



Montecito Sanitary District & Montecito Water
District
Enhanced Recycled Water Feasibility Analysis

Technical Memorandum 7 O&G TREATMENT AT MSD

FINAL | September 2022





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Abbreviations

AACE International	Association for the Advancement of Cost Engineering International
ADWF	average dry weather flow
Carollo	Carollo Engineers, Inc.
City	City of Santa Barbara
DAF	Dissolved Air Flotation
DPR	Direct Potable Reuse
ft	foot, feet
gpm	gallons per minute
gpm/sf	gallons per minute per square foot, feet
IPR	Indirect Potable Reuse
MBR	membrane bioreactor
MDL	method detection limit
mgd	million gallons per day
mg/L	milligrams per liter
MSD	Montecito Sanitary District
MSD WWTP	Montecito Sanitary District Wastewater Treatment Plant
MWD	Montecito Water District
N/A	not available
NPDES	National Pollutant Discharge Elimination System
NPR	Non-Potable Reuse
O&G	oil and grease
O&M	operations and maintenance
PFD	process flow diagram
sf	square foot, feet
TDS	total dissolved solids
TM	technical memorandum
TSS	total suspended solids

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Technical Memorandum 7

O&G TREATMENT AT MSD

7.1 Introduction

This project, conducted for and in collaboration with the Montecito Water District (MWD) and the Montecito Sanitary District (MSD), examines the potential implementation of recycled water projects and the beneficial use of treated wastewater from the community of Montecito. The project goal is to maximize wastewater reuse capabilities, thus producing a new local drought-proof water supply for the community and reducing the discharge of treated wastewater to the ocean. The analysis considers local and regional partnerships, non-potable and potable reuse alternatives, and various treatment methods and technologies. The options included in the study are as follows:

1. **Montecito Non-Potable Reuse (NPR)** - local project producing tertiary quality water for irrigation of large landscapes in Montecito.
2. **Carpinteria Indirect Potable Reuse (IPR)** - regional project producing purified water involving a partnership with neighboring special district(s) and the use of the Carpinteria Groundwater Basin.
3. **Montecito Direct Potable Reuse (DPR)** - local project in Montecito producing purified water and utilizing raw water augmentation at the MWD water treatment facility.
4. **Santa Barbara DPR** - regional project producing purified water and involving a partnership with the City of Santa Barbara (City) and raw water augmentation at the City's regional water treatment facility.

Figure 7.1 shows the potential regional partners.

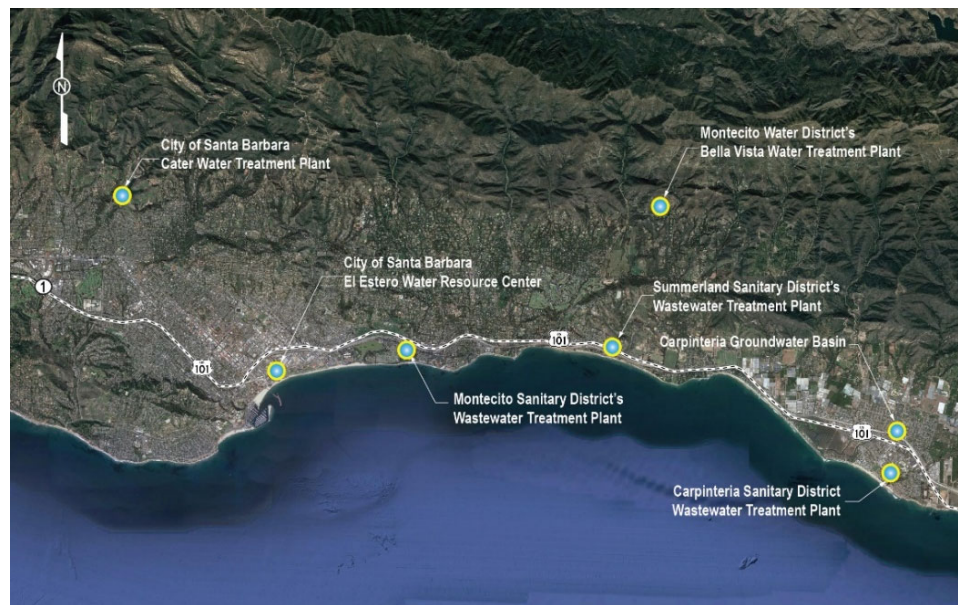


Figure 7.1 Potential Regional Partners

This technical memorandum (TM) provides background on oil and grease (O&G) concentrations in the Montecito Sanitary District Wastewater Treatment Plant (MSD WWTP) effluent and the need for reducing the O&G concentrations to facilitate downstream membrane treatment processes. Dissolved Air Flotation (DAF) is a proven technology that effectively removes the O&G either ahead of or after biological treatment at the MSD WWTP. A Class 5 cost assessment was completed for DAF options using quotes from three different vendors for both primary full stream (spanning a range of flow) and secondary effluent flow (flow based upon future average dry weather flow (ADWF) of 0.7 million gallons per day (mgd)) treatment alternatives. Note: DAF would only apply for non-membrane bioreactor (MBR) treatment options, as MBR is capable of handling O&G in the raw wastewater.

7.2 Objectives

The main objectives of this TM are:

- Review historical O&G data for the MSD WWTP.
- Develop and evaluate a primary DAF treatment alternative for O&G removal where all MSD WWTP influent flow would be treated by DAF.
- Develop and evaluate a secondary DAF treatment alternative for O&G removal where a smaller ADWF from the MSD WWTP would be treated by DAF.

7.3 Available Data

The following data was reviewed to perform the analysis that is summarized in this TM:

- MSD WWTP: O&G data from February 23, 2021, to October 6, 2021.

7.4 Sources of O&G

O&G is a category of waste that includes emulsions or solids comprised of esters of glycerol, fatty acids, or triglycerides obtained from vegetable or animal sources. They are produced both from municipal, commercial and industrial sources. Although O&G are often discussed together, the component that remains a liquid at room temperature is referred to as “oil” and “grease” refers to fats, waxes, and soaps that solidify and plug pipelines and treatment processes. When left untreated, O&G can be harmful to wastewater systems and wastewater treatment processes.

7.5 Background of O&G at MSD

MSD is considering using the treated effluent from the MSD WWTP as a source for either NPR or potable reuse applications, and a key part of treatment for water reuse is membrane treatment for total dissolved solids (TDS) reduction. O&G pose a threat to membrane treatment since O&G can clog the membranes, which could reduce their capacity or lead to significant maintenance such as too frequent chemical cleanings or even replacement¹. To maintain an efficient membrane performance and not create warranty challenges with membrane suppliers, there should be no detectable O&G going into the membranes treatment (until proven otherwise and guaranteed by membrane suppliers). The MSD WWTP goal for O&G effluent concentration should therefore be less than the method detection limit (MDL) of 1.4 milligrams per liter (mg/L).

¹ The membrane pilot system at the MSD WWTP is investigating the extent of impact.

It should be noted MSD has a source control program for fats, oils and grease generated at commercial food service facilities within the District. Each food service establishment is required to use grease control devices to separate and remove the oil and grease with a permitted effluent limit maximum of 100 mg/L. District staff also perform periodic random inspections to verify source control procedures are followed.

Limiting residential oil and grease is difficult and the District does not have a compliance program for residential homeowner. Instead, the Districts uses public outreach to educate homeowners on methods to minimize oil and grease within their wastewater stream.

Figure 7.2 shows the MSD WWTP influent and effluent O&G concentrations. Figure 7.3 shows only the MSD WWTP effluent O&G concentrations, providing greater clarity for the lower level values. Both figures show good O&G removal through the aeration basins; however, the data show periods with high O&G concentrations in the MSD WWTP effluent.

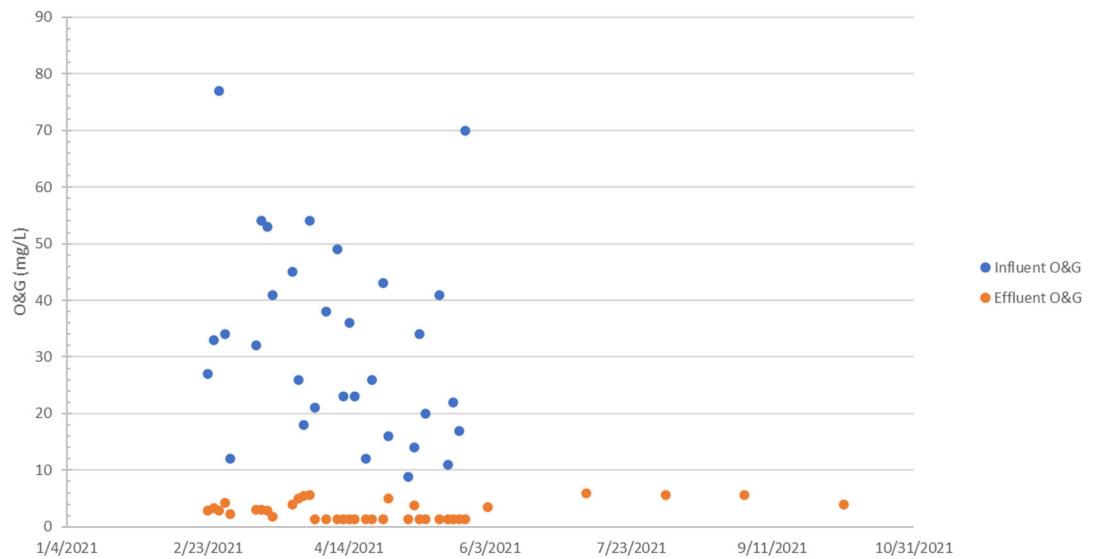


Figure 7.2 MSD WWTP O&G Data from 2/2021 to 10/2021 (Note: MDL is 1.4 mg/L)

- DAF unit:
 - Contact basin.
 - Air saturation tank.
 - Settling plates.
 - Sludge scraper.
 - Sludge hopper.
 - Recycle pump.
- Chemical reaction tank/ Flocculator.
- Chemical feed pumps.
- Polymer feed system.
- Sludge transfer pump.

Figure 7.4 shows a process flow diagram (PFD) of a DAF system. Figure 7.5, Figure 7.6, and Figure 7.7, show example photos of a DAF system installed for wastewater treatment.

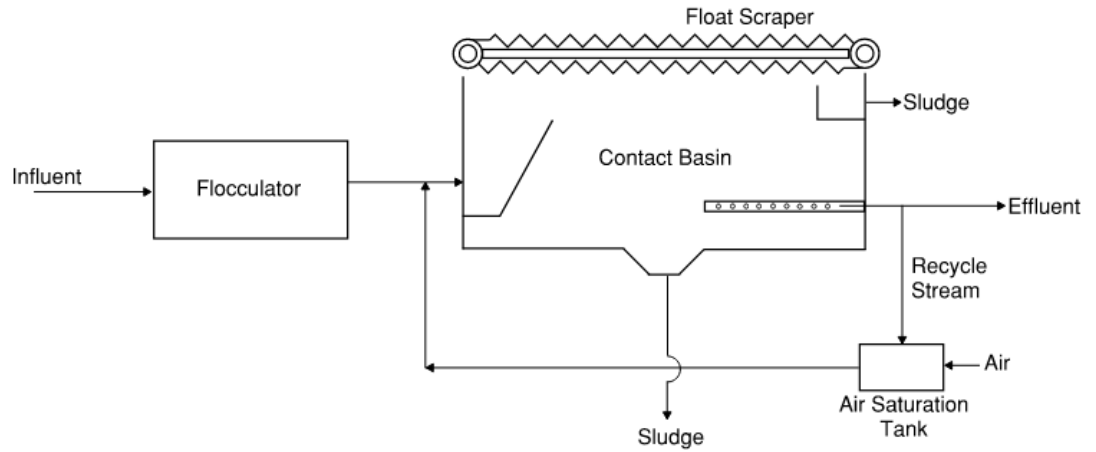


Figure 7.4 PFD for a DAF System



Figure 7.5 DAF Unit Contact Basin with External Platform and Chemical Feed System



Figure 7.6 DAF Unit Sludge Scraper System



Figure 7.7 DAF Unit in Service

In this study, two DAF alternatives were evaluated to treat O&G in order to protect downstream membrane treatment processes:

- Alternative 1: Primary DAF that treats 100 percent of the MSD WWTP influent flow.
- Alternative 2: Secondary DAF that treats a smaller flow of MSD WWTP effluent for reuse.

Figure 7.8 and Figure 7.9 present simplified process schematics of the two DAF alternatives considered for the MSD WWTP.

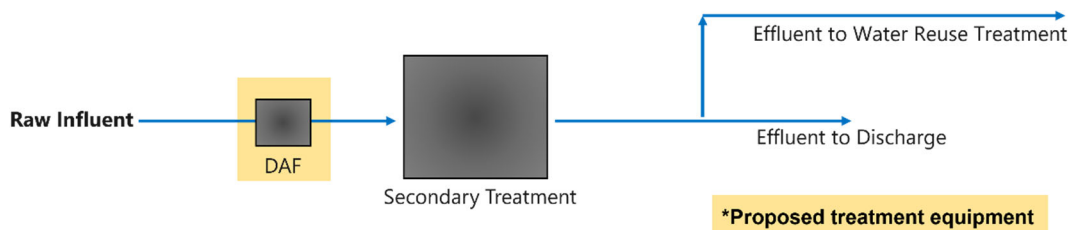


Figure 7.8 Alternative 1: Primary DAF Full Flow Simplified PFD

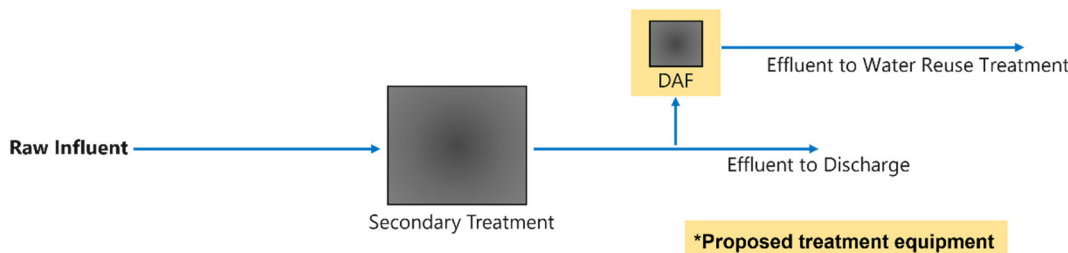


Figure 7.9 Alternative 2: Secondary DAF Simplified PFD

7.6.1 Conceptual Design Criteria

Table 7.2 summarizes the treatment criteria and forms the fundamental basis of the DAF system sizing for the alternatives evaluated. The Alternative 1 design flow is the MSD WWTP’s future maximum instantaneous flow of 8.76 mgd. The future maximum instantaneous flow was calculated by applying a 1.065 factor to the current maximum instantaneous flow of 8.23 mgd as described in *Technical Memorandum 1 MSD Flow and NPDES Permit Analysis* (TM01; Carollo Engineers, Inc.(Carollo), 2021). The lower future ADWF of 0.70 mgd is the design flow for Alternative 2.

Table 7.2 DAF Treatment Criteria

Treatment Criteria	Units	Alternative 1: Primary DAF Full Flow	Alternative 2: Secondary DAF ADWF
Max Instantaneous Flow	mgd (gpm)	8.76	0.7
Max Hourly Flow	mgd (gpm)	6.29	0.7
Effluent O&G Goal	mg/L	<1.4	<1.4

Notes:
Abbreviation: gpm - gallons per minute.

Table 7.3 presents the conceptual design criteria of the DAF systems for two DAF vendors considered for this study. A third vendor was contacted but did not provide the design criteria and cost for their system by the time of this analysis. Additionally, a fourth vendor was considered but did not believe they could reach the 1.4 mg/L O&G treatment goal without pilot testing or further bench scale studies. It was also recommended by the vendor to consider a walnut shell filter as a polishing step or an activated glass media filter for flows with lower O&G concentrations. Pilot testing, or at a minimum bench-scale laboratory testing, is recommended before proceeding with a DAF design. The two vendors that provided a conceptual cost for this study are:

- Ecologix - Option 1a for Alternative 1 and option 1b for Alternative 2.
- World Water Works - Option 2a for Alternative 1 and option 2b for Alternative 2.

For Alternative 1, option 1a has two DAF units each treating half the influent flow, whereas 2a has one large DAF unit and one smaller DAF unit with flows split to equalize the liquid loading rate. For Alternative 2, both options 1b and 2b use a single unit to treat the partial effluent flow. The overall system length, width, and area in Table 7.3 are based on the size of the DAF units, chemical reactors, and walking space between the units.

Table 7.3 DAF System Design Criteria

Design Parameter	Unit	Alternative 1: Primary DAF - Full Flow			Alternative 2: Secondary DAF - Lower Flow			
		Option 1a	Option 2a		Option 3a	Option 1b	Option 2b	Option 3b
Vendor	--	Ecologix	World Water Works		Suez	Ecologix	World Water Works	Suez
Model Number	--	E-1035	RSP-13L	RSP-25SW		E-515	RSP-11S	
Design Flow	mgd (gpm)	8.76 (6,083)	6.4 (4,444)	2.36 (1,639)		0.70 (486)	0.70 (486)	
Number of Trains	--	2	1	1		1	1	
Flow/train	gpm	3,042	4,444	1,639		486	486	
Projected Surface area	sf	5,058	2,311	847	N/A ⁽¹⁾	1,085	291	N/A ⁽¹⁾
Loading rate	gpm/sf	0.60	1.92	1.93		0.45	1.67	
Overall System Length	ft	80	70			40	50	
Overall System Width	ft	55	50			35	40	
Overall System Area	sf	4,400	3,500			1,400	2,000	

Notes:

Abbreviations: ft - foot, feet; gpm/sf - gallons per minute per square foot, feet; N/A - not available; sf - square foot, feet.

(1) Not provided by the vendor at the time of this analysis.

7.6.2 Conceptual Cost Opinion

Appendix 7A includes a conceptual-level capital and annual operations and maintenance (O&M) cost opinion developed for the two treatment alternatives. There was no bench- or pilot-scale tests completed to support the development of this cost estimate. The capital cost opinions are expressed in March 2022 dollars (the corresponding 20-Cities Average Engineering News Record Construction Cost Index of 12,791). Cost opinions are consistent with the Association for the Advancement of Cost Engineering International's (AACE International) Class 5 estimates. This level of engineering cost estimating is generally made with limited information (e.g., PFDs, preliminary equipment lists, and preliminary O&M cost). Typical accuracy for Class 5 estimates is expected to be in the range of -50 to +100 percent.

7.6.2.1 Economic Analysis of Cost Opinions

An economic analysis was performed for the two treatment alternatives evaluated with two different vendor options. The values introduced in this section represent the sum of capital cost opinions and the present worth of annual O&M cost projections, assuming a discount rate of 4 percent and term of 20 years.

Table 7.4 summarizes the conceptual-level cost opinions for the two treatment alternatives and two vendors. Figure 7.10 compares capital costs, annual O&M costs, and total present worth. The cost analysis indicates:

- For Alternative 1, full flow wastewater influent DAF treatment, the capital costs of the two vendor options are comparable, whereas the annual O&M costs and total present worth of option 1a is higher compared to option 2a.
- For Alternative 2, smaller secondary effluent DAF treatment of ADWF, the capital costs of the two vendor options are comparable and the annual O&M costs and total present worth of option 1b is higher compared to option 2b.
- The higher O&M cost associated with option 1a and 1b is due to a more conservative approach resulting in higher chemical usage provided by the vendor, Ecologix. The chemical usage provided by the vendor could be further refined by water quality testing and jar testing to obtain site-specific chemical doses, which is out of the scope of the study.

Overall, Alternative 2, DAF treatment of secondary effluent ADWF is more cost effective than Alternative 1, full flow DAF treatment. Bench- or pilot-scale testing of both alternatives would help refine the costs for the two alternatives. If MSD proceeds with a DAF treatment option for O&G removal, bench-scale or pilot-scale testing is recommended.

The detailed cost opinions are provided in Appendix 7A, and the additional vendor information of the DAF units evaluated are provided in Appendix 7B.

Table 7.4 Montecito Sanitary District Wastewater O&G Treatment Cost Options

Cost Opinions	Alternative 1: Primary DAF - Full Flow		Alternative 2: Secondary DAF - Partial Flow	
	Option 1a	Option 2a	Option 1b	Option 2b
Construction cost	\$6,030,000	\$6,660,000	\$1,250,000	\$1,440,000
Annual O&M Cost	\$710,000	\$470,000	\$370,000	\$250,000
Present Worth				
Present worth of annual O&M ⁽¹⁾	\$9,650,000	\$6,390,000	\$5,030,000	\$3,400,000
Total present worth	\$15,680,000	\$13,050,000	\$6,280,000	\$4,840,000

Notes:

(1) Assuming a discount rate of 4 percent annually and a term of 20 years.

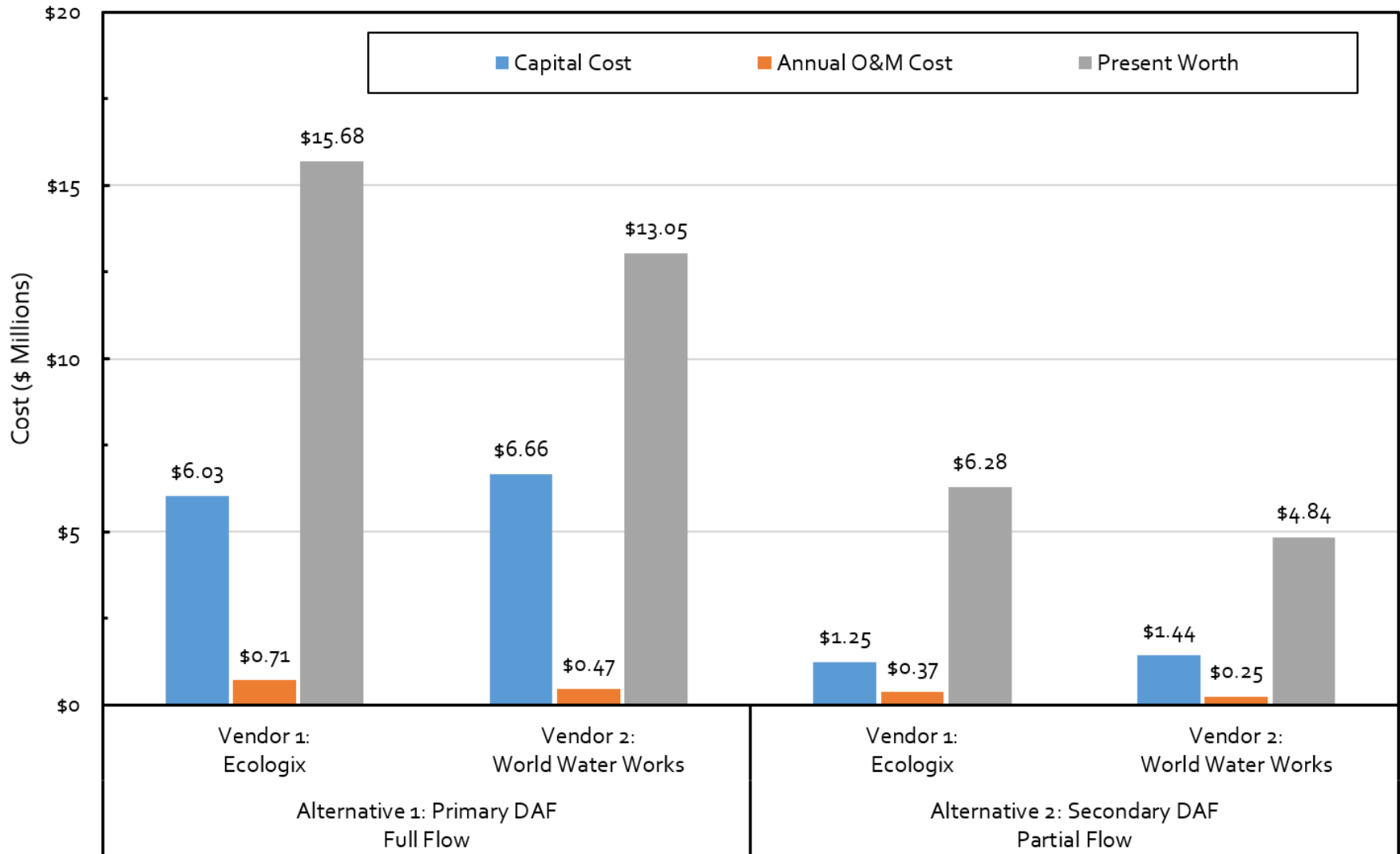


Figure 7.10 Montecito Sanitary District Wastewater O&G Treatment Cost Options

7.7 Summary

Historical water quality shows the MSD WWTP can have as high as 6 mg/L of O&G in the effluent stream. To meet the operational target of 1.4 mg/L O&G to protect downstream membrane treatment, the MSD WWTP needs additional, targeted, O&G treatment. DAF is a proven technology that can effectively reduce O&G. In this study, a cost analysis was completed for different DAF alternatives for O&G removal and the conclusions are summarized as follows:

- Two DAF treatment alternatives were evaluated:
 - Alternative 1: Primary DAF that treats 100 percent of the MSD WWTP influent flow.
 - Alternative 2: Secondary DAF that treats the future ADWF of 0.7 mgd of the MSD WWTP effluent for reuse subsequent water reuse.
- Two different equipment supplier options were evaluated for the two treatment alternatives.
- A Class 5 cost opinion was completed for each treatment alternative and vendor option.
 - The average capital cost for Alternative 1 is \$6,345,000 and the average capital cost for Alternative 2 is \$1,345,000.
- If MSD proceeds with a DAF design, bench- or pilot-scale testing for O&G reduction is recommended. Further, there are other technology options, such as a walnut shell filter, activated glass filtration media, or organoclay filter that could also be evaluated as part of the pilot-scale testing for Alternative 2 with lower O&G concentrations.

7.8 References

Carollo Engineers, Inc., 2021. Montecito Sanitary District & Montecito Water District Enhanced Recycled Water Feasibility Analysis, Technical Memorandum 1 MSD Flow and NPDES Permit Analysis. Project Number 12289A10, December 2021

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Appendix 7A

CAPITAL AND ANNUAL OPERATIONS AND MAINTENANCE COST OPINIONS

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Conceptual Cost Opinion

AACE International Class 5 Estimate (Expected Accuracy Range of -50% to +100%)	Factor	Vendor Option 1	Vendor Option 2
		Ecologix	World Water Works
CAPITAL COST¹			
DIRECT COST			
Site Work ²	10%	\$172,000	\$172,000
Yard Piping and Valves ²	15%	\$258,000	\$258,000
Foundation		\$213,000	\$169,000
DAF System ³		\$1,577,000	\$1,859,000
Installation ²	20%	\$344,000	\$344,000
Electrical ⁴	15%	\$288,000	\$330,000
I&C ⁴	10%	\$192,000	\$220,000
SUBTOTAL DIRECT COST		\$3,040,000	\$3,350,000
Contingency ⁵	30%	\$912,000	\$1,005,000
TOTAL DIRECT COST		\$3,950,000	\$4,360,000
INDIRECT COST			
General Conditions, Overhead, Profit & Risk ⁶	22%	\$869,000	\$959,000
Bonds and Insurance ⁶	3%	\$119,000	\$131,000
Tax (7.75% Montecito Rate) ⁶	7.75%	\$306,000	\$338,000
TOTAL INDIRECT COST		\$1,290,000	\$1,430,000
TOTAL CONSTRUCTION COST		\$5,240,000	\$5,790,000
Engineering, Administration, and Legal ⁷	15%	\$786,000	\$869,000
TOTAL CAPITAL COST		\$6,030,000	\$6,660,000
ANNUAL OPERATION & MAINTENANCE COST			
Chemical (Coagulant, Caustic Soda, and Polymer) ⁸		\$425,000	\$271,000
Annual Power		\$250,000	\$167,000
Labor	\$ 35.00	\$10,000	\$10,000
General ⁵	0.5%	\$20,000	\$22,000
TOTAL ANNUAL O&M COST		\$710,000	\$470,000
ECONOMIC ANALYSIS			
Present Worth of Annual O&M ⁹		\$9,650,000	\$6,390,000
TOTAL PRESENT WORTH		\$15,680,000	\$13,050,000
Annualized Capital Cost		\$440,000	\$490,000
TOTAL EQUIVALENT ANNUAL COST		\$1,150,000	\$960,000
COST \$/1,000 Gallons Treated		\$3.42	\$2.85

¹Cost opinions correspond to March dollars (ENR 20-Cities Average Construction Cost Index = 12,791).

²Discipline allowance is calculated from average equipment costs of the two DAF vendor systems.

³Includes DAF unit, reaction tanks/ flocculator, chemical feed pumps, polymer feed system, and sludge transfer pump.

⁴Applied to equipment costs and installation.

⁵Applied to direct costs.

⁶Applied to direct costs with contingency.

⁷Applied to total construction cost.

⁸Applied unit chemical cost to monthly maximum flow of 0.92 MGD.

⁹Assumes discount rate of 4% per year and term of 20 years.

Conceptual Cost Opinion

AACE International Class 5 Estimate (Expected Accuracy Range of -50% to +100%)	Factor	Vendor Option 1	Vendor Option 2
		Ecologix	World Water Works
CAPITAL COST¹			
DIRECT COST			
Site Work ²	10%	\$34,000	\$34,000
Yard Piping and Valves ²	15%	\$51,000	\$51,000
Foundation		\$68,000	\$97,000
DAF System ³		\$314,000	\$360,000
Installation ²	20%	\$67,000	\$67,000
Electrical ⁴	15%	\$57,000	\$64,000
I&C ⁴	10%	\$38,000	\$43,000
SUBTOTAL DIRECT COST		\$630,000	\$720,000
Contingency ⁵	30%	\$189,000	\$216,000
TOTAL DIRECT COST		\$820,000	\$936,000
INDIRECT COST			
General Conditions, Overhead, Profit & Risk ⁶	22%	\$180,000	\$206,000
Bonds and Insurance ⁶	3%	\$25,000	\$28,000
Tax (7.75% Montecito Rate) ⁶	7.75%	\$64,000	\$73,000
TOTAL INDIRECT COST		\$270,000	\$310,000
TOTAL CONSTRUCTION COST		\$1,090,000	\$1,250,000
Engineering, Administration, and Legal ⁷	15%	\$164,000	\$188,000
TOTAL CAPITAL COST		\$1,250,000	\$1,440,000
ANNUAL OPERATION & MAINTENANCE COST			
Chemical (Coagulant, Caustic Soda, and Polymer) ⁸		\$305,000	\$195,000
Annual Power		\$55,000	\$43,000
Labor	\$ 35.00	\$10,000	\$10,000
General ⁵	0.5%	\$4,000	\$5,000
TOTAL ANNUAL O&M COST		\$370,000	\$250,000
ECONOMIC ANALYSIS			
Present Worth of Annual O&M ⁹		\$5,030,000	\$3,400,000
TOTAL PRESENT WORTH		\$6,280,000	\$4,840,000
Annualized Capital Cost		\$90,000	\$110,000
TOTAL EQUIVALENT ANNUAL COST		\$460,000	\$360,000
COST \$/1,000 Gallons Treated		\$1.90	\$1.49

¹Cost opinions correspond to March dollars (ENR 20-Cities Average Construction Cost Index = 12,791).

²Discipline allowance is calculated from average equipment costs of the two DAF vendor systems.

³Includes DAF unit, reaction tanks/ flocculator, chemical feed pumps, polymer feed system, and sludge transfer pump.

⁴Applied to equipment costs and installation.

⁵Applied to direct costs.

⁶Applied to direct costs with contingency.

⁷Applied to total construction cost.

⁸Applied unit chemical cost to the design flow of 0.7 MGD.

⁹Assumes discount rate of 4% per year and term of 20 years.



Appendix 7B
VENDOR INFORMATION

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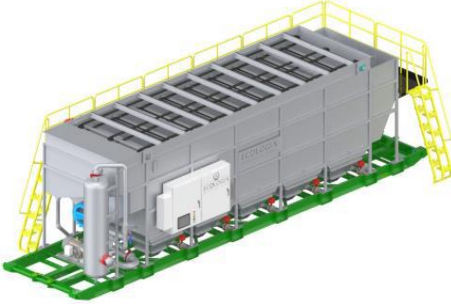



Line	Item Description	Qty	Unit	Price (USD)	Ext. Price (USD)
Ecologix Environmental Systems LLC Accounts Receivable 11800 Wills Road, Suite 100 Alpharetta, Georgia 30009 United States				Quote Date:	1-Jan-2022 Revised 30-March-2022
Quotation					


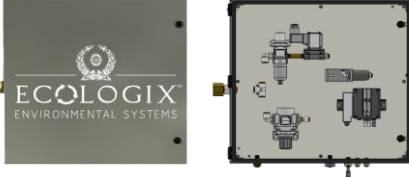



Bill To:	Viking Edeback, PE Carollo Tel: 520-230-4712 Email: VEdeback@carollo.com	Ship To:	
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Quote #:	44043	Terms:	50% deposit with PO, 25% Net 30, balance due prior to shipment.
Sales Rep:	Vincent Palermo	F.O.B.:	Alpharetta, GA
Customer #:	15511	Ship Via:	Best Way

Line Item	Item Description	Qty	Unit	Price US)	Ext. Price (USD)
1	<p>Ecologix E-1035 DAF System</p> <p>The Ecologix E-1035 can process flow rates up to 3,237 GPM (735.1 m³/hr) with combined TSS loadings of up to 1,500 mg/L. This system provides extra capacity for either potential future growth or improved processing, due to the increased surface area capacity. Counter-Current flow design for increased effluent quality, Lamella Tubes with 5,058ft² (469.9m²) of Surface Area, 304 Stainless Steel DAF Body, Top Scraper with Viton Flights, Sch40 316SS Piping and Valves, Sch 80 PVC or HDPE Sludge Piping, Internal Duplex Steel Whitewater Pump, 316SS Saturation Tank, and Mezzanine with Alternating Tread Stairs.</p> <p>DAF Dimensions: 43' 5" L x 11' 2" W x 10' 10" H</p>	2	EA	\$ 596,250.00	\$ 1,192,500.00
	 <i>Image for illustration only</i>				
2	<p>CRT-7500 - 1900-3800gpm - Chemical Reaction Tank</p> <p>The CRT-7500 is sized for 1900-3800gpm with 2-4 minute contact time. Made of 304SS, each unit has three compartments with three mixers. The first compartment is for the addition of Coagulant, pH adjustment and Oxidation, as necessary. The second compartment is for the rapid mixing of Polymer. The Third compartment is for slow mixing and expansion of the polymer.</p>	2	EA	\$ 192,300.00	\$ 384,600.00
	 <i>Image for illustration only</i>				

Line	Item Description	Qty	Unit	Price (USD)	Ext. Price (USD)
3	<p>System PLC - Allen Bradley CompactLogix</p> <p>PLC is compact, skid mounted, fully controlled, with 10.5" TFT high resolution HMI panel, remote monitoring and control capabilities. Panel includes the Allen Bradley CompactLogix PLC processor, able to be tied into a plant SCADA system. Panel is capable of connecting to other process skids by simply adding power and a single CAT5E ethernet cable. Easy remote access to PLC, HMI, IPC, and IP Camera. Industrial VPN router designed to for remote access, across the Internet, to machines and installations on site. Troubleshoot machines remotely without going on-site, drastically reducing support costs.</p>	2	EA	Included	Included
4	<p>Pneumatic Control Panel</p> <p>Air distribution control panel for air flow as well as the air pressure throughout the E-DAF system. It manages the air distribution to the whitewater pump along with the solenoid valves for the pneumatically actuated valves. This gives the operator peace-of-mind and if needed, the freedom to add additional pneumatically actuated valves by simply adding more solenoids to the existing solenoids bank. This panel is the master hub for all compressed air applications making it easy to maintain and control. As it is also connected to the main PLC, this panel alerts the operator for any compressed air loss or fluctuation in air supply.</p>	2	EA	Included	Included
5	<p>Saturation Tank</p> <p>304SS saturation tank provides hydraulic retention time under pressure allowing separation and removal of large, undissolved air bubbles. Resulting average air bubble size is as low as 1-10 microns, much smaller than industry average.</p>	2	EA	Included	Included
6	<p>Whitewater Pump</p> <p>Off the shelf, non-proprietary, ANSI pump with internal duplex steel hardened for high salinity levels. Easier to maintain and readily available to replace, if needed. Results in lower capital cost and lower operating cost.</p>	2	EA	Included	Included
7	<p>Rotary Lobe Sludge Transfer Pump</p> <p>4" skid mounted pump transfers sludge away from the DAF system.</p>	2	EA	Included	Included
8	<p>Flow Sensor + pH Sensor + TSS sensor</p> <p>Eight inch, flanged magnetic flow meter for automatic and accurate sensing of influent and effluent flow rates to treatment system. Meter is equipped with an internal PTFE liner for industrial applications.</p>	2	EA	Included	Included
9	<p>Chemical Feed Pumps</p> <p>Two (2) Grundfos (or equivalent) chemical feed pumps: one (1) coagulant feed pump and one (1) caustic feed pump. PVC Sch80 pipe and nylon tubing (or equivalent compatible materials). Pumps to be mounted on the flocc tubes. Includes foot valves and injection quills.</p>	2	EA	Included	Included
10	<p>Emulsion Polymer Activation System + Polymer Feed Pump</p> <p>Pre-engineered polymer mixing system designed with intuitive controls. It is an in-line or makedown unit and is engineered to meet liquid polymer applications utilizing diaphragm or progressive cavity pump technologies. The unique mixing regime delivers a highly activated polymer solution to every application with optimum performance.</p> <p>Dimensions: 2' 10" (0.86m) L x 2' 0" (0.60m) W</p>	2	EA	Included	Included
				Subtotal:	\$ 1,577,100.00

Line	Item Description	Qty	Unit	Price (USD)	Ext. Price (USD)
Ecologix Environmental Systems LLC Accounts Receivable 11800 Wills Road, Suite 100 Alpharetta, Georgia 30009 United States		 Quotation		Quote Date:	1-Jan-2022
Bill To:	Viking Edeback, PE Carollo Tel: 520-230-4712 Email: VEdeback@carollo.com	Ship To:			
Quote #:	44043	Terms:	50% deposit with PO, 25% Net 30, balance due prior to shipment.		
Sales Rep:	Vincent Palermo	F.O.B.:	Alpharetta, GA		
Customer #:	15511	Ship Via:	Best Way		
Line Item	Item Description	Qty	Unit	Price US)	Ext. Price (USD)
1	Ecologix E-1030 DAF The Ecologix E-1030 can process flow rates up to 2,774 GPM (630 m ³ /hr) with combined TSS loadings of up to 1,500 mg/L. This system provides extra capacity for either potential future growth or improved processing, due to the increased surface area capacity. Counter-Current flow design for increased effluent quality, Lamella Tubes with 4,335ft ² (402m ²) of Surface Area, 304 Stainless Steel DAF Body, Top Scraper with Viton Flights, Sch40 316SS Piping and Valves, Sch 80 PVC or HDPE Sludge Piping, Internal Duplex Steel Whitewater Pump, 316SS Saturation Tank, and Mezzanine with Alternating Tread Stairs. DAF Dimensions: 37' 11"L x 11' 2"W x 10' 10"H	2	EA	\$ 520,000.00	\$ 1,040,000.00
					
	<i>Image for illustration only</i>				
2	CRT-7500 - 1900-3800gpm - Chemical Reaction Tank The CRT-7500 is sized for 1900-3800gpm with 2-4 minute contact time. Made of 316SS, each unit has three compartments with three mixers. The first compartment is for the addition of Coagulant, pH adjustment and Oxidation, as necessary. The second compartment is for the rapid mixing of Polymer. The Third compartment is for slow mixing and expansion of the polymer.	2	EA	\$ 180,000.00	\$ 360,000.00
					
	<i>Image for illustration only</i>				
3	Ecologix E-515 DAF The Ecologix E-515 can process flow rates up to 695 GPM (157m ³ /h) with combined TSS and O&G loadings of up to 1,500 mg/L. This system provides extra capacity for either potential future growth or improved processing, due to the increased surface area capacity. Counter-Current flow design for increased effluent quality, Lamella Tubes with 1,085ft ² (100m ²) of Surface Area, 304 Stainless Steel DAF Body, Scraper, Flight, Weirs, Sch40 PVC Piping and Valves, internal 316 Stainless Steel Pumps, Whitewater Pump, Saturation Tank, Top Scraper and Bottom Cone, and Galvanized Mezzanine. DAF Dimensions: 20'L x 9' W x 11' H	1	EA	\$ 199,000.00	\$ 199,000.00
					
	<i>Image for illustration only</i>				
4	FLT-640 Floctube Triple wrap for longer reaction time and compact footprint. DAF flocculation tubes are sized for 160-450gpm. Includes a painted CS support structure. Also includes PVC Piping and Fittings for flocculation, pH sensor, flow meter, sample ports and drain ports, chemical injection ports for coagulant, caustic soda and polymer.	1	EA	\$ 19,000.00	\$ 19,000.00
					
	<i>Image for illustration only</i>				

Line	Item Description	Qty	Unit	Price (USD)	Ext. Price (USD)
5	<p>System PLC Controls – Allen Bradley Controls</p> <p>This panel is compact and skid mounted, fully PLC controlled, it has a 10.5" TFT high resolution HMI panel and remote monitoring and control capabilities. This panel includes the Allen Bradley CompactLogix PLC processor, capable of tying into a plant SCADA system. It is capable of connecting to other process skids by simply adding power and a single CAT5E Ethernet cable. Easy Remote Access to PLC, HMI, IPC, IP Camera. Industrial VPN router designed to offer easy remote access, across the Internet, to machines and installations on site. Troubleshoot machines remotely without going on-site, drastically reducing support costs.</p>	3	EA	\$ 39,000.00	\$ 117,000.00
					
	<i>Image for illustration only</i>				
6	<p>Pneumatic Control Panel</p> <p>A second Panel mounted on the E-DAF is an Air Distribution Control panel. It controls both the air flow as well as the air pressure throughout the E-DAF system. It manages the air distribution to the Whitewater Pump along with the Solenoid Valves for the pneumatically actuated valves. This gives the operator peace-of-mind and if needed, the freedom to add additional pneumatically actuated valves by simply adding more solenoids to the existing solenoids bank. This panel is the master hub for all Compressed Air application making it easy to maintain and control. As it is also connected to the main PLC, this panel alerts the operator for any compressed air loss or fluctuation in</p>	3	EA	\$ 7,500.00	\$ 22,500.00
					
	<i>Image for illustration only</i>				
7	<p>Chemical Feed Pumps</p> <p>Two (2) chemical feed pumps: one (1) Caustic Soda, one (1) Coagulant feed pump. HDPE Plastic Stand. Grundfos brand or Equivalent quality. PVC Sch80 Pipe and Nylon Tubing (or equivalent compatible materials). Includes foot valves and injection quills.</p>	6	EA	\$ 8,500.00	\$ 51,000.00
					
	<i>Image for illustration only</i>				
8	<p>Emsulsion Polymer Activation System + Polymer Feed Pump</p> <p>This pre-engineered polymer mixing system is designed with intuitive controls. It is an in-line or makedown unit, and is engineered to meet liquid polymer applications utilizing diaphragm or progressive cavity pump technologies. The unique mixing regime delivers a highly activated polymer solution to every application with optimum performance. Skid Dimensions: 2'-10" L x 2'-0" W</p>	3	EA	\$ 19,800.00	\$ 59,400.00
					
	<i>Image for illustration only</i>				
9	<p>Rotary Lobe Sludge Transfer Pump</p> <p>Sludge Transfer Skid: 4" skid mounted on a skid. Transfers sludge away from the DAF system.</p>	3	EA	\$ 8,500.00	\$ 25,500.00
					
	<i>Image for illustration only</i>				
				Freight Estimate:	TBD
<p>Payments: 50% deposit with PO, 25% Net 30, balance due prior to shipment. Shipping: Ex-Factory, 12-16 weeks after receipt of PO and approval of submittals. Warranty: One (1) Year on workmanship and equipment. Start-Up and Training: \$1,800/man-day plus Travel and Expenses. Remote Monitoring and Control: Shall be automatically charged at the rate of \$0.07/BBL Terms: Your use and access of the Hardware, Products, Services specified herein are governed by Ecologix Environmental Systems terms of service found at https://www.EcologixSystems.com/terms-of-service. You agree to be bound by those terms of service unless otherwise agreed to herein or in another agreement.</p>				Total:	\$ 1,893,400.00

E-1035 DAF System Specifications:

1. **SHIPPING WT:** 22,000 lbs (approx.)

2. **OPERATING WT:** 150,000 lbs (approx.)

3. **DESIGN PARAMETERS:**

- DAF Design Flow Rate: 3,237 gpm / 110,982 BPD
- Loading Rate: 0.64 gpm/ sq. ft. of projected area
- Maximum TSS @ Designed Flow Rate: 1440 mg/l
- Projected Surface Area: 5,058 sq. ft.

4. **MATERIAL OF CONSTRUCTION:**

- All wetted metal materials to be SS 304 / SS 316
- All non-wetted metal materials to be SS 304
- All flanges to be ANSI 150# ANSI flanges ASTM A-182 - ANSI B16.5
- All metal piping to be Sch 10 - pipe SS 304 / SS 316
- All non-metal piping materials to be PVC Sch80 / HDPE
- All Structure Beams to be Rectangular Tubing 3" x 2" x 11 ga SS 304
- All anchor material to be 1/2" SS 304
- Flight Material of Construction: EPDM Rubber / Viton
- Tube Settlers Material of Construction: Polypropylene

5. **SAFETY AND HEALTH:**

- All moving parts are inaccessible, as required by OSHA
- All electric power elements are in accordance with OSHA regulations

6. **COATING:**

- All stainless steel parts are sandblasted
- Mezzanine platform to be carbon steel painted grit black with safety yellow handrails and alternating tread stairs

7. **WELDING:**

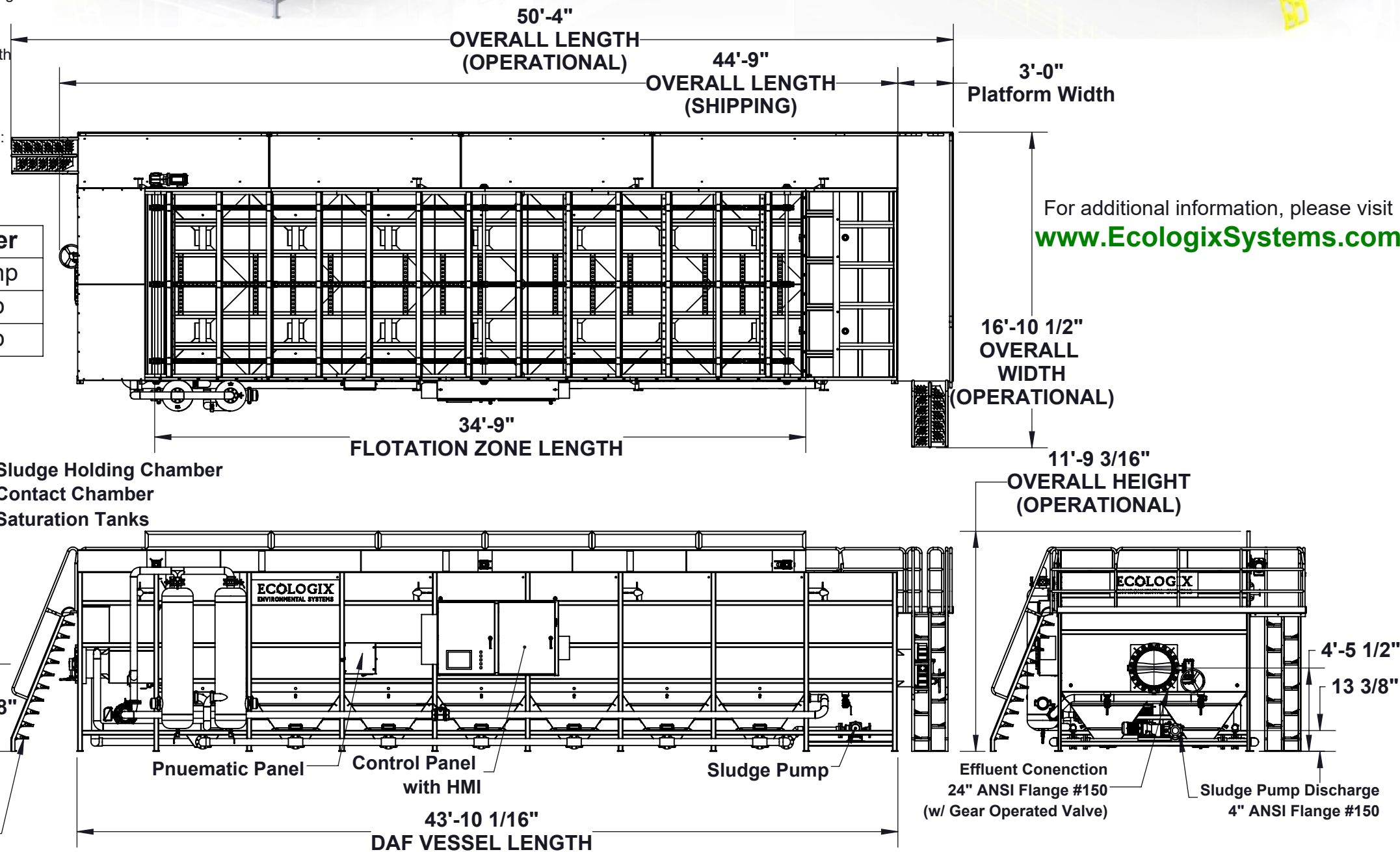
- All welds to conform to AWS applicable specification(s).
- Welding equipment for sheet metal and structural elements: Wirefed MIG or TIG where applicable
- Welding equipment for piping and fittings: TIG or MIG

8. **EQUIPMENT INFORMATION:** See Table.

Equipment	Brand	Power
Whitewater Pump	Pioneer	100 hp
Sludge Pump	Boerger	3 hp
Scraper Motor	SEW	1 hp



**ECOLOGIX
E-1035 DAF**



For additional information, please visit
www.EcologixSystems.com

REVISION HISTORY				
REV	DESCRIPTION	DATE	BY	APV
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11800 Wills Road Suite 110, Alpharetta, GA 30009
Phone: 678-514-2100 Fax: 678-514-2106
www.ecologixsystems.com

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SIGN.	NAME	DATE
DRAWN	MNT	7/22/2021
CHECKED	NPT	7/22/2021
ENG APPR	NPT	7/22/2021
MGR APPR	NPT	7/22/2021

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ANGLES 40.5°
CUTTING DISTANCE ± 0.005
WELDING DISTANCE ± 0.005

**ECOLOGIX E-1035
Submittal Drawing**

SIZE	DRAWING: Configuration Name	REV
D	ECOLOGIX-E1035	1
FILE NAME:	AN00215.1035	
MATERIAL:	SEE SPECS	
SCALE:	N.T.S	WEIGHT: SEE SPECS
		SHEET NO. 1 OF 1

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ECOLOGIX E-515 DAF System Specifications

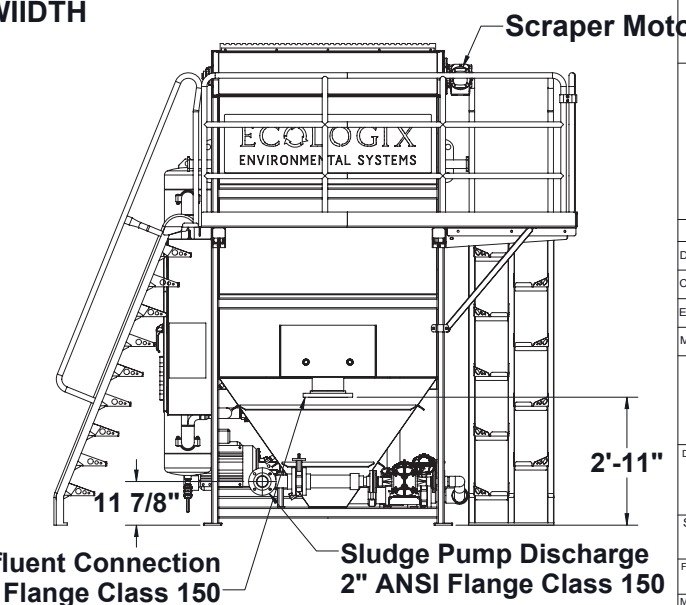
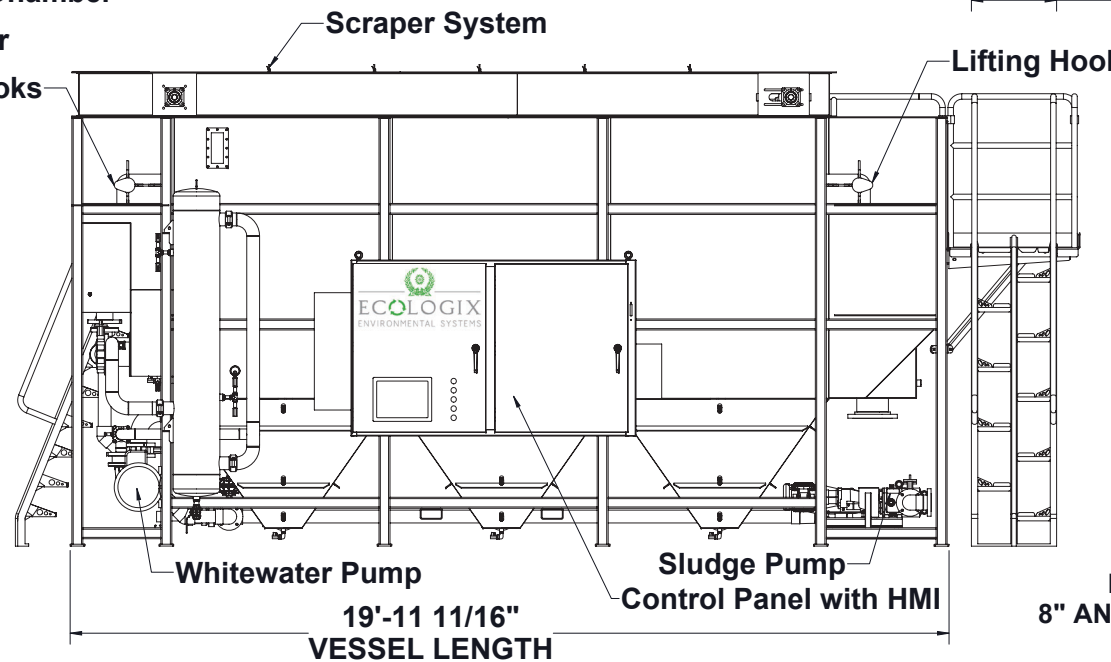
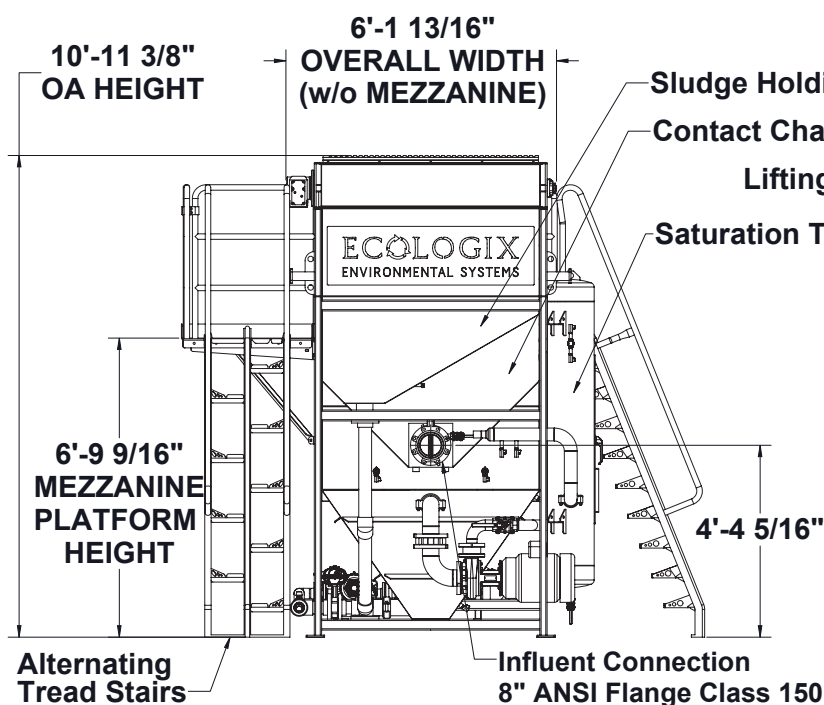
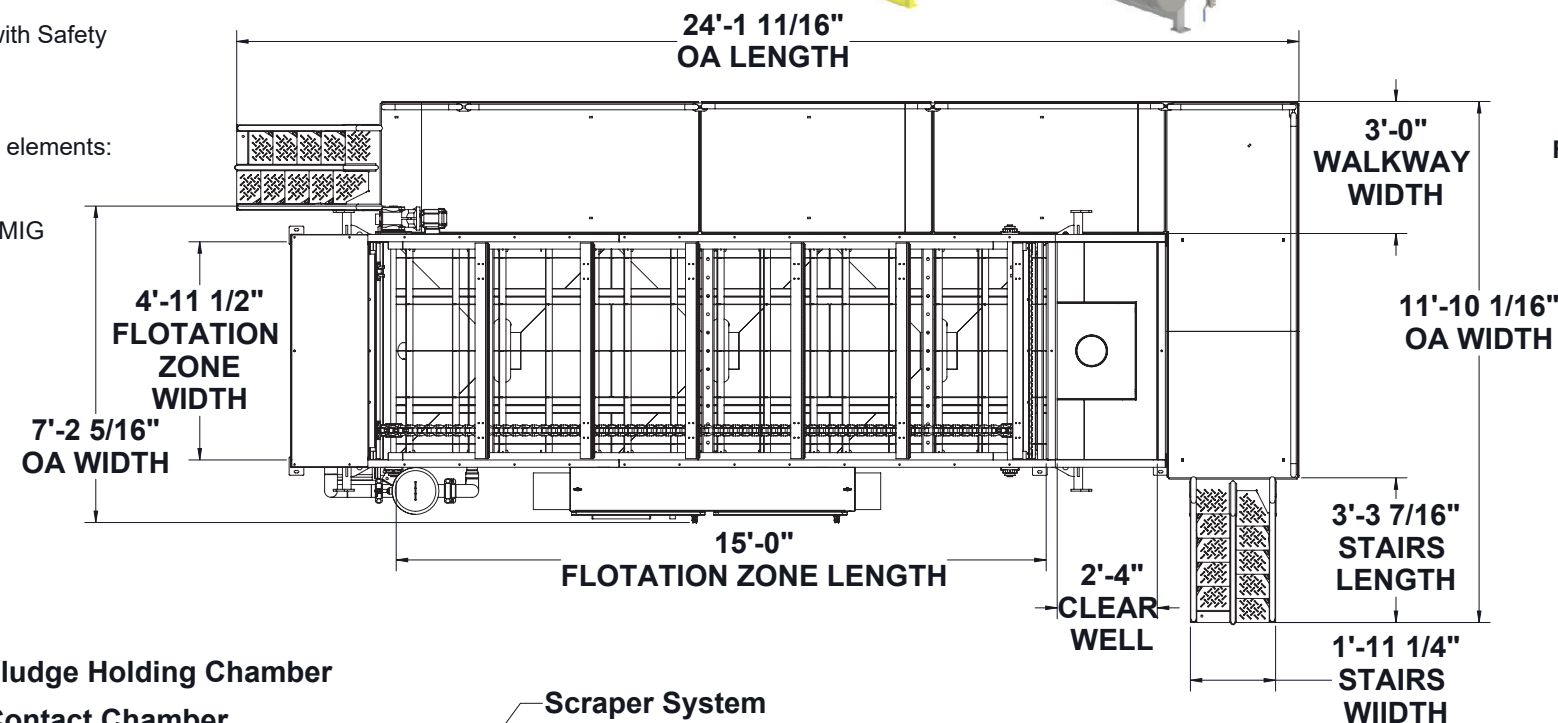
- SHIPPING WT** = 7,800 lbs (approx)
- OPERATING WT** = 29,000 lbs (approx)
- DESIGN PARAMETERS:**
 - DAF Design Flow Rate: 695 GPM / 23,828 BPD
 - Loading Rate: 0.64 gpm/ sq. ft. of projected area
 - Maximum TSS @ Designed Flow Rate: 1440 mg/ l
 - Projected Surface Area: 1085 sq. ft.
- MATERIAL OF CONSTRUCTION:**
 - All wetted metal materials to be 304SS or 316SS
 - All non-wetted metal materials to be 304SS or 316SS
 - All flanges to be ANSI 150# ANSI flanges ASTM A-182 - ANSI B16.5
 - All metal piping to be Sch 40 - pipe 304SS or 316SS
 - All non-metal piping materials to be PVC Sch80
 - All Structure Beams to be Rectangular Tubing 3" x 2" x 11 ga 304SS
 - All anchor material to be 1/2" 304SS
 - Flight Material of Construction: Viton or EPDM Scraping Rubber
 - Tube Settlers Material of Construction: Polypropylene
- SAFETY AND HEALTH:**
 - All moving parts are inaccessible, as required by OSHA
 - All electric power elements are in accordance with OSHA regulations
- COATING:**
 - All stainless steel parts are sandblasted
 - Mezzanine Platform to be carbon steel painted Grit Black with Safety Yellow Handrails and Alternating Tread Stairs
- WELDING:**
 - All welds to conform to AWS applicable specification(s)
 - Welding equipment/ supplies for sheet metal and structural elements: Wire fed MIG machine or TIG where applicable
 - Welding equipment/ supplies for piping and fittings: TIG or MIG
- EQUIPMENT INFORMATION:**

Equipment	Brand	Power
Whitewater Pump	Pioneer	30 hp
Sludge Pump	Boerger	2 hp
Scraper Motor	SEW	1/2 hp



ECOLOGIX E-515 DAF

For additional information, please visit www.ecologixsystems.com



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SIGN:	NAME	DATE
DRAWN	NPT	11/18/2020
CHECKED	NPT	11/18/2020
ENG APPR	NPT	11/18/2020
MGR APPR	EG	11/18/2020

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ANGLES ±0.5°
CUTTING DISTANCE ±1/16"
WELDING DISTANCE ±1/16"

DRAWING TITLE: **ECOLOGIX E-515**
Submission Drawing

SIZE	DRAWING: Configuration Name	REV
D	ECOLOGIX : E-515	1

FILE NAME: AN00218
MATERIAL: SEE SPECS
SCALE: N.T.S. WEIGHT: SEE SPECS SHEET NO. 1 OF 1

LAST UPDATE:

CAD FILE LOCATION:

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FLT-640 - 3 STAGE FLOC TUBES:

- 1. SHIPPING WT: 3030 lbs (approx.)
- 2. OPERATING WT: 5950 lbs (approx.)
- 3. DESIGN PARAMETERS:

- Design Flow Rate: 160 to 450 GPM
- Retention Time: 150 to 55 sec.
- Volume: 350 Gallons

4. MATERIAL OF CONSTRUCTION:

- All pipings materials to be Sch 80 PVC
- All non-wetted metal materials to ASTM A36 Carbon Steel
- All flanges to be ANSI 150# ANSI flanges ASTM A-182 - ANSI B16.5

- All the structure to be ASTM A36 Carbon Steel
- Gasket Materials to be: Buna or EPDM Rubber

5. SAFETY AND HEALTH:

- All electric power elements are in accordance with OSHA regulations

6. COATING:

- All A-36 ASTM Carbon Steel parts to be power coated with Performance Polymer Alloy Coating Plastcoat PPA 571 ES

7. WELDING:

- All welds to conform to AWS applicable specification(s)
- Welding equipment/ supplies for sheet metal and structural elements: Wirefed MIG machine

7. PUMPS:

- Pump shelf to fit up to (5) five Prominent Chemical Feed Pumps / Grundfos Chemical Feed Pumps

- Prominent / Grundfos Chemical Feed Pumps

- Pumps to be defined per project

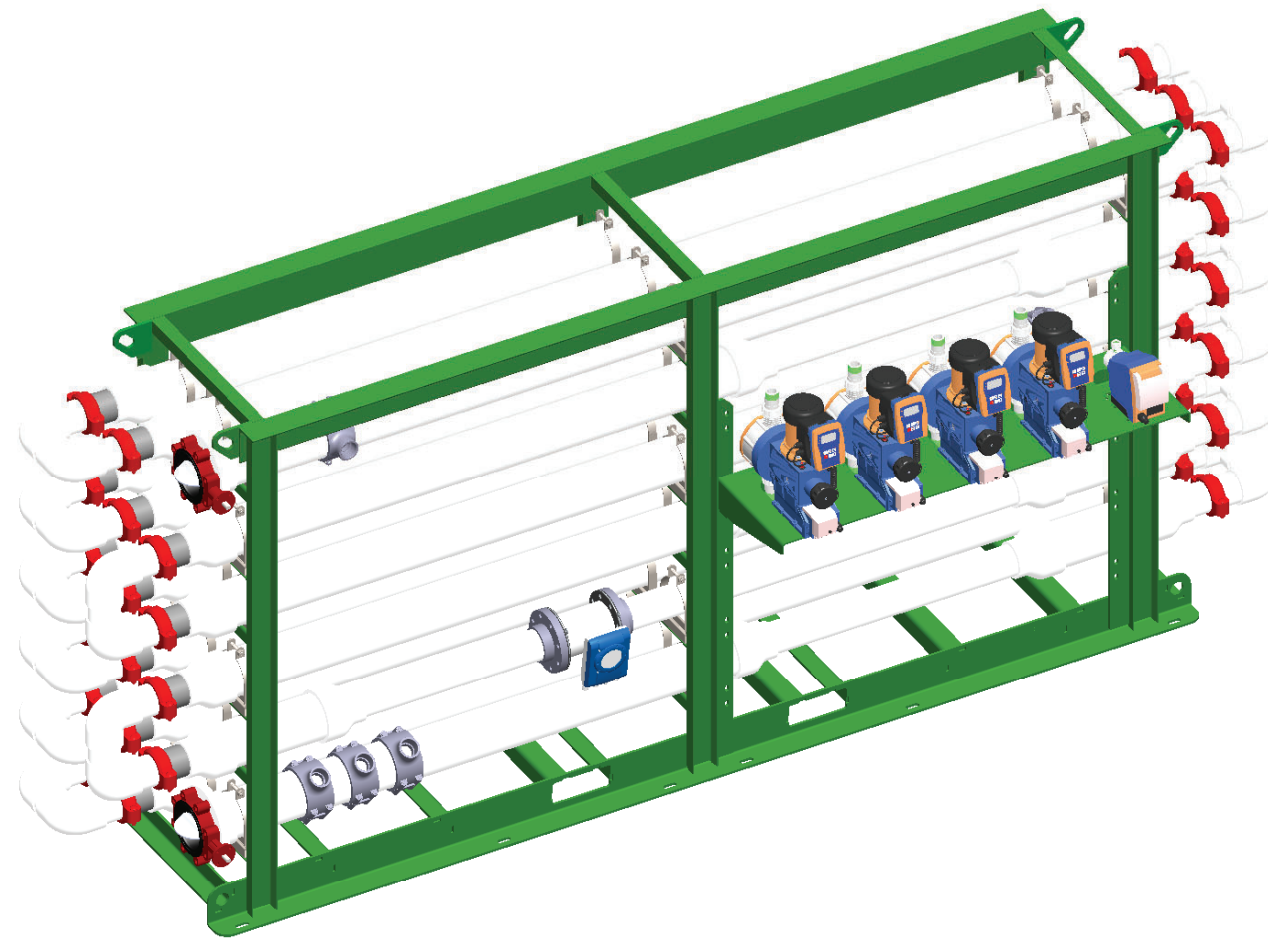
- All tubing and/or hose connetions between the pump and the injections

main process line to be supplied by Ecologix

- Injection Quills and foot valves to be supply in accordance with the application and number of pumps.

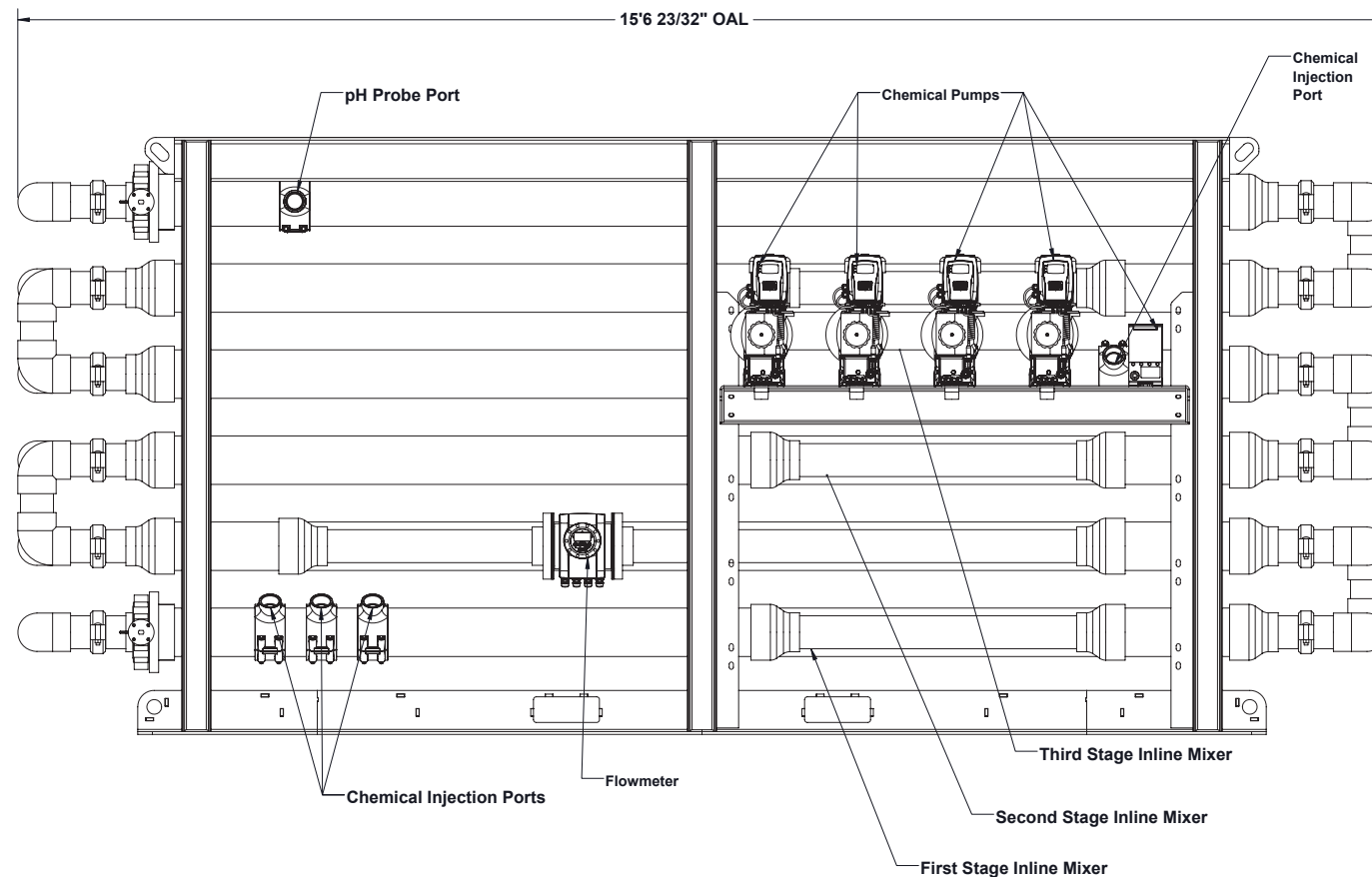
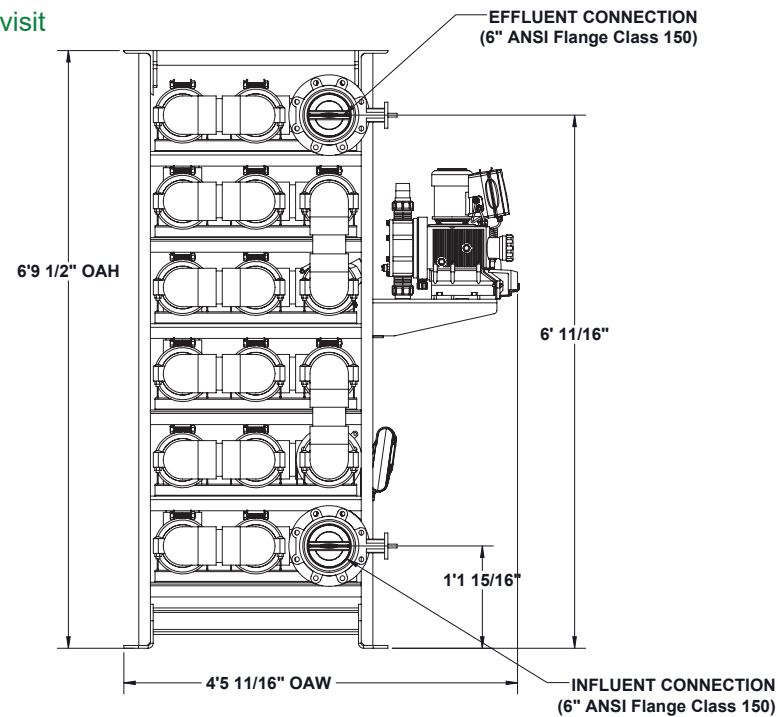
8. INSTRUMENTATION:

- Flowmeter and pH probe to be Kronhe / Endress Hauser



ECOLOGIX FLOC TUBES FLT-640

For additional information, please visit www.EcologixSystems.com



REVISION HISTORY				
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ECOLOGIX
ENVIRONMENTAL SYSTEMS

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SIGN:	NAME	DATE
	IK	6/11/2020
CHECKED:		6/11/2020
ENG APPR:		
MGR APPR:		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
ANGLES ±0.5°
CUTTING DISTANCE ±¹/₁₆"
WELDING DISTANCE ±¹/₈"

DRAWING TITLE
6"X4" FLT Submittal Drawing

SIZE	DRAWING: Configuration Name	REV
D	AM00221.06.2	1

FILE NAME: **AM00221.6-Submittal**

MATERIAL:

SCALE: 1:4 WEIGHT: SHEET NO. 1 OF 1

LAST UPDATE: CAD FILE LOCATION:

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DISSOLVED AIR FLOTATION – RSP-13L

The Ideal DAF™ Dissolved Air Flotation system removes suspended solids, fats, oils and greases, and other insoluble materials. The Ideal DAF™ achieves high rate removal efficiencies at a low operational cost by employing such proprietary techniques as: Progressive Water Extraction, Cross-Flow, Dissolved Air Generator (Ideal DAG™), Lamella Plate Pack Design, and proficient Hydraulic design.

Dissolved Air Flotation (DAF) is the process whereby micro-air-bubbles cause suspended materials to float to the surface of a vessel to achieve liquid/solids separation. The water to be treated enters the vessel through a proprietary influent system designed to reduce velocity and distribute water across the length of the system. In order to optimize treatment, the influent system is designed with multiple options for “whitewater” and flocculant injection points, where applicable. Whitewater is a highly saturated pressurized stream of air and DAF effluent that is generated through a proprietary, highly efficient, and robust DAG™ system. The wastewater then enters the vessel, and the microbubbles, which have attached to the particle surface, affect the particle density, causing the suspended solids to float to the surface where a chain and flight system skim them from the surface into a top cone. The clarified liquid is continuously removed at several points inside the vessel and passes over pipe weirs into an effluent box. From the effluent box, the wastewater gravity feeds out of the system.



FEATURES

- Polypropylene Frame Construction
 - ▶ Provides superior qualities compared to stainless steel such as: lighter weight, higher chemical resistance (corrosion resistance), longer life span, less expensive (materials costs), and lower maintenance.
- Lamella Plates
 - ▶ Corrugated plates provide increased surface area to enhance separation performance.
- Progressive Water Extraction
 - ▶ The process of extracting the clean water from the system as the influent travels through the system, providing additional time for the concentrated slurry to separate.
- Dissolved Air
 - ▶ The DAG™ is used for generating 5-12 micron bubbles at very high saturation efficiencies.
- Cross Flow
 - ▶ The vessel design is such that the influent water is spread across the length of the vessel to reduce the velocity of the water to optimize separation efficiencies.
- Cone Bottom Sludge Removal
 - ▶ A safe, low-maintenance method for efficient removal of any settled particles.

SPECIFICATIONS

Overall System

Model	RSP-13L	
Maximum Temp	170 °F	77 °C
pH Tolerance	1 – 12 S.U.	

Dimensions (approximate)

Vessel (WxLxH)	11'0" x 32'5" x 15'6"	3.36 m x 9.00 m x 3.05 m
Overall (excluding platform)	15'2" x 37'9" x 15'6"	4.98 m x 11.82 m x 3.05 m
Platform Dimensions		
Standard (WxL)	3'0" x 11'0"	0.92 m x 3.36 m
Extended (Optional)	2'0" x 33'6"	0.61 m x 7.96 m

DAF Weight (approximate)

Shipping	43,000 lbs	19,505 kg
Operational	209,000 lbs	94,805 kg

Pipe Diameters

Inlet	2 x 16" (150 lb ANSI Flange)
Outlet	30" (150 lb ANSI Flange)
Sludge	6" (150 lb ANSI Flange)

Standard Equipment

Dissolved Air Generator DAG™	See Proposal
Sludge Pump	See Proposal
Solenoid Valves	SMC
Rake Drive Motor	Motovario Gear Reducer (5 HP, TEFC Inverter Duty)
Control Valves	Orbinox 3" Pneumatic Knife Gate

Materials of Construction

Vessel	Polypropylene
Exo Skeleton	304 Stainless Steel
Piping	Polypropylene and Sch.80 PVC
Lamella Plates	HDPE
Platform/Grating	Fiberglass
Pneumatic Valves	Cast Body / Stainless Steel Internals
Manual Valves	SCH 80 PVC or Cast Body / Stainless Steel Internals
Chain/Flight/Wear Blocks	Acetal / Fiberglass / UHMW
Gaskets	EPDM

Optional Equipment

Advanced Pipe Flocculator	Sludge Tank
Advanced PLC Controls	Splash Guards Stainless
Cover	Steel Vessel
Effluent Tank	Thickening Beach™
Extended Platform	

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DISSOLVED AIR FLOTATION – RSP-25SW

The Ideal DAF™ Dissolved Air Flotation system removes suspended solids, fats, oils and greases, and other insoluble materials. The Ideal DAF™ achieves high rate removal efficiencies at a low operational cost by employing such proprietary techniques as: Progressive Water Extraction, Cross-Flow, Dissolved Air Generator (Ideal DAG™), Lamella Plate Pack Design, and proficient Hydraulic design.

Dissolved Air Flotation (DAF) is the process whereby micro-air-bubbles cause suspended materials to float to the surface of a vessel to achieve liquid/solids separation. The water to be treated enters the vessel through a proprietary influent system designed to reduce velocity and distribute water across the length of the system. In order to optimize treatment, the influent system is designed with multiple options for “whitewater” and flocculant injection points, where applicable. Whitewater is a highly saturated pressurized stream of air and DAF effluent that is generated through a proprietary, highly efficient, and robust DAG™ system. The wastewater then enters the vessel, and the microbubbles, which have attached to the particle surface, affect the particle density, causing the suspended solids to float to the surface where a chain and flight system skim them from the surface into a top cone. The clarified liquid is continuously removed at several points inside the vessel and passes over pipe weirs into an effluent box. From the effluent box, the wastewater gravity feeds out of the system.



FEATURES

- Polypropylene Frame Construction
 - ▶ Provides superior qualities compared to stainless steel such as: lighter weight, higher chemical resistance (corrosion resistance), longer life span, less expensive (materials costs), and lower maintenance.
- Lamella Plates
 - ▶ Corrugated plates provide increased surface area to enhance separation performance.
- Progressive Water Extraction
 - ▶ The process of extracting the clean water from the system as the influent travels through the system, providing additional time for the concentrated slurry to separate.
- Dissolved Air
 - ▶ The DAG™ is used for generating 5-12 micron bubbles at very high saturation efficiencies.
- Cross Flow
 - ▶ The vessel design is such that the influent water is spread across the length of the vessel to reduce the velocity of the water to optimize separation efficiencies.
- Cone Bottom Sludge Removal
 - ▶ A safe, low-maintenance method for efficient removal of any settled particles.

SPECIFICATIONS

Overall System

Model	RSP-25SW	
Maximum Temp	170 °F	77 °C
pH Tolerance	1 – 12 S.U.	

Dimensions (approximate)

Vessel (WxLxH)	11'0" x 29'6" x 10'0"	3.36 m x 9.00 m x 3.05 m
Overall (excluding platform)	16'4" x 38'9" x 10'0"	4.98 m x 11.82 m x 3.05 m
Platform Dimensions		
Standard (WxL)	3'0" x 11'0"	0.92 m x 3.36 m
Extended (Optional)	2'0" x 26'1"	0.61 m x 7.96 m

DAF Weight (approximate)

Shipping	20,750 lbs	9,415 kg
Operational	127,950 lbs	58,040 kg

Pipe Diameters

Inlet	14" (150 lb ANSI Flange)
Outlet	18" (150 lb ANSI Flange)
Sludge	3" (150 lb ANSI Flange)

Standard Equipment

Dissolved Air Generator DAG™	See Proposal
Sludge Pump	See Proposal
Solenoid Valves	SMC
Rake Drive Motor	Nord Gear Reducer (5 HP, TEFC Inverter Duty)
Control Valves	Orbinox 3" Pneumatic Knife Gate

Materials of Construction

Vessel	Polypropylene
Exo Skeleton	304 Stainless Steel
Piping	Polypropylene and Sch.80 PVC
Lamella Plates	HDPE
Platform/Grating	Fiberglass
Pneumatic Valves	Cast Body / Stainless Steel Internals
Manual Valves	SCH 80 PVC or Cast Body / Stainless Steel Internals
Chain/Flight/Wear Blocks	Acetal / Fiberglass / UHMW
Gaskets	EPDM

Optional Equipment

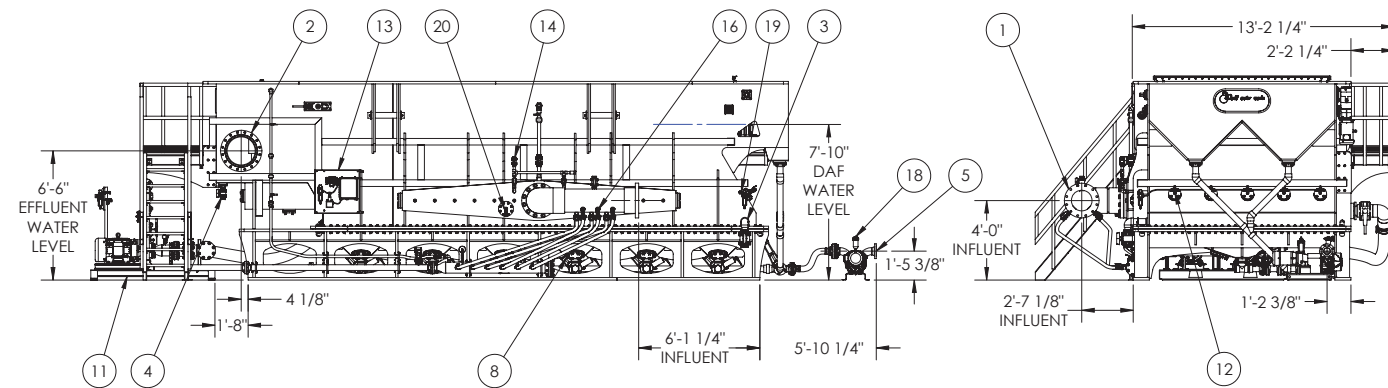
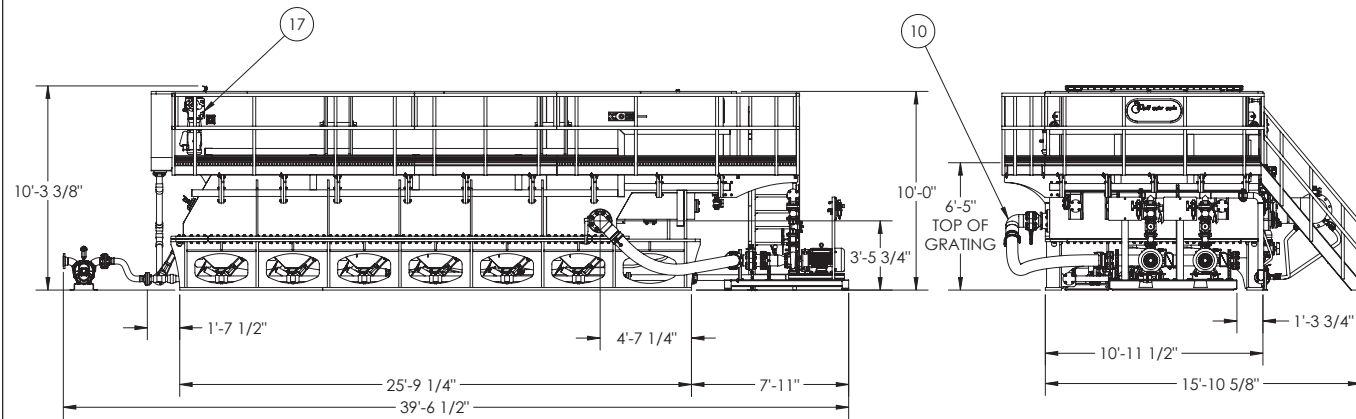
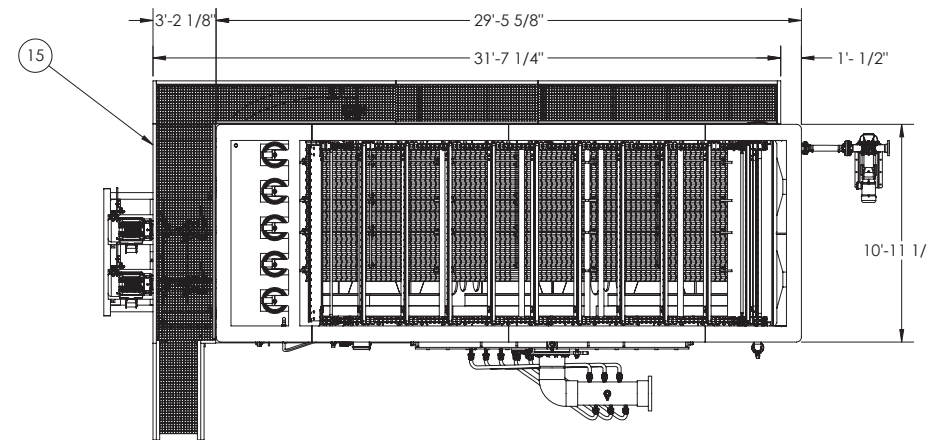
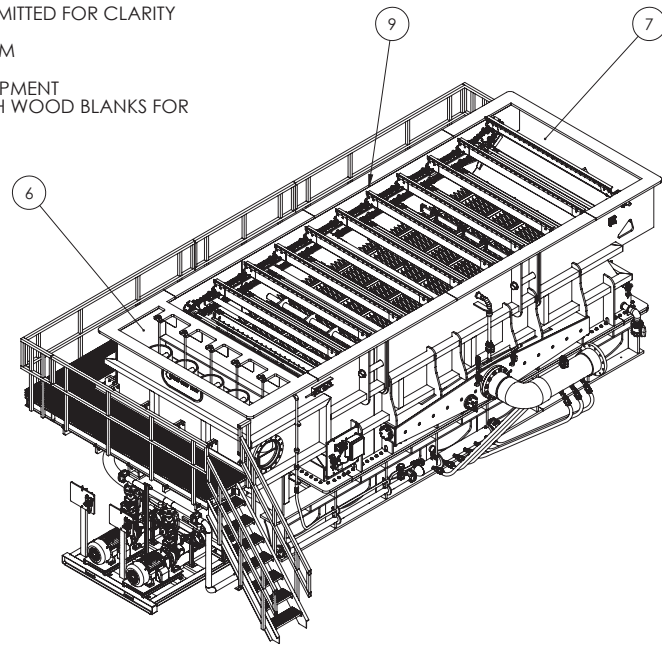
Advanced Pipe Flocculator	Sludge Tank
Advanced PLC Controls	Splash Guards Stainless
Cover	Steel Vessel
Effluent Tank	Thickening Beach™
Extended Platform	

GENERAL NOTES

1. ALL IS TO BE CONSTRUCTED GREY FROM HIGH IMPACT NATURAL STRESS RELIEVED, VIRGIN COPOLYMER POLYPROPYLENE. U.O.W.S SERVICE: WASTE WATER @ 40°F ~ 130°F
2. ALL FLANGES TWO-HOLED TO THE CENTER LINE
3. STEEL REINFORCEMENTS TO BE: 304 STAINLESS STEEL
4. ALL DIMENSIONS SHOWN APPLY TO AMBIENT TEMPERATURE (NON-EXPAND)
5. A SPREADER BEAM IS REQUIRED TO BE DESIGNED TO ENSURE VERTICAL OR MINIMUM OUTWARD LIFT
6. SOME HIDDEN LINES AND COMPONENTS OMITTED FOR CLARITY
7. TANKS TO BE TRANSPORTED EMPTY
8. ALL GASKET MATERIAL TO BE 3/16" THK. EPDM
9. ALL FASTENERS TO BE 304 SS
10. HYDRO. TEST TO BE COMPLETED BEFORE SHIPMENT
11. ALL FLANGES FACES TO BE PROTECTED WITH WOOD BLANKS FOR SHIPPING

EMPTY WEIGHT: 22575 LBS
OPERATIONAL WEIGHT: 44250 LBS

RSP-25SW SH-101 DAF



ITEM NO.	DESCRIPTION
1	INFLUENT, 14" FLANGE 150 LB
2	EFFLUENT, 18" FLANGE 150 LB
3	INFLUENT DRAIN, 3" PVC BALL VALVE
4	EFFLUENT DRAIN, 1-1/2" PVC BALL VALVE
5	SLUDGE DISCHARGE, 3" FLANGE 150 LB
6	CLEAN WATER EFFLUENT WEIR BOX
7	SLUDGE HOPPER
8	CONE BOTTOM SOLIDS REMOVAL VALVES (AUTO), 3"
9	SKIMMER PADDLE
10	DAG RECIRCULATION, 3" FLANGE 150 LB
11	DAG PUMP SKID 40HP
12	AIR BLOWDOWN
13	JUNCTION PANEL
14	POLYMER INJECTION
15	EXTENDED WALKWAY AND STAIRS
16	DISSOLVED AIR INJECTION VALVES
17	SOLIDS SKIMMER & GEAR DRIVE MOTOR (5 HP)
18	SLUDGE PUMP, 3"
19	1/2" AIR CONNECTION 50 PSI (MIN)
20	SAMPLE/INJECTION PORTS, 1/2" PVC BALL VALVE

REV	DATE	DESCRIPTION
00	02/19/20	INITIAL REVIEW



CLIENT: World Water Works - OK
LOCATION: Oklahoma City, OK
FILE NAME: 20057-0701
DESCRIPTION: GENERAL ARRANGEMENT

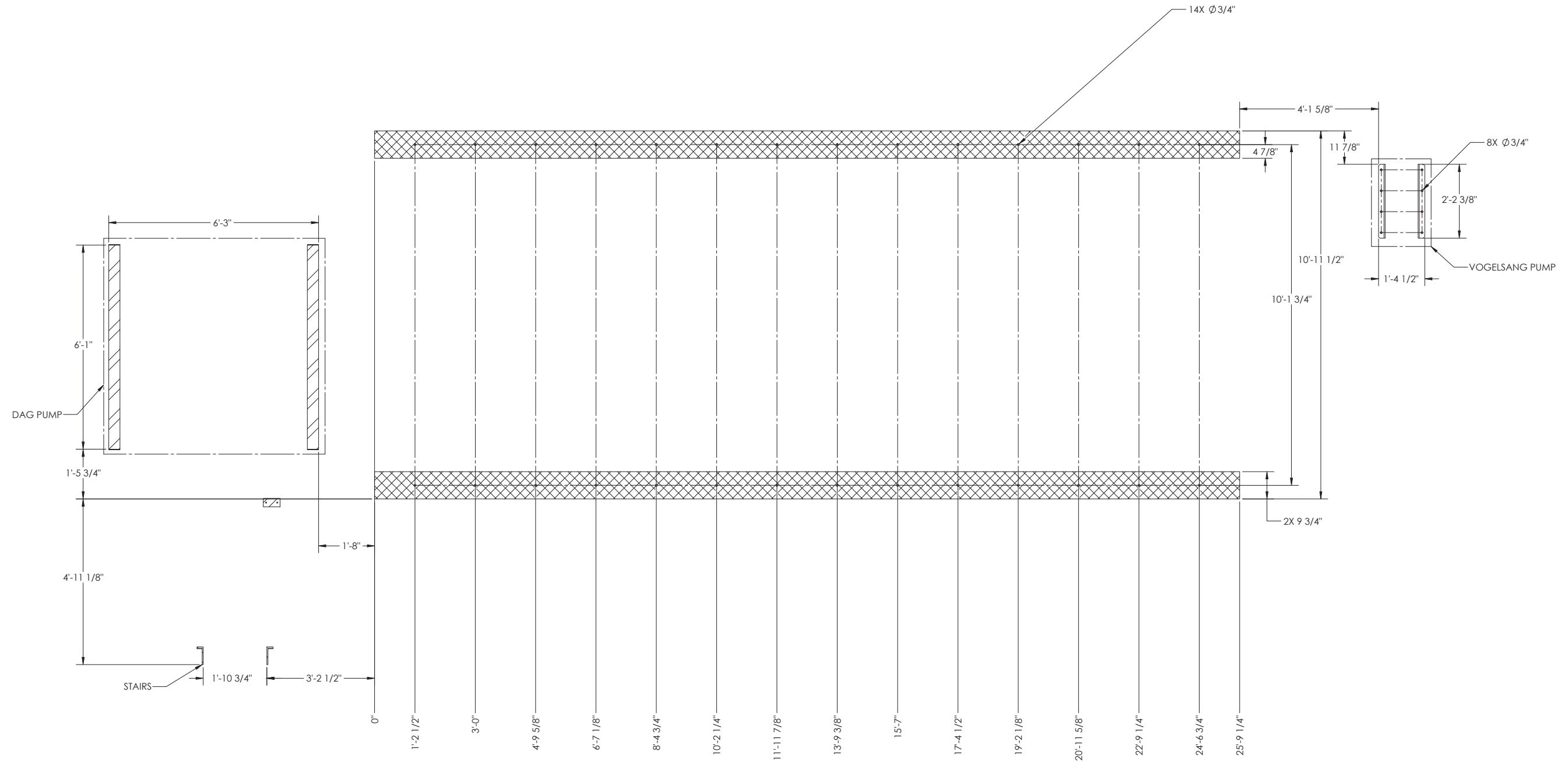
FOR APPROVAL	
P.O.#:	
DRAWN BY: LM	
CHECKED BY: RG	
DATE: 02/19/20	
SCALE: 1:48	
JOB #: 20-057	
DRAWING #	0701
SHEET: 1	OF 2 SHEETS

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FOOTPRINT DETAIL

SCALE 1 : 20



REV	DATE	DESCRIPTION	BY
00	02/19/20	INITIAL REVIEW	LM



CLIENT: World Water Works - OK
LOCATION: Oklahoma City, OK
FILE NAME: 20057-0701
DESCRIPTION: GENERAL ARRANGEMENT

P.O.#:
DRAWN BY: LM
CHECKED BY: RG
DATE: 02/19/20
SCALE: 1:48
JOB #: 20-057
DRAWING #
0701
SHEET: 2
OF 2 SHEETS

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DISSOLVED AIR FLOTATION – RSP-11S

The Ideal DAF™ Dissolved Air Flotation system removes suspended solids, fats, oils and greases, and other insoluble materials. The Ideal DAF™ achieves high rate removal efficiencies at a low operational cost by employing such proprietary techniques as: Progressive Water Extraction, Cross-Flow, Dissolved Air Generator (Ideal DAG™), Lamella Plate Pack Design, and proficient Hydraulic design.

Dissolved Air Flotation (DAF) is the process whereby micro-air-bubbles cause suspended materials to float to the surface of a vessel to achieve liquid/solids separation. The water to be treated enters the vessel through a proprietary influent system designed to reduce velocity and distribute water across the length of the system. In order to optimize treatment, the influent system is designed with multiple options for “whitewater” and flocculant injection points, where applicable. Whitewater is a highly saturated pressurized stream of air and DAF effluent that is generated through a proprietary, highly efficient, and robust DAG™ system. The wastewater then enters the vessel, and the microbubbles, which have attached to the particle surface, affect the particle density, causing the suspended solids to float to the surface where a chain and flight system skim them from the surface into a top cone. The clarified liquid is continuously removed at several points inside the vessel and passes over pipe weirs into an effluent box. From the effluent box, the wastewater gravity feeds out of the system.



FEATURES

- Polypropylene Frame Construction
 - ▶ Provides superior qualities compared to stainless steel such as: lighter weight, higher chemical resistance (corrosion resistance), longer life span, less expensive (materials costs), and lower maintenance.
- Lamella Plates
 - ▶ Corrugated plates provide increased surface area to enhance separation performance.
- Progressive Water Extraction
 - ▶ The process of extracting the clean water from the system as the influent travels through the system, providing additional time for the concentrated slurry to separate.
- Dissolved Air
 - ▶ The DAG™ is used for generating 5-12 micron bubbles at very high saturation efficiencies.
- Cross Flow
 - ▶ The vessel design is such that the influent water is spread across the length of the vessel to reduce the velocity of the water to optimize separation efficiencies.
- Cone Bottom Sludge Removal
 - ▶ A safe, low-maintenance method for efficient removal of any settled particles.

SPECIFICATIONS

Overall System

Model	RSP-11S	
Maximum Temp	170 °F	77 °C
pH Tolerance	1 – 12 S.U.	

Dimensions (approximate)

Vessel (WxLxH)	6'7" x 17'5" x 10'0"	2.01 m x 5.31 m x 3.05 m
Overall (excluding platform)	8'9" x 21'2" x 10'0"	2.67 m x 6.46 m x 3.05 m
Platform Dimensions		
Standard (WxL)	3'0" x 5'10"	0.92 m x 1.78 m
Extended (Optional)	2'0" x 20'5"	0.61 m x 6.23 m

DAF Weight (approximate)

Shipping	10,250 lbs	4,650 kg
Operational	37,450 lbs	16,990 kg

Pipe Diameters

Inlet	8" (150 lb ANSI Flange)
Outlet	8" (150 lb ANSI Flange)
Sludge	3" (150 lb ANSI Flange)

Standard Equipment

Dissolved Air Generator DAG™	See Proposal
Sludge Pump	See Proposal
Solenoid Valves	SMC
Rake Drive Motor	Nord Gear Reducer (1.5 HP, TEFC Inverter Duty)
Control Valves	Orbinox 3" Pneumatic Knife Gate

Materials of Construction

Vessel	Polypropylene
Exo Skeleton	304 Stainless Steel
Piping	Polypropylene and Sch.80 PVC
Lamella Plates	HDPE
Platform/Grating	Fiberglass
Pneumatic Valves	Cast Body / Stainless Steel Internals
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Chain/Flight/Wear Blocks	Acetal / Fiberglass / UHMW
Gaskets	EPDM

Optional Equipment

Advanced Pipe Flocculator	Sludge Tank
Advanced PLC Controls	Splash Guards Stainless
Cover	Steel Vessel
Effluent Tank	Thickening Beach™
Extended Platform	

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