FACT SHEET STATEMENT OF BASIS
MONA WASTEWATER TREATMENT PLANT
PERMIT: DISCHARGE, BIOSOLIDS & STORM WATER
UPDES PERMIT NUMBER: UT0025950
UPDES BIOSOLIDS PERMIT NUMBER: UTL-025950
UPDES MULTI-SECTOR STORM WATER GENERAL PERMIT NUMBER: UTR000000
MINOR MUNICIPAL

FACILITY CONTACTS

Person Name:	Brent P. Arns	Person Name:	Brent P. Arns
Position:	General Manager	Position:	Storm Water Coordinator
Person Name:	Brent P. Arns	Person Name:	Brent P. Arns
Position:	Plant Superintendent	Position:	Laboratory Director
Person Name:	Brent P. Arns		
Position:	Biosolids Coordinator		

Facility Name:	Mona Wastewater Treatment Plant
Mailing Address:	50 West Center Street Mona, Utah 84645
Telephone:	435 -623-4913
Actual Address:	Approximately 300 West 560 North

DESCRIPTION OF FACILITY

Mona City is building a new wastewater treatment plant. The facility has a design capacity of 0.5 MGD. The facility will be a Membrane Bioreactor (MBR) serving a population of approximately 1600. The facility does not currently include any categorical industries in the service area, and there are no plans for any to start up in the foreseeable future. It will be located at approximately 300 West 560 North. The influent enters the facility through 2 mm drum screens. The influent will continue through the screening and grit removal to mix with return activated sludge and continue on to the anoxic basin, then to the aerobic basin. From there it will continue to the membrane basins. The secondary effluent will be pumped to a back pulse tank where it will overflow through UV disinfection and then to the discharge. The design has dual process trains able to run parallel.

The sludge from the MBR process enters a screw press unit for dewatering of the sludge. The sludge is then disposed of in the landfill.

The Mona facility has only recently been completed, and has had no history of discharging. There is the risk of some upsets in the treatment process. Due to the nature of the treatment process being employed, most situations should be able to be dealt with, and not result in a discharge violation. In the event that a discharge violation does occur during the startup period, The Executive Secretary will review the situation and exercise discretion in determining what enforcement may be warranted

An anti-degradation review was completed during the design proposal process for the facility.

DISCHARGE

DESCRIPTION OF DISCHARGE

The Mona WWTP is a new facility and has not yet discharged. There is no data from this facility. Data from other similar facilities shows they are very successful at meeting treatment expectations and discharge limits.

Outfall	Description of Discharge Point
001	Located near latitude 39°49'34" N and longitude 111°51'47" W, approximately 750 feet west of proposed WWTP. The discharge through a 15-inch diameter gravity flow pipe, over a rip rap spreader, and over land approximately 650 feet to Mona Reservoir.

RECEIVING WATERS AND STREAM CLASSIFICATION

The final discharge will flow overland to Mona reservoir with a classification of 2B, 3B and 4.

Class 2B	-Protected for secondary contact recreation such as boating, wading, or similar uses.
Class 3B	-Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.
Class 4	-Protected for agricultural uses including irrigation of crops and stock watering.

BASIS FOR EFFLUENT LIMITATIONS

Limitations on total suspended solids (TSS), biochemical oxygen demand (BOD_5), E-Coli coliform, pH and percent removal for BOD_5 and TSS are based on current Utah Secondary Treatment Standards, *UAC R317-1-3.2*. The oil and grease is based on best professional judgment (BPJ). The permit limitations are:

Parameter	Effluent Limitations			
	Monthly Average	Weekly Average	Minimum	Maximum
Flow, MGD	0.5	0.5	NA	NA
BOD_5, mg/L BOD_5 Min. % Removal	25 85	35 NA	NA NA	NA NA
TSS, mg/L TSS Min. % Removal	25 85	35 NA	NA NA	NA NA
E. Coli, No/100mL	126	157	NA	NA
Oil & Grease, mg/L	NA	NA	NA	10.0
pH, Standard Units	NA	NA	6.5	9.0

NA – Not Applicable.

SELF-MONITORING AND REPORTING REQUIREMENTS

The following self-monitoring requirements are included in the new permit. The permit will require reports to be submitted monthly and quarterly, as applicable, on Discharge Monitoring Report (DMR) forms due 28 days after the end of the monitoring period. Lab sheets for biomonitoring must be attached to the biomonitoring DMR.

Self-Monitoring and Reporting Requirements *a			
Parameter	Frequency	Sample Type	Units
Total Flow *b *c	Continuous	Recorder	MGD
BOD_5, Influent *d Effluent	2 x Monthly 2 x Monthly	Grab Grab	mg/L mg/L
TSS, Influent *d Effluent	2 x Monthly 2 x Monthly	Grab Grab	mg/L mg/L
E. Coli, No/100mL	2 x Monthly	Grab	No./100mL
pH	2 x Monthly	Grab	SU
Dissolved Oxygen	2 x Monthly	Grab	Mg/L
Temperature	2 x Monthly	Grab	
Oil & Grease	Monthly If Sheen is Observed	Grab	mg/L
WET, Acute Biomonitoring	Quarterly	Composite	Pass/Fail
Ammonia as (N) *f	Yearly	Composite/Grab	mg/L
Total Kjeldahl Nitrogen *f	Yearly	Grab	mg/L
Nitrate, NO3 *f	Yearly	Grab	mg/L
Nitrite, NO2 *f	Yearly	Grab	mg/L
Total Phosphorus *f	Yearly	Grab	mg/L
Orthophosphate *f	Yearly	Composite/Grab	mg/L
Hardness*f	Yearly	Composite/Grab	
Organic Toxics *e *f	Once Every 2 Years	Grab	mg/L
Metals, Influent *d *e *f *g Effluent *d *e *f *g	Once Every 2 Years Once Every 2 Years	Composite/Grab Composite/Grab	mg/L mg/L

*a See Definitions, *Part VII*, for definition of terms.

*b Flow measurements of influent/effluent volume shall be made in such a manner that the permittee can affirmatively demonstrate that representative values are being obtained.

*c If the rate of discharge is controlled, the rate and duration of discharge shall be reported.

*d In addition to monitoring the final discharge, influent samples shall be taken and analyzed for this constituent at the same frequency as required for this constituent in the discharge.

*e Testing must be performed in the second, and fourth years of the permit cycle. A list of the organics to be tested can be found in 40CFR122 appendix D table II. If results of metal analysis are detectable, more frequent sampling of the metals may be required.

*f These parameters are being monitored for informational purposes only. The data gathered will assist in the development of more accurate WLA in the future. The constituents do not have effluent limits associated with them, and are not enforceable.

*g Metals Monitoring for this permit.

Metals Monitoring *e			
Parameter	Sample Type	Frequency	Units
Total Arsenic	Composite	Once Every 2 Years	mg/L
Total Cadmium			
Total Chromium			
Total Copper			
Total Cyanide			
Total Lead			
Total Mercury	Composite/Grab		
Total Molybdenum	Composite		
Total Nickel			
Total Selenium			
Total Silver			
Total Zinc			

*e Testing must be performed in the second, and fourth years of the permit cycle. A list of the organics to be tested can be found in 40CFR122 appendix D table II. If results of metal analysis are detectable, more frequent sampling of the metals may be required.

BIOSOLIDS

DESCRIPTION OF TREATMENT AND DISPOSAL

The Mona WWTP is expected to dispose of approximately twenty five dry metric tons (DMT) of wastewater solids (sewage sludge) per year. The wastewater solids will be stabilized during the MBR process with an average retention time of over 60 days. The wastewater solids from the MBR process will be de-watered with a screw press. All sludge from Mona WWTP will be disposed of in a permitted landfill.

SOLIDS MONITORING REQUIREMENTS

Under *40 CFR 503* solids are not required to be monitored for heavy metals content or pathogen reduction if the solids are disposed in a landfill.

LANDFILL MONITORING

Paint Filter Test

Under *40 CFR 258,* landfill monitoring requirements, the solids will need to pass a paint filter test before the solids are disposed of in a landfill. If the solids do not pass a paint filter test, the solids cannot be disposed in a landfill.

Vector Attraction Reduction Monitoring

Under *40 CFR 503.33*, the solids need to meet a method of vector attraction reduction (VAR). Since the solids will be disposed of at a permitted landfill, Mona WWTP will need to insure that the solids are covered daily with soil or another approved material. If the solids are not covered daily, the solids cannot be disposed in the landfill.

Minimum Frequency of Monitoring	
Amount of Solids Disposed Per Year	**Monitoring Frequency**
> 0 to < 290, DMT	Once per year

Since Mona WWTP is not expected to produce more than 290 DMT of solids per year, Mona WWTP will be required to monitor at least once per year for the paint filter tests.

RECORD KEEPING

The record keeping requirements from *40 CFR 503.17* are included under *Part V.F.* of the permit. Since the solids are disposed in a landfill the records need to be retained for a minimum of five years.

REPORTING

Mona WWTP needs to submit an annual solids report as required in *40 CFR 503.18*. This report is to include the results of all solids monitoring performed in accordance with *Part III.B.3.* of the permit, information on management practices, solids treatment, and certifications. This report is due no later than February 19 of each year. Each report is for the previous calendar year.

STORM WATER

STORMWATER REQUIREMENTS

The *Utah Administrative Code (UAC) R-317-8-3.9* requires storm water permit provisions to include the development of a storm water pollution prevention plan for waste water treatment facilities if the facility meets one or both of the following criteria.

1. waste water treatment facilities with a design flow of 1.0 MGD or greater, and/or,
2. waste water treatment facilities with an approved pretreatment program as described in *40CFR Part 403,*

Mona WWTP does not meet one of the above criteria; therefore this permit does not include storm water provisions. The permit does however include a storm water re-opener provision.

PRETREATMENT REQUIREMENTS

The permittee has not been designated for pretreatment program development because it does not meet conditions which necessitate a full program. The flow through the plant is less than five (5) MGD, there are no categorical industries discharging to the treatment facility, industrial discharges comprise less than 1 percent of the flow through the treatment facility, and there is no indication of pass through or interference with the operation of the treatment facility such as upsets or violations of the POTW's UPDES permit limits.

Although the permittee does not have to develop a State-approved pretreatment program, any wastewater discharges to the sanitary sewer are subject to Federal, State and local regulations. Pursuant to *Section 307* of the *Clean Water Act*, the permittee shall comply with all applicable Federal General Pretreatment Regulations promulgated, found in *40 CFR 403* and the State Pretreatment Requirements found in *UAC R317-8-8*.

An industrial waste survey (IWS) is required of the permittee as stated in Part II of the permit. The IWS is to assess the needs of the permittee regarding pretreatment assistance. The IWS is required to be submitted within sixty (60) days after the issuance of the permit. If an Industrial User begins to discharge or an existing Industrial User changes their discharge the permittee must resubmit an IWS no later than sixty days following the introduction or change as stated in Part II of the permit.

It is required that the permittee submit for review any local limits that are developed to the Division of Water Quality for review. If local limits are developed, it is recommended that the permittee perform an annual evaluation of the need to revise or develop technically based local limits for pollutants of concern, to implement the general and specific prohibitions *40 CFR, Part 403.5(a)* and *Part 403.5(b)*. This evaluation may indicate that present local limits are sufficiently protective, need to be revised or should be developed.

BIOMONITORING REQUIREMENTS

A nationwide effort to control toxic discharges where effluent toxicity is an existing or potential concern is regulated in accordance with the *State of Utah Permitting and Enforcement Guidance Document for Whole Effluent Toxicity Control (biomonitoring).* Authority to require effluent biomonitoring is provided in *Permit Conditions, UAC R317-8-4.2, Permit Provisions, UAC R317-8-5.3* and *Water Quality Standards, UAC R317-2-5* and *R317 -2-7.2*.

Since the permittee will be a new minor municipal discharging facility the permit will require whole effluent toxicity (WET) biomonitoring testing. Acute toxicity testing will be required using one species quarterly, alternating between Ceriodaphnia dubia and Pimephales promelas (fathead minnow).

The permit will contain the standard requirements for accelerated testing upon failure of a WET test and a PTI (Preliminary Toxicity Investigation) and TRE (Toxicity Reduction Evaluation) as necessary.

PERMIT DURATION

It is recommended that this permit be effective for a duration of five (5) years.

Drafted by
Daniel Griffin P.E., Discharge
Mark Schmitz, Biosolids
Mike George, Storm Water
Utah Division of Water Quality

Utah Division of Water Quality
ADDENDUM
Statement of Basis
Wasteload Analysis

Date: **October 19, 2011**

Facility: **Mona City Wastewater Treatment Facility**
Mona, UT
UPDES No. UT-0025950

Receiving water: **Wetlands adjacent to Mona Reservoir (2B, 3B, 4)**

This addendum summarizes the wasteload analysis that was performed to determine water quality based effluent limits (WQBEL) for this discharge. Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses (UAC R317-2-8). Projected concentrations are compared to numeric water quality standards to determine acceptability. The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

Discharge
Outfall 001: Mona Reservoir

The design flow for the discharge is 0.5 MGD (0.77 cfs), as estimated by the permittee.

Receiving Water
The receiving water for outfall 001 is wetlands adjacent to Mona Reservoir. The designated uses for Mona Reservoir are 2B, 3B, and 4.

Mona Reservoir is not listed as impaired for any parameters and does not have an approved TMDL. Currant Creek downstream of Mona Reservoir is listed as impaired for temperature and pH (2010 Utah Integrated Report).

The discharge is located within the fringe wetlands along Mona Reservoir. For a portion of some years, the pipe is likely submerged by the reservoir. The critical water surface elevation for the wasteload analysis was considered the lowest elevation for seven consecutive days with a ten year return frequency (7Q10). The 7Q10 water surface elevation was assumed to be below the discharge pipe based on aerial photography and site reconnaissance. No water surface elevation data was available for this analysis.

Mixing Zone
The allowable mixing zone in lakes and reservoirs shall not exceed 200 feet for chronic conditions and shall not exceed 35 feet for acute conditions, per UAC R317-2-5. Water quality standards must be met at the end of the mixing zone.

Dilution Factor

Since no water is anticipated at the discharge location during critical conditions, no dilution factor was applied.

Effluent Limits

Effluent limits for this discharge are water quality standards for the receiving water. The applicable water quality standards are attached as an appendix to this wasteload.

The water quality standards for dissolved metals are dependent on hardness (total as CaCO3). Water Quality data was obtained for the drinking water sources for Mona. The membrane wastewater treatment plant is not anticipated to alter the hardness of the influent. Therefore, an average hardness of 200 mg/L based on the drinking water source was used for determining the dissolved metals effluent limits.

For parameters without a WQBEL, permit limits should be set according to rules found in R317-1-3 and categorical UPDES discharge requirements.

WLA Document: *mona_wwtp_wla_2011_final.doc*
Analysis: *mona_wwtp_wla_2011_final.xls*

Prepared by:
Nicholas von Stackelberg, P.E.
Water Quality Management Section

Wasteload Analysis

Facility:	**Mona City WWTP**	**UPDES No: UT- 0025950**
Discharging to:	**Mona Reservoir**	

I. Introduction

Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on receiving water quality. The wasteload analysis does not take into account downstream designated uses [R317-2-8, UAC] nor anti-degradation policy and procedures [R317-2-3, UAC].
Projected concentrations are compared to numeric water quality standards for acceptability. The primary water quality parameters of concern may include metals (as a function of hardness), total dissolved solids (TDS), total residual chlorine (TRC), unionized ammonia (as a function of pH and temperature, measured and evaluated interms of total ammonia), and dissolved oxygen.

Mathematical water quality modeling is employed to determine water quality response to point source discharges. Models aid in the effort of anticipating water quality at future effluent flows at critical environmental conditions (e.g., high temperature, high pH, etc). The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions as determined by staff of the Division of Water Quality.

II. Receiving Water and Mixing Zone

Discharge: Wetland
Drains To: Mona Reservoir Beneficial Use: 2B, 3B, 4
Mixing Zone Allowed: Due to discharge to wetland, no dilution is allowed.

III. Effluent Limitation fo Flow

All Seasons		
Not to Exceed:	0.50 MGD	Daily Average
	0.77 cfs	Daily Average

Prepared by:
Nicholas von Stackelberg, P.E.
Utah Division of Water Quality
801-536-4374

Appendix

A-I. Numeric Water Quality Standards for Protection of Recreation (Class 2B Waters)

Parameter	Maximum Concentration	
Physical		
pH Minimum	6.5	
pH Maximum	9.0	
Bacteriological		
E. coli (30 Day Geometric Mean)	206	(#/100 mL)
E. coli (Maximum)	668	(#/100 mL)

A-II. Numeric Water Quality Standards for Protection of Aquatic Wildlife (Class 3B Waters)

Physical

Temperature	27 deg C				
pH Minimum	6.5				
pH Maximum	9.0				
Dissolved Oxygen (DO)		5.5	mg/l (30 Day Average)		
Early Life Stages Present	No	6.0	mg/l (7 Day Average)		
		5.0	mg/l (1 Day Average)		

Inorganics

				pH	Temp
Total Ammonia (TNH3)	Function of Temperature and pH				
		2.0	mg/l as N (30 Day Average)	8.00	17.5
		8.4	mg/l as N (1 Hour Average)	8.00	20.0
Total Residual Chlorine (TRC)		0.011	mg/l (4 Day Average)		
		0.019	mg/l (1 Hour Average)		

Dissolved Metals

Parameter	Chronic Standard (4 Day Average) Concentration	Acute Standard (1 Hour Average) Concentration
Aluminum	87.0 µg/L	750.0 µg/L
Arsenic	150.0 µg/L	340.0 µg/L
Cadmium	0.4 µg/L	3.9 µg/L
Chromium VI	11.0 µg/L	16.0 µg/L
Chromium III	130.8 µg/L	1005.2 µg/L
Copper	16.2 µg/L	25.8 µg/L
Cyanide	5.2 µg/L	22.0 µg/L
Iron		1000.0 µg/L
Lead	5.3 µg/L	136.1 µg/L
Mercury	0.012 µg/L	2.4 µg/L
Nickel	93.5 µg/L	841.7 µg/L
Selenium	4.6 µg/L	18.4 µg/L
Silver		10.6 µg/L
Zinc	212.5 µg/L	210.8 µg/L

Based upon a Hardness of 200 mg/l as CaCO3

Organics [Pesticides]

Parameter	Chronic Standard (4 Day Average) Concentration	Acute Standard (1 Hour Average) Concentration
Aldrin		1.500 µg/L
Chlordane	0.0043 µg/L	1.200 µg/L
DDT, DDE	0.001 µg/L	0.550 µg/L
Diazinon	0.17 µg/L	0.17 µg/L
Dieldrin	0.0056 µg/L	0.240 µg/L
Endosulfan, a & b	0.056 µg/L	0.110 µg/L
Endrin	0.036 µg/L	0.086 µg/L
Heptachlor & H. epoxide	0.0038 µg/L	0.260 µg/L
Lindane	0.08 µg/L	1.000 µg/L
Methoxychlor		0.030 µg/L
Mirex		0.001 µg/L
Nonylphenol	6.6 µg/L	28.0 µg/L
Parathion	0.0130 µg/L	0.066 µg/L
PCB's	0.014 µg/L	
Pentachlorophenol	15.00 µg/L	19.000 µg/L
Toxephene	0.0002 µg/L	0.730 µg/L

A-III. Numeric Water Quality Standards for Protection of Agriculture (Class 4 Waters)

Parameter	Maximum Concentration	
Total Dissolved Solids	1200	mg/L
Arsenic	0.1	mg/L
Boron	0.75	mg/L
Cadmium	0.01	mg/L
Chromium	0.1	mg/L
Copper	0.2	mg/L
Lead	0.1	mg/L
Selenium	0.05	mg/L
Gross Alpha	15	pCi/L

FILE COPY

Mona Wastewater Treatment Plant Antidegradation Application

Mona, UT

September, 2010

FORSGREN Associates Inc.

370 East 500 South, Suite 200
Salt Lake City, Utah 84111
Phone: 801.364.4785
Fax: 801.364.4802

Antidegradation Review Application

Part A: Applicant Information

Applicant: Mona City

Facility Owner: Mona City

Facility Location: Approximately 300 West, 560 North in Mona Utah

Application or Plans Prepared By: Forsgren Associates

Project Name: Mona Wastewater Treatment Plant

Receiving Water: Currant Creek, then Mona Reservoir

What Are the Designated Uses of the Receiving Water (R317-2-6)?
Both waters are classified as 2B,3A,4.

Category of Receiving Water (Category 1, 2, or 3 from R317-2-3.2, -3.3, and -3.4):
3

UPDES Permit Number (if appropriate):

<u>What is the application for? (check all that apply)</u>

☒ An application for a UPDES permit for a new facility or project.

☐ An expansion or modification of an existing wastewater treatment works facility that will result in an additional of a new pollutant not currently covered by the permit.

☐ An expansion or modification of an existing wastewater treatment works that will result in an increase in the mass or concentration of a pollutant discharged to waters of the state.

☐ A permit renewal requiring limits for a pollutant not covered by the previous permit.

☐ An expansion or modification of an existing wastewater treatment works that will result in an increase in volume discharged over the volume used to obtain previous permit limits.

☐ A proposed UPDES permit renewal with no changes in facility operations.

Part B. Is a Level II ADR required?

This section of the application is intended to help applicants determine if a Level II ADR is required for specific permitted activities. However, the Executive Secretary may require a Level II ADR for an activity that would otherwise be exempt if extenuating circumstances suggest that a more extensive review of alternatives is needed to protect water quality.

B1. Are water quality impacts of the proposed project temporary and limited (Section 3.3.4)? Proposed projects that will have temporary and limited effects on water quality can be exempted from a Level II ADR.

☐ **Yes** Identify the reasons used to justify this determination from Part B1.1 and proceed to Part G. No Level II ADR is required.

☒ **No** (Proceed to Part B2 of the Application)

B1. 1 Complete this question only if the applicant is requesting a Level II review exclusion for temporary and limited projects (see R317-2-3.5(b)(3) and R317-2-3.5(b)(4)). For projects requesting a temporary and limited exclusion please indicate the factor(s) used to justify this determination (check all that apply and provide details as appropriate) (Section 3.3.4 of Implementation Guidance):

☐ The length of time during which water quality will be lowered is limited. How long?

☐ Water quality impacts are related exclusively to sediment or turbidity and fish spawning will not be impaired.

☐ There is little potential for long-term residual or short-term (acute) negative influences to existing uses.

B2. Will any pollutants use assimilative capacity? For most pollutants, are pollutant concentrations in the effluent higher than the ambient concentrations at critical conditions in the receiving water (Section 3.3.3 of Implementation Guidance)? For some pollutants such as pH, assimilative capacity is used when effluent concentrations are less than the ambient concentrations in the receiving water.

☒ **Yes** A Level II ADR is required. Proceed to Part C.

☐ **No** No Level II ADR is required and there is <u>no need to proceed further with application questions</u>.

B3. Is the proposed project to an existing UPDES permit with no proposed changes to the discharge (Section 3.3.3 of Implementation Guidance)?

☐ **Yes** No Level II ADR is required and there is no need to proceed further with application questions.

☐ **No** A Level II ADR is required. Proceed to Part C.

B4. Is the permit being renewed with new effluent limits and the corresponding effluent concentrations and load for these parameters will not increase (Section 3.3.3)?

☐ **Yes** No Level II ADR is required and there is no need to proceed further with application questions.

☐ **No** A Level II ADR is required. Proceed to Part C.

Part C. Is the degradation from the project socially and economically necessary to accommodate important economic or social development in the area in which the waters are located?

The applicant must provide as much detail as necessary for DWQ to concur that the project is socially and economically necessary when answering the questions in this section. More information is available in Section 6.2 of the Implementation Guidance.

C1. Optional Independent Report. Questions C2 through C6 are provided for the convenience of applicants. However, in some cases it may be easier to address the factors captured by these questions in a separate report. Applicants that prefer a separate report should record the report name here and proceed to Part D of the application.

Report Name:

C2. Describe the social and economic benefits that would be realized through the proposed project, including the number and nature of jobs created and anticipated tax revenues.

The City of Mona, Utah is growing rapidly and will soon be one of the largest communities on the Wasatch Front without a centralized sewer system. The homes in the City are currently serviced by septic systems and, less commonly, by cesspools. The installation of a sewer system along with the construction of a wastewater treatment plant will be key pieces of infrastructure necessary for the continuing development of the community. Additional development with increased density will increase tax revenue and create jobs. Future commercial and light industrial enterprise operations are currently limited without a centralized wastewater system.

C3. Describe any environmental benefits to be realized through implementation of the proposed project.

Due to the shallow aquifer, the possibility of pollutants from septic tanks entering groundwater is high. Disposal areas for individual on-site systems may be constructed below the water table or directly above the water table with an inadequate barrier between the disposal field and the groundwater. This condition increases the potential for elevated nitrate levels in the groundwater, a health concern for infants and at-risk individuals. A sewer collection system combined with a wastewater treatment plant would alleviate most concerns regarding untreated pollutants negatively affecting the environment.

C4. Describe any social and economic losses that may result from the project, including impacts to recreation or commercial development.

The proposed WWTP will not impact recreation or commercial development in a negative way.

C5. Summarize any supporting any information from the affected communities on preserving assimilative capacity to support future growth and development.

Preserving the assimilative capacity of natural body of Currant Creek and Mona Reservoir to receive waste water, without harmful effects and damage is important to the Mona City. They chose a top of the line wastewater treatment technology because of this. The MBR system, combined with UV disinfection will provide an effluent with fewer pollutants than currently exist in Mona Reservoir.

C6. Please describe any structures or equipment associated with the project that will be placed within or adjacent to the receiving water.

No structures or equipment will be placed within or directly adjacent to Currant Creek. The proposed effluent will sheet flow from property adjacent to Currant Creek which will eventually flow into Mona Reservoir.

Part D. Identify and rank (from increasing to decreasing potential threat to designated uses) the parameters of concern.

Parameters of concern are parameters in the effluent at concentrations greater than ambient concentrations in the receiving water. More information is available in Section 3.3.3 of the Implementation Guidance. Proceed to Part E.

Typical parameters of concern for municipal wastewater treatment effluent are BOD_5, TSS, Nitrogen, Phosphorous, and Ammonia. In addition, lead and copper must be considered as they are in the existing water supply and the probability of home owners pipes leaching these metals is high. There are no industries in Mona, therefore, there are no additional anticipated heavy metals. The attached spreadsheet in Appendix A shows sampling data for Mona Reservoir available at the time of this report. Nitrogen, pH, DO, phosphorus and TDS are pollutants from the report whose limits will be compared with effluent from the proposed treatment plant.

Pollutant	Currant Mona Reservoir Condition	Proposed Effluent	Parameter of Concern
Nitrogen	.1 mg/L	<3 mg/L[1]	Yes
pH	8.44	7-7.5[2]	Yes
DO	6.81 mg/L	4-6 mg/L [3]	Yes
Phosphorus	.04 mg/L	<0.5 mg/L [1]	Yes
TDS	860.9 mg/L	180-224 ppm[4]	No
Arsenic	6.5 ug/L	Non-detect	No
Barium	74.55 ug/L	50-60 ppb[5]	No
Cadmium	Non-detect	Non-detect	No
Chromium	5 ug/L	Non-detect	No
Copper	Non-detect	49-100 ppt[6]	Yes
Iron	29.35 ug/L	Non-detect	No
Lead	Non-detect	4-13 ppt[7]	Yes
Magnesium	57.16 mg/L	Non-detect	No
Mercury	Non-detect	Non-detect	No
Silver	Non-detect	Non-detect	No
Zinc	Non-detect	Non-detect	No

[1] GE water ZeeWeed MBR equipment info:
http://www.gewater.com/products/equipment/mf_uf_mbr/mbr.jsp

[2] Range taken from treatment effluent data of currently operating Burley Idaho Municipal Treatment Plant

[3] Data not typically sampled for at treatment plants. Numbers are engineer's best estimate based on treatment plant process parameters.

[4] Info taken from Mona Water Consumer Confidence Report

[5] Barium data is taken from Mona Water Consumer Confidence Report (See appendix B) sampled in 2004. Report indicates amounts are from household corrosion of pipes, discharge of drilling wastes, discharge from metal refineries, and erosion of natural deposits. Ppb is parts per billion.

[6] Copper data is taken from Mona Water Consumer Confidence Report sampled in 2007. Report indicates amounts are from household corrosion of pipes and erosion of natural deposits. Ppt is parts per trillion. Numbers indicate amount present in currant drinking water.

[7] Lead data is taken from Mona Water Consumer Confidence Report sampled in 2007. Report indicates amounts are from household corrosion of pipes and erosion of natural deposits. Ppt is parts per trillion

Part E. Alternative Analysis Requirements of a Level II Antidegradation Review. *Level II ADRs require the applicant to determine whether there are feasible less-degrading alternatives to proposed project. More information is available in Section 5.5 and 5.6 of the Implementation Guidance.*

E1. Please attach, as an appendix to this application, a report that describes the following factors for all alternative treatment options (see 1) a technical description of the treatment process, including construction costs and continued operation and maintenance expenses, 2) the mass and concentration of discharge constituents, and 3) a description of the reliability of the system, including the frequency where recurring operation and maintenance may lead to temporary increases in discharged pollutants. Most of this information is typically available from a Facility Plan, if available.

Report Name: *Screening of Alternatives – E1*

E2. Were any of the following alternatives feasible (check all that apply):

- ☐ Pollutant Trading
- ☐ Total Containment
- ☐ Water Recycling/Reuse
- ☐ Improved O&M of Existing Systems
- ☐ Land Application
- ☐ Seasonal or Controlled Discharge
- ☐ Connection to Other Facilities
- ☐ New Construction
- ☐ Upgrade to Existing Facility

E3. From the applicant's perspective, what is the preferred treatment option?

Membrane Bioreactor (MBR)

A variation of the activated sludge process wherein the clarification and filtration unit processes that traditionally occur in separate basins are replaced with a polypropylene or polyethylene membrane installed within the activated sludge. Effluent is drawn through the membrane by creating a hydraulic gradient across the membrane, either through mechanical means by using a pump to create a vacuum on the downstream side of the membrane or through physical means by creating a hydraulic head condition on the upstream side of the membrane.

E4. Is the preferred option also the least polluting alternative?

☒ **Yes**

☐ **No**

If no, what is the least polluting alternative?

If no, provide a summary of the justification for not using the least polluting alternative and if appropriate, provide a more detailed justification as an attachment. Name of attachment:

Part F. Optional Information

F1. Does the applicant want to conduct optional public reviews? More information is available in Section 3.7.1 of the Implementation Guidance

☒ **No**

☐ **Yes**

F2. Does the project include an optional mitigation plan?

☒ **No** Proceed to Part G

☐ **Yes** Proceed to Part F2.1

Report Name:

F2.1 Does the mitigation plan apply to specific project alternatives?

☐ **No**

☐ **Yes**

Part G. Certification of Antidegradation Review

G1. Applicant Certification

The application should be signed by the same responsible person who signed the accompanying permit application or certification.

Based on my inquiry of the person(s) who manage the system or those persons directly responsible for gathering the information, the information in this application and associated documents is, to the best of my knowledge and belief, true, accurate, and complete.

Signature: ______________________________

Date: ______________________

G2. DWQ Certification and Approval

G2.1 To the best of my knowledge, the ADR was conducted in accordance with the rules and regulations outlined in UAC R-317-2-3.

WQM Section

Signature: CWB

Date: 9/30/10

G2.2 To the best of my knowledge, all feasible treatment options were examined and a final treatment option was selected that represents the least degrading, yet affordable (as defined in R-317-2-3.5(c) treatment option (this signature is only required for Level II reviews).

DWQ Permitting

Signature: [signature]

Date: 10/20/10

A
SAMPLING DATA

name	arrival_date	value_text	display_name	min_detect
MONA RES AB DAM 01	8/25/1998 0:00	6.2	Arsenic	
MONA RES AB DAM 01	8/2/2000 0:00	6.8	Arsenic	
MONA RES AB DAM 01	8/25/1998 0:00	71.0	Barium	
MONA RES AB DAM 01	8/2/2000 0:00	78.1	Barium	
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect	Cadmium	1.0
MONA RES AB DAM 01	8/2/2000 0:00	*Non-detect	Cadmium	
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect	Chromium	5.0
MONA RES AB DAM 01	8/2/2000 0:00	5.	Chromium	
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect	Copper	12.0
MONA RES AB DAM 01	8/2/2000 0:00	*Non-detect	Copper	
MONA RES AB DAM 01	6/26/1998 0:00	8.2	Dissolved oxygen (DO)	
MONA RES AB DAM 01	6/26/1998 0:00	7.7	Dissolved oxygen (DO)	
MONA RES AB DAM 01	8/25/1998 0:00	6.5	Dissolved oxygen (DO)	
MONA RES AB DAM 01	8/25/1998 0:00	6	Dissolved oxygen (DO)	
MONA RES AB DAM 01	6/1/2000 0:00	7.69	Dissolved oxygen (DO)	
MONA RES AB DAM 01	6/1/2000 0:00	7.66	Dissolved oxygen (DO)	
MONA RES AB DAM 01	8/2/2000 0:00	6.96	Dissolved oxygen (DO)	
MONA RES AB DAM 01	8/2/2000 0:00	5.77	Dissolved oxygen (DO)	
MONA RES AB DAM 01	5/29/2002 0:00	7.95	Dissolved oxygen (DO)	
MONA RES AB DAM 01	5/29/2002 0:00	7.46	Dissolved oxygen (DO)	
MONA RES AB DAM 01	6/3/2004 0:00	13.87	Dissolved oxygen (DO)	
MONA RES AB DAM 01	8/3/2004 0:00	1.08	Dissolved oxygen (DO)	
MONA RES AB DAM 01	6/8/2006 0:00	6.01	Dissolved oxygen (DO)	
MONA RES AB DAM 01	6/8/2006 0:00	6.63	Dissolved oxygen (DO)	
MONA RES AB DAM 01	6/8/2006 0:00	10.26	Dissolved oxygen (DO)	
MONA RES AB DAM 01	6/8/2006 0:00	4.44	Dissolved oxygen (DO)	
MONA RES AB DAM 01	8/1/2006 0:00	5.83	Dissolved oxygen (DO)	
MONA RES AB DAM 01	8/1/2006 0:00	3.36	Dissolved oxygen (DO)	
MONA RES MIDLAKE SOUTH 02	6/26/1998 0:00	7.9	Dissolved oxygen (DO)	
MONA RES MIDLAKE SOUTH 02	6/26/1998 0:00	8.2	Dissolved oxygen (DO)	
MONA RES MIDLAKE SOUTH 02	8/25/1998 0:00	6.3	Dissolved oxygen (DO)	
MONA RES MIDLAKE SOUTH 02	8/25/1998 0:00	5.9	Dissolved oxygen (DO)	
MONA RES MIDLAKE SOUTH 02	6/1/2000 0:00	7.94	Dissolved oxygen (DO)	
MONA RES MIDLAKE SOUTH 02	6/1/2000 0:00	7.94	Dissolved oxygen (DO)	
MONA RES MIDLAKE SOUTH 02	8/2/2000 0:00	7.1	Dissolved oxygen (DO)	
MONA RES MIDLAKE SOUTH 02	8/2/2000 0:00	5.5	Dissolved oxygen (DO)	
MONA RES MIDLAKE SOUTH 02	5/29/2002 0:00	8.28	Dissolved oxygen (DO)	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	6.31	Dissolved oxygen (DO)	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	2.64	Dissolved oxygen (DO)	
MONA RES AB DAM 01	8/25/1998 0:00	20.6	Iron	
MONA RES AB DAM 01	8/2/2000 0:00	38.1	Iron	
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect	Lead	3.0
MONA RES AB DAM 01	8/2/2000 0:00	*Non-detect	Lead	
MONA RES AB DAM 01	6/26/1998 0:00	67	Magnesium	
MONA RES AB DAM 01	8/25/1998 0:00	67.1	Magnesium	
MONA RES AB DAM 01	8/25/1998 0:00	67.7	Magnesium	
MONA RES AB DAM 01	6/2/2000 0:00	68.5	Magnesium	
MONA RES AB DAM 01	8/2/2000 0:00	66.8	Magnesium	
MONA RES AB DAM 01	8/2/2000 0:00	66.6	Magnesium	
MONA RES AB DAM 01	5/29/2002 0:00	61.2	Magnesium	
MONA RES AB DAM 01	8/3/2004 0:00	35.7	Magnesium	

MONA RES AB DAM 01	6/8/2006 0:00	43.5	Magnesium	
MONA RES AB DAM 01	8/1/2006 0:00	42.1	Magnesium	
MONA RES AB DAM 01	8/1/2006 0:00	42.6	Magnesium	
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect	Manganese	5.0
MONA RES AB DAM 01	8/2/2000 0:00	*Non-detect	Manganese	
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect	Mercury	0.2
MONA RES AB DAM 01	8/2/2000 0:00	*Non-detect	Mercury	
MONA RES AB DAM 01	6/26/1998 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + N	0.02
MONA RES AB DAM 01	6/26/1998 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + N	0.02
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + N	0.1
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + N	0.1
MONA RES AB DAM 01	6/2/2000 0:00	0.1	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES AB DAM 01	6/2/2000 0:00	0.1	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES AB DAM 01	8/2/2000 0:00	0.1	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES AB DAM 01	8/2/2000 0:00	0.1	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES AB DAM 01	5/29/2002 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES AB DAM 01	6/3/2004 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES AB DAM 01	8/3/2004 0:00	0.12	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES AB DAM 01	6/8/2006 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES AB DAM 01	6/8/2006 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES AB DAM 01	8/1/2006 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES AB DAM 01	8/1/2006 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES MIDLAKE SOUTH 02	6/26/1998 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + N	0.02
MONA RES MIDLAKE SOUTH 02	6/26/1998 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + N	0.02
MONA RES MIDLAKE SOUTH 02	8/25/1998 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + N	0.1
MONA RES MIDLAKE SOUTH 02	8/25/1998 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + N	0.1
MONA RES MIDLAKE SOUTH 02	6/2/2000 0:00	0.1	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES MIDLAKE SOUTH 02	6/2/2000 0:00	0.1	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES MIDLAKE SOUTH 02	8/2/2000 0:00	0.1	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES MIDLAKE SOUTH 02	8/2/2000 0:00	0.1	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES MIDLAKE SOUTH 02	5/29/2002 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES MIDLAKE SOUTH 02	5/29/2002 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES MIDLAKE SOUTH 02	6/8/2006 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES MIDLAKE SOUTH 02	6/8/2006 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	*Non-detect	Nitrogen, Nitrite (NO2) + Nitrate (NO3	
MONA RES AB DAM 01	6/26/1998 0:00	8.4	pH	
MONA RES AB DAM 01	6/26/1998 0:00	8.42	pH	
MONA RES AB DAM 01	6/26/1998 0:00	8.4	pH	
MONA RES AB DAM 01	8/25/1998 0:00	8.5	pH	
MONA RES AB DAM 01	8/25/1998 0:00	8.51	pH	
MONA RES AB DAM 01	8/25/1998 0:00	8.5	pH	
MONA RES AB DAM 01	6/1/2000 0:00	8.37	pH	
MONA RES AB DAM 01	6/1/2000 0:00	8.35	pH	
MONA RES AB DAM 01	6/2/2000 0:00	8.42	pH	
MONA RES AB DAM 01	8/2/2000 0:00	8.31	pH	
MONA RES AB DAM 01	8/2/2000 0:00	8.19	pH	
MONA RES AB DAM 01	8/2/2000 0:00	8.59	pH	
MONA RES AB DAM 01	5/29/2002 0:00	8.32	pH	
MONA RES AB DAM 01	5/29/2002 0:00	8.29	pH	
MONA RES AB DAM 01	5/29/2002 0:00	8.3	pH	
MONA RES AB DAM 01	6/3/2004 0:00	8.89	pH	

MONA RES AB DAM 01	6/3/2004 0:00	8.32	pH	
MONA RES AB DAM 01	8/3/2004 0:00	9.75	pH	
MONA RES AB DAM 01	8/3/2004 0:00	7.83	pH	
MONA RES AB DAM 01	6/8/2006 0:00	7.99	pH	
MONA RES AB DAM 01	6/8/2006 0:00	8.71	pH	
MONA RES AB DAM 01	6/8/2006 0:00	8.75	pH	
MONA RES AB DAM 01	6/8/2006 0:00	8.35	pH	
MONA RES AB DAM 01	6/8/2006 0:00	8.51	pH	
MONA RES AB DAM 01	8/1/2006 0:00	8.42	pH	
MONA RES AB DAM 01	8/1/2006 0:00	8.42	pH	
MONA RES AB DAM 01	8/1/2006 0:00	6.38	pH	
MONA RES MIDLAKE SOUTH 02	6/26/1998 0:00	8.4	pH	
MONA RES MIDLAKE SOUTH 02	6/26/1998 0:00	8.4	pH	
MONA RES MIDLAKE SOUTH 02	8/25/1998 0:00	8.6	pH	
MONA RES MIDLAKE SOUTH 02	8/25/1998 0:00	8.6	pH	
MONA RES MIDLAKE SOUTH 02	6/1/2000 0:00	8.39	pH	
MONA RES MIDLAKE SOUTH 02	6/1/2000 0:00	8.41	pH	
MONA RES MIDLAKE SOUTH 02	8/2/2000 0:00	8.28	pH	
MONA RES MIDLAKE SOUTH 02	8/2/2000 0:00	8.15	pH	
MONA RES MIDLAKE SOUTH 02	5/29/2002 0:00	8.32	pH	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	9.61	pH	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	9.39	pH	
MONA RES AB DAM 01	6/26/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES AB DAM 01	6/26/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES AB DAM 01	6/26/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES AB DAM 01	6/26/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES AB DAM 01	8/25/1998 0:00	0.031	Phosphorus as P	
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES AB DAM 01	8/25/1998 0:00	0.049	Phosphorus as P	
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES AB DAM 01	6/2/2000 0:00	0.111	Phosphorus as P	
MONA RES AB DAM 01	6/2/2000 0:00	0.024	Phosphorus as P	
MONA RES AB DAM 01	6/2/2000 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	6/2/2000 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	8/2/2000 0:00	0.04	Phosphorus as P	
MONA RES AB DAM 01	8/2/2000 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	8/2/2000 0:00	0.022	Phosphorus as P	
MONA RES AB DAM 01	8/2/2000 0:00	0.028	Phosphorus as P	
MONA RES AB DAM 01	5/29/2002 0:00	0.021	Phosphorus as P	
MONA RES AB DAM 01	5/29/2002 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	6/3/2004 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	6/3/2004 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	8/3/2004 0:00	0.021	Phosphorus as P	
MONA RES AB DAM 01	8/3/2004 0:00	0.027	Phosphorus as P	
MONA RES AB DAM 01	6/8/2006 0:00	0.021	Phosphorus as P	
MONA RES AB DAM 01	6/8/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	6/8/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	6/8/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	8/1/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	8/1/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	8/1/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	8/1/2006 0:00	0.034	Phosphorus as P	

MONA RES MIDLAKE SOUTH 02	6/26/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES MIDLAKE SOUTH 02	6/26/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES MIDLAKE SOUTH 02	6/26/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES MIDLAKE SOUTH 02	6/26/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES MIDLAKE SOUTH 02	8/25/1998 0:00	0.023	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	8/25/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES MIDLAKE SOUTH 02	8/25/1998 0:00	*Non-detect	Phosphorus as P	0.02
MONA RES MIDLAKE SOUTH 02	8/25/1998 0:00	0.088	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	6/2/2000 0:00	*Non-detect	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	6/2/2000 0:00	0.039	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	6/2/2000 0:00	*Non-detect	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	6/2/2000 0:00	*Non-detect	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	8/2/2000 0:00	0.039	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	8/2/2000 0:00	0.022	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	8/2/2000 0:00	*Non-detect	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	8/2/2000 0:00	0.035	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	5/29/2002 0:00	0.033	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	5/29/2002 0:00	0.049	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	5/29/2002 0:00	*Non-detect	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	5/29/2002 0:00	*Non-detect	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	6/8/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	6/8/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	6/8/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	6/8/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	0.034	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	0.052	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	*Non-detect	Phosphorus as P	
MONA RES AB DAM 01	5/29/2002 0:00	0.8	Salinity	
MONA RES AB DAM 01	5/29/2002 0:00	0.8	Salinity	
MONA RES AB DAM 01	6/3/2004 0:00	0.8	Salinity	
MONA RES AB DAM 01	8/3/2004 0:00	0.48	Salinity	
MONA RES AB DAM 01	6/8/2006 0:00	0.64	Salinity	
MONA RES AB DAM 01	6/8/2006 0:00	0.59	Salinity	
MONA RES AB DAM 01	6/8/2006 0:00	0.6	Salinity	
MONA RES AB DAM 01	6/8/2006 0:00	0.64	Salinity	
MONA RES AB DAM 01	8/1/2006 0:00	0.61	Salinity	
MONA RES AB DAM 01	8/1/2006 0:00	0.61	Salinity	
MONA RES MIDLAKE SOUTH 02	5/29/2002 0:00	0.8	Salinity	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	0.45	Salinity	
MONA RES MIDLAKE SOUTH 02	8/1/2006 0:00	0.45	Salinity	
MONA RES AB DAM 01	8/25/1998 0:00	1.8	Selenium	
MONA RES AB DAM 01	8/2/2000 0:00	1.8	Selenium	
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect	Silver	2.0
MONA RES AB DAM 01	8/2/2000 0:00	*Non-detect	Silver	
MONA RES AB DAM 01	6/26/1998 0:00	229.0	Sodium	
MONA RES AB DAM 01	8/25/1998 0:00	226.0	Sodium	
MONA RES AB DAM 01	6/2/2000 0:00	221.	Sodium	
MONA RES AB DAM 01	8/2/2000 0:00	224.	Sodium	
MONA RES AB DAM 01	5/29/2002 0:00	171	Sodium	
MONA RES AB DAM 01	8/3/2004 0:00	123	Sodium	
MONA RES AB DAM 01	6/8/2006 0:00	129	Sodium	

MONA RES AB DAM 01	8/1/2006 0:00	126		Sodium	
MONA RES AB DAM 01	8/1/2006 0:00	131		Sodium	
MONA RES AB DAM 01	6/26/1998 0:00		1098	Solids, Dissolved	
MONA RES AB DAM 01	8/25/1998 0:00		1092	Solids, Dissolved	
MONA RES AB DAM 01	6/2/2000 0:00		1052	Solids, Dissolved	
MONA RES AB DAM 01	8/2/2000 0:00		920	Solids, Dissolved	
MONA RES AB DAM 01	5/29/2002 0:00		946	Solids, Dissolved	
MONA RES AB DAM 01	6/3/2004 0:00		838	Solids, Dissolved	
MONA RES AB DAM 01	8/3/2004 0:00		502	Solids, Dissolved	
MONA RES AB DAM 01	6/8/2006 0:00		652	Solids, Dissolved	
MONA RES AB DAM 01	8/1/2006 0:00		648	Solids, Dissolved	
MONA RES AB DAM 01	8/25/1998 0:00	*Non-detect		Zinc	30.0
MONA RES AB DAM 01	8/2/2000 0:00	*Non-detect		Zinc	

B

MONA CONSUMER CONFIDENCE REPORT

Annual Drinking Water Quality Report
Mona Town - 2009

We're pleased to present to you this year's Annual Drinking Water Quality Report. This report is designed to inform you about the quality of the water and services we deliver to you every day. Our constant goal is to provide you with a safe and dependable supply of drinking water. We want you to understand the efforts we make to continually improve the water treatment process and protect our water resources. We are committed to ensuring the quality of your water. Our water sources are Mona well and Upper Clover Creek spring.

Source Protection:
The Drinking Water Source Protection Plan for Mona Town is available for your review. It contains information about source protection zones, potential contamination sources and management strategies to protect our drinking water. Our sources have been determined to have a low level of susceptibility from potential contamination. We have also developed management strategies to further protect our sources from contamination. Please contact us if you have questions or concerns about our source protection plan.

Cross Connection Education:
There are many connections to our water distribution system. When connections are properly installed and maintained, the concerns are very minimal. However, unapproved and improper piping changes or connections can adversely affect not only the availability, but also the quality of the water. A cross connection may let polluted water or even chemicals mingle into the water supply system when not properly protected. This not only compromises the water quality but can also affect your health. So, what can you do? Do not make or allow improper connections at your homes. Even that unprotected garden hose lying in the puddle next to the driveway is a cross connection. The unprotected lawn sprinkler system after you have fertilized or sprayed is also a cross connection. When the cross connection is allowed to exist at your home, it will affect you and your family first. If you'd like to learn more about helping to protect the quality of our water, call us for further information about ways you can help.

We are pleased to report that our drinking water meets federal and state requirements. This report shows our water quality and what it means to you our customer.

If you have any questions about this report or concerning your water utility, please contact Allan Pay at (435) 660-1098, or his mailing address at PO Box 69, Mona UT. 84645.
We want our valued customers to be informed about their water utility. If you want to learn more, please attend any of our regularly scheduled meetings. They are held on the second and fourth Tuesdays of each month at 7:30 pm in the City Office at 50 W. Center St.

Mona Town routinely monitors for constituents in our drinking water in accordance with the Federal and Utah State laws. The following table shows the results of our monitoring for the period of January 1st to December 31st, 2009. All drinking water, including bottled drinking water, may be reasonably expected to contain at least small amounts of some constituents. It's important to remember that the presence of these constituents does not necessarily pose a health risk.

In the following table you will find many terms and abbreviations you might not be familiar with. To help you better understand these terms we've provided the following definitions:
Non-Detects (ND) - laboratory analysis indicates that the constituent is not present.
ND/Low - High - For water systems that have multiple sources of water, the Utah Division of Drinking Water has given water systems the option of listing the test results of the constituents in one table, instead of multiple tables. To accomplish this, the lowest and highest values detected in the multiple sources are recorded in the same space in the report table.

Parts per million (ppm) or Milligrams per liter (mg/l) - one part per million corresponds to one minute in two years or a single penny in $10,000.
Parts per billion (ppb) or Micrograms per liter (ug/l) - one part per billion corresponds to one minute in 2,000 years, or a single penny in $10,000,000.
Parts per trillion (ppt) or Nanograms per liter (nanograms/l) - one part per trillion corresponds to one minute in 2,000,000 years, or a single penny in $10,000,000,000.
Picocuries per liter (pCi/L) - picocuries per liter is a measure of the radioactivity in water.
Action Level (AL) - the concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
Maximum Contaminant Level (MCL) - The "Maximum Allowed" (MCL) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
Maximum Contaminant Level Goal (MCLG) - The "Goal"(MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
Date- Because of required sampling time frames i.e. yearly, 3 years, 4 years and 6 years, sampling dates may seem out-dated.

TEST RESULTS

Contaminant	Violation Y/N	Level Detected ND/Low-High	Unit Measurement	MCLG	MCL	Date Sampled	Likely Source of Contamination
Microbiological Contaminants							
Total Coliform Bacteria	N	ND	N/A	0	Presence of coliform bacteria in 5% of monthly samples	2009	Naturally present in the environment
Fecal coliform and *E.coli*	N	ND	N/A	0	If a routine sample and repeat sample are total coliform positive, and one is also fecal coliform or *E. coli* positive	2009	Human and animal fecal waste
Turbidity for Ground Water	N	ND – 1	NTU	N/A	5	2004	Soil runoff
Radioactive Contaminants							
Alpha emitters	N	3	pCi/1	0	15	2005	Erosion of natural deposits
Inorganic Contaminants							
Barium	N	50 – 60	ppb	2000	2000	2004	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Copper a. 90% results b. # of sites that exceed the AL	N	a. 49 – 100 b.0	Ppt	1300000	AL=1300000	2007	Corrosion of household plumbing systems; erosion of natural deposits
Fluoride	N	400 – 500	ppb	4000	4000	2004	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories
Lead a. 90% results b. # of sites that exceed the AL	N	a. 4 – 13 b.0	Ppt	0	AL=15000	2007	Corrosion of household plumbing systems, erosion of natural deposits
Nitrate (as Nitrogen)	N	400	ppb	10000	10000	2009	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits

Selenium	N	2 – 4	ppb	50	50	2004	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines
Sodium	N	2 – 5	ppm	20	20	2004	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills.
Sulfate	N	21 – 29	ppm	1000*	1000*	2004	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills, runoff from cropland
TDS (Total Dissolved solids)	N	180 – 224	ppm	2000**	2000**	2004	Erosion of natural deposits

Radioactive Contaminants:
Alpha emitters. Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of getting cancer.
Inorganic Contaminants:
Barium. Some people who drink water containing barium in excess of the MCL over many years could experience an increase in their blood pressure.
Copper. Copper is an essential nutrient, but some people who drink water containing copper in excess of the action level over a relatively short amount of time could experience gastrointestinal distress. Some people who drink water containing copper in excess of the action level over many years could suffer liver or kidney damage. People with Wilson's disease should consult their personal doctor.
Fluoride. Some people who drink water containing fluoride in excess of the MCL over many years could get bone disease, including pain and tenderness of the bones. Children may get mottled teeth.
Lead. Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.
Nitrate. Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.
Selenium. Selenium is an essential nutrient. However, some people who drink water containing selenium in excess of the MCL over many years could experience hair or fingernail losses, numbness in fingers or toes, or problems with their circulation.
Sodium. Sodium is an essential nutrient. However, some people who drink water containing sodium in excess of the MCL may experience health promlems.
Sulfate. High levels of sulfates in the drinking water may cause some people to have stomach problems.
TDS (Total Dissolved Solids). TDS is an aesthetic water quality problem, however high levels may cause some people to experience health problems.

Nitrates: As a precaution we always notify physicians and health care providers in this area if there is ever a higher than normal level of nitrates in the water supply.

Lead: Lead in drinking water is rarely the sole cause of lead poisoning, but it can add to a person's total lead exposure. All potential sources of lead in the household should be identified and removed, replaced or reduced.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Mona City is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

As you can see by the table, our system had no violations. We're proud that your drinking water meets or exceeds all Federal and State requirements. We have learned through our monitoring and testing that some constituents have been detected. The EPA has determined that your water IS SAFE at these levels.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

We at Mona Town work around the clock to provide top quality water to every tap. We ask that all our customers help us protect our water sources, which are the heart of our community, our way of life and our children's future.

E-1
Screening of Alternatives

CHAPTER 5
INITIAL SCREENING OF WASTE WATER TREATMENT PLANT ALTERNATIVES

5.2.4 Wastewater Treatment Plant Design – Solids Stream

For the most part, the methods and systems reported in Table 5-1 are used to treat the liquid portion of the wastewater. Of equal, if not more importance in the overall design of treatment facilities, are the corresponding unit operations and processes or systems used to process the sludge removed from the liquid portion of the wastewater. The principal methods now in use are reported below.

5.3 DEVELOPMENT OF TREATMENT ALTERNATIVES

5.3.1 "No Action Alternative"

Residents will continue to maintain existing individual septic tanks and cess pools, and City ordinances will continue to require new developments to install septic tanks with a back-up leach field. The City may continue to grow at its relatively fast pace until groundwater contamination becomes an enforcement issue.

This Alternative will not be pursued further considering the high growth rate of the area and the fact that Mona will be one of the largest cities along the Wasatch Front without a centralized sewer system. Individual systems must be properly maintained to remain in proper working condition or they may produce sewage backups, slow flushing toilets and sinks, unpleasant odors, and off-color grass above the absorption field. It is assumed that groundwater aquifer quality has not been greatly affected by the amount of septic discharge yet, but it is only a matter of time before this is the case.

5.3.2 Construct New Facilities

Several traditional alternatives with low capital cost and minimal operation requirements have long been considered for smaller communities; the evidence abounding in observation of existing systems constructed in the 1970's and 1980's throughout much of the American West. The traditional choices of individual on-site systems and facultative lagoons were conducive for low density housing and low land prices. Those conditions are no longer the norm throughout the Intermountain States and the Wasatch Front as land speculators and baby boomers have combined resources and interests to claim second, vacation, and retirement homes in rural picturesque mountain and desert hamlets.

5.4.2.1 Facultative Lagoons

The Facultative Lagoon or stabilization ponds are designed around aerobic and facultative organisms receiving oxygen from atmospheric and algal respiration in the upper water layers, anoxic zone in the intermediate layers also called facultative zone, and sludge deposits which support anaerobic organisms in the bottom layers. This type of lagoon does not require any aerators, heaters, or mixers it realize on photosynthesis of the algae to utilize CO_2 form the water and produce O_2 on the upper levels and anaerobic fermentation on the lower water layers. On warm sunny days oxygen levels in the lagoon may reach saturation in the surface levels of water, however, oxygen concentration decreases through the night.

Reduced oxygenation and fermentation reaction rates are expected during winter months as the water temperature cools, thus deceasing the effluent quality. In fall and spring when water the density is unstable, inversion of the lagoon will most likely occur producing high levels of turbidity and objective odors.

In many northern regions discharge from the lagoons is prohibited during cold months, when iced over, or during summer months when algae levels are high. Facultative lagoons require sufficient volume to contain storage during non-discharge periods, adequate detention time as determined by DEQ (180 days), and satisfactory loading rates in BOD per volume.

Facultative lagoons are typically divided into series of three cells and sometimes have parallel cells to achieve the designed parameters. Geo-textiles or lining systems are used to prevent seepage of water into the groundwater; seepage rates are checked upon installation for possible leaks. Inlet and outlet structures are configured to create the desired flow patterns through the process and prevent shortcutting flow.

Construction of facultative lagoons was not considered further primarily because of space requirements and inability to meet surface water discharge limits. Estimated space requirements for this facility are estimated to exceed 50 acres for 500,000 gpd. A facultative lagoon does not provide process flexibility with respect in incremental expansion; acquisition of additional land, particularly in areas of increasing property value, generally proves difficult.

In addition, public perception of treatment ponds of this size would be seen as undesirable; as the ponds may produce considerable odor each spring and fall when the waters invert.

Figure 5-2: Facultative Lagoons, Franklin, ID

5.4.2.2 Aerated Lagoons

The Aerated Lagoons are designed around either mechanical mixers or diffused aeration to supply oxygen for treatment. Aerated water where organic levels are high results in a mixer liquor suspended solids (MLSS), in a lagoon process the MLSS is low compared to activated sludge treatment types but acts in the same manner, and that is to break down of waste organics for BOD removal.

Figure 5-3: Aerator in Lagoon

Cokeville, WY

An aerated lagoon can significantly reduce BOD levels and during summer months nitrification will occur. However, in cooler conditions biological activity slows thus increasing sludge accumulation rates.

Of the lagoon cells, aerators or diffusers are typically installed in the first cell and proceeding cells or secondary cells, while subsequent cells are not aerated and are designed for increased detention time which reduces suspended solids. Aerators are mounted on floating pontoons or anchored in some fashion. Diffusers are anchored to the bottom of the lagoon cell and air is pumped through. Aerated lagoon depths range from 8 ft to 15 ft.

Aerated lagoons are typically divided into series of 3 cells and sometimes have parallel cells to achieve the designed parameters. Geo-textiles or lining systems are used to prevent adverse groundwater impacts; seepage rates are checked upon installation for possible leaks. Inlet and outlet structures are configured to create the desired flow patterns through the process and prevent shortcutting flow.

The aerated lagoon alternative was eliminated for similar reasons as facultative lagoons; because of space requirements, process flexibility, and public perception issues (odor and aesthetics). Estimated space requirements for this facility are estimated to exceed 15 acres for 500,000 gpd. Public perception of treatment ponds of this size would be seen as undesirable in a growing community with increasing property values. There may also be a potential for strong odors. The cost of an aerated lagoon is similar to mechanical treatment facilities; however, without a significant cost advantage to overcome the negative aspects of space requirements, process flexibility, and public perceptions over the mechanical treatment system, the aerated lagoon was eliminated.

5.4.2.3 Mechanical Treatment

Conventional treatment, often termed mechanical treatment, has been proven to produce high effluent qualities and is feasible to communities the size of Mona and larger. The processes have been used for years in water pollution control and are fully proven and reliable. The typical mechanical plant includes an aeration basin where environmental conditions are controlled to produce an active population of bacteria. The bacteria feed upon the pollutants in the sewage and the oxygen necessary to sustain microbial life is provided by introducing air into the basin through some mechanical means. To maintain a heavy inventory of bacteria, effluent from the aeration basin is conveyed to a clarifier and bacterial floc, which settles in the clarifier, is returned to the aeration basin as a return activated sludge. Filtration of final effluent may be necessary to ensure that plant effluent complies with discharge requirements at all times.

Today, mechanical plants that treat the type of wastewater produced by small communities are typically categorized according to the predominant type of bacterial growth and the reactor type.

The bacterial growth may be suspended growth, attached growth, or a combination of the two. The common reactor types include a batch reactor, a plug flow reactor, a complete mixed reactor, a packed bed reactor, and a fluidized bed reactor.

Conventional

The dispersed-growth reactor is an aeration tank or basin containing a suspension of the wastewater and microorganisms, the mixed liquor. The contents of the tank are mixed vigorously by aeration. Following the aeration step, the microorganisms are separated from the liquid by sedimentation. A portion of the biological sludge is recycled to the aeration basin and the remainder is removed and sent for processing.

Extended Aeration

Extended Aeration is a variation of the conventional suspended growth system where the process is operated at a long hydraulic detention time and high sludge age. The process application is usually limited to small systems where stability and simplicity of operation are higher priorities than efficiency.

Oxidation Ditch

Sewage is treated in large round or oval ditches with one or more horizontal aerators typically called brush or disc aerators which drive the mixed liquor around the ditch and provide aeration. These systems are relatively easy to maintain and are resilient to shock loads that often occur in smaller communities during peak flows.

Sequencing Batch Reactor (SBR)

SBR's rely on a fill-and-draw operation of at least two reactors. The SBR employs filling, aerating, settling and decant steps sequentially in each tank. Dual reactor systems employ alternating operation of each tank to allow time for filling of the first tank while the second tank is aerated, settled and decanted.

Membrane Bioreactor (MBR)

A variation of the activated sludge process wherein the clarification and filtration unit processes that traditionally occur in separate basins are replaced with a polypropylene or polyethylene membrane installed within the activated sludge. Effluent is drawn through the membrane by creating a hydraulic gradient across the membrane, either through mechanical means by using a pump to create a vacuum on the downstream side of the membrane or through physical means by creating a hydraulic head condition on the upstream side of the membrane.

Trickling Filter

A trickling filter consists of a basin or tower filled with support media such as stones, plastic shapes, or wooden slats. Wastewater is applied over the media where it is metabolized by microorganisms, which have become attached to the media forming a biological layer. Oxygen is normally supplied by the natural flow of air through the media. Periodically, portions of the biological layer slough off the media and are separated from the liquid in a clarifier.

RBC

Rotating biological contactors are fixed-film reactors similar to trickling filters in that organisms are attached to support media. However, for an RBC, the support media are slowly rotating discs that are partially submerged in flowing wastewater in the reactor. Oxygen is supplied from the air when the film is out of the water and from the liquid when submerged. Sloughed pieces of biofilm are removed in the same manner as for the trickling filters.

IFAS

Integrated Fixed-Film/Activated Sludge Systems add the benefits of placing attached growth systems into the suspended growth process. Suspended growth systems have process flexibility and provide a high degree of treatment. Attached growth processes are intrinsically stable and resistant to organic and hydraulic shock loadings. The IFAS combines the advantages of both of these systems.

MBBR

The moving bed bio-reactor is an advanced biological process where media with a large surface area compared to its overall size is placed in the biological reactor. The media is housed in a cylindrical drum that rotates causing the media to tumble and migrate – at various times either providing a trickling effect or gathering and releasing oxygen. The movement of the media eliminates dead zones, loss of surface area, and generation of unpleasant odors.

5.4.3 Regionalization

The closest existing wastewater treatment facility is located about 10 miles south of Mona in Nephi, Utah. An option that was considered was pumping the City's wastewater to Nephi, but this is not a desirable solution because of the significant cost to install a pipeline with associated pumping equipment.

CHAPTER 6
FINAL SCREENING OF WASTE WATER TREATMENT PLANT ALTERNATIVES

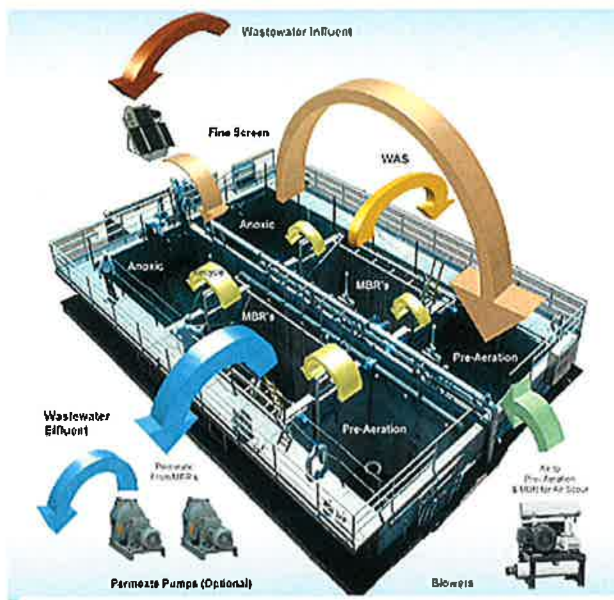
6.1 EVALUATION OF TREATMENT ALTERNATIVES

This evaluation describes treatment alternatives that can resolve the needs previously identified and meet initial screening criteria of alternatives in chapter 5. Each alternative is discussed according to the following features operation, principles, specific design parameters, historical performance, and advantages and disadvantages.

6.2 MEMBRANE BIOREACTOR (MBR)

6.2.1 MBR Process Description

The MBR is a variation of the activated sludge process wherein the clarification and filtration unit processes that traditionally occur in separate basins are replaced with a polypropylene or polyethylene membrane installed within the activated sludge. Effluent is drawn through the membrane by creating a hydraulic gradient across the membrane, either through mechanical means by using a pump to create a vacuum on the downstream side of the membrane or through physical means by creating a hydraulic head condition on the upstream side of the membrane. The resulting flow through the membrane is known as the flux rate. The flux rate is the principal factor in determining the quantity, or surface area, of membrane material required to meet the design flow conditions.

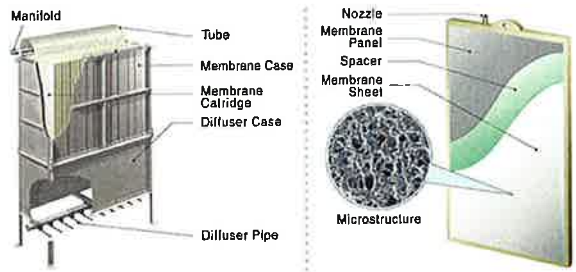


The membrane pore size is carefully controlled during the manufacturing process to limit the diameter of the opening, thereby providing a physical barrier to the conveyance of solids in the effluent. The solids left behind increase the mixed liquor suspended solids (MLSS) concentration, a parameter used to describe the quantity of microorganisms in the treatment basin. In comparison to other activated sludge treatment processes, the MLSS in an MBR is maintained at a much higher concentration, typically on the order of 2 to 5 times that of an oxidation ditch.

The high MLSS concentrations are achieved with high Return Activated Sludge (RAS) rates. The RAS flow recycles mixed liquor from the terminal end of the reactor basin to the front of the reactor basin. The RAS flow is typically 4 times the influent flow rate and may be achieved by pumping or by gravity flow depending upon the design specific to the treatment plant.

Membranes used in MBR facilities are manufactured in two configurations, 1.) a hollow fiber that resembles floating line used for fly fishing and 2.) flat plates where the membrane is supported on the exterior of a plastic framework. The hollow fiber was introduced into the U.S. market first with installations approaching the ten year mark. The flat plate followed the hollow fiber by approximately five years. Both configurations have been used for longer periods of time in other countries.

The hollow fiber configuration typically uses a pump to draw water from the outside of the fiber into the hollow center. Generally, multiple fibers are arranged in a bundle and potted in an epoxy on one or both ends. A watertight fitting envelopes the potted ends and connects to a header pipe for conveyance of the extracted water to a collection point.



The flat plat configuration has a similar functional design and operates similar to the hollow fiber. A primary difference is the material used for the membrane. It is possible to use a static hydraulic head to drive water through the flat plate membrane. At least one flat plate manufacturer relies on the formation of a biofilm on the surface of the membrane to provide a consistent filtered product.

Periodically, water, and sometimes a mild disinfectant, is backpulsed through the fibers to open the pores and to maintain the flux rate through the membrane. Less frequently, the pumps return a disinfectant solution to accomplish a lengthier clean-in-place. If operating conditions are heavier than normal, some systems may require removal of the membrane cassettes for submerging in an acid solution for cleaning.

Both configurations employ membranes arranged in a cartridge configuration, reactor tanks constructed of concrete or steel, an aeration system complete with blowers and diffusers, a means of mixing the biomass, a recycle system for the RAS, effluent pumps to remove the water and discharge to the disinfection process, and process controls including valves, meters, and instruments.

Membrane bioreactors require more effort in the preliminary treatment processes typically accomplished through installation of finer mesh screens (1 mm to 3 mm openings) and grit removal. Fine screening for a membrane bioreactor system is an essential pretreatment step to prevent unwanted solids in the waste stream from entering the membrane tank. This prudent design measure minimizes solids accumulation and protects the membranes from damaging debris and particles, resulting in extended membrane life, reduced operating costs, higher quality sludge and trouble-free operation. Screen configurations acceptable to most manufacturers of MBR equipment are the band screen and rotary drum screen, both of which use a perforated plate for the screening surface.

6.2.2 MBR Design Parameters

The following design parameters are common benchmarks used for designing wastewater treatment facilities and affect design performance and project costs.

Table 6-1: Design Parameters for Membrane Bioreactor

MLSS Concentration (mg/l)	Solids Retention Time (days)	Hydraulic Detention Time Vol/Q (hours)	RAS Rate Qr/Q	Food to Mass F/M Lb BOD_5 applied/ Lb MLVSS-day
6,000 – 14,000	30-60	4-8	3-4	2,000

Where:

- MLSS is a measure of the suspended solids contained in one liter of the mixed liquor that are combustible at 550°C.
- Solids Retention Time (sludge age) is a measure of the length of time a particle of suspended solids has been undergoing aeration, expressed in day. It is usually computed by dividing the weight of the suspended solids in the aeration tank by the weight of excess activated sludge discharged from the system per day.
- Hydraulic Detention Time, also termed the mean cell residence time, is a measure of the average length of time the raw wastewater is held in the reactor basin and is calculated by dividing the reactor volume by the influent flow rate.
- RAS Rate is a measure of the activated return sludge normally returned continuously to the aeration tank. Recycling of activated sludge back to the aeration tank provides bacteria for incoming wastewater. It should be brown in color with no obnoxious odor and is often also returned in small portions to the primary settling tanks to aid sedimentation. Settled activated sludge is generally thinner than raw sludge. Some activated sludge is wasted to prevent excessive solids build up.
- Food to Mass (microorganism) Ratio is a measure defined by dividing the BOD_5 concentration contained in the influent by the mixed liquor volatile suspended solids concentration in the reactor tank.

6.2.3 MBR Performance

The following table lists the performance achievable under normal operating circumstances.

Table 6-2: Performance Parameters for Membrane Bioreactor

Parameter	Units	Influent Strength	Effluent Performance
BOD_5	mg/l	220	<5
COD	mg/l	500	0
TSS	mg/l	220	<1
Total Nitrogen	mg/l	40	10
Total Phosphorous	mg/l	10	.5
Turbidity	NTU		<0.2
E Coli	#/100 ml	10^7	2.2

6.2.4 MBR Manufacturers

There are three systems with multiple installations manufactured by global companies with considerable industry experience. There are also several other systems newer to the U.S. market but with several installations in Europe and the Far East. The following table is a partial list of known manufacturers along with the parent company, the membrane configuration, and the number of U.S. installations.

Table 6-3: Manufacturer Information for Membrane Bioreactor Equipment

Parent Company	Trade Name	Model No.	Configuration	U.S. Installations
G.E. Water	Zenon	Z-MOD S UG Z-MOD S AG Z-MOD M & L ZeeWeed™	Hollow Fiber	250/80
Siemens	U.S. Filter Memcor	Xpress™ MemJet™	Hollow Fiber	50/8
Kubota	Enviroquip	MPAC S™ MPAC B™ MPAC C™ SymBio® UNR™	Flat Plate	600/25
Toray	Kruger	NEOSEP	Flat Plate	75/1
Koch	Puron	PURON®	Hollow Fiber	50/3
Norit X-Flow	---	AquaFlex Xiga	60	45/4

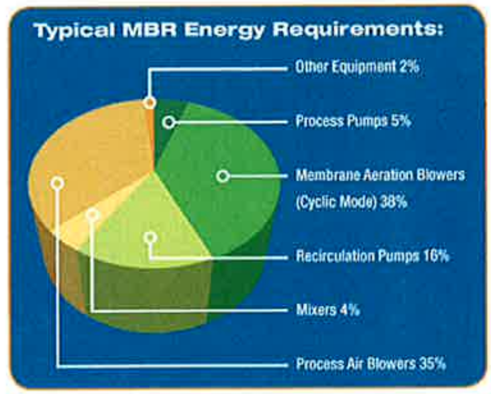
6.2.5 MBR Process Advantages

The advantages offered by the MBR include:

WWTP in The Hamptons, Georgia

- Highest quality effluent of any activated sludge process without additional processes.
- High ability to handle variations in wastewater strength due to high MLSS concentration.
- Smallest footprint. Reactor basins are smaller due to high MLSS concentration and reduced hydraulic retention time.
- Most flexibility for incremental expansion. MBR systems can operate as at flows as low as 10% of the design capacity. This feature allows deferred cost by constructing basin capacity initially and purchasing the expensive membrane equipment incrementally as growth demands.

- Increased aesthetics. The smaller footprint often results in a configuration where the treatment plant is completely housed in a building designed to architecturally match surrounding structures. In addition, setbacks are often reduced as a result of the treatment plant housing.
- MBR systems tend to produce less sludge with a higher solids concentration from the reactor basin.
- Reduce biological operation requirements due to the physical barrier and the degree of automation inherent in the installation.
- Minimized problems with sludge settleability.



6.2.6 MBR Process Disadvantages

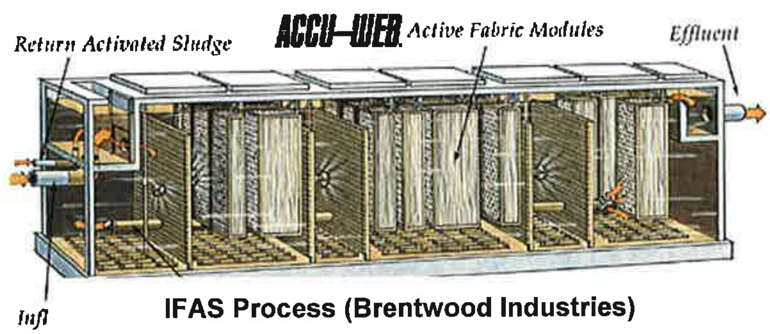
The disadvantages associated with the MBR process include:

- High capital cost for the membrane equipment.
- Requires finer mesh screens to protect the membranes from deleterious materials.
- Higher operation and maintenance cost due to power requirements.
- System must be sized hydraulically for peak hour flows. This may entail equalization basins.
- Operations staff must have a higher capability for instrumentation and controls.
- Shorter history of operating installations.

6.3 INTEGRATED FIXED FILM ACTIVATED SLUDGE (IFAS)

6.3.1 IFAS Process Description

The Integrated Fixed-Film Activated Sludge process, or IFAS as it is known in industry parlance, is actually a hybrid system intended to capture the benefits of both the suspended growth activated sludge process and the fixed-film process. Activated sludge is recognized for its flexibility in process control based on returning activated sludge (RAS) to the reactor basin giving the operator the ability to manage sludge age as well as sludge concentration. Fixed-film processes are known as inherently stable and resistant to organic and hydraulic shock loading.



IFAS Process (Brentwood Industries)

The activated sludge process is designed around beneficial bacteria suspended in the wastewater to create a homogenous mixture or biomass of organic material. The fixed-film systems rely on the adhesion of microorganisms responsible for the conversion of organic material contained in the wastewater to gases and cell tissue of new bacteria. There are many variations promoted by various scientists and marketed by equipment manufacturers of both the activated sludge process and the fixed-film systems.

IFAS Process (STM-Aerator)

IFAS processes have been utilized in the industry since the 1930's, although without the benefit of a return sludge and a short hydraulic retention time they were not highly successful. The practice was supplanted by activated sludge systems in the U.S. until the late 1980's when new interest was generated in the integration of fixed- film and activated sludge. The systems developed in the last decade have improved the treatment effectiveness over previous efforts in IFAS designs.

The enhanced treatment provided by an IFAS system is related to the amount of biomass growth on the surface of the media and the activity of the suspended biomass in the reactor. IFAS technology has been implemented in both municipal and industrial applications using various fixed film media incorporated into many suspended growth configurations. IFAS technology has been designed for new wastewater treatment works, in retrofitting existing plants to increase capacity, and in augmenting the treatment of existing facilities for nitrification/denitrification.

Considerable effort has been expended experimenting with different materials for the fixed film media. Currently, media can be categorized as fixed in place media which is attached in a fixed configuration in the activated sludge reactor basin and dispersed media which is allowed to move within the mixed liquor solution. Fixed in place media include synthetic fabrics, rope of natural materials, and PVC sheets. Each type of media inherently has advantages and disadvantages.

Table 6-4: IFAS Media Advantages & Disadvantages

FIXED-IN-PLACE TYPES		ADVANTAGES	DRAWBACKS
	Fabric Web-type (AccuWeb)	• Simple to install • Low initial cost • No maintenance • Rapid upgrade • No material losses	• May foul if rag removal is inadequate
	Rope-type	• Rapid upgrade • No material losses	• Material breakage and entanglement • Field assembly needed • May foul if rag removal is inadequate
	PVC Sheet Media (Trickling Filter Media)	• Rapid upgrade • No material losses	• Structured media may impede mixing • May foul if rag removal is inadequate • Potential plugging from excess biomass
DISPERSED TYPES		**ADVANTAGES**	**DRAWBACKS**
	Polypropylene Finned Cylinders	• Excellent mixing • May eliminate RAS	• Media losses (washout or abrasion) • Aeration devices and screens may foul • Difficult to maintain aeration system

All IFAS processes require a preliminary treatment design with fine screens to remove deleterious materials from the raw wastewater that will interfere or bind up the fixed film or result in excessive biomass build up on the fixed film. In addition, as the fixed film has the potential to interfere with the aerations system, a consistent mixing regime must be established to maintain the solids in suspension, to facilitate substrate transfer, and to ensure even oxygen transfer. Additional design considerations include sufficient oxygen capability for the additional biomass, providing a means to contain and filter dispersed media, providing the capability to remove fixed-in-place media for maintenance, and attention to the potential for solids accumulation in the media.

6.3.2 IFAS Design Parameters

The following design parameters are common benchmarks used for designing wastewater treatment facilities and affect design performance and project costs.

Table 6-5: Design Parameters for IFAS

MLSS Concentration (mg/l)	Solids Retention Time (days)	Hydraulic Detention Time Vol/Q (hours)	RAS Rate Qr/Q	Food to Mass F/M Lb BOD_5 applied/ Lb MLVSS-day
1,500 – 4,000	4-8	8-24	0.5-2.0	0.2-0.5

Where:

- MLSS is a measure of the suspended solids contained in one liter of the mixed liquor that are combustible at 550 degrees centigrade.
- Solids Retention Time (sludge age) is a measure of the length of time a particle of suspended solids has been undergoing aeration, expressed in day. It is usually computed by dividing the weight of the suspended solids in the aeration tank by the weight of excess activated sludge discharged from the system per day.

- Hydraulic Detention Time, also termed the mean cell residence time, is a measure of the average length of time the raw wastewater is held in the reactor basin and is calculated by dividing the reactor volume by the influent flow rate.
- RAS Rate is a measure of the activated return sludge normally returned continuously to the aeration tank. Recycling of activated sludge back to the aeration tank provides bacteria for incoming wastewater. It should be brown in color with no obnoxious odor and is often also returned in small portions to the primary settling tanks to aid sedimentation. Settled activated sludge is generally thinner than raw sludge. Some activated sludge is wasted to prevent excessive solids build up.
- Food to Mass (microorganism) Ratio is a measure defined by dividing the BOD_5 concentration contained in the influent by the mixed liquor volatile suspended solids concentration in the reactor tank.

6.3.3 IFAS Performance

The following table lists the performance achievable under normal operating circumstances.

Table 6-6: Performance Parameters for IFAS

Parameter	Units	Influent Strength	Effluent Performance
BOD_5	mg/l	220	<10
COD	mg/l	500	0
TSS	mg/l	220	<1
Total Nitrogen	mg/l	40	<5
Total Phosphorous	mg/l	10	2
Turbidity	NTU		
E Coli	#/100 ml	10^7	

6.3.4 IFAS Manufacturers

There are three systems with multiple installations manufactured by global companies with considerable industry experience. There are also several other systems newer to the U.S. market but with several installations in Europe and the Far East. The following table is a partial list of known manufacturers along with the parent company, the membrane configuration, and the number of U.S. installations.

Table 6-7: Manufacturer Information for IFAS

Parent Company	Trade Name	Model No.	Configuration	Installations World/U.S.
BrentWood	---	AccuWeb™	Fixed-in-place Fabric	15/9
WesTech	---	STM-Aerotor™	Fixed-in-place Polyethylene disc	32/21
AnoxKaldnes	---	HYBAS™	Dispersed Polyethylene discs	18/7
LGV	EimCo	ClearTec®	Fixed-in-place Textile	16/4
Siemens/U.S. Filter	Envirex	AGAR®	Dispersed Polyethylene discs	11/5
Hydroxyl	AquaPoint IDI	ActiveCell™	Dispersed Polyethylene discs	22/12
Apex Mills	EnTex	BioWeb™	Fixed-in-place Rope lattice	10/10
	EnTex	BioPortz™	Dispersed Polyethylene discs	0/0

6.3.5 IFAS Process Advantages

The advantages offered by the IFAS include:

- Resilience to organic and hydraulic shock loading due to inconsistent raw wastewater quality and quantity. This advantage is more pronounced in smaller systems.
- High ability to handle variations in wastewater strength due to combination of attached bacteria and suspended bacteria.
- Reduced footprint. Reactor basins may be smaller due to a higher MLSS concentration compared to conventional activated sludge and the additional treatment gained from the attached growth bacteria.
- Provides a convenient approach to increasing the capacity of an existing plant without increasing the physical size of the facility.

IFAS Process, STM-Aerotor (WesTech Engineering)

- Incremental expansion may be more convenient due to the ability to increase the amount of fixed film.
- IFAS systems tend to produce less sludge.
- Reduced loading on the clarifier due to a lower MLSS concentration. Less risk of upset conditions in the clarifier.
- Minimized problems with sludge settleability by reducing the food to microorganism (F/M) ratio.
- Because of reduced sludge volume index (SVI), which allows a more concentrated RAS and thus a potentially reduced return sludge flow rate (RAS) which reduces power costs and increases hydraulic retention time in the aeration basin.
- Improved nitrification due to the increased sludge age possible with the attached growth bacteria.

6.3.6 IFAS Process Disadvantages

The disadvantages associated with the IFAS process include:

- Dispersed media systems require additional infrastructure such as screens or weirs to confine the media to the reactor basin.
- System must be sized hydraulically for peak hour flows. This may entail equalization basins.
- Some types of fixed film experience degradation and require replacement at regular intervals.
- Shorter history of operating installations when compared to conventional activated sludge.
- Solids buildup may occur in the reactor basin as a result of the fixed film interfering with flow patterns or trapping sludge in the media matrix.

6.4 SELECTION OF TREATMENT ALTERNATIVES

This evaluation is discussed in two sections of economic and non-economic factors; each topic is assigned a specific weighted value (1 to 5) based on the Mona City Council's opinion of significances. Each treatment process type is assigned a selection value (-2 to 2) based on Forsgren's analysis of the alternative.

For the final screening the construction of a mechanical treatment plant systems two technologies were selected: an Integrated Fixed Film Activated Sludge (IFAS) system, and a membrane bioreactor (MBR) system. For this screening of alternatives, each topic is assigned a specific weighted value (1 to 5) based on the Engineer's opinion of significance. Items of minimal importance will be given a value of 1, with values increasing to 5 for items considered very important. Each treatment option is then assigned a selection value (-2 to +2) based on Forsgren's analysis of the alternative. The following table summarizes the screening values used in this analysis of alternatives.

Table 6-8: Values for Final Screening of Alternatives

Weight Value:	Selection Value Criteria:
1 - Minimal Importance	+2 Significant beneficial impact to owner compared to other alternatives.
2 - ↓	+1 Minimal beneficial impact to owner compared to other alternatives.
3 - Important	0 No impact to owner compared to other alternatives.
4 - ↓	-1 Minimal adverse impact to owner compared to other alternatives.
5 - Very Important	-2 Significant adverse impact to owner compared to other alternatives.

6.4.1 Economic Analysis

One of the most significant considerations of the selection and preliminary design of a new wastewater treatment facility is the question of cost -- not only initial construction costs, but also annual operation and maintenance costs. Opinions of probable costs for comparison of alternatives are derived from published or historical bid information, manufacturers' quotations, bid tabulation from similar projects recently constructed in the region, engineer's judgment, or limited quantity takeoffs. The accuracy of the opinions varies according to the level of detail; therefore, a confidence factor is applied to the opinions of probable cost. In addition, a project contingency during construction should be included to account for undefined items and for unforeseen conditions.

6.4.1.1 Wastewater Treatment Plant Capital Costs

Initial capital costs associated with implementing a new wastewater treatment facility will be projected and tabulated including: construction of the new facilities, engineering design, construction observation, inspection, and materials testing, legal, fiscal, land and right of ways, start-up and operations training, preparation of operation and maintenance manuals, mapping, administrative, and all other miscellaneous project costs necessary to have an operating treatment plant.

Construction cost of the new wastewater treatment facility will be the largest cost item associated with the project. When preparing opinions of probable construction cost, the same basis of establishing cost opinions will be used to evaluate all the principal alternatives and to project future costs. This criterion is considered to be very important and a weight value of 5 is assigned.

IFAS System

The IFAS system has the lowest capital cost of the two alternatives. A selection value of +1 has been assigned. The STM Aerator plant layout was assumed to be more of a campus style, with multiple buildings and tanks. Such a layout necessitated a larger footprint and resulted in a higher site civil yard piping costs. The layout includes only two CMU buildings with a standing seam metal roof system. Equipment housed in the headworks building includes an automatic bar screen with washer/compactor, grit chamber, and grit classifier. The aeration basins were sized by the manufacturer – and verified by the engineer – and concrete wall and slab thicknesses were assumed. The two 35-ft clarifiers were sized to 10-States Standards and concrete volumes were again based on assumed slab thicknesses. The RAS pumps, WAS pumps, belt-filter press, and in-channel hi/lo UV disinfection system were assumed to be in a single building to maximize common-wall construction.

Table 6-9: IFAS WWTP Preliminary Design and Construction Cost Estimate

Description	Value
Contractor Costs	
Site Civil	$335,000
Yard Piping	$270,000
Lift Station	$280,000
Headworks	$655,000
STM Aerotor Basins	$1,330,000
Clarifiers	$970,000
RAS / Solids Handling / UV Disinfection Building	$1,540,000
Plant Drain Pump Station	$60,000
Sub-Total Cost	**$5,380,000**
Non-Contractor Costs	
Land Purchase/Easements	$220,000
System Integration	$90,000
Materials Testing	$15,000
Misc Project Costs	$50,000
Construction Cost	**$5,755,000**
20% Construction Contingency	**$1,151,000**
Design (8% of Construction)	**$461,000**
Construction Management (10% of Construction)	**$576,000**
Total Project Cost	**$7,943,000**

MBR System

The MBR system has the highest capital cost. A selection value of -1 has been assigned. The MBR plant layout was assumed to be a single 60-ft by 80-ft CMU structure fed by an off-site sewer lift station. The building houses all of the equipment and tanks required for the MBR plant, which includes a two fine-screens with washer/compactor, anoxic basin with mixers and recycle pumps, pre-aeration basin with fine-bubble diffusers, MBR basin, permeate pumps, in-line hi/lo UV system, positive-displacement blowers, WAS pumps, polymer system, belt-filter press, bridge crane, chemical storage tanks, effluent water booster pumps, HVAC and electrical.

Electricity costs were included in the overall O&M costs for the mechanical systems assuming an average power rate of $0.08/kWh. The MBR system uses the most power and the IFAS system uses the least.

Table 6-13 – IFAS Power Demands

Equipment	HP per Unit	# Duty Units	Avg HP per Unit	Daily Running Hours	Annual Power Cost
Screen	3	1	2.4	6	$317
Grit Chamber	5	1	4.0	24	$2,116
Grit Classifier	2	1	1.6	4	$141
Anoxic Mixers	7.5	2	6	24	$6,347
STM Aerotor	7.5	4	6.0	24	$12,693
RAS Pumps	5	2	4.0	24	$4,231
Sludge System	10	1	8	4	$705
Clarifiers	0.5	2	0.4	24	$423
UV Disinfection	20	1	16	24	$8,462
				Total Annual Power Cost	**$35,435**

Table 6-14 – MBR Power Demands

Equipment	HP per Unit	# Duty Units	Avg HP per Unit	Daily Running Hours	Annual Power Cost
MBR Blowers	30	2	19.4	24	$20,521
Aeration Blowers	18	2	13.8	24	$14,597
Recycle Pumps	10	2	7.7	24	$8,140
Permeate Pumps	7.5	2	5.8	4	$1,023
Screen	3	1	2.4	6	$317
Anoxic Mixers	7.5	2	6	24	$6,347
Sludge System	10	1	8	4	$705
UV Disinfection	20	1	16	24	$8,462
				Total Annual Power Cost	**$60,112**

Chemicals

Chemicals have many uses on a wastewater treatment site as part of the process or for ancillary purposes. Chemicals may be used for odor control, disinfection, process stabilization, constituent removal, sludge stabilization, etc. Chemical usage can contribute a significant cost to the operation and maintenance of a treatment plant. Chemical use in IFAS system would be negligible. Chemical quantities and costs for the MBR were provided by the manufacturer. The MBR system will use two types of cleaning chemical as well as a polymer flux enhancer to improve performance. The two cleaning chemicals are sodium hypochlorite and oxalic acid, with an expected annual cost of $769 and $375, respectively. The flux enhancer has an estimated annual cost of $8,421 assuming a dosage of 11 gallons per day.

Equipment Replacement

Items such as pumps, blowers, instruments, membranes, motors, etc. have life expectancies that are shorter than the 20-year design time period. Therefore, O&M costs of replacement were calculated in the annual cost based on a given piece of equipment's expected life.

Labor

Although not a perfect inverse relationship, there is a trade-off between plant automation and ongoing labor requirements for most treatment processes. The higher degree of automation implemented, the less labor cost in future years, although the skill level of the labor must account for the increased automation.

Salvage Value

Salvage value, while useful in many managerial accounting decisions, is not often considered in the analysis of wastewater treatment alternatives due several factors including most municipal treatment plants are a permanent construction and it is impractical to remove and relocate the infrastructure and most municipalities maintain possession of the treatment facility throughout its useful life.

6.4.2 Non-Economic Factors

6.4.2.1 Process Stability

Process reliability refers to the ability of a process to produce an effluent of consistent quality. Reliability is a factor that is both inherent in the design and dependant upon the reliability of each piece of equipment selected by the manufacturer including valves, motors, instruments, pumps etc., all comprising the total treatment system. Reliability is salient to a treatment system because the treatment plant protects the environment. The treatment facility will accept the responsibility of meeting the discharge permit issued by the DEQ, a permit that has financial penalties associated with prolonged and egregious violations.

Both of the processes advanced into final screening can produce an effluent that meets the preliminary effluent limits under normal conditions, however, their ability to reliably meet the effluent limits with fluctuating conditions varies. The MBR process provides the most reliable system due to the membrane filtration which introduces a physical barrier that prevents particles exceeding a specific size from exiting the treatment process via the effluent stream. The IFAS process has a reasonably reliable record of treatment depending upon the redundancy built into the process trains.

Process reliability is considered to be important and a weight value of 4 is assigned. Both types of treatment plants have numerous installations across the country. Each has a proven track record of exceeding the preliminary permit loadings. A value of +1 was assigned to the IFAS system, since a design that has redundant trains can provide a stable effluent quality. The MBR system was given a +2 considering its design relies on physical barriers and thereby reduces the possibility of a process upset that would compromise effluent quality.

6.4.2.2 Space Requirements

Though land is available in and around Mona, price per acre rates still increase capital cost. Selection of the treatment technology will consider smaller land footprints to be advantageous since this will minimize capital costs, maximize the area that is available for residential or commercial development, minimize the buffer area needed for the treatment facility, and optimize property values.

The high dollar cost of adequate land for a treatment plant was used as a discriminating factor for the initial screening. The footprint of a plant also affects the capital cost; the more compact the footprint, the less money spent on concrete, steel, and site improvements.

Space requirements are also considered to be important and a weight value of 3 is assigned. The IFAS plant is more of a campus-style layout, albeit a small one, and was given a selection value of 0, whereas one of the most attractive features of an MBR plant is the ability to greatly reduce footprint, thus giving it a selection value of +1.

6.4.2.3 Process Flexibility

Process flexibility is defined as the ability of a process to adapt to variations in wastewater strength and wastewater quantity on a daily and seasonal basis. The treatment system selected will primarily treat residential wastewater and limited commercial and industrial connections are expected. Process flexibility is considered to be of an important nature and a weight value of 4 is assigned.

Both systems have process flexibility advantages and disadvantages. The MBR system has a unique advantage over the IFAS in that higher mixed liquor concentrations are able to absorb higher organic shock loads. However, the IFAS has the advantage in terms of hydraulic loading since it relies upon gravity flow-through and is not hampered by maximum flux rates that may be limited by extreme conditions such as fouling or low-temperature influent wastewater. As long as the MBR flux rate is designed conservatively, it has the overall flexibility advantage having a turn-down ratio approaching 10:1 and is assigned a selection value of +1 with the IFAS given a 0.

6.4.2.4 Process Complexity

Process complexity addresses the effort and skill level required of the operations staff to run the treatment system and the associated time requirements. Process complexity may be partially offset by increased plant automation, however, automation may also introduce a different type of complexity, which is certainly a different skill set is required of the operations staff. Process complexity is often a compromise with effluent quality; the relationship being that additional complexity provides greater process control and thus enhances the potential to produce a higher quality effluent.

The complexity of the treatment system used will result is the amount of training and experience the operator needs. Process complexity is considered to be important and a weight value of 4 has been assigned. The MBR treatment process is less susceptible to process upsets than is the IFAS system, and would therefore require less operator oversight. A selection value of +1 has been assigned to the MBR process and a value of 0 has been assigned for the IFAS system.

6.4.2.5 Effluent Disposal

An important part of the treatment process is the disposal of treated effluent, so it was given a weight value of 4. Liquid disposal is an important consideration since a UPDES will be required if the effluent is discharged to surface water in Currant Creek or Mona Reservoir. Another disposal option for effluent is to discharge it to the groundwater through injection wells. This option would require a groundwater discharge permit.

Preliminary meetings with DEQ staff have been helpful in bracketing potential discharge limits, which are as follows:

Table 6-15: Anticipated Effluent Discharge Limits

Discharge Type	BOD/TSS	Nitrates	Phosphorus	Filtration Required?
Surface Water	25/25	N/A	Future	No
Ground Water		10	N/A	No
Land Application				Yes
Secondary Reuse				Yes

Both treatment processes would be able to produce effluent of sufficient quality to meet surface and groundwater discharges as they stand today. However, the MBR system produces a much higher quality effluent that could be used for other reuse scenarios, whereas the IFAS would require a plant upgrade. Due to the much higher effluent quality, and the ability to reuse the MBR effluent with little additional treatment, the MBR effluent disposal was given a selection value of +2 and the IFAS was given a 0.

6.4.2.6 Power Requirements

Power is typically the largest budget item for a wastewater treatment plant. Mechanical treatment of wastewater requires a plethora of pumps and blowers to move the water from one process to the next and to supply the air required by the microorganisms for respiration.

Electricity costs were included in the overall O&M costs for the mechanical systems. Power requirements for each alternative would have an impact on the size and complexity of a back-up power supply. Power requirements are considered between minimal importance and important and has been assigned a weight value of 2. The MBR system uses more than twice the power of the IFAS system. The selection value of -2 was assigned to the MBR system and a selection value of +1 was assigned to the IFAS system.

6.4.2.7 Sludge Production and Stabilization

Management of biosolids, which can be described as stabilizing and disposal of sludge, is of importance in the operation of a treatment facility. While several methods of biosolids management are available, one beneficial use of biosolids is capping landfills and mine tailings, with the alternative being landfill disposal. Landfill disposal costs are typically based on the weight of the material landfilled. Therefore, it behooves the wastewater system to remove as much water as practicable from the biosolids prior to transport to the landfill. A process that reduces the sludge volume also becomes attractive under this scenario.

As discussed above in the section on Disposal, all wastewater treatment produces biosolids or sludge. This screening criterion is considered important because of treatment, disposal and labor costs that are associated with sludge production. A weight value of 2 has been assigned to this criterion. The MBR system was given a +1 over the 0 given to the IFAS system since it has a much longer sludge age that slightly reduces the overall sludge volume as well as reduces the volatile suspended solids content.

6.4.2.8 Expandability

Expandability refers to how conducive the technology and the installation is to expansion. Planned expansion allows a community to time their expenses for a wastewater system with growth, the future growth typically paying for an expansion through some form of an impact fee. Planned expansion typically results in a higher cost for the first phase of a treatment system due

Table 6-15: Final Alternative Screening Evaluation Matrix

Selection Criteria	Weight Value	IFAS System		MBR System	
		Selection Value	Total Value	Selection Value	Total Value
Capital Cost	5	1	5	-1	-5
O&M Cost	5	1	5	-1	-5
Process Stability	4	1	4	2	8
Space Requirements	3	0	0	1	3
Process Flexibility	4	0	0	1	4
Process Complexity	4	0	0	1	4
Effluent Disposal	4	0	0	2	8
Power Requirements	2	1	2	-2	-4
Sludge Production	2	0	0	1	2
Expandability	3	0	0	1	3
Public Perception	1	0	0	2	2
Totals			**16**		**20**

LEGEND

Weight Value	Selection Value
1 - Minimal Importance	+2 Significant beneficial impact to owner
2 - ↓	+1 Minimal beneficial impact to owner
3 - Important	0 No impact to owner
4 - ↓	-1 Minimal negative impact to owner
5 - Very Important	-2 Significant negative impact to owner