Upper Oconee Basin Water Authority

Treatment Plant Expansion Committee
Oconee County Administrative Building
April 29, 2026 9:00 a.m.

Minutes

Members Present
John Daniell, Oconee County
Jim Dove, Chairman TPE Committee
Pat Graham, Barrow County
Adam Layfield, Oconee County
Joey Leslie, Jackson County
Bill Nash, Barrow County

Others Present
Amber Bailey, NEGRC
Aaron Baird, Ardurra
Chip Ferguson, Atkinson Ferguson, LLC
Nathan Hester, JCWSA
Kyle Holder, Jacobs
Chuck Horton, Oconee County
Trace Jeffers, Jacobs
Tom Kelley, Jacobs
Bill King, Barrow County
Eva Kennedy, NEGRC
Rebecca Lindsay, UOBWA Owner's Representative
Brian Skeens, Jacobs
Al Sosebee, Jacobs

Call to Order
Chairman Jim Dove called the meeting to order.

Review of March 11, 2026 Meeting Minutes
Chairman Jim Dove asked members if they had a chance to review the minutes and if there were any comments.

Action: A motion to approve the minutes was made by Adam Layfield and seconded by John Daniell. The motion passed unanimously.

Jacobs Update

Tom Kelley gave an update on several items. Amendment #3, included possible VFD alternative systems and a third solids handling lagoon. Amendment #4 included authorization to design a cross over connection downstream of a high service pump station. Amendment #5 included the 2nd part of a VFD evaluation (soft start) and a possible change to the VFD design. The 100% design plan will be updated and resubmitted in July. This project would potentially be released for bidding in September and open for bidding in October with construction beginning in 2027.

Action: No action was necessary.

Presentation of Findings by Ardurra

Aaron Baird gave an overview of the rapid mix system versus an alternative jet dispersion rapid mix system.

Action: No action was necessary.

Owner's Representative Report

Rebecca Lindsay stated that filter #3 was operational again.

Action: No action was necessary.

Other Business

There was no other business.

Adjourn

John Daniell motioned to adjourn and was seconded by Pat Graham.

Action: The meeting was adjourned at 10:05 a.m.

_____ _____

Amber Bailey Date of Approval
Executive Assistant

BEAR CREEK WATER TREATMENT PLANT

RAPID MIX EVALUATION –JET DISPERSION RAPID MIX SYSTEM

ARDURRA

Upper Oconee Basin Water Authority

AGENDA

- INTRODUCTION
- SYSTEM DESIGN
- ROME, GA. REFERENCE
- SYSTEM LAYOUT
- EVALUATION TABLE
- QUESTIONS/CLOSING/REFERENCES

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INTRODUCTION – JET DISPERSION RAPID MIXING

- Diffusion mixing by a pumped water jets.
  - *Pumped System through a designed nozzle.*
  - *Typical will utilize a side stream of the process water, but they can be designed to utilize plant water or dedicated finished water.*

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INTRODUCTION (CON'T.) - JET DISPERSION RAPID MIXING

ADVANTAGES

- Little to no headloss by the mixer
- Effective (high G values)
- Controllable degree of mixing
- Low power consumption
- Cost effective

DISADVANTAGES

- Not widely utilized in industry
- Nozzle clogging
- Pumped system
- Not typically a vendor packaged system.
- Difficult to apply to larger system (piping larger than 60".

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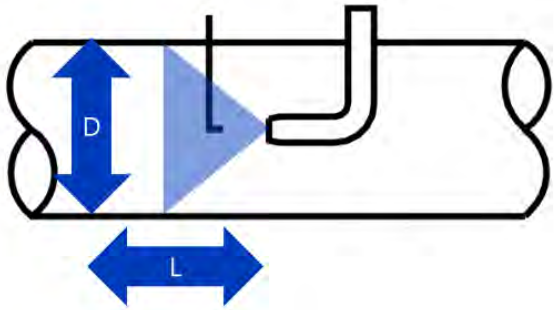
SYSTEM DESIGN

RAPID MIX DESIGN PARAMETERS

- Velocity Gradient (G)
  - *Ratio of power dissipated per unit volume.*
  - *Intensity of mixing*
- G*t
  - *Measures velocity gradient over time.*

$$G = \sqrt{\frac{P}{\mu V}}$$



JET DISPERSION DESIGN PARAMETERS

- Effective Mixing Length
  - *1 to 2D*
- Sidestream Flow
  - *3 to 5% Plant Flow*
- Velocity Gradient
  - *300 to 1,000 s^{-1}*
- G*t
  - *400 to 1,600*
- Jet Velocity > 20-fps

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DESIGN REFERENCE – ROME, GEORGIA

SYSTEM:

- Plant:
  - *18-MGD Permitted, 7-MGD ADF*
  - *36" RW Forcemain*
  - *5-HP Constant Speed Motors*
  - *Water Source: Two separate rivers.*
- System:
  - *Designed 2012*
  - *In Service since ~2015*
  - *Coagulant: Alum, swapped to PACl*
  - *Hydraulically split via weir gates*

FEEDBACK:

- System worked well. Operations & Maintenance had no major complaints.
- Pumps are still original to the construction. Rebuilt every 5-years.
- Biggest Maintenance Issue: Basket Strainers
- Secondary Maintenance Concerns:
  - *Access*
  - *no hoist system provided.*
- Overall: Positive Feedback

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DESIGN REFERENCE – ROME, GEORGIA

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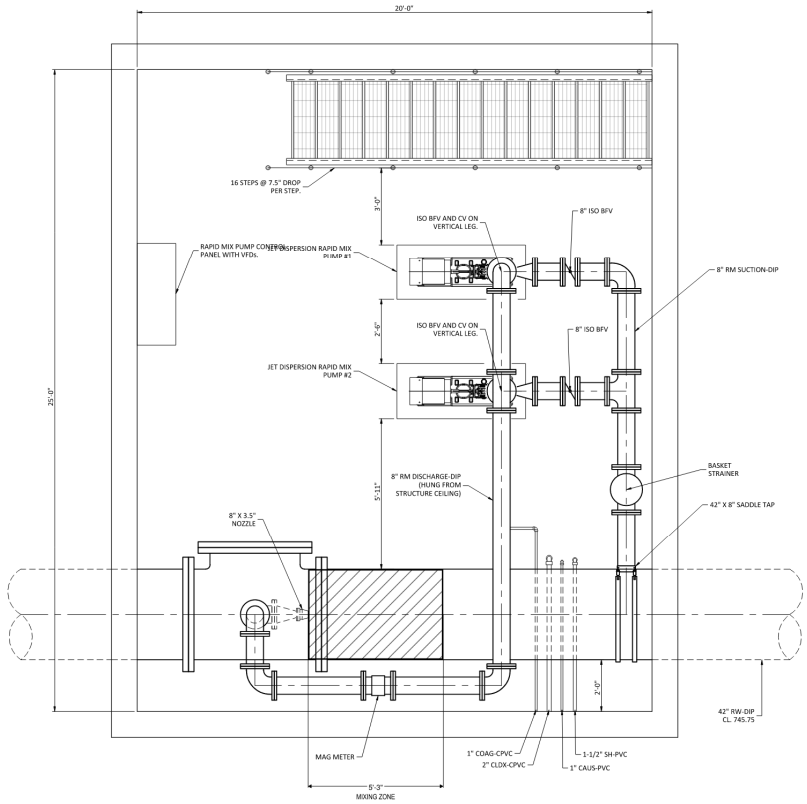
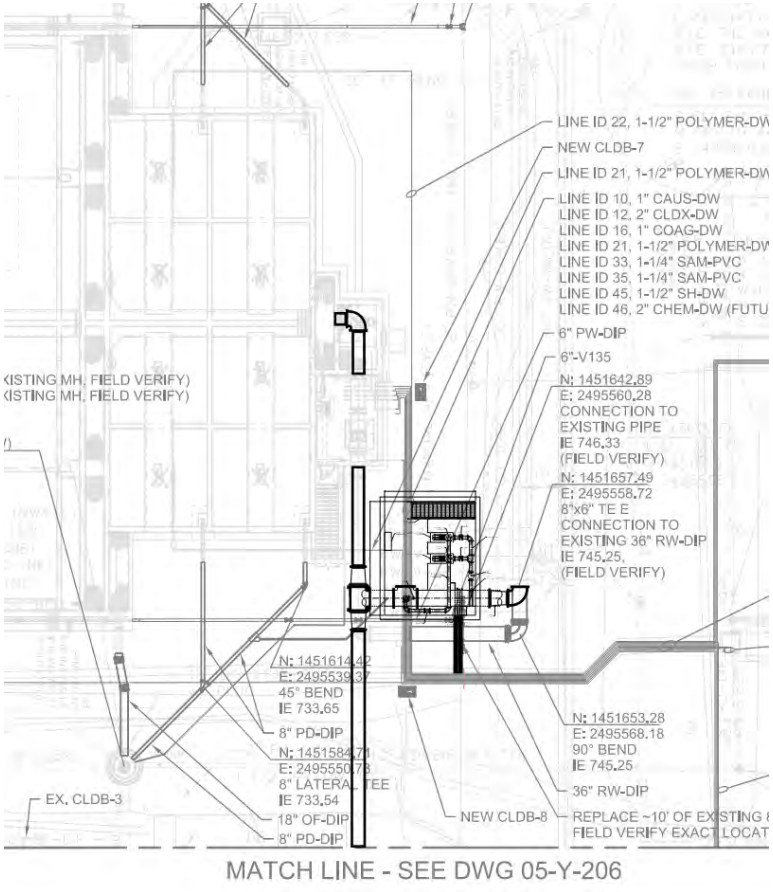
JET DISPERSION SYSTEM – PROPOSED LAYOUT





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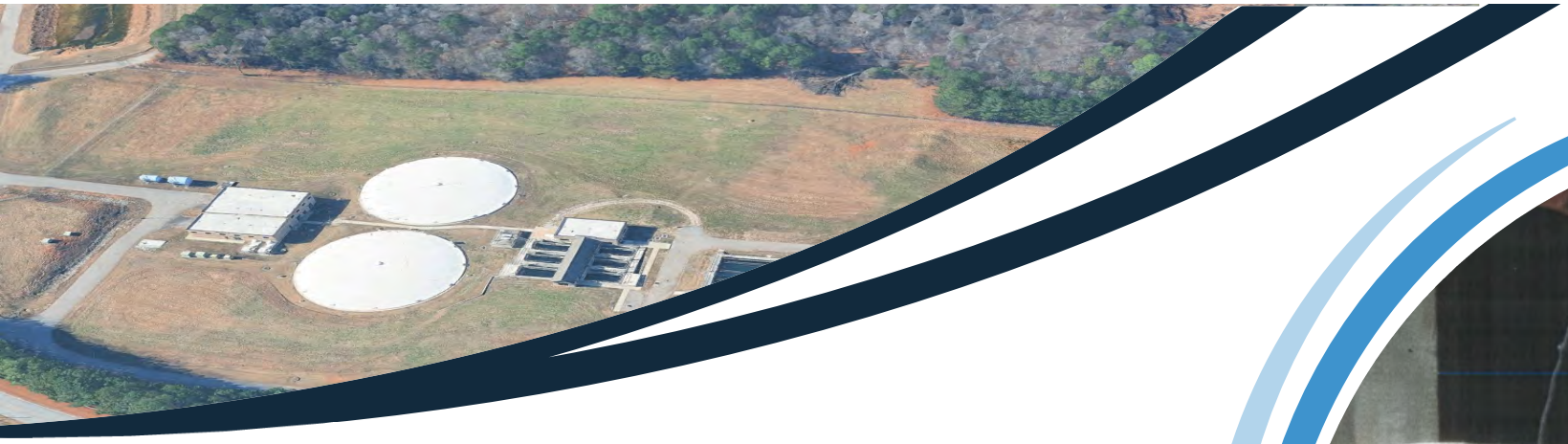
JET DISPERSION EVALUATION TABLE

Parameter	Mechanical Rapid Mix System	Jet Dispersion Rapid Mix System (Control Valve)	Jet Dispersion Rapid Mix System (Hydraulic Split)	Explanation
Required Pump Horsepower	25-HP/15-HP	10-HP	10-HP	Jacobs PER = 15-HP 100% Drawings = 25-HP
Velocity Gradient [G, s^-1] @ (42/21/5 MGD)	765/592	937	937	*Acceptable values range from 300 to 1000 s^-1* *Ten State Standards recommend target of 750 s^-1*
Detention Time [s] @ (42/21/5 MGD)	9/17/145	1/2/7	1/2/7	*EPA Guidelines recommend less than 30 s* **Not generally considered with Jet Dispersion Systems*
G*t @ (42/21/5 MGD)	6589/13178/110694 - 25HP 5104/10208/85744 - 15HP	729/1457/6120	729/1457/6120	*Acceptable values range from 400 to 1600.* **Not generally considered with Mech Rapid Mix Systems.*
Pipe Velocity @ 5 MGD (FPS)	1.09	0.8	0.8	Lower pipe velocity while forming flocc with jet dispersion system. Will increase probability of floc settling prior to reaching the sed basin. Settled floc may lead to high turbidity in flocc. basins once scour velocities in the forcemain are met.
Travel Time to Sed. Basin from Coag Addition [s] @ (42/21/5 MGD)	1/2/9	13/26/110	13/26/110	All times taken from longest travel path. *Ten State Standards 4.2.2.a recommends <30 seconds.*
Production Down Time?	No	No	No	Both alternates can be constructed while existing system remains in operation.
Chemical Injection Configuration	Used two points of injection	Single Point	Single Point	Single point offers common water quality entering sedimentation basins.
Flow Measurement	Mag Meters	Mag Meters	Mag Meters	Flow measurement was left the same for all alternates. Difference is that mechanical mixers are downstream of flow measurement, jet dispersion is upstream of flow measurement.
Structure Size	170-sf	500-sf	720-sf Top of Structure = 758.00	Hydraulic split alternate would have an estimated top of structure height of 758.00. 4.25-ft higher than sed basin.
Equipment Requirements	2 Vertical Mixers	2 - Jet Dispersion Pumps 1 - Jet Dispersion Nozzle 1 - Basket Strainer 1 - Exhaust Fan 1 - Gravity Louver 4 - 8" BFVs 2 - 8" CVs 1 - 8" Mag Meter	2 - Jet Dispersion Pumps 1 - Jet Dispersion Nozzle 1 - Basket Strainer 1 - Exhaust Fan 1 - Gravity Louver 4 - 8" BFVs 2 - 8" CVs 1 - 8" Mag Meter* 4 - Weir Gates	Jet Dispersion System would required substantially more equipment to be added to the system than the mechanical mixers. *Mag meter could be eliminated, but is recommended to ensure reliable operation.
Chem Pumps	Baseline	Chemical Pumps will need to be of an increased capacity	Chemical Pumps will need to be of an increased capacity	Ardurra did not evaluate the chemical feed systems, but listed statement from previous alternates analysis which required single point injection alternates to have upsized chemical feed pumps.
Capital Cost	$451,800.00	$831,800.00	$1,038,600.00	Deduct, CV @ Grade = $136,500 Deduct, CV Suction Lift = $179,000 Deduct, HS @ Grade = $153,300 Deduct, HS Suction Lift = $156,800
Net Present Cost (20-yr)	$1,035,987.05 / $841,888.54	$1,149,547.51	$1,297,245.83	Mech Mix - 25-HP/15-HP



QUESTIONS?

REFERENCES:

Kawamura, S., 2000. *Integrated Design and Operation of Water Treatment Facilities,* 2nd Edition, John Wiley & Sons, New York, NY.

Carollo. (2024, May). *Chemical Mixing: Nothing But a G Thing? 2024 PNWS AWWA Annual Conference*. Anaheim; California.

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Upper Oconee Basin Water Authority

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

BEAR CREEK WATER TREATMENT PLANT
JET DISPERSION MIXING SYSTEM
Step 1: Establish Design Criteria & Given Data

Problem:

Establish design criteria, constants, and given design data for the jet dispersion mixing system.

Design Criteria

Target G-Value	1000	s^{-1}
Target G*t	400 to 1600	
Target Nozzle Flow	5%	Plant Flow
Pump Efficiency (e)	100%	Water HP
	85%	Mech HP
Pressure @ Nozzle	7	psi
	16.17	ft.
Effective Mixing Length	1.5	1.5*D

Constants

Gravity	32.2	ft/s^2
	9.81	m/s^2
Water Density	62.4	lb/ft^3
Dynamic Viscocity (μ)	0.000021	$lb*s/ft^2$
Coefficient of Discharge (Cd)	**0.75**	

Given:

Pipe Diameter	42	in
	3.5	ft
Pipe Cross-Section	9.62	ft^2

Plant Flows:

MGD	cfs	gpm	m^3/s
5	7.74	5372	0.22
21	32.49	22564	0.92
42	64.98	45127	1.84

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

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BEAR CREEK WATER TREATMENT PLANT
JET DISPERSION MIXING SYSTEM
Step 2: Determine G*t value

Problem:

Determine detention time and G*t across provided flow ranges.

Key Equations:

$$Detention\ Time(s) = \text{Volume} \div \text{Flow}$$

$$G * t = \text{Mixing Time (s)} * \text{G } (s^{-1})$$

Solution

Flow (MGD)	Flow (ft^3/s)	X-Sect (sf)	Mixing Length (ft)	Volume (ft^3)	Detention Time (s)	G*t
5	7.74	9.62	5.25	50.51	6.53	6529
21	32.49	9.62	5.25	50.51	1.55	1555
42	64.98	9.62	5.25	50.51	0.78	777

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem:

Determine require hydraulic horsepower to meet targeted G-value.

Key Equations:

$$P(\frac{ft*lb}{s}) = 2G^2 * \mu * V$$

Solution:

G-Value (1/s)	Dynamic Viscosity (lb*s/ft^2)	Volume (ft^3)	Power (ft*lb/s)	Hydraulic Power (HP)
1000	0.000021	50.51	2121	3.86

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

BEAR CREEK WATER TREATMENT PLANT
JET DISPERSION MIXING SYSTEM
Step 4: Determine Velocity and Velocity Head Requirements

Problem:

Determine velocity and velocity head required to achieve determined hydraulic horsepower.

Key Equations:

$$\boldsymbol{Power\ (kW) = \frac{9.81 * Q * H}{e_{water}}}$$

Solution:

Plant Flow (MGD)	Plant Flow (m^3/s)	Nozzle Flow (m^3/s)	Power (HP)	Power (kW)	Velocity Head (m)	Velocity (m/s)	Velocity Head (ft.)	Velocity (ft/s)
5	0.22	0.01	3.86	2.88	26.77	22.92	87.82	75.21
21	0.92	0.05	3.86	2.88	6.37	11.18	20.91	36.70
42	1.84	0.09	3.86	2.88	3.19	7.91	10.46	25.95

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem

Determine nozzle diameter to achieve target velocity.

Key Equations:

$$d = \left(\frac{Q}{0.785 * v}\right)^{0.5}$$

Solution:

Flow (MGD)	Nozzle Flow (m^3/s)	Velocity (m/s)	Diameter (m)	Diameter (ft)	Diameter (in.)	
5	0.01	22.92	0.0247	0.08	0.97	
21	0.05	11.18	0.0724	0.24	2.85	***Select 3.5" Nozzle**
42	0.09	7.91	0.1217	0.40	4.79	

Comments:

Preliminary nozzle size of 3.5" selected.

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

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BEAR CREEK WATER TREATMENT PLANT
JET DISPERSION MIXING SYSTEM
Step 6: Verify Jet Velocity at Selected Nozzle Size

Problem:

Determine velocities across flow range at selected Nozzle Size.

Key Equations:

$$d = \left(\frac{Q}{0.785 * v} \right)^{0.5}$$

Solution:

Nozzle Flow (gpm)	Nozzle Flow (m^3/s)	Nozzle Size (in.)	Diameter (ft.)	Diameter (m)	Velocity (m/s)	Velocity (ft/s)
729	0.05	3.5	0.292	0.089	7.4	24.3

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

BEAR CREEK WATER TREATMENT PLANT
JET DISPERSION MIXING SYSTEM
Step 7: Verify Hydraulic Power with Selected Nozzle

Problem:

Determine hydraulic power requirement based on calculated velocities from selected nozzle size.

Key Equations:

$$Power\ (kW) = \frac{9.81 * Q * H}{e_{water}}$$

Solution:

Nozzle Flow (m^3/s)	Velocity (ft/s)	Velocity (m/s)	Velocity Head (m)	Power (kW)	Power (HP)
0.05	24.32	7.41	2.80	1.26	1.69

Comments:
*Actual side stream flow at 5-MGD likely will be determined by pump selection and available turn-down.

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

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BEAR CREEK WATER TREATMENT PLANT
JET DISPERSION MIXING SYSTEM
Step 8: Verify G-Value based on Hydraulic Power Input for Selected Nozzle

Problem

Determine G-Value based on calcualted Hydraulic Power Input for selected nozzle

Key Equations:

$$G(s^{-1}) = \sqrt{\frac{P}{\mu * V}}$$

Solution:

Power (HP)	Power (ft * lb/sec)	X-Sect	Mixing Length (ft)	Volume (ft^3)	G-Value
1.69	931.85	9.62	5.25	50.51	937.28

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem

Verify detention time and G*t values based on calculated G-values with the selected nozzle size.

Key Equations:

$$Detention\ Time\ (s) = \text{Volume} \div \text{Flow} \qquad G * t = \text{Detention Time (s)} * \text{G } (s^{-1})$$

Solution:

Flow (MGD)	Plant Flow (ft^3/s)	Volume (ft^3)	Detention Time (s)	G*t
5	7.74	50.51	7	6120
21	32.49	50.51	2	1457
42	64.98	50.51	0.78	729

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem:

Determine mechanical energy Input required to achieve velocity based on selected Nozzle Size.

Key Equations:

$$P(hp) = \frac{0.97 * C_d * \quad * v^3}{550}$$

Solution:

Nozzle Velocity (ft/s)	Nozzle Diameter (in.)	Nozzle Cross Section (ft^2)	Coefficient of Discharge	Power (hp)
24.32	3.50	0.07	0.75	1.27

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem:

Determine side stream suction & discharge pipe size.

Key Equations:

$$V = \frac{Q}{A}$$

Solution:

Side Stream Flow (GPM)	Side Stream Pipe Diameter (in.)	Side Stream Pipe Area (sf)	Side Stream Pipe Velocity (fps)
729	8.00	0.35	4.65

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

BEAR CREEK WATER TREATMENT PLANT
JET DISPERSION MIXING SYSTEM
Step 12: Determine Pump Horsepower

Problem:

Determine jet dispersion pump estimated total dynamic head and calculate break horse power.

Key Equations:

$$TDH = \text{required pressure at nozzle} + \text{exit loss of jet water} + \text{pipe friction losses}$$

$$BHP = \frac{Q * TDH}{3960 * e_{mechanical}}$$

Solution:

Nozzle Flow (GPM)	Required Nozzle Pressure (ft)	Estimated Exit Losses (ft)	Pipe Friction Losses*	TDH (ft)	TDH (psi)
729	16.17	9	4.00	29	13

Nozzle Flow (GPM)	BHP	
729	8	**Use 10-HP Motor**

Comments:
**Friction losses estimated via FlowMaster & conceptual layout drawings.

Upper Oconee Basin Water Authority

UPPER OCONEE BASIN WATER AUTHORITY
BEAR CREEK WTP EXPANSION TO 42 MGD
RAPID MIX EVALUATION

COMPARISON EVALUATION TABLE

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Parameter	Mechanical Rapid Mix System	Jet Dispersion Rapid Mix System (Control Valve)	Jet Dispersion Rapid Mix System (Hydraulic Split)	Explanation
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Production Down Time?	No	No	No	Both alternates can be constructed while existing system remains in operation.
Chemical Injection Configuration	Used two points of injection	Single Point	Single Point	Single point offers common water quality entering sedimentation basins.
Flow Measurement	Mag Meters	Mag Meters	Mag Meters	Flow measurement was left the same for all alternates. Difference is that mechanical mixers are downstream of flow measurement, jet dispersion is upstream of flow measurement.
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Capital Cost	$451,800.00	$831,800.00	$1,038,600.00	Deduct, CV @ Grade = $136,500 Deduct, CV Suction Lift = $179,000 Deduct, HS @ Grade = $153,300 Deduct, HS Suction Lift = $156,800
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Capital Cost	$451,800.00	$665,300.00	$804,500.00	Deduct, CV @ Grade = $128,600 Deduct, CV Suction Lift = $170,600 Deduct, HS @ Grade = $77,700 Deduct, HS Suction Lift = $101,700
Net Present Cost (20-yr)	$1,035,987.05 / $841,888.54	$983,047.51	$1,063,145.83	Mech Mix - 25-HP/15-HP

UPPER OCONEE BASIN WATER AUTHORITY
BEAR CREEK WTP EXPANSION TO 42 MGD
RAPID MIX EVALUATION
PRELIMINARY ESTIMATE

MECHANICAL RAPID MIX SYSTEM

Item No.	Description	Qty	Unit	Equip.	Unit Labor	Unit Material	Unit Sub	Unit Misc	Unit Total	Extended Equip.	Extended Labor	Extended Material	Extended Sub	Extended Misc	Extended Total
MECHANICAL MIXING SYSTEM															
1	36" DUCTILE IRON PIPING	85	LF	$ -	$ 950	$ 800	$ -	$ -	$ 1,750	$ -	$ 80,750	$ 68,000	$ -	$ -	$ 148,750
3	36" DUCTILE IRON 90° BEND	2	EA	$ -	$ 5,000	$ 10,000	$ -	$ -	$ 15,000	$ -	$ 10,000	$ 20,000	$ -	$ -	$ 30,000
4	25-HP MECHANICAL MIXING SYSTEM	1	EA	$ -	$ 46,875	$ 62,500	$ -	$ -	$ 109,375	$ -	$ 46,875	$ 62,500	$ -	$ -	$ 109,375
MISCELLANEOUS															
1	CHEMICAL FEED LINES (4)	360	LF	$ -	$ 30	$ 5	$ -	$ -	$ 35	$ -	$ 10,800	$ 1,800	$ -	$ -	$ 12,600
2	RAPID MIX TANK	71	CY	$ -	$ -	$ -	$ -	$ 2,128	$ 2,128	$ -	$ -	$ -	$ -	$ 151,064	$ 151,064
SUBTOTAL															$ 451,789
										Owner's Construction Allowance					$ -
										General Conditions (0%)					$ -
										Contingency (0%)					$ -
										Total Amount					**$ 451,800**

UPPER OCONEE BASIN WATER AUTHORITY
BEAR CREEK WTP EXPANSION TO 42 MGD
RAPID MIX EVALUATION
PRELIMINARY ESTIMATE

JET DISPERSION SYSTEM WITH CONTROL VALVE

ARDURRA
COLLABORATE. INNOVATE. CREATE.

Item No.	Description	Qty	Unit	Equip.	Unit Labor	Unit Material	Unit Sub	Unit Misc	Unit Total	Extended Equip.	Extended Labor	Extended Material	Extended Sub	Extended Misc	Extended Total
JET DISPERSION STRUCTURE															
1	20x25 SUBGRADE CONCRETE STRUCTURE	75	CY	$ -	$ -	$ -	$ -	$ 2,128	$ 2,128	$ -	$ -	$ -	$ -	$ 159,575	$ 159,575
2	CONCRETE STAIRS	55	SF	$ -	$ -	$ 8	$ 9	$ -	$ 17	$ -	$ -	$ 442	$ 498	$ -	$ 940
3	CONCRETE PIPE SUPPORTS	3	EA	$ -	$ -	$ -	$ -	$ 1,200	$ 1,200	$ -	$ -	$ -	$ -	$ 3,600	$ 3,600
4	STRUCTURE MEP	1	LS	$ -	$ -	$ -	$ 50,000	$ -	$ 50,000	$ -	$ -	$ -	$ 50,000	$ -	$ 50,000
5	MANUAL HOIST SYSTEM	1	LS	$ -	$ -	$ -	$ -	$ 5,000	$ 5,000	$ -	$ -	$ -	$ -	$ 5,000	$ 5,000
JET DISPERSION SYSTEM															
1	36" DUCTILE IRON PIPING	200	LF	$ -	$ 950	$ 800	$ -	$ -	$ 1,750	$ -	$ 190,000	$ 160,000	$ -	$ -	$ 350,000
2	36" DUCTILE IRON TEE	1	EA	$ -	$ 7,500	$ 15,000	$ -	$ -	$ 22,500	$ -	$ 7,500	$ 15,000	$ -	$ -	$ 22,500
3	36" DUCTILE IRON 90° BEND	2	EA	$ -	$ 5,000	$ 10,000	$ -	$ -	$ 15,000	$ -	$ 10,000	$ 20,000	$ -	$ -	$ 30,000
4	36" 316-SST TEE	1	EA	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250
5	JET DISPERSION PUMPS	2	EA	$ -	$ 9,375	$ 12,500	$ -	$ -	$ 21,875	$ -	$ 18,750	$ 25,000	$ -	$ -	$ 43,750
6	8 X 3.5" NOZZLE	1	EA	$ -	$ 5,625	$ 7,500	$ -	$ -	$ 13,125	$ -	$ 5,625	$ 7,500	$ -	$ -	$ 13,125
7	8" BASKET STRAINER	1	EA	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625
8	8" JET DISPERSION SUCTION PIPING	20.5	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 513	$ 4,100	$ -	$ -	$ 4,613
9	8" JET DISPERSION DISCHARGE PIPING	45	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 1,125	$ 9,000	$ -	$ -	$ 10,125
10	8" BUTTERFLY VALVES	4	EA	$ -	$ 1,150	$ 2,300	$ -	$ -	$ 3,450	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
11	8" CHECK VALVES	2	EA	$ -	$ 2,450	$ 4,900	$ -	$ -	$ 7,350	$ -	$ 4,900	$ 9,800	$ -	$ -	$ 14,700
12	8" MAGMETER	1	EA	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
13	36" x 8" SADDLE TAP	1	EA	$ -	$ 5,000	$ 6,000	$ -	$ -	$ 11,000	$ -	$ 5,000	$ 6,000	$ -	$ -	$ 11,000
14	6" PROCESS DRAIN	65	LF	$ -	$ 7	$ 155	$ -	$ -	$ 162	$ -	$ 455	$ 10,075	$ -	$ -	$ 10,530
15	UTILITY RELOCATIONS	1	LS	$ -	$ -	$ -	$ -	$ 25,000	$ 25,000	$ -	$ -	$ -	$ -	$ 25,000	$ 25,000
MISCELLANEOUS COSTS															
1	CHEMICAL FEED LINES	80	LF	$ -	$ 30	$ 5	$ -	$ -	$ 35	$ -	$ 2,400	$ 400	$ -	$ -	$ 2,800
SUBTOTAL															$ 831,732
														Owner's Construction Allowance	$ -
														General Conditions (0%)	$ -
														Contingency (0%)	$ -
														Total Amount	**$ 831,800**

Upper Oconee Basin Water Authority

UPPER OCONEE BASIN WATER AUTHORITY
BEAR CREEK WTP EXPANSION TO 42 MGD
RAPID MIX EVALUATION
PRELIMINARY ESTIMATE

ARDURRA
COLLABORATE. INNOVATE. CREATE.

JET DISPERSION SYSTEM WITH HYDRAULIC SPLIT

Item No.	Description	Qty	Unit	Equip.	Unit Labor	Unit Material	Unit Sub	Unit Misc	Unit Total	Extended Equip.	Extended Labor	Extended Material	Extended Sub	Extended Misc	Extended Total
JET DISPERSION STRUCTURE															
1	20x25 SUBGRADE CONCRETE STRUCTURE	75	CY	$ -	$ -	$ -	$ -	$ 2,128	$ 2,128	$ -	$ -	$ -	$ -	$ 159,575	$ 159,575
2	CONCRETE STAIRS	55	SF	$ -	$ -	$ 8	$ 9	$ -	$ 17	$ -	$ -	$ 442	$ 498	$ -	$ 940
3	CONCRETE PIPE SUPPORTS	3	EA	$ -	$ -	$ -	$ -	$ 1,200	$ 1,200	$ -	$ -	$ -	$ -	$ 3,600	$ 3,600
4	STRUCTURE MEP	1	LS	$ -	$ -	$ -	$ 50,000	$ -	$ 50,000	$ -	$ -	$ -	$ 50,000	$ -	$ 50,000
5	MANUAL HOIST SYSTEM	1	LS	$ -	$ -	$ -	$ -	$ 5,000	$ 5,000	$ -	$ -	$ -	$ -	$ 5,000	$ 5,000
HYDRAULIC SPLIT STRUCTURE															
1	20x25 SUBGRADE CONCRETE STRUCTURE	70	CY	$ -	$ -	$ -	$ -	$ 2,128	$ 2,128	$ -	$ -	$ -	$ -	$ 148,936	$ 148,936
2	CONCRETE STAIRS	65	SF	$ -	$ -	$ 8	$ 9	$ -	$ 17	$ -	$ -	$ 523	$ 588	$ -	$ 1,111
3	WEIR GATES	4	EA	$ -	$ 18,750	$ 25,000	$ -	$ -	$ 43,750	$ -	$ 75,000	$ 100,000	$ -	$ -	$ 175,000
4	MISC. METALS	1	LS	$ -	$ -	$ -	$ -	$ 15,000	$ 15,000	$ -	$ -	$ -	$ -	$ 15,000	$ 15,000
JET DISPERSION SYSTEM															
1	36" DUCTILE IRON PIPING	140	LF	$ -	$ 950	$ 800	$ -	$ -	$ 1,750	$ -	$ 133,000	$ 112,000	$ -	$ -	$ 245,000
2	36" DUCTILE IRON TEE	0	EA	$ -	$ 7,500	$ 15,000	$ -	$ -	$ 22,500	$ -	$ -	$ -	$ -	$ -	$ -
3	36" DUCTILE IRON 90° BEND	2	EA	$ -	$ 5,000	$ 10,000	$ -	$ -	$ 15,000	$ -	$ 10,000	$ 20,000	$ -	$ -	$ 30,000
4	36" 316-SST TEE	1	EA	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250
4	JET DISPERSION PUMPS	2	EA	$ -	$ 15,625	$ 12,500	$ -	$ -	$ 28,125	$ -	$ 31,250	$ 25,000	$ -	$ -	$ 56,250
5	8 X 3.5" NOZZLE	1	EA	$ -	$ 9,375	$ 7,500	$ -	$ -	$ 16,875	$ -	$ 9,375	$ 7,500	$ -	$ -	$ 16,875
6	8" BASKET STRAINER	1	EA	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625
7	8" JET DISPERSION SUCTION PIPING	20.5	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 513	$ 4,100	$ -	$ -	$ 4,613
8	8" JET DISPERSION DISCHARGE PIPING	45	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 1,125	$ 9,000	$ -	$ -	$ 10,125
9	8" BUTTERFLY VALVES	4	EA	$ -	$ 1,150	$ 2,300	$ -	$ -	$ 3,450	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
10	8" CHECK VALVES	2	EA	$ -	$ 2,450	$ 4,900	$ -	$ -	$ 7,350	$ -	$ 4,900	$ 9,800	$ -	$ -	$ 14,700
11	8" MAGMETER	1	EA	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
14	36" x 8" SADDLE TAP	1	EA	$ -	$ 5,000	$ 6,000	$ -	$ -	$ 11,000	$ -	$ 5,000	$ 6,000	$ -	$ -	$ 11,000
15	6" PROCESS DRAIN	65	LF	$ -	$ 7	$ 155	$ -	$ -	$ 162	$ -	$ 455	$ 10,075	$ -	$ -	$ 10,530
16	UTILITY RELOCATES	1	LS	$ -	$ -	$ -	$ -	$ 25,000	$ 25,000	$ -	$ -	$ -	$ -	$ 25,000	$ 25,000
MISCELLANEOUS COSTS															
1	CHEMICAL FED LINES	80	LF	$ -	$ 30	$ 5	$ -	$ -	$ 35	$ -	$ 2,400	$ 400	$ -	$ -	$ 2,800
2	CONTROL VALVE (DEDUCT)	-1	EA	$ -	$ 2,000	$ 20,000	$ -	$ -	$ 22,000	$ -	$ (2,000)	$ (20,000)	$ -	$ -	$ (22,000)
SUBTOTAL															$ 1,038,529

Owner's Construction Allowance	$ -
General Conditions (0%)	$ -
Contingency (0%)	$ -
Total Amount	**$ 1,038,600**

UPPER OCONEE BASIN WATER AUTHORITY
BEAR CREEK WTP EXPANSION TO 42 MGD
RAPID MIX EVALUATION
PRELIMINARY ESTIMATE

JET DISPERSION SYSTEM WITH CONTROL VALVE - ABOVE GRADE

Item No.	Description	Qty	Unit	Equip.	Unit Labor	Unit Material	Unit Sub	Unit Misc	Unit Total	Extended Equip.	Extended Labor	Extended Material	Extended Sub	Extended Misc	Extended Total
JET DISPERSION STRUCTURE															
1	20x25 SLAB ON GRADE	20	CY	$ -	$ -	$ -	$ -	$ 600	$ 600	$ -	$ -	$ -	$ -	$ 12,000	$ 12,000
2	CONCRETE STAIRS	0	SF	$ -	$ -	$ 8	$ 9	$ -	$ 17	$ -	$ -	$ -	$ -	$ -	$ -
3	CONCRETE PIPE SUPPORTS	2	EA	$ -	$ -	$ -	$ -	$ 1,200	$ 1,200	$ -	$ -	$ -	$ -	$ 2,400	$ 2,400
4	STRUCTURE MEP	1	LS	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000
5	MANUAL HOIST SYSTEM	0	LS	$ -	$ -	$ -	$ -	$ 5,000	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ -
JET DISPERSION SYSTEM															
1	36" DUCTILE IRON PIPING	200	LF	$ -	$ 950	$ 800	$ -	$ -	$ 1,750	$ -	$ 190,000	$ 160,000	$ -	$ -	$ 350,000
2	36" DUCTILE IRON TEE	2	EA	$ -	$ 7,500	$ 15,000	$ -	$ -	$ 22,500	$ -	$ 15,000	$ 30,000	$ -	$ -	$ 45,000
3	36" DUCTILE IRON 90° BEND	6	EA	$ -	$ 5,000	$ 10,000	$ -	$ -	$ 15,000	$ -	$ 30,000	$ 60,000	$ -	$ -	$ 90,000
4	36" 316-SST TEE	1	EA	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250
4	JET DISPERSION PUMPS	2	EA	$ -	$ 15,625	$ 12,500	$ -	$ -	$ 28,125	$ -	$ 31,250	$ 25,000	$ -	$ -	$ 56,250
5	8 X 3.5" NOZZLE	1	EA	$ -	$ 9,375	$ 7,500	$ -	$ -	$ 16,875	$ -	$ 9,375	$ 7,500	$ -	$ -	$ 16,875
6	8" BASKET STRAINER	1	EA	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625
7	8" JET DISPERSION SUCTION PIPING	20.5	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 513	$ 4,100	$ -	$ -	$ 4,613
8	8" JET DISPERSION DISCHARGE PIPING	45	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 1,125	$ 9,000	$ -	$ -	$ 10,125
9	8" BUTTERFLY VALVES	4	EA	$ -	$ 1,150	$ 2,300	$ -	$ -	$ 3,450	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
10	8" CHECK VALVES	2	EA	$ -	$ 2,450	$ 4,900	$ -	$ -	$ 7,350	$ -	$ 4,900	$ 9,800	$ -	$ -	$ 14,700
11	8" MAGMETER	1	EA	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
14	36" x 8" SADDLE TAP	1	EA	$ -	$ 5,000	$ 6,000	$ -	$ -	*$ 11,000*	$ -	$ 5,000	$ 6,000	$ -	$ -	$ 11,000
15	6" PROCESS DRAIN	0	LF	$ -	$ 7	$ 155	$ -	$ -	$ 162	$ -	$ -	$ -	$ -	$ -	$ -
16	UTILITY RELOCATIONS	0	LS	$ -	$ -	$ -	$ -	$ 25,000	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -
MISCELLANEOUS COSTS															
1	CHEMICAL FEED LINES	80	LF	$ -	$ 30	$ 5	$ -	$ -	$ 35	$ -	$ 2,400	$ 400	$ -	$ -	$ 2,800
SUBTOTAL															$ 695,238

Owner's Construction Allowance	$ -
General Conditions (0%)	$ -
Contingency (0%)	$ -
Total Amount	**$ 695,300**

UPPER OCONEE BASIN WATER AUTHORITY
BEAR CREEK WTP EXPANSION TO 42 MGD
RAPID MIX EVALUATION
PRELIMINARY ESTIMATE

ARDURRA
COLLABORATE. INNOVATE. CREATE.

JET DISPERSION SYSTEM WITH CONTROL VALVE - SUCTION LIFT PUMPS

Item No.	Description	Qty	Unit	Equip.	Unit Labor	Unit Material	Unit Sub	Unit Misc	Unit Total	Extended Equip.	Extended Labor	Extended Material	Extended Sub	Extended Misc	Extended Total
JET DISPERSION STRUCTURE															
1	PRECAST CONCRETE VAULT (12X7)	1	LS	$ -	$ 22,500	$ 18,000	$ -	$ 2,128	$ 42,628	$ -	$ 22,500	$ 18,000	$ -	$ 2,128	$ 42,628
2	SLAB ON GRADE	5	CY	$ -	$ -	$ -	$ -	$ 600	$ 600	$ -	$ -	$ -	$ -	$ 3,000	$ 3,000
3	CONCRETE PIPE SUPPORTS	0	EA	$ -	$ -	$ -	$ -	$ 1,200	$ 1,200	$ -	$ -	$ -	$ -	$ -	$ -
4	STRUCTURE MEP	0	LS	$ -	$ -	$ -	$ 50,000	$ -	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -
5	MANUAL HOIST SYSTEM	0	LS	$ -	$ -	$ -	$ -	$ 5,000	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ -
JET DISPERSION SYSTEM															
1	36" DUCTILE IRON PIPING	200	LF	$ -	$ 950	$ 800	$ -	$ -	$ 1,750	$ -	$ 190,000	$ 160,000	$ -	$ -	$ 350,000
2	36" DUCTILE IRON TEE	1	EA	$ -	$ 7,500	$ 15,000	$ -	$ -	$ 22,500	$ -	$ 7,500	$ 15,000	$ -	$ -	$ 22,500
3	36" DUCTILE IRON 90° BEND	2	EA	$ -	$ 5,000	$ 10,000	$ -	$ -	$ 15,000	$ -	$ 10,000	$ 20,000	$ -	$ -	$ 30,000
4	36" 316-SST TEE	1	EA	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250
5	JET DISPERSION PUMPS	2	EA	$ -	$ 12,638	$ 16,850	$ -	$ -	$ 29,488	$ -	$ 25,275	$ 33,700	$ -	$ -	$ 58,975
6	8 X 3.5" NOZZLE	1	EA	$ -	$ 5,625	$ 7,500	$ -	$ -	$ 13,125	$ -	$ 5,625	$ 7,500	$ -	$ -	$ 13,125
7	8" BASKET STRAINER	1	EA	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625
8	8" JET DISPERSION SUCTION PIPING	30.5	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 763	$ 6,100	$ -	$ -	$ 6,863
9	8" JET DISPERSION DISCHARGE PIPING	55	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 1,375	$ 11,000	$ -	$ -	$ 12,375
10	8" BUTTERFLY VALVES	4	EA	$ -	$ 1,150	$ 2,300	$ -	$ -	$ 3,450	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
11	8" CHECK VALVES	2	EA	$ -	$ 2,450	$ 4,900	$ -	$ -	$ 7,350	$ -	$ 4,900	$ 9,800	$ -	$ -	$ 14,700
12	8" MAGMETER	1	EA	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
13	36" x 8" SADDLE TAP	1	EA	$ -	$ 5,000	$ 6,000	$ -	$ -	$ 11,000	$ -	$ 5,000	$ 6,000	$ -	$ -	$ 11,000
14	4" PROCESS DRAIN	65	LF	$ -	$ 7	$ 130	$ -	$ -	$ 137	$ -	$ 455	$ 8,450	$ -	$ -	$ 8,905
15	UTILITY RELOCATIONS	0	LS	$ -	$ -	$ -	$ -	$ 25,000	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -
MISCELLANEOUS COSTS															
1	CHEMICAL FEED LINES	120	LF	$ -	$ 30	$ 5	$ -	$ -	$ 35	$ -	$ 3,600	$ 600	$ -	$ -	$ 4,200
SUBTOTAL															$ 652,745
										Owner's Construction Allowance					$ -
										General Conditions (0%)					$ -
										Contingency (0%)					$ -
										Total Amount					**$ 652,800**

UPPER OCONEE BASIN WATER AUTHORITY
BEAR CREEK WTP EXPANSION TO 42 MGD
RAPID MIX EVALUATION
PRELIMINARY ESTIMATE

JET DISPERSION SYSTEM WITH HYDRAULIC SPLIT - ABOVE GRADE

Item No.	Description	Qty	Unit	Equip.	Unit Labor	Unit Material	Unit Sub	Unit Misc	Unit Total	Extended Equip.	Extended Labor	Extended Material	Extended Sub	Extended Misc	Extended Total
JET DISPERSION STRUCTURE															
1	20x25 SLAB ON GRADE	20	CY	$ -	$ -	$ -	$ -	$ 600	$ 600	$ -	$ -	$ -	$ -	$ 12,000	$ 12,000
2	CONCRETE STAIRS	0	SF	$ -	$ -	$ 8	$ 9	$ -	$ 17	$ -	$ -	$ -	$ -	$ -	$ -
3	CONCRETE PIPE SUPPORTS	2	EA	$ -	$ -	$ -	$ -	$ 1,200	$ 1,200	$ -	$ -	$ -	$ -	$ 2,400	$ 2,400
4	STRUCTURE MEP	1	LS	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000
5	MANUAL HOIST SYSTEM	0	LS	$ -	$ -	$ -	$ -	$ 5,000	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ -
HYDRAULIC SPLIT STRUCTURE															
1	20x25 SUBGRADE CONCRETE STRUCTURE	70	CY	$ -	$ -	$ -	$ -	$ 2,128	$ 2,128	$ -	$ -	$ -	$ -	$ 148,936	$ 148,936
2	CONCRETE STAIRS	65	SF	$ -	$ -	$ 8	$ 9	$ -	$ 17	$ -	$ -	$ 523	$ 588	$ -	$ 1,111
3	WEIR GATES	4	EA	$ -	$ 18,750	$ 25,000	$ -	$ -	$ 43,750	$ -	$ 75,000	$ 100,000	$ -	$ -	$ 175,000
4	MISC. METALS	1	LS	$ -	$ -	$ -	$ -	$ 15,000	$ 15,000	$ -	$ -	$ -	$ -	$ 15,000	$ 15,000
JET DISPERSION SYSTEM															
1	36" DUCTILE IRON PIPING	140	LF	$ -	$ 950	$ 800	$ -	$ -	$ 1,750	$ -	$ 133,000	$ 112,000	$ -	$ -	$ 245,000
2	36" DUCTILE IRON TEE	0	EA	$ -	$ 7,500	$ 15,000	$ -	$ -	$ 22,500	$ -	$ -	$ -	$ -	$ -	$ -
3	36" DUCTILE IRON 90° BEND	6	EA	$ -	$ 5,000	$ 10,000	$ -	$ -	$ 15,000	$ -	$ 30,000	$ 60,000	$ -	$ -	$ 90,000
4	36" 316-SST TEE	1	EA	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250
5	JET DISPERSION PUMPS	2	EA	$ -	$ 15,625	$ 12,500	$ -	$ -	$ 28,125	$ -	$ 31,250	$ 25,000	$ -	$ -	$ 56,250
6	8 X 3.5" NOZZLE	1	EA	$ -	$ 9,375	$ 7,500	$ -	$ -	$ 16,875	$ -	$ 9,375	$ 7,500	$ -	$ -	$ 16,875
7	8" BASKET STRAINER	1	EA	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625
8	8" JET DISPERSION SUCTION PIPING	20.5	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 513	$ 4,100	$ -	$ -	$ 4,613
9	8" JET DISPERSION DISCHARGE PIPING	45	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 1,125	$ 9,000	$ -	$ -	$ 10,125
10	8" BUTTERFLY VALVES	4	EA	$ -	$ 1,150	$ 2,300	$ -	$ -	$ 3,450	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
11	8" CHECK VALVES	2	EA	$ -	$ 2,450	$ 4,900	$ -	$ -	$ 7,350	$ -	$ 4,900	$ 9,800	$ -	$ -	$ 14,700
12	8" MAGMETER	1	EA	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
13	36" x 8" SADDLE TAP	1	EA	$ -	$ 5,000	$ 6,000	$ -	$ -	$ 11,000	$ -	$ 5,000	$ 6,000	$ -	$ -	$ 11,000
14	6" PROCESS DRAIN	0	LF	$ -	$ 7	$ 155	$ -	$ -	$ 162	$ -	$ -	$ -	$ -	$ -	$ -
15	UTILITY RELOCATIONS	0	LS	$ -	$ -	$ -	$ -	$ 25,000	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -
MISCELLANEOUS COSTS															
1	CHEMICAL FEED LINES	80	LF	$ -	$ 30	$ 5	$ -	$ -	$ 35	$ -	$ 2,400	$ 400	$ -	$ -	$ 2,800
2	CONTROL VALVE (DEDUCT)	-1	EA	$ -	$ 1,000	$ 20,000	$ -	$ -	$ 21,000	$ -	$ (1,000)	$ (20,000)	$ -	$ -	$ (21,000)
SUBTOTAL															$ 885,285

Owner's Construction Allowance	$ -
General Conditions (0%)	$ -
Contingency (0%)	$ -
Total Amount	**$ 885,300**

UPPER OCONEE BASIN WATER AUTHORITY
BEAR CREEK WTP EXPANSION TO 42 MGD
RAPID MIX EVALUATION
PRELIMINARY ESTIMATE

JET DISPERSION SYSTEM WITH HYDRAULIC SPLIT - SUCTION LIFT PUMPS

Item No.	Description	Qty	Unit	Equip.	Unit Labor	Unit Material	Unit Sub	Unit Misc	Unit Total	Extended Equip.	Extended Labor	Extended Material	Extended Sub	Extended Misc	Extended Total
JET DISPERSION STRUCTURE															
1	PRECAST CONCRETE VAULT (12X7)	1	LS	$ -	$ 22,500	$ 18,000	$ -	$ 2,128	$ 42,628	$ -	$ 22,500	$ 18,000	$ -	$ 2,128	$ 42,628
2	SLAB ON GRADE	5	CY	$ -	$ -	$ -	$ -	$ 600	$ 600	$ -	$ -	$ -	$ -	$ 3,000	$ 3,000
3	CONCRETE PIPE SUPPORTS	0	EA	$ -	$ -	$ -	$ -	$ 1,200	$ 1,200	$ -	$ -	$ -	$ -	$ -	$ -
4	STRUCTURE MEP	0	LS	$ -	$ -	$ -	$ 50,000	$ -	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -
5	MANUAL HOIST SYSTEM	0	LS	$ -	$ -	$ -	$ -	$ 5,000	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ -
HYDRAULIC SPLIT STRUCTURE															
1	20x25 SUBGRADE CONCRETE STRUCTURE	70	CY	$ -	$ -	$ -	$ -	$ 2,128	$ 2,128	$ -	$ -	$ -	$ -	$ 148,936	$ 148,936
2	CONCRETE STAIRS	65	SF	$ -	$ -	$ 8	$ 9	$ -	$ 17	$ -	$ -	$ 523	$ 588	$ -	$ 1,111
3	WEIR GATES	4	EA	$ -	$ 18,750	$ 25,000	$ -	$ -	$ 43,750	$ -	$ 75,000	$ 100,000	$ -	$ -	$ 175,000
4	MISC. METALS	1	LS	$ -	$ -	$ -	$ -	$ 15,000	$ 15,000	$ -	$ -	$ -	$ -	$ 15,000	$ 15,000
JET DISPERSION SYSTEM															
1	36" DUCTILE IRON PIPING	140	LF	$ -	$ 950	$ 800	$ -	$ -	$ 1,750	$ -	$ 133,000	$ 112,000	$ -	$ -	$ 245,000
2	36" DUCTILE IRON TEE	0	EA	$ -	$ 7,500	$ 15,000	$ -	$ -	$ 22,500	$ -	$ -	$ -	$ -	$ -	$ -
3	36" DUCTILE IRON 90° BEND	2	EA	$ -	$ 5,000	$ 10,000	$ -	$ -	$ 15,000	$ -	$ 10,000	$ 20,000	$ -	$ -	$ 30,000
4	36" 316-SST TEE	1	EA	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250	$ -	$ 8,250	$ 33,000	$ -	$ -	$ 41,250
5	JET DISPERSION PUMPS	2	EA	$ -	$ 12,638	$ 16,850	$ -	$ -	$ 29,488	$ -	$ 25,275	$ 33,700	$ -	$ -	$ 58,975
6	8 X 3.5" NOZZLE	1	EA	$ -	$ 5,625	$ 7,500	$ -	$ -	$ 13,125	$ -	$ 5,625	$ 7,500	$ -	$ -	$ 13,125
7	8" BASKET STRAINER	1	EA	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625	$ -	$ 3,125	$ 2,500	$ -	$ -	$ 5,625
8	8" JET DISPERSION SUCTION PIPING	20.5	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 513	$ 4,100	$ -	$ -	$ 4,613
9	8" JET DISPERSION DISCHARGE PIPING	45	LF	$ -	$ 25	$ 200	$ -	$ -	$ 225	$ -	$ 1,125	$ 9,000	$ -	$ -	$ 10,125
10	8" BUTTERFLY VALVES	4	EA	$ -	$ 1,150	$ 2,300	$ -	$ -	$ 3,450	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
11	8" CHECK VALVES	2	EA	$ -	$ 2,450	$ 4,900	$ -	$ -	$ 7,350	$ -	$ 4,900	$ 9,800	$ -	$ -	$ 14,700
12	8" MAGMETER	1	EA	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800	$ -	$ 4,600	$ 9,200	$ -	$ -	$ 13,800
13	36" x 8" SADDLE TAP	1	EA	$ -	$ 5,000	$ 6,000	$ -	$ -	$ 11,000	$ -	$ 5,000	$ 6,000	$ -	$ -	$ 11,000
14	4" PROCESS DRAIN	65	LF	$ -	$ 7	$ 130	$ -	$ -	$ 137	$ -	$ 455	$ 8,450	$ -	$ -	$ 8,905
15	UTILITY RELOCATIONS	0	LS	$ -	$ -	$ -	$ -	$ 25,000	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -
MISCELLANEOUS COSTS															
1	CHEMICAL FEED LINES	120	LF	$ -	$ 30	$ 5	$ -	$ -	$ 35	$ -	$ 3,600	$ 600	$ -	$ -	$ 4,200
2	CONTROL VALVE (DEDUCT)	1	EA	$ -	$ 1,000	$ 20,000	$ -	$ -	$ 21,000	$ -	$ 1,000	$ 20,000	$ -	$ -	$ 21,000
SUBTOTAL															$ 881,792
										Owner's Construction Allowance					$ -
										General Conditions (0%)					$ -
										Contingency (0%)					$ -
										Total Amount					**$ 881,800**

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

BEAR CREEK WATER TREATMENT PLANT
MECHANICAL RAPID MIX BASIN (25-HP) NET PRESENT COST
Step 1: Determine Capital Cost

Problem:

Establish Capital Cost.

Key Equation:

$$PW_{cap} = -C_0$$

Solution

Capital Cost	**$451,800.00**

Comments:

*Key Assumptions for analysis

DISCOUNT RATE	**PRESENT WORTH TIME FRAME**
5.00%	20

Problem:

Establish Present Cost for Annual Maintenance.

Key Equation:

$$PW_{annual} = A(1 - \frac{(1+\mathrm{i})^{-\mathrm{n}}}{\mathrm{i}})$$

Solution

Item	Annual Cost (Both Mixers)	Justification
Preventive maintenance labor	$2,250	Quarterly inspections, greasing, alignment checks (≈ 30 hrs/year @ $75/hr loaded rate)
Lubricants & consumables	$800	Gear oil, grease, seals
Minor parts & wear items	$1,000	Bearings, fasteners, couplings
Electrical/mechanical troubleshooting	$1,000	Motor testing, VFD checks
Corrective maintenance allowance	$1,200	Minor unplanned maintenance
Total (A)	**$6,250**	
PW ANNUAL	**$77,888.81**	

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem:

Establish Present Cost for Future Replacement/Major Rehabilitation.

Key Equation:

$$PW_{repl} = \sum_{t+1}^{20} \frac{F_n}{(1+i)^n}$$

Solution

Item	Cost (Both Mixers)	Service Life	Description
Mechanical Seal/Bearing overhaul @ Year 10	$20,000.00	8-12 years depending on service, Year 10 was selected as reasonable midpoint	Shaft seals, upper/lower bearings, alignment and testing
Gear Box Rebuild @ Year 12	$35,000.00	10-15 years, Year 12 was selected as reasonable midpoint	Internal gear inspection, bearing replacement, seal replacement, oil system refresh
VFD Replacement @ Year 15	$25,000.00	12-17 years, Year 15 was selected as midpoint.	Electronics aging, thermal cycling, obsolescence
Motor Replacement @ Year 18	$36,000.00	15-20 years, Year 18 was selected as midpoint.	25-HP TEFC motor. Includes removal, installation, alignment, and testing

PW FUTURE REHAB/REPLACEMENT

Item	Cost (Both Mixers)	Year	PW Value
Mechanical Seal/Bearing Overhaul	$20,000.00	10	$12,278.27
Gear Box Rebuild	$35,000.00	12	$19,489.31
VFD Replacement	$20,000.00	15	$9,620.34
Motor Replacement	$30,000.00	18	$12,465.62
		PW Future Replacement/Rehab.	**$53,853.54**

Comments:
Full mixer replacement not included (25-30 years with proper maintenance)

Primary wear drivers:
Gearbox gear teeth
Bearings under torsion load
Shaft alignment
Slow-speed, high-torque duty
Primary fail:
Mechanical fatigue
Lubrication degradation
Gear wear over time

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

BEAR CREEK WATER TREATMENT PLANT
MECHANICAL RAPID MIX BASIN (25-HP) NET PRESENT COST
Step 4: Determine Average Annual Energy Consumption Present Cost

Problem:

Establish Present Cost for Electric Annual Cost.

Key Equation:

$$PW_{electric} = A(1 - \frac{(1+\mathrm{i})^{-\mathrm{n}}}{\mathrm{i}}) \qquad kW_{input} = \frac{HP * 0.746}{\eta}$$

Solution:

HP	Motor Efficiency	kW Input Per Mixer	kW Input Total	kWh Input Total/yr	$/kwh	Annual Cost
25	0.9	21	41	363053	$ 0.10	$ 36,305.33

PW ELECTRIC	**$452,444.70**

Comments:

Assumed constant opeartion of the mixers

Cost breakdown metrics

Metric	Value
Cost per mixer	$10,900 / year
Cost per HP	$725 / HP-year
Cost per basin	$10,900 / year
Cost per MGD (42 MGD total)	$520 / MGD-year
Energy intensity	8,480 kWh / HP-year

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

BEAR CREEK WATER TREATMENT PLANT
MECHANICAL RAPID MIX BASIN (25-HP) NET PRESENT COST
Step 5: Determine Present Worth

Problem:

Establish Present Worth for Electric Annual Cost Present Worth.

Key Equation:

$$PW = PW_{cap} + PW_{annual} + PW_{repl} + PW_{electric}$$

Solution:

PW_cap	$451,800.00
PW_annual	$77,888.81
PW_repl	$53,853.54
PW_electric	$452,444.70
PW Mechanical Mix	**$1,035,987.05**

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

BEAR CREEK WATER TREATMENT PLANT
MECHANICAL RAPID MIX BASIN (15-HP) NET PRESENT COST
Step 1: Determine Capital Cost

Problem:

Establish Capital Cost.

Key Equation:

$$PW_{cap} = -C_0$$

Solution

Capital Cost	**$451,800.00**

Comments:

*Key Assumptions for analysis

DISCOUNT RATE	**PRESENT WORTH TIME FRAME**
5.00%	20

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem:

Establish Present Cost for Annual Maintenance.

Key Equation:

$$PW_{annual} = A(1 - \frac{(1+\mathrm{i})^{-\mathrm{n}}}{\mathrm{i}})$$

Solution

Item	Annual Cost (Both Mixers)	Justification
Preventive maintenance labor	$2,250	Quarterly inspections, greasing, alignment checks (≈ 30 hrs/year @ $75/hr loaded rate)
Lubricants & consumables	$800	Gear oil, grease, seals
Minor parts & wear items	$1,000	Bearings, fasteners, couplings
Electrical/mechanical troubleshooting	$1,000	Motor testing, VFD checks
Corrective maintenance allowance	$1,200	Minor unplanned maintenance
Total (A)	**$6,250**	
PW ANNUAL	**$77,888.81**	

Comments:

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BEAR CREEK WATER TREATMENT PLANT
MECHANICAL RAPID MIX BASIN (15-HP) NET PRESENT COST
Step 3: Determine Future Replacement/Rehabilitation Present Cost

Problem:

Establish Present Cost for Future Replacement/Major Rehabilitation.

Key Equation:

$$PW_{repl} = \sum_{t+1}^{20} \frac{F_n}{(1+i)^n}$$

Solution

Item	Cost (Both Mixers)	Service Life	Description
Mechanical Seal/Bearing overhaul @ Year 10	$15,000.00	8-12 years depending on service, Year 10 was selected as reasonable midpoint	Shaft seals, upper/lower bearings, alignment and testing
Gear Box Rebuild @ Year 12	$25,000.00	10-15 years, Year 12 was selected as reasonable midpoint	Internal gear inspection, bearing replacement, seal replacement, oil system refresh
VFD Replacement @ Year 15	$15,000.00	12-17 years, Year 15 was selected as midpoint.	Electronics aging, thermal cycling, obsolescence
Motor Replacement @ Year 18	$25,000.00	15-20 years, Year 18 was selected as midpoint.	25-HP TEFC motor. Includes removal, installation, alignment, and testing

PW FUTURE REHAB/REPLACEMENT

Item	Cost (Both Mixers)	Year	PW Value
Mechanical Seal/Bearing Overhaul	$15,000.00	10	$9,208.70
Gear Box Rebuild	$25,000.00	12	$13,920.94
VFD Replacement	$15,000.00	15	$7,215.26
Motor Replacement	$25,000.00	18	$10,388.02
		PW Future Replacement/Rehab.	**$40,732.91**

Comments:

Full mixer replacement not included (25-30 years with proper maintenance)

Primary wear drivers:
Gearbox gear teeth
Bearings under torsion load
Shaft alignment
Slow-speed, high-torque duty
Primary fail:
Mechanical fatigue
Lubrication degradation
Gear wear over time

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem:

Establish Present Cost for Electric Annual Cost.

Key Equation:

$$PW_{electric} = A(1 - \frac{(1+\mathrm{i})^{-\mathrm{n}}}{\mathrm{i}}) \qquad kW_{input} = \frac{HP * 0.746}{\eta}$$

Solution:

HP	Motor Efficiency	kW Input Per Mixer	kW Input Total	kWh Input Total/yr	$/kwh	Annual Cost
15	0.9	12	25	217832	$ 0.10	$ 21,783.20

PW ELECTRIC	**$271,466.82**

Comments:

Assumed constant opeartion of the mixers

Cost breakdown metrics

Metric	Value
Cost per mixer	$10,900 / year
Cost per HP	$725 / HP-year
Cost per basin	$10,900 / year
Cost per MGD (42 MGD total)	$520 / MGD-year
Energy intensity	8,480 kWh / HP-year

Problem:

Establish Present Worth for Electric Annual Cost Present Worth.

Key Equation:

$$PW = PW_{cap} + PW_{annual} + PW_{repl} + PW_{electric}$$

Solution:

PW_cap	$451,800.00
PW_annual	$77,888.81
PW_repl	$40,732.91
PW_electric	$271,466.82
PW Mechanical Mix	**$841,888.54**

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

BEAR CREEK WATER TREATMENT PLANT
JET DIFFUSION CONTROL VALVE NET PRESENT COST
Step 1: Determine Capital Cost

Problem:

Establish Capital Cost.

Key Equation:

$$PW_{cap} = -C_0$$

Solution

Capital Cost	**$831,800.00**

Comments:

*Key Assumptions for analysis

DISCOUNT RATE	**PRESENT WORTH TIME FRAME**
5.00%	20

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem:

Establish Present Cost for Annual Maintenance.

Key Equation:

$$PW_{annual} = A(1 - \frac{(1+\mathrm{i})^{-\mathrm{n}}}{\mathrm{i}})$$

Solution

Item	Annual Cost (Both Mixers)	Justification
Preventive maintenance labor	$1,875	Quarterly inspections, greasing, alignment checks (≈ 25 hrs/year @ $75/hr loaded rate)
Lubricants & consumables	$300	Grease, seal flush fluid, filters
Minor parts & wear items	$750	Bearings, fasteners, couplings
Electrical/mechanical troubleshooting	$500	Motor testing, VFD checks
Jet nozzle inspection/cleaning	$250	Periodic flushing, fouling prevention
Instrumentation/valve adjustments	$500	Feedback devices, control valves
Corrective maintenance allowance	$2,000	Minor unplanned maintenance, vault maintenance
Total (A)	**$6,175**	
PW ANNUAL	**$76,954.15**	

Comments:

Problem:

Establish Present Cost for Future Replacement/Major Rehabilitation.

Key Equation:

$$PW_{repl} = \sum_{t+1}^{20} \frac{F_n}{(1+i)^n}$$

Solution

Item	Cost (Both Pumps)	Service Life	Description
Mechanical Seal Replacement @ Year 8	$18,000.00	6-8 years, year 8 was selected	Tamdem mechanical seals, seal flush system components, labor for removal/reinstallation, alignment and testing
Pump Bearing Overhaul @ Year 10	$12,000.00	8-12 years, Year 10 was selected as midpoint.	Upper and lower bearing replacement, shaft inspection, reassembly and balance check
Control Valve and Actuator Rehab @ Year 12	$20,000.00	10-14 years, Year 12 was selected as midpoint.	Stainless trim, labor intensive, shutdown, alignment and testing.
VFD Replacement @ Year 15	$25,000.00	12-17 years, Year 15 was selected as midpoint.	Electronics aging, thermal cycling, obsolescence
Motor Replacement @ Year 18	$36,000.00	15-20 years, Year 18 was selected as midpoint.	26.3-HP TEFC motors. Removal, installation, alignment and testing

PW FUTURE REHAB/REPLACEMENT

Item	Cost (Both Mixers)	Year	PW Value
Mechanical Seal Replacement	$18,000.00	8	$12,183.11
Pump Bearing Overhaul	$12,000.00	10	$7,366.96
Control Valve and Actuator Rehab	$50,000.00	12	$27,841.87
Motor Replacement	$20,000.00	18	$8,310.41
		PW Future Replacement/Rehab.	**$55,702.35**

Comments:

Full pump replacement not included (25-30 years with proper maintenance)
Primary wear drivers:
Mechanical seals
Bearings at higher RPM
Motor insulation
Power Electronics
Systems fail due to:
Rotational Speed (big difference with mechanical)
Seal face wear
Thermal cycling

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem:

Establish Present Cost for Electric Annual Cost.

Key Equation:

$$PW_{electric} = A(1 - \frac{(1+\mathrm{i})^{-\mathrm{n}}}{\mathrm{i}}) \qquad kW_{input} = \frac{HP * 0.746}{\eta}$$

Solution:

HP	Motor Efficiency	kW Input Per Mixer	kW Input Total	kWh Input Total/yr	$/kwh	Annual Cost
10	0.88	8	17	148522	$ 0.10	$ 14,852.18

PW ELECTRIC	**$185,091.01**

Comments:

Assumed constant opeartion of the pumps
Efficiency provided by pump manufacturer
Cost breakdown metrics

Metric	Value
Cost per pump	$19,450 / year
Cost per HP	$740 / HP-year
Cost per basin	$10,900 / year
Cost per MGD (42 MGD basis)	$909 / MGD-year
Energy intensity	8,480 kWh / HP-year

Problem:

Determine Net Present Cost.

Key Equation:

$$PW = PW_{cap} + PW_{annual} + PW_{repl} + PW_{electric}$$

Solution:

PW_cap	$831,800.00
PW_annual	$76,954.15
PW_repl	$55,702.35
PW_electric	$185,091.01
PW Jet Dispersion	**$1,149,547.51**

Comments:

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem:

Establish Capital Cost.

Key Equation:

$$PW_{cap} = -C_0$$

Solution

Capital Cost	**$1,038,600.00**

Comments:

*Key Assumptions for analysis

DISCOUNT RATE	**PRESENT WORTH TIME FRAME**
5.00%	20

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem:

Establish Present Cost for Annual Maintenance.

Key Equation:

$$PW_{annual} = A(1 - \frac{(1+\mathrm{i})^{-\mathrm{n}}}{\mathrm{i}})$$

Solution

Item	Annual Cost (Both Mixers)	Justification
Preventive maintenance labor	$1,875	Quarterly inspections, greasing, alignment checks (≈ 25 hrs/year @ $75/hr loaded rate)
Lubricants & consumables	$300	Grease, seal flush fluid, filters
Minor parts & wear items	$750	Bearings, fasteners, couplings
Electrical/mechanical troubleshooting	$500	Motor testing, VFD checks
Jet nozzle inspection/cleaning	$250	Periodic flushing, fouling prevention
Instrumentation/valve adjustments	$500	Feedback devices, control valves
Corrective maintenance allowance	$2,000	Minor unplanned maintenance, vault maintenance
Total (A)	**$6,175**	
PW ANNUAL	**$76,954.15**	

Comments:

Less maintenance expected than modulating valves due to structures controlling hydraulics vs. valves and actuators

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

Problem:

Establish Net Present Cost for Future Replacement/Major Rehabilitation.

Key Equation:

$$PW_{repl} = \sum_{t+1}^{20} \frac{F_n}{(1+i)^n}$$

Solution

Item	Cost (Both Pumps)	Service Life	Description
Mechanical Seal Replacement @ Year 8	$18,000.00	6-8 years, year 8 was selected	Tamdem mechanical seals, seal flush system components, labor for removal/reinstallation, alignment and testing
Pump Bearing Overhaul @ Year 10	$12,000.00	8-12 years, Year 10 was selected as midpoint.	Upper and lower bearing replacement, shaft inspection, reassembly and balance check
VFD Replacement @ Year 15	$25,000.00	12-17 years, Year 15 was selected as midpoint.	Electronics aging, thermal cycling, obsolescence
Motor Replacement @ Year 18	$36,000.00	15-20 years, Year 18 was selected as midpoint.	26.3-HP TEFC motors. Removal, installation, alignment and testing

PW FUTURE REHAB/REPLACEMENT

Item	Cost (Both Mixers)	Year	PW Value
Mechanical Seal Replacement	$18,000.00	8	$12,183.11
Pump Bearing Overhaul @ Year 10	$12,000.00	10	$7,366.96
Motor Replacement	$20,000.00	18	$8,310.41
		PW Future Replacement/Rehab.	**$27,860.48**

Comments:

Full pump replacement not included (25-30 years with proper maintenance
Primary wear drivers:
Hydraulic wear and erosion at structures
Chemical wear and erosion at structures
Structural fatigue
Systems fail due to:
Hydraulic imbalance
Plugging or partial obstruction
Localized concrete or lining damage

Prepared By: Carey Clark
Checked By: Aaron Baird
Date: April 2026

BEAR CREEK WATER TREATMENT PLANT
JET DIFFUSION CONTROL HYDRAULIC SPLIT PRESENT COST
Step 4: Determine AverageAnnual Energy Consumption Present Cost

Problem:

Establish Present Cost for Electric Annual Cost.

Key Equation:

$$PW_{electric} = A(1 - \frac{(1+\mathrm{i})^{-\mathrm{n}}}{\mathrm{i}}) \qquad kW_{input} = \frac{HP * 0.746}{\eta}$$

Solution:

HP	Motor Efficiency	kW input per mixer	kW input total	kW Hydraulic Split Input	kWh input total/yr	$/kwh	Annual Cost
10	0.9	8	17	14	123438	$ 0.10	$ 12,343.81

PW ELECTRIC	**$153,831.20**

Comments:

Assumed constant opeartion of the pumps
Assumed 15% power reduction compared to valve control due to pumps operating closer to BEP
Cost breakdown metrics

Metric	Value
Cost per pump	$19,450 / year
Cost per HP	$740 / HP-year
Cost per basin	$10,900 / year
Cost per MGD (42 MGD basis)	$909 / MGD-year
Energy intensity	8,480 kWh / HP-year

BEAR CREEK WATER TREATMENT PLANT
JET DIFFUSION CONTROL HYDRAULIC SPLIT PRESENT COST
Step 5: Determine Net Present Cost

Problem:

Determine Net Present Cost.

Key Equation:

$$PW = PW_{cap} + PW_{annual} + PW_{repl} + PW_{electric}$$

Solution:

PW_cap	$1,038,600.00
PW_annual	$76,954.15
PW_repl	$27,860.48
PW_electric	$153,831.20
PW Hydraulic Split	**$1,297,245.83**

Comments: