBR Alternative

Table 6.6: Life Cycle Cost Analysis

Life Cycle Cost Parameter	Conventional Activated Sludge Alternative	BioMag Alternative	MBR Alternative
Capital Costs	$ 188,290,000	$ 172,140,000	$ 195,038,000
Annual Costs	$ 559,000	$ 864,000	$ 795,000
Annual O&M	$ 2,941,000	$ 4,070,000	$ 3,271,000
Present Worth	$ 54,563,000	$ 76,917,000	$ 63,386,000
Life Cycle Cost	**$ 242,853,000**	**$ 249,057,000**	**$ 258,424,000**

As shown in **Table 6.6**, the CAS Alternative has the lowest life cycle cost and is therefore recommended by Woodard & Curran as the secondary treatment alternative to include in the capital cost evaluation. In addition, this alternative does not require any proprietary equipment or significant changes to the hydraulic profile of the existing plant. From an operations and maintenance perspective, operators already understand the process which offers a higher degree of confidence over the other alternatives.

7. 20-YEAR AND BUILDOUT CAPITAL COSTS

Woodard & Curran's opinions of probable cost for the 20-Year and Full Buildout Capacity Improvements as described in the previous Sections were developed for the recommendations of this TM and are presented in the Tables below. Theis cost estimate is based on the following with additional details provided in Appendix E:

- **Equipment:** Woodard & Curran requested vendor proposals for most of the equipment.
- **Construction:** Woodard & Curran estimated the cost for construction using the cost factors described in Section 2 of this TM.
- **Services and Contingency:** Calculated as described in Section 2 of this TM.

7.1 20-Year Capacity Improvements Cost Summary

Woodard & Curran's opinion of probable cost for the 20-Year Capacity Improvements are based on the selected CAS alternative and are presented in **Table 7.0** below. The process developed for estimating these costs was to include equipment procurement and construction elements that would be required to meet the projected flows and loadings at the 20-year mark. For example, all of the MLE specific process equipment would be required, but only certain common processes would be necessary at the 20-year mark

such as a portion of the filters, the UV disinfection and the digester. Other elements such as grit removal, the gravity belt thickener and the remaining filters and UV disinfection equipment was not included. This cost estimate is based on the following:

Table 7.0: 20-Year Capacity Improvements Cost – CAS

Description	Cost
Equipment	$ 15,542,000
Construction	$ 44,654,000
Services	$ 12,039,000
Contingency	$ 21,671,000
Total	**$ 93,905,000**

7.2 Long-Term Capacity Improvements Cost Summary

Table 7.1 summarizes the Long-Term Capacity Improvements for each of the three alternatives considered for this evaluation.

Table 7.1: Long-Term Capacity Improvements Cost Summary

Estimate of Probable Project Costs	Alternative 1 MLE Process	Alternative 2 BioMag	Alternative 3 MBR
Equipment Procurement	$ 37,242,000	$ 40,816,000	$ 46,270,000
Construction	$ 83,457,000	$ 67,928,000	$ 75,550,000
Services	$ 24,140,000	$ 21,749,000	$ 24,364,000
Contingency	$ 43,452,000	$ 39,148,000	$ 43,855,000
Hydraulic Improvement Allowance	$ -	$ 2,500,000	$ 5,000,000
Total Project Costs (Includes Contingency)	**$ 188,290,000**	**$ 172,140,000**	**$ 195,038,000**

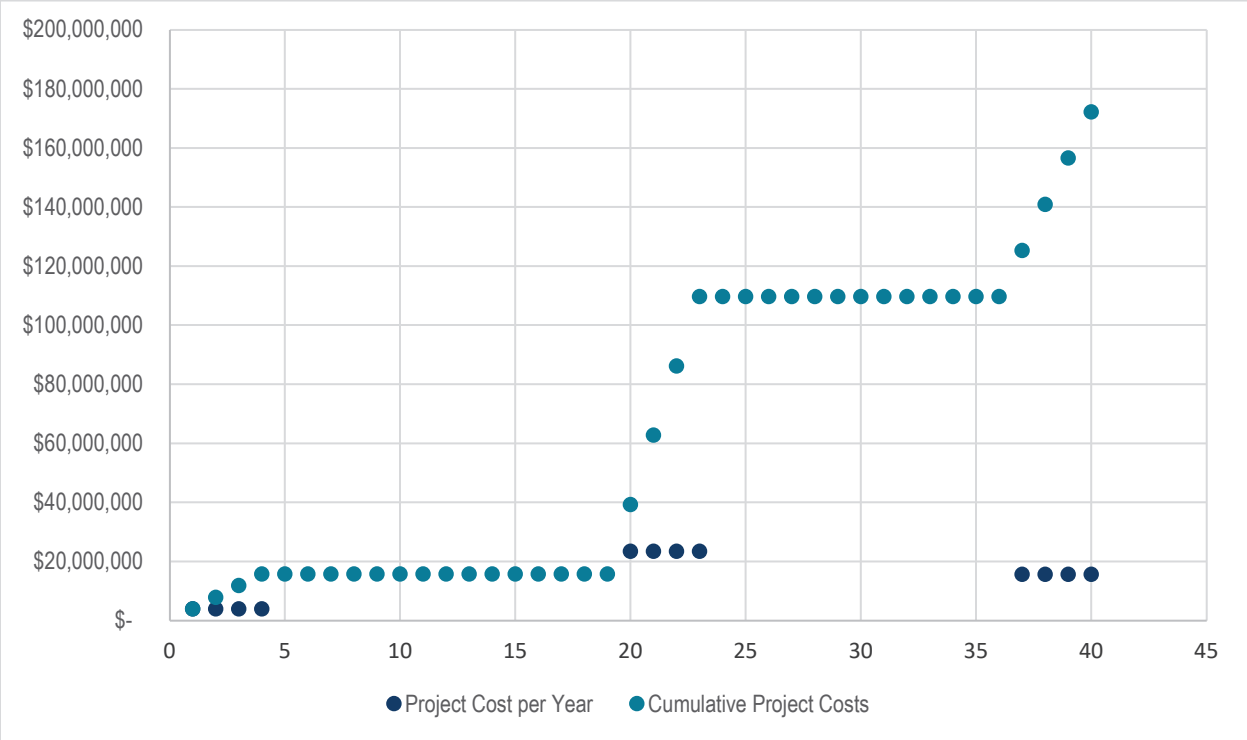
7.3 Staged Capital Improvements Cost Summary

This section describes the capital investment requirement anticipated at each stage of growth/development for Alternative 1 (MLE). **Table 7.2** and **Figure 7.2** summarize the anticipated costs at each capital improvement stage. Each of the improvement stages was assumed to be delivered over evenly over a 4-year period. All costs are in terms of 2023 dollars. The difference between the Long-Term Improvements costs summarized between Tables 7.1 and 7.2, take into account the portion of the improvements that have already been implemented with each capital improvement stage.

Table 7.2: Staged Capital Improvements Cost Summary

Capital Improvement	Capital Costs per Stage	Cumulative Project Costs
Near Term Improvements	$ 15,764,000	$ 15,764,000
20-Year Improvements	$ 93,905,000	$ 109,669,000
Long-Term Improvements	$ 62,496,000	$ 172,165,000

Figure 7.2: Staged Capital Improvements Cost Summary



Appendix A - Site Figures

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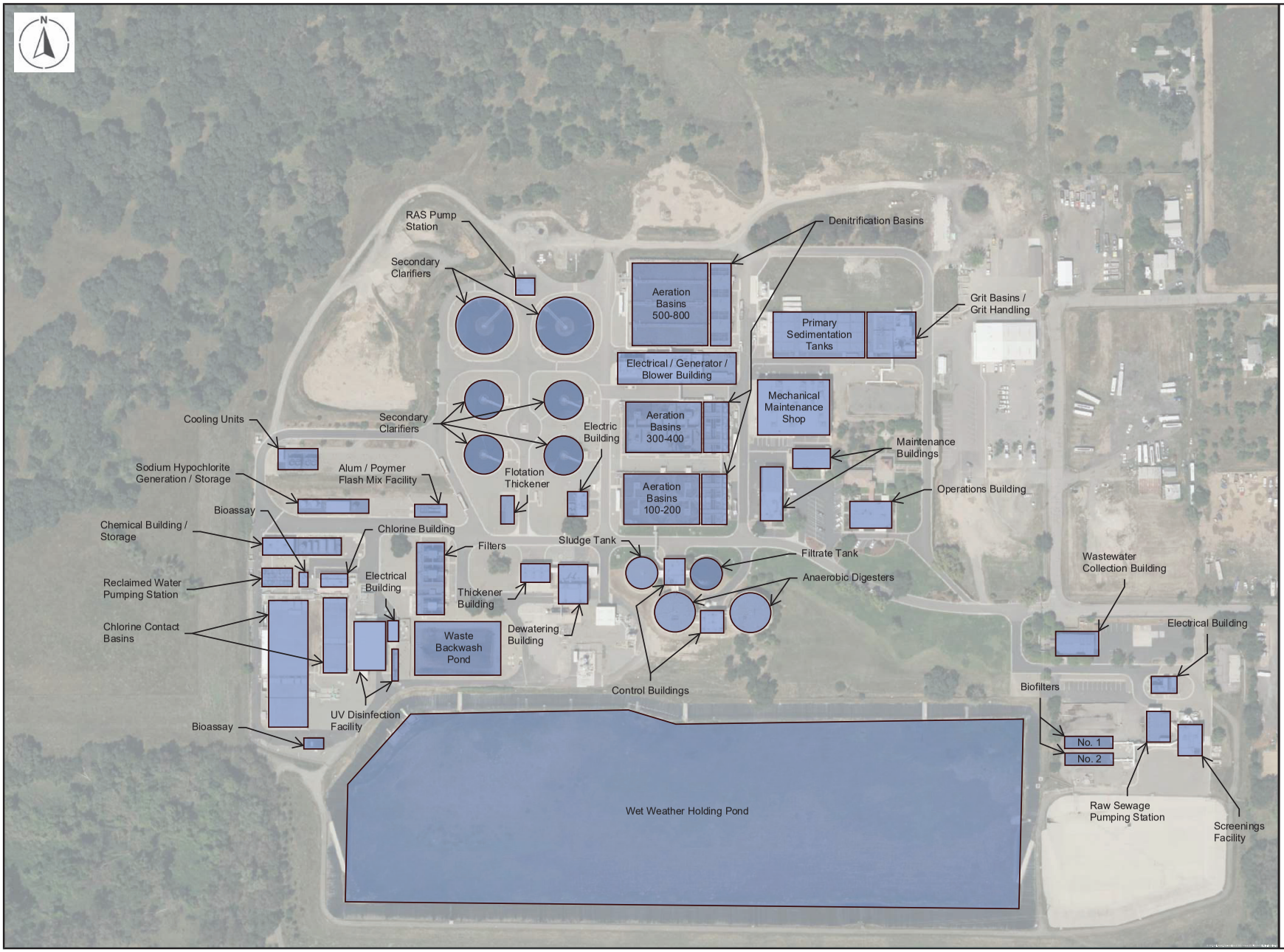

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PE SEAL:

CLIENT INFO:

Roseville, California
Dry Creek WWTP
Capacity Evaluation

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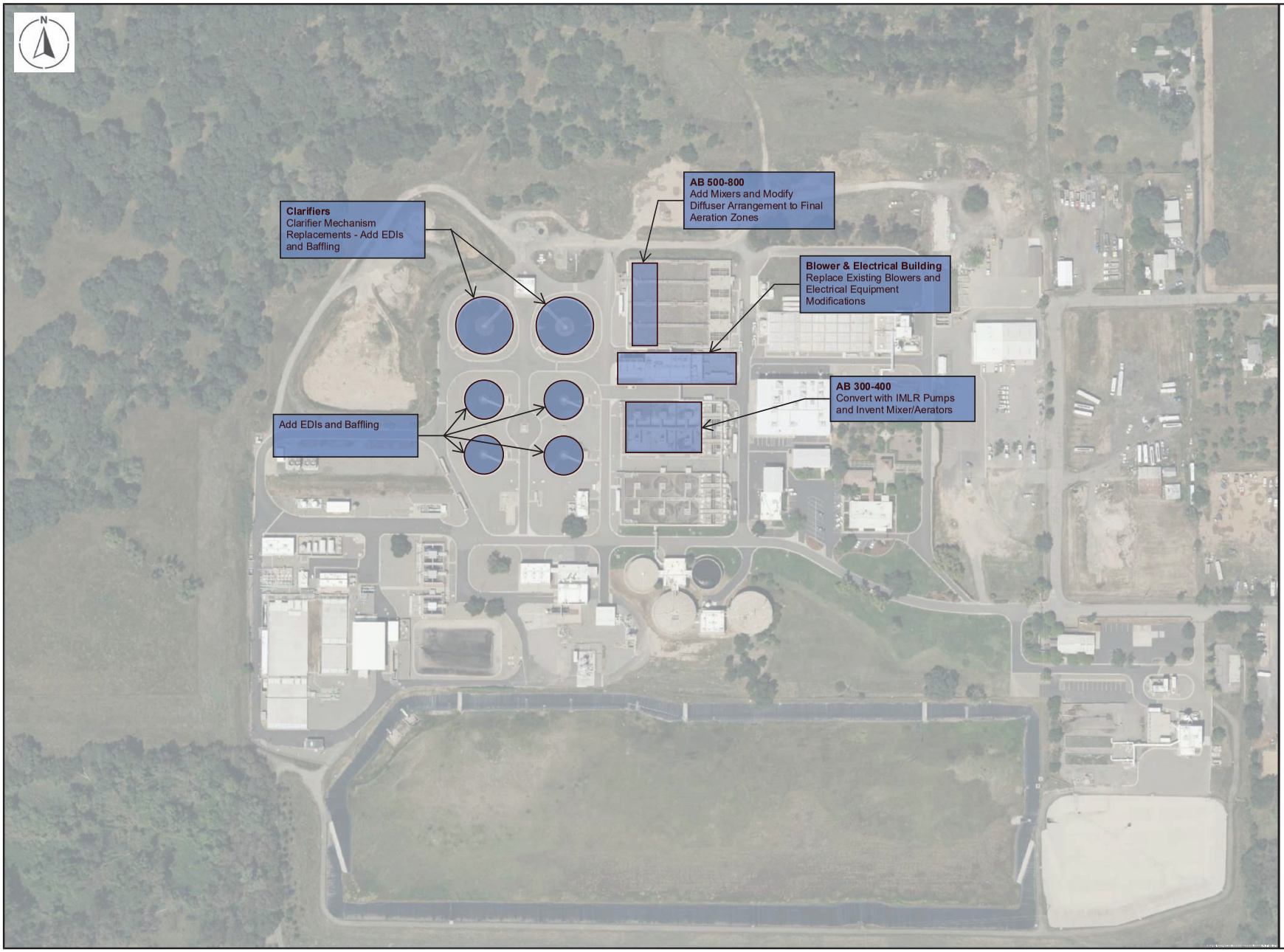

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Near Term Improvements

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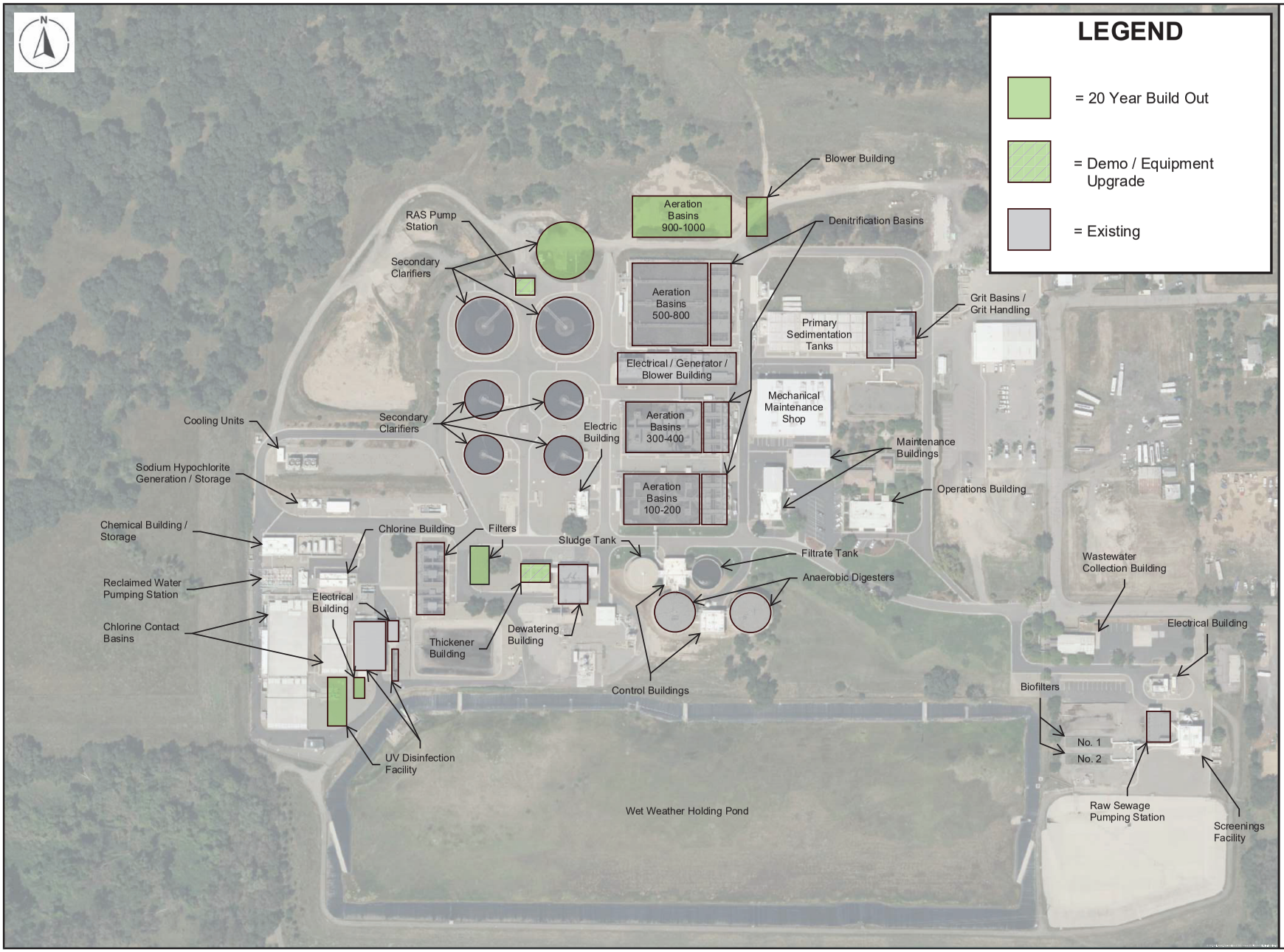

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Controlled Activated Sludge (CAS) 20 Year Build Out

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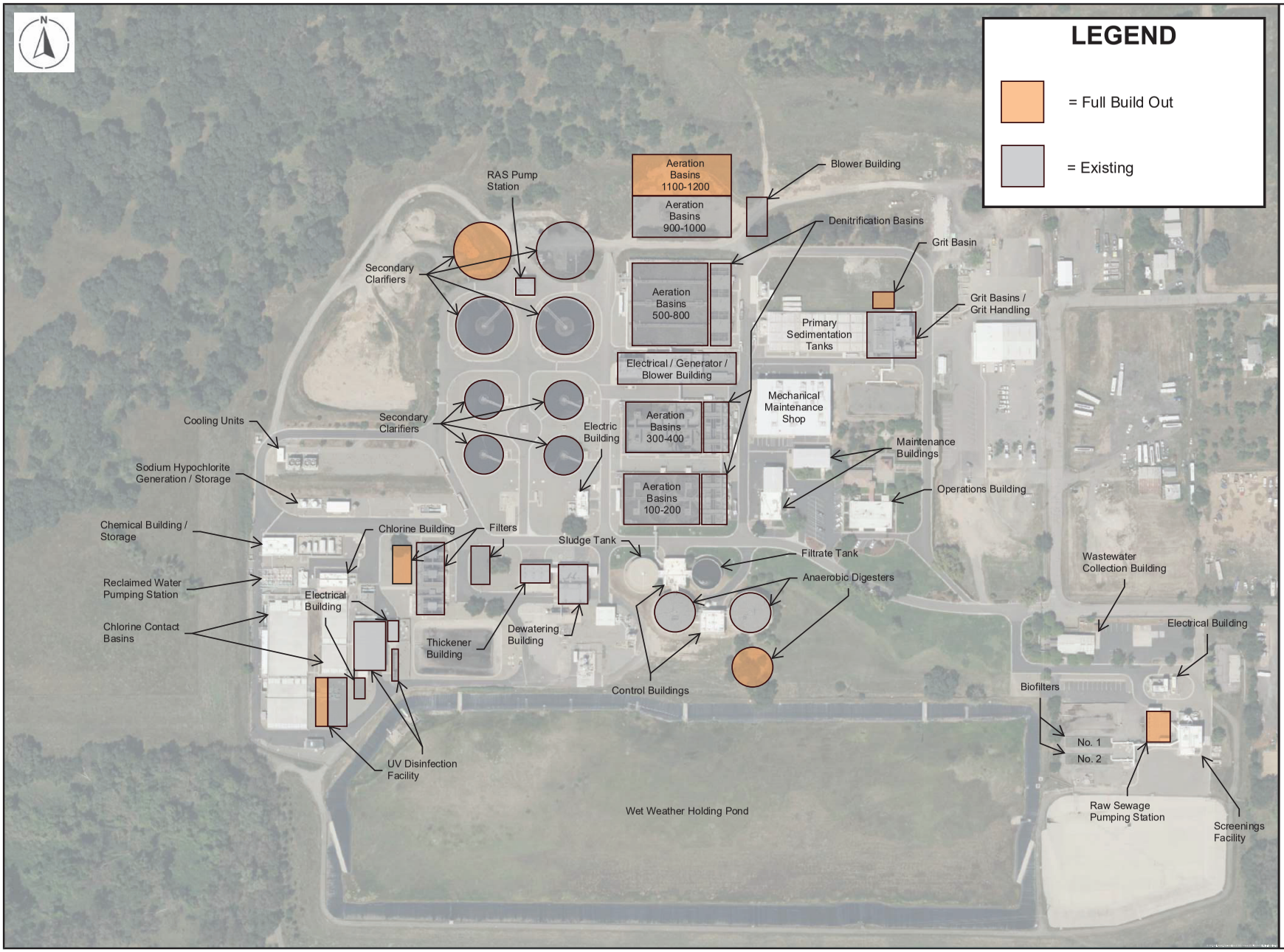

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PE SEAL:

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DRAWING TITLE:

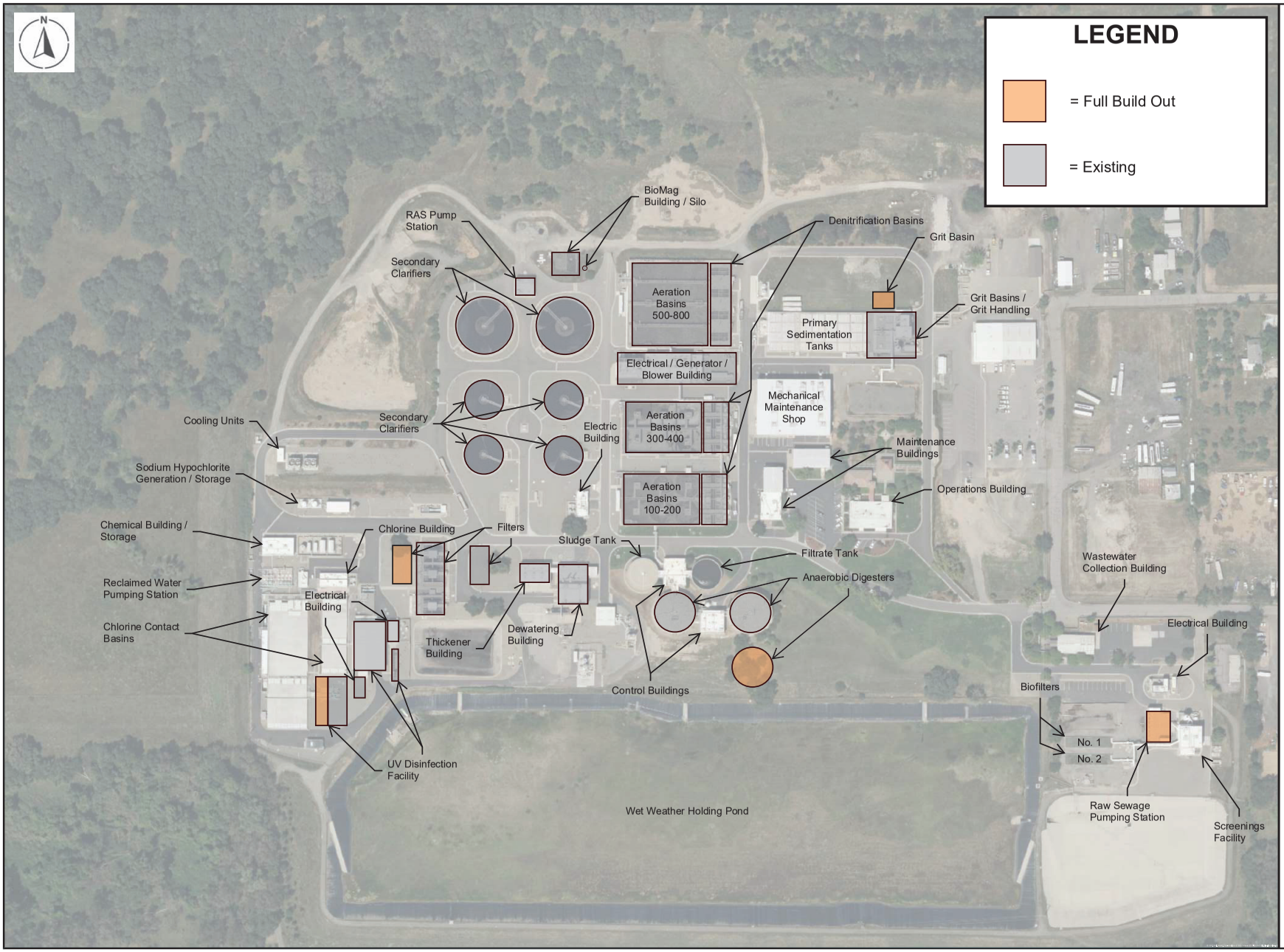
Alternative 1:
Controlled Activated Sludge (CAS) Full Build Out

DRAWING NO:

SHEET: OF

c:\users\tjulian\onedrive - woodard & curran_pcfolders\documents\projects\roseville, ca\site plan figures\roseville

PLOT SCALE: 1:1



Woodard & Curran
41 Hutchins Drive
Portland, Maine 04102
800.426.4262 | www.woodardcurran.com

PE SEAL:

CLIENT INFO:

Roseville, California
Dry Creek WWTP
Capacity Evaluation

JOB NO:	011844.01
DATE:	
SCALE:	1" = 200'
DESIGNED BY:	
DRAWN BY:	
CHECKED BY:	
FILENAME:	ROSEVILLE.dwg

DRAWING TITLE:

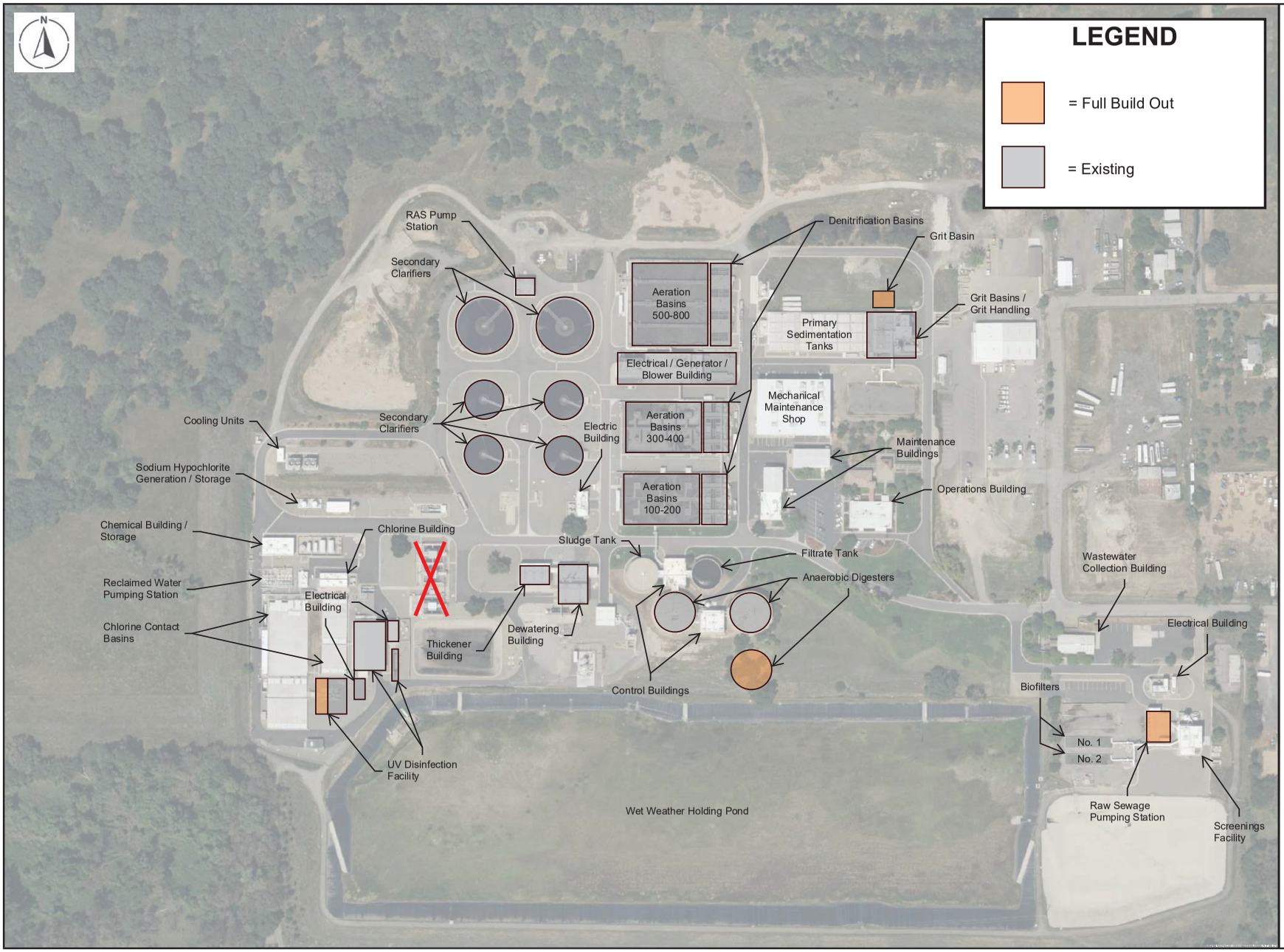
Alternative 2:
BioMag Full Build Out

DRAWING NO:

SHEET: OF

c:\users\tjulian\onedrive - woodard & curran_pcfolders\documents\projects\roseville, ca\site plan figures\roseville

PLOT SCALE: 1:1



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PE SEAL:

CLIENT INFO:

Roseville, California
Dry Creek WWTP
Capacity Evaluation

JOB NO:	011844.01
DATE:	
SCALE:	1" = 200'
DESIGNED BY:	
DRAWN BY:	
CHECKED BY:	
FILENAME:	ROSEVILLE.dwg

DRAWING TITLE:

Alternative 3:
Membrane
Bioreactor (MBR)
Full Build Out

DRAWING NO:

SHEET: OF

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Appendix B - Blower Info

Lamson MSC Blowers

Woodard & Curran - Dry Creek WWTP

Quote Reference # NASH-1351

Quote Valid Until : 03-19-2023 00:00:00 -0400

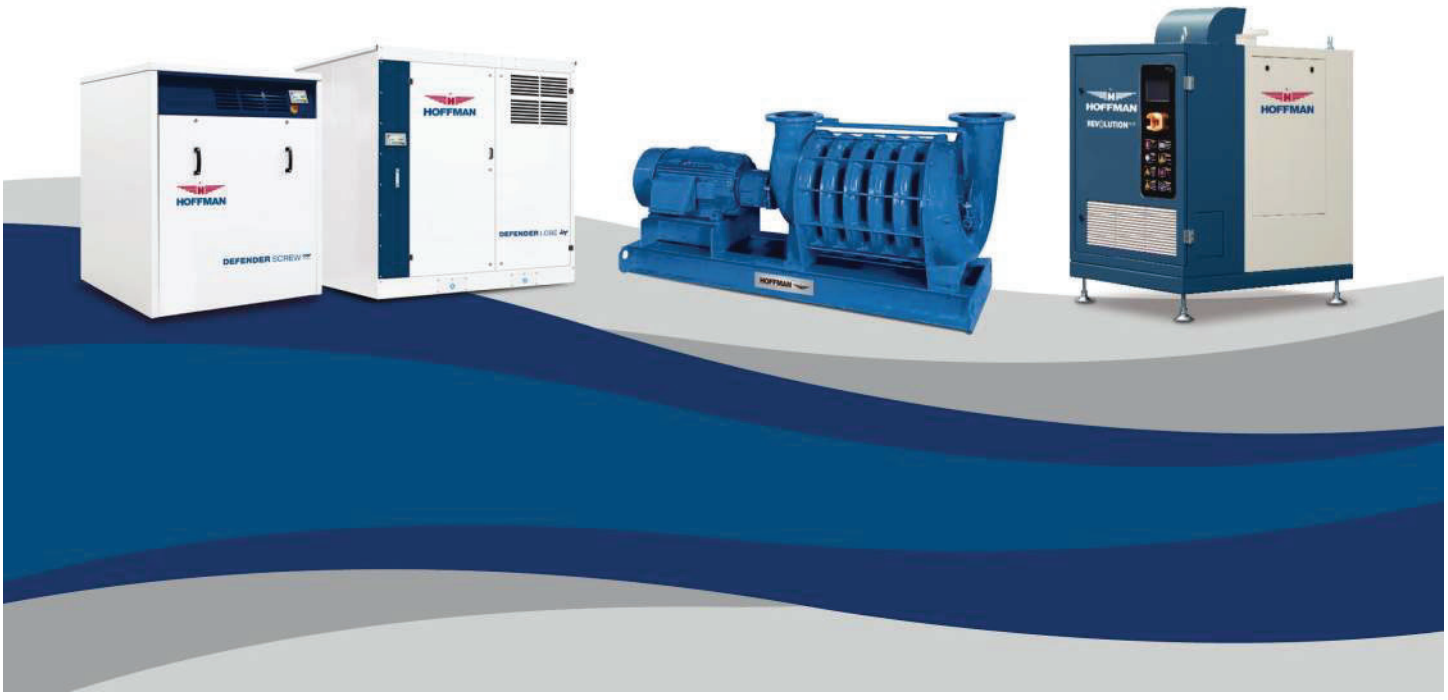


Table Of Contents

Section **Page#**

Adrianne Twymon
Mobile: (724) 247-5256
Email: adrianne.twymon@irco.com

Woodard & Curran - Dry Creek WWTP
Quote #NASH-1351
Opportunity #SF-1071335

1 Pricing Summary

SCOPE OF SUPPLY				
Line#	**Part Number**	**Description**	**Qty**	**Total Price**
1.0				
	RGLLPKG	GD 1600 BLOWER/EXHAUSTER	6	Included
	VP1012723	FILTER/SIL,INL,ENDUSTRA,P09RN-GD0427,16IN	6	Included
	HF00485059	EXPANSION JOINT 16IN W/O RODS +	6	Included
	HF00485051	EXPANSION JOINT 14IN W/O RODS +	6	Included
	BA1062160000	VALVE,B/FLY,16IN W/HANDWHEEL GEAR ACT	6	Included
	VP1024065	VALVE-B/FLY,14IN ,WAFER,GEAR ACTUATOR	6	Included
	BA1006600000	VALVE,CHECK,14IN WAFER STYLE	6	Included
2.0				
	NEWNBRM	350 HP - WEG Motor	6	Included
	NEWNBRM	PLC CONTROLS & VFD	6	Included
3.0	FREIGHT	FREIGHT	1	Included

Product Quote Amount	$2,558,434.19
Freight Amount	$14,000.00
Total Quote Amount	$2,572,434.19

Adrianne Twymon
Mobile: (724) 247-5256
Email: adrianne.twymon@irco.com

2 General Terms

Currency	USD
Payment Terms	Upon Credit Approval: Less than $100,000.00 Selling price, • 100% payment to be made net 30 days from shipment. Greater than $100,000.00 Selling price, Progressive: • 10% payment due upon submittal of drawings40% payment due 45 days prior to shipment50% balance due 30 days after shipment • All payments to be made net 30 days from date of invoice
Lead Time (weeks)	24.0
Inco Term	EXW - Ex Works
Transfer of Ownership	Origin – Seller Plant
Freight Terms	Prepaid

Adrianne Twymon
Mobile: (724) 247-5256
Email: adrianne.twymon@irco.com

3 Field Service Rates

HOFFMAN LAMSON
An Ingersoll Rand Business

Policy

2023 Field Service Rates

Centrifugal Products

Effective Jan 1, 2023

POLICY:
The services of a technician or engineer from Ingersoll Rand Engineered Products Division to inspect or repair a machine in the field, whether under warranty or not, are subject to a service charge. A firm commitment in the form of a hard copy purchase order will be required before the technician or engineer is scheduled and/or departs for any job site.

A purchase order must be emailed, along with site readiness completed paperwork (if applicable), to our service department at SERVICE.CF@IRCO.COM before any service can be performed.

If the machine in question is within the warranty period and inspection by the Hoffman and Lamson technician or engineer reveals a defect in workmanship or materials for which the factory is accountable, the service charge will be rescinded. However, if in the judgment of Ingersoll Rand, the factory is not accountable for whatever defect or deficiency exists, then the service charge will apply. Ingersoll Rand terms and conditions of sale apply to all field service work

LEVELS OF SERVICE:

Field Service Technicians provide customers with
- Preventative Maintenance / Warranty Renewal Programs
- Exclusive to Hoffman & Lamson
- Comprehensive set of service and maintenance procedures
- Designed to return your blower to a warrantable condition
- Provides increased reliability and performance
- Start-up
- Laser Alignment
- Troubleshooting
- Diagnostics & Testing

Training, Controls Tuning & Site Analysis provide customers with
- Certified Vibration Analysis
- Training and Maintenance Seminars

Engineering Services provide customers with
- Blower reconfiguration for performance changes
- Performance curves
- Amp curves
- System Consulting
- Technical product support
- Customer application engineering
- Seismic Calculation
- Product Upgrades
- Instrumentation upgrades

Level of service required and associated rates will be verified prior to commencing service work.

NORTH AMERICA SERVICE RATES:

- Field Service Technician… $201.60 USD per hour
- Engineering Services:
  Training, Controls Tuning & Site Analysis… $246.75 USD per hour
- Transportation
  - By company car, rental cars – as incurred. $0.85 per mile
  - By common carrier – as incurred
- Living Expenses… $331 per diem
- Adder for registration with online contractor management database such as ISNetworld or Cognibox… $288.00 per

INTERNATIONAL SERVICE RATES:

- Field Service Technician… $252.00 USD per hour
- Engineering Services:
  Training, Controls Tuning & Site Analysis… $325.50 USD per hour
- Transportation
  - By company car, rental cars – as incurred. $0.85 per mile
  - By common carrier – as incurred
- Living Expenses… $331 per diem

CANCELLATION POLICY
Please note that once a Service Visit has been scheduled, time has been reserved in the schedule exclusively for you. If the visit is cancelled less than 24 hours before it is scheduled to take place, a minimum cancellation fee of $500 or 10% of the total visit (whichever is greater) will be charged.
To avoid a cancellation fee, please provide notice at least 24 hours prior to your appointment.
You can cancel or reschedule an appointment by emailing us at**:** SERVICE.CF@IRCO.COM or calling 877-GD –NASH 1

EMERGENCY VISITS
Service rates for emergency field service requests (typically 2 weeks or less from request to departure) will incur 20% for labor and travel rates before a technician or engineer departs and will be communicated in advance.

PARTS:
Any parts used for service will be invoiced at prevailing prices unless repair is being covered under warranty. All parts are shipped Ex-works, factory, Charleroi, PA 15022 USA.

Any parts returned will incur Restocking order charge of 25%.

INCREASE OF SERVICE RATES:
Rates quoted herein are subject to adjustment without notice. Charges for engineering or technical field service will be based upon rates in effect at the time the services are performed, but in no case will an increase exceed 10% of the quoted rates. *Service Quotes provided are estimates, actual time and expenses will be invoiced.*

RATES:
Transportation and rental car are charged at cost plus a 15% carrying fee. Rates apply from date of departure from base point until return. Rates at jobsite apply portal to portal

OVERTIME:
Work and/or travel totaling over 8 hours per day Monday through Friday and all Saturday work or travel will be charged at 1.5 times the applicable rate. All chargeable Sundays and holidays will be 2 times the applicable rate. Where work extends from one week to the next, but no work is performed over weekend, customer has option. (1) Paying roundtrip to base point including time and expenses, or (2) retaining Representative in local area, paying living expenses. Rates at 1.5 times daily rates for Saturdays and/or 2 times for Sundays not worked.

Work requested after the first consecutive 8 ST hours Mon-Fri, all requested work after 5PM to 8 AM Mon – Fri & 8 consecutive Sat hours between 7AM & 5 PM will be billed at 1.5X

Work requested hours Mon-Fri after midnight including consecutive hours the next day & 8 consecutive hours Sunday up to 5PM will be billed at 2.0X

STARTUP:
If the Field Service Technician is required to make a second trip because the job is not ready for start-up, or any other items in the checklist are incomplete, a hard copy purchase order to Hoffman_Lamson will be required before the technician returns to the jobsite. This start-up trip is also contingent on a current account in good standing.

INTERNATIONAL TRAVEL:
Ingersoll Rand company policy allows for business class travel for any international flight of eight (8) hours or more in duration.

LONG TERM ASSIGNMENTS:
Where Representative is required at a specific jobsite for more than sixty (60) days, Nash reserves the right to assign a replacement, with associated travel cost, time and expenses for purchaser's account. Representative will present time sheet showing days and hours worked for the purchaser's approval and signature before leaving jobsite.

PAYMENT:
Subject to Ingersoll Rand terms and conditions of sale. Net 30 days subject to Ingersoll Rand credit manager approval. Orders over $100,000.00 USD may be subject to progress payments. We accept approved credit card orders. No International service work will commence without the customer having opened a letter of credit or cash in advance. The cost of the service will be estimated beforehand and adjusted after the work is completed. There will be no exceptions to this policy.

Payments will be in U.S. dollars, net 30 days.

For long-term assignments, invoicing will be rendered, and payments will be due at maximum one (1) month intervals.

4 Technical Information

5 RGLLPKG

5.1 Config Technical Details

MODEL:RGLLPKG			
Blower Characteristics :			
Model	RGLL9A: Model 1600	Motor Speed	3600 (60Hz)
Impeller Material	Cast	Stages	6
Application	Air	Inlet Temp	110.0
Discharge Temp	223.25	Discharge Pressure	8.5
Package	Standard Package	Drive Position	Inlet Driven
Blower Options :			
Shaft Material	Carbon Steel	Lubrication	Oil Standard
Seal	Labyrinth	Bearing Housing	Open Housing
Inlet Position	STD	Outlet Position	STD
Head/Section Material	Gray Iron	Head/Section Coating	Standard
Lubrication Method	Standard	Baffle Ring Material	Nickel Plated Carbon Steel
Impellers :			
Options:			
Paint Specification	Revolution Blue (Standard)	Radiant Heat Shield	No Shield Specified
Bearing Vibration Monitor	Standard Provision Only	Bearing Temp Monitor	Standard Provisions Only
Motors :			
Model Name	RGLL9A: Model 1600	HP	350
Enclosure	TEFC	Frame	
Drive Type	Direct Coupled	Base	Standard
Base Options	Jacking Screws$_tilda_$Machines Pads	Drive Coupling	SPCR
Element Size		Guard	Orange Peel-Alum
Testing :			
Certified Rotor Balance	Yes	Certified Impeller Balance	Yes
ASME PTC Test	None	Mechanical Run Test	Standard
Certifications :			
Additional Blower Options :			
Skid Wiring	No Wiring	Nameplate	Standard
Spacer Coupling	Yes	Jacking Screw	Yes
Machines Pads	Yes	Machine Pads Labour Hours	1
Zinc Coat Prep	False	Non-Standard Paint	False

5.2 Technical Data

HOFFMAN LAMSON

Technical & Performance Data

LAMSON 1600 Series

Centrifugal Products

DESIGN STANDARD

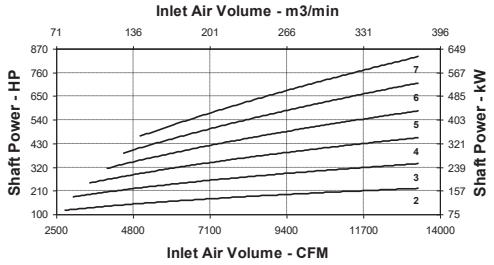
Number of Stages	2-7 (60 Hz) 2-8 (50 Hz)
Inlet Connection	16" Flange, ANSI 125# Drilling
Outlet Connection	14" Flange, ANSI 125# Drilling
Operating Speed	3550 RPM (60 Hz), 2925 RPM (50 Hz)
Casing Pressure	25 PSIG (1.73 bar)
Air Seals	Labyrinth Type - *Carbon Ring Optional*
Bearings	Anti-friction, designed for extended L_{10} life
Lubrication	AEON® CF Oil
Impeller	28.0 inches (711 millimeters) Diameter (statically balanced)
Impeller Tip Speed	435 feet/second (133 meters/second)
Drive Type	Direct Coupled (Inlet drive is standard)
Drive Shaft Diameter	2nd Stage: 1.8745 inches (47.61 millimeters) 3-8 Stage: 2.875 inches (73.03 millimeters)
Vibration	235 in/sec. (5.97 mm/sec.) Peak Velocity
Rotor	Balanced Per ISO 1940, ANSI S2.19

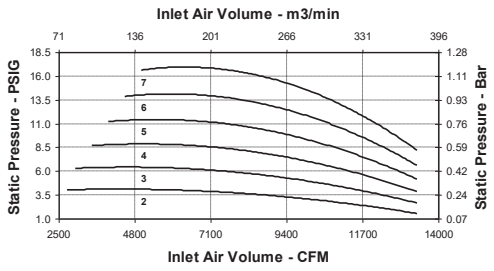
MATERIAL STANDARD

Casing	ASTM A48 Class 30 Cast Iron
Bearing Housings	ASTM A48 Class 30 Cast Iron
Bearing Housing Inserts	ASTM B505 Bearing Grade Bronze
Tie Rods	ASTM A108 C1045 Steel
Labyrinth Seal	ASTM B86 Z35631 Alloy Zinc Aluminum 12
Carbon Ring Seal Optional	ASTM C695 Fine Grain Molded Graphite
Joint Sealing	RTV Silicone Compound
MBR™ Baffle Rings	ASTM A36 Electroless Nickel Plated Steel
Balance Piston	ASTM A36 HR Structural Steel (4-8 Stage)
Shaft	ASTM A322 Grade 4140CT HRS *Stainless Steel Optional*
Impeller	ASTM B26 A355-T6 Cast Aluminum
Base & Motor Pedestal	ASTM A36 Hot Rolled Structural Steel
Isolation Base Pads	Suitable Resilient Material
Finish	Universal Primer - Acrylic Topcoat

PRESSURE PERFORMANCE

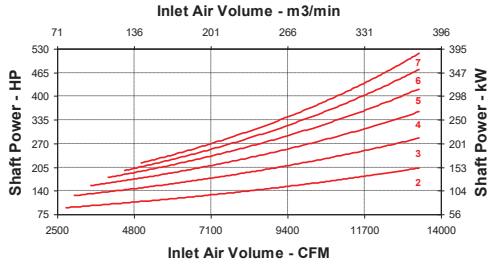
14.7 PSIA [1 Bar], 68°F [20°C], 36% RH, Speed: 3550 RPM

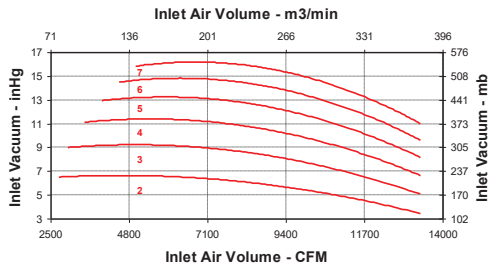




VACUUM PERFORMANCE

29.9 inHg [1 Bar], 68°F [20°C], 36% RH, Speed: 3550 RPM





PRODUCT NOTES

1. Information is approximate and subject to change without notice
2. Performances noted above are typical and not job specific
3. Consult authorized Hoffman/Lamson sales representative for job specific blower or exhauster performance sizing
4. Factory ASME PTC-10 test offered for performance verification

Gardner Denver Nash
PO Box 130, Bentleyville, PA 15314
Phone: +1 800-982-3009 / +1 724-239-1500
Fax: +1 724-239-1502
E-mail: info.HoffmanLamson@gardnerdenver.com
Web: www.**Hoffman**and**Lamson**.com

All Nash facilities are ISO 9001 certified.

5.3 Dimensions & Drawings

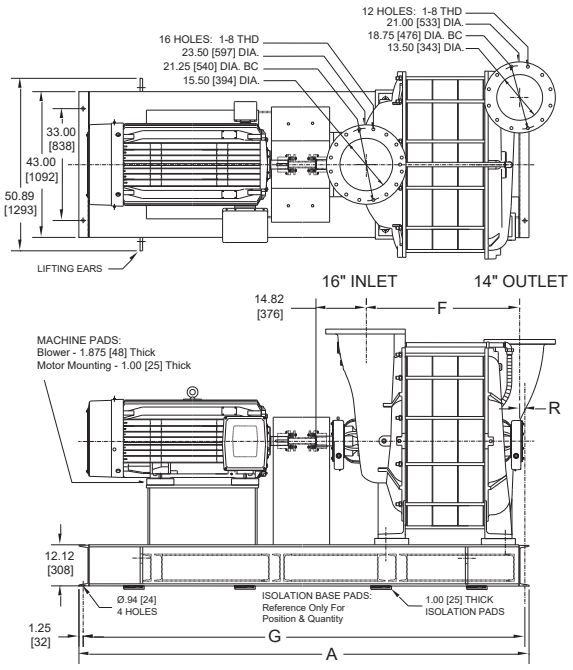
HOFFMAN LAMSON

Dimensional Data

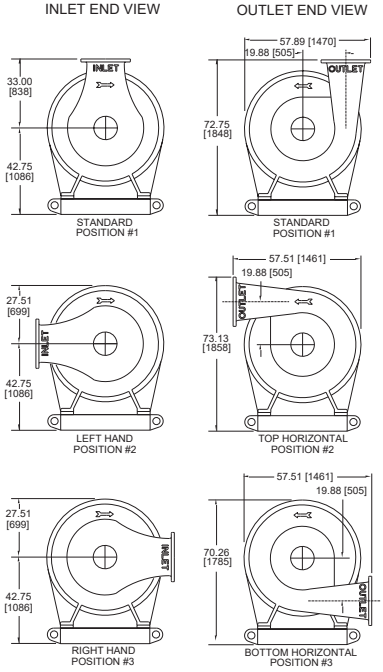
LAMSON 1600 Series

Centrifugal Products

GENERAL ARRANGEMENT



FLANGE ORIENTATIONS



DIMENSIONAL DATA – inches [millimeters]

FRAME	A	F	G	R
1602	102.00 [2591]	30.31 [770]	99.50 [2527]	1.50 [38]
1603	119.00 [3023]	37.81 [960]	116.50 [2959]	1.50 [38]
1604	126.00 [3200]	45.31 [1151]	123.50 [3137]	1.50 [38]
1605	141.00 [3581]	52.81 [1341]	138.50 [3518]	1.50 [38]
1606	159.00 [4039]	60.31 [1532]	156.50 [3975]	1.50 [38]
1607	174.00 [4420]	67.81 [1722]	171.50 [4356]	1.50 [38]
1608	174.00 [4420]	67.81 [1722]	171.50 [4356]	1.50 [38]

WEIGHTS – lb (kg) & INERTIA – lb-ft² [kg-m²]

FRAME	PKG. LESS MOTOR	BARE UNIT	WK^2
1602	6650 [3016]	4150 [1882]	75 [3.15]
1603	7850 [3561]	5350 [2427]	115 [4.81]
1604	9050 [4105]	6550 [2971]	151 [6.33]
1605	10,500 [4763]	7750 [3515]	186 [7.82]
1606	11,700 [5307]	8950 [4060]	222 [9.33]
1607	13,150 [5965]	10,150 [4604]	258 [10.85]
1608	14,350 [6509]	11,350 [5148]	294 [12.34]

PRODUCT NOTES

1. Information is approximate, subject to change without notice, and not for construction use unless certified
2. Position #1 is standard inlet & outlet orientation
3. A and G dimensions may vary depending on motor frame size

Gardner Denver Nash
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Web: www.**Hoffman**and**Lamson**.com

All Nash facilities are ISO 9001 certified.

5.4 Performance Curve Data

HOFFMAN LAMSON CF SELECT plus

1600, 6 Stage(s) (6 x A3) , 3560 RPM

Date: 3/23/2023

Project Name: City of Roseville

Customer:

Sales Order Number:

Application Engineer: AAT

Comment: Multistage Blowers AB 100-400 Swing AB 500-800

AMBIENT GAS PARAMETERS	ENGLISH UNITS	METRIC UNITS
Molecular Weight	28.143 lbm/lbmol	28.143 kg/kgmol
R Value	54.897 ft.lbf/lbm.R	0.295 kJ/kg.K
Density	0.067 lbm/ft^3	1.079 kg/m^3
Sp. Heat @ Const. P	0.250 BTU/lbm.R	1.046 kJ/kg.K
Ratio of Sp. Heats	1.395	1.395
Partial Pres. of Vapor	1.091	1.091

GAS MIX:	VOL
Air	100

Inlet Set 1

CORRECTED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Ambient Pressure	130 ALTI-FT	14.63 PSIA	1.01 bar a
Relative Humidity	85%	85%	85%
Ambient Temperature	110 F	110.00 F	43.33 C
Inlet Pressure	-0.2 PSIG	14.43 PSIA	-13.79 mbar g
Inlet Flow	5867 SCFM	6919 ICFM	11755 m3/h
Discharge Pressure	8.5 PSIG	8.50 PSIG	0.59 bar g
MEASURED VALUES	**ORIGINAL UNITS**	**ENGLISH UNITS**	**METRIC UNITS**
Surge Flow Rate	2164 SCFM	2552 ICFM	4336 m3/h
Surge Pressure	10.61 PSIG	10.61 PSIG	0.73 bar g
Pressure Rise to Surge	2.11 PSIG	2.11 PSIG	0.15 bar g
Max. Vol. Turndown	63.12%	63.12%	63.12%
Pressure @ Design	8.50 PSIG	8.50 PSIG	0.59 bar g
Power @ Design	306.57 HP	306.57 HP	228.61 KW
Efficiency @ Design	74.35%	74.35%	74.35%
Temperature @ Design	223.25 F	223.25 F	106.25 C

HOFFMAN LAMSON

CF SELECT plus

Inlet Set 2

CORRECTED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Ambient Pressure	130 ALTI-FT	14.63 PSIA	1.01 bar a
Relative Humidity	85%	85%	85%
Ambient Temperature	110 F	110.00 F	43.33 C
Inlet Pressure	-0.2 PSIG	14.43 PSIA	-13.79 mbar g
Inlet Flow	5646 SCFM	6658 ICFM	11312 m3/h
Discharge Pressure	7.85 PSIG	7.85 PSIG	0.54 bar g
MEASURED VALUES	**ORIGINAL UNITS**	**ENGLISH UNITS**	**METRIC UNITS**
Surge Flow Rate	2164 SCFM	2552 ICFM	4336 m3/h
Surge Pressure	10.61 PSIG	10.61 PSIG	0.73 bar g
Pressure Rise to Surge	2.76 PSIG	2.76 PSIG	0.19 bar g
Max. Vol. Turndown	61.67%	61.67%	61.67%
Pressure @ Design	7.85 PSIG	7.85 PSIG	0.54 bar g
Power @ Design	344.19 HP	344.19 HP	256.66 KW
Efficiency @ Design	74.35%	74.35%	74.35%
Temperature @ Design	226.32 F	226.32 F	107.96 C

HOFFMAN LAMSON

CF SELECT plus

Inlet Set 3

CORRECTED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Ambient Pressure	130 ALTI-FT	14.63 PSIA	1.01 bar a
Relative Humidity	85%	85%	85%
Ambient Temperature	110 F	110.00 F	43.33 C
Inlet Pressure	-0.2 PSIG	14.43 PSIA	-13.79 mbar g
Inlet Flow	2934 SCFM	3460 ICFM	5878 m3/h
Discharge Pressure	8.5 PSIG	8.50 PSIG	0.59 bar g
MEASURED VALUES	**ORIGINAL UNITS**	**ENGLISH UNITS**	**METRIC UNITS**
Surge Flow Rate	2164 SCFM	2552 ICFM	4336 m3/h
Surge Pressure	10.61 PSIG	10.61 PSIG	0.73 bar g
Pressure Rise to Surge	2.11 PSIG	2.11 PSIG	0.15 bar g
Max. Vol. Turndown	26.24%	26.24%	26.24%
Pressure @ Design	8.50 PSIG	8.50 PSIG	0.59 bar g
Power @ Design	211.19 HP	211.19 HP	157.49 KW
Efficiency @ Design	60.82%	60.82%	60.82%
Temperature @ Design	271.22 F	271.22 F	132.90 C

HOFFMAN LAMSON

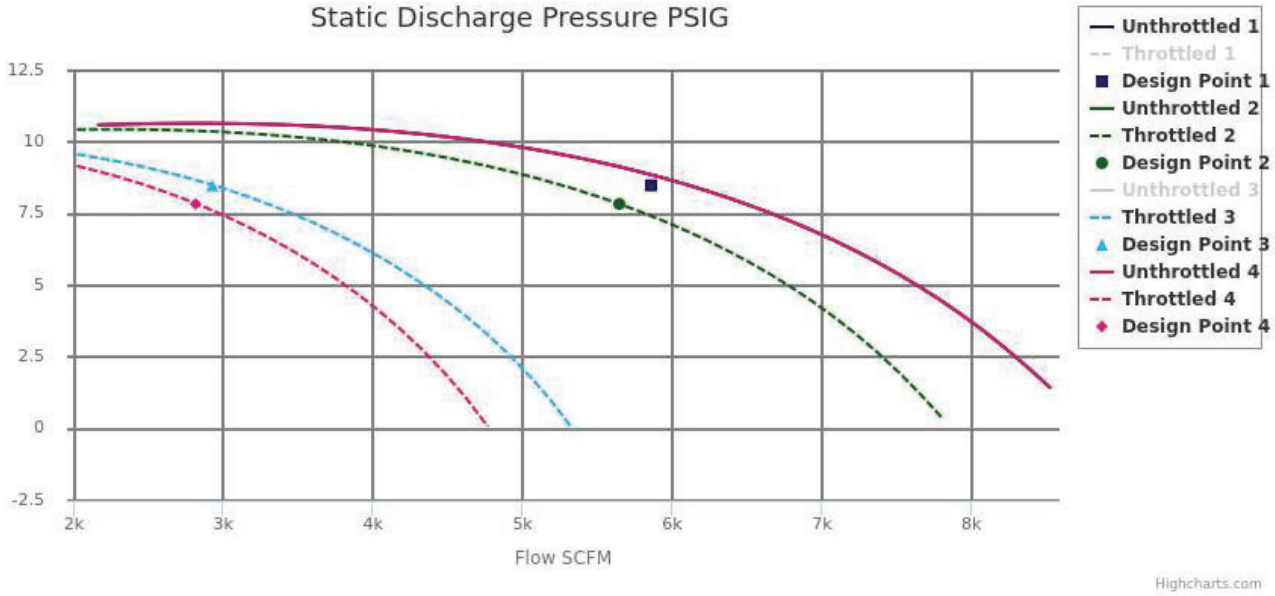
CF SELECT plus

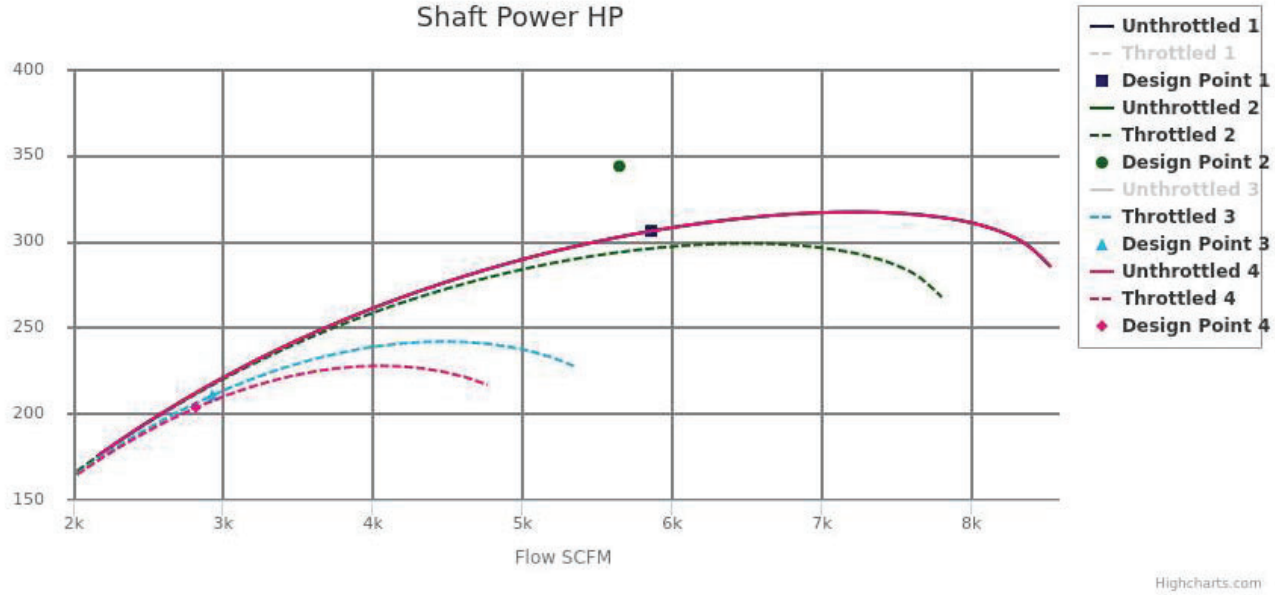
Inlet Set 4

CORRECTED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Ambient Pressure	130 ALTI-FT	14.63 PSIA	1.01 bar a
Relative Humidity	85%	85%	85%
Ambient Temperature	110 F	110.00 F	43.33 C
Inlet Pressure	-0.2 PSIG	14.43 PSIA	-13.79 mbar g
Inlet Flow	2823 SCFM	3329 ICFM	5656 m3/h
Discharge Pressure	7.85 PSIG	7.85 PSIG	0.54 bar g
MEASURED VALUES	**ORIGINAL UNITS**	**ENGLISH UNITS**	**METRIC UNITS**
Surge Flow Rate	2164 SCFM	2552 ICFM	4336 m3/h
Surge Pressure	10.61 PSIG	10.61 PSIG	0.73 bar g
Pressure Rise to Surge	2.76 PSIG	2.76 PSIG	0.19 bar g
Max. Vol. Turndown	23.34%	23.34%	23.34%
Pressure @ Design	7.85 PSIG	7.85 PSIG	0.54 bar g
Power @ Design	203.96 HP	203.96 HP	152.09 KW
Efficiency @ Design	60.03%	60.03%	60.03%
Temperature @ Design	273.36 F	273.36 F	134.09 C

HOFFMAN LAMSON

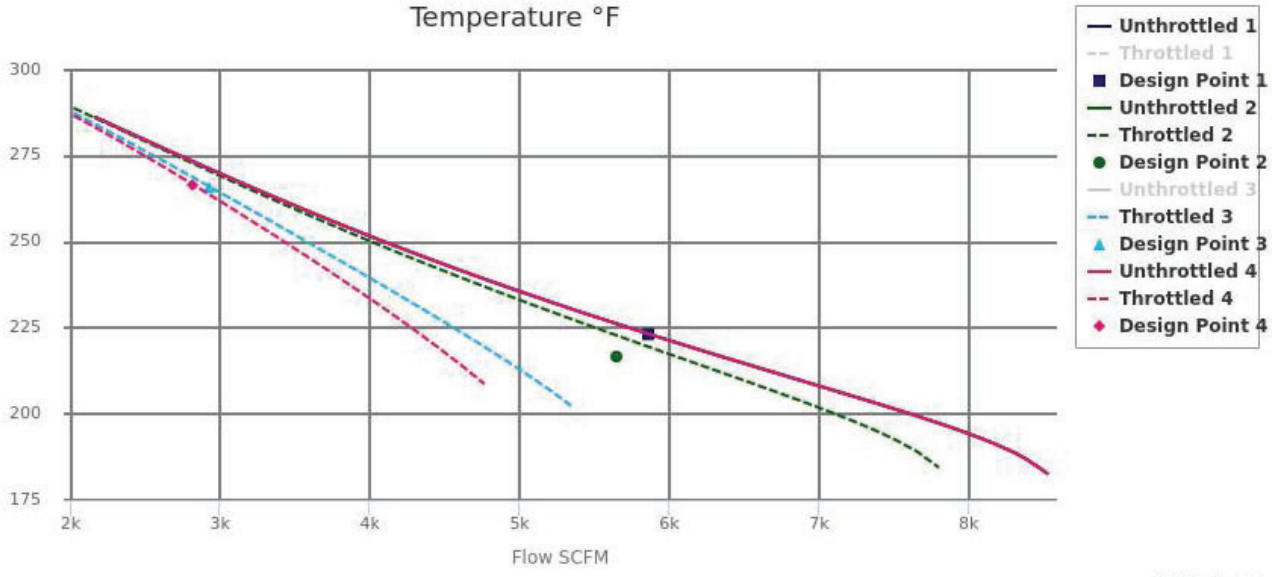
CF SELECT plus

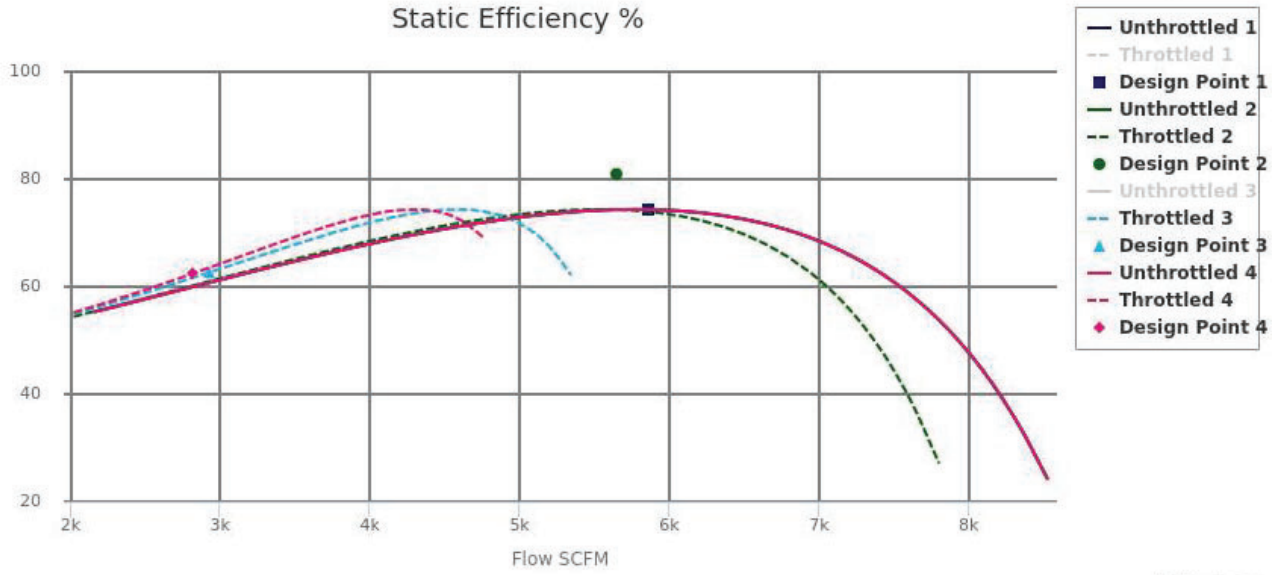


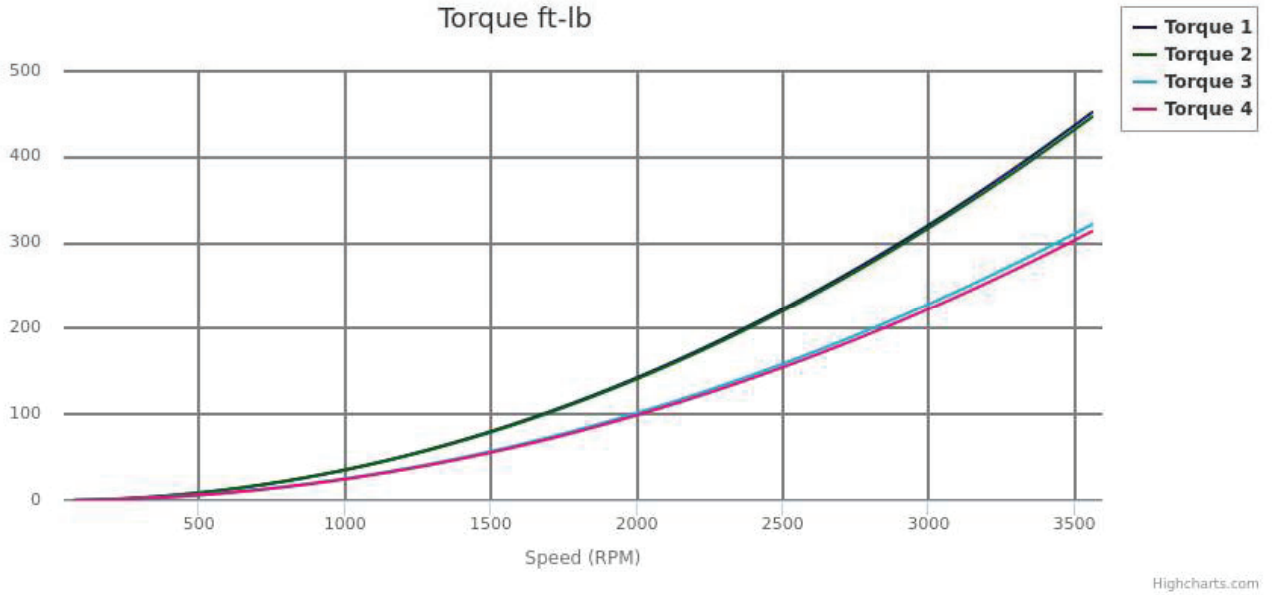


HOFFMAN LAMSON

CF SELECT plus







6 Terms and Conditions

https://www.gardnerdenver.com/en-us/hoffmanandlamson/about-us/download-library

Adrianne Twymon
Mobile: (724) 247-5256
Email: adrianne.twymon@irco.com

7 Closing Comments

BLOWER SCOPE OF SUPPLY:

- Structural Steel Base Plate with Neoprene/Cork Isolation Base Pads
- Oil Lubricated Bearings
- Labyrinth Shaft Seals
- 16" Inlet Filter/Silencer
- 16" Inlet Expansion Joint without Control Rods.
- 14" Outlet Expansion Joint without Control Rods.
- 16" Inlet Throttle Butterfly Control Valve
- 14" Discharge Isolation Butterfly Control Valve
- 14" Check Valve to prevent backflow
- PLC & VFD Packaged System - NEMA 12

FACTORY TESTING:

Blowers are given a standard factory mechanical test consisting of operating the unit for a minimum of one hour after stabilization. Speed, vibration, and temperature levels are recorded and verified to be within Gardner Denver engineering and ISO quality PTC9016 standards during this test. The customer as measured by the above mechanical test shall consider successful performance of this equipment as the basis for acceptance unless otherwise noted.

- Mechanical Run Test (unwitnessed)
- Dynamic Rotor Balance

CLARIFICATIONS AND COMMENTS:

- The complete scope of supply is as noted above. Any item not specifically noted is not included. Any accessories quoted are shipped loose for mounting by others unless otherwise noted.
- Performance curves are included with the proposal.
- Unloading, storage, installation or installation supervision, motor starters, switchgear, interconnecting wiring and conduit, pipes, fittings, gaskets, hardware and anchor bolts are not included.
- Preparation procedures and paint shall be manufacturer's standard specification coating system unless otherwise noted.
- Blower coupling alignment must be checked and adjusted to limits as noted in O&M manual by others after equipment is installed and prior to start-up at the job site, not by the representative.
- On-site blower and controls start up assistance by a factory technicians or authorized representative is not included. Standard field service rates are attached to this quotation.
- Motors have been included with this scope of supply.

Adrianne Twymon
Mobile: (724) 247-5256
Email: adrianne.twymon@irco.com

Lone Star Turbo Blowers

GEARLESS TURBO (DT SERIES) SINGLE STAGE CENTRIFUGAL BLOWER PROPOSAL

PROJECT: Roseville, CA Dry Creek WWTP

DATE: February 27, 2023 QUOTE NO.: ALR0186-DT, rev.1

EQUIPMENT: Gearless Turbo Single Stage Blowers

PROPOSED BY: Amber Roberts

SUPPLIER: LONE STAR BLOWER

LONE STAR BLOWER

8883 West Monroe Road
Houston, Texas 77061

TEL: 832-532-3112
FAX: 832-532-3115

1.1 APPLICATION

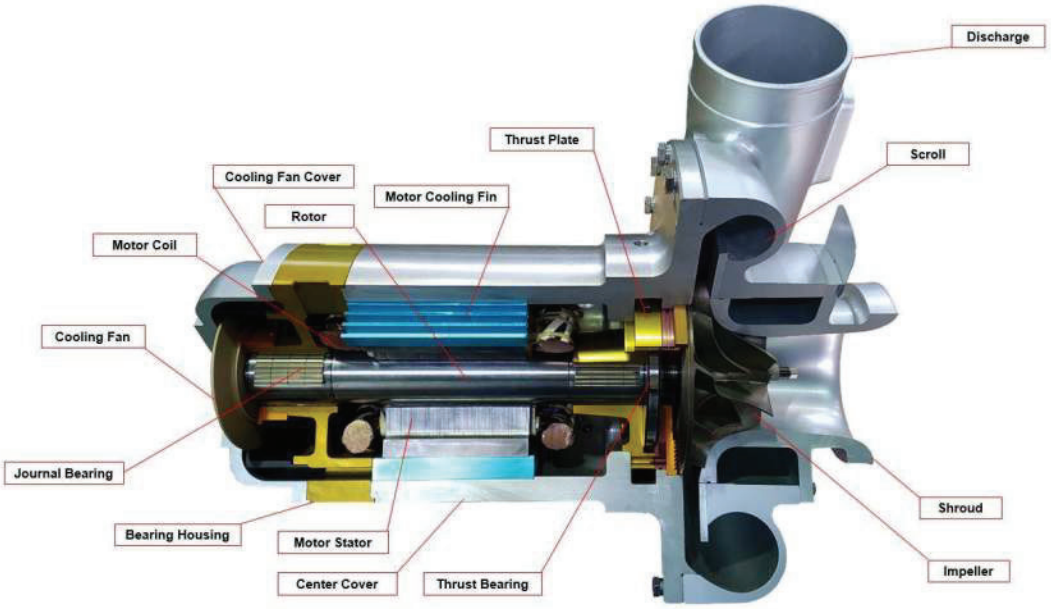
PROCESS	AB 100 – 400, Duty	AB 500 – 800, Duty	Common Backup*
BLOWER MODEL	MAX250-C080	MAX300—C080	MAX300-C080
QTY	Three (3) duty	Two (2 duty)	One (1)
DESIGN FLOW	5,646 SCFM	5,868 SCFM	5,868 SCFM
DESIGN PRESSURE	7.85 PSIG	8.5 PSIG	8.5 PSIG
DESIGN TEMPERATURE	100°F	100°F	100°F
DESIGN RH%	80%	80%	80%
MOTOR RATING, HP	250 HP, FLA-285.7	300 HP, FLA-342.8	300 HP, FLA-342.8

* Common backup blower designed to meet operational requirements of both blower systems.

1.2 BLOWER DESIGN

The Gearless Air Bearing Turbo Blower design has rapidly evolved over the past 10 years. Lone Star offers the largest product range (20 to 1,000 HP) of gearless turbo blowers with over 7,000 units installed. The Gearless Turbo Blower offers:

20 to 40% more energy efficiency compared to other technologies
75 to 85 dBA
1/3 the floor space compared to other technologies
Oil Free Compression
Low Maintenance
Easy Installation – Plug & Play



Quotation No.: ALR0185-DT

The following is a price summary for this quotation.

System AB 100 – 400, Duty	**QTY**	**PRICE**
DT MAX Series Blower, Model MAX250-C080, includes integral - Local Control Panel, Filters, VFD, enclosure and Instrumentation.	3	$329,955
Blower Accessory Package	3	$15,150
Harmonic Filter	3	$31,875
Testing	Lot	$11,400
Packaging & Freight	Lot	$6,500
Spare Parts	Lot	$900
Field/Startup Services	Lot	$6,900
	Grand Total	**$402,680**

System AB 500 – 800, Duty	**QTY**	**PRICE**
DT MAX Series Blower, Model MAX300-C080, includes integral - Local Control Panel, Filters, VFD and Instrumentation.	2	$260,500
Blower Accessory Package	2	$11,800
Harmonic Filter	2	$22,800
Testing	Lot	$7,400
Packaging & Freight	Lot	$5,500
Spare Parts	Lot	$900
Field/Startup Services	Lot	$5,800
	Grand Total	**$314,700**

Common Backup	**QTY**	**PRICE**
DT MAX Series Blower, Model MAX300-C080, includes integral - Local Control Panel, Filters, VFD and Instrumentation.	1	$130,250
Blower Accessory Package	1	$5,900
Harmonic Filter	1	$11,400
Testing	Lot	$3,700
Packaging & Freight	Lot	$2,300
Spare Parts	Lot	$300
Field/Startup Services	Lot	$3,100
	Grand Total	**$156,950**

SCOPE OF SUPPLY: Any work or equipment beyond the scope of this proposal will be performed or provided only after customer approval and acceptance by Lone Star Blower. No assumption should be made that anything not specifically defined is included.

PRICE: The price quoted is for all items purchased at one time. Partial orders may be subject to price adjustment.

PAYMENT TERMS: 25% upon Approval of Submittals; 70% upon delivery or readiness for shipping; 5% upon successful startup or latest 8 weeks after delivery. Terms subject to credit approval.

PACKAGING & FREIGHT: Packaging and Shipping Cost DAP Jobsite (INCOTERMS® 2010) are included.

APPROVAL DRAWINGS: 4-6 Weeks after acceptance of order.

SHIPMENT: 18-22 Weeks after receipt of Signed Submittal Drawings.

COMPLETE PACKAGE WARRANTY: A 12-month warranty will begin upon successful completion of startup and certification for full-scale operation by Lone Star Blower, or 6 months from shipment, whichever occurs first. Under no circumstances will the warranty begin upon “beneficial use”, completion of the project, or acceptance of the equipment as determined by the engineer or end user. Any and all warranty terms and conditions detailed in the proposal herein shall supersede and/or supplement the warranty language denoted in the Lone Star Blower terms and conditions.

TERMS & CONDITIONS: See attached Lone Star Blower Terms and Conditions.

START UP: Startup/Field Services are included.

Technical Offer – DT MAX Series Blower	
Customer	Roseville, CA – Dry Creek WWTP
Date	February 20, 2023

Lone Star Blower gearless centrifugal turbo air blowers, accessories and controls with variable frequency drive control for efficiency optimization and minimized power consumption. This proposal is offered in accordance with Lone Star Blower standard specifications.

Each Blower Package is UL1450 Listed and includes the following integrated components to provide a complete package.

Blower Core, includes:

7075 Aluminum Alloy Impeller, Anodized
Titanium Alloy Shaft
Direct Coupled High Efficiency Permanent Magnet Synchronous Motor, 480V/3ph/60Hz
Air Foil Bearings w/Nano Silver Triple Treatment (NTSB) & 3-Stage Heat Treatment
Blow-Off Valve/Silencer
Internal Vibration and Dynamic Absorption Isolators

High Efficiency Variable Frequency Drives

480V/3ph/60Hz, UL508 Listed
Compliance with standards of ANSI, NEMA, IEEE, and National Electric Code

Blower Local Control Panel (LCP) (not all features and functions listed)

PLC (Allen Bradley MicroLogix) Based Controller
Color Operator Interface Terminal (OIT)
Certified per UL 508A
Communication capability with SCADA and MCP (if applicable) network via Ethernet
I/O inputs and outputs for blower control and monitoring
Control Functionality for Operation, Monitoring, and Safety Protection

Instrumentation:

Inlet Filter Differential Pressure Transmitter
Inlet Air Temperature Transmitter
Discharge Air Pressure Transmitter
Discharge Air Temperature Transmitter
Differential Pressure Transmitter
Motor Winding Temperature Sensors

Acoustic Enclosure

All above components integrated into an acoustic enclosure
Louver Connection (Flanged connection available)

Technical Offer – Blower Accessory Package (shipped loose)	
Customer	Roseville, CA – Dry Creek WWTP
Date	February 20, 2023

Lone Star Blower includes all required accessories for a complete system.

Discharge Accessories (Shipped Loose; for each blower, for Installation by Customer):

Discharge Butterfly Valve, Wafer Style, w/ EPDM Seat, and Manual Actuator
Discharge Expansion Joint
Discharge Check Valves, Wafer Style, w/EPDM Seat

Harmonic Filter (Shipped Loose; for each blower, for Installation by Customer):

Harmonic Filter mounted in a standalone NEMA 1 enclosure for IEEE 519 compliance. Option available for mounting inside blower enclosure, contact Lone Star for additional information.

Technical Offer – Testing	
Customer	Roseville, CA – Dry Creek WWTP
Date	February 20, 2023

Lone Star Blower performs mechanical testing under full load for all new blowers. The standard mechanical test includes balance report and vibration analysis. In addition to mechanical testing, the following tests (unwitnessed) are included:

- Blower ASME PTC13 Test

Technical Offer – Packaging and Freight	
Customer	Roseville, CA – Dry Creek WWTP
Date	February 20, 2023

Lone Star Blower ships from our Houston, Texas, USA factory. Packaging, Handling and Freight DAP jobsite (INCOTERM® 2010) is included. Equipment will be shrink wrapped & labeled.

Technical Offer – Field/Startup Services	
Customer	Roseville, CA – Dry Creek WWTP
Date	February 20, 2023

Lone Star Blower has a fully trained and experienced service group which will perform field service, equipment commissioning and onsite repairs. This proposal includes onsite field service for startup and training of the proposed blowers. Two (2) trips, four (4) eight hour (8-hr) days, each trip.

- Additional service is available per Lone Star's published labor rate sheet. Advance notification of 15 working days is required for scheduling.

Technical Offer – Spare Parts	
Customer	Roseville, CA – Dry Creek WWTP
Date	February 20, 2023

The following spare parts are included:

One (1) set main process air filters per blower

Technical Offer – Comments/Clarifications	
Customer	Roseville, CA – Dry Creek WWTP
Date	February 20, 2023

1. **ITEMS NOT INCLUDED:** Master Control Panel, Step-Down Transformer, Fittings, Piping Hardware, Elbows, Existing Equipment Removal and Loading, Equipment Installation, Equipment Wiring, Taxes, Duties and anything not listed in the above scope of supply shall be provided by others.

SYSTEM AB 100 - 400 SUPPORTING DATA

- Blower Performance Curves
- Blower GA
- Blower Cutsheet

MAX Q FINDER

rev. 20.09.17.0

Compressor Datasheet

General information

Customer	: Roseville, CA	Model	: MAX250-C080
Project	: Dry Creek WWTP - AB 100 - 400	C-Number	: X250C080S6P0
Process	: Activated Sludge	Quantity	: Total 4 (Duty:3 & Stand-by:1)
User Info	:	Last Saved Date	: 2023-Feb-20 13:18:23

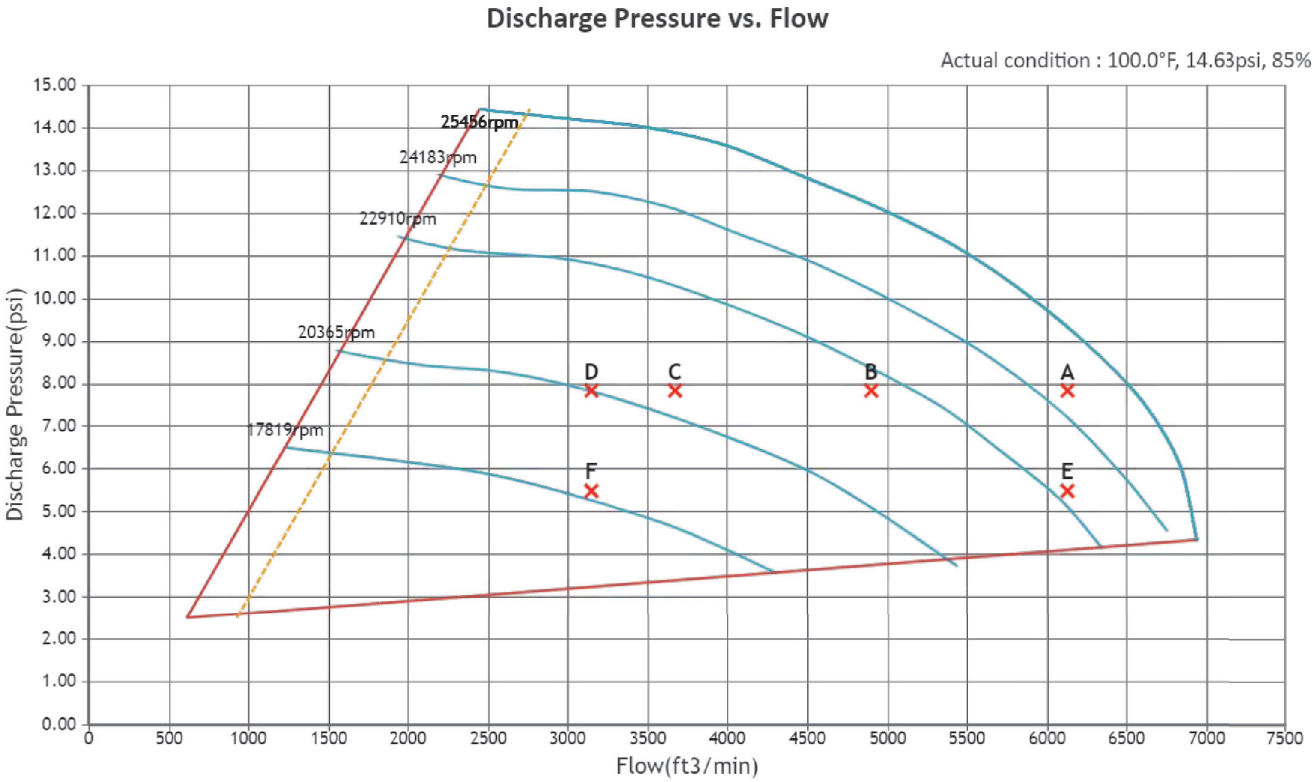
Operating Conditions

		A	B	C	D	E	F
Operating point		100%	80%	60%	51%	100%	51%
Inlet pressure @ Inlet Flange	psi.a	14.42	14.42	14.42	14.42	14.42	14.42
Elevation	ft	130	130	130	130	130	130
Relative humidity	%	85	85	85	85	85	85
Inlet temperature	°F	100	100	100	100	100	1009
Inlet flow (68.0°F, 14.70psi, 36%)	SCFM	5646.0	4517.0	3387.0	2900.0	5646.0	2900.0
Inlet flow (0.0°C, 1.01325bar.g, 0.0%)	Nm3/min	148.5	118.8	89.1	76.3	148.5	76.3
Mass Flow	Kg/s	3.201	2.561	1.920	1.644	3.201	1.644
Discharge pressure	psi.g	7.85	7.85	7.85	7.85	5.5	5.5

Performance

Rise to Surge	psi.g	5.66	3.19	1.6	1.02	6.24	1.31
Turn down ratio	%	76.9	71.1	61.5	55	82.7	66.3
Speed	rpm	24535	22444	20838	20282	23098	17990
Temperature rise	°F	106.42	98.86	97.6	98.14	87.34	72.4
Discharge temperature	°F	206.42	198.86	197.6	198.14	187.34	172.4
Power(total)	kW	202.1	150.3	111.2	95.7	165.9	70.7

Performance Map



MAX FINDER

rev. 20.09.17.0

Compressor Datasheet

General information

Customer	: Roseville, CA	Model	: MAX250-C080
Project	: Dry Creek WWTP - AB 100 - 400	C-Number	: X250C080S6P0
Process	: Activated Sludge	Quantity	: Total 4 (Duty:3 & Stand-by:1)
User Info	:	Last Saved Date	: 2023-Feb-20 13:21:27

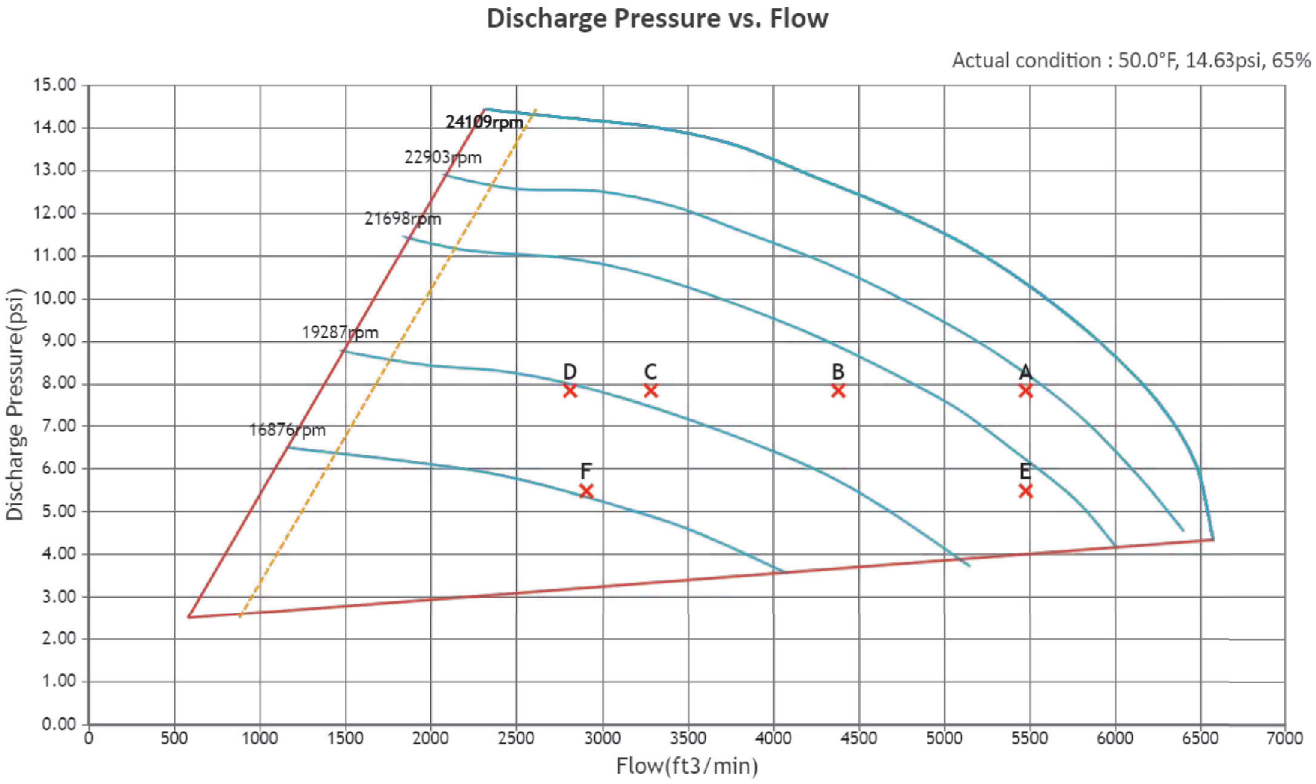
Operating Conditions

		A	B	C	D	E	F
Operating point		100%	80%	60%	51%	100%	53%
Inlet pressure @ Inlet Flange	psi.a	14.63	14.63	14.63	14.63	14.63	14.63
Elevation	ft	130	130	130	130	130	130
Relative humidity	%	65	65	65	65	65	65
Inlet temperature	°F	50	50	50	50	50	50
Inlet flow (68.0°F, 14.70psi, 36%)	SCFM	5646.0	4517.0	3387.0	2900.0	5646.0	3000.0
Inlet flow (0.0°C, 1.01325bar.g, 0.0%)	Nm3/min	148.5	118.8	89.1	76.3	148.5	78.9
Mass Flow	Kg/s	3.201	2.561	1.920	1.644	3.201	1.701
Discharge pressure	psi.g	7.85	7.85	7.85	7.85	5.5	5.5

Performance

Rise to Surge	psi.g	4.79	2.9	1.31	0.87	5.51	1.16
Turn down ratio	%	75.5	69.4	59.2	52.4	81.7	65.5
Speed	rpm	22618	20883	19531	19060	21187	16956
Temperature rise	°F	93.78	89.64	88.74	90.54	76.86	65.88
Discharge temperature	°F	143.78	139.64	138.74	140.54	126.86	115.88
Power(total)	kW	173.8	132.8	98.7	86.1	142.3	64.8

Performance Map



MAX FINDER

rev. 20.09.17.0

Compressor Datasheet

General information

Customer	: Roseville, CA	Model	: MAX250-C080
Project	: Dry Creek WWTP - AB 100 - 400	C-Number	: X250C080S6P0
Process	: Activated Sludge	Quantity	: Total 4 (Duty:3 & Stand-by:1)
User Info	:	Last Saved Date	: 2023-Feb-20 13:13:2

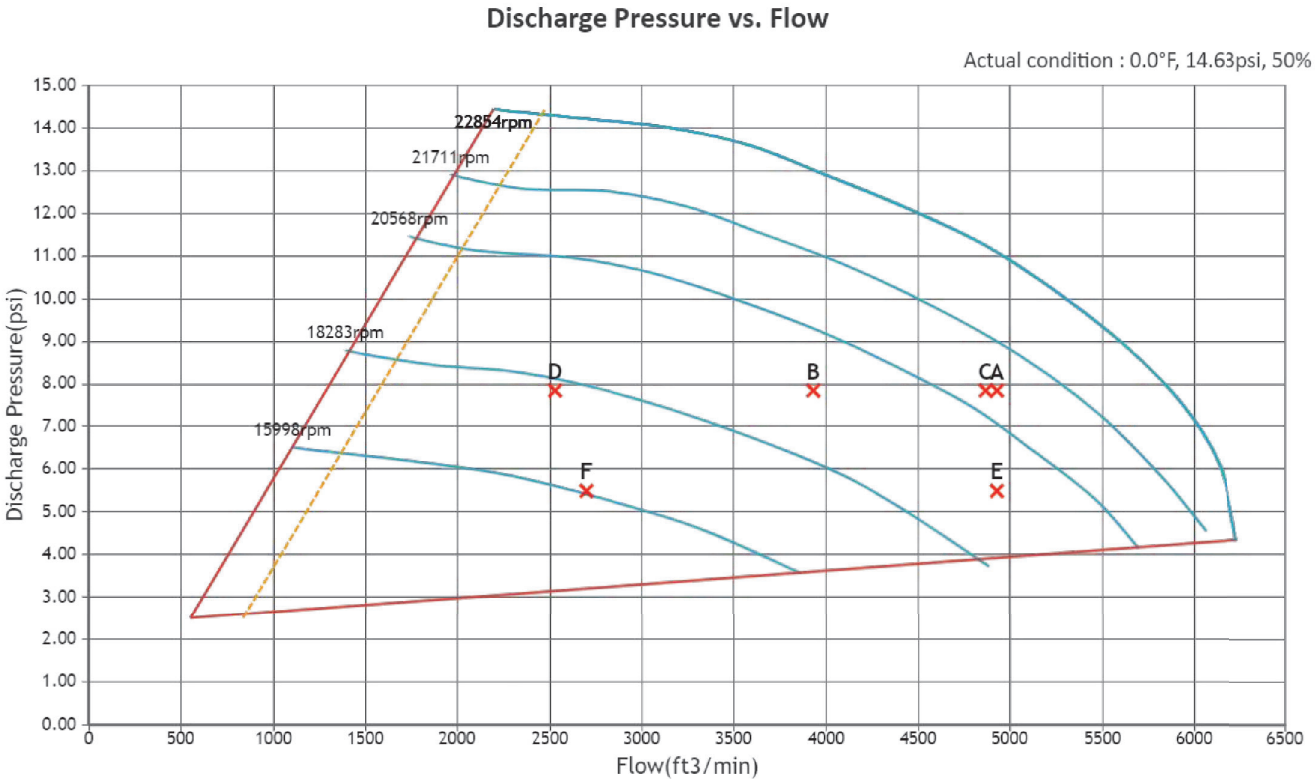
Operating Conditions

		A	B	C	D	E	F
Operating point		100%	80%	60%	51%	100%	55%
Inlet pressure @ Inlet Flange	psi.a	14.42	14.42	14.42	14.42	14.42	14.42
Elevation	ft	130	130	130	130	130	130
Relative humidity	%	50	50	50	50	50	50
Inlet temperature	°F	0	0	0	0	0	0
Inlet flow (68.0°F, 14.70psi, 36%)	SCFM	5656.0	4516.0	5587.0	2900.0	5656.0	3100.0
Inlet flow (0.0°C, 1.01325bar.g, 0.0%)	Nm3/min	148.8	118.8	147	76.3	148.8	81.6
Mass Flow	Kg/s	3.206	2.560	3.167	1.644	3.206	1.757
Discharge pressure	psi.g	7.85	7.85	7.85	7.85	5.5	5.5

Performance

Rise to Surge	psi.g	4.21	2.47	4.06	0.73	4.93	1.16
Turn down ratio	%	74.2	67.7	73.9	49.7	80.7	64.7
Speed	rpm	20984	19498	20885	17972	19557	16015
Temperature rise	°F	82.94	80.42	82.58	82.76	67.28	59.36
Discharge temperature	°F	82.94	80.42	82.58	82.76	67.28	59.36
Power(total)	kW	153.3	118.7	150.8	78.4	124.4	60.1

Performance Map

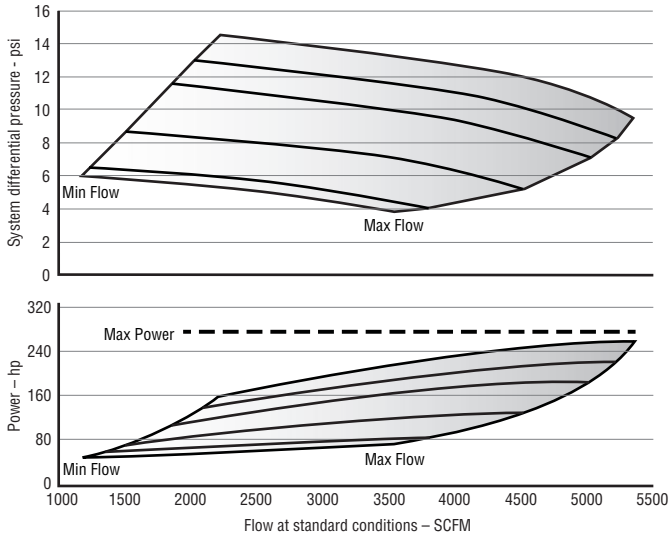


MAX250

Gearless High Speed Turbo Blower

Model MAX250-C080

Service
Air and Pressure



Standard Specifications

Gas	Air Only
Flow Range	100% to 45% of Rated Flow*
Maximum Case Pressure	35 PSIG / 2.4 bar
VFD (integral)	Vacon, KEB, Yaskawa
Stages	Single Stage
Power Driver Options	Intregal Permanent Magnet Electric Motor
Cooling	Self Cooled Air Cooled
Bearings	NSTB+ Air Foil
Enclosure	Standard
Sound Level	75 dB @ 3 feet free field
Filtration Rating (std)	99% at 2 micron, or as required

Control Options

Control Methods	Speed Control, Blow Off Control, Pressure, Flow
Local Controller	sLOC™ Standard - Custom for Allen Bradley, Modicon, Siemens or Other
HMI	sLOC™ Standard or Custom HMI
Remote Monitoring	sLINK™ or Custom
Control Set Points	Pressure, Flow, Power, Custom Input

Standard Materials of Construction

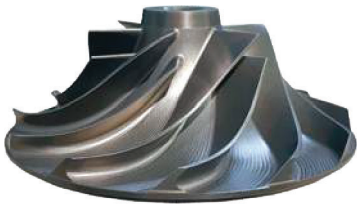
Casing	A356 Cast Aluminum
Volute	A356 Cast Aluminum
Bearings	Inconel with Teflon, Nano Silver Coatings
Impeller	5 Axis Machined anodized 7075 Aluminum
Shaft	Titanium alloy with Sm2C017 Magnets
Blower Base Skid	ASTM A36 Structural Steel
Isolation Pads	Adjustable Feet with Mounting Anchor
Finish	Powder Coated Cabinet

Optional Testing & Certifications

Electrical	UL 508A, UL 1450, CSA, CE, IEEE519
Hazardous Location	Not Classified
Balancing	ISO 1940 - G2.5, ~4W/N API
Noise Level	OSHA 1910.95, ISO 2151:2004
Performance Testing	ASME PTC-10, PTC-13, ISO 5389

Standard Options

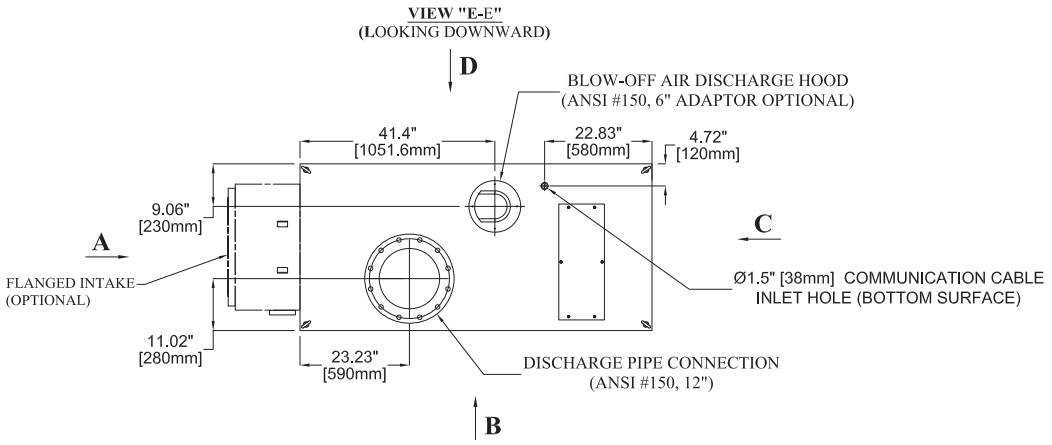
- High and Low Ambient Temperature
- Sperated Electrical and Mechanical Enclosure
- Flanged Intake
- Outdoor Enclosure
- Dual and Duplex Options
- Harmonic Filter

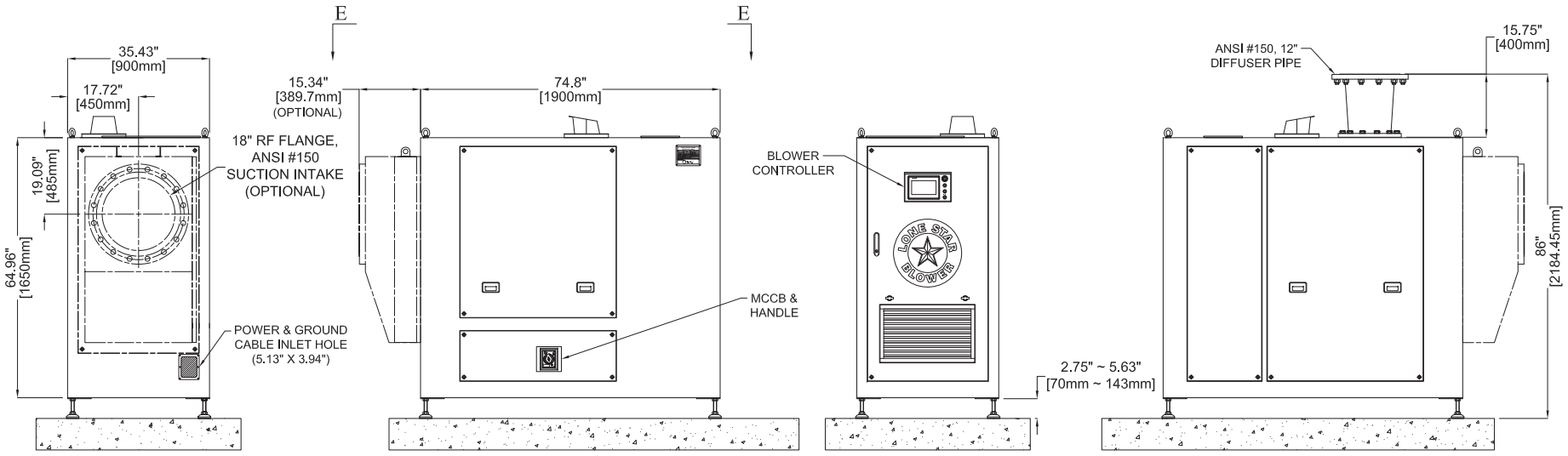


www.lonestarblower.com

** Information is approximate and can change without notice / * Performance Based on 1 Atm, 68F/20C, 36% RH and 3550 rpm*

REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED





VIEW "A"
(REAR SIDE)

VIEW "B"
(LEFT SIDE)

VIEW "C"
(FRONT SIDE)

VIEW "D"
(RIGHT SIDE)

ALL DIMENSIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.
PLEASE CONSULT WITH LONE STAR PRIOR TO DESIGNING AROUND PARTICULAR EQUIPMENT.

MODELS	WEIGHT
MAX200-C060 ~ C080 LOUVER	2,050 LBS (930 KG)
MAX200-C060 ~ C080 FLANGED INTAKE	2,150 LBS (975 KG)

UNLESS OTHERWISE SPECIFIED
DO NOT SCALE

THIRD ANGLE PROJECTION

DRAWING IS FOR REFERENCE ONLY
UNLESS SPECIFIED AS RELEASED.

APPROVALS		
DRAWN	JMC	06/04/2021
CHECK		
ENGINEER		
MANUFACTURING		
CONTROL		
APPROVED		

LONE STAR

TITLE
DT SERIES
BLOWER MAX200-C060~C080

SIZE	CAGE CODE	DWG NUMBER	REV
A	-	MAX200-C060~C080	0
SCALE		SHEET 1 OF 1	

SYSTEM AB 500 - 800 SUPPORTING DATA

- Blower Performance Curves
- Blower GA
- Blower Cutsheet

MAX FINDER

rev. 20.09.17.0

Compressor Datasheet

General information

Customer	: Roseville, CA	Model	: MAX300-C080
Project	: Dry Creek WWTP - AB 500 - 800	C-Number	: X300C080S6P0
Process	: Activated Sludge	Quantity	: Total 3 (Duty:2 & Stand-by:1)
User Info	:	Last Saved Date	: 2023-Feb-20 10:0:25

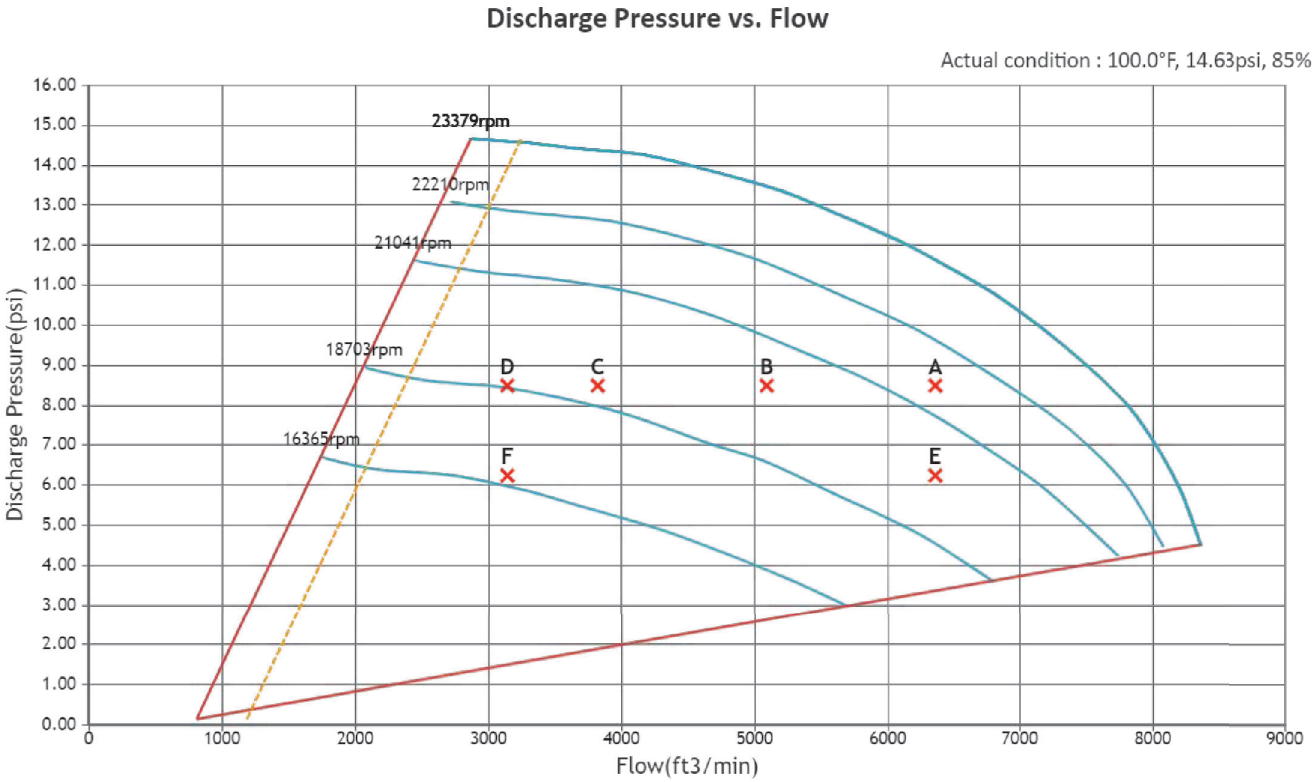
Operating Conditions

		A	B	C	D	E	F
Operating point		100%	80%	60%	50%	100%	50%
Inlet pressure @ Inlet Flange	psi.a	14.42	14.42	14.42	14.42	14.42	14.42
Elevation	ft	130	130	130	130	130	130
Relative humidity	%	85	85	85	85	85	85
Inlet temperature	°F	100	100	100	100	100	100
Inlet flow (68.0°F, 14.70psi, 36%)	SCFM	5868.0	4694.4	3520.0	2900.0	5868.0	2900.0
Inlet flow (0.0°C, 1.01325bar.g, 0.0%)	Nm3/min	154.4	123.5	92.6	76.3	154.4	76.3
Mass Flow	Kg/s	3.327	2.661	1.995	1.644	3.327	1.644
Discharge pressure	psi.g	8.5	8.5	8.5	8.5	6.25	6.25

Performance

Rise to Surge	psi.g	3.77	2.18	1.02	0.58	4.35	0.73
Turn down ratio	%	68.8	61.1	48.2	37.1	73.9	47.1
Speed	rpm	21493	20091	19024	18657	19984	16551
Temperature rise	°F	104.26	101.38	102.64	106.96	83.92	79.24
Discharge temperature	°F	204.26	201.38	202.64	206.96	183.92	179.24
Power(total)	kW	204.5	160	121.6	104.3	165.7	77.3

Performance Map



MAX FINDER

rev. 20.09.17.0

Compressor Datasheet

General information

Customer	: Roseville, CA	Model	: MAX300-C080
Project	: Dry Creek WWTP - AB 500 - 800	C-Number	: X300C080S6P0
Process	: Activated Sludge	Quantity	: Total 3 (Duty:2 & Stand-by:1)
User Info	:	Last Saved Date	: 2023-Feb-20 10:4:27

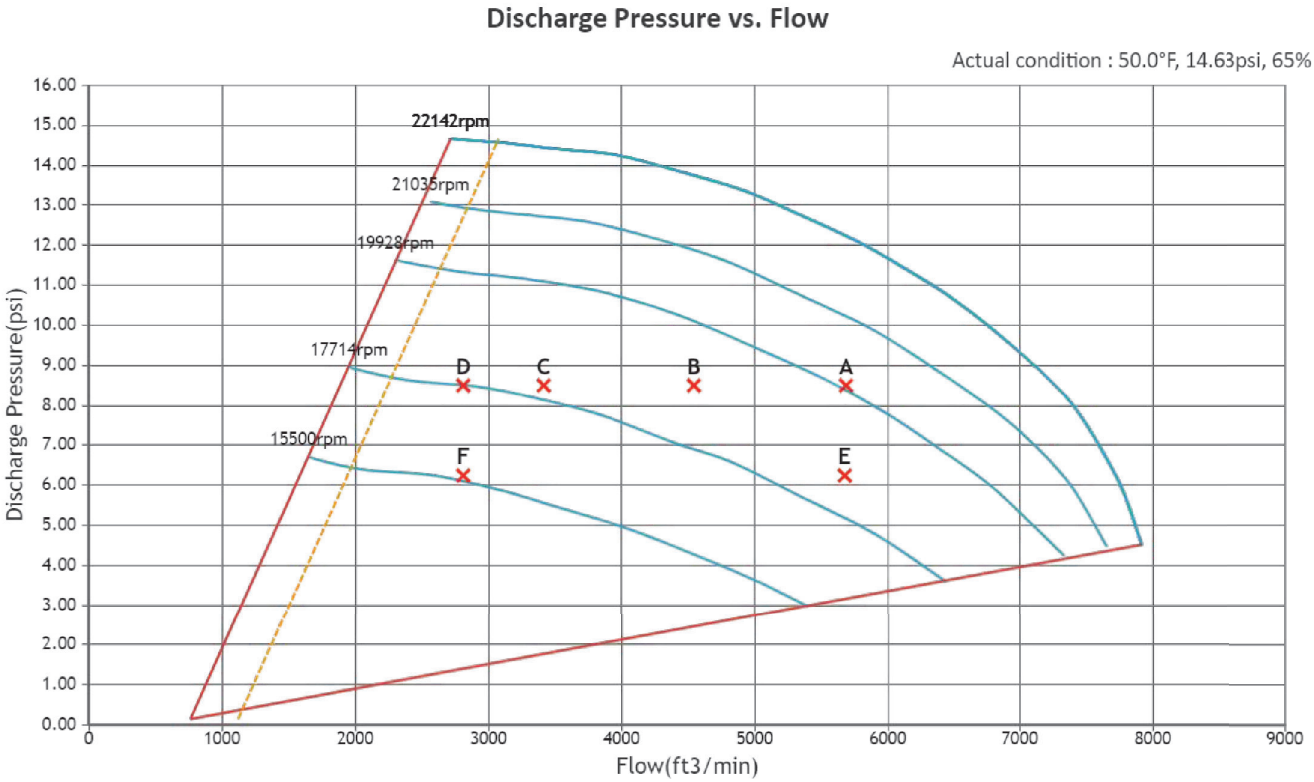
Operating Conditions

		A	B	C	D	E	F
Operating point		100%	80%	60%	50%	100%	50%
Inlet pressure @ Inlet Flange	psi.a	14.42	14.42	14.42	14.42	14.42	14.42
Elevation	ft	130	130	130	130	130	130
Relative humidity	%	65	65	65	65	65	65
Inlet temperature	°F	50	50	50	50	50	50
Inlet flow (68.0°F, 14.70psi, 36%)	SCFM	5868.0	4694.0	3521.0	2900.0	5858.0	2900.0
Inlet flow (0.0°C, 1.01325bar.g, 0.0%)	Nm3/min	154.4	123.5	92.6	76.3	154.1	76.3
Mass Flow	Kg/s	3.327	2.661	1.996	1.644	3.321	1.644
Discharge pressure	psi.g	8.5	8.5	8.5	8.5	6.25	6.25

Performance

Rise to Surge	psi.g	3.34	1.89	0.87	0.44	3.77	0.58
Turn down ratio	%	66.9	58.8	45.1	33.4	72.3	44
Speed	rpm	19972	18778	17893	17603	18459	15569
Temperature rise	°F	93.42	92.16	94.32	98.82	74.7	72.9
Discharge temperature	°F	143.42	142.16	144.32	148.82	124.7	122.9
Power(total)	kW	178.5	142	109	94	143.6	69.4

Performance Map



MAX Q FINDER

rev. 20.09.17.0

Compressor Datasheet

General information

Customer	: Roseville, CA	Model	: MAX300-C080
Project	: Dry Creek WWTP - AB 500 - 800	C-Number	: X300C080S6P0
Process	: Activated Sludge	Quantity	: Total 3 (Duty:2 & Stand-by:1)
User Info	:	Last Saved Date	: 2023-Feb-20 10:8:45

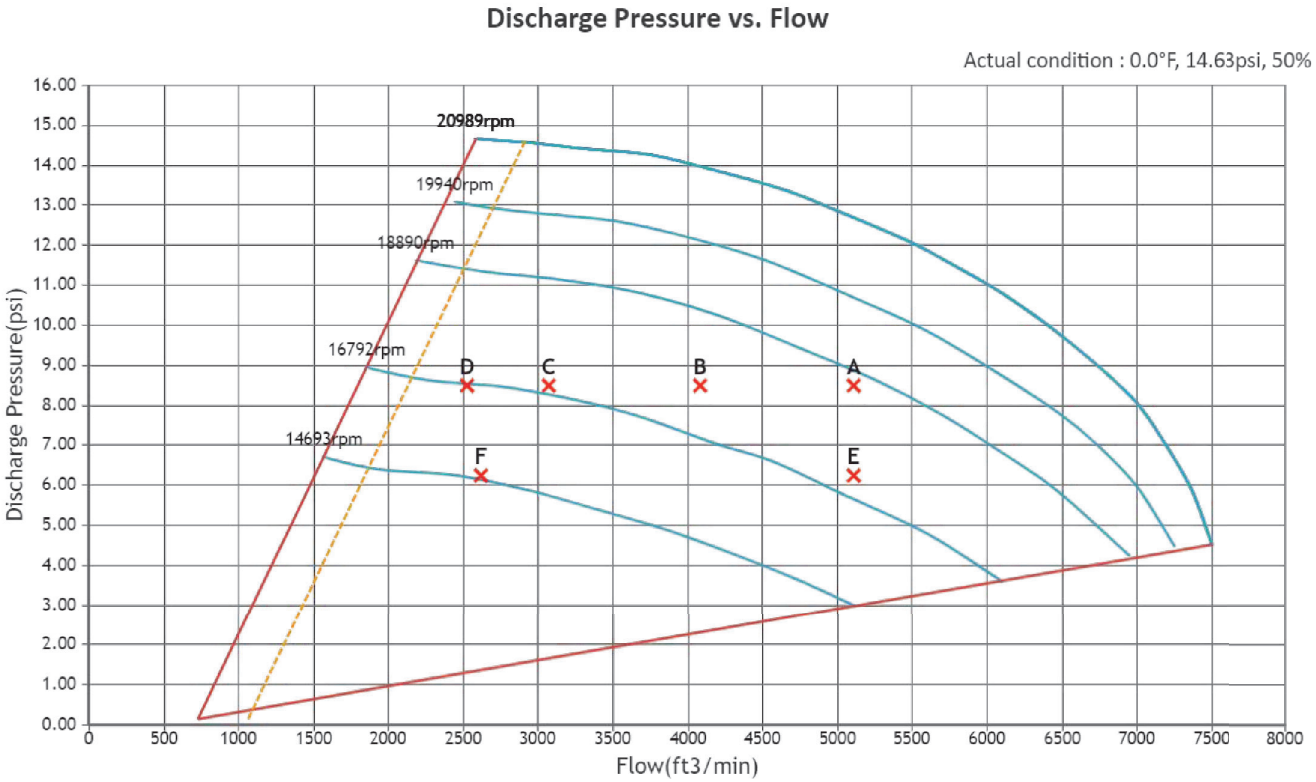
Operating Conditions

		A	B	C	D	E	F
Operating point		100%	80%	60%	50%	100%	51%
Inlet pressure @ Inlet Flange	psi.a	14.42	14.42	14.42	14.42	14.42	14.42
Pressure loss factor	psi.a	0.2	0.2	0.2	0.2	0.2	0.2
Elevation	ft	130	130	130	130	130	130
Relative humidity	%	50	50	50	50	50	50
Inlet temperature	°F	0	0	0	0	0	0
IInlet flow (68.0°F, 14.70psi, 36%)	SCFM	5868.0	4694.0	3520.0	2900.0	5868.0	3000.0
Inlet flow (0.0°C, 1.01325bar.g, 0.0%)	Nm3/min	154.4	123.5	92.6	76.3	154.4	78.9
Mass Flow	Kg/s	3.327	2.661	1.995	1.644	3.327	1.701
Discharge pressure	psi.g	8.5	8.5	8.5	8.5	6.25	6.25

Performance

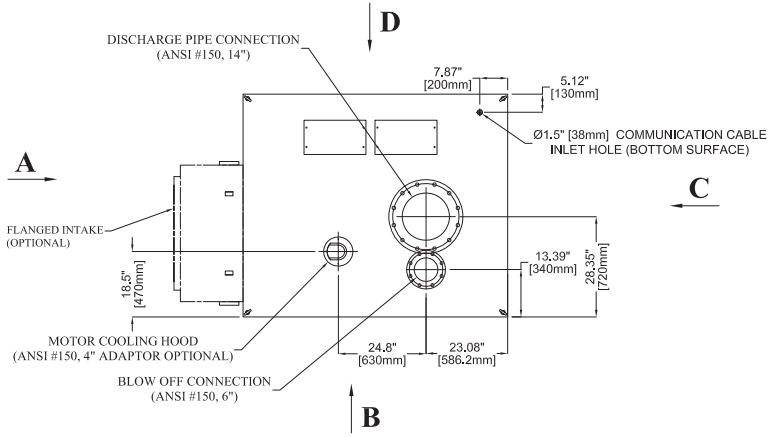
Rise to Surge	psi.g	2.9	1.6	0.73	0.44	3.19	0.58
Turn down ratio	%	65.2	56.5	42	29.6	70.7	42.7
Speed	rpm	18587	17602	16888	16658	17154	14733
Temperature rise	°F	83.3	82.94	86	90.14	65.84	66.02
Discharge temperature	°F	83.3	82.94	86	90.14	65.84	66.02
Power(total)	kW	159.6	127.2	98.9	85.4	126.2	64.6

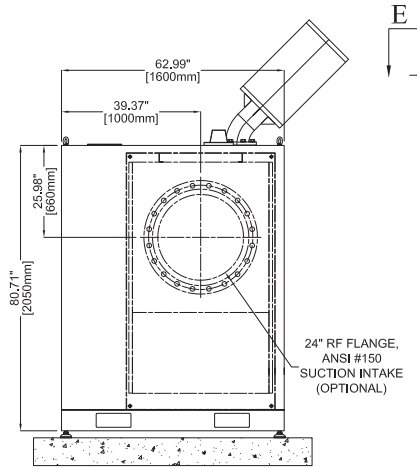
Performance Map



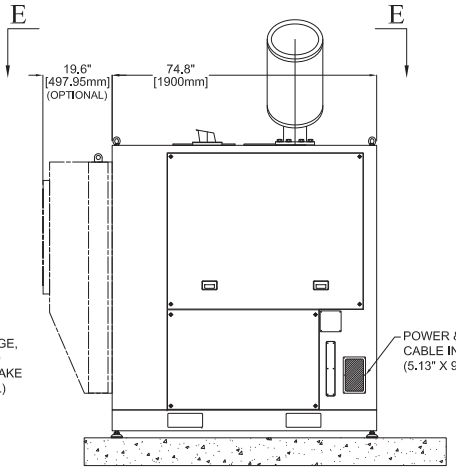
REVISION HISTORY			
REV	DESCRIPTION	DATE	APPROVED

VIEW "E-E"
(LOOKING DOWNWARD)

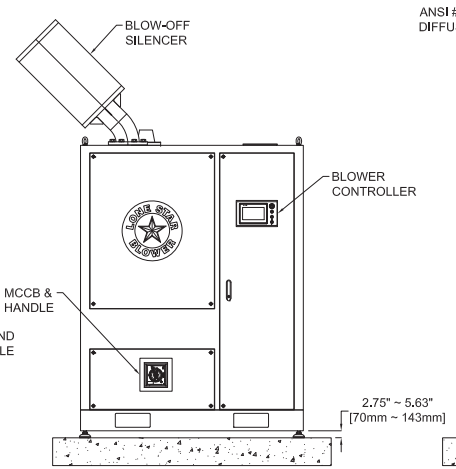




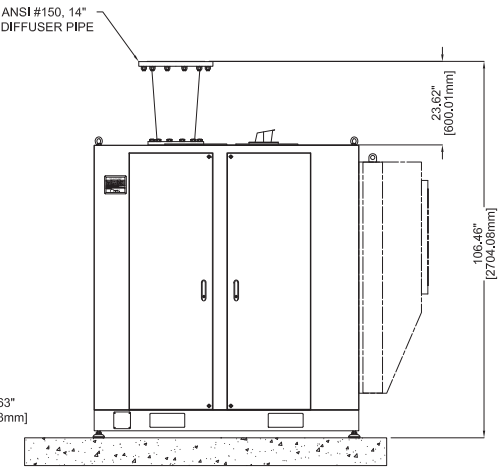
VIEW "A"
(REAR SIDE)



VIEW "B"
(LEFT SIDE)



VIEW "C"
(FRONT SIDE)



VIEW "D"
(RIGHT SIDE)

ALL DIMENSIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.
PLEASE CONSULT WITH LONE STAR PRIOR TO DESIGNING AROUND PARTICULAR EQUIPMENT.

MODELS	WEIGHT
MAX300-C080 LOUVER	3,792 LBS (1,720 KG)
MAX300-C080 FLANGED INTAKE	3,892 LBS (1,765 KG)

UNLESS OTHERWISE SPECIFIED
DO NOT SCALE

THIRD ANGLE PROJECTION

DRAWING IS FOR REFERENCE ONLY
UNLESS SPECIFIED AS RELEASED.

APPROVALS		
DRAWN	JMC	06/04/2021
CHECK		
ENGINEER		
MANUFACTURING		
CONTROL		
APPROVED		

LONE STAR

TITLE
DT SERIES
BLOWER MAX300-C080

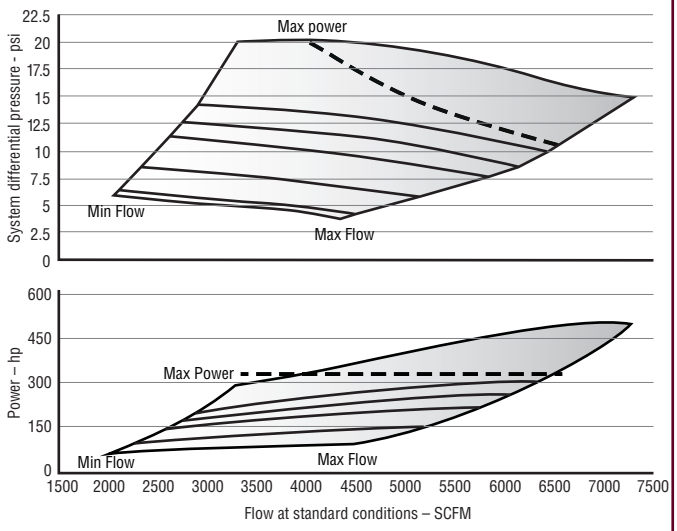
SIZE	CAGE CODE	DWG NUMBER	REV
A	-	MAX300-C080	0
SCALE		SHEET 1 OF 1	

MAX300

Gearless High Speed Turbo Blower

Model MAX300-C080

Service
Air and Pressure



Standard Specifications

Gas	Air Only
Flow Range	100% to 45% of Rated Flow*
Maximum Case Pressure	35 PSIG / 2.4 bar
VFD (integral)	Vacon, KEB, Yaskawa
Stages	Single Stage
Power Driver Options	Intregal Permanent Magnet Electric Motor
Cooling	Self Cooled Air Cooled
Bearings	NSTB+ Air Foil
Enclosure	Standard
Sound Level	75 dB @ 3 feet free field
Filtration Rating (std)	99% at 2 micron, or as required

Control Options

Control Methods	Speed Control, Blow Off Control, Pressure, Flow
Local Controller	sLOC™ Standard - Custom for Allen Bradley, Modicon, Siemens or Other
HMI	sLOC™ Standard or Custom HMI
Remote Monitoring	sLINK™ or Custom
Control Set Points	Pressure, Flow, Power, Custom Input

Standard Materials of Construction

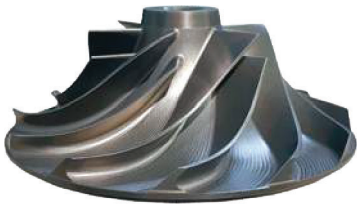
Casing	A356 Cast Aluminum
Volute	A356 Cast Aluminum
Bearings	Inconel with Teflon, Nano Silver Coatings
Impeller	5 Axis Machined anodized 7075 Aluminum
Shaft	Titanium alloy with Sm2C017 Magnets
Blower Base Skid	ASTM A36 Structural Steel
Isolation Pads	Adjustable Feet with Mounting Anchor
Finish	Powder Coated Cabinet

Optional Testing & Certifications

Electrical	UL 508A, UL 1450, CSA, CE, IEEE519
Hazardous Location	Not Classified
Balancing	ISO 1940 - G2.5, ~4W/N API
Noise Level	OSHA 1910.95, ISO 2151:2004
Performance Testing	ASME PTC-10, PTC-13, ISO 5389

Standard Options

- High and Low Ambient Temperature
- Sperated Electrical and Mechanical Enclosure
- Flanged Intake
- Outdoor Enclosure
- Dual and Duplex Options
- Harmonic Filter



www.lonestarblower.com

** Information is approximate and can change without notice / * Performance Based on 1 Atm, 68F/20C, 36% RH and 3550 rpm*

COMMON BACKUP

- Blower Performance Curves
- Blower GA (See Blower System AB 500-800 GA)
- Blower Cutsheet (See Blower System AB 500-800 Cutsheet)

MAX FINDER

rev. 20.09.17.0

Compressor Datasheet

General information

Customer	: Roseville, CA	Model	: MAX300-C080
Project	: Dry Creek WWTP - Common Backup	C-Number	: X300C080S6P0
Process	: Activated Sludge	Quantity	: Total 1 (Duty:1 & Stand-by:)
User Info	:	Last Saved Date	: 2023-Feb-27 10:49:48

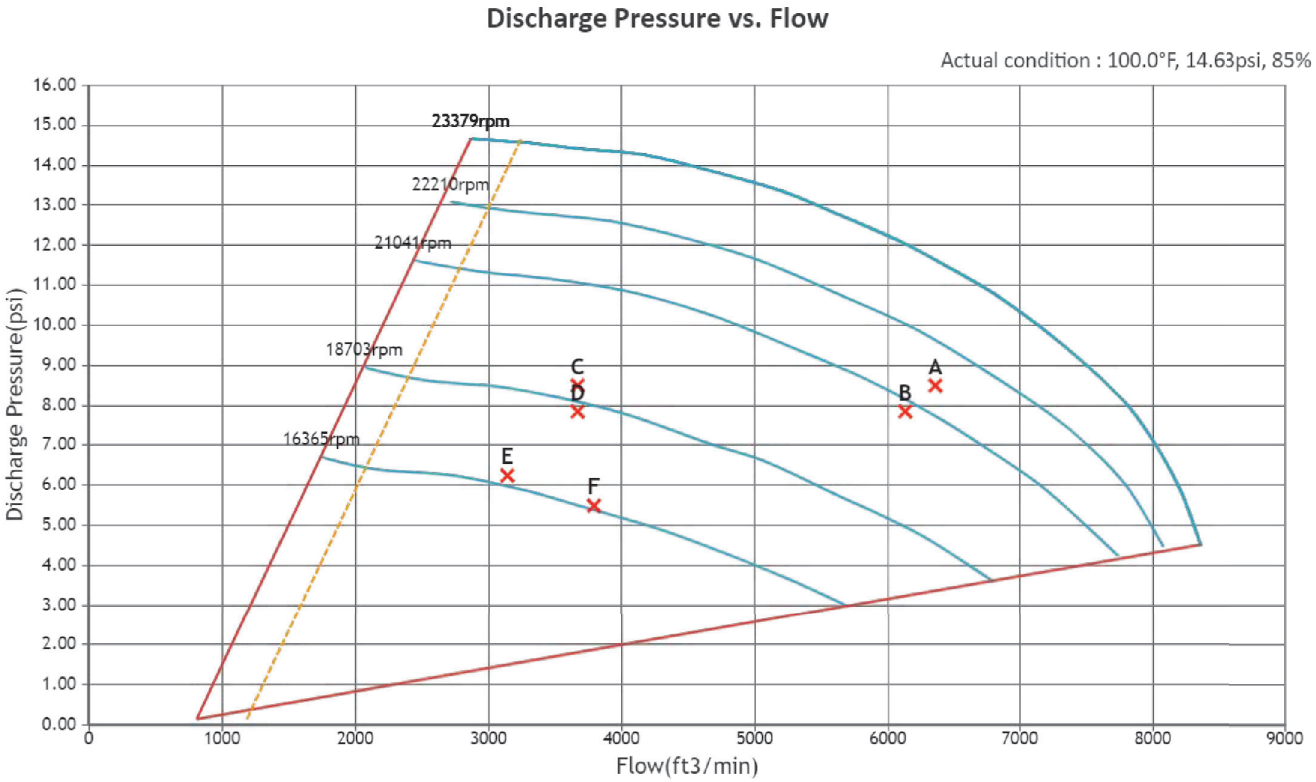
Operating Conditions

		A	B	C	D	E	F
Operating point		A	B	C	D	E	F
Inlet pressure @ Inlet Flange		14.42	14.42	14.42	14.42	14.42	14.42
Elevation	ft	130	130	130	130	130	130
Relative humidity	%	85	85	85	85	85	85
Inlet temperature	°F	100	100	100	100	100	100
Inlet flow (68.0°F, 14.70psi, 36%)	SCFM	5868.0	5656.0	3387.0	3387.0	2900.0	3500.0
Inlet flow (0.0°C, 1.01325bar.g, 0.0%)	Nm3/min	154.4	148.8	89.1	89.1	76.3	92.1
Mass Flow	Kg/s	3.327	3.206	1.920	1.920	1.644	1.984
Discharge pressure	psi.g	8.5	7.85	8.5	7.85	6.25	5.5

Performance

Rise to Surge	psi.g	3.77	3.63	0.87	0.87	0.73	1.31
Turn down ratio	%	68.9	69.2	46.1	48.6	47.1	58.9
Speed	rpm	21457	20758	18931	18391	16551	16395
Temperature rise	°F	103.72	96.88	103.36	95.62	79.24	69.16
Discharge temperature	°F	203.72	196.88	203.36	195.62	179.24	169.16
Power(total)	kW	204.8	184.3	117.7	109.1	77.3	81.5

Performance Map



MAX FINDER

rev. 20.09.17.0

Compressor Datasheet

General information

Customer	: Roseville, CA	Model	: MAX300-C080
Project	: Dry Creek WWTP - Common Backup	C-Number	: X300C080S6P0
Process	: Activated Sludge	Quantity	: Total 1 (Duty:1 & Stand-by:)
User Info	:	Last Saved Date	: 2023-Feb-27 10:54:12

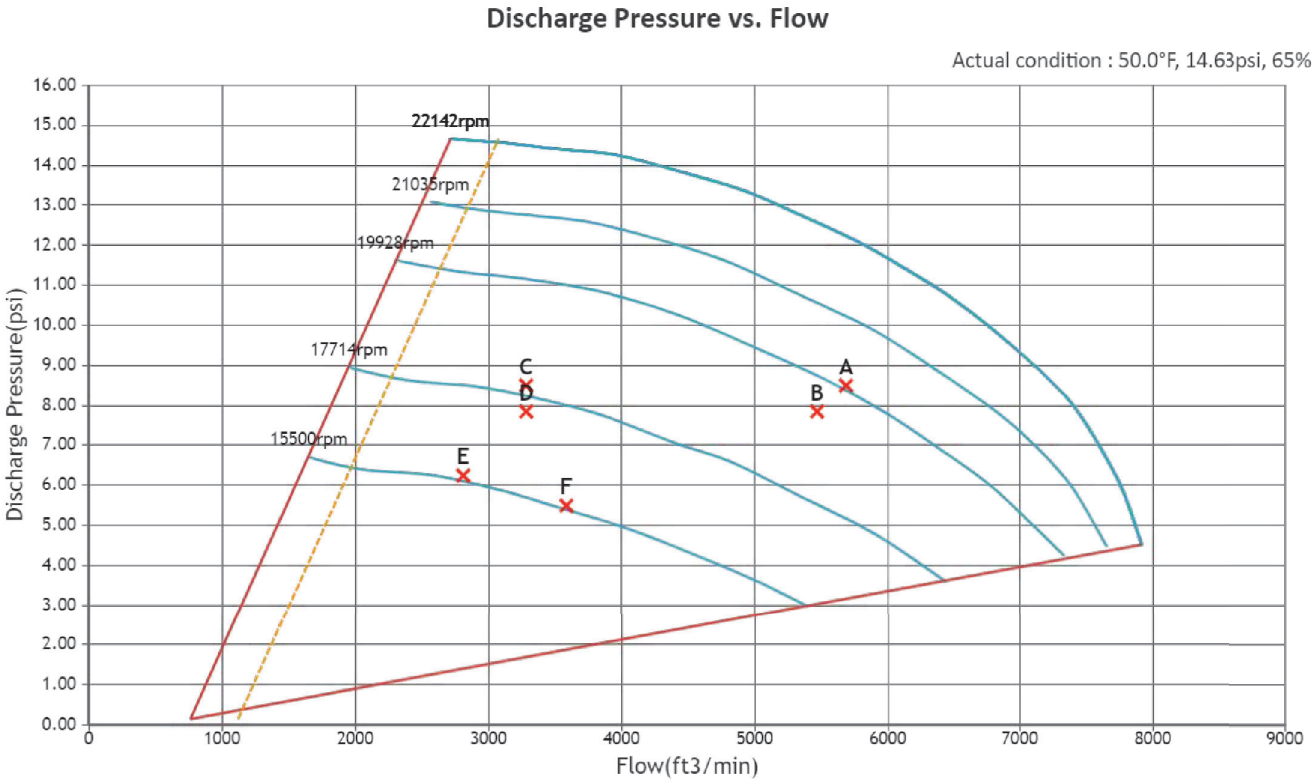
Operating Conditions

		A	B	C	D	E	F
Operating point		A	B	C	D	E	F
Inlet pressure @ Inlet Flange		14.42	14.42	14.42	14.42	14.42	14.42
Elevation	ft	130	130	130	130	130	130
Relative humidity	%	65	65	65	65	65	65
Inlet temperature	°F	50	50	50	50	50	50
Inlet flow (68.0°F, 14.70psi, 36%)	SCFM	5868.0	5646.0	3387.0	3387.0	2900.0	3700.0
Inlet flow (0.0°C, 1.01325bar.g, 0.0%)	Nm3/min	154.4	148.5	89.1	89.1	76.3	97.3
Mass Flow	Kg/s	3.327	3.201	1.920	1.920	1.644	2.098
Discharge pressure	psi.g	8.5	7.85	8.5	7.85	6.25	5.5

Performance

Rise to Surge	psi.g	3.34	3.05	0.73	0.73	0.58	1.31
Turn down ratio	%	67	67.3	42.9	45.6	44	58.9
Speed	rpm	19937	19262	17828	17278	15569	15528
Temperature rise	°F	92.88	87.3	95.04	88.38	72.9	63
Discharge temperature	°F	142.88	137.3	145.04	138.38	122.9	113
Power(total)	kW	178.7	161.5	105.7	98.2	69.4	76.5

Performance Map



MAX Q FINDER

rev. 20.09.17.0

Compressor Datasheet

General information

Customer	: Roseville, CA	Model	: MAX300-C080
Project	: Dry Creek WWTP - Common Backup	C-Number	: X300C080S6P0
Process	: Activated Sludge	Quantity	: Total 1 (Duty:1 & Stand-by:)
User Info	:	Last Saved Date	: 2023-Feb-27 10:56:38

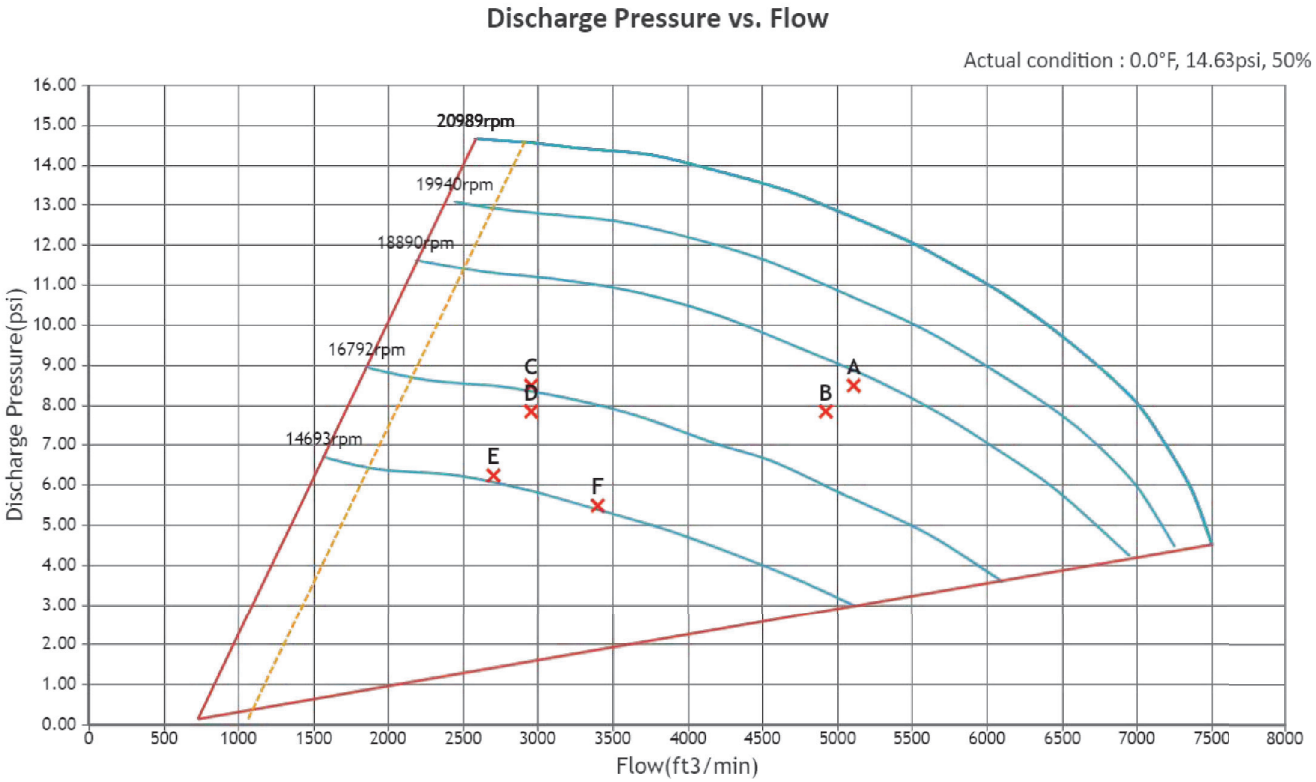
Operating Conditions

		A	B	C	D	E	F
Operating point		A	B	C	D	E	F
Inlet pressure @ Inlet Flange		14.42	14.42	14.42	14.42	14.42	14.42
Elevation	ft	130	130	130	130	130	130
Relative humidity	%	50	50	50	50	50	50
Inlet temperature	°F	0	0	0	0	0	0
Inlet flow (68.0°F, 14.70psi, 36%)	SCFM	5868.0	5656.0	3387.0	3387.0	3100.0	3900.0
Inlet flow (0.0°C, 1.01325bar.g, 0.0%)	Nm3/min	154.4	148.8	89.1	89.1	81.6	102.6
Mass Flow	Kg/s	3.327	3.206	1.920	1.920	1.757	2.211
Discharge pressure	psi.g	8.5	7.85	8.5	7.85	6.25	5.5

Performance

Rise to Surge	psi.g	2.9	2.76	0.58	0.73	0.58	1.31
Turn down ratio	%	65.2	65.6	39.7	42.5	44.6	58.7
Speed	rpm	18587	17981	16833	16285	14791	14722
Temperature rise	°F	83.3	78.08	86.72	80.6	65.48	56.84
Discharge temperature	°F	83.3	78.08	86.72	80.6	65.48	56.84
Power(total)	kW	159.6	144.3	95.9	89.3	66.4	72.3

Performance Map



DT-MAX Gearless Turbo North America Installation List

Customer	State	Model	Qty	Year Install	Flow (SCFM)	Discharge Pressure (PSIG)
Connersville WWTP	IN	MAX75	1	2010	1,600	8.5
Little Rock (Kimberly Clark)	AR	MAX300	2	2011	5,300	7.5
Little Rock (Kimberly Clark)	AR	MAX100	3	2011	1,200	7.5
Running Spring	CA	MAX50	1	2011	700	8.3
City of Houston	TX	MAX100	2	2012	1,100	11.0
City of Houston	TX	MAX400	2	2012	5,600	11.4
Colorado Springs	CO	MAX100	4	2012	1,200	8.2
Monroe WWTP	WI	MAX200	1	2013	4,000	10.5
Abilene	TX	MAX300	4	2013	7,500	8.5
City of Houston	TX	MAX50	1	2014	800	8.0
Fairhope	AL	MAX75	2	2014	576	8.7
City of Burton	OH	MAX30	3	2014	488	8.6
Escondido	CA	MAX75	1	2015	1,600	14.0
City of Bucyrus	OH	MAX100	1	2016	1,500	7.5
Oceanside	CA	MAX500	2	2017	9,000	8.3
Harris County (HC MUD 170)	TX	MAX150	4	2017	2,800	7.5
Boardman WWTP	OH	MAX300	3	2017	6,000	7.5
College Station (Carters Creek WWTP)	TX	MAX300	2	2017	6,200	8.0
Candlelight WWTP (Spring)	TX	MAX50	1	2017	1,125	7.0
AJ Brown WWTP	TX	MAX100	3	2018	1,600	10.0
AJ Brown WWTP	TX	MAX50	3	2018	1,200	4.5
Greenwood Village WWTP (Houston)	TX	MAX100	2	2018	2,150	6.0
Winnipeg	MB	MAX400	6	2018	6,320	11.5
Pine Trail	TX	MAX100	1	2019	2,500	7.0
Brittmoore	TX	MAX100	1	2019	2,300	7.5
College Station (Lick Creek WWTP)	TX	MAX200	3	2019	3,950	9.0
Mosquito Creek	OH	MAX125	3	2020	2,000	10.5
Security WWTP	CO	MAX125	4	2019	2,000	7.2
Dowdell WWTP	TX	MAX50	2	2019	1,000	7.6
TRA Denton Creek	TX	MAX100	2	2020	2,250	7.5
Floyd Branch RWWTP	TX	MAX200	3	2020	3,000	10.8
Orange WWTP	MA	MAX40	2	2020	850	8.0
Park Creek WWTP	TX	MAX20	2	2020	250	7.0
Veranda WWTP	TX	MAX75	3	2020	1,203	8.5
Kiel WWTP*	WI	MAX300	3	2021*	5,791	7.8
Ft Wayne WWTP	IN	MAX500	1	2022	10,190	8.5
Rexburg WWTP	ID	MAX250	3	2021	4,320	7.0
Arlington WWTP	TN	MAX125	1	2021	2,600	8.7
City Of Louisville	OH	MAX100	2	2021	2,500	6.3
Grande Cheese	WI	MAX150	2	2022	3,782	7.3
Sheboygan WWTP	WI	MAX400D	1	2022	5,020	15.0
Ville De Saint Hyacinthe	QUEBEC	MAX300	4	2023*	6,530	8.7
Keswick WRRF	ONTARIO	MAX150	4	2022*	2,950	6.8
Vallejo Flood & Sewer District	CA	MAX50	1	2022	1,200	8.0
Steep Bank / Flat Bank WWTP	TX	MAX150	4	2022	2,880	7.0
Ville De Alma	Quebec	MAX100	3	2023*	3,900	8.9
Ville de Levis	Quebec	MAX100	2	2023*	2,360	8.7
Ville de Levis	Quebec	MAX400	2	2023*	9,120	9.2
Guayama WWTP, Puerto Rico	Puerto Rico	MAX300D	3	2023*	5,990	10.8
Guayama WWTP, Puerto Rico	Peurto Rico	MAX250D	3	2023*	5,000	10.8
Austin WWTP	MN	MAX350	4	2023*	6,134	10.5
Ville de Terrebone	Quebec	MAX200	4	2023*	4,335	8.5
City of Eloy	AZ	MAX40	5	2023*	780	6.3
Ciy of Watertown	WI	MAX100	2	2023*	2,200	8.2
Air Pro	OH	MAX150	2	2023*	4,180	7.0
Ville de Terrebone	Quebec	MAX200	4	2023*	4,335	8.5
Giisemex, Acapulco	Mexico	MAX50	3	2023*	985	8.0

There are over 7,000 units installed globally which makes the DT-MAX blowers one of the world's most used gearless turbo blower. A longer more extensive installation list can be supplied upon request.

*Units in startup or production phase. Completion Q2/Q3 2023

Office: + 832 532 3112
Fax: + 832 532 3115
www.lonestarblower.com

Lone Star Blower, Inc

TERMS & CONDITIONS OF SALE
(EQUIPMENT AND/OR SERVICE)

1. GENERAL: As used herein, "Seller" means Lone Star Blower "Purchaser" means the entity to which Seller's offer is made, or the entity purchasing Equipment and/or service from Seller. The term "Equipment" as used herein includes any and all products, equipment, parts, and accessories furnished by Seller to Purchaser. All offers and sales by Seller are expressly conditional upon these Terms and Conditions of Sale. Any terms or conditions in Purchaser's purchase order (or in any other Purchaser communication) which are different from or in addition to the terms and conditions contained in these Terms and Conditions of Sale are hereby objected to. All orders submitted to Seller are subject to approval by Seller's headquarters.

2. DELIVERY: The shipment/delivery period is an estimate only and commences after Seller's receipt of all necessary information, approvals, and signed submittals with release for manufacturing. In no event shall delivery be construed as falling within the meaning of "time is of the essence". Seller reserves the right to deliver in installments. Unless otherwise specified in Seller's quotation, delivery is F.O.B. Seller's manufacturing facility.

3. TITLE and RISK OF LOSS: Unless otherwise specified in Seller's written quotation, title and risk of loss or damage to the Equipment shall pass to Purchaser upon tender of delivery F.O.B. manufacturing facility. Notwithstanding the foregoing, a security interest in the Equipment or any replacement shall remain in Seller, regardless of mode of attachment to realty or other property, until full payment has been received by Seller. Purchaser agrees upon request to do all things and acts necessary to perfect and maintain said security interest and shall protect Seller's interest by adequately insuring the Equipment against loss or damage from any cause.

4. TAXES: Purchaser shall be responsible for applicable local, state and federal taxes which may be now or hereafter be applicable to, measured by, or imposed upon, or with respect to this transaction, the Equipment, its sale, its value or its use, or any services performed in connection therewith (except any taxes on Seller's income). If sales, use or other State or Municipal taxes in addition to any listed specifically as part of the stated purchase price, are imposed upon Seller, Purchaser agrees to pay the same or reimburse Seller upon demand. Seller will accept a valid exemption certificate from Purchaser, if applicable. If an exemption certificate previously accepted by Seller is not recognized by the governmental taxing authority involved, Purchaser agrees to promptly reimburse Seller for any taxes covered by such exemption certificate which Seller is required to pay.

5. PAYMENT: Unless specifically agreed otherwise in writing, payment is due in full within 30 days of the invoice date. Seller reserves the right to charge late fees on overdue amounts at a monthly rate of 1.5% (one and a half percent) or the rate permitted by law, whichever is lower. Purchaser shall have no right to set-off against any amounts which may become payable to Seller under this contract or otherwise, for amounts which Seller may allegedly or in fact owe Purchaser or any affiliate of Purchaser or assignee whether arising under this contract or otherwise. Any waiver by Seller of any lien or lien right shall be conditioned upon Purchaser's timely payment to Seller of all amounts due.

6. INSTALLATION: Unless Seller's written quotation specifies that Seller will perform installation of the Equipment, it is understood and agreed that Seller will not perform any installation of the Equipment.

7. START-UP, OTHER SERVICE: Any service (for example, Equipment start-up, if applicable) to be performed by Seller is specified in Seller's written quotation. Dates/time for the service is subject to scheduling and confirmation by Seller's service department. Seller's performance of service is subject to Seller's normal working hours (8:30 am to 5:00 pm, Monday through Friday excluding public holidays), unless expressly agreed otherwise. If any forklift, crane, and/or other lifting or rigging equipment or lighting equipment is necessary (as reasonably determined by Seller's service technician) for Seller to perform the service, Purchaser shall supply such equipment at its own expense together with sufficiently skilled and qualified labor in connection therewith, unless expressly agreed otherwise. If Purchaser requests Seller to comply with Purchaser's safety programs/procedures in connection with performing service at Purchaser's premises, Seller shall comply with such safety programs/procedures that have been provided in advance to Seller in writing with reasonable opportunity to review/implement, to the extent they are reasonable and applicable to the scope of Seller's activities at the premises.

8. INSURANCE: During the term of the Contract, Seller agrees to have the following insurance coverage:

a) Commercial General Liability insurance in an amount of $1,000,000 each occurrence for bodily injury and physical damage to tangible property, subject to an annual aggregate not to exceed $2,000,000;
b) Automobile Liability insurance in an amount of $1,000,000 combined single limit each occurrence;
c) Worker's Compensation insurance in accordance with applicable statutory law; and
d) Employer's Liability insurance in an amount of $1,000,000 for bodily injury each accident or disease.

If Seller will physically enter onto Purchaser's premises (or a third party's premises) in connection with the sale of the Equipment/ service, Seller agrees to, at Purchaser's reasonable request, provide an ACORD form of certificate confirming the above-stated insurance coverage.

Seller shall have no other insurance-related requirement, unless specifically agreed to in writing by an authorized manager of Seller in connection with the order.

9. RETURN POLICY: Shipping and handling charges are not refundable. Purchaser is responsible for the return shipping fee. All returned items are subject to a 30% restocking fee. Returned items must be in brand new condition with all packaging enclosed in the exact condition in which you received them. Special order or non-stock items will not be accepted for return/refund.

10. CANCELLATION: Each party has the right to cancel the order/contract in whole or in part in writing with immediate effect if the other party becomes insolvent, makes a general assignment for the benefit of creditors, suffers or permits the appointment of a receiver for its business or assets, becomes subject to any proceeding under any bankruptcy or insolvency law, or has wound up or liquidated (voluntarily or otherwise). In addition, each party has the right to cancel the order/contract or any part thereof if the other party fails, within 30 days after receipt of written notice from the non-breaching party specifying the material breach and intent to terminate, to commence and diligently pursue cure of the breach. Unless an order is cancelled by Purchaser in accordance with this paragraph, Purchaser shall pay Seller's cancellation charges if Purchaser cancels the order (including if Purchaser cancels the order for Purchaser's convenience). The cancellation charges shall be reasonable and may include (among other things) all costs and expenses incurred, and commitments made by Seller and a reasonable profit thereon. Notwithstanding anything set forth to the contrary, Seller may suspend Seller's performance or cancel the order/contract (or any part thereof) immediately if Purchaser fails to provide payment security (if applicable) or if Purchaser fails to make any payments when due.

11. WARRANTY: Seller hereby warrants to Purchaser that the Equipment manufactured or distributed by it and delivered hereunder will be free from defects in material and workmanship under proper use and service; this warranty shall expire one (1) year from start-up or 18 months from the original shipment date from Seller's manufacturing facility whichever comes first. This warranty applies only to Equipment manufactured by Seller and does not cover motors, starters, electrical equipment or other components or accessories manufactured by others. Seller will repair or replace, F.O.B. its factory, any defective part or parts, at no charge, if promptly returned to it within the above-noted warranty period. This warranty extends only to the original purchaser of Equipment furnished hereunder and shall be void if the Equipment is repaired or tampered with in any manner other than by Seller's authorized service personnel. If Seller's inspection does not disclose a defect covered by the warranty, the Equipment will be returned to Purchaser at its expense or, if Purchaser elects, Seller will repair or replace the equipment and charge for such service at the regular rate.

Seller hereby warrants to Purchaser that all other Equipment manufactured by Seller and delivered hereunder will be free from defects in material and workmanship under proper use and service; this warranty shall expire one year from the original shipment date from Seller's manufacturing facility. This warranty applies only to Equipment manufactured by Seller and does not cover components or accessories outside of standard packaged equipment offered. Seller will repair or replace, F.O.B. its factory, any defective part or parts, at no charge, if promptly returned to it within the warranty period. This warranty extends only to the original purchaser of Equipment furnished hereunder and shall be void if the product is repaired or tampered with in any manner other than by Seller's authorized service personnel. If Seller's inspection does not disclose a defect covered by the warranty, the Equipment will be returned to Purchaser at its expense or, if Purchaser elects, Seller will repair or replace the Equipment and charge for such service at the regular rate.

Seller warrants to Purchaser that Equipment or parts thereof repaired or replaced pursuant to the above warranty under proper use and service against defects in workmanship and material; this warranty shall expire 60 days from date of start-up of such repaired or replaced Equipment or parts thereof or on the expiration of the original Equipment warranty, whichever is later.

If the nature of the defect is such that it is appropriate in the judgment of Seller to do so, repairs shall be made at the site of the Equipment. Seller warrants to Purchaser that any services performed by Seller in connection with startup or other servicing of Equipment shall be performed in a workmanlike manner; this warranty shall expire 60 days after the service date visit. If any nonconformity with this warranty appears, Seller shall re-perform the non-conforming portion of the services in a conforming manner.

Any warranties granted beyond those stated above must be specifically identified as a warranty in Seller's specific quotation. Correction by Seller of nonconformities (i.e. repair or replacement of Equipment that is defective in material or workmanship, and re-performance of service which was not performed in a workmanlike manner) in the manner and warranty period provided above shall be Purchaser's exclusive remedy (and Seller's exclusive obligation) with respect to nonconforming Equipment and/or services.

In the event Purchaser and Seller agree that Seller will sell any used Equipment to Purchaser, such used Equipment is sold AS-IS, WITH ALL FAULTS, AND WITHOUT WARRANTY OF ANY KIND.

THE ABOVE-STATED WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, IMPLIED, OR OTHERWISE. SELLER HEREBY EXPRESSLY DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR ANY PARTICULAR PURPOSE.

12. CONFIDENTIALITY: In connection with the order and/or performance under this contract, Seller and Buyer (as to information disclosed, the "Disclosing Party") may each disclose Confidential Information to the other party hereto (the "Receiving Party"). " Confidential Information" shall mean all information related to the business or products (including but not limited to the Equipment) or services of the Disclosing Party that is not generally known to the public, and all pricing and terms of this contract, provided that the obligations of this paragraph shall not apply as to any portion of the Confidential Information which: (i) is or becomes generally available to the public other than as a result of disclosure by the Receiving Party, its representatives or its affiliates, or (ii) has been or is subsequently independently developed by the Receiving Party, its representatives or affiliates, without reference to the Confidential Information, or (iii) is required to be disclosed by law or valid legal process provided that the Receiving Party who intends to make such disclosure shall promptly notify the Disclosing Party in advance of such disclosure and reasonably cooperate in attempts to maintain the confidentiality of the Confidential Information. The Receiving Party agrees, except as otherwise required by law: (i) to use the Confidential Information only as the Disclosing Party intended it to be used by the Receiving Party in connection with providing or receiving the Equipment/service under this contract, and (ii) to take reasonable measures to prevent disclosure of the Confidential Information, except disclosure to its employees to the extent necessary to facilitate providing or receiving Equipment/services as contemplated under this contract. Upon the Disclosing Party's request, the Receiving Party shall destroy or return to Disclosing Party all copies of Confidential Information. If either party or any of their respective affiliates or representatives is required or requested by subpoena, interrogatories, or similar legal process
to disclose any Confidential Information, such party agrees to provide the Disclosing Party with prompt written notice of such request, so that the Disclosing Party may seek an appropriate protective order or waive compliance by the Receiving Party with the provisions herein. It is understood and agreed that this paragraph survives any expiration/termination of this contract.

13. INTELLECTUAL PROPERTY: No patents, copyrights, trademarks, trade secrets, or other intellectual property rights are being sold, granted, transferred, or assigned to Purchaser. Without limiting the generality of the foregoing, Seller retains all right, title and interest in and to all inventions, discoveries, ideas, works of authorship (including but not limited to all drawings), processes, methods, know-how, and techniques developed, discovered or conceived by Seller or its employees, including without limitation those developed and/or used in connection with the manufacture of Equipment or performing services hereunder. Such rights include, but are not limited to, patent rights, copyrights, trade secret rights, trademark rights, mask work rights and other proprietary rights throughout the world. Purchaser acknowledges and understands that no drawings, designs, specifications, or anything else provided by Seller shall be deemed to be "work made for hire."

14. PATENT INDEMNITY: Seller shall defend any suit or proceeding brought against Purchaser and shall pay any adverse judgment entered therein so far as such suit or proceeding is based upon a claim that the use of the Equipment or any part thereof manufactured by Seller, and furnished under this contract constitutes infringement of any patent of the United States of America, provided Seller is promptly notified in writing and given authority, information and assistance for defense of same, and Seller shall, at its option, procure for Purchaser the right to continue to use said Equipment, or modify it so that it becomes non-infringing, or replace the same with non-infringing equipment, or remove said Equipment and to refund the purchase price (less a reasonable amount for the time the Equipment was used). The foregoing shall not be construed to include any agreement by Seller to accept any liability whatsoever in respect to patents for inventions including more that the Equipment furnished hereunder, or in respect of patents for methods and processes to be carried out with the aid of said Equipment, except those which are inherent in the Equipment as furnished. The foregoing states the entire liability of Seller with regard to patent infringement. If any Equipment shall be sold by Seller to meet Purchaser's specifications or requirements and is not a part of Seller's standard line offered by it to the trade generally in the usual course of Seller's business, Purchaser agrees to defend, protect, and indemnify and save harmless Seller from any loss, damage, or injury arising out of a claim, suit or action at law or equity for actual or alleged infringement of any patent of the United States or foreign country because of the sale of such Equipment, and to defend any suits or actions which may be brought against Seller.

15. SOFTWARE: In the event any Equipment includes software in any form, such software is not sold to Purchaser but is only licensed on a limited, non-exclusive basis. Subject to Purchaser's compliance with these terms and conditions of sale, Seller grants to Purchaser for the useful life of such Equipment a royalty-free, non-exclusive, non-transferable license to use the software as intended by Seller solely for normal use of the Equipment. Purchaser shall not create derivative works based on the software, or reverse engineer, or disassemble or decompile the software, or transfer, copy, modify, or otherwise change the software.

16. EXPORT CONTROL: Equipment, technical data, technology, software, and services furnished by Seller to Purchaser shall at all times be subject to any and all applicable export control laws and regulations, including but not limited to applicable U.S. Export Administration Regulations, United Nations resolutions and European Union directives relating to trade embargoes and restrictions. Purchaser agrees and warrants that no Product, services, technical data, technology, software or other technical information or assistance or other item furnished by Seller, or any good or product resulting therefrom, shall be exported or re-exported by Purchaser or its authorized transferees, if any, directly or indirectly, in violation of any law or regulation.

Any export and/or re-export must be in strict accordance with applicable U.S. export laws and regulations, as well as United Nations resolutions and European Union directives relating to trade embargoes and restrictions. Violation of this paragraph constitutes a material and non-curable breach and entitles Seller to terminate the order immediately (even after shipment of the Equipment).

17. FORCE MAJEURE: If either party is delayed at any time by any Force Majeure, such party shall have such additional time within which to perform its obligations as may reasonably be necessary under the circumstances. "Force Majeure" means circumstances beyond the delayed party's reasonable control, including but not limited to, acts of God, acts of public enemies, wars, delays by Seller's suppliers, blockades, insurrections, riots, epidemics, quarantine restrictions, floods, lightning, fire, storms, earthquakes, and civil disturbances.

18. LIMITATION OF LIABILITY:
IN NO EVENT SHALL SELLER BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS OR REVENUE, LOSS OF TOTAL OR PARTIAL USE OF THE EQUIPMENT OR SERVICES, DOWNTIME COSTS, AND DELAY COST) HOWSOEVER ARISING, WHETHER ON ACCOUNT OF EQUIPMENT OR SERVICES FURNISHED HEREUNDER, DELAYS OR OTHERWISE (WHETHER A CLAIM IS BASED ON WARRANTY, STRICT LIABILITY, CONTRACT, TORT, NEGLIGENCE OR OTHERWISE).

SELLER'S TOTAL LIABILITY FOR ALL CLAIMS OF ANY KIND (WHETHER BASED ON WARRANTY, STRICT LIABILITY, CONTRACT, TORT, NEGLIGENCE OR OTHERWISE) FOR ANY LOSS OR DAMAGE ARISING OUT OF, CONNECTED WITH, OR RESULTING FROM THIS CONTRACT OR THE PERFORMANCE OR BREACH THEREOF, OR FROM THE DESIGN, MANUFACTURE, SALE, DELIVERY, RESALE, REPAIR, REPLACEMENT, INSTALLATION, TECHNICAL DIRECTION OF INSTALLATION, INSPECTION, SERVICING, OPERATION OR USE OF ANY EQUIPMENT COVERED BY OR FURNISHED UNDER THIS CONTRACT SHALL BE LIMITED TO 100% OF THE PURCHASE PRICE AMOUNT PAID BY PURCHASER TO SELLER UNDER THIS CONTRACT FOR THE SPECIFIC EQUIPMENT OR SERVICE WHICH GIVES RISE TO THE CLAIM. ALL CAUSES OF ACTION AGAINST SELLER ARISING OUT OF OR RELATING TO THIS CONTRACT OR THE PERFORMANCE HEREOF SHALL EXPIRE UNLESS BROUGHT WITHIN ON YEAR OF TIME OF ACCRUAL THEREOF.

19. MISCELLANEOUS:
19.1 If for any reason, Seller's quotation (or any other document or act by Seller) is deemed an acceptance of an offer from Purchaser, such acceptance is expressly conditional upon Purchaser's assent to any additional or different terms or conditions set forth in these Terms and Conditions of Sale.

19.2 No modification or additional term or condition shall be applicable to this contract by virtue of Seller's receipt, acknowledgment or acceptance of Purchaser's purchase order, shipping instruction forms, or other Purchaser documentation containing terms or conditions which are different from or in addition to those set forth in these Terms and Conditions of Sale. Any such modifications or additional terms or conditions are specifically rejected and deemed a material alteration hereof. Purchaser's issuance of a purchase order or Purchaser's acceptance of any drawings, Equipment, or services from Seller shall (without prejudice to any other manner in which acceptance of these Terms and Conditions of Sale may be evidenced) constitute full acceptance of these Terms and Conditions of Sale.

19.3. Neither party shall assign or transfer this contract without the prior written consent of the other party (which consent shall not be unreasonably withheld); any purported assignment in violation of this sentence shall be void. Irrespective of the foregoing, Seller may without consent assign this contract (or any of rights or obligations hereunder) to any of its affiliates and use sub-contractors.

19.4. If any part of this document is held by a court of competent jurisdiction to be invalid or unenforceable for any reason, such invalidity or enforceability does not affect any other provision, and this document shall be construed as if the invalid or unenforceable provision had never been set forth.

19.5. Neither party's failure to enforce, or its waiver of a breach of, any provision contained in this document shall constitute a waiver of any other breach or of such provision.

19.6. The validity, performance, and all other matters relating to the interpretation and effect of this contract shall be governed by the laws of the State of Texas, USA, without regard to its conflict of laws principles, and the exclusive forum shall be the State of Texas. The United Nations Convention on the International Sale of Goods shall not apply.

19.7 These Terms and Conditions of Sale cannot be superseded, amended, or modified except by a written document signed in handwriting by
Seller's duly authorized officer and Buyer's duly authorized representative.

19.8. All headings, captions and numbering in these Terms and Conditions of Sale are for convenience of reference only and shall notbe used to interpret any meaning of any terms or condition.

19.9. Seller and Purchaser are independent contractors; neither party shall act as the agent for the other. This contract is between Seller and
Purchaser alone, and there are no intended rights or benefits provided hereunder to any third party.

Invoair Turbo Blowers

Inovair®
Geared Centrifugal Blowers

Designed and manufactured in the U.S.A.

Represented By:
Goble Sampson
Matt Bentley

Project: Roseville CA – Aeration Basin Blowers

Quote No: 357887

Date: 02-23-2023

Specification: Inovair Standard Design

Five (5) single-stage IM-50 series geared centrifugal blowers, accessories, and controls for use with variable frequency drive (VFD) for variable output capacity control. Three blowers will be 400HP, designed for a capacity of 8470 SCFM at 7.85 PSIG discharge pressure for AB 100-400 and two blowers will be 300HP, designed for a capacity of 5870 SCFM at 8.5 PSIG discharge pressure for AB 500-500. One 400HP blower will function as a redundant blower for both systems. Each unit is equipped with automatic temperature compensation and automatic speed adjustment for varying liquid levels.

Major Skid Components:
Inovair centrifugal blower with integral speed increasing gearbox and oil reservoir
High Efficiency Motor 400/300 HP / 4160V / 60 Hz / 52/40 FLA / 3ph suitable for VFD drive
Structural steel base
Oil lube system with mechanical pump, oil filter, and air-oil cooler, initial oil fill
Skid mounted instruments
Blow-off (bypass) valve, electric-actuated
Vibration isolation pads
Integral inlet filter

Shipped Loose Components:
12" Discharge Check Valve x 5
12" Discharge EPDM Expansion Joint x 5
12" EPDM Manual Butterfly Valve x 5
Oil service pump – (2 total)

Instruments Include:
Inlet pressure transducer
Inlet filter differential pressure switch
Oil temperature sensor
Low oil pressure switch
Discharge pressure transducer

Control Panel:
Each blower unit will come with a NEMA 4 Local control panel (LCP) with an A-B PLC machine level controller. Panel door mounted items include operator interface monitor (HMI) and shutdown button. A separate 120/60/1 15 amp power supply is required.

Paint:
Manufacturer's standard powder coat finish.

Start-up Service:
Six days (2 trips) of start-up and operator training is included. Additional service is available at $2,500 per day plus travel and living expenses billed at cost, plus 10%. Advance notification of 10 working days is required for scheduling.

Factory Test (Non-witnessed):
Factory Performance Test – air-end/gearbox
Functional Control Panel System Test
Mechanical Run Test
Motor Routine Test

Drawings and Shipment:
Standard submittal for information only will be in 6 weeks after acceptance of the order by Inovair. If required additional submittal information to Inovair standards will follow within a reasonable time. Delivery is estimated to be 44-50 weeks after approved submittal is received by Inovair.

Payment Terms: Terms of invoiced values below, without deduction, are to be paid within 30 days after invoice date. Payment shall not be dependent on the Contractor or Manufacturer's Representative being paid by any third parties. Under no circumstances will payment be dependent on acceptance of the equipment by the Owner.

Approval of Submittal: 20% of total
Delivery to Jobsite: 70% of total
Completion of Equipment Commissioning: 10% of total

Items Not Included:

Installation, anchor bolts, interconnecting pipe, fittings, bolts, nuts, gaskets, wiring, valves, oil and lubricants, or any other items not specifically listed above.

Notes:

- IM series units are direct-coupled to the motor, so there are no belt losses or belt maintenance.
- VFD's are required for operation but not included in the Inovair scope of supply
  - They will need to have ethernet cards for direct communication with the Inovair LCP
- Blower weight will be approximately 7500 lbs.

Price: $1,680,300 (One Million Six Hundred Eighty Thousand Three Hundred Dollars)

Delivered to Jobsite – Roseville CA

This proposal is firm for 60 days.

Quoted by:

Nate Neufeld
Sales Manager
Inovair
14801 W. 114th Terrace
Lenexa, KS 66215
Office: 913-469-7259
Cell: 913-953-7078

Warranty:

Inovair geared centrifugal blower and accompanying manufactured components are warranted to be free from defects in materials and workmanship for a period of twenty-for (24) months, commencing at the time the blower system is placed into service, but in no event are these manufactured components to be warranted for longer than thirty (30) months from date of shipment. Electrical and other purchased components (supplied by other manufacturers) are warranted in accordance to those stated warranty policies, and are not eligible under this warranty.

The replacement or repair of parts normally consumed in service such as oil, grease, belts, etc. is considered part of routine maintenance and upkeep and such parts are not eligible for repair or exchange free of charge under this warranty.

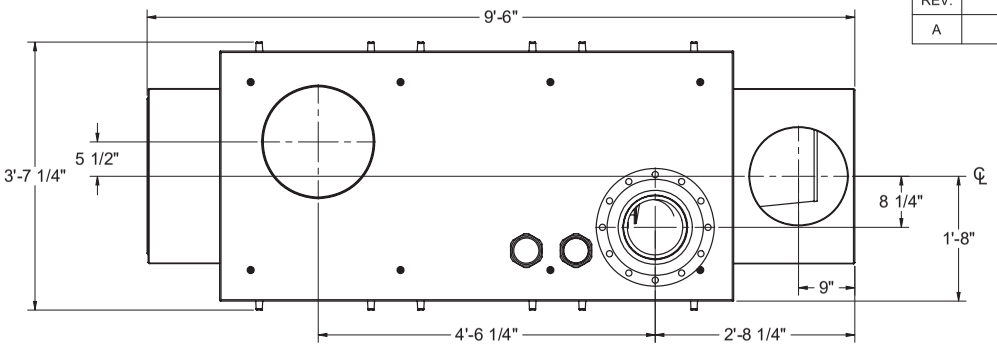
During the warranty period, if any warrantied part is defective or fails to perform as specified when operating at design conditions and if the blower system has been environmentally and physically protected prior to start-up and has been installed, operated and maintained all in accordance with the written instructions provided, exchange free of charge a replacement for such defective part. Defective parts must be returned by the owner postage paid. This limited warranty coverage is extended only to the original owner. IF THE BLOWER DRIVE RATIO IS ALTERED IN ANY WAY WITHOUT FACTORY APPROVAL, WARRANTY COVERAGE IS VOID. USE OF ANY PULLEY NOT MANUFACTURED OR SUPPLIED BY BLOWER MANUFACTURER VOIDS ALL WARRANTY COVERAGE. Disassembly of blower or removal of the blower serial plate voids all warranties. Claims for freight damages should be directed to the freight company.

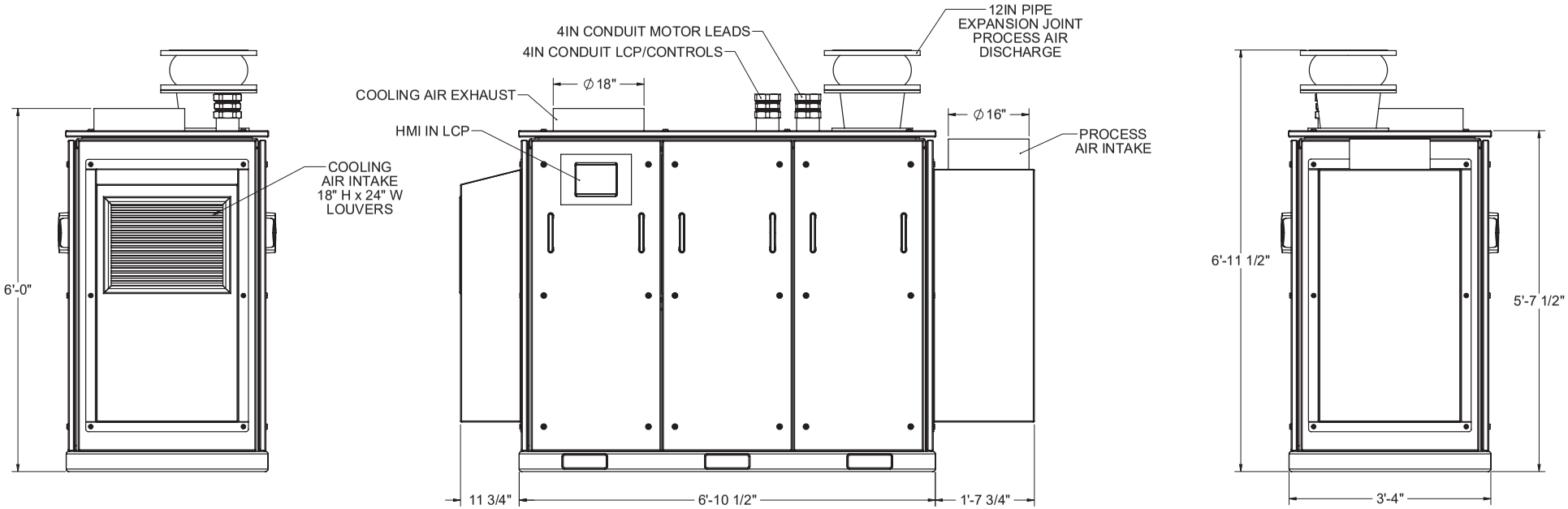
NO OTHER WARRANTY EXPRESSED OR IMPLIED and SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY AS TO THE MERCHANTABILITY OF THE BLOWER SYSTEM OR AS TO ITS FITNESS FOR ANY PARTICULAR PURPOSE. Blower manufacturer is not responsible for consequential or incidental damages of any nature resulting from such things as, but not limited to, defects in design, material, workmanship, or delays in delivery of blower, availability of replacements or repairs.

The waiver or abridgement of any single provision or group of provisions, either by ruling or agreement, shall not be construed to alter or void any other provisions of this warranty.

REVISIONS				
REV.	DESCRIPTION	ECO	DATE	ENG
A	INITIAL RELEASE	---	1/20/2023	RLJ

3FT PERIMETER ACCESS RECOMMENDED





NOTES:
1. FOR INITIAL SALES/PLANNING PURPOSES ONLY
2. DETAILED LAYOUT TO BE PROVIDED WITH SUBMITTAL
3. 460VAC/3PH WIRING IS REQUIRED TO BE IN A SEPARATE CONDUIT FROM 120VAC/1PH AND CONTROL

ALL UNITS ARE INCHES UNLESS OTHERWISE SPECIFIED

TOLERANCES UNLESS OTHERWISE SPECIFIED:
1 PLACE DECIMAL ±0.060
2 PLACE DECIMAL ±0.040
3 PLACE DECIMAL ±0.020
FRACTIONAL < 1" ±1/32
FRACTIONAL >= 1" ±1/16
ANGULAR ±°0.5

DWG. SIZE: B

PROCHARGER SUPERCHARGER SYSTEMS | inovair Aerodynamic Blowers

Accessible Technologies
14801 W 114th Terr.
Lenexa, KS 66215
PH: 913-338-2886
FAX: 913-338-2879

DESCRIPTION: INOVAIR IM-50, 12IN DISCHARGE, 16IN REMOTE AIR INTAKE

PART #: IM-50 LAYOUT WYLIE, TX
FINISH:
MATERIAL: PER SALES ORDER

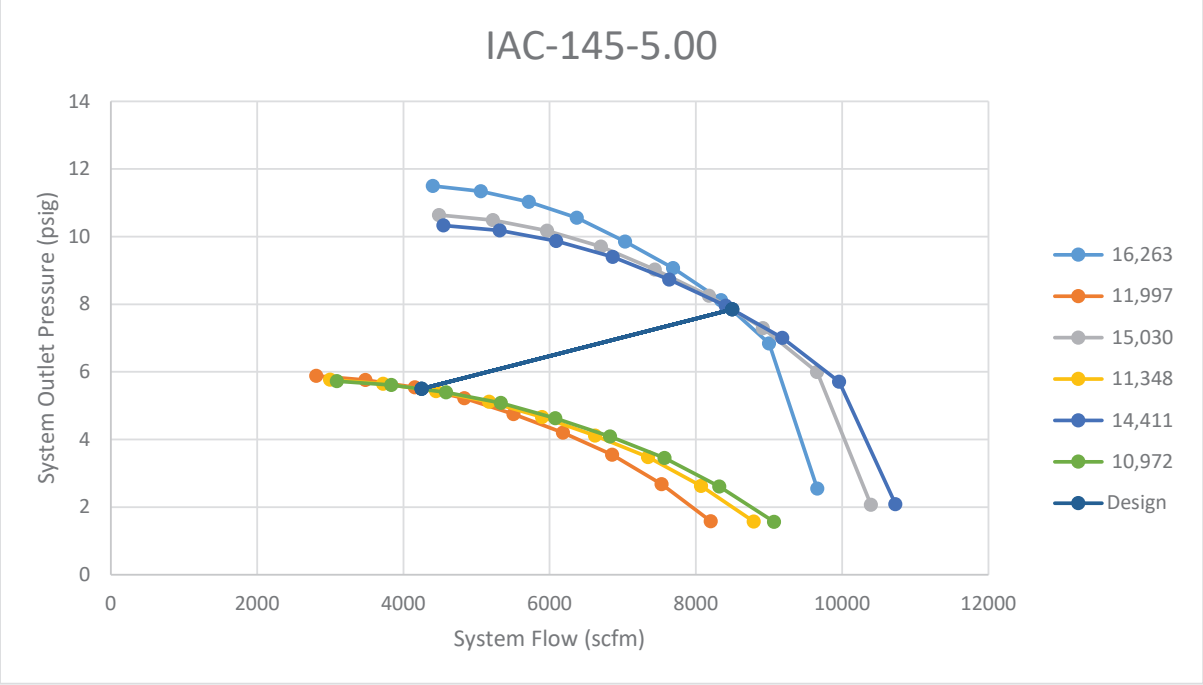
ENGINEER: RLJ | CHECKED: -- | DRAWN: RLJ
SCALE: 1:20 | DATE: 1/20/2023 | SHEET 1 OF 1 | REV: A

inovair®
Geared Centrifugal Blowers

Project: Roseville CA - AB 100-400 Flow Range
Aero Stage: IAC-145-5.00
Altitude (ft): 130

Point	Flow	Flow	Pressure	Temp	RH	Motor HP	System Power	Outlet Temp
(#)	(scfm)	(icfm)	(psig)	(F)	(%)	(hp)	(KW)	(F)
1	8500	9508	7.85	100	85%	359.5	289.1	194
2	4250	4754	5.50	100	85%	124.9	101.1	165
3	8500	8244	7.85	50	65%	308.6	248.3	133
4	4250	4122	5.50	50	65%	111.6	90.4	110
5	8500	7713	7.85	20	50%	287.4	231.3	98
6	4250	3857	5.50	20	50%	105.2	85.3	77

HP bases on +/- 5% tolerance
SCFM based on 68F, 36% RH, 14.7 psia

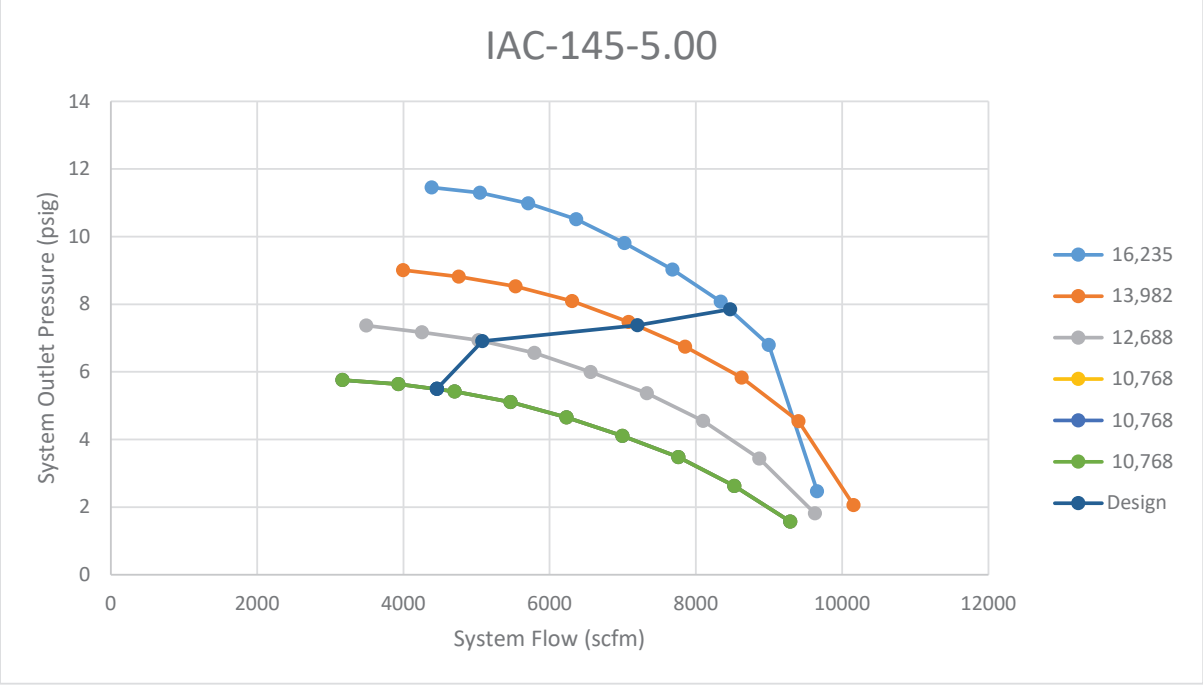


inovair®
Geared Centrifugal Blowers

Project: Roseville CA - AB 100-400 Power Information
Aero Stage: IAC-145-5.00
Altitude (ft): 130

Point	Flow	Flow	Pressure	Temp	RH	Motor HP	System Power	Outlet Temp
(#)	(scfm)	(icfm)	(psig)	(F)	(%)	(hp)	(KW)	(F)
1	8470	9474	7.85	100	85%	357.5	287.5	194
2	7200	6983	7.38	50	65%	240.9	194.0	127
3	5080	4927	6.91	50	65%	159.2	128.6	122
4	4459	3873	5.50	0	50%	105.2	85.3	54
5	4459	3873	5.50	0	50%	105.2	85.3	54
6	4459	3873	5.50	0	50%	105.2	85.3	54

HP bases on +/- 5% tolerance
SCFM based on 68F, 36% RH, 14.7 psia

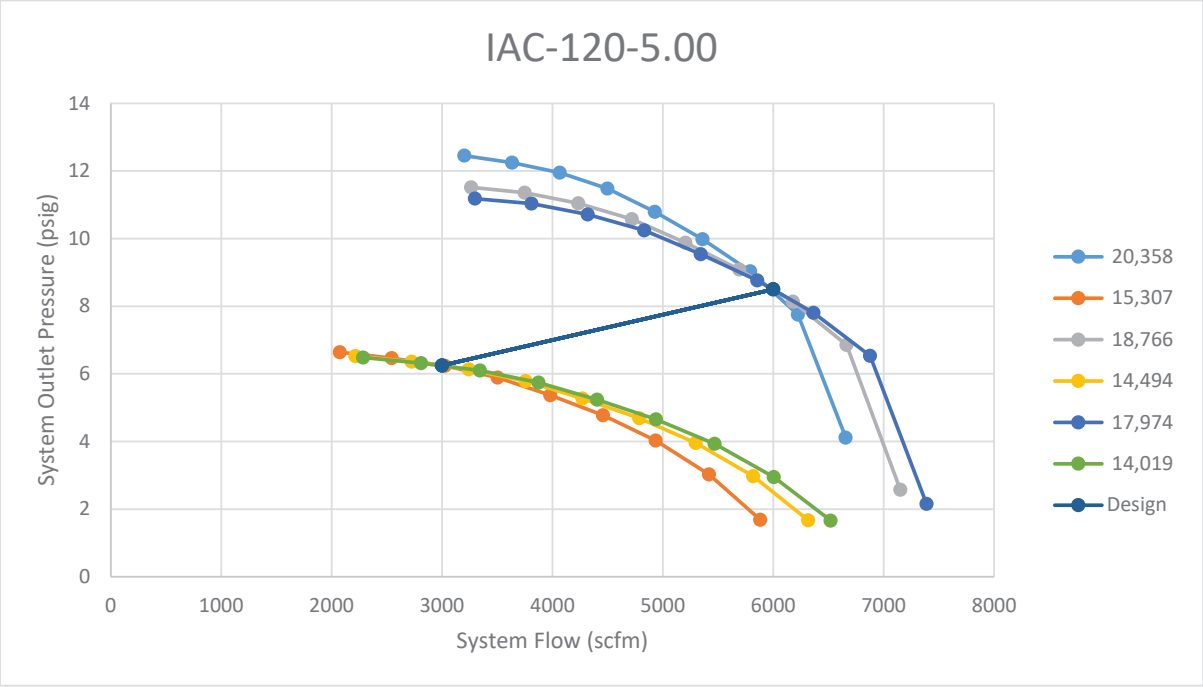


inovair®
Geared Centrifugal Blowers

Project: Roseville CA - AB 500-800 Flow Range
Aero Stage: IAC-120-5.00
Altitude (ft): 130

Point	Flow	Flow	Pressure	Temp	RH	Motor HP	System Power	Outlet Temp
(#)	(scfm)	(icfm)	(psig)	(F)	(%)	(hp)	(KW)	(F)
1	6000	6711	8.50	100	85%	273.2	219.9	201
2	3000	3356	6.25	100	85%	98.2	79.7	173
3	6000	5820	8.50	50	65%	232.5	187.3	139
4	3000	2910	6.25	50	65%	87.8	71.4	117
5	6000	5445	8.50	20	50%	215.9	174.0	103
6	3000	2722	6.25	20	50%	82.9	67.4	83

HP bases on +/- 5% tolerance
SCFM based on 68F, 36% RH, 14.7 psia

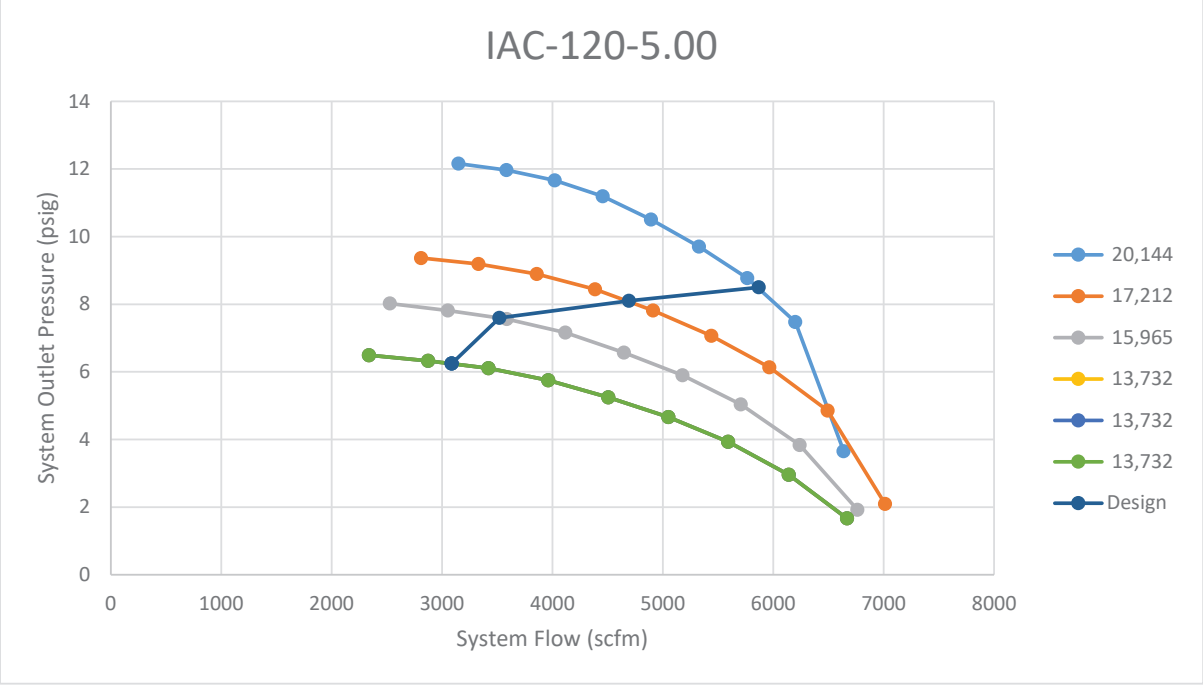


inovair®
Geared Centrifugal Blowers

Project: Roseville CA - AB 500-800 Power Information
Aero Stage: IAC-120-5.00
Altitude (ft): 130

Point	Flow	Flow	Pressure	Temp	RH	Motor HP	System Power	Outlet Temp
(#)	(scfm)	(icfm)	(psig)	(F)	(%)	(hp)	(KW)	(F)
1	5870	6566	8.50	100	85%	263.9	212.5	200
2	4694	4553	8.10	50	65%	169.1	136.5	132
3	3520	3414	7.60	50	65%	120.5	97.5	128
4	3089	2683	6.25	0	50%	81.6	66.4	61
5	3089	2683	6.25	0	50%	81.6	66.4	61
6	3089	2683	6.25	0	50%	81.6	66.4	61

HP bases on +/- 5% tolerance
SCFM based on 68F, 36% RH, 14.7 psia

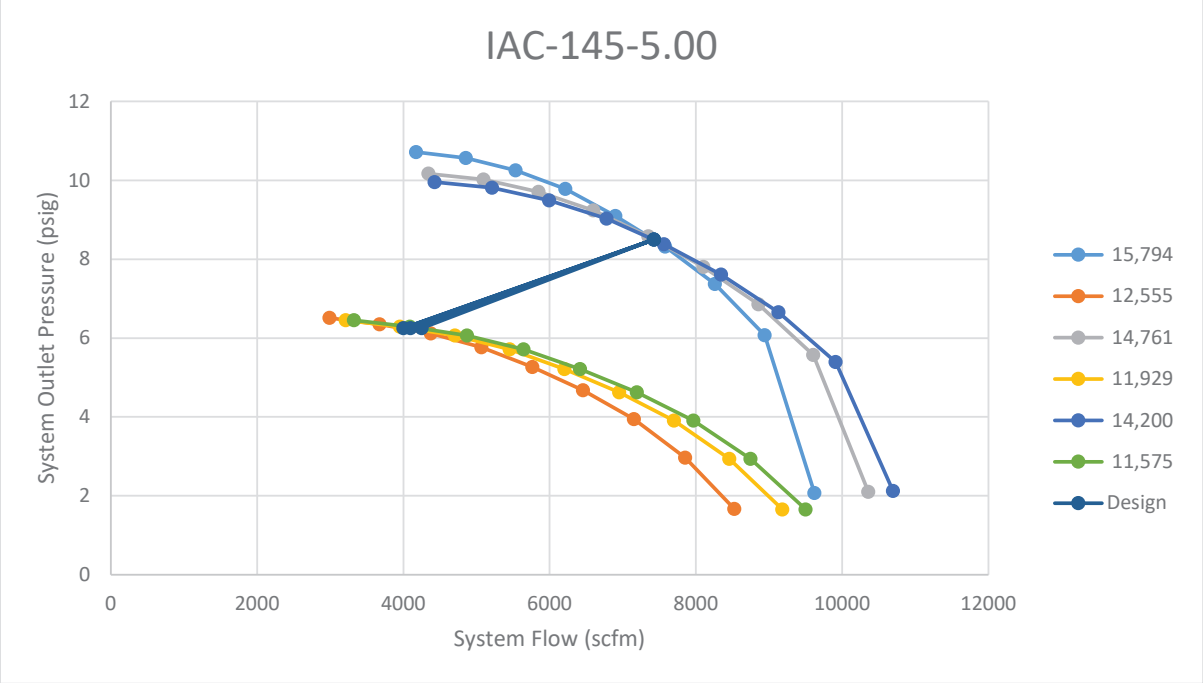


inovair®
Geared Centrifugal Blowers

Project: Roseville CA - AB 100-400 Redundancy for AB 500-800
Aero Stage: IAC-145-5.00
Altitude (ft): 130

Point	Flow	Flow	Pressure	Temp	RH	Motor HP	System Power	Outlet Temp
(#)	(scfm)	(icfm)	(psig)	(F)	(%)	(hp)	(KW)	(F)
1	7429	8310	8.50	100	85%	319.7	257.2	195
2	4000	4474	6.25	100	85%	132.9	107.5	174
3	7429	7206	8.50	50	65%	280.3	225.6	136
4	4100	3977	6.25	50	65%	121.5	98.4	118
5	7429	6741	8.50	20	50%	262.2	211.1	101
6	4250	3857	6.25	20	50%	118.1	95.6	84

HP bases on +/- 5% tolerance
SCFM based on 68F, 36% RH, 14.7 psia



Reference Sites

- Blue Springs – Jeff Butner – 816-224-2717 - Dec 2016
- Pickerington OH – Seth Borland – 740-243-0322 – April 2018
- Reed Creek GA – Matthew Gibbs – 706-855-7138 – October 2018
- Livingston MT – Russ Smith – 406-224-5022 – Nov 2018
- Madison AL – Mark Bland – 256-722-0253 – March 2019
- Fairbury IL – Brad Duncan – 815-419-5324 – November 2019
- Gardner KS – Scott Millholland – 913-856-6523 – December 2019
- New Castle IN – Steve Dickerson – 765-465-8358 – January 2020
- Meridian CO – John Buuler – 303-718-8360 – August 2020
- Burley ID – Dee Hodge – 208-650-5042 – September 2020
- Lafayette CO – Bab Hansen – 303-655-5506 – October 2020
- Stayton OR – Troy Sanders – 503-871-2252 – December 2020
- Paducah KY – Chris Hatton – 270-559-1751 – January 2021
- East Peoria IL Plant #3 – Adam Mingus – 309-678-5235 – March 2021
- Hutchinson KS – Joel Davenport – 620-694-2685 – July 2021
- Concord NH – Dan Driscoll – 603-230-3658 – September 2021

IηOVAIR
TERMS AND CONDITIONS

TERMS OF SALE

The sale of products and services ("Products") by Accessible Technologies, Inc. and its divisions, subsidiaries, and affiliates ("Iηovair") are subject to these terms and conditions ("Agreement") regardless of other or additional terms or conditions that conflict with or contradict this Agreement in any purchase order, document, or other communication ("Order"). Preprinted terms and conditions on any document of customer ("Customer") (for example: Orders or confirmations) and/or Iηovair's failure to object to conflicting or additional terms will not change or add to the terms of this Agreement.

1. ORDERS. Quotes from Iηovair are invitations to tender and are subject to change at any time without notice. All Orders are subject to acceptance by Iηovair. Contracts between Customer and Iηovair are formed upon Iηovair's written acceptance or execution of Customer's Order and shall be subject to this Agreement. All Orders including, but not limited to, Electronic Purchase Orders, for Products identified by Iηovair as non-standard, are non-cancelable, non-returnable. Iηovair may identify Products as non-standard by various means including, but not limited to, quotes, Scope of Services, Products lists, attachments or exhibits. Customer may not change, cancel or reschedule Orders for standard Products without Iηovair's consent. Iηovair reserves the right to allocate the sale of Products among its Customers.
2. PRICES. Prices are subject to change at any time. Prices are for Products only and do not include taxes, shipping charges, freight, duties, and other charges or fees, such as fees for special packaging and labeling of the Products, permits, certificates, customs declarations and registration (collectively, "Additional Fees"). Customer is responsible for any Additional Fees.
3. TERMS OF PAYMENT. Terms of invoiced values, without deduction, are to be paid within 30 days after invoice date. Payment shall not be dependent on the Contractor or Manufacturer's Representative being paid by any third parties. Under no circumstances will payment be dependent on acceptance of the equipment by the Owner.

Approval of Submittal: 20% of total
Delivery to Jobsite: 70% of total
Completion of Equipment Commissioning: 10% of total

Total invoice amount is due no later than 30 days following equipment start-up or 60 days after shipment, whichever occurs first. Payment shall not be dependent on the Contractor or Manufacturer's Representative being paid by any third parties. Under no circumstances will payment be dependent on acceptance of the equipment by the Owner. Any other payment terms must be approved in writing by Iηovair. On any past due invoice, Iηovair may charge (i) interest from the payment due date to the date of payment at 12% per annum, plus reasonable attorney fees and collection costs; or (ii) the maximum amount that is allowed under the applicable law if Iηovair's interest rate is deemed invalid. At any time, Iηovair may change the terms of Customer's credit, require financial data from Customer for verification of Customer's creditworthiness, require a bank guarantee or other security, or suspend any outstanding Orders of Customer. Iηovair may apply payments to any of Customer's accounts. If Customer defaults on any payment under this Agreement, Iηovair may reschedule or cancel any outstanding delivery and declare all outstanding invoices due and payable immediately. Unless otherwise provided by applicable law, any credit issued by Iηovair to Customer in respect of any of Customer's accounts will expire if unused for twelve (12) months following the date of issuance of such credit.
4. DELIVERY AND TITLE. Unless otherwise specified by Iηovair in writing, all deliveries by Iηovair are EXW Iηovair's warehouse (INCOTERMS 2013). Title shall pass to Customer upon delivery of the Products to the carrier. Iηovair's delivery dates are estimates only and subject to timely receipt of supplies by Iηovair. Iηovair is not liable for delays in delivery. Iηovair reserves the right to make partial deliveries and Customer will accept delivery and pay for the Products delivered. A delayed delivery of any part of an Order does not entitle Customer to cancel other deliveries.
5. IηOVAIR'S LIMITED WARRANTY. See included statement of warranty.
6. PRODUCT RETURN Customer may return Products to Iηovair only with a return material authorization ("RMA") number issued by Iηovair. Customer must notify Iηovair in writing of any damage to the outer packaging or the Products, shortage, or other discrepancy ("Visual Defect") within 3 days after receipt of the shipment; otherwise, Customer is deemed to have accepted the Products and may not revoke acceptance. RMAs will be issued only for Visual Defects created solely by Iηovair, and only if Customer satisfies the notice requirement. RMAs will not be granted for damage, shortage, or other discrepancy created by Customer, the carrier or freight provider, or any other third party. Product return pursuant to a warranty requires written notice from Customer to Iηovair within the warranty period detailing the Product defect. Customer must return the Products to Iηovair freight prepaid in original manufacturer's shipping cartons or equivalent, along with acceptable proof of purchase, within the warranty period and as specified in the RMA. At Iηovair's discretion, Iηovair will return all Products not eligible for return to Customer, freight collect, or hold Product for Customer's account at Customer's expense.

7. LIMITATION OF LIABILITY. To the extent permitted by law, neither Iηovair nor its employees or agents are liable for and Customer is not entitled to any indirect, special, incidental or consequential damages (for example, loss of profits or revenue, loss of data, loss of use, rework, manufacturing expense, injury to reputation, or loss of Customers). To the extent permitted by applicable law, Customer's recovery from Iηovair for any direct damages will not exceed the price of the Product at issue. To the extent the preceding limitation of liability is deemed invalid under applicable law, Iηovair's total liability in any event will not exceed USD 50,000 or the equivalent thereof. Customer will indemnify, defend and hold Iηovair harmless from any claims based on: (i) Iηovair's compliance with Customer's designs, specifications, or instructions, (ii) modification of any Product by anyone other than Iηovair, or (iii) use of Products in combination with other products or in violation of clause 9 below.

8. FORCES BEYOND IΗOVAIR'S CONTROL. Iηovair is not liable for failure to fulfill its obligations under this Agreement due to causes beyond its reasonable control (for example: acts of nature, acts or omissions of the Customer, operational disruptions, man-made or natural disasters, epidemic medical crises, materials shortages, strikes, criminal acts, delays in delivery or transportation, or inability to obtain labor or materials through its regular sources).

9. USE OF PRODUCTS. Customer shall comply with the manufacturer's or supplier's Product specifications. Products are not authorized for use in critical safety or other applications where a failure may reasonably be expected to result in personal injury, loss of life, or serious property damage. If Customer uses or sells the Products for use in any such applications or fails to comply with the manufacturer's Product specifications, Customer acknowledges that such use, sale, or non-compliance is at Customer's sole risk.

10. EXPORT/IMPORT. Certain Products and related technology and documentation sold by Iηovair are subject to export control laws, regulations and orders of the United States, the European Union, and/or other countries ("Export Laws"). The Customer shall comply with such Export Laws and obtain any license, permit or authorization required to transfer, sell, export, re-export or import the Products and related technology and documentation.

The Customer will not export or re-export the Products and related technology and documentation to any country or entity to which such export or re-export is prohibited, including any country or entity under sanction or embargoes administered by the United Nations, U.S. Department of Treasury, U.S. Department of Commerce or U.S. Department of State. The Customer will not use the Products and related technology and documentation in relation to nuclear, biological or chemical weapons or missile systems capable of delivering same, or in the development of any weapons of mass destruction.

11. PRODUCT INFORMATION. Product information (for example, statements or advice (technical or otherwise) advertisement content, and information related to a Product's specifications, features, export/import control classifications, uses or conformance with legal or other requirements) is provided by Iηovair on an "AS IS" basis and does not form a part of the properties of the Product. Iηovair makes no representation as to the accuracy or completeness of the Product information, and DISCLAIMS ALL REPRESENTATIONS, WARRANTIES AND LIABILITIES UNDER ANY THEORY WITH RESPECT TO THE PRODUCT INFORMATION. Iηovair recommends Customer validate any Product Information before using or acting on such information. All Product information is subject to change without notice. Iηovair is not responsible for typographical or other errors or omissions in Product information.

12. GOVERNMENT CONTRACTS. Iηovair is a distributor of "Commercial Items" as defined in FAR 2.101. Iηovair agrees only to the clauses in the Federal Acquisition Regulation ("FAR") and Defense Federal Acquisition Regulation ("DFAR") that are required to be inserted in subcontracts for commercial items as set forth in FAR 52.244-6(c)(1), FAR 52.212-5(e)(1), and DFAR 252.244-7000 if it is a subcontract under a Department of Defense prime contract. In accordance with FAR 12.211, Customer will receive only those rights in technical data customarily provided to Iηovair by the manufacturers. By no means will this be interpreted as providing to Customer unlimited rights in data, software, or intellectual property rights provided by the manufacturers or any other third party. Iηovair specifically rejects the flow down of the requirements of the: (i) Trade Agreements Act, FAR 52.225-5 or DFARS 252.225-7021; (ii) the Buy American Act, FAR 52.225-1 or DFARS 252.225-7001; and (iii) any Preference for Domestic Specialty Metals regulation.

13. ELECTRONIC ORDERS. In the event that any part of the purchase and sale of Products, including Customer's acknowledgment, utilizes electronic data interchange, Customer's internal portal or third party portal, or any other electronic means ("Electronic Purchase Order"), this Agreement will continue to apply to the purchase and sale of Products between Customer and Iηovair. Customer's acceptance of Iηovair's acknowledgment request or Iηovair's specification of details with respect to Electronic Purchase Orders via writing, email or other electronic data interchange shall be binding on Customer.

14. GENERAL.

A. This Agreement shall be governed, construed, and enforced in accordance with the laws of the country where the Iηovair entity that accepted Customer's Order ("Governing Country") is located. The courts of the Governing Country shall have jurisdiction and venue over all controversies arising out of, or relating to, this Agreement. If the Governing Country is the United States of America, the laws and courts of the State of Kansas will apply without reference to Kansas' conflict of laws principles. The United Nations Convention for the International Sale of Goods shall not apply.

B. Customer may not assign this Agreement without the prior written consent of Iηovair, and Iηovair's affiliates may perform Iηovair's obligations under this Agreement. This Agreement is binding on successors and assigns.

C. This Agreement can only be modified in writing signed by authorized representatives of both Iηovair and Customer.

D. Iηovair and Customer are independent contractors and agree that this Agreement does not establish a joint venture,

agency relationship, or partnership.
E. Iηovair's failure to object to any document, communication, or act of Customer will not be deemed a waiver of any of these terms and conditions.
F. The unenforceability of any of these terms or conditions will not affect the remainder of the terms or conditions.
G. Products, including software or other intellectual property, are subject to any applicable rights of third parties, such as patents, copyrights and/or user licenses, and Customer will comply with such rights.
H. Customer and Iηovair will comply with applicable laws and regulations.
I. The parties agree to use electronic signatures and agree that any electronic signatures will be legally valid, effective, and enforceable.

Appendix C - BioMag Info

DRY CREEK WWTP

ROSEVILLE, CA

BIOMAG™ CONCEPTUAL PROPOSAL

WOODARD & CURRAN

March 2023

Evoqua Sales Contact:

Brandon Olson
MISCO Water
bolson@miscowater.com
(925) 596-1286

CONTENTS

1. Introduction

Evoqua Water Technologies is pleased to present a preliminary BioMag system proposal. The BioMag system is a treatment intensification process using magnetite to ballast the biological flocs in an activated sludge process. This high-density ballast material increases the settling rate of the flocs allowing the plant to operate at elevated mixed liquor concentrations, treating more within a smaller footprint, while still achieving excellent effluent quality.

The treatment goals for this facility, in applying the BioMag system, are to:

- increase plant capacity.
- reduce overall bioreactor footprint.
- handle peak flows more reliably.

Figure 1 below is a process flow diagram showing how the components of a BioMag system are typically integrated into the RAS and WAS lines of the main secondary treatment process of a plant.

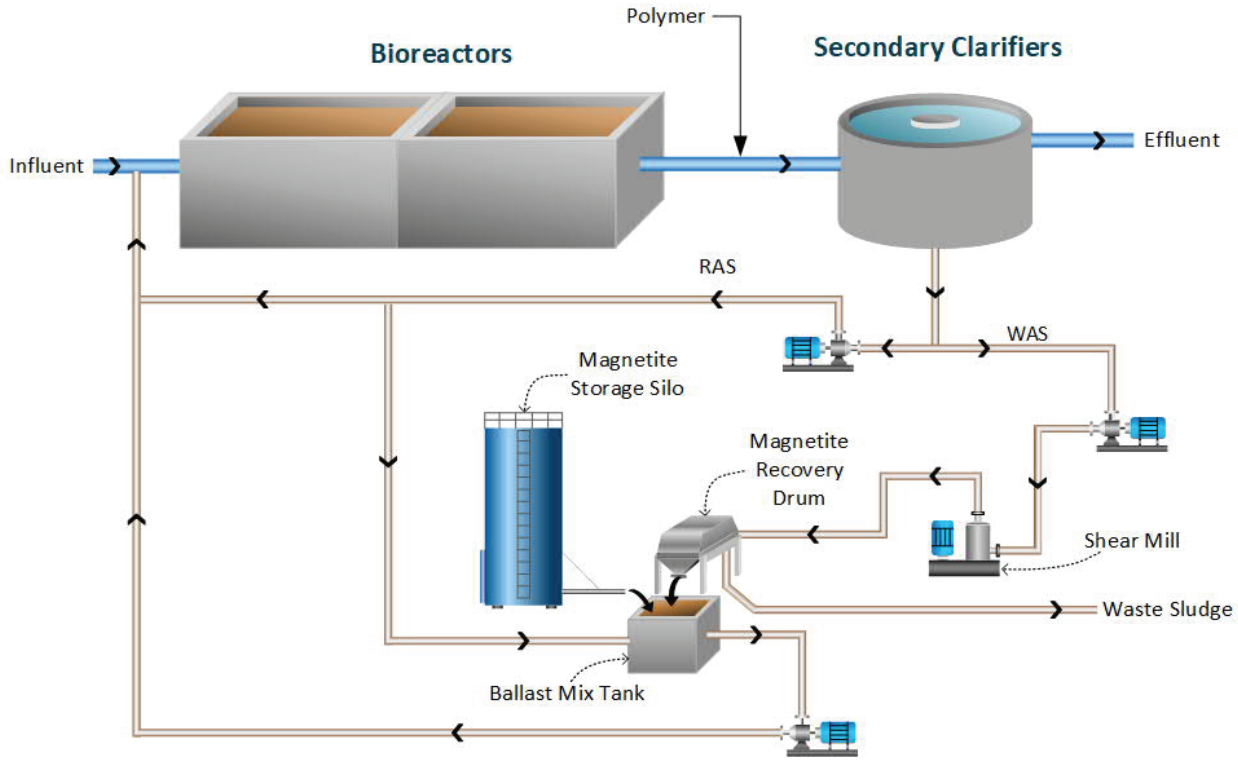


Figure 1: Typical BioMag process flow diagram.

2. Magnetite

The BioMag system uses magnetite to ballast the biological flocs in an activated sludge process. Magnetite is a ferrimagnetic, iron oxide with chemical formula Fe_3O_4. It has a dark gray to black color and is chemically inert. Magnetite is a high-density material with a specific gravity ranging from 4.8 to 5.2 and is strongly attracted to magnets. The magnetite material used as part of the BioMag system is graded for a specific particle size range, optimized for embedment into the biological flocs of the activated sludge process. The high density and magnetic properties are key to the BioMag system. The high density leads to increased settling rates and the attraction to magnets allows the material to be recovered and reused.

Figure 2: Sample of magnetite material used with the BioMag system.

3. Design Criteria

Table 1 summarizes the design influent flows used as the basis for the proposed BioMag system.

Table 1: Design influent flows.

Parameter	Unit	Project Buildout
Average Dry Weather Flow	MGD	18.4
Average Annual Flow	MGD	21.8
Max Month Flow	MGD	34.4
Peak Daily Flow	MGD	50.2
Peak Hourly Flow	MGD	64.1

Table 2 summarizes the primary effluent loading used as the basis for the proposed BioMag system.

Table 2: Design influent water quality.

Parameter	Unit	Project Buildout Average	Project Buildout Max Month
Biochemical Oxygen Demand (BOD_5)	lb/d (mg/L)	31,341 (172)	43,462 (151)

Parameter	Unit	Project Buildout Average	Project Buildout Max Month
Total Suspended Solids (TSS)	lb/d (mg/L)	28,053 (154)	43,462 (151)
Ammonia Nitrogen (NH_3-N)	lb/d (mg/L)	5,667 (31)	7,934 (28)
Total Kjeldahl Nitrogen (TKN)	lb/d (mg/L)	7,084 (39)	9,918 (35)
Total Phosphorus (TP)	lb/d (mg/L)	1,273 (7)	2,008 (7)
Alkalinity	mg/L as $CaCO_3$	350	350
Maximum Influent Temperature	°C	TBD	TBD
Minimum Influent Temperature	°C	18	18

Table 3 summarizes the target effluent performance used as the basis for the proposed BioMag system. Evoqua can provide effluent performance guarantees upon request depending on the scope of supply from Evoqua. An effluent guarantee for biologically treated parameters such as BOD, ammonia, and TN can be provided if the biological treatment system design, equipment, and controls are provided by Evoqua. If the scope of supply by Evoqua is limited to the BioMag feed and recovery system, as outlined in this proposal, Evoqua can offer a performance guarantee for solids separation parameters such as effluent TSS and/or TP.

Table 3: Monthly average effluent performance.

Parameter	Unit	Value
BOD_5	mg/L	10
TSS	mg/L	10
NH_3-N	mg/L	N/A
NO_3-N	mg/L	N/A
TN	mg/L	10
TP	mg/L	N/A

4. BioMag Design Summary

With BioMag, no additional process or clarifier tankage is required to meet the buildout conditions. There is sufficient capacity within the existing bioreactor and clarifier tankage to handle all flows under the buildout conditions.

Table 4 summarizes the estimated process parameters used as the basis for the conceptual BioMag system outlined in this proposal. The proposed BioMag system is based on preliminary biological sizing

calculations performed by Evoqua and, therefore, may differ from any biological sizing done by the Owner or their consultant. The biological sizing used as the basis for this proposal is only an estimate and final biological sizing shall be confirmed by others, unless Evoqua has been selected to supply the biological system, in addition to the BioMag feed and recovery system.

Table 4: Design and process parameters.

Parameter	Value
Number of bioreactor treatment trains	The existing plant has two sets of aeration basins, each set consisting of four (4) parallel treatment trains configured in an MLE operation. Eight (8) treatment trains in total.
Total bioreactor volume	Trains 1 thru 4: 4,408,000 gallons (1,102,000 gal each train) Trains 5 thru 8: 4,152,000 gallons (1,038,000 gal each train)
Anoxic tank volume	Trains 1 thru 4: 1,128,000 gallons (282,000 gal each train) Trains 5 thru 8: 888,000 gallons (222,000 gal each train)
Aerobic tank volume	Trains 1 thru 4: 3,280,000 gallons (820,000 gal each train) Trains 5 thru 8: 3,264,000 gallons (816,000 gal each train)
Sludge Yield	0.73 lb TSS/lb BOD
Total system SRT	~8.8 days
MLSS	Average: 2,850 mg/L Max Month: 3,900 mg/L
Aeration/Mixing System	Typical design ranges for various types include: Fine bubble: 0.2-0.3 scfm/ft^2 at ADF Floating mixers: 50 HP/MG Submersible mixers: bulk velocity of 1.2-1.5 ft/s
WAS	Average: 22,870 lb/d Max Month: 31,672 lb/d
RAS requirements	70-100% at ADF Up to a total of 28 MGD at peak flow (RAS per clarifier would be proportional to clarifier size)
Number of clarifiers, existing	4 small 2 large
Clarifier diameter	Small: 85’ diameter x 12’ SWD Large: 125’ diameter x 16’ SWD

5. Operating Costs

As a guidance and reference, Table 5 lists the main consumables associated with the BioMag system recommended for this project.

Table 5: Estimated BioMag consumables.

Item	Guidance
Magnetite consumption	2,077 – 2,360 lb/day at avg. day (≈ $0.32/lb.)
Magnetite feed/recovery equipment power	2,955 kWhr/d at avg. day
Polymer – as dry active	Up to 1.5 mg/L at peak as needed

6. Additional Design Considerations

In the event that BioMag is the selected technology for this project, the following items will need to be evaluated and discussed in more detail for a finalized design:

- Aeration equipment type and age.
- Anoxic tankage mixing.
- Supplemental mixing requirements.
- Return sludge and waste sludge pumping capacity.
- Headworks screening. Evoqua recommends a minimum influent screen size of ¼" for the BioMag system. If influent screening is insufficient, Evoqua may require pre-screening of the WAS flow before the BioMag recovery system.
- BioMag building layout and location. Estimated building footprint: 50' x 60'
- Biosolids wasting strategy. The proposed BioMag design assumes continuous wasting of activated sludge to the BioMag recovery system (24 hours per day, 7 days per week). If the wasting will not be continuous, Evoqua will need to reevaluate the sizing of our equipment as this will require intermittent processing at higher flows.
- Chemical feed system, chemical preference.

7. System Design Responsibilities

Table 6 below helps outline which parties have primary responsibility for the design of various systems involved in the upgrade of the plant with BioMag.

Table 6: Design responsibilities

Item	Primary	Guidance
Biological system sizing, design, and equipment. This includes calculation of oxygen requirements, sludge yield, sludge age and waste sludge generation.	Others	EVOQUA
Clarifier equipment design and supply.	Others unless provided by Evoqua	EVOQUA
BioMag feed and recovery system sizing, design, and equipment.	EVOQUA	
BioMag equipment building layout and design	Others	EVOQUA
Plant hydraulics, pipe sizing and pump headloss calculations.	Others	EVOQUA

For the purposes of this budgetary proposal, Evoqua has conducted a preliminary sizing of the biological process since certain parameters such as MLSS and waste sludge volume are needed as inputs for the design of the BioMag equipment. However, final design of the biological process would be completed by others unless Evoqua has been selected to provide the equipment for the biological process (i.e. aeration, mixers, controls, etc.).

Evoqua has also conducted a preliminary sizing of the secondary clarifiers to determine the minimum required surface area and RAS pumping capacity associated with the enhanced settling rates of the BioMag system.

8. Equipment Scope of Supply

Table 7 below outlines the scope of supply from Evoqua for the proposed BioMag system. All equipment or services not specified in Table 7 are to be supplied by others. Motor HP's listed below are estimates. Final motor sizes to be determined during detailed design.

Table 7: Evoqua scope of supply.

Item	Qty	Description
Ballast Storage & Feed System		
Flow control valve – ballast mix tank feed	1	Motor operated plug valve

Item	Qty	Description
Flow meter – ballast mix tank feed	1	Mag meter
Level transmitter – ballast mix tank (tank by others)	1	Radar
High level switch – ballast mix tank (tank by others)	1	Float style
Pump – ballast mix tank discharge	1D, 1S	Positive displacement, 25 HP each
Ballast mix tank	0	Concrete tanks by others Will require two tanks, each 28’ L x 5.5’ W x 7.5’ H
Ballast mix tank mixer	6 (3 per tank)	Vertical shaft, 3 HP each
Magnetite storage	1	25-ton outdoor silo
Magnetite dry feeder	1	Up to 10’ long Stinger® feed pipe extending from silo to ballast mix tank
Air compressor	2 (lead/lag)	10 HP units
Air receiver	1	240-gallon vertical tank
Air dryer	1	Heatless desiccant
Compressed air system instrumentation	1 lot	Dew point sensor, pressure switch, pressure gauge
Ballast Recovery System		
Magnetic drum separator	12	36” x 72” drum, 7.5 HP each
Shear pump	6	10 HP each
Pump – shear mill feed	0	Assumed use existing or provided by others
Pump – post recovery WAS transfer pump (after magnetite recovery)	1D, 1S	Positive displacement, 25 HP each
Flow control valve – mag drum feed	12	Motor operated plug valve
Flow meter – mag drum feed	12	Mag meter
Level switch – mag drum	12	Capacitance style

Item	Qty	Description
Speed switch – mag drum	12	Proximity style
Post recovery WAS sump	0	Concrete sump by others, size to be determined, typically small sump just used for pump draw off
Level transmitter – post recovery WAS sump (sump by others)	1	Radar
High level switch – post recovery WAS sump (sump by others)	1	Float style
BioMag System Control System Hardware		
BioMag control panel	1	NEMA 12 control panel, HMI, PLC, I/O
Services		
Engineering support		Engineering submittals and O&M manual
Installation oversight, start-up, commissioning, performance testing and training		Up to 21 days

9. Budgetary Pricing

The budgetary price for the Evoqua BioMag system, as defined herein, including engineering, field services, and equipment supply is **$6,000,000.**

This price makes no provision for taxes, tariffs, duties, permitting fees and other fees and charges that are not made explicit above.

All pricing is quoted at FCA, Factory (full freight allowed). No taxes, regulatory fees or other costs related to the procurement and installation of the system are included.

The initial magnetite charge for the proposed system will require approximately **200-250** ton(s) of virgin magnetite at design conditions. Evoqua can provide magnetite at a cost of **$650** per ton plus freight.

The scope of supply and pricing are based on Evoqua standard equipment selection, standard terms of sale and warranty terms. Any variations from these standards may affect this budgetary quotation. Additionally, please note this budgetary quotation is for review and informational purposes only and does not constitute an offer for acceptance.

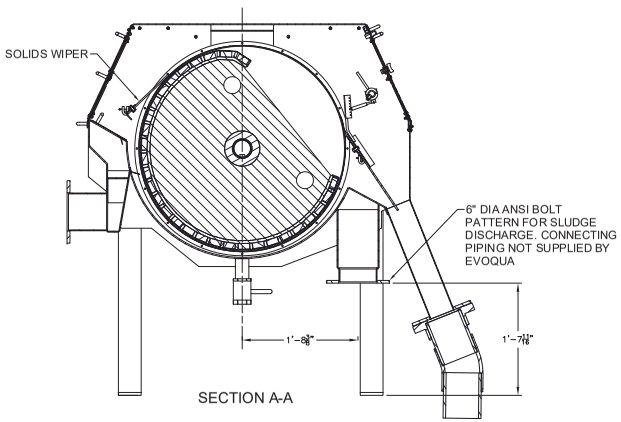
Should you have any questions regarding this quotation, or would like to request a firm proposal and order form, please contact the following Evoqua Regional Representative:

Brandon Olson
MISCO Water
bolson@miscowater.com
(925) 596-1286

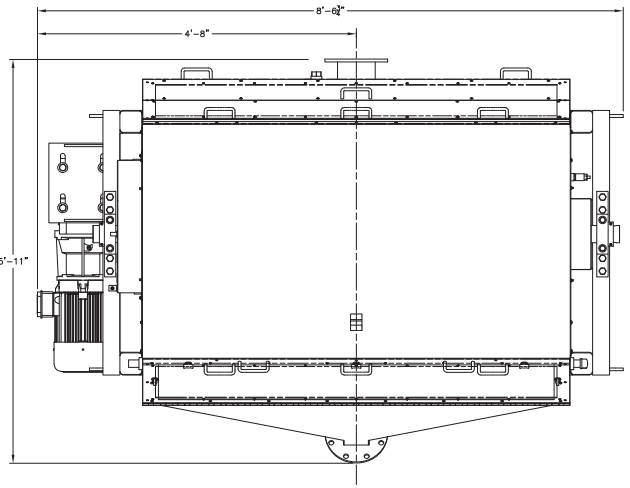
Appendices

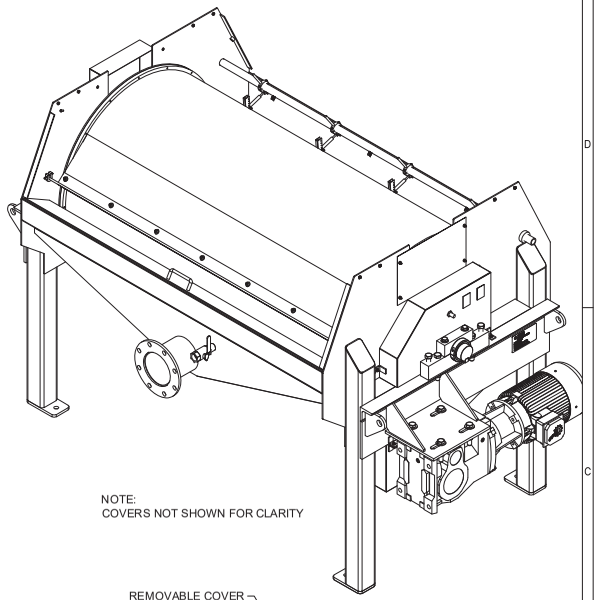
A. Typical Drawings

Appendix A – Typical Drawings

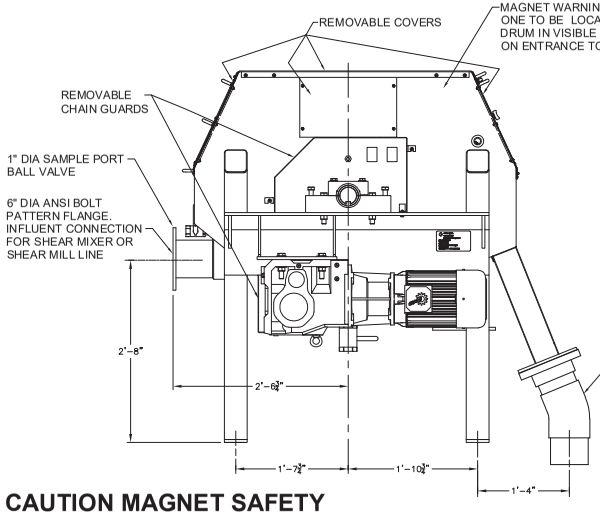


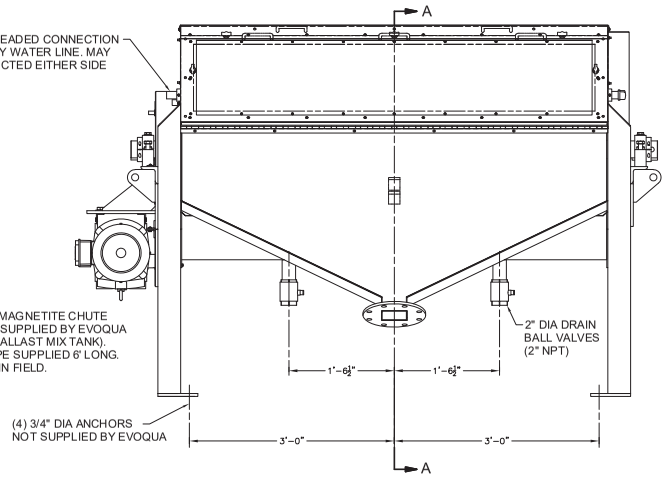
SECTION A-A

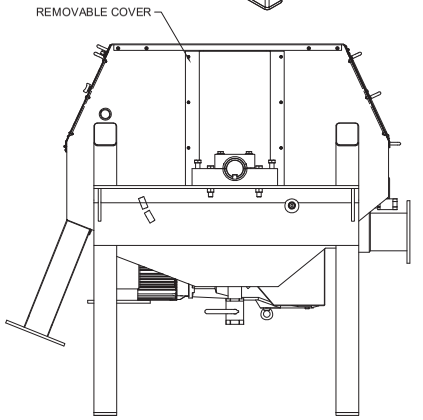




NOTE:
COVERS NOT SHOWN FOR CLARITY







CAUTION MAGNET SAFETY

The following **WARNINGS apply within 3 feet** of the Magnetic Drum Seperator.
This equipment produces powerful magnetic fields.

WARNING TO PACEMAKER USERS: If you use a heart pacemaker or similar device, **NEVER approach** this equipment. Your device may malfunction in the magnetic field, leading to illness or your death.

WARNING: Keep steel and iron objects away from the equipment to avoid **serious pinch-type and eye injuries** caused by objects attracted to the magnet. Do not allow hands, fingers, face and other body parts to be caught between the equipment and nearby steel and iron objects.

CAUTION: Keep credit cards, computer disks, and other magnetic storage devices away from the equipment because magnetically stored information may be corrupted by the magnetic field.

CAUTION: Keep electronic devices, such as computers or monitors, **away** from the equipment because exposure to the magnetic field may result in malfunction or permanent damage to such devices.

MAG DRUM SEPARATOR NOTES:

- ALL STRUCTURAL ITEMS (INCLUDING FLANGES AND COVERS) WILL BE 304 STAINLESS STEEL EXCEPT FOR MAGNET BACKING PLATE WHICH WILL BE MAGNETIC STEEL.
- MOTOR CHARACTERISTICS: 7.5HP, 1770 RPM, 230/460V, 3 PH, 60HZ
- WEIGHT OF THE ASSEMBLED MAG DRUM SEPARATOR WILL BE:
  ASSEMBLED DRUM NO LIQUID: 5200#
  ASSEMBLED DRUM WITH MAX LIQUID: 6000#

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN
1	DRIVE MOTOR NOTES, VIEW UPDATED	1/3/20	GAJ	RJF	TLL	200052
0	ORIGINAL ISSUE	2/6/15	RJF	RJF	TLL	

DESIGNER	RJF 2/6/15
CHECKER	DATE
FEDIE	2/6/15
ENGINEER	DATE
TLL	2/6/15
MANAGER	DATE
FILE:	
SCALE:	1:10

TITLE: INSTALLATION GENERAL ARRANGEMENT
36" X 72" MAGNETIC DRUM SEPARATOR
BioMag/CoMag TREATMENT SYSTEMS

CLIENT

EVOQUA WATER TECHNOLOGIES
WAUKESHA, WI
262-547-0141

PROJECT	CODE	DRAWING	SHEET	REV
	M-GA01	703-1630	1 OF 1	1

STD: BORDER-0106-24X36D1 | INTL REF: | 02/3/2022 - 11:04 AM | BAR = 1" AT PLOT SCALE

APPROVAL DRAWING

☐ APPROVED
–TO BE RELEASED FOR FABRICATION

☐ APPROVED AS NOTED
–TO BE RELEASED FOR FABRICATION WITH REVISIONS AS NOTED

☐ NOT APPROVED
–TO BE REVISED AND RE–SUBMITTED

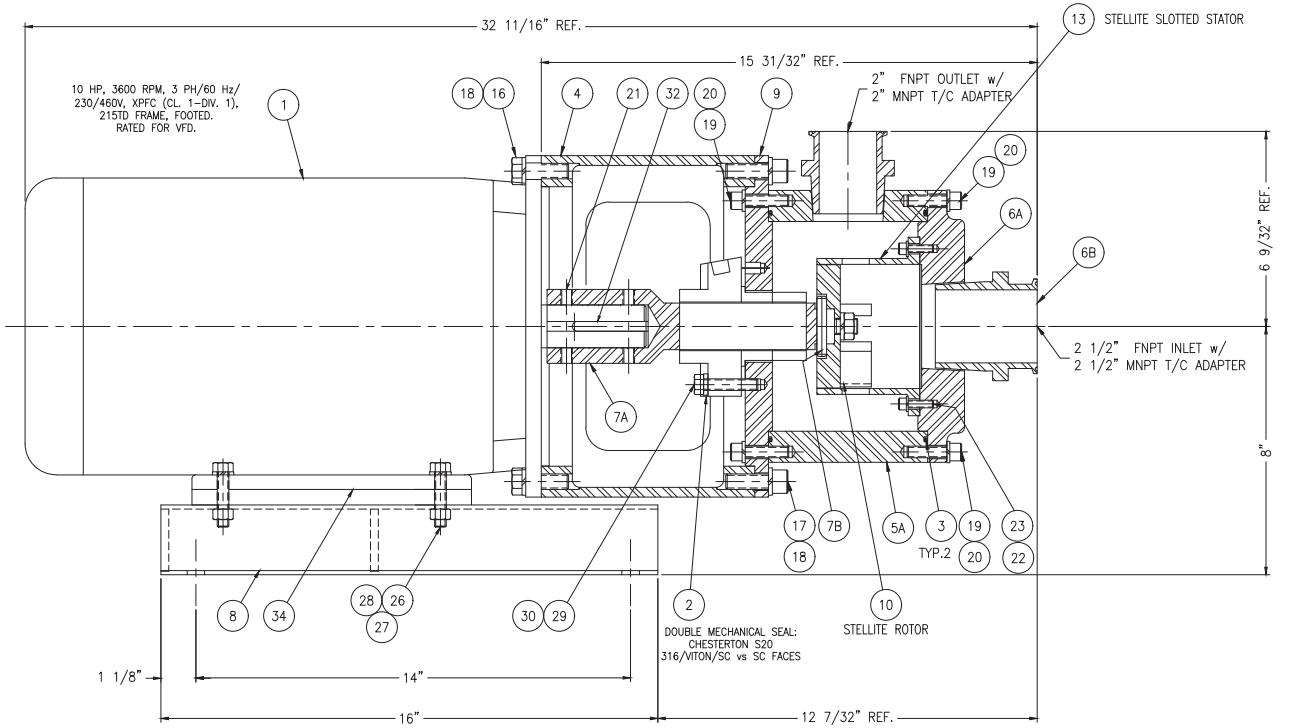
SIGNED:_____ DATE: _____

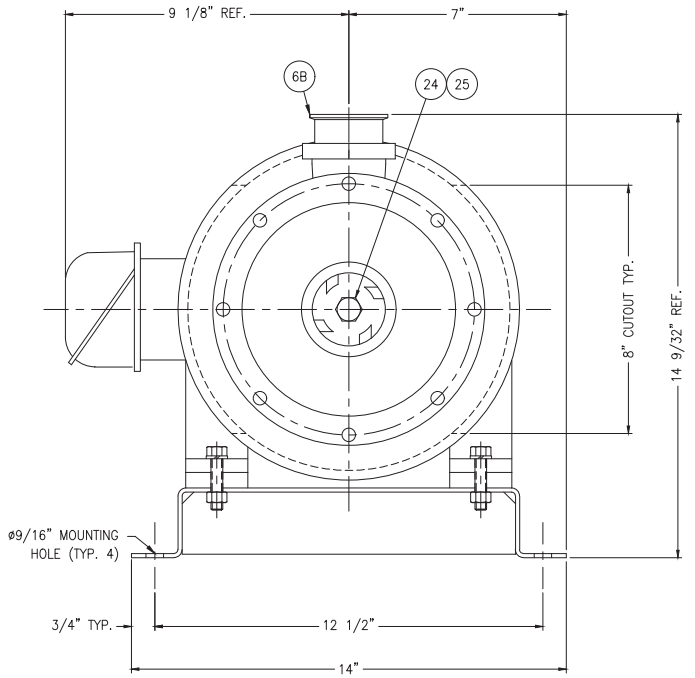
COMPANY:_____

PARTS LIST

P/N	DESCRIPTION	QTY.	P/N	DESCRIPTION	QTY.
1	MOTOR	1	18	LOCKWASHER	8
*2	MECHANICAL SEAL	1	19	SOCKET HEAD CAP SCREW	16
*3	O–RING	2	20	LOCKWASHER	16
4	MOTOR ADAPTOR	1	21	SET SCREWS	8
5	MIXING CHAMBER	1	22	SOCKET HEAD CAP SCREW	2
5B	FERRULE NPT OUTLET ADAPTER	1	23	LOCKWASHER	2
6A	INLET FLANGE	1	24	HEX HEAD JAM NUT	1
6B	FERRULE NPT INLET ADAPTER	1	25	LOCKWASHER	1
7A	COUPLING	1	26	HEX HEAD BOLT	4
7B	ROTOR DRIVE PIN	1	27	HEX HEAD NUT	4
8	MOTOR BASE	1	28	LOCKWASHER	4
9	MECHANICAL SEAL PLATE	1	29	HEX HEAD BOLT	4
*10	STELLITE ROTOR	1	30	PLAIN THICK WASHER	4
*13	STELLITE SLOTTED STATOR	1	32	MOTOR KEY	1
16	HEX HEAD BOLT	4	34	MOTOR SPACER	2
17	SOCKET HEAD CAP SCREW	4			

* DENOTES RECOMMENDED SPARE PARTS





NOTES:
1.) ALL WETTED PARTS TO BE 316 SS. ECEPT ROTOR & STATOR.
2.) ALL WETTED PARTS TO HAVE A 32RA/150 GRIT (#4) FINISH.
3.) ALL EXTERIOR STAINLESS SURFACES TO HAVE A GLASS BEAD BLAST FINISH.
4.) ALL ELASTOMERS TO BE VITON.
5.) SEAL BARRIER SUPPLIED BY CUSTOMER.

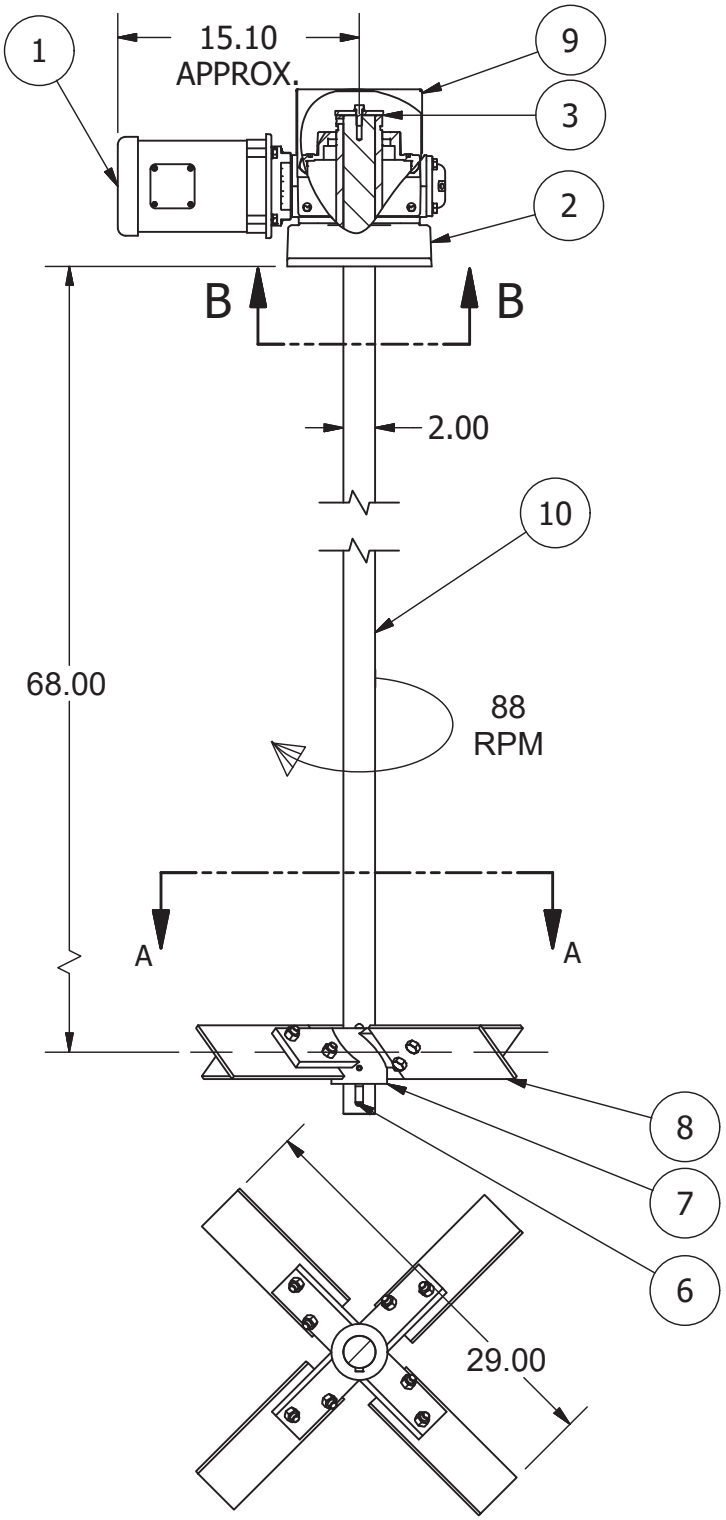
SYM.	DESCRIPTION	BY	DATE
1	CORRECTED NOTES /REMOVED BARRIER SYS.	MH	8/22

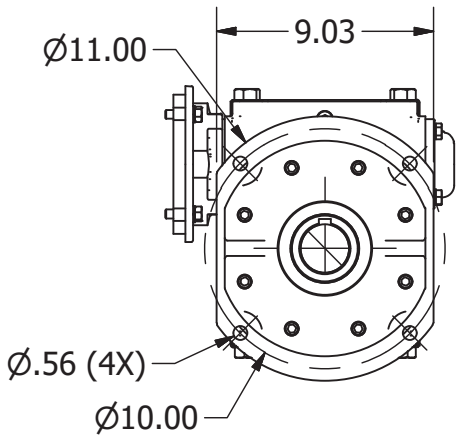
REVISIONS

Ross Engineering, Inc.
32 WESTGATE BLVD.
SAVANNAH, GA 31405

EVOQUA WATER TECH
w/ TRI–CLAMP INLET & OUTLET
GENERAL ASSEMBLY DRAWING

DWN:	APP:	CAD FILE: \ 118104–01	
MH		SCALE: 1/2" = 1"	
DATE: 8/02/22	DATE:	D–118104–01	REV. 1





MOUNTING DETAIL

-ENGINEERING DATA-		
TORQUE:	974	IN-LB.
BENDING MOMENT:	6859	IN-LB
MIXER WEIGHT	400	LB
PUMPING RATE:	8197	GPM

ITEM	DESCRIPTION
10	2" SHAFT FOR XCEL-6
9	SHAFT GUARD
8	29"AXIAL BLADE
7	AXIAL HUB 2.0" SHAFT
6	GIB KEY SQUARE HUB TURBINES
3	XCEL SERIES CAP PLATE
2	GEARBOX: RATIO = 15:1
1	MOTOR: 3.0 HP TEFC, 3/60/230/460 1800RPM

PARTS LIST

CUSTOMER DATA:

CUSTOMER: _____

SERIAL #: _____

P.O.#: _____

TAG#: M-910

QUANTITY: ONE

UNITED EQUIPMENT TECHNOLOGIES CORP.
26 MAPLE ST
MECHANICS FALLS, ME 04256

TITLE

XCEL-6 OPEN TANK MIXER

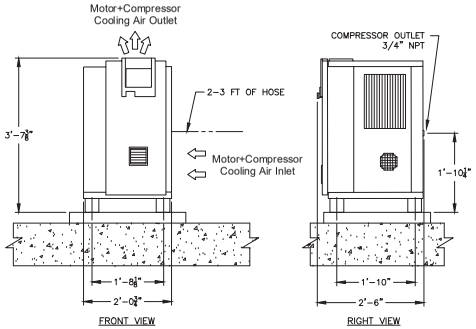
MATERIAL, WETTED PARTS: 304SS

REV

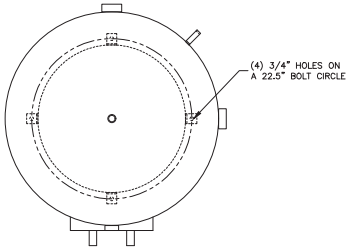
SHEET 1 OF 1

DATE 6/26/14

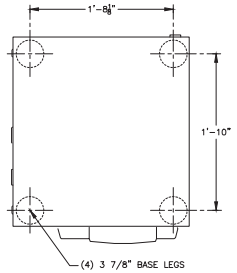
DWG NO 45286



COMPRESSOR INFORMATION
SCALE: 1:16



AIR RECEIVER MOUNTING DETAIL
SCALE: 1:8

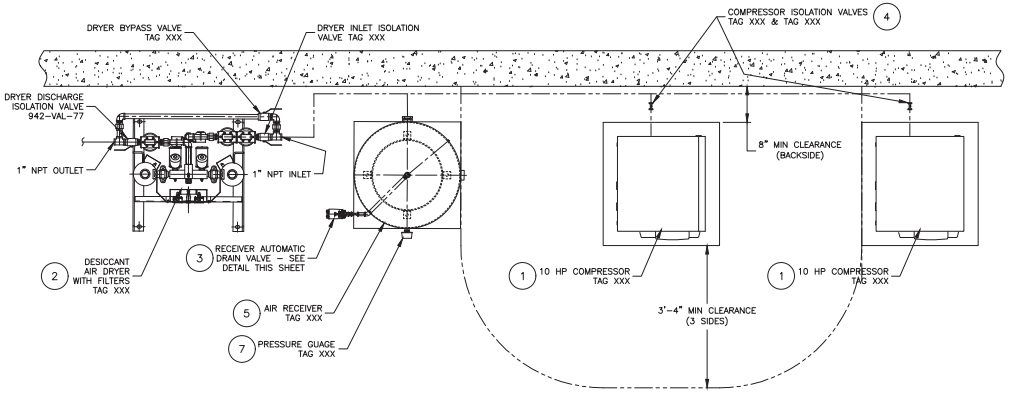


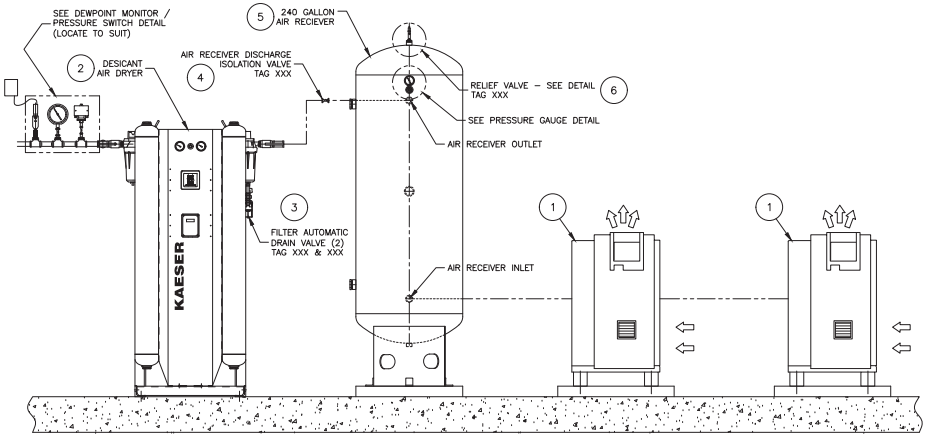
AIR COMPRESSOR MOUNTING DETAIL
SCALE: 1:8

REF SYM	QTY	PART NUMBER	TAG NUMBER	DESCRIPTION	MATERIAL
1	2	W3T505211		AIR COMPRESSOR, 10 HP, 460V, 3PH, 60HZ, KAESER SM10	
2	1	W3T505212		DESSICANT DRYER. KAD-90 KAESER WITH (2) INLET & (1) OUTLET FILTERS & (1) KAESER ECO-DRAIN 30, 115V INSTALLED ON KC FILTER	
3	1	W3T505213		KAESER ECO-DRAIN 30, 115V PACKAGE (1) FOR INLET FILTER, (1) FOR AIR RECEIVER	
4	3	W2T269904		BALL VALVE, 1" NPT	BRASS
5	1	W2T404136		AIR RECEIVER, 240 GAL, 200PSI	C.S.
6	1	W2T540514		PRESSURE RELIEF VALVE, 1/2" NPT	BRASS
7	2	W2T440357		PRESSURE GAUGE, 4.5" DIAL, 0-160PSI	
8	1	W2T269902		BALL VALVE, 1/2" NPT	BRASS
9	1	W2T556742		DEWPOINT MONITOR SYSTEM	
10	1	W2T556705		PRESSURE SWITCH, ASHCROFT, B SERIES, 100 PSI	

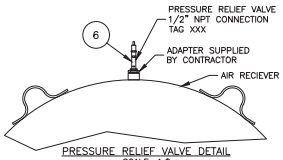
LIST OF COMPONENTS

REF SYMBOL NUMBERS RELATE TO THE MAIN BioMag BILL OF MATERIAL ITEM NUMBERS.

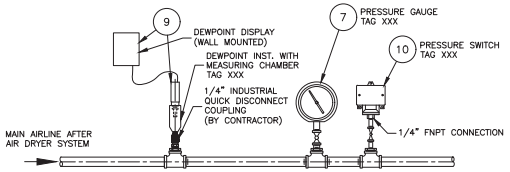




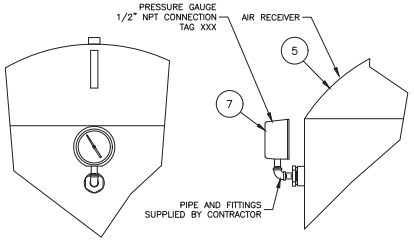
COMPRESSOR SYSTEM ARRANGEMENT
SCALE: 1:16



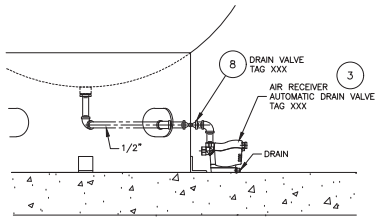
PRESSURE RELIEF VALVE DETAIL
SCALE: 1:8



DEWPOINT MONITOR - PRESSURE SWITCH - PRESSURE GAUGE DETAIL
(LOCATE TO SUIT)
SCALE: 1:8



PRESSURE GAUGE DETAIL
SCALE: 1:8



AIR RECEIVER AUTOMATIC DRAIN DETAIL
SCALE: 1:8

GENERAL NOTES:

1) THIS IS A TYPICAL AIR COMPRESSOR GENERAL ARRANGEMENT. PLEASE REFER TO THE CONTRACT DRAWINGS FOR SPECIFIC LAYOUT AND SYSTEM P&ID'S. THIS DRAWING IS ONLY TO BE USED FOR DEFINITION OF SCOPE OF SUPPLY BY EVOQUA WATER TECHNOLOGIES.
2) CONDENSATE DRAINS AND TRAPS TO BE DESIGNED AND SPECIFIED BY THE ENGINEER/CONTRACTOR
3) ALL AUTO-DRAINS SHALL BE HARD PIPED OR HOSED TO FLOOR DRAINS SUCH THAT WATER IS NOT TRAPPED IN THE DRAIN CAUSING AN AIR POCKET OR OTHER PREVENTION OF FREE FLOWING DRAINS.
4) AUTO DRAINS SHALL BE SHIPPED LOOSE FOR INSTALLATION ONTO THE AIR RECEIVER AND INLET FILTERS. DRAIN IS EQUIPPED WITH 120V DUPLEX PLUG.

COMPRESSOR NOTES:

5) WEIGHT: 567LBS EACH
6) ENGINEER TO DESIGN ROOM FOR PROPER VENTILATION FOR THE AIR COMPRESSOR. PER THE O&M KAESER SM10 REQUIRES 1835 CFM.
7) AIR COMPRESSOR CAN ACCOMMODATE 460V 3PH 60 HZ POWER. MOTOR STARTER IS MOUNTED IN THE AIR COMPRESSOR CABINET.
8) 2-3 FT OF FLEX HOSE IS RECOMMENDED ON THE OUTLET OF EACH AIR COMPRESSOR FOR SERVICEABILITY AND MAINTENANCE. HOSE TO BE RATED FOR 200° F AND 200 PSI. REFERENCE ENGINEER'S PIPE SPECIFICATION FOR PROPER MATERIALS FOR COMPRESSED AIR AND DRAINS.

DRYER NOTES:

9) WEIGHT: 575LBS
10) DRYER IS DESIGNED TO ALTERNATE CYCLES THRU THE TOWERS.
11) DRYER REQUIRES 115V 1PH 60HZ POWER.
12) DRYER IS A DESICCANT FILLED TWIN TOWER SYSTEM.
13) DRAINS ON THE FILTERS ARE SHIPPED LOOSE INSTALLED BY THE CONTRACTOR AND REQUIRE 115V 1PH 60HZ. DRAINS ON THE DRYER ARE INTEGRAL TO THE DRYERS BUT DO NEED TO BE PIPED TO FLOOR DRAIN.

AIR RECEIVER NOTES:

14) WEIGHT: 542LBS
15) RECEIVER RATED AT 200 PSI AT 400° F
16) RECEIVER FINISH PAINTED TO MATCH COMPRESSORS

ANCHOR NOTES:

17) ANCHORS SHALL BE PROVIDED BY THE CONTRACTOR

COMPRESSOR CONTROLS:

18) SIGMA CONTROL BASIC PLC-BASED CONTROL SYSTEM WITH MONITORING OF EMERGENCY STOP, MOTOR OVERLOAD, DIRECTION OF ROTATION, AIREND DISCHARGE TEMPERATURE, ANALOG INPUTS, CABINET TEMPERATURE, SERVICE HOURS, BACK PRESSURE AND MINIMUM STARTING TEMPERATURE. IDLE PERIOD TIMER SHUTS THE COMPRESSOR DOWN IF AIR IS NOT REQUIRED FOR A PRESET TIME.
19) CONTROL UNIT WILL ALSO INCLUDE 24 HOUR LEAD-LAG OPTION FOR COMPRESSOR PACKAGE OPERATIONAL FLEXIBILITY.

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN
0	ISSUED FOR MASTER USE	4/4/18	RJF	RJF	TLL	180038

DESIGNER	DATE
FEDIE	3/28/18
CHECKER	DATE
ENGINEER	DATE
MANAGER	DATE
FILE:	
SCALE: 1:8 & 1:16	

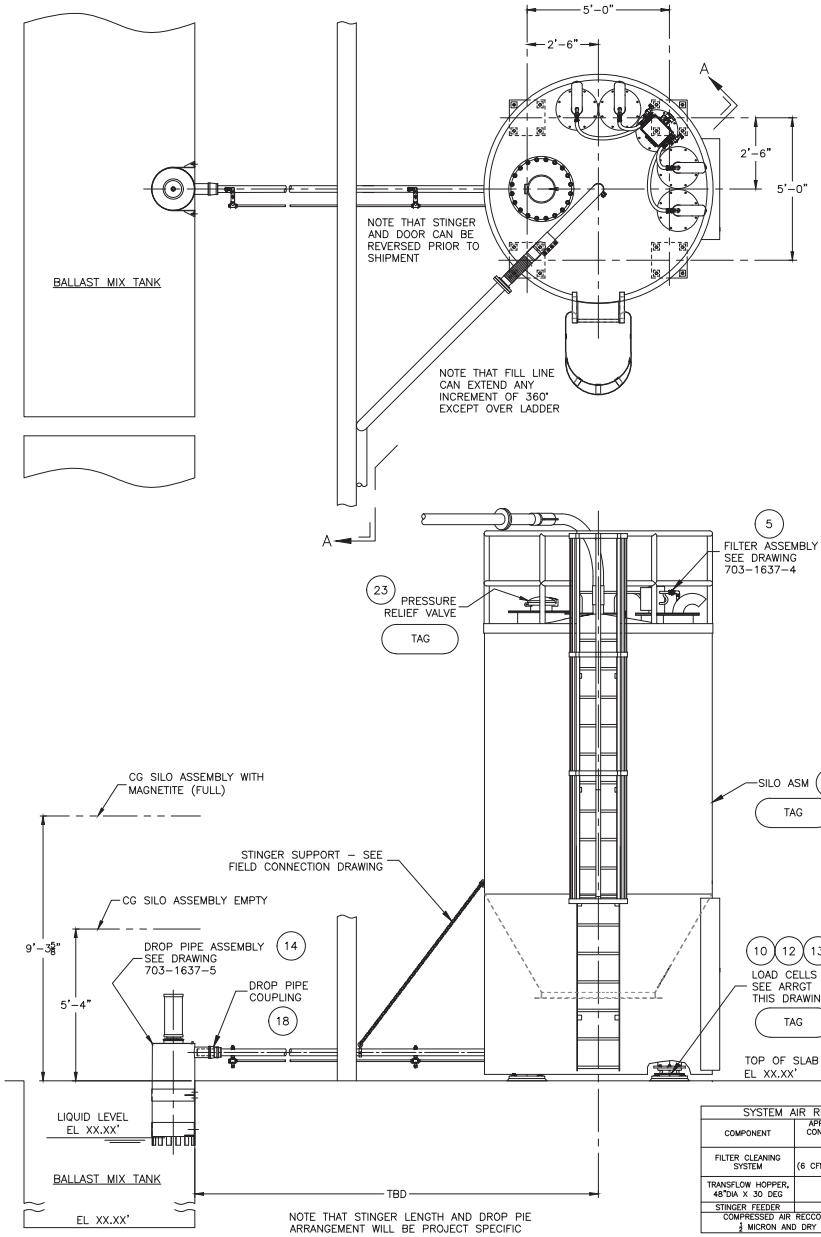
TITLE: GENERAL ARRANGEMENT FOR KAESER 10HP AIR COMPRESSOR AND DRYER SYSTEM BIOMAG MAGNETITE FEED SYSTEM

CLIENT

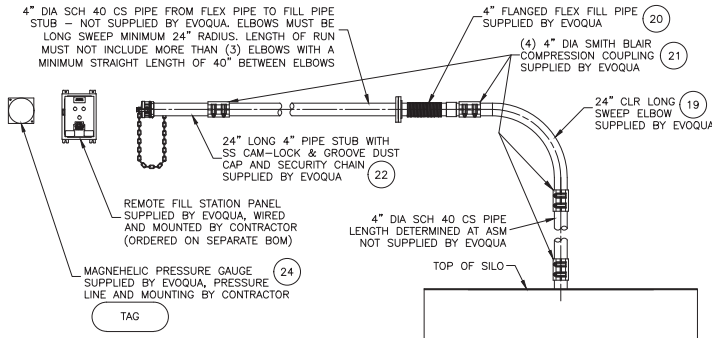
EVOQUA WATER TECHNOLOGIES
WAUKESHA, WI
262-547-0141

PROJECT	CODE	DRAWING	SHEET	REV
	8002A	703-1638	1 OF 1	0

STD: BORDER-0106-24X36D1 | INTL REF: | 01/20/2022 - 1:10 PM | BAR = 1" AT PLOT SCALE



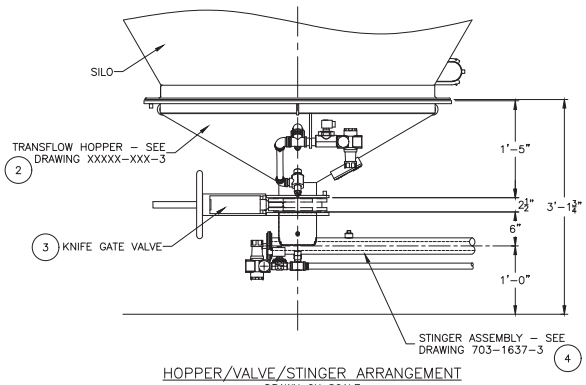
SYSTEM AIR REQUIREMENTS		
COMPONENT	APPROX. AIR CONSUMPTION (CFM)	OPERATING PRESSURE (PSIG)
FILTER CLEANING SYSTEM	24 (6 CFM/CANISTER)	50
TRANSFLOW HOPPER, 48"DIA X 30 DEG	9	10 TO 15
STINGER FEEDER	1.5	15 TO 20
COMPRESSED AIR RECCOMENDED FILTRATION TO ½ MICRON AND DRY TO -20°F DEWPOINT		



SECTION A-A
FILL PIPE ARRANGEMENT

REF. SYMBOL	QUANTITY	PART NUMBER	DESCRIPTION
1	1	W3T	SILO ASSEMBLY
2	1	W3T345797	TRANSFLOW HOPPER ASSEMBLY
3	1	W2T837930	6" KNIFE GATE VALVE
4	1	W3T	STINGER ASSEMBLY
5	4	W3T405052	SILO FILTER HOUSING
6	4	W2T849923	SILO FILTER
7	1	W3T405053	COMPRESSED AIR HEADER ASSEMBLY
8	1	W3T404941	FILTER TIMER PANEL ASSEMBLY
9	1	W3T404915	FILTER INSTRUMENT KIT
10	1	W3T452842	LOAD CELL KIT
11	1	W2T857515	LOAD CELL CONNECTING CABLE
12	4	W3T346009	LOAD CELL TOP MOUNTING PLATE
13	4	W3T345991	LOAD CELL BOTTOM MOUNTING PLATE
14	1	W3T	DROP PIPE ASSEMBLY
15	1	W3T345835	UPPER DROP PIPE CLAMP
16	1	W3T345836	LOWER DROP PIPE CLAMP
17	1	W2T819372	DROP PIPE MUFFLER
18	1	W2T478929	DROP PIPE COUPLING
19	1	W2T819376	FILL PIPE ELBOW
20	1	W2T819378	FILL PIPE FLEXIBLE CONNECTOR
21	4	W2T317664	FILL PIPE COUPLINGS
22	1	W3T345833	FILL PIPE STUB WITH DUST CAP
23	1	W2T819379	PRESSURE RELIEF VALVE
24	1	W2T819375	MAGNEHELIC GAUGE
25	1	W3T345834	FIELD MATERIAL KIT
*	1		REMOTE FILL PANEL (REF DWG XXXXX-891-XX)

REF SYMBOL NUMBERS RELATE TO THE MAIN BioMag BILL OF MATERIAL ITEM NUMBERS.
* SEE ELECTRICAL BOM FOR FILL STATION PANEL

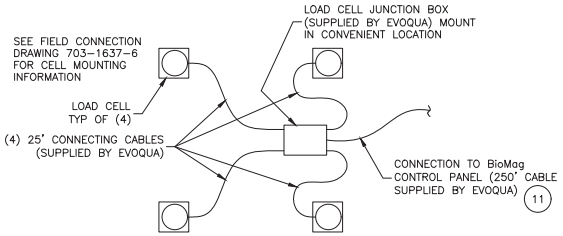


HOPPER/VALVE/STINGER ARRANGEMENT
DRAWN 2X SCALE

X SILO FIELD HARDWARE KIT
X DROP PIPE HARDWARE KIT

GENERAL NOTES:

1. MATERIALS OF CONSTRUCTION: SEE COMPONENT DRAWINGS FOR SPECIFIC MATERIALS OF CONSTRUCTION AND PAINTING INFORMATION.
2. GROUNDING AND BONDING REQUIRED
3. ESTIMATED WEIGHTS:
   - COMPLETE ASSEMBLY EMPTY: SEE BELOW
   - COMPLETE ASSEMBLY FULL: SEE BELOW
   - SEE COMPONENT DRAWINGS FOR INDIVIDUAL COMPONENT WEIGHTS
4. DESIGNED FOR SEISMIC CALCULATIONS WITH A SPECIFIC GRAVITY OF 112 LBS/FT^3 FOR THE MAGNETITE.
5. CONNECTIONS TO SILO MUST INCLUDE ENOUGH FLEXIBILITY TO ALLOW SILO TO "FLOAT" IN ORDER FOR SCALE SYSTEM TO READ ACCURATELY
6. SYSTEM ASSEMBLY IS REQUIRED. SEE FIELD CONNECTION INSTRUCTIONS FOR DETAIL AND HARDWARE LIST.
7. PURCHASED ITEMS FINISHED PER MFG STD
8. SYSTEM WIRING BY OTHERS
9. FILTER SOCK WITH WORM GEAR CLAMP TO BE ATTACHED TO PRESSURE RELIEF VALVE.



LOAD CELL ARRANGEMENT TAG
10 LOAD CELL KIT

DESIGN NOTES:

MAX DECK LIVE LOAD:	30 PSF
MATERIAL DENSITY:	112LBS/FT^3 (AERATED)
	150LBS/FT^3 (UNAERATED)
MAX INTERNAL PRESSURE:	1.00 PSI
MAX INTERNAL VACUUM:	0.03 PSI
USABLE CAPACITY:	475 FT^3
EMPTY WEIGHT:	7300# (FULLY ASSEMBLED)
FULL WEIGHT:	57,300#

WORK THIS GA DRAWING WITH THE FOLLOWING DRAWINGS:

703-1637-2: SILO DETAIL & SPECIFICATIONS
703-1637-3: HOPPER & STINGER GENERAL ARRANGEMENT
703-1637-4: FILTER GENERAL ARRANGEMENT
703-1637-5: DROP PIPE GENERAL ARRANGEMENT
703-1637-6: FIELD CONNECTION INSTRUCTIONS & HARDWARE LIST

FOR APPROVAL ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN
1	UPDATED DRAWING NUMBER, BOM ITEMS	7/24/19	TJU	TLL	AJK	190042
0	ISSUED FOR MASTER USE	4/4/18	RJF	RJF	TLL	180038

DESIGNER	FEDIE	DATE 3/28/18
CHECKER		DATE
ENGINEER		DATE
MANAGER		DATE
FILE:		
SCALE:	1:24 - 1:20	

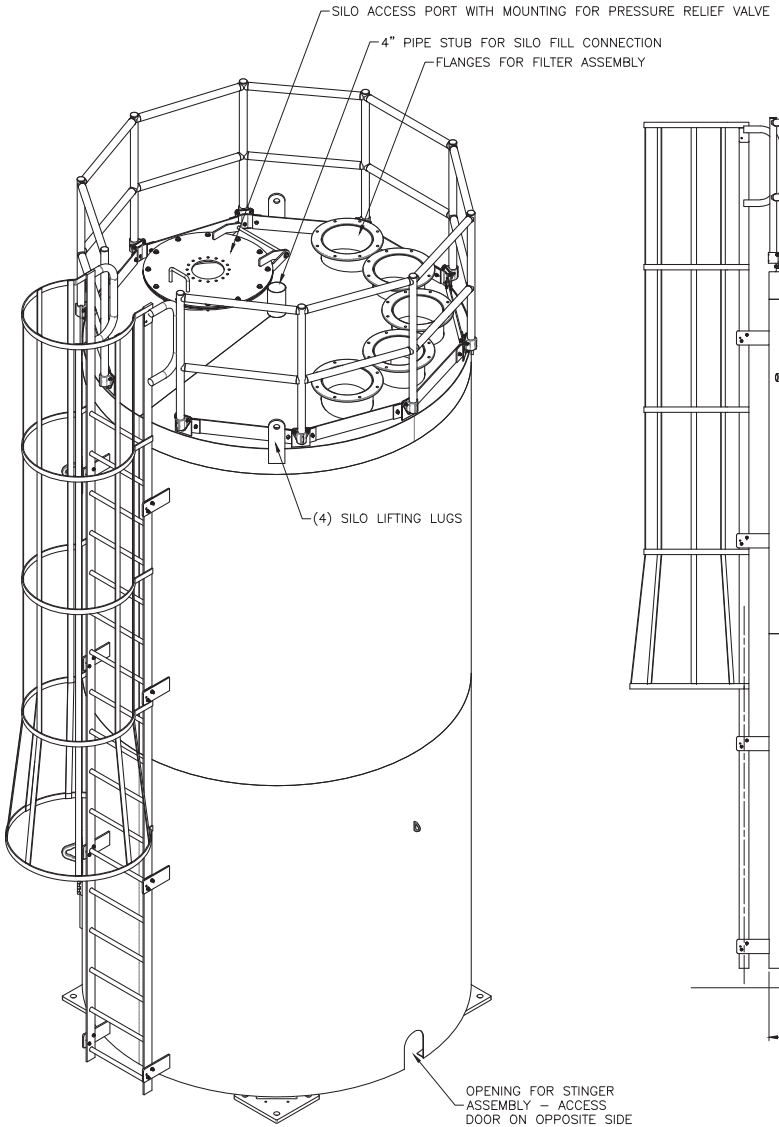
TITLE: MAG STORAGE SILO GENERAL ARRANGEMENT
GENERAL VIEWS & MATERIAL LIST
BIOMAG SYSTEM - 25 TON SILO

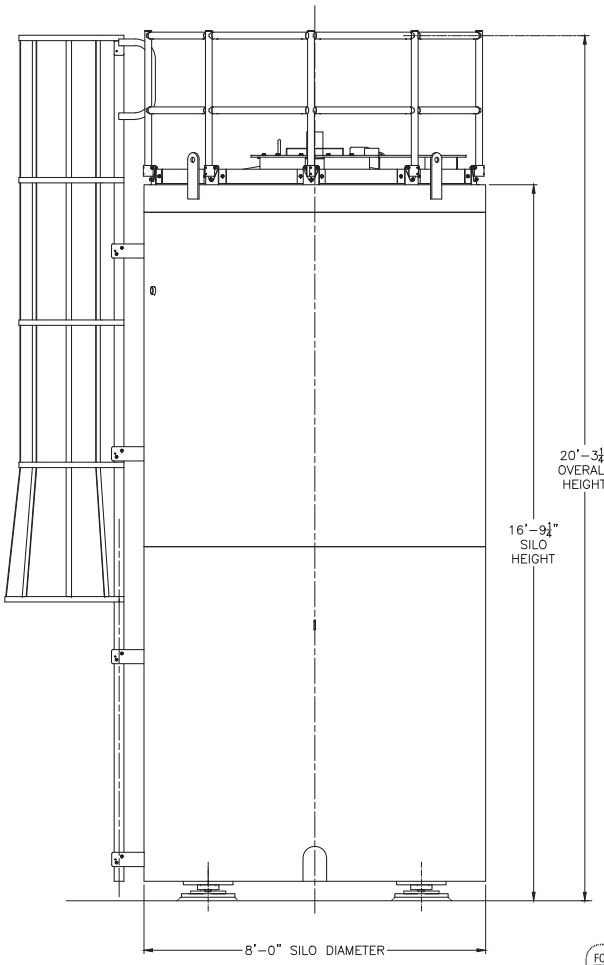
CLIENT

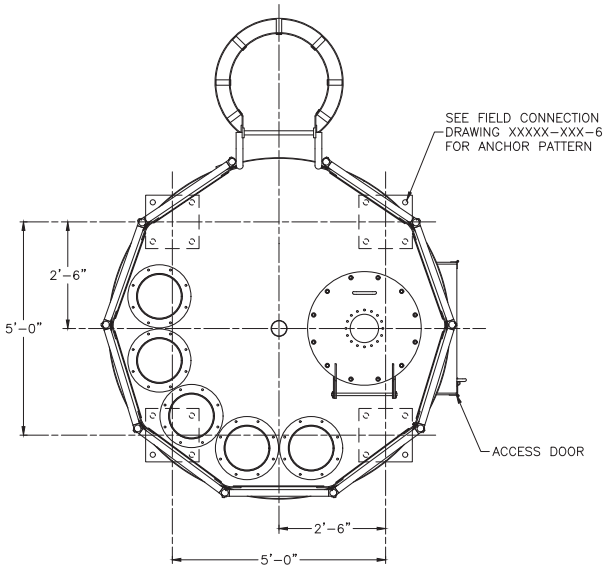
EVOQUA WATER TECHNOLOGIES
WAUKESHA, WI
262-547-0141

PROJECT	CODE	DRAWING	SHEET	REV
	8002A	703-1637-1	1 OF 6	1

STD: BORDER-0106-24X36D1 | INTL REF: | 01/24/2022 - 8:11 AM | BAR = 1" AT PLOT SCALE







SILO FABRICATION NOTES:

- MATERIAL OF CONSTRUCTION: CARBON STEEL, 3/16" THICK WALLS, 3/8" TOP PLATE AND W10 X 22 BEAM LEGS.
- WELDING: WELDING PROCEDURES AND PROCESSES SHALL MEET THE REQUIREMENTS OF ASME IX. NON DESTRUCTIVE EXAMINATION WILL CONSIST OF A LEAK TEST OF ALL PROCESS CONTAINMENT WELDS THROUGH DIE PENETRANT EXAMINATION AND SHALL BE DOCUMENTED FOR RECORD.
- SURFACE PREPARATION:
  INTERIOR: COMMERCIAL BLAST CLEANING PER SSPC–SP6–63
  EXTERIOR: COMMERCIAL BLAST CLEANING PER SSPC–SP6–63
- PAINTING:
  INTERIOR: NO PAINT
  EXTERIOR: (1) COAT OF SHERWIN WILLIAMS B62Y110 COPOXY GOLD PRIMER 3 MILS MDFT FOLLOWED BY (1) COAT OF SHERWIN WILLIAMS ACROLON 218HS 5 MILS MDFT. COLOR TO BE EVOQUA BLUE (FED STANDARD COLOR #15052).
- SILO WILL SHIP WITH MINIMAL ACCESSORIES ASSEMBLED. FILTERS, TRANSFLOW HOPPER, LADDER AND RAILING REQUIRE FIELD ASSEMBLY. SEE FIELD CONNECTION DRAWING FOR ASSEMBLY DETAIL AND HARDWARE.
- WEIGHT: 6,583# EMPTY

WORK THIS GA DRAWING WITH THE FOLLOWING DRAWINGS:

703–1637–1: GENERAL VIEWS & MATERIALS LIST
703–1637–3: HOPPER & STINGER GENERAL ARRANGEMENT
703–1637–4: FILTER GENERAL ARRANGEMENT
703–1637–5: DROP PIPE GENERAL ARRANGEMENT
703–1637–6: FIELD CONNECTION INSTRUCTIONS & HARDWARE LIST

FOR APPROVAL ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN
1	UPDATED DRAWING NUMBER, BOM ITEMS	7/24/19	TJU	TLL	AJK	190042
0	ISSUED FOR MASTER USE	4/4/18	RJF	RJF	TLL	180038

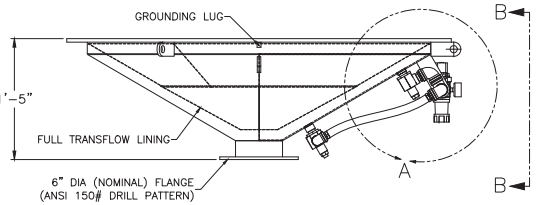
DESIGNER	FEDIE 3/28/18
CHECKER	DATE
ENGINEER	DATE
MANAGER	DATE
FILE:	
SCALE:	1:16

TITLE: MAG STORAGE SILO GENERAL ARRANGEMENT
SILO DETAIL & SPECIFICATIONS
BIOMAG SYSTEM – 25 TON SILO

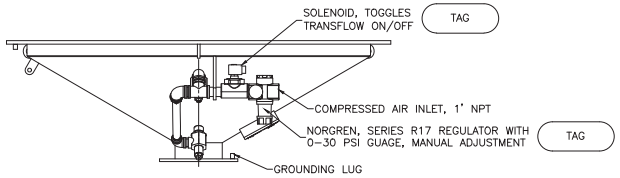
CLIENT

EVOQUA WATER TECHNOLOGIES
WAUKESHA, WI
262–547–0141

PROJECT	CODE	DRAWING	SHEET	REV
	8002A	703–1637–2	2 OF 6	1



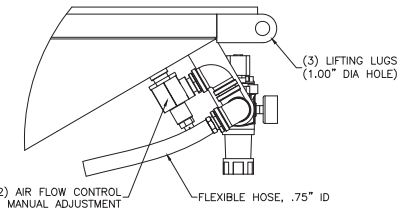
HOPPER ASSEMBLY



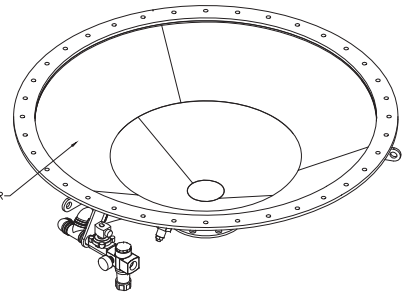
VIEW B-B

TRANSFLOW HOPPER NOTES:

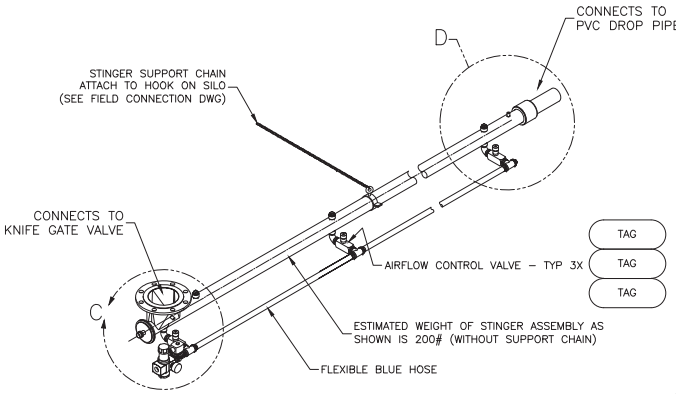
- QUANTITY: (1)
- MATERIAL OF CONSTRUCTION:
  LINER: C/S WITH 316SS TRANSFLOW FLUIDIZING MATERIAL
  PLUMBING: ALUMINUM, BRASS, GALV STEEL
  HOSE: SYNTHETIC RUBBER
  GASKETS: NEOPRENE
  HARDWARE: STAINLESS STEEL
- WELDING, GRINDING AND CLEANUP PER YOUNG IND. ENG. SPEC 185.200 AS FOLLOWS:
  WELDING.....CLASS 2
  GRINDING INTERIOR.....CLASS 2
  GRINDING EXTERIOR.....CLASS 2
  CLEANUP INTERIOR.....CLASS 2
  CLEANUP EXTERIOR.....CLASS 2
- GROUNDING & BONDING REQUIRED
- DESIGN TEMPERATURE: AMBIENT
- DESIGN PRESSURE: ± 17" W.C.
- HOPPER WEIGHT: 225#
- COMPRESSED AIR REQUIREMENT: SEE MAIN GA DRAWING
- HOPPER SHIPPED LOOSE FOR FIELD INSTALLATION BY OTHERS. SEE EVOQUA FIELD ASSEMBLY DRAWING FOR HARDWARE LIST.



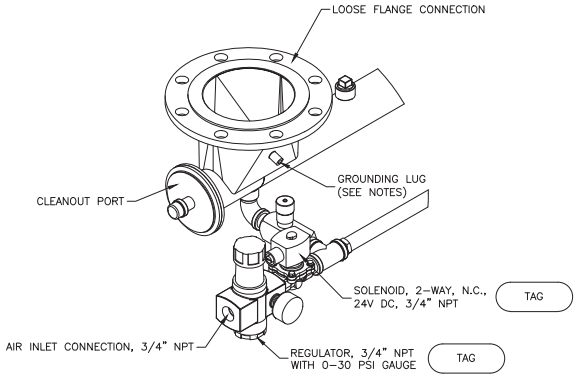
DETAIL A



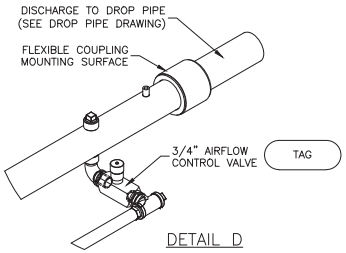
(2) TRANSFLOW HOPPER DETAILS



STINGER ASSEMBLY



DETAIL C



DETAIL D

STINGER NOTES:

- QUANTITY: (1)
- MATERIAL OF CONSTRUCTION:
  STINGER: C/S WITH 316SS TRANSFLOW FLUIDIZING MATERIAL
  PLUMBING: ALUMINUM, BRASS, GALV STEEL
  HOSE: SYNTHETIC RUBBER
  GASKETS: NEOPRENE
  HARDWARE: STAINLESS STEEL
- WELDING, GRINDING AND CLEANUP PER YOUNG IND. ENG. SPEC 185.200 AS FOLLOWS:
  WELDING.....CLASS 2
  GRINDING INTERIOR.....CLASS 2
  GRINDING EXTERIOR.....CLASS 2
  CLEANUP INTERIOR.....CLASS 2
  CLEANUP EXTERIOR.....CLASS 2
- GROUNDING & BONDING REQUIRED
- DESIGN TEMPERATURE: AMBIENT
- DESIGN PRESSURE: 20 PSIG MAX
- STINGER WEIGHT: APPROXIMATELY 200#
- COMPRESSED AIR REQUIREMENT: SEE MAIN GA DRAWING
- STINGER SHIPPED LOOSE FOR FIELD INSTALLATION BY OTHERS. SEE EVOQUA FIELD ASSEMBLY DRAWING FOR HARDWARE LIST.

(4) STINGER ARRANGEMENT

FOR APPROVAL ONLY
NOT TO BE USED FOR
CONSTRUCTION
PURPOSES

WORK THIS GA DRAWING WITH THE FOLLOWING DRAWINGS:

XXXXX-XXX-1: GENERAL VIEWS & MATERIALS LIST
XXXXX-XXX-2: SILO DETAIL & SPECIFICATION
XXXXX-XXX-4: FILTER GENERAL ARRANGEMENT
XXXXX-XXX-5: DROP PIPE GENERAL ARRANGEMENT
XXXXX-XXX-6: FIELD CONNECTION INSTRUCTIONS & HARDWARE LIST

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN
1	UPDATED DRAWING NUMBER, BOM ITEMS	7/24/19	TJU	TLL	AJK	190042
0	ISSUED FOR MASTER USE	4/4/18	RJF	RJF	TLL	180038

DESIGNER	FEDIE 3/28/18
CHECKER	DATE
ENGINEER	DATE
MANAGER	DATE
FILE:	
SCALE:	1:8 - 1:5

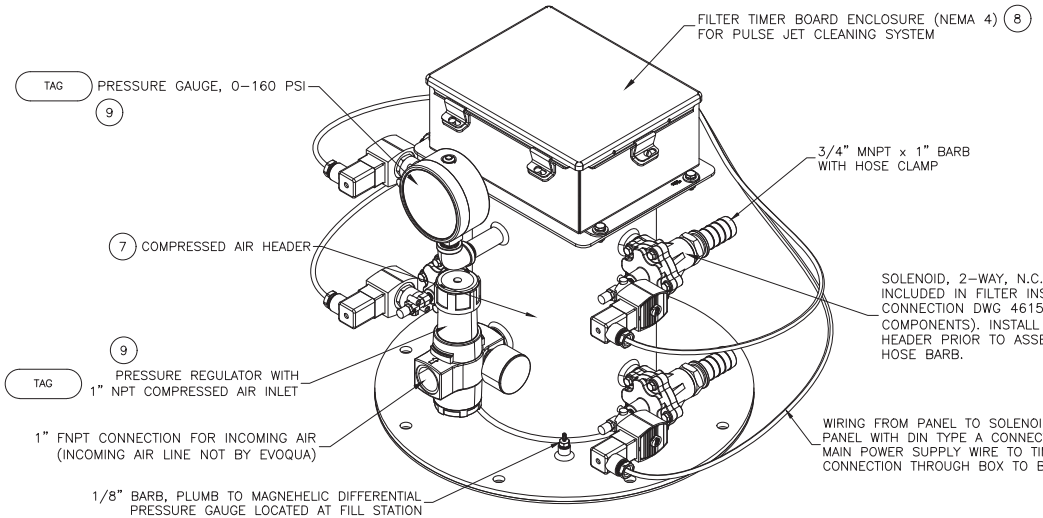
TITLE: MAG STORAGE SILO GENERAL ARRANGEMENT
HOPPER & STINGER GENERAL ARRANGEMENT
BIOMAG SYSTEM - 25 TON SILO

CLIENT

EVOQUA WATER TECHNOLOGIES
WAUKESHA, WI
262-547-0141

PROJECT	CODE	DRAWING	SHEET	REV
	8002A	703-1637-3	3 OF 6	1

STD: BORDER-0106-24X36D1 | INTL REF: | 01/24/2022 - 8:13 AM | BAR = 1" AT PLOT SCALE

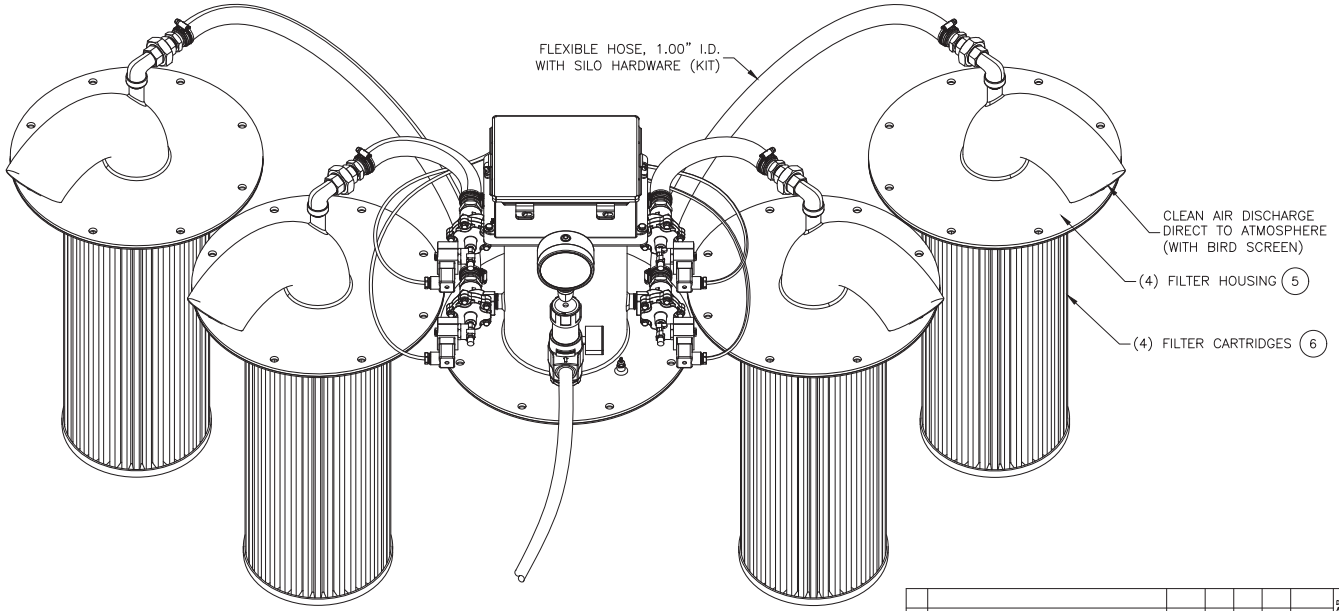


AIR HEADER ASSEMBLY

NOTE: FILTER ASSEMBLY IS SUPPLIED IN SUB–ASSEMBLIES AND WILL REQUIRE FINAL ASSEMBLY AT INSTALLATION. VALVES, SOLENOIDS, REGULATOR AND PRESSURE GAUGE ARE INCLUDED IN THE FILTER INSTRUMENT KIT (NOTED BELOW). HARDWARE, HOSE AND MISC FITTINGS ARE INCLUDED WITH SILO FIELD CONNECTION KIT (NOTED BELOW).

(9) FILTER INSTRUMENT KIT

(X) SILO FIELD CONNECTION & HARDWARE KIT



SILO FILTER ARRANGEMENT

FILTER NOTES:

- MATERIAL OF CONSTRUCTION:
  FABRICATED HOUSING: CARBON STEEL
  PLUMBING FITTINGS: 304SS, ALUMINUM, BRASS, GALV STEEL
  GASKETS: NEOPRENE
  HARDWARE: STAINLESS STEEL
- FILTER CLOTH AREA: 464 SQ FT (AIR TO CLTH RATIO 1.51:1)
- FILTER TUBES: (4) CARTRIDGES, 26" LONG, STYLE "D"
- FILTER MEDIA: CELLULOSE POLYESTER BLEND
- TIMER BOARD REQUIRES 24 VDC INPUT
- GROUNDING & BONDING REQUIRED
- EXPECTED DIFFERENTIAL OPERATING PRESSURE: 2–4" WC
- DESIGN TEMPERATURE: AMBIENT (180° F MAX)
- ACFM: 700 MAX
- NORMAL TIMER SETTINGS:
  OFF TIME: 10 SECONDS
  ON TIME: 200 MILLISECONDS (0.2 SECONDS)
- FILTERS SHIPPED LOOSE FOR FIELD INSTALLATION BY OTHERS. SEE EVOQUA FIELD ASSEMBLY DRAWING FOR HARDWARE LIST.

FOR APPROVAL ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

WORK THIS GA DRAWING WITH THE FOLLOWING DRAWINGS:

703–1637–1: GENERAL VIEWS & MATERIALS LIST
703–1637–2: SILO DETAIL & SPECIFICATION
703–1637–3: HOPPER & STINGER GENERAL ARRANGEMENT
703–1637–5: DROP PIPE GENERAL ARRANGEMENT
703–1637–6: FIELD CONNECTION INSTRUCTIONS & HARDWARE LIST

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN
1	UPDATED DRAWING NUMBER, BOM ITEMS	7/24/19	TJU	TLL	AJK	190042
0	ISSUED FOR MASTER USE	4/3/18	RJF	RJF	TLL	180038

DESIGNER	FEDIE 3/28/18
CHECKER	DATE
ENGINEER	DATE
MANAGER	DATE
FILE:	
SCALE:	1:4

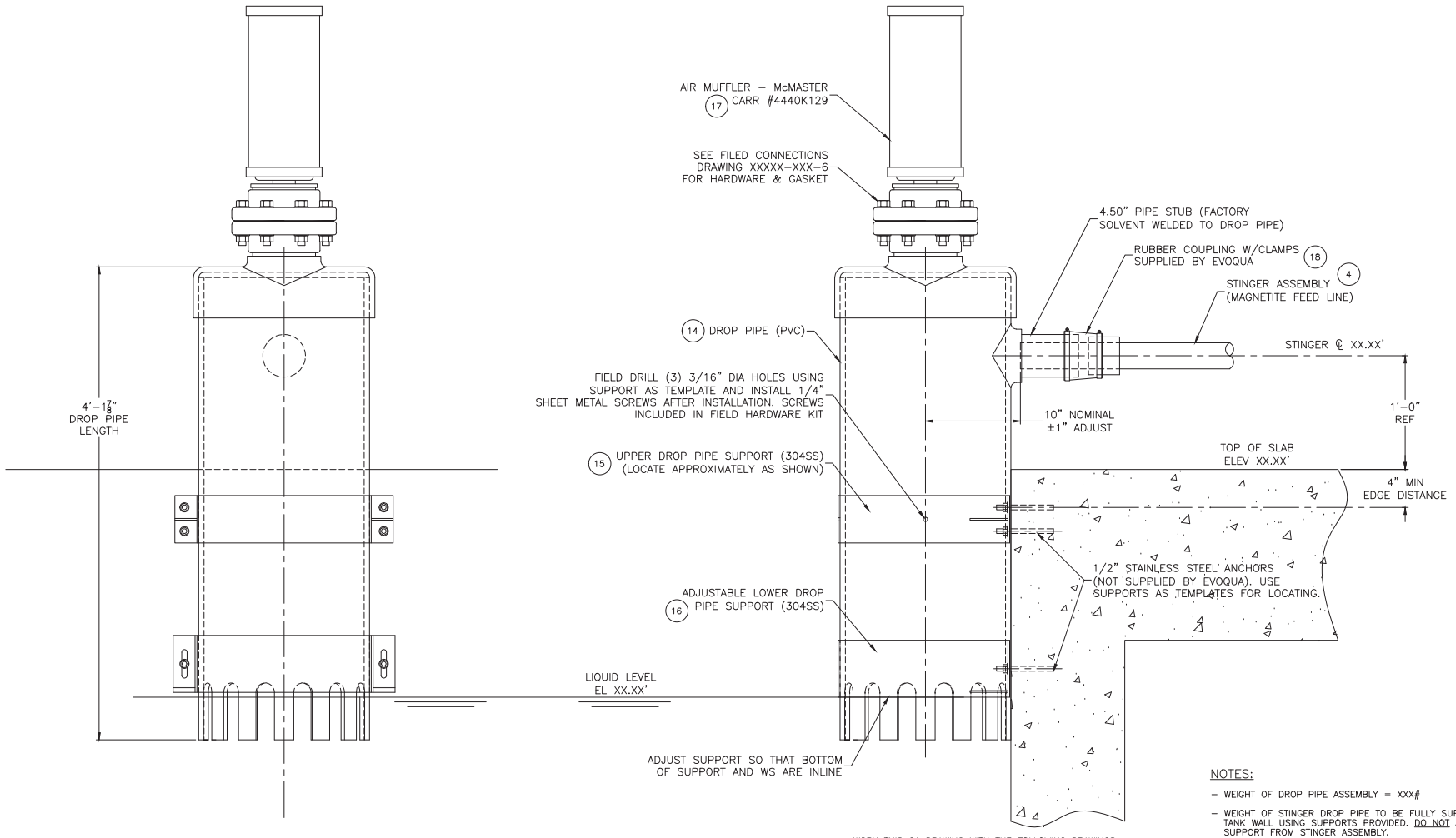
TITLE: MAG STORAGE SILO GENERAL ARRANGEMENT
FILTER GENERAL ARRANGEMENT
BIOMAG SYSTEM – 25 TON SILO

CLIENT

EVOQUA WATER TECHNOLOGIES
WAUKESHA, WI
262–547–0141

PROJECT	CODE	DRAWING	SHEET	REV
	8002A	703–1637–4	4 OF 6	1

STD: BORDER–0106–24X36D1 | INTL REF: | 01/24/2022 – 8:13 AM | BAR = 1" AT PLOT SCALE



FOR APPROVAL ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

WORK THIS GA DRAWING WITH THE FOLLOWING DRAWINGS:

703–1637–1: GENERAL VIEWS & MATERIALS LIST
703–1637–2: SILO DETAIL & SPECIFICATION
703–1637–3: HOPPER & STINGER General ARRANGEMENT
703–1637–4: FILTER GENERAL ARRANGEMENT
703–1637–6: FIELD CONNECTION INSTRUCTIONS & HARDWARE LIST

NOTES:

- WEIGHT OF DROP PIPE ASSEMBLY = XXX#
- WEIGHT OF STINGER DROP PIPE TO BE FULLY SUPPORTED BY TANK WALL USING SUPPORTS PROVIDED. DO NOT ATTEMPT TO SUPPORT FROM STINGER ASSEMBLY.
- ITEM NUMBERS NOTED CORRESPOND WITH BioMag SYSTEM BOM

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN
1	UPDATED DRAWING NUMBER, BOM ITEMS	7/24/19	TJU	TLL	AJK	190042
0	ISSUED FOR MASTER USE	4/4/18	RJF	RJF	TLL	180038

DESIGNER	FEDIE 3/28/18
CHECKER	DATE
ENGINEER	DATE
MANAGER	DATE
FILE:	
SCALE:	1:5

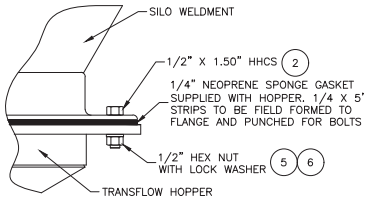
TITLE: MAG STORAGE SILO GENERAL ARRANGEMENT
DROP PIPE GENERAL ARRANGEMENT
BIOMAG SYSTEM – 25 TON SILO

CLIENT

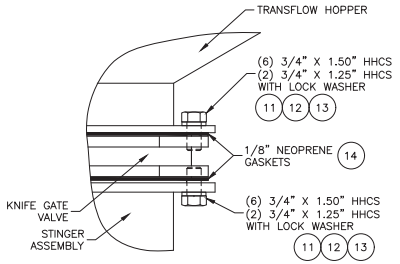
EVOQUA WATER TECHNOLOGIES
WAUKESHA, WI
262–547–0141

PROJECT	CODE	DRAWING	SHEET	REV
	8002A	703–1637–5	5 OF 6	1

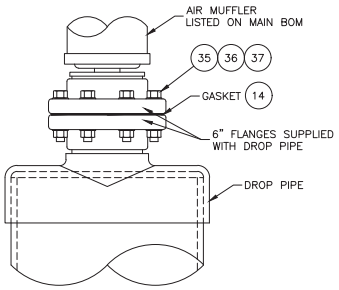
STD: BORDER–0106–24X36D1 | INTL REF: | 01/24/2022 – 8:13 AM | BAR = 1" AT PLOT SCALE



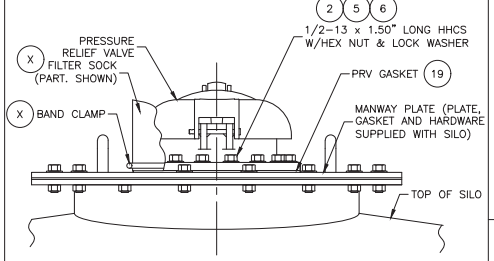
TRANSFLOW HOPPER TO SILO CONNECTION



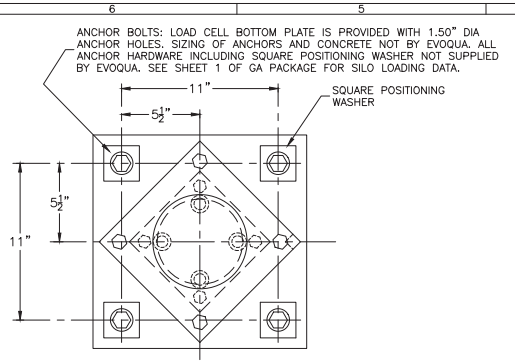
VALVE & STINGER TRANSFLOW HOPPER CONNECTION

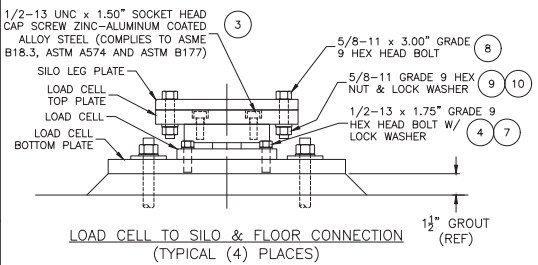


AIR MUFFLER TO DROP PIPE CONNECTION

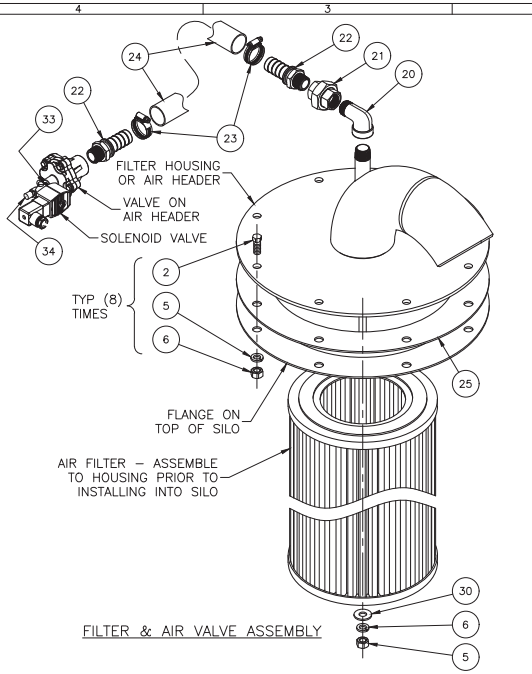


PRESSURE RELIEF VALVE TO TOP OF SILO CONNECTION

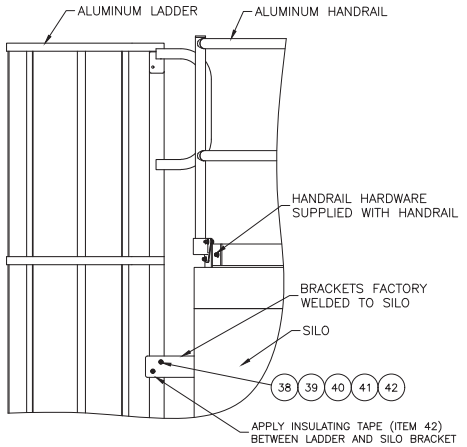




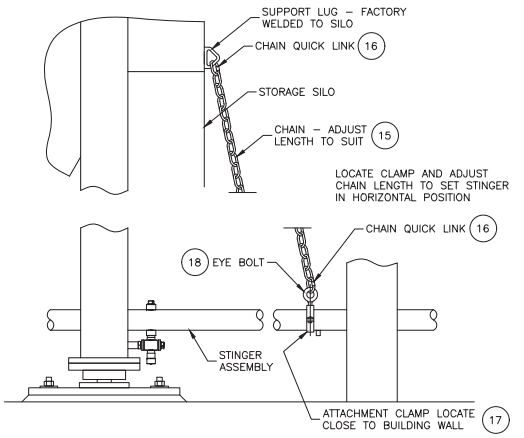
LOAD CELL TO SILO & FLOOR CONNECTION
(TYPICAL (4) PLACES)



FILTER & AIR VALVE ASSEMBLY

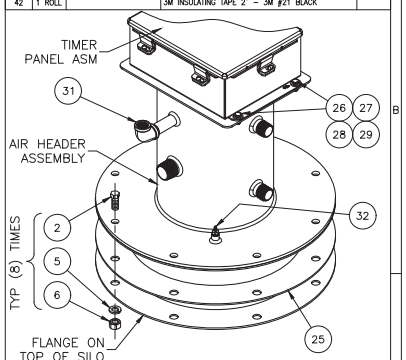


LADDER & HANDRAIL TO SILO



STINGER END SUPPORT CONNECTION

REF. SYMBOL	QUANTITY	PART NUMBER	DESCRIPTION	MATERIAL
1	15		1/4" DIA x 3/4" LONG SHEET METAL SCREWS	SS
2	100		1/2" x 1.50" LONG HEX HD CAP SCREW	SS
3	16		1/2" x 1.50" LONG SOCKET HD CAP SCREW – ZINC–ALUMINUM COATED ALLOY STEEL (McMASTER–CARR #91274A452 OR EQUAL)	
4	16		1/2" x 1.75" LONG GRADE 9 HEX HD CAP SCREW	
5	100		1/2" HEX NUT	SS
6	100		1/2" LOCK WASHER	SS
7	16		1/2" GRADE 9 LOCK WASHER	
8	16		5/8" x 3.00" LONG GRADE 9 HEX HD CAP SCREW	
9	16		5/8" GRADE 9 HEX NUT	
10	16		5/8" GRADE 9 LOCK WASHER	
11	4		3/4" x 1.25" LONG HEX HD CAP SCREW	SS
12	12		3/4" x 1.50" LONG HEX HD CAP SCREW	SS
13	16		3/4" LOCK WASHER	SS
14	3		6" NOMINAL DIA x 1/8" THICK FLANGE GASKET	NEO
15	8 FT		5/16" GRADE 120, 6600 LBS WLL, POWDER COATED CHAIN (PEWAG WINNER PRO 300 SERIES #N820 OR EQUAL)	
16	2		3–1/4" L – 11/32" STAINLESS STEEL QUICK LINK	
17	1		TWO PIECE CLAMPING HANGER FOR 2–1/2" PIPE, McMASTER–CARR 3023T29 OR EQUAL	ZINC PLATED
18	1		1/2"–13 x 55/64" MACHINERY EYE BOLT	316SS
19	1		8" API GASKET 1/8" THICK	NEO
20	4		3/4" FNPT x 3/4" MNPT STREET ELBOW	SS
21	4		3/4" THREADED UNION	SS
22	8		3/4" MNPT x 1" HOSE BARB ADAPTER	SS
23	8		HOSE CLAMP 3/4" TO 1–3/4" RANGE	SS
24	30 ft		AIR HOSE, 1" ID x 1–3/8" OD 200PSI, BLACK	
25	5		GASKET, 1/8" THICK, 17.75" OD x 12.00" ID WITH (8) 9/16" DIA HOLES EQUALLY SPACED ON 16.06" DIA BOLT CIRCLE	NEO PRENE
26	4		1/4" HEX HD CAP SCREW X 3/4" LONG	SS
27	4		1/4" HEX NUT	SS
28	4		1/4" PLAIN WASHER	SS
29	4		1/4" LOCK WASHER	SS
30	4		1/2" x 1–1/4" OD FLAT WASHER	SS
31	1		1/2" THREADED ELBOW	SS
32	1		ADAPTER, 1/8" MNPT x 1/8" BARB	SS
33	4		1/8" CLOSED NIPPLE	SS
34	4		1/8 MNPT MUFFLER, McM CARR 4402K51 OR EQUAL	304SS
35	8		3/4" HEX HD CAP SCREW X 4" LONG	SS
36	8		3/4" HEX NUT	SS
37	16		3/4" PLAIN WASHER	SS
38	18		3/8" HEX HD CAP SCREW X 1.75" LONG	SS
39	18		3/8" HEX NUT	SS
40	36		3/8" PLAIN WASHER	SS
41	18		3/8" LOCK WASHER	SS
42	1 ROLL		3M INSULATING TAPE 2" – 3M #21 BLACK	



AIR HEADER ASSEMBLY

WORK THIS GA DRAWING WITH THE FOLLOWING DRAWINGS:
703–1637–1: GENERAL VIEWS & MATERIALS LIST
703–1637–2: SILO DETAIL & SPECIFICATION
703–1637–3: HOPPER & STINGER General ARRANGEMENT
703–1637–4: FILTER GENERAL ARRANGEMENT
703–1637–5: DROP PIPE GENERAL ARRANGEMENT

FIELD CONNECTION NOTES:

- ITEM NUMBERS SHOWN ON THIS DRAWING REFER STRICTLY TO THE LIST OF COMPONENTS ON THIS DRAWING AND DO NOT RELATE TO THE MAIN BioMag BILL OF MATERIALS.
- FIELD CONNECTION HARDWARE WILL BE SHIPPED AS ITEM 28 & 69 ON THE MAIN BIOMAG BILL OF MATERIALS.
- LIKE ITEMS WILL BE PACKAGED IN A SINGLE BOX CLEARLY LABELED AS TO CONTENTS AND QUANTITY

REV	DESCRIPTION	DATE	DWN	CHKD	APVD	ECN
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DESIGNER	DATE
FEDIE	3/23/18
CHECKER	DATE
ENGINEER	DATE
MANAGER	DATE
FILE:	
SCALE:	VARIES

TITLE: MAG STORAGE SILO GENERAL ARRANGEMENT
MISC FIELD CONNECTIONS & HARDWARE LIST
BIOMAG SYSTEM

CLIENT

EVOQUA WATER TECHNOLOGIES
WAUKESHA, WI
262–547–0141

PROJECT	CODE	DRAWING	SHEET	REV
	8002A	703–1637–6	6 OF 6	1

STD: BORDER–0106–24X36D1 | INTL REF: | 01/24/2022 – 8:14 AM | BAR = 1" AT PLOT SCALE

Appendix D - MBR Info

Budget Proposal for
Dry Creek WWTP - Roseville, CA

ZeeWeed Membrane Bioreactor

Submitted To:
Anthony Elberti, PE
Woodard & Curran
980 WASHINGTON ST STE 325
DEDHAM MA 02026-6797, U.S

March 2023

Proposal Number: 542083

Submitted By:
Jason Kizer – Veolia Regional Sales Manager
Phone: (619) 994-7805
Email: *jason.kizer@veolia.com*

Table of Contents

1 Veolia Company Overview

Veolia is pleased to submit this budgetary proposal for the Technology Evaluation of a ZeeWeed Membrane Bioreactor System.

Resourcing the World.

At Veolia, we provide our customers with innovative solutions that directly support their business operations and goals. We're uniquely positioned to provide solutions in water, waste and energy that promote sustainability and the circular economy. Alongside 160 years of expertise in water, energy and waste, Veolia offers innovative solutions in the pursuit of human progress and well-being.

We're more than the world's leading provider of environmental solutions – we're dedicated to customized, cost-effective solutions that reflect best practices, environmental protection and a better quality of life.

Today, water, waste and energy can all be recovered – transforming what is discarded into a valuable resource. Veolia embraces this future by developing access to, preserving, and replenishing the world's resources.

Our mission: Resourcing the World

Today we know that our planet's natural resources are limited, and the world's demands are increasing. Veolia is Resourcing the world — helping develop access to resources, preserving available resources and replenishing them. Resourcing the world is not just about protecting the environment, but also regenerating it by developing sustainable access to resources while committing to their preservation and renewal.

Culture of Safety

Veolia's "Goal Zero" safety pledge is our commitment to strive for zero- work related injuries and illnesses and is a foundational element of our safety culture. Veolia places great importance and emphasis on the health & safety of our employees, customers, and the communities in which we conduct business. Our Goal Zero vision is part of our continual improvement philosophy regarding worker and workplace safety. Quite simply, we invest enormous amounts of time and resources to ensure our employees receive the necessary training and tools for success to perform their daily activities in a safe and compliant manner. We operate in strict compliance with all rules, regulations, and laws to meet and then exceed our commitments.

1.1 Reference installations in California

- Irvine Ranch WWTP – 11.0 MGD - 2013
- Visalia WWTP – 18.0 MGD - 2017
- Riverside WWTP – 31.0 MGD - 2016

Irvine Ranch Wastewater Treatment Facility

plant name	Irvine Ranch Wastewater Treatment Facility
owner (*location*):	Irvine Ranch Water District *(Irvine, California)*
installation type:	greenfield
project method:	design, bid, build
commissioned:	December 2013
contact information	
owner/operator contact:	Gaspar Garza - Operations Tel: 949-453-5826 Email: Garza@irwd.com
design engineer contact:	Gregorio Estrada - *HDR Engineering, Inc.* Tel: 714-730-2391 Email: gregorio.estrada@hdrinc.com
general contractor contact:	Nathaniel Johnson – *Filanc Construction* Tel: 303-325-6323 Email: njohnson@filanc.com
description of facility	
system type:	ZeeWeed MBR
feed source:	municipal wastewater (20 to 25°C)
process:	biological nutrient removal
effluent use:	surface water discharge to a reservoir for re-use
unit operations:	headworks, primary clarification, membrane filtration, high-rate clarifier, UV disinfection
process configuration:	nitrification/denitrification
membrane configuration:	8 membrane trains (L:51.5ft x W:10ft x D:12ft SWD:9-10ft) 7 cassettes per train in a single row (7 cassette spaces) 308 modules per train in 48 module cassettes, 2464 modules total
membrane type:	ZeeWeed 500D 340 ft^2 manufactured by SUEZ
aeration type:	cyclic aeration, 225 dcfm per cassette
cassette access:	aluminum covers on membrane tanks, lifting bracket for cassette removal, cassette laydown beside the membrane tanks
membrane life:	5 years to date
membrane replacement history:	no modules repaired or replaced to date
current additional services provided:	InSight-Basic

project delivery		scheduled	actual
equipment submittal dates:	1st submittal - engineering	Aug-2-08	Aug-2-08
equipment delivery dates:	2nd delivery - equipment 3rd delivery - loose ship 4th delivery - membranes	Oct-22-10 Sep-29-10 Jun-24-11	Oct-28-10 Sep-27-10 July-1-11

design & operational information	parameter	influent	effluent
influent & effluent design criteria:	BOD (mg/L) TSS (mg/L) TKN(mg/L) turbidity (NTU)	150 150 41 -	≤5 ≤5 ≤1 (summer) ≤0.2

flow & net flux:		flow (mgd)		flux (gfd)		
		design	operating	design	operating	@20°C
	ADF	10.9	10	13.01	11	11.6
	MDF	11.5	14	17.76	16	16.8

TMP range	design: 0 to 8 psi	operating: 1.1 psi
MLSS:	design: 10,000-12,000 mg/L in mem tank	operating: 8,000-9,000 mg/L in bioreactor 11,100- 13,200 mg/L in the membrane tank
plant performance:	plant meeting design objectives by performance test	
plant power consumption:	power data not available	

cleaning information	frequency		volume (gal/clean)	
maintenance clean:	design	actual	design	actual
NaOCl (200 mg/L)	2/week	2/week	5	5
citric acid (2000 mg/L)	1/week	0/week	11	-
recovery clean:	design	actual	design	actual
NaOCl (1000 mg/L)	2/year	2/year	228	220
citric acid (2000 mg/L)	2/year	0/year	108	-

Visalia Water Conservation Plant

plant name	Visalia Water Conservation Plant
owner (*location*):	City of Visalia (*Visalia, California*)
installation type:	upgrade of existing facility
project method:	design, bid, build
commissioned:	July 2016
contact information	
owner/operator contact:	Jason Rodrigues – *Plant Operator* Tel: 559-713-4671 Email: jason.rodrigues@visalia.city
design engineer contact:	Ali Ahmadi - *Parsons Environment & Infrastructure Inc.* Tel: 626-400-2553 Email: ali.ahmadi@parsons.com
general contractor contact:	Ruben Moreno Jr. - Senior Project Manager *W.M. Lyles Co.* Tel: 529-268-1540 Email: rmoreno@wmlylesco.com
description of facility	
system type:	ZeeWeed LEAPmbr
feed source:	municipal primary effluent (15 to 25°C)
process:	biological nutrient removal
effluent use:	reuse
unit operations:	influent pumping, course screens, grit removal, primary clarification, 2-mm fine screens, biological treatment, membrane filtration, anaerobic sludge digestion, sludge dewatering, gravity belt thickener, sludge disintegrator, UV disinfection
process configuration:	modified Ludzack-Ettinger (pre-anoxic, aerobic, 1 recyle)
membrane configuration:	10 membrane trains (L:76.2ft x W:9ft x D:12ft , SWD 9.1-9.8ft) 8 cassettes per train in single row (11 cassette spaces) 382 modules per train in 48-module cassettes, 3820 modules total
membrane type:	ZeeWeed 500D 370 ft^2 modules manufactured by SUEZ
aeration type:	LEAPmbr aeration 80/160 dcfm per cassette in LEAP-Lo & LEAP-Hi respectively
cassette access:	steel tank covers on membrane tanks, lifting bracket for cassette removal, cassette laydown on membrane tank covers

plant name	Visalia Water Conservation Plant
membrane life:	2.5 years to date
membrane replacement history:	no modules repaired or replaced
additional services provided:	InSight-Pro, 24/7 technical support services, 8 service visits

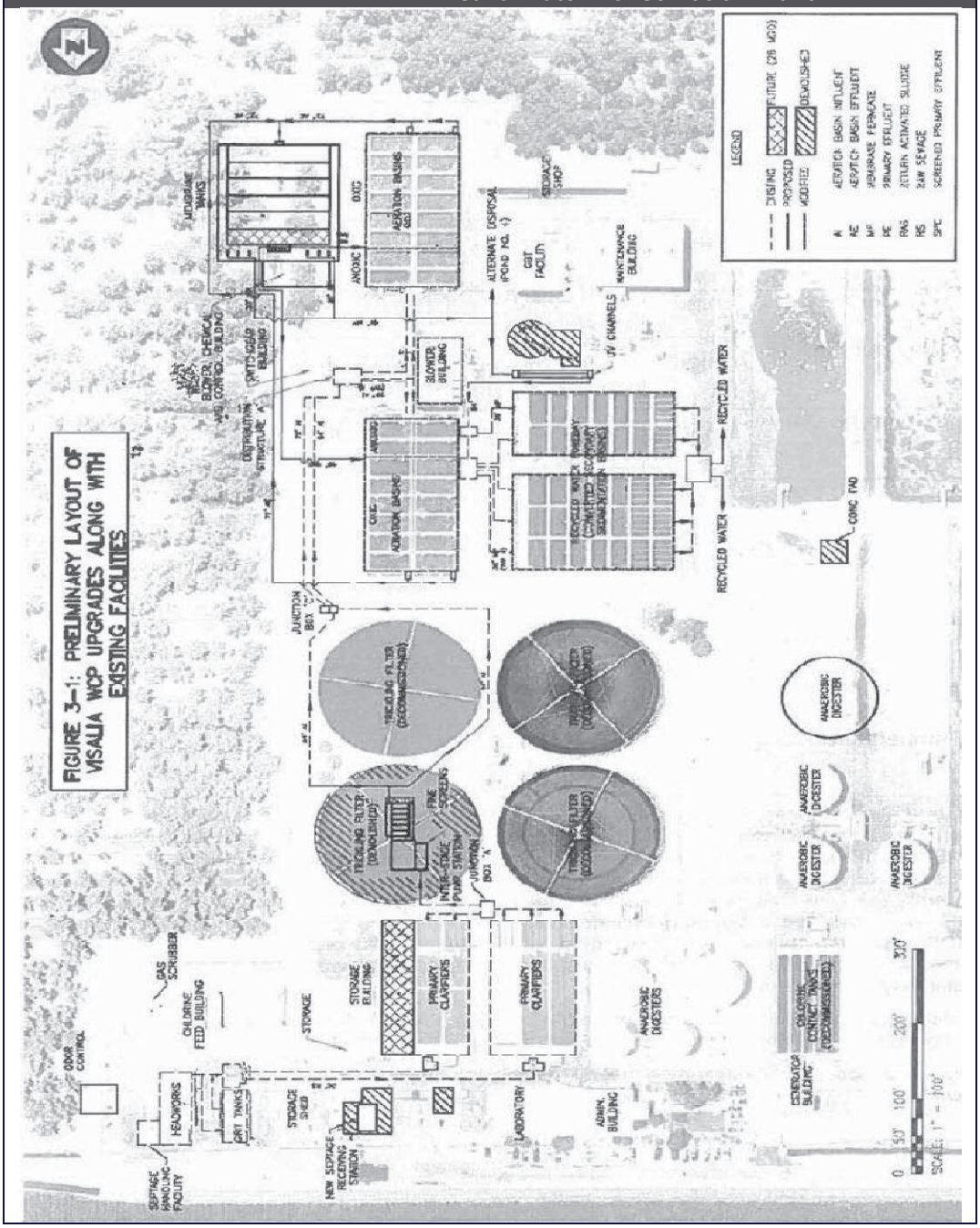
project delivery		scheduled	actual
equipment submittal dates:	1st submittal - P&IDs & cutshts	19-Jan-11	19-Jan-11
	2nd submittal - Electrical	2-Mar-11	2-Mar-11
	3rd submittal - Electrical	13-Apr-11	13-Apr-11
	final submittal	12-May-11	12-May-11
equipment delivery dates:	1st delivery – kit for headers	2-Jul-15	2-Jul-15
	2nd delivery - cassettes	2-Jul-15	2-Jul-15
	3rd delivery - control panels	4-Nov-15	4-Nov-15
	4th delivery – spare parts	2-Dec-15	2-Dec-15
	5th delivery - blowers	21-Sep-15	21-Sep-15
	6th delivery - permeate pumps	21-Sep-15	21-Sep-15
	7th delivery - backpulse pumps	8-Sep-18	8-Sep-18
	8th delivery - header pipe	21-Aug-15	21-Aug-15
	9th delivery - membranes	1-Jun-16	1-Jun-16

design & operational information	parameter	influent	effluent
influent & effluent design criteria:	BOD (mg/L)	400	≤5 for 95%
	TSS (mg/L)	500	≤2.5 for 95%
	TN	61	≤8 for 95%
	TKN(mg/L)	-	-
	NH_3-N (mg/L)	-	-
	TP (mg/L)	-	-
	turbidity (NTU)	-	≤0.2 for 95%
		-	≤0.5 for 100%

flow & net flux:		flow (mgd)		flux (gfd)		
		design	operating	design	operating	@20°C
	ADF	18	10.9	12.74	12.36	10.2
	MWF	19	-	13.44	-	-
	MMF	19	-	13.44	-	-
	MDF	28.8	-	20.38	-	-
	PHF	36	17.8	25.47	30.6	25.5
TMP range	design: 0 to 8 psi			operating: 0.3 to 7.4 psi		
MLSS:	design: 8,000-12,000 mg/L in mem tank			operating: 6,500-7,500 mg/L in bioreactor 8,000-10,000 mg/L in mem tank		
plant performance:	plant meeting design objectives by performance test					
power consumption:	348 kWh/MG - (for the membrane blowers)					

cleaning information	frequency		volume (gal/clean)	
maintenance clean:	design	actual	design	actual
NaOCl (200 mg/L)	1/week	1/week	9.15	10-15
citric acid (2000 mg/L)	0/week	-	21.5	-
recovery clean:	design	actual	design	actual
NaOCl (1000 mg/L)	4/year	4/year	300	220-240
citric acid (2000 mg/L)	1/year	1/year	141	150-160

PFD	Visalia Water Conservation Plant



Riverside Regional Water Quality Control Plant

plant name	Riverside Regional Water Quality Control Plant
owner (*location*):	City of Riverside (*Riverside, California*)
installation type:	retrofit/expansion
project method:	design, bid, build
commissioned:	March 2016
contact information	
owner/operator contact:	Edward Filadelfia - Operations Manager *City of Riverside* Tel: 951-533-9001 Email: efiladelfia@riversideca.gov
design engineer contact:	John L. Corbin - *Black & Veatch* Tel: 602-381-4427 Email: corbinjl@bv.com
general contractor contact:	Jerry Newman - Construction Manager *PCL Construction* Tel: 602-799-4650 Email: jnewman@pcl.com
description of facility	
system type:	ZeeWeed LEAPmbr
feed source:	municipal wastewater (20 to 30°C)
process:	biological nutrient removal
effluent use:	surface water discharge to Santa Ana River
unit operations:	influent pumping, bar screens, vortexing grit removal, primary clarification, fine screens, biological treatment, membrane filtration, digestion, sludge thickening, chlorine disinfection & dechlorination
process configuration:	4-stage Bardenpho (pre-anoxic, aerobic post-anoxic, 1 recycle)
membrane configuration:	8 membrane trains (L:73.2ft x W:19.4ft x D:12.8ft) 14 cassettes per train in 2 rows (space for 20 cassettes) 672 modules per train in 48-module cassettes, 5,376 modules total
membrane type:	ZeeWeed 500D 370 ft^2 modules manufactured by SUEZ
aeration type:	LEAPmbr aeration 80/160 dcfm per cassette in LEAP-Lo & LEAP-Hi respectively
cassette access:	Aluminum covers on membrane tanks, lifting bracket for cassette removal, cassette laydown beside the membrane tanks
membrane life:	2.7 years to date

plant name	Riverside Regional Water Quality Control Plant
membrane replacement history:	no modules replaced or repaired
additional services provided:	InSight-Pro, 24/7 technical support services, 8 service visits

project delivery		scheduled	actual
equipment submittal dates:	1st submittal - P&IDs & BOMs 2nd submittal - GAs & cutsheets 3rd submittal - control/electrical final submittal - design submittal	21-Dec-10 4-Mar-11 30-Jun-11 11-Nov-11	21-Dec-10 4-Mar-11 30-Jun-11 11-Nov-11
equipment delivery dates:	1st delivery - stage 1 spares 2nd delivery - kits, electric, spares 3rd delivery - DS-hardware	8-May-14 4-Jun-15 10-Apr-15	8-May-14 4-Jun-15 10-Apr-15

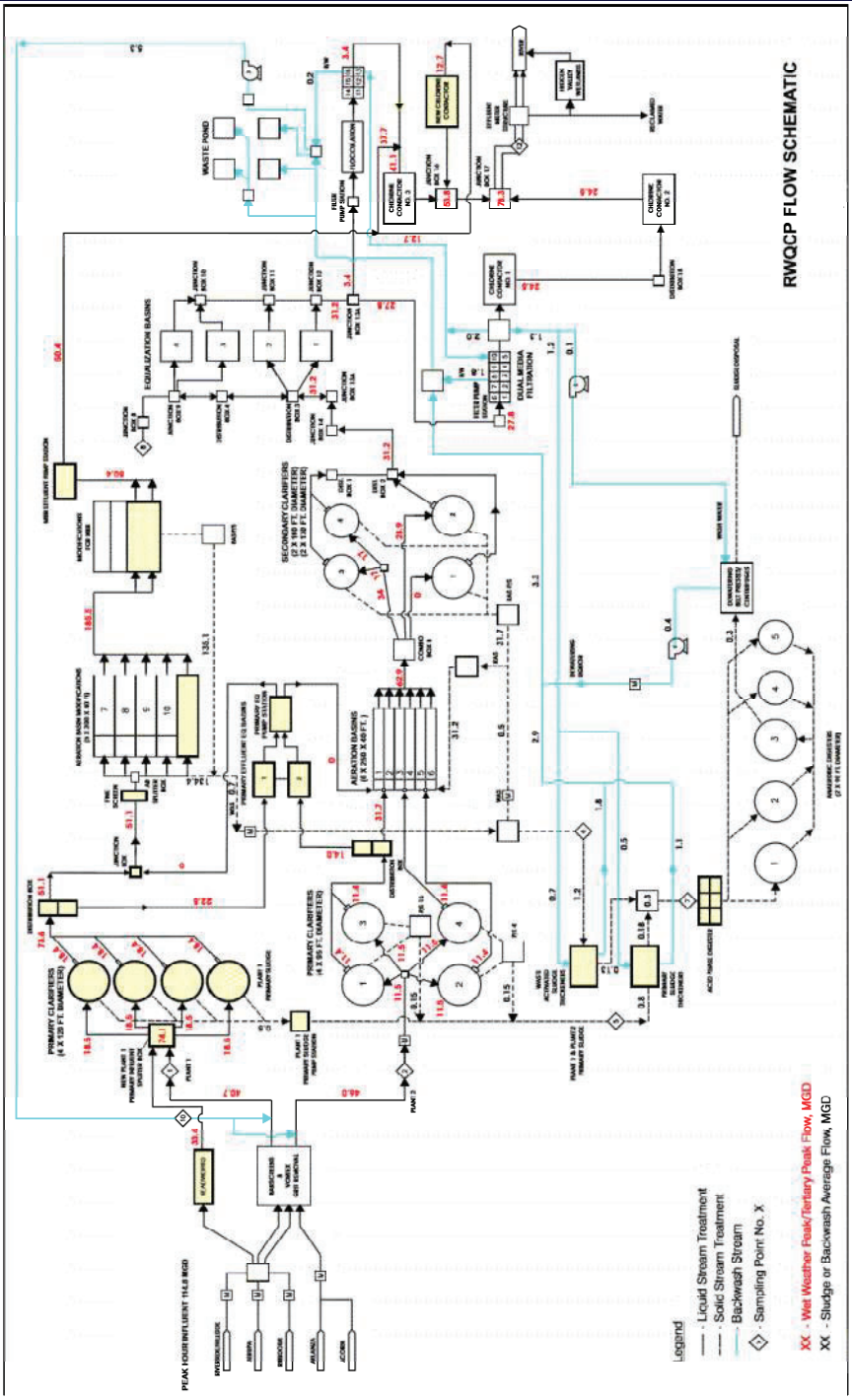
design & operational information	parameter	influent	effluent
influent & effluent design criteria:	BOD (mg/L) TSS (mg/L) NH_3-N(mg/L) turbidity (NTU)	257 248 30.1 - -	- - - ≤0.2 for 95% ≤0.5 for 100%

flow & net flux:		flow (mgd)		flux (gfd)		
		design	operating	design	operating	@20°C
	ADF	26.0	18.0	14.4	13.3	11.4
	MMF	30.7	-	24.7	-	-
	MWF	39.0	-	19.7	-	-
	MDF	39.0	37.3	22.5	30.5	20.3

TMP range	design: 0 to 8 psi	operating: 0.1 to 0.2.5 psi
MLSS:	design: 8,000-12,000 mg/L in mem tank	operating: 7,000 mg/L in bioreactor 9,500 mg/L in the RAS
plant performance:	plant meeting design objectives by performance test	
power consumption:	power data not available	

cleaning information	frequency		volume (gal/clean)	
maintenance clean:	design	actual	design	actual
NaOCl (200 mg/L)	2/week	2/week	15.5	~16
citric acid (2000 mg/L)	1/week	1/week	30.0	~30
recovery clean:	design	actual	design	actual
NaOCl (1000 mg/L)	2/year	2/year	648	~650
citric acid (2000 mg/L)	2/year	2/year	251	~250

PFD	Riverside Regional Water Quality Control Plant



2 Basis of Design

The basis of design used for the ZeeWeed Membrane Bioreactor System are highlighted herein.

Influent Design Flows

Flow Conditions[1]	Phase I	Phase II	Units
Average Dry Weather Flow (ADWF)	14.7	18.4	mgd
Average Annual Flow (AA)	17.7	21.8	mgd
Peak Month Flow (PMF)	27.6	34.4	mgd
Peak Day Wet Weather Flow (PDWWF)	40.2	50.2	mgd
Peak Hour Wet Weather Flow (PHWWF)	51.4	55.1	mgd
Maximum flow with one train offline for maintenance or cleaning (for less than a month)	17.7	21.8	mgd

Note 1: any flow conditions that exceed the above-noted flow limits must be equalized prior to treatment in the ZeeWeed membrane bioreactor system.

ADWF, AA – the average flow rate occurring over a 24-hour period based on annual flow rate data.

PMF – the average flow rate occurring over a 24-hour period during the 30-day period with the highest flow based on annual flow rate data

PDWWF – the maximum flow rate averaged over a 24-hour period occurring within annual flow rate data.

PHWWF – the maximum flow rate sustained less than 2-hour period based on annual flow rate data.

2.1 Influent Quality

The system was designed using the primary effluent parameters as the influent quality into the MBR system. The primary effluent quality is as follows:

Primary Effluent	Units	Design Conditions
$CBOD_5$	mg/L	205
TSS	mg/L	154
NH_4-N	mg/L	34
pH[1]	mg/L as $CaCO_3$	250

Note 1: Assumed

Below are the ultrafiltration system influent characteristics that were used for this design; any deviation from the values below may impact the membrane system design.

Acceptable Mixed Liquor Properties Entering into Membrane Tanks

Properties of Mixed Liquor Entering Membrane Tanks	Acceptable Operating Range
temperature (°C)	18
MLSS concentration (mg/L) [1]	≤ 10,000

pH (SU)	6.5 – 7.5
soluble $cBOD_5$ concentration (mg/L)	≤ 5
NH_3-N concentration (mg/L)	≤ 1.0
colloidal TOC (cTOC) concentration (mg/L) [2]	≤ 10
soluble alkalinity (mg/L as $CaCO_3$)	50 – 150
time to filter (TTF) (seconds) [3]	≤ 200
material greater than 2 mm in size (mg/L) [4]	≤ 1

note 1: Membrane tank MLSS concentration of up to 12,000 mg/L is permissible during MDF and PHF events only. Membrane tanks MLSS concentration to be ≤10,000 mg/L during all other flow conditions.

note 2: Colloidal TOC (cTOC) is the difference between the TOC measured in the filtrate passing through a 1.5-µm filter paper and the TOC measured in the ZeeWeed membrane permeate.

note 3: Per seller's standard time to filter (TTF) procedure (available upon request).

note 4: Per seller's standard sieve test procedure (available upon request).

note 5: Chemicals that are not compatible with the ZeeWeed PVDF membrane are not permitted in the membrane tanks.

2.2 Effluent Quality

The following performance parameters are expected upon equipment startup and once the biological system has stabilized.

Effluent	Units	Effluent Requirements
$CBOD_5$	mg/L	5
TSS	mg/L	5
TN	mg/L	10
turbidity	NTU	≤ 0.2 NTU 95% of the time within a 24-hr period ≤ 0.5 NTU at any time

2.3 Influent Variability

Influent wastewater flows or loads in excess of the design criteria defined above must be equalized prior to entering the membrane tanks. In the event that the influent exceeds the specifications used in engineering this proposal, or the source of influent changes, the ability of the treatment system to produce the designed treated water quality and/or quantity may be impaired. Buyer may choose to continue to operate the system but assumes the risk of damage to the system and/or additional costs due to increased membrane cleaning frequency, potential for biological upset and/or increased consumables usage.

3 ZeeWeed Membrane Bioreactor (MBR)

The membrane bioreactor (MBR) process consists of a suspended growth biological reactor integrated with a membrane filtration system, using the ZeeWeed hollow fiber ultrafiltration membrane. ZeeWeed ultrafiltration membranes are directly immersed in mixed liquor. Using a permeate pump, a vacuum is applied to a header pipe connected to the membranes drawing treated water through the hollow fiber membranes. Air is introduced below the bottom of the membrane modules, producing turbulence that scours the outer surface of the hollow fibers.

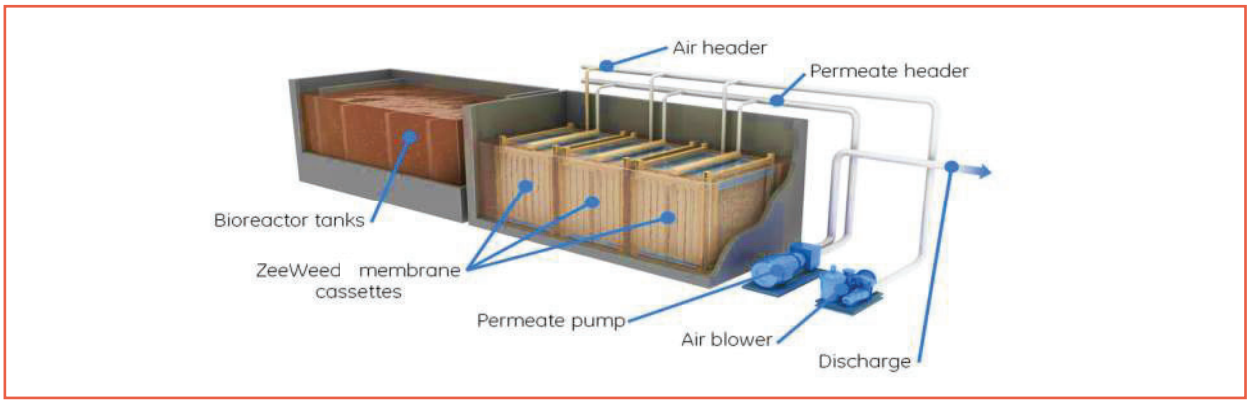


Figure 1: Membrane Bioreactor

LEAPmbr Aeration Technology

Our systems have been optimized using several innovations including the latest LEAPmbr aeration technology and the ZeeWeed 500 module with increased membrane surface area. Together these lead to an overall increase in productivity through improved design fluxes, and an optimized membrane tank.

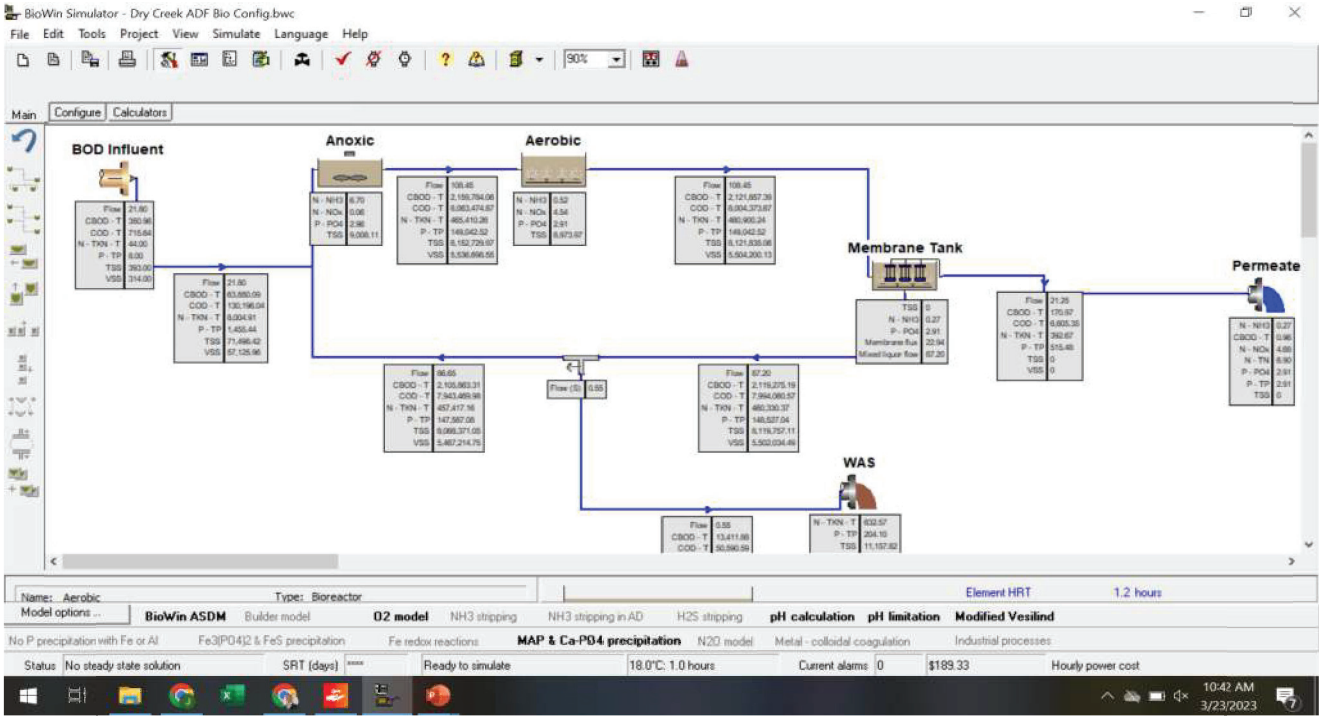
LEAPmbr aeration was introduced in 2011 and has since proven itself as a substantial energy-savings technology, becoming Veolia's standard for MBRs. LEAPmbr aeration systems use factory installed LEAP aerators which are integrated into the base of each cassette. There are no moving parts in the LEAPmbr aerators. The membrane blowers continuously introduce air into the LEAPmbr aerator chambers below the membrane module. When sufficient volume has built up, the air releases through a coarse-bubble diffuser that generates large mushroom-cap bubbles. These large bubbles have a fast-rising velocity and create wakes that are more effective at removing solids than the smaller bubbles produced by cyclic/sequential aeration. LEAPmbr aeration has decreased the power requirements for air scouring by 30%, by increasing the scouring energy through a diffuser that produces higher scouring intensity

ZeeWeed 500 Series Membrane

At the core of the ZeeWeed MBR system is the ZeeWeed 500 Series reinforced hollow-fiber membrane—the industry's leading choice in membranes for long-life and high performance in the harsh, high-solids environment of a bioreactor. ZeeWeed fibers are reinforced with an internal support to which the membrane is bonded. As a result of this – the ZeeWeed fiber has a tensile strength greater than 135 lbs., greatly exceeding other non-reinforced fibers in the industry. The rugged fibers are held in modular cassettes that are immersed directly into the mixed liquor. Each Permeation is outside-in, which minimizes energy demands and prevents particles from fouling and plugging the inside of the membrane fiber. Outside-in permeation also simplifies membrane cleaning and maintenance, utilizing a stream of coarse bubbles which rise vertically along the length of the membrane to scour rejected solids away from the membrane surface. Periodically, the permeate flow can be automatically reversed to backflush solids that have accumulated on the membrane surface.

3.1 Biological System Design

As part of the ZeeWeed MBR system design, a model of the WWTP was created in BioWin 6.2 process simulator as shown below with unit system in mgd and concentrations in mg/L. A methanol dosing of 100gpd was also incorporated. The model was used to calibrate and validate the design under steady-state conditions. The BioWin model can be used in the engineering design to refine the process under various operating conditions.



Biological Design Parameters	Value	Unit
Flow basis for biological design	34.4	mgd
Total pre-anoxic tank working volume[1]	2,016,000	gal
Total aerobic working volume (excluding membranes)	13,000,000	gal
Total design HRT	10.7	hours
Aerobic design SRT	11	days
Total design SRT	12.7	days
Waste sludge removal (based on MMF and 10 g/L)	950,000	gpd
Design MLSS concentration in bioreactor	8,000	mg/L
OTR	135,216	lb /O_2/day
Design liquid depth in bioreactor	13	ft

Note1: Existing tank volume

The BioWin model indicates the requirement of an aerobic volume of ~50% more volume than the existing tankage (i.e., 6,544,000 gal).

3.2 Membrane System Design

Membrane Design Parameters	FY44-45	Projected Buildout
Number of membrane trains	6	6
Number of cassette spaces per train	10	10
Number of cassettes installed per train	9	10
Design configuration per train	8 x (64/64) + 1 x (36/64) + 1 Spare Space	8 x (64/64) + 2 x (40/64)
Total number of cassettes installed per plant	54	60
Type of cassette	ZeeWeed 500EV, 530 ft^2	ZeeWeed 500EV, 530 ft^2
Total number of modules installed per train	548	592
Total number of modules installed per plant	3,288	3,552
Spare space	14.4%	7.5%
Membrane tank internal dimensions (L x W x SWD)	68.3’ x 9’ x 13’	68.3’ x 9’ x 13’

Note 1: Tank dimensions and volumes are preliminary only.

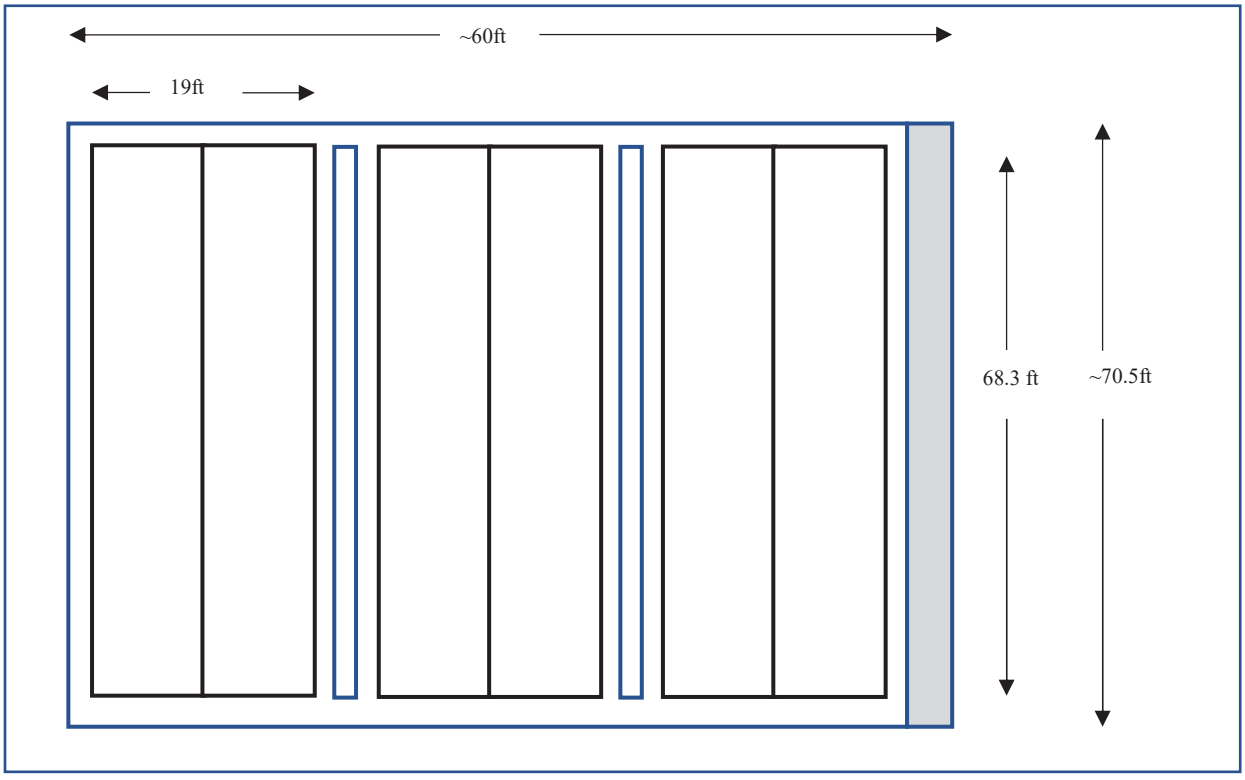
Note 2: The ultrafiltration system is designed for installation within concrete tanks supplied by buyer.

Note 3: Excess flow should be equalized using additional tankage

Note 4: 2mm fine screens (by Others) are ***required*** for the successful operation of a ZeeWeed MBR system.

Membrane tank design

The ZeeWeed membrane system design layout is shown below. Membrane modules are assembled into cassettes and cassettes are installed in concrete tanks supplied by buyer.



4 Scope of Supply by Veolia

Veolia's scope of supply for a ZeeWeed Membrane Bioreactor system is as follows. Please note:

- Electrical rating on all motors is 460V / 3ph / 60 Hz. Single phase power requirement is 120V.
- Proposed equipment and instrumentation to be installed in a NFPA 820 non classified area.
- All devices will be Veolia standard devices supplied to Veolia specifications.

FY44-45	Projected Buildout	Description
The MBR system will consist of the following equipment:		
ZeeWeed Membranes		
6 lot	-	membrane tank cassette mounting assemblies
54	6	ZeeWeed 500EV membrane cassettes
3,288	264	ZeeWeed 500EV membrane modules
6 sets	-	permeate collection & air distribution header piping
6	-	membrane tank level transmitter (one per train)
Ejector & Associated Equipment		
1	-	air ejector assembly w/ air supply assembly
Master Control Panel		
1	-	master control panel w/ Allen Bradley Control Logix PLC and Panelview plus 7 HMI and Flexlogic I/O
1	-	AB Control Logix PLC CPU Card - Spare
Process Pump & Associated Equipment		
6	-	positive displacement, reversible lobe process pump
6	-	required pump isolation valves and check valves
6 sets	-	pressure transmitter, pressure gauge, flow meter
6 sets	-	chemical injection ports and valves
6	-	integrity test air injection ports with isolation valves
6	-	Hach TU5300 turbidimeter (one per train) - includes isolation valves, throttle valve and backplate.
Backpulse System		
incl	-	process pumps will also provide backpulse duty
1	-	flow through backpulse water storage tank, with tank level control and associated valves Volume:10,000 Gallon
Membrane Air Scour Blowers		
6+1	-	membrane air scour blowers - includes isolation valves, flow switches, pressure gauges and acoustical enclosures

FY44-45	Projected Buildout	Description
Membrane Cleaning Systems		
1+1	-	sodium hypochlorite chemical feed system - includes dosing pump and associated valving.
1+1	-	citric acid chemical feed system - includes dosing pump and associated valving
Miscellaneous		
1+1	-	air compressor for pneumatic valve operation and refrigerated air drier
1	-	Integrity test regulation system, low pressure, precision relieving regulator
1	-	Router & network switch for remote monitor system
General		
included	included	P&IDs and equipment general arrangement and layout drawings for Veolia supplied equipment
included	included	operating training
included	included	operating & maintenance manuals
included	included	field service and start-up assistance - 40 days support over 3 site visits from Veolia field-service personnel for commissioning, plant start-up and operator training
included	included	InSight Pro – Process consulting service– 1 year
included	included	24/7 emergency phone support – 1 year
included	included	equipment mechanical warranty - 1 year or 18 months from shipment
included	included	membrane warranty–10 year (2-year cliff and 8 year prorated)

Note 1: additional man-hours will be billed separately from the proposed system capital cost at an additional rate plus living and traveling expenses. Detailed Veolia service rates are available upon request.

Note 2: To receive complete 24/7 Emergency Telephone Technical Support Service and to allow for InSight Monitor Service, a suitable secure remote internet connection, by buyer, is required.

5 Buyer Scope of Supply

The following items are for supply by buyer and will include but are not limited to:

- Overall plant design responsibility
- Review and approval of design parameters related to the MBR Process.
- Review and approval of Veolia-supplied equipment drawings and specifications
- Detail drawings of all termination points where Veolia equipment or materials tie into equipment or materials supplied by buyer
- Design, supply, and installation of lifting devices including overhead traveling bridge crane and/or monorail able to lift 4,535 kg (10,000 lb) for membrane removal, lifting davits c/w a hoist, guide rails for submersible mixers and pumps etc.
- Civil works, provision of main plant tank structure, buildings, equipment foundation pads etc. including but not limited to:
  - Common channels, housekeeping pads, equipment access platforms, walkways, handrails, stairs etc.
  - All process tankage including equalization tank, bioreactor tank, membrane tank, treated water storage tank, etc., c/w tank covers or grating as required.
  - All chemical storage tanks, day tanks, and secondary containments
- All biological process equipment relating to the MBR system
- HVAC equipment design, specifications, and installation (where applicable)
- UPS, power conditioner, emergency power supply and specification (where applicable)
- 2-mm Pretreatment fine screens
- VFDs and MCC for all Veolia supplied equipment
- Plant SCADA system
- Process & utilities piping, pipe supports, hangers, valves, etc. including but not limited to:
  - Piping, pipe supports and valves between Veolia-supplied equipment and other plant process equipment
  - Piping between any loose-supplied Veolia equipment
  - Process tank aeration system air piping, equalization tank system piping, etc.
  - Interconnecting piping between Veolia-supplied skids and tanks (as applicable)
- Electrical wiring, conduit and other appurtenances required to provide power connections as required from the electrical power source to the Veolia control panel and from the control panel to any electrical equipment, pump motors and instruments external to the Veolia-supplied enclosure
- Supply and installation of suitable, secure remote internet connection for 24/7 emergency telephone technical support service and InSight remote monitoring & diagnostics service
- Design, supply and installation of equipment anchor bolts and fasteners for Veolia supplied equipment. All seismic structural analysis and anchor bolt sizing

- Receiving (confirmation versus packing list), unloading and safe storage of Veolia-supplied equipment at site until ready for installation
- Installation on site of all Veolia supplied skids and loose-shipped equipment
- Alignment of rotating equipment
- Raw materials, chemicals, and utilities during equipment start-up and operation
- Disposal of initial start-up wastewater and associated chemicals
- Supply of seed sludge for biological process start-up purposes
- Laboratory services, operating and maintenance personnel during equipment checkout, start-up, and operation
- Touch up primer and finish paint surfaces on equipment as required at the completion of the project
- Weather protection as required for all Veolia-supplied equipment. Skids and electrical panels are designed for indoor operation and will need shelter from the elements
- All permits

6 Typical list of Vendors and lead time

Equipment	Vendor	Lead time
Membranes[1]	Veolia	52 weeks
Membrane blowers	Aerzen/Sulzer	20-24 weeks
Process pumps	Boerger	36-40 weeks
RAS pumps	Flowserve/Sulzer	36-40 weeks
chemical dosing pumps	Prominent	12-14 weeks
control panel	Allen bradley	32-34 weeks
air compressors	Gardner Denver	22-24 weeks

note 1: If membranes are required on site before the procurement duration allows, they can be released for procurement ahead of the other major equipment.

7 Commercial

7.1 Pricing

Pricing for the proposed equipment and services is summarized in the table below. All pricing is based on the design operating conditions and influent characteristics detailed in section 1. The pricing herein is for budgetary purposes only and does not constitute an offer of sale. No sales, consumer use or other similar taxes or duties are included in the pricing below.

Option 1: Price for all equipment & service for FY44-45	$17,480,000 USD
Option 2: Price for additional equipment & service for Projected Buildout	$1,399,200 USD

7.2 Equipment Shipment and Delivery

Equipment shipment is estimated below. The buyer and seller will arrange a kick-off meeting after contract acceptance to develop a firm shipment schedule.

Typical Drawing Submission and Equipment Shipment Schedule

Deliverables		8-12 weeks	2-3 weeks	46-52 weeks		2 weeks
Acceptance of PO						
Submission of drawings						
Drawings approval						
Equipment manufacturing						
Equipment shipment						
Plant operations manuals						

The delivery schedule is presented based on current workload backlogs and production capacity. This estimated delivery schedule assumes no more than 2 weeks for buyer review of submittal drawings. Any delays in buyer approvals or requested changes may result in additional charges and/or a delay to the schedule.

7.3 Freight Terms

The following freight terms used are defined by INCOTERMS 2020.

All pricing is CIP to project site.

7.4 Terms and Conditions of Sale

This proposal has been prepared and is submitted based on the seller's standard terms and conditions of sale.

Appendix E - Cost Estimate

Near Term Improvements
Cost Estimate

TABLE 1
ROSEVILLE DRY CREEK WWTP - INTERIM IMPROVEMENTS
PRELIMINARY COST ESTIMATE

		Description	Units	Quantity	Unit Cost	Tot Cost	
I	**Equipment Procurement**						
1.000	**MLE Specific Process Equipment**						
1.001	Aerobic Invent Mixers	Hyperclassic Mixer/Aerators w/o walkways	EA	6	$100,000	$600,000	
1.002	Blowers	Multistage Centrifugals	LS	1	$874,330	$874,330	
1.003	Control Valves	Actutated Butterfly Valves	EA	6	$10,000	$60,000	
1.004	Air Flow Meters	Thermal Mass Flow Meters	EA	6	$20,000	$120,000	
1.005	Diffuser Modifications	Reduce diffusers in last aerobic zone	EA	4	$100,000	$400,000	
1.006							
1.007							
1.008							
1.009							
1.100	**Equipment Subtotal**						$ 2,054,330
1.200	**Equipment Installation**		LS	1	40%	$821,732	$ 821,732
		Total Equipment Procurement Cost					**$2,876,062**
II	**Construction**						
2.000	**MLE Specific Civil/Structural**						
2.001	Modifications to existing Soluble Carbon Feed System		LS	1	$25,000	$25,000	
2.002							
2.003							
2.004							
2.005							
2.006							
2.007							
2.008							
2.009							
2.010							
2.011	Miscellaneous Metals	ladders, platforms, railings	LS	1	$50,000	$50,000	
2.100	**Common Process Civil/Structural**						
2.101							
2.102							
2.103							
2.104							
2.105							
2.106							
2.107							
2.200		**Civil/Structural Sub Total**					**$75,000**
3.000	**MLE Specific Process Mechanical (IMLR and Aeration Piping)**						
3.001	New Piping & Valving and Installation		%	40%	$ 2,054,330	$ 821,732	
3.002	Process Mechanical Allowance (%)		%	25%	$ 2,129,330	$ 532,333	
3.100	**Common Process Mechanical**						
3.101	Cooling Water Modifications		LS	1	$ 3,158,000	$ 3,158,000	
3.102							
3.200		**Mechanical Sub Total**					**$4,512,065**
4.000	**Electrical / I&C**						
							2,951,062
4.001	Electrial and I&C Costs	Percent of Total Project	%	15%	$2,951,062	$442,659	
4.002	Electrical Allowance	To account for additional generation and transformer capacity	1	LS	$500,000	$500,000	
4.100		**Electrical / I&C Sub Total**					**$942,659**
5.000	**Summary Construction Cost**						
5.100	Total Direct Construction Cost						5,529,724
5.200	General Conditions	Craft supervision and misc matl - inc above	%	10%	$5,529,724	$552,972	
5.300	Taxes (3)	Not included in estimate	%	0%	$8,405,786	$0	
5.400	Contractors Overhead		%	10%	$5,529,724	$552,972	
5.500	Contractors Profit		%	10%	$5,529,724	$552,972	
5.500	Sludge procurement shipping		lot	100%	$40,000	$40,000	
		Other Sub Total					$1,698,917
		Total Construction Cost					**$ 7,228,641**
III	**Services**						
6.000	**CM /Eng/ Procurement**						
6.100	Detailed Eng/ Design	Prepare Const Design Package	%	10.0%	$10,104,703	$1,010,470	
6.200	H.O. Services during Const	Engineering Services During Construction	%	5.0%	$10,104,703	$505,235	
6.300	Construction Management	Full Time CM	%	4.0%	$10,104,703	$404,188	CM included in
6.400	Permitting	Allowance for bldg. and environmental permits	%	1.0%	$10,104,703	$101,047	
		Total Services Cost					**$ 2,020,941**
		Project Sub-Total					12,125,644
		Contingency	%	30%	$12,125,644		3,637,693
		TOTAL PROJECT COST					**$ 15,763,337**

MLE (20 Year Build Out)
Cost Estimate

TABLE 1
ROSEVILLE DRY CREEK WWTP - ALTERNATIVE 1: MLE
PRELIMINARY COST ESTIMATE

		Description	Units	Quantity	Unit Cost	Tot Cost		FY44-45 Cost
I	**Equipment Procurement**							
1.000	**MLE Specific Process Equipment**							
1.001	Anoxic Tank Mixers		EA	48	$25,000	$1,200,000		$600,000
1.002	Aerobic Invent Mixers	Hyperclassic Mixer/Aerators w/ walkways	EA	36	$142,500	$5,130,000		$2,565,000
1.003	IMLR Pumps	Flygt NP 3202.095	EA	12	$56,056	$672,672		$ 112,112.00
1.004	Blowers	Multistage Centrifugals	LS	1	$1,510,206	$1,510,206		$ 755,103.18
1.005	Control Valves	Actutated Butterfly Valves	EA	36	$10,000	$360,000		$ 180,000.00
1.006	Air Flow Meters	Thermal Mass Flow Meters	EA	36	$20,000	$720,000		$ 360,000.00
1.007	Slide Gates	Stainless Steel Downward Opening Weir Gates	EA	12	$50,000	$600,000		$ 300,000.00
1.008	85' Diameter Clarifiers	Clearstream Inlet Dispersion Well & Density Current Baffles	EA	2	$475,000	$950,000		
1.009	125' Diameter Clarifiers	Clearstream Inlet Dispersion Well & Density Current Baffles	EA	4	$734,000	$2,936,000		$ 1,468,000.00
1.010	RAS Pumps for 4 - 85' Diameter	Dry Pit Submersibles, Vertical Arrangement 2,100 GPM, 25 HP	EA	8	$30,000	$240,000		
1.011	RAS Pumps for 4 - 125' Diameter	Dry Pit Submersibles, Vertical Arrangement, 4,400 GPM, 25 HP	EA	6	$40,000	$240,000		$ 120,000.00
1.100	**Common Process Equipment**							
1.101	Raw Sewage Pumps	Replace 5 existing pumps with larger pumps	EA	6	$280,000	$1,680,000		$ -
1.102	Grit Pumps	Match existing system	EA	2	$50,000	$100,000		$ -
1.103	Grit Blower	Match existing system	EA	1	$30,000	$30,000		$ -
1.104	Grit Classifier	Match existing system	EA	1	$150,000	$150,000		$ -
1.105	Filters	4 Additional Filtration Systems	LS	1	$5,582,250	$5,582,250		$ 2,791,125.00
1.106	UV For Filter Media Effluent	3 Channels 9 Banks/Channel	LS	1	$3,700,000	$3,700,000		$ 1,850,000.00
1.107	Gravity Belt Thickener	1 Additional GBT Equipment	LS	1	$ 300,000	$ 300,000		$ -
1.108	Digester Equipment	1 Additional Anaerobic Digester Equipment	LS	1	$ 500,000	$ 500,000		$ -
1.200	**Equipment Subtotal**						$ 26,601,128	$ 11,101,340
1.300	**Equipment Installation**		LS	1	40%	$10,640,451	$ 10,640,451	$ 4,440,536
		Total Equipment Procurement Cost					**$37,241,580**	**$ 15,541,876**
II	**Construction**							
2.000	**MLE Specific Civil/Structural**							
2.001	Excavation	Excavation Items - excavate and dispose of excess material	cy	36112	$25	$902,812		$451,406
2.002	Backfill	backfill and compact structural fill	cy	9084	$30	$272,523		$136,261
2.003	Grading	finish grading	sf	2500	$4	$10,000		$5,000
2.004	Loam and seed	clean up site	sf	500	$2	$1,000		$500
2.005	Paving	Paving for walk	sf	0	$6	$0		$0
2.006	Concrete Slabs	4,000 psi reinforced concrete	CYD	3219	$1,100	$3,540,877		$1,770,438
2.007	Concrete Walls	4,000 psi reinforced concrete	CYD	3204	$1,500	$4,806,653		$2,403,327
2.008	Elevated Concrete Slabs	4,000 psi reinforced concrete	CYD	443	$1,600	$708,307		$354,153
2.009	AB 900-1200 Influent Splitter Box	Concrete Walls - New	LS	1	$200,000	$200,000		$100,000
2.010	New Final Clarifier Splitter Box	Concrete Walls - Modify Existing	LS	1	$500,000	$500,000		$250,000
2.011	Miscellaneous Metals	ladders, platforms, railings	LS	1	$200,000	$200,000		$100,000
2.100	**Common Process Civil/Structural**							
2.101	Influent Flow Meter Replacement	Allowance	LS	1	$ 250,000	$ 250,000		$ -
2.102	Aerated Grit	See ICE conceptual estimate	LS	1	$ 1,167,000	$ 1,167,000		$ -
2.103	Digester	See ICE conceptual estimate	LS	1	$ 3,479,000	$ 3,479,000		$ -
2.104	New Filters 1 & 2	See ICE conceptual estimate	LS	1	$ 3,039,000	$ 3,039,000		$ 2,279,250
2.105	New Filters 1 & 3	See ICE conceptual estimate	LS	1	$ 3,039,000	$ 3,039,000		$ 2,279,250
2.106	UV Drain Vault	See ICE conceptual estimate	LS	1	$ 456,000	$ 456,000		$ 228,000
2.107	UV Electrical Building	See ICE conceptual estimate	LS	1	$ 201,000	$ 201,000		$ 100,500
2.108	UV Structure	See ICE conceptual estimate	LS	1	$ 4,551,000	$ 4,551,000		$ 2,275,500
2.200		**Civil/Structural Sub Total**					**$27,324,172**	**$12,733,586**
3.000	**Primary Effluent, RAS, MLSS and Final Effluent Mechanical**							
3.001	18" DIP RAS Pipe	Length including fittings	LF	246	$290	$71,340		
3.002	18" Mitered Bend		EA	2	$5,000	$10,000		
3.003	18" DIP RAS Pipe (Inside Building)	Length including fittings	LF	63.75	$260	$16,575		
3.004	18"x12" Reducer		EA	4	$9,000	$36,000		
3.005	12" (FIT-001/002)		EA	2	$5,000	$10,000		
3.006	18" Tee		EA	3	$10,000	$30,000		
3.007	18" Plug Valve		EA	5	$20,000	$100,000		
3.008	18" (UN-IDENTIFIED)		EA	3	$10,000	$30,000		
3.009	18"x14" Reducer		EA	3	$3,500	$10,500		
3.010	14" 90º Bend		EA	3	$2,900	$8,700		
3.011	24" DIP RAS Pipe (Inside Building)	Length including fittings	LF	55.33	$350	$19,366		
3.012	24"x18" Wye Tee Reducer		EA	3	$15,000	$45,000		
3.013	18" Plug Valve		EA	3	$25,000	$75,000		
3.014	18" Check Valve		EA	3	$19,000	$57,000		
3.015	18"x14" Reducer		EA	3	$10,000	$30,000		
3.016	14" Flanged Coupling		EA	3	$500	$1,500		
3.017	24" DIP RAS Pipe (Outside Building)	Length including fittings	LF	37	$400	$14,800		
3.018	24" Mitered Bend		EA	1	$8,800	$8,800		
3.019	36"x24" Reducer		EA	1	$9,500	$9,500		
3.020	48" DIP Clarifier Feed Pipe	Length including fittings	LF	441	$850	$374,850		
3.021	48" Mitered Bend		EA	3	$12,000	$36,000		
3.022	60" DIP Mixed Liquor Pipe		LF	107	$1,400	$149,800		
3.100	**MLE Specific Process Mechanical (IMLR and Aeration Piping)**							
3.101	New Piping & Valving and Installation		%	40%	$ 6,460,215	$ 2,584,086		
3.102	Process Mechanical Allowance (%)		%	25%	$ 12,031,301	$ 3,007,825		$ 6,736,642
3.200	**Common Process Mechanical**							
3.201	New Piping & Valving and Installation	unload, rigging and setting equipment 30% of equipment cost	%	40%	$ 4,641,125	$ 3,612,675		
3.202	Process Mechanical Allowance (%)	0	%	25%	$ 11,803,625	$ 6,993,563		$ 10,606,238
3.300		**Mechanical Sub Total**					**$17,342,879**	**$ 17,342,879**
4.000	**Electrical / I&C**							
							64,565,752	
4.001	Electrial and I&C Costs	Percent of Total Project	%	15%	$64,565,752	$9,684,863		
4.100		**Electrical / I&C Sub Total**					**$9,684,863**	**$ 4,241,319**

TABLE 1
ROSEVILLE DRY CREEK WWTP - ALTERNATIVE 1: MLE
PRELIMINARY COST ESTIMATE

		Description	Units	Quantity	Unit Cost	Tot Cost		
5.000	**Summary Construction Cost**							
5.100	Total Direct Construction Cost						54,351,914	34,317,785
5.200	General Conditions	Craft supervision and misc matl - inc above	%	10%	$54,351,914	$5,435,191		$ 3,431,778
5.300	Taxes (3)	Not included in estimate	%	0%	$91,593,494	$0		
5.400	Contractors Overhead		%	10%	$54,351,914	$5,435,191		$ 3,431,778
5.500	Contractors Profit		%	10%	$54,351,914	$5,435,191		$ 3,431,778
5.500	Sludge procurement shipping		lot	100%	$40,000	$40,000		$ 40,000.00
		Other Sub Total					$16,345,574	$ 10,335,335
		Total Construction Cost					**$ 70,697,488**	**$ 44,653,120**
III	**Services**							
6.000	**CM /Eng/ Procurement**							
6.100	Detailed Eng/ Design	Prepare Const Design Package	%	10.0%	$107,939,068	$10,793,907		$ 6,019,500
6.200	H.O. Services during Const	Engineering Services During Construction	%	5.0%	$107,939,068	$5,396,953		$ 3,009,750
6.300	Construction Management	Full Time CM	%	4.0%	$107,939,068	$4,317,563	CM included in	$ 2,407,800
6.400	Permitting	Allowance for bldg. and environmental permits	%	1.0%	$107,939,068	$1,079,391		$ 601,950
		Total Services Cost					**$ 21,587,814**	**$ 12,038,999**
		Project Sub-Total					129,526,882	72,233,996
		Contingency	%	30%	$129,526,882		38,858,065	$ 21,670,199
		TOTAL PROJECT COST					**$ 168,384,946**	**$ 93,904,194**

MLE (Full Build Out)
Cost Estimate

TABLE 1
ROSEVILLE DRY CREEK WWTP - ALTERNATIVE 1: MLE
PRELIMINARY COST ESTIMATE

		Description	Units	Quantity	Unit Cost	Tot Cost	
I	**Equipment Procurement**						
1.000	**MLE Specific Process Equipment**						
1.001	Anoxic Tank Mixers		EA	48	$25,000	$1,200,000	
1.002	Aerobic Invent Mixers	Hyperclassic Mixer/Aerators w/ walkways	EA	36	$142,500	$5,130,000	
1.003	IMLR Pumps	Flygt NP 3202.095	EA	12	$56,056	$672,672	
1.004	Blowers	Multistage Centrifugals	LS	1	$1,510,206	$1,510,206	
1.005	Control Valves	Actutated Butterfly Valves	EA	36	$10,000	$360,000	
1.006	Air Flow Meters	Thermal Mass Flow Meters	EA	36	$20,000	$720,000	
1.007	Slide Gates	Stainless Steel Downward Opening Weir Gates	EA	12	$50,000	$600,000	
1.008	85' Diameter Clarifiers	Clearstream Inlet Dispersion Well & Density Current Baffles	EA	2	$475,000	$950,000	
1.009	125' Diameter Clarifiers	Clearstream Inlet Dispersion Well & Density Current Baffles	EA	4	$734,000	$2,936,000	
1.010	RAS Pumps for 4 - 85' Diameter	Dry Pit Submersibles, Vertical Arrangement 2,100 GPM, 25 HP	EA	8	$30,000	$240,000	
1.011	RAS Pumps for 4 - 125' Diameter	Dry Pit Submersibles, Vertical Arrangement, 4,400 GPM, 25 HP	EA	6	$40,000	$240,000	
1.100	**Common Process Equipment**						
1.101	Raw Sewage Pumps	Replace 5 existing pumps with larger pumps	EA	6	$280,000	$1,680,000	
1.102	Grit Pumps	Match existing system	EA	2	$50,000	$100,000	
1.103	Grit Blower	Match existing system	EA	1	$30,000	$30,000	
1.104	Grit Classifier	Match existing system	EA	1	$150,000	$150,000	
1.105	Filters	4 Additional Filtration Systems	LS	1	$5,582,250	$5,582,250	
1.106	UV For Filter Media Effluent	3 Channels 9 Banks/Channel	LS	1	$3,700,000	$3,700,000	
1.107	Gravity Belt Thickener	1 Additional GBT Equipment	LS	1	$ 300,000	$ 300,000	
1.108	Digester Equipment	1 Additional Anaerobic Digester Equipment	LS	1	$ 500,000	$ 500,000	
1.200	**Equipment Subtotal**						$ 26,601,128
1.300	**Equipment Installation**		LS	1	40%	$10,640,451	$ 10,640,451
		Total Equipment Procurement Cost					**$37,241,580**
II	**Construction**						
2.000	**MLE Specific Civil/Structural**						
2.001	Excavation	Excavation Items - excavate and dispose of excess material	cy	36112	$25	$902,812	
2.002	Backfill	backfill and compact structural fill	cy	9084	$30	$272,523	
2.003	Grading	finish grading	sf	2500	$4	$10,000	
2.004	Loam and seed	clean up site	sf	500	$2	$1,000	
2.005	Paving	Paving for walk	sf	0	$6	$0	
2.006	Concrete Slabs	4,000 psi reinforced concrete	CYD	3219	$1,100	$3,540,877	
2.007	Concrete Walls	4,000 psi reinforced concrete	CYD	3204	$1,500	$4,806,653	
2.008	Elevated Concrete Slabs	4,000 psi reinforced concrete	CYD	443	$1,600	$708,307	
2.009	AB 900-1200 Influent Splitter Box	Concrete Walls - New	LS	1	$200,000	$200,000	
2.010	New Final Clarifier Splitter Box	Concrete Walls - Modify Existing	LS	1	$500,000	$500,000	
2.011	Miscellaneous Metals	ladders, platforms, railings	LS	1	$200,000	$200,000	
2.100	**Common Process Civil/Structural**						
2.101	Influent Flow Meter Replacement	Allowance	LS	1	$ 250,000	$ 250,000	
2.102	Aerated Grit	See ICE conceptual estimate	LS	1	$ 1,167,000	$ 1,167,000	
2.103	Digester	See ICE conceptual estimate	LS	1	$ 3,479,000	$ 3,479,000	
2.104	New Filters 1 & 2	See ICE conceptual estimate	LS	1	$ 3,039,000	$ 3,039,000	
2.105	New Filters 1 & 3	See ICE conceptual estimate	LS	1	$ 3,039,000	$ 3,039,000	
2.106	UV Drain Vault	See ICE conceptual estimate	LS	1	$ 456,000	$ 456,000	
2.107	UV Electrical Building	See ICE conceptual estimate	LS	1	$ 201,000	$ 201,000	
2.108	UV Structure	See ICE conceptual estimate	LS	1	$ 4,551,000	$ 4,551,000	
2.200		**Civil/Structural Sub Total**					**$27,324,172**
3.000	**Primary Effluent, RAS, MLSS and Final Effluent Mechanical**						
3.001	18" DIP RAS Pipe	Length including fittings	LF	246	$290	$71,340	
3.002	18" Mitered Bend		EA	2	$5,000	$10,000	
3.003	18" DIP RAS Pipe (Inside Building)	Length including fittings	LF	63.75	$260	$16,575	
3.004	18"x12" Reducer		EA	4	$9,000	$36,000	
3.005	12" (FIT-001/002)		EA	2	$5,000	$10,000	
3.006	18" Tee		EA	3	$10,000	$30,000	
3.007	18" Plug Valve		EA	5	$20,000	$100,000	
3.008	18" (UN-IDENTIFIED)		EA	3	$10,000	$30,000	
3.009	18"x14" Reducer		EA	3	$3,500	$10,500	
3.010	14" 90º Bend		EA	3	$2,900	$8,700	
3.011	24" DIP RAS Pipe (Inside Building)	Length including fittings	LF	55.33	$350	$19,366	
3.012	24"x18" Wye Tee Reducer		EA	3	$15,000	$45,000	
3.013	18" Plug Valve		EA	3	$25,000	$75,000	
3.014	18" Check Valve		EA	3	$19,000	$57,000	
3.015	18"x14" Reducer		EA	3	$10,000	$30,000	
3.016	14" Flanged Coupling		EA	3	$500	$1,500	
3.017	24" DIP RAS Pipe (Outside Building)	Length including fittings	LF	37	$400	$14,800	
3.018	24" Mitered Bend		EA	1	$8,800	$8,800	
3.019	36"x24" Reducer		EA	1	$9,500	$9,500	
3.020	48" DIP Clarifier Feed Pipe	Length including fittings	LF	441	$850	$374,850	
3.021	48" Mitered Bend		EA	3	$12,000	$36,000	
3.022	60" DIP Mixed Liquor Pipe		LF	107	$1,400	$149,800	
3.100	**MLE Specific Process Mechanical (IMLR and Aeration Piping)**						
3.101	New Piping & Valving and Installation		%	40%	$ 14,558,878	$ 5,823,551	
3.102	Process Mechanical Allowance (%)		%	25%	$ 25,701,050	$ 6,425,263	
3.200	**Common Process Mechanical**						
3.201	New Piping & Valving and Installation	unload, rigging and setting equipment 30% of equipment cost	%	40%	$ 12,042,250	$ 3,612,675	
3.202	Process Mechanical Allowance (%)	0	%	25%	$ 27,974,250	$ 6,993,563	
3.203	Cooling Water Modifications		LS	1	$ 3,158,000	$ 3,158,000	
3.300		**Mechanical Sub Total**					**$27,157,782**
4.000	**Electrical / I&C**						
							64,565,752

TABLE 1
ROSEVILLE DRY CREEK WWTP - ALTERNATIVE 1: MLE
PRELIMINARY COST ESTIMATE

		Description	Units	Quantity	Unit Cost	Tot Cost	
4.001	Electrial and I&C Costs	Percent of Total Project	%	15%	$64,565,752	$9,684,863	
4.100		**Electrical / I&C Sub Total**					**$9,684,863**
5.000	**Summary Construction Cost**						
5.100	Total Direct Construction Cost						64,166,817
5.200	General Conditions	Craft supervision and misc matl - inc above	%	10%	$64,166,817	$6,416,682	
5.300	Taxes (3)	Not included in estimate	%	0%	$101,408,396	$0	
5.400	Contractors Overhead		%	10%	$64,166,817	$6,416,682	
5.500	Contractors Profit		%	10%	$64,166,817	$6,416,682	
5.500	Sludge procurement shipping		lot	100%	$40,000	$40,000	
		Other Sub Total					$19,290,045
		Total Construction Cost					**$ 83,456,862**
III	**Services**						
6.000	**CM /Eng/ Procurement**						
6.100	Detailed Eng/ Design	Prepare Const Design Package	%	10.0%	$120,698,441	$12,069,844	
6.200	H.O. Services during Const	Engineering Services During Construction	%	5.0%	$120,698,441	$6,034,922	
6.300	Construction Management	Full Time CM	%	4.0%	$120,698,441	$4,827,938	CM included in
6.400	Permitting	Allowance for bldg. and environmental permits	%	1.0%	$120,698,441	$1,206,984	
		Total Services Cost					**$ 24,139,688**
		Project Sub-Total					144,838,130
		Contingency	%	30%	$144,838,130		43,451,439
		TOTAL PROJECT COST					**$ 188,289,569**

BioMag Cost Estimate

Rev 1

TABLE 2
ROSEVILLE DRY CREEK WWTP - ALTERNATIVE 2: BIOMAG
PRELIMINARY COST ESTIMATE

		Description	Units	Quantity	Unit Cost	Tot Cost	
I	**Equipment Procurement**						
1.000	**BioMag Specific Process Equipment**						
1.001	BioMag System	Incl. equipment, engineering, field services and supply.	LS	1	$6,000,000	$6,000,000	
1.002	Initial Magnetite Delivery	200 tons of virgin magnetite, $650/ton	Tons	200	$650	$130,000	
1.003	Fine Screens	3 Rotary Perforated Drum Screens (2 + 1, 30 MGD capacity ea)	LS	1	$600,000	$600,000	
1.004	Blowers	Replace Blowers for Different Pressure Req'd	LS	1	$ 2,280,000	$2,280,000	
1.005	New Mixers	Larger Hp for higher MLSS	EA	8	$ 33,000	$264,000	
1.006	New Mixer Aerators	Larger Hp for higher MLSS	EA	24	$ 120,000	$2,880,000	
1.007	125' D - Clarifier Mechanisms	Replace All Existing Mechanisms	EA	2	$ 734,000	$1,468,000	
1.008	85' D - Clarifier Mechanisms	Replace All Existing Mechanisms	EA	4	$ 475,000	$1,900,000	
1.009	RAS Pumps for 4 - 85' Diameter	Replace All Pumps w/ Higher Capacity	EA	8	$ 40,000	$320,000	
1.010	RAS Pumps for 4 - 125' Diameter	Replace All Pumps w/ Higher Capacity	EA	3	$ 50,000	$150,000	
1.011	Control Valves	Actutated Butterfly Valves	EA	24	$10,000	$240,000	
1.012	Air Flow Meters	Thermal Mass Flow Meters	EA	24	$20,000	$480,000	
1.013	Slide Gates	Stainless Steel Downward Opening Weir Gates	EA	8	$50,000	$400,000	
1.100	**Common Process Equipment**						
1.101	Raw Sewage Pumps	Replace 5 existing pumps with larger pumps	EA	6	$ 280,000	$ 1,680,000	
1.102	Grit Pumps	Match existing system	EA	2	$ 50,000	$ 100,000	
1.103	Grit Blower	Match existing system	EA	1	$ 30,000	$ 30,000	
1.104	Grit Classifier	Match existing system	EA	1	$ 150,000	$ 150,000	
1.105	Filters	4 Additional Filtration Systems	LS	1	$ 5,582,250	$ 5,582,250	
1.106	UV For Filter Media Effluent	3 Channels 9 Banks/Channel	LS	1	$ 3,700,000	$ 3,700,000	
1.107	Gravity Belt Thickener	1 Additional GBT Equipment	LS	1	$ 300,000	$ 300,000	
1.108	Digester Equipment	1 Additional Anaerobic Digester Equipment	LS	1	$ 500,000	$ 500,000	
1.200	**Equipment Subtotal**						$ 29,154,250
1.300	**Equipment Installation**		LS	1	40%	$11,661,700	
		Total Equipment Procurement Cost					**$40,815,950**
II	**Construction**						
2.000	**BioMag Specific Civil/Structural**						
2.001	Excavation	Excavation Items - excavate and dispose of excess material	cy	416	$25	$10,405	
2.002	Backfill	backfill and compact structural fill	cy	200	$30	$6,000	
2.003	Grading	finish grading	sf	8744	$4	$34,976	
2.004	Loam and seed	clean up site	sf	8744	$2	$17,488	
2.005	Magnetite Silo Support Slab	50' x 60' Slab on Grade	CYD	14.22	$1,000	$14,222	
2.006	Ballasted Floc Mixing and Recovery Building	16' Tall Split Faced Block Building	SF	3000	$250	$750,000	
2.100	**BioMag Specific Demolition**						
2.101	Demo of Existing Invent Mixers	Cost per unit removed	EA	16	$5,000	$80,000	
2.102	Demo of Existing Blowers	Cost per unit removed	EA	4	$10,000	$40,000	
2.103	Demo of Existing RAS Pumps	Cost per unit removed	EA	3	$7,500	$22,500	
2.104	Demo of Existing Clarifier Mechanisms	Cost per unit removed	EA	6	$20,000	$120,000	
2.200	**Common Process Civil/Structural**						
2.201	Influent Flow Meter Replacement	Allowance	LS	1	$ 250,000	$ 250,000	
2.202	Aerated Grit	See ICE conceptual estimate	LS	1	$ 1,167,000	$ 1,167,000	
2.203	Digester	See ICE conceptual estimate	LS	1	$ 3,479,000	$ 3,479,000	
2.204	New Filters 1 & 2	See ICE conceptual estimate	LS	1	$ 3,039,000	$ 3,039,000	
2.205	New Filters 1 & 3	See ICE conceptual estimate	LS	1	$ 3,039,000	$ 3,039,000	
2.206	UV Drain Vault	See ICE conceptual estimate	LS	1	$ 456,000	$ 456,000	
2.207	UV Electrical Building	See ICE conceptual estimate	LS	1	$ 201,000	$ 201,000	
2.208	UV Structure	See ICE conceptual estimate	LS	1	$ 4,551,000	$ 4,551,000	
2.300		**Civil/Structural Sub Total**					**$17,277,591**
3.000	**BioMag Specific Mechanical**						
3.001	New Piping & Valving and Installation		%	40%	$17,112,000	$6,844,800	
3.002	Process Mechanical Allowance (%)		%	25%	$17,945,091	$4,486,273	
3.100	**Common Process Mechanical**						
3.101	New Piping & Valving and Installation	unload, rigging and setting equipment 30% of equipment cost	%	40%	$ 12,042,250	$4,816,900	
3.102	Process Mechanical Allowance (%)	0	%	25%	$ 27,974,250	$6,993,563	
3.103	Cooling Water Modifications		LS	1	$ 3,158,000	$3,158,000	
3.200		**Mechanical Sub Total**					**$26,299,535**
4.000	**Electrical / I&C**						
							57,831,041
4.001	Electrial and I&C Costs	Percent of Total Project	%	15%	$57,831,041	$8,674,656	
4.100		**Electrical / I&C Sub Total**					**$8,674,656**
5.000	**Summary Construction Cost**						
5.100	Total Direct Construction Cost						52,251,782
5.200	General Conditions	Craft supervision and misc matl - inc above	%	10%	$52,251,782	$5,225,178	
5.300	Taxes (3)	Not included in estimate	%	0%	$93,067,732	$0	
5.400	Contractors Overhead		%	10%	$52,251,782	$5,225,178	
5.500	Contractors Profit		%	10%	$52,251,782	$5,225,178	
5.500	Sludge procurement shipping						
		Other Sub Total					$15,675,535
		Total Construction Cost					**$ 67,927,317**
III	**Services**						
6.000	**CM /Eng/ Procurement**						
6.100	Detailed Eng/ Design	Prepare Const Design Package	%	10.0%	$108,743,267	$10,874,327	
6.200	H.O. Services during Const	Engineering Services During Construction	%	5.0%	$108,743,267	$5,437,163	
6.300	Construction Management	Full Time CM	%	4.0%	$108,743,267	$4,349,731	
6.400	Permitting	Allowance for bldg. and environmental permits	%	1.0%	$108,743,267	$1,087,433	

Rev 1

TABLE 2
ROSEVILLE DRY CREEK WWTP - ALTERNATIVE 2: BIOMAG
PRELIMINARY COST ESTIMATE

		Description	Units	Quantity	Unit Cost	Tot Cost	
		Total Services Cost					**$ 21,748,653**
		Project Sub-Total					130,491,920
		Contingency	%	**30%**	$130,491,920		39,147,576
		TOTAL PROJECT COST					**$ 169,639,496**

MBR Cost Estimate

Rev 1

TABLE 3
ROSEVILLE DRY CREEK WWTP - ALTERNATIVE 3: MBR
PRELIMINARY COST ESTIMATE

		Description	Units	Quantity	Unit Cost	Tot Cost	
I	**Equipment Procurement**						
1.000	**MBR Specific Process Equipment**						
1.001	MBR System	Incl. equipment, engineering, field services and supply.	LS	1	$17,480,000	$17,480,000	
1.002	MBR Services and Build Out		LS	1	$1,399,200	$1,399,200	
1.003	Fine Screens	3 Rotary Perforated Drum Screens (2 + 1, 30 MGD capacity ea)	LS	1	$600,000	$600,000	
1.004	MBR Bridge Crane	Travelling Bridge Crane (75' x 70' x 20', 5T)	LS	1	$ 136,686	$136,686	
1.005	Fine Screen Monorail		LS	1	$ 75,000	$75,000	
1.006	Chemical Storage		LS	1	$ 200,000	$200,000	
1.007	Anoxic Tank Mixers		EA	32	$25,000	$800,000	
1.008	Aerobic Invent Mixers	Hyperclassic Mixer/Aerators w/ walkways	EA	24	$142,500	$3,420,000	
1.009	IMLR Pumps	Flygt NP 3202.095	EA	8	$56,056	$448,448	
1.010	Blowers	Single Stage Centrifugal Turbo	LS	1	$1,510,206	$1,510,206	
1.011	Control Valves	Actutated Butterfly Valves	EA	24	$10,000	$240,000	
1.012	Air Flow Meters	Thermal Mass Flow Meters	EA	24	$20,000	$480,000	
1.013	Slide Gates	Stainless Steel Downward Opening Weir Gates	EA	8	$50,000	$400,000	
1.014							
1.100	**Common Process Equipment**						
1.101	Raw Sewage Pumps	Replace 5 existing pumps with larger pumps	EA	6	$ 280,000	$ 1,680,000	
1.102	Grit Pumps	Match existing system	EA	2	$ 50,000	$ 100,000	
1.103	Grit Blower	Match existing system	EA	1	$ 30,000	$ 30,000	
1.104	Grit Classifier	Match existing system	EA	1	$ 150,000	$ 150,000	
1.105	UV For Filter MBR Effluent	3 Channels 7 Banks/Channel	LS	1	$ 3,100,000	$ 3,100,000	
1.106	Gravity Belt Thickener	1 Additional GBT Equipment	LS	1	$ 300,000	$ 300,000	
1.107	Digester Equipment	1 Additional Anaerobic Digester Equipment	LS	1	$ 500,000	$ 500,000	
1.200	**Equipment Subtotal**						$ 33,049,541
1.300	**Equipment Installation**		LS	1	40%	$13,219,816	
		Total Equipment Procurement Cost					**$46,269,357**
II	**Construction**						
2.000	**MBR Specific Civil/Structural**						
2.001	Excavation	Excavation Items - excavate and dispose of excess material	cy	3237	$100	$323,700	
2.002	Backfill	backfill and compact structural fill	cy	1133	$200	$226,590	
2.003	Grading	finish grading	sf	9306	$2	$18,612	
2.004	Loam and seed	clean up site	sf	4056	$2	$8,112	
2.005	Concrete Slabs	4,000 psi reinforced concrete	CYD	294.19	$1,100	$323,604	
2.006	Concrete Walls	4,000 psi reinforced concrete	CYD	388.17	$1,500	$582,250	
2.007	Elevated Concrete Slabs	4,000 psi reinforced concrete	CYD	46.89	$1,600	$75,027	
2.008	Misc. Metals		LS	1	$1,000,000	$1,000,000	
2.009	New Splitter Boxes		LS	1	$750,000	$750,000	
2.010	Chemical Containment		LS	1	$150,000	$150,000	
2.011	Chemical Pavillions		SF	2500	$100	$250,000	
2.012	MBR Building (85' x 65')	20' Tall Split Faced Block Building	SF	5525	$275	$1,519,375	
2.100	**MBR Specific Demolition**						
2.101	Demo of Existing Invent Mixers	Cost per unit removed	EA	16	$5,000	$80,000	
2.102	Demo of Existing Blowers	Cost per unit removed	EA	4	$10,000	$40,000	
2.103	Demo of Existing RAS Pumps	Cost per unit removed	EA	3	$7,500	$22,500	
2.104	Demo of Existing Clarifier Mechanisms	Cost per unit removed	EA	6	$20,000	$120,000	
2.200	**Common Process Civil/Structural**						
2.201	Influent Flow Meter Replacement	Allowance	LS	1	$ 250,000	$ 250,000	
2.202	Aerated Grit	See ICE conceptual estimate	LS	1	$ 1,167,000	$ 1,167,000	
2.203	Digester	See ICE conceptual estimate	LS	1	$ 3,479,000	$ 3,479,000	
2.204	UV Drain Vault	See ICE conceptual estimate	LS	1	$ 456,000	$ 456,000	
2.205	UV Electrical Building	See ICE conceptual estimate	LS	1	$ 201,000	$ 201,000	
2.206	UV Structure	See ICE conceptual estimate	LS	1	$ 4,551,000	$ 4,551,000	
2.300		**Civil/Structural Sub Total**					**$15,593,769**
3.000	**MBR Specific Mechanical**						
3.001	New Piping & Valving and Installation		%	40%	$27,189,541	$10,875,816	
3.002	Process Mechanical Allowance (%)		%	25%	$29,747,435	$7,436,859	
3.100	**Common Process Mechanical**						
3.101	New Piping & Valving and Installation	unload, rigging and setting equipment 30% of equipment cost	%	40%	$ 12,042,250	$4,816,900	
3.102	Process Mechanical Allowance (%)	0	%	25%	$ 27,974,250	$6,993,563	
3.103	Cooling Water Modifications		LS	1	$ 3,158,000	$3,158,000	
3.200		**Mechanical Sub Total**					**$33,281,138**
4.000	**Electrical / I&C**						
							61,600,626
4.001	Electrial and I&C Costs	Percent of Total Project	%	15%	$61,600,626	$9,240,094	
4.100		**Electrical / I&C Sub Total**					**$9,240,094**
5.000	**Summary Construction Cost**						
5.100	Total Direct Construction Cost						58,115,001
5.200	General Conditions	Craft supervision and misc matl - inc above	%	10%	$58,115,001	$5,811,500	
5.300	Taxes (3)	Not included in estimate	%	0%	$104,384,358	$0	
5.400	Contractors Overhead		%	10%	$58,115,001	$5,811,500	
5.500	Contractors Profit		%	10%	$58,115,001	$5,811,500	
5.500	Sludge procurement shipping						
		Other Sub Total					$17,434,500
		Total Construction Cost					**$ 75,549,501**
III	**Services**						
6.000	**CM /Eng/ Procurement**						
6.100	Detailed Eng/ Design	Prepare Const Design Package	%	10.0%	$121,818,858	$12,181,886	
6.200	H.O. Services during Const	Engineering Services During Construction	%	5.0%	$121,818,858	$6,090,943	

Rev 1

TABLE 3
ROSEVILLE DRY CREEK WWTP - ALTERNATIVE 3: MBR
PRELIMINARY COST ESTIMATE

		Description	Units	Quantity	Unit Cost	Tot Cost	
6.300	Construction Management	Full Time CM	%	4.0%	$121,818,858	$4,872,754	
6.400	Permitting	Allowance for bldg. and environmental permits	%	1.0%	$121,818,858	$1,218,189	
		Total Services Cost					**$ 24,363,772**
		Project Sub-Total					146,182,630
		Contingency	%	**30%**	$146,182,630		43,854,789
		TOTAL PROJECT COST					**$ 190,037,419**