TOWN OF BERNALILLO

Wastewater Treatment Plant (WWTP) Master Plan (MP)

FINAL REPORT

Prepared for:
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BER191-31

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ENGINEERS | ARCHITECTS | PLANNERS

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The technical material and data contained in this Engineering Report was prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.

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12/14/2021

All questions about the meaning or intent of this document shall be submitted only to the Engineer of Record, stated above, in writing.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF TABLES (continued)

APPENDICES

ABBREVIATIONS AND ACRONYMS

AIS	American Iron and Steel Act
A2O	Anaerobic / Anoxic / Oxic (A20)
AO	Administrative Order
ATS	Automatic Transfer Switch
BFP	Belt Filter Press
BOD	biochemical oxygen demand
BOD_5	5-day biochemical oxygen demand
C1	Commercial
CALM	Comprehensive Assessment and Listing Methodology
CCTV	closed circuit television
CDGB	Community Development Block Grant

ABBREVIATIONS AND ACRONYMS (continued)

cf air/lb BOD5	cubic feet of air per pound of 5-day biochemical oxygen demand
cfm	Cubic feet per minute
cfu	colony forming unit
CR	Commercial Residential
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Fund
dBA	A-weighted decibels
DIP	ductile iron pipe
DMP	Disposal Management Plan
DMR	Discharge Monitoring Reporting
DO	dissolved oxygen
EBPR	enhanced biological phosphorus removal
ECHO	Environmental Compliance History Online
EPA	Environmental Protection Agency
FRP	fiberglass reinforced plastic
gal/min*m	gallons per minute per meter
gpcd	gallons per capita per day
gpm	gallons per minute
GWQB	Groundwater Quality Bureau
HMI	human machine interface
HP	horsepower
HVAC	Heating, Ventilation, and Air Conditioning
ICIP	Infrastructure Capital Improvement Plan
kW	kilowatt
lbs./day	pounds per day
lbs./hr*m	pounds per hour per meter
lf	linear feet
LPCA	Low Profile Cascade Aerator
M1	Light Industrial

ABBREVIATIONS AND ACRONYMS (continued)

max	maximum
MGD	million gallons per day
mg/L	milligrams per liter
MIC	Microbially Induced Corrosion
min	Minimum
ml	milliliter
MLSS	mixed liquor suspended solids
mm	millimeter
MPN	most probable number
MRCOG	Mid-Region Council of Governments
N	Nitrogen
NEPA	National Environmental Policy Act
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMFA	New Mexico Finance Authority
NMGRT	New Mexico Gross Receipts Tax
NOD	Nitrogenous Oxygen demand
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
O&G	Oil and Grease
O&M	Operation and Maintenance
OIP	Operator Interface Panel
ORP	Oxidation-Reduction Potential
P	Phosphorus
PAO	Polyphosphate accumulating organisms
pCi/L	picocuries per liter
PER	Preliminary Engineering Report
pH	potential hydrogen
PCBs	polychlorinated biphenyls

ABBREVIATIONS AND ACRONYMS (continued)

PLC	program logic controller
PolyP	polyphosphates
PPRF	Public Project Revolving Fund
psi	pounds per square inch
PVC	polyvinyl chloride
R1	Single Family Residential
RAS	Return Activated Sludge
RIP	Rural Infrastructure Program
RR	Rural Residential
SCADA	Supervisory Control and Data Acquisition
scfm	standard cubic feet per minute
sf	square feet
SRT	solids retention time
SU	Special Use
SWB	Solid Waste Bureau
SWD	side water depth
SWQB	Surface Water Quality Bureau
TDH	Total Dynamic Head
TKN	Total Kjeldahl Nitrogen
TM	Technical Memorandum
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
UPS	uninterruptible power supply
UV	ultraviolet
uWs/cm2	ultraviolet wastewater per square centimeter
VFAs	volatile fatty acids
VFDs	variable frequency drives

ABBREVIATIONS AND ACRONYMS (continued)

WQCC	Water Quality Control Commission
WQS	Water Quality Standards
VSS	Volatile suspended solids
WAS	Waste Activated Sludge
WIFIA	Water Infrastructure Finance and Innovation Act
WET	Whole Effluent Toxicity
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

The Town of Bernalillo, New Mexico, located in Sandoval County, is at the major crossroads of Interstate 25 (I-25) and U.S. Highway 550. Residing in the middle Rio Grande valley, the Town limits extend to both the east and west sides of the river. Bernalillo is bordered by Pueblos to the north (Santa Ana) and south (Sandia), the City of Rio Rancho to the West, and the rural community of Placitas to the east. The Town is located approximately 18 miles north of the City of Albuquerque.

This Master Plan (MP) document has been prepared for the wastewater treatment plant (WWTP) to assist the Town in planning for capital improvements, addressing existing deficiencies, and determining adequate staffing. The report covers a planning period of 20 years (2021 to 2041). Sanitary sewage collected in the Town ends up at the WWTP located at 585 Calle Chaparral, shown in Figure 1-1, where it undergoes physical and biological treatment prior to disposal into the Rio Grande.

1.1 Brief History of WWTP

The Bernalillo WWTP was first constructed in 1960 which included a clarifier, trickling filter, clarigester, pump house, chlorine disinfection structure, effluent pump lift station, and other miscellaneous elements. In 1980, major renovations were completed which included demolition of the original plant for an entirely new treatment system. The plant was constructed with a new entrance works facility, an oxidation ditch aeration basin with brush aerators, secondary clarifiers, chlorine disinfection facilities, and sludge drying beds. In July 2002, minor improvements to the plant included a new scum digester, return activated sludge (RAS) pump building, and renovation to the sludge drying beds. To better account for the discharge into the Rio Grande from the treatment plant, an effluent flow measurement system was installed in April of 2004.

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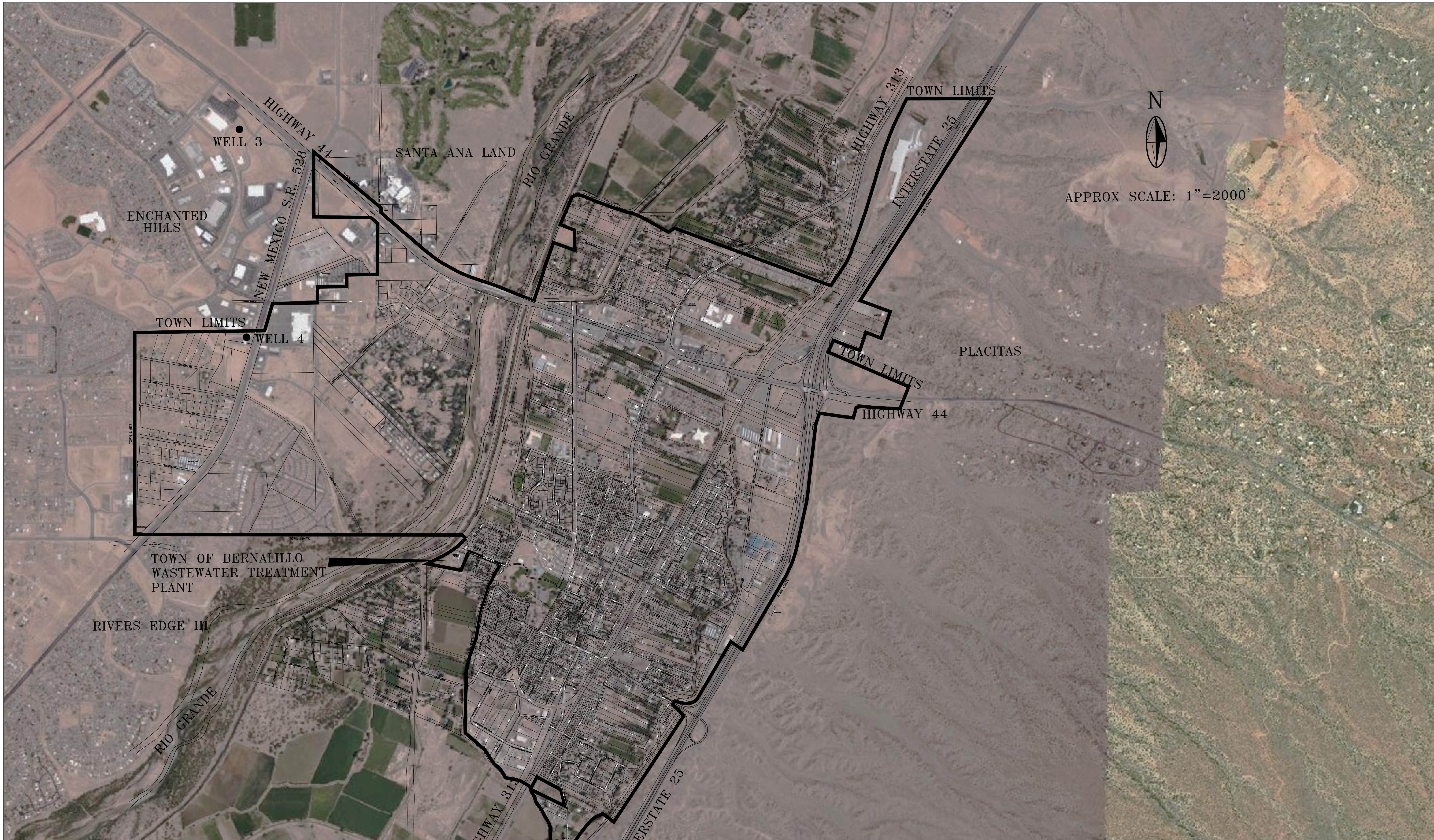

WASTEWATER TREATMENT PLANT MASTER PLANNING DOCUMENT - TOWN OF BERNALILLO, NEW MEXICO

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VICINITY MAP

FIGURE 1-1

In 2004, a Preliminary Engineering Report (PER) was prepared for the WWTP which suggested that many of the plant's primary treatment facilities were outdated and in need of capacity upgrades. A new WWTP was constructed in 2009 with improvements that consisted of an influent lift station, a headworks facility including screening and grit removal, a packaged Aero-Mod sequential oxidation (Sequox®) biological nutrient removal system, a blower building to supplement the biological treatment process, and a UV disinfection structure. These upgrades also included the demolition of the existing headworks facilities, the existing biological treatment facilities, the secondary clarifiers, the chlorine disinfection contact chamber, and Sludge Bed Nos. 3 and 4.

Under a separate design and construction contract, but around the same time as the new WWTP, a new solids handling and maintenance building was built to house a belt filter press (BFP) for sludge dewatering. This building was constructed over the Existing Sludge Bed Nos. 1 and 2. Existing Sludge Bed Nos. 5-10 remain on the site but are currently not being used.

1.2 Purpose of Planning Document

The Town's purpose for preparation of this planning document is to proactively address future needs associated with one of their most costly investments, the WWTP. Priorities include understanding replacement needs on account of service life for installed equipment / structures; anticipating growth (residential, commercial, and industrial) in the community and its impact on flows and loads requiring treatment; ensuring adequate staffing levels in the wastewater department for compliance, operations, and maintenance; and anticipating changes to the discharge permit requirements for possible additional treatment and future compliance.

1.3 Document Organization and Content

This MP is organized in the following sections as follows:

Section 1.0 – Introduction

Provides a brief introduction regarding the master planning effort for the WWTP, a summary history of the plant, objectives of the report, and the organization of the document.

Section 2.0 – Existing Conditions

Describes the current sewer customers, flow and load data, existing permitting requirements, and a design summary of the existing WWTP unit operations. This Section also provides a capacity, condition, and service life assessment for the major components of the treatment facility.

Section 3.0 – Future Conditions

Describes the methodology and results of growth projections for residential, commercial, and industrial customers in the community. The growth projections are then utilized to prepare estimates for future flows, loads, and solids production. A summary of potential future permitting is also provided.

Section 4.0 – Operations and Staffing Evaluation

Describes current staffing of the Town's wastewater department with comparisons to other similar wastewater utilities in the region and provides recommendations for suggested staffing changes. Provides an overview of the operations and process control efforts undertaken by the wastewater staff with recommendations for potential adjustments. The treatment plant controls system is also described for the current configuration and recommendations for improvements given the facility's operating requirements.

Section 5.0 – Liquid Treatment Facilities

This Section provides an overview of the liquid treatment unit operations, systems, and equipment. Proposed improvements, with alternatives where applicable, are identified for addressing existing deficiencies, service life replacements, future capacity needs, and considerations to potential permitting changes. High level, budgetary cost estimates are included for planning purposes.

Section 6.0 – Solids Handling Facilities

This Section provides an overview of the solids handling unit operations, systems, and equipment. Proposed improvements, with alternatives where applicable, are identified for addressing existing deficiencies, service life replacements, future capacity needs, and considerations to potential permitting changes. High level, budgetary cost estimates are included for planning purposes.

Section 7.0 – Recommendations

Individual improvements from Sections 5.0 and 6.0 are prioritized and packaged into proposed projects for phased implementation. The prioritized projects are defined, and the cost estimates are expanded to account for Professional Services, Contractor General Conditions, and New Mexico Gross Receipts Taxes (NMGRT). This Section also describes potential funding services to facilitate implementation of the improvements.

Section 8.0 – References

Throughout this MP, there are superscript numerical notations, e.g., (1), to identify the origin of resource materials utilized. In Section 8.0, the bibliography of these references is presented.

2.0 EXISTING CONDITIONS

2.1 Current Conditions

The Town of Bernalillo currently has approximately 9,370 residents (2021). This estimate is based on data obtained from the Mid-Region Council of Governments (MRCOG) Data Analysis Sub Zone (DASZ) 2040 Socioeconomic Forecast[1]. The Town identifies with the DASZs 1062, 2421, 2422, 2423, 2424, and 2425 (see Figure 2-1). The MRCOG forecast included a 2016 population (8,878 people) and a projected 2040 population (11,500 people). Assuming linear growth occurs over that period, an annual growth rate of 1.084% is applicable. See Section 3.1.1. for population trending over time.

2.1.1 Sewer Customers

The Town of Bernalillo's sewer system consists of conventional gravity collection lines and wastewater lift stations that convey all the waste generated to the Town's WWTP on the East side of the Rio Grande. The Town's sewer system collects waste from both residential and commercial customers with a few of the commercial customers being situated outside of the Town limits. Table 2-1 summarizes the commercial and residential customers both inside and outside the Town limits served by the sewer system during the years 2018, 2019, and 2020. Although the Town has seen fluctuations to the residential sewer customers being served, the same pattern was not seen for the commercial entities over the same period.

TABLE 2-1
SUMMARY OF SEWER CUSTOMERS BY CATEGORY

BILLING CATEGORY	JUN-18	JUN-19	JUN-20	AVERAGE
Residential Sewer Customer (Inside)	2,942	2,968	2,953	2,954
Commercial Sewer Customer (Inside)	179	179	180	179
Commercial Sewer Customer (Outside)	5	5	5	5

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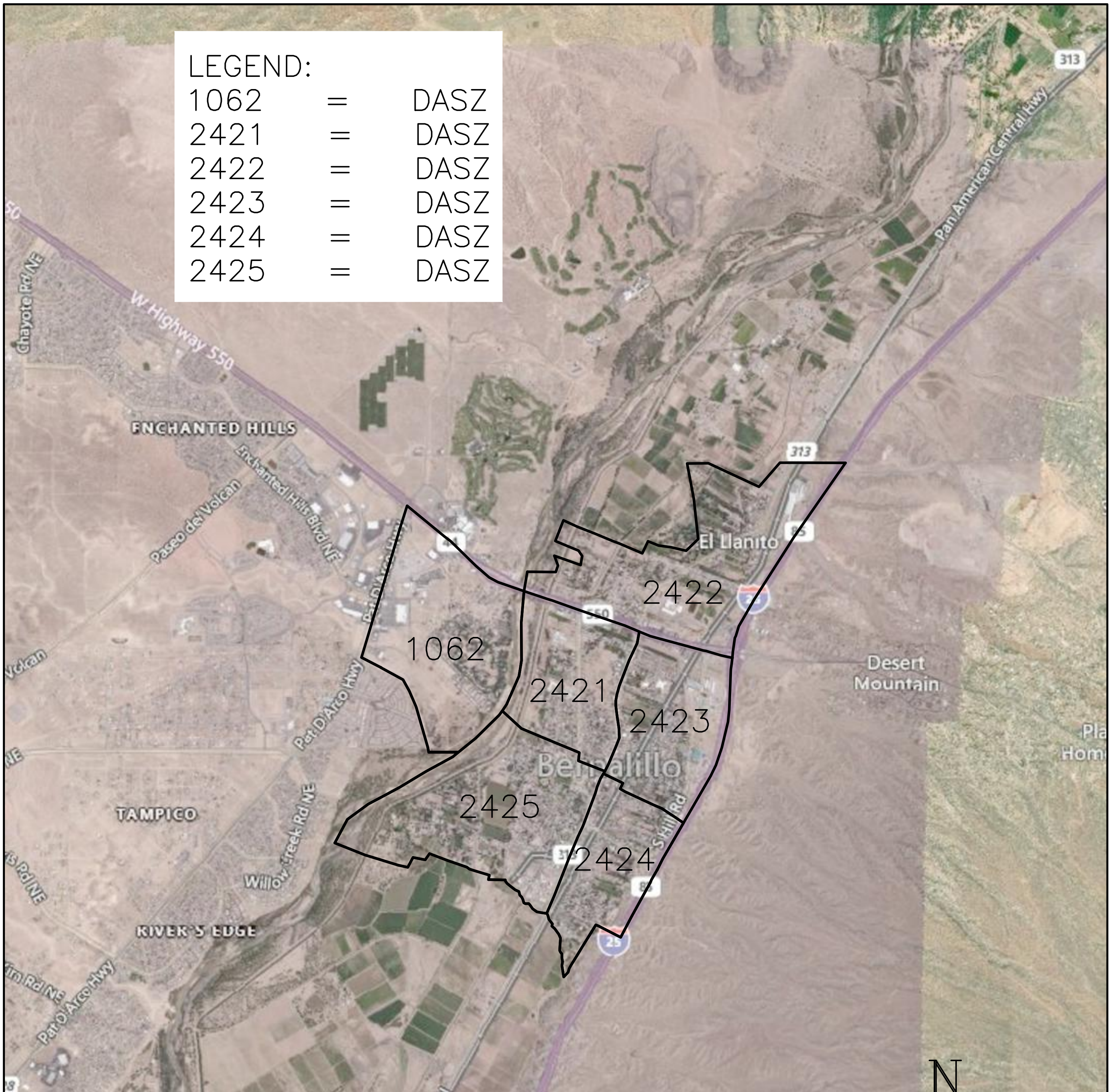

WASTEWATER TREATMENT PLANT MASTER PLANNING DOCUMENT - TOWN OF BERNALILLO, NEW MEXICO

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FIGURE 2-1
MRCOG SUBZONE MAP FOR BERNALILLO

2.1.2 Recent Operating Data

The Town collects data at the WWTP for both operations and permitting purposes. Table 2-2 provides influent data for the past 3 years. Influent samples are generally collected once per week and are taken as 24-hour flow weighted composites.

TABLE 2-2
INFLUENT DATA SUMMARY

PARAMETER	2018	2019	2020	AVG
Flow (million gallons per day [MGD])*	0.63	0.66	0.60	0.63
Biochemical oxygen demand (BOD) (milligrams per liter [mg/L])	311	389	306	333
BOD (lbs./day)	1,632	2,142	1,532	1,751
Total suspended solids (TSS) (mg/L)	237	234	207	225
TSS (lbs./day)	1,243	1,286	1,036	1,184
Total Kjedahl Nitrogen (TKN) (mg/L)	N/A	50.1	48.9	49.3
TKN (lbs./day)	N/A	275.8	244.7	259.2
Total Phosphorus (TP) (mg/L)	7.8	8.0	8.5	8.2
TP (lbs./day)	41.0	44.0	42.5	43.1

*Influent flow data is not collected at the WWTP, the presented data is effluent flow.

Similarly, the Town collects effluent samples weekly and are taken as 24-hour flow weighted composites. Table 2-3 presents the effluent data for past 3 years.

TABLE 2-3
EFFLUENT DATA SUMMARY

PARAMETER	2018	2019	2020	AVG
Flow (MGD)	0.63	0.66	0.6	0.63
Potential Hydrogen (pH) (minimum [min] / maximum [max])	6.7 / 7.97	7.13 / 7.62	6.91 / 7.88	6.7 / 7.97
BOD (mg/L)	7.0	7.2	4.8	6.3
BOD (lbs./day)	37.0	39.9	23.9	33.2
BOD (% Removal)	97.7%	98.1%	98.4%	98.1%
TSS (mg/L)	8.3	5.5	6.2	6.7
TSS (lbs./day)	43.8	30.4	31.2	35.3
TSS (% Removal)	96.5%	97.6%	97.0%	97.0%
E. coli (colony forming unit [cfu]/100 milliliters[ml])	7.38	10.6	12.8	10.0
E. coli (billion cfu/day)	0.176	0.266	0.290	0.239
Dissolved Oxygen (DO) (mg/L) (min)	4.16	0.9	0.4	-
Ammonia (mg/L) (Max)	1.7	10.0	12.0	-
Adjusted Gross Alpha (picocuries per liter [pCi/L])	4.66	4.8	9.4	9.4
Nitrate (mg/L) (Max)	8.2	8.2	56.0	-
TP (mg/L)	3.47	3.08	3.38	3.31
TP (lbs./day)	18.2	17.0	16.9	17.4
Arsenic (mg/L) (Max)	0.011	0.015	0.110	-

2.1.3 Per Capita Flows and Loads

Typical of planning documents, calculating per capita values for wastewater flow and constituent loading to the treatment works is useful in understanding current and future conditions. The calculated values for the Town can be compared to those found in reputable reference materials to help justify their use for projection purposes.

Utilizing the estimated population for 2018, 2019, and 2020 (see Section 3.1.1.) and the influent data above, the per capita flow and loading values for the Town have been calculated and are shown in Table 2-4. Additionally, this same table shows comparable values from technical resource documents and recommended per capita quantities for use in the future projections.

TABLE 2-4
PER CAPITA VALUES FOR PLANNING PURPOSES

Parameter	Town Data				Metcalf & Eddy, 5th Edition(2)	Recommended Standards for Wastewater Facilities, 2014(3)	Values to Use for Planning
	2018	2019	2020	Avg			
Flow (gallons per capita per day [gpcd])	69.4	72.0	64.7	68.7	50-120	100	70
BOD (lb/capita/day)	0.18	0.23	0.17	0.19	0.11-0.26	0.17	0.20
TSS (lb/capita/day)	0.14	0.14	0.11	0.13	0.13-0.33	0.2	0.14
TKN (lb/capita/day)	-	0.030	0.026	0.028	0.020-0.040	0.036	0.030
TP (lb/capita/day)	0.005	0.005	0.005	0.005	0.003-0.010	-	0.005

It should be noted that the per capita values are inclusive of contributions by the Town's current residential and commercial customers.

2.2 Existing Permitting

The discharge of treated effluent from the WWTP is governed under the National Pollution Discharge Elimination System (NPDES) Permit Number NM0023485. The NPDES program is regulated by the U.S. Environmental Protection Agency (EPA) as a means of controlling the discharge of contaminants to any stream or body of water in the country. The vast majority of NPDES permit programs are administered at the state level, but in New Mexico, the NPDES program is administered by EPA Region 6 in Dallas, Texas. The Town discharges into a segment of the Rio Grande administered by the Pueblo of Sandia whose water quality standards (WQS) establish the requirements for the Town's effluent limits. Table 2-5 shows the limits for the current permit, which is effective until August 31, 2026.

TABLE 2-5
TOWN OF BERNALILLO – WWTP NPDES PERMIT LIMITS
(SEPTEMBER 1, 2021 THROUGH AUGUST 31, 2026)

Effluent Characteristics	Discharge Limitations				
	30-Day Average (lbs./day)	7-Day Average (lbs./day)	Concentration (mg/L)*		
			30-Day Average	7-Day Average	Daily Maximum
Flow, (MGD)	Report (0.8 MGD Annual Average)	Report	N/A	N/A	N/A
5-day biochemical oxygen demand (BOD_5)	200	300	30	45	N/A
TSS	200	300	30	45	N/A
BOD_5 % removal, minimum	≥85	N/A	N/A	N/A	N/A
TSS % removal, minimum	≥85	N/A	N/A	N/A	N/A
Total Residual Chlorine	N/A	N/A	N/A	N/A	11 ug/l
Escherichia coli (*E. coli)* Bacteria (cfu/100 ml)	1.43×10^9 cfu (or most probable number [MPN])/day	N/A	47 cfu (or MPN)/ 100 ml	N/A	88 cfu (or MPN)/ 100 ml
pH	6.6 minimum, 9.0 maximum				
DO	N/A	N/A	N/A	N/A	5 or greater
Phosphorus, total	N/A	N/A	N/A	N/A	Report
Nitrogen, total	N/A	N/A	N/A	N/A	Report
Oil and Grease (O&G)	N/A	N/A	N/A	N/A	Report
Mercury	N/A	N/A	N/A	N/A	Report
Adjusted Gross Alpha	N/A	N/A	N/A	N/A	Report
Polychlorinated biphenyls (PCBs)	N/A	N/A	N/A	N/A	Report
Arsenic, total	N/A	N/A	N/A	N/A	Report
Ammonia, total (as N)	N/A	N/A	N/A	N/A	Report
Nitrate, total	N/A	N/A	N/A	N/A	Report
Whole Effluent Toxicity (WET)	48-Hour Acute Static Renewal				
Species	*Daphnia pulex, Pimephales promelas (Fathead minnow)*				
Critical Dilution	6%				

No discharge of floating solids or visible foam in other than trace amounts.
No visible films of oil, globules of oil, grease or solids in or on the water, or coatings on stream banks.
*Unless noted.

Nutrient monitoring is included in the most recent permit renewal. Nutrient removal has been highlighted as a priority for the EPA going forward.

The permitting of sewage sludge disposed of at a landfill is governed by the New Mexico Environment Department (NMED) Solid Waste Bureau (SWB). NMED categorizes sludge as a “special waste” product and is therefore subject to stringent handling, transportation, and disposal requirements. Prior to disposal of any sludge at a permitted landfill, a Disposal Management Plan (DMP) must be submitted and approved by the NMED SWB. The general requirements of this DMP are as follows:

- Description of current operations.
- Description of disposal facility.
- Documentation that sludge transport driver has proper permitting and clearance.
- Description of sludge sampling and analysis techniques. Sampling must conform to the requirements of 20.9.8.16.D NMAC.
- Contingency action plan for accidental / unplanned discharge or spill.
- Any changes to the originally approved DMP must be approved by NMED SWB.

Prior to the disposal of sludge at a solid waste facility, the generator shall test a representative sample for the following parameters to verify that no exceedance of the specified pollutants is occurring.

- No free liquids as determined by paint filter liquids test (U.S. EPA test method 9095), unless exempt in accordance with 20.9.4.17 New Mexico Administrative Code (NMAC);
- Percent solids (no specified limits);
- pH, within the range of 2.0 to 12.5;
- PCBs, less than 50 mg/Kg; and
- Toxicity characteristic leaching procedure (TCLP) (U.S. EPA test method 1311), for the following parameters and maximum allowable concentrations:
    - Arsenic, 5.0 mg/L;
    - Benzene, 0.5 mg/L;
    - Cadmium,1.0 mg/L;
    - Chlordane, 0.03 mg/L;

- Chromium, 5.0 mg/L;
- 2,4-Dichlorophenoxy-acetic acid, 10.0 mg/L;
- Lead, 5.0 mg/L;
- Lindane, 0.4 mg/L;
- Mercury, 0.2 mg/L;
- Methyl ethyl ketone, 200.0 mg/L; and
- Toxaphene, 0.5 mg/L.

2.2.1 Permit Compliance

In general, the Town has historically been compliant with the effluent limits in their NPDES permits. However, there have been regular exceedances for certain parameters: DO, total phosphorus, and *E. coli*. In August, 2021, the Town received an Administrative Order (AO) for violations of their permit pertaining to the above noted parameters during the period of June 2019 to March 2021.

DO concentrations have been an issue since the requirement was included in the Town's NPDES permit (first effective August 1, 2016). The low DO levels are primarily associated with the lack of effective reaeration prior to effluent sample measurement and, to some extent, the design of the activated sludge treatment process. The Aero-Mod process uses two parallel trains for treatment. In the Stage 2 basins, the diffused air alternates on and off between the two trains. Because the wastewater is continuously flowing, this results in half of the flow being very low in oxygen as it enters the final clarifiers. The Town installed a low-profile cascade post aeration system between the Aero-Mod and the UV disinfection which has been ineffective at raising the DO levels sufficiently for compliance.

The Aero-Mod package plant is configured to promote biological phosphorus removal. This configuration is further described below in Section 2.3. The WWTP has been effective at achieving the effluent limit through this biological treatment process with only sporadic exceedances. In reviewing the operations data surrounding these exceedances, there is not an apparent cause for the failure of the biological treatment process to achieve compliance.

However, of significant note is that in the recently issued NPDES Permit (effective September 1, 2021 to August 31,2026), the phosphorus limit was removed. The EPA identified that the inclusion of a phosphorus limit for the WWTP was a mistake.

The Town's WWTP utilizes UV radiation to attain *E. coli* compliance. A separate Technical Memorandum (TM)[4] was written prior to this MP which addresses the issues with the disinfection system performance. The TM concluded that the *E. coli* exceedances in the Town's effluent are likely due to a combination of missed maintenance intervals, shielding from other solids (algae) in the effluent and the inability of the existing system to achieve the required dose.

The Enforcement and Compliance History Online (ECHO) database provides a detailed list of the history of noncompliance with the Discharge Monitoring Reporting (DMR) program for facilities across the United States. A summary of the compliance exceedances for the Town of Bernalillo's WWTP for the period between 2018 – 2021 from ECHO and the August 2021 AO is detailed below:

- DO:
  - Exceedance for the daily minimum DO concentration occurred nine times over the 3+ year period.
- TP:
  - Exceedance for the 30-day average TP concentration occurred four times over the 3+ year period.
  - Exceedance for the daily maximum TP concentration occurred four times over the 3+ year period.
  - Exceedance for the 30-day average TP loading occurred twice over the 3+ year period.
- *E. coli*:
  - Exceedance for the 30-day average *E. coli* concentration occurred four times over the 3+ year period.
  - Exceedance for the daily maximum *E. coli* concentration occurred six times over the 3+ year period.

- BOD_5:
    - Exceedance for the 30-day average BOD_5 concentration occurred once over the 3+ year period.

2.3 WWTP Design Summary

The WWTP consists of many unit operations to process the raw sewage into a compliant finished effluent. Table 2-6 presents a summary of the general sizing and equipment characteristics of the major plant components.

TABLE 2-6
EXISTING WWTP FACILITIES AND EQUIPMENT

UNIT OPERATION	EQUIPMENT	DESCRIPTION
Influent Lift Station	Submersible Sewage Pumps	3 – 10 horsepower (HP) Flygt Model NP3127-421 Self-Cleaning Pumps. Operating Conditions: Single Pump; Q=1,000 gallons per minute (gpm) @ 26′ total dynamic head (TDH). Parallel Pumps: Q=869 gpm @ 30.8′ TDH. These pumps have been repaired / overhauled.
Entrance Works	Climber Screen	Vulcan Model No. ESR 23-358-3 2 HP Climber Screen. Bar Rack Clear Spacing of 3 millimeter (mm) @ an incline of 50-degrees. Channel Width = 2′, Channel Depth = 5′, Avg. Daily Flow = 1.2 MGD.
	Bar Rack	Bar Rack Clear Spacing of 3/4″.
	Aerated Grit Blower	1 – 5 HP Hardy Systems Corp Model HPP-MD3003-5 HP-2FS-2. 1 - 3003-21L1 Tuthill MD Pneumatic Blower. Design Parameters: 75 standard cubic feet per minute (scfm) @ 5 pounds per square inch (psi), motor speed of 2,198 revolutions per minute (rpm), 80 A-weighted decibels (dBA) estimated noise level.
	Grit Classifier	3/4 HP HydroGritter Grit Washer – Amwell. 12″ grit washer @ a 20-degree incline. Model DSC Dewatering Screw Conveyor. Design Flow: 1.2 MGD average – dry weather, 2.4 MGD maximum – dry weather, 2.7 MGD maximum – wet weather.

TABLE 2-6
EXISTING WWTP FACILITIES AND EQUIPMENT (continued)

UNIT OPERATION	EQUIPMENT	DESCRIPTION
Biological Treatment (Aero-Mod):	Bio-P Fermentation Basin	Basin Size: 12′ wide x 39′–4″ long x 18′-0″ wall height. Side Water Depth (SWD) = 16′. Volume = 56,549 gallons.
	Bio-P Anaerobic Basin	Basin Size: 12′ wide x 39′-4″ long x 18′-0″ wall height. SWD = 16′. Volume = 56,549 gallons. 3 HP Mixer (Aire-O2 Process Aerator).
	Stage 1 – Aeration Basins	Two Individual Basins – Basin Size: 26′-8″ wide x 77′ long x 18′ wall height. SWD = 16′ . Volume = 490,718 gallons. Model 1000CE DO Analyzer. Optical DO Sensor.
	Stage 2 – Aeration Basins	Two Individual Basins – Basin Size: 13′-6″ wide x 158′-3″ long x 18′ wall height. SWD = 16′. Volume = 511,363 gallons.
	Aeration Blowers	Three Individual Kaeser Model EB420C fine bubble blowers, 50 HP, 742 scfm design flow @ 7.6 psi.
		Three Individual Kaeser model EB420C coarse bubble blowers, 50 HP, 650 scfm design flow @ 7.0 psi.
	Air Headers	6″, 8″, 12″ DIP Air Headers. 6″, 8″, 12″ PVC Air Feed Lines. 2″ PVC Flex-Hose Air Feed Lines.
	Secondary Clarifiers	Two Individual Basins – Basin Size: 20′ wide x 80′ long x 18′ wall height. Total Weir Length = 296′.
	Sludge Digester	Two Individual Basins - Basin Size: 41′-4″ wide x 38′ long by 18′ wall height. Volume = 388,100 gallons.
RAS	Airlift Pumps	4″ diameter PVC line, 1/2″ air supply line, Capable of delivering 100 gpm over an area of 32 square feet.
WAS	Airlift Pumps	4″ diameter PVC line, 1/2″ air supply line, Capable of delivering 100 gpm over an area of 32 square feet.
Scum	Scum Airlift Pump	4″ diameter PVC line, 1/2″ air supply line, Capable of delivering 100 gpm over an area of 32 square feet.
Post Aeration System	Cascade Aerator	JMS Low Profile Cascade Aerator (LPCA).

TABLE 2-6
EXISTING WWTP FACILITIES AND EQUIPMENT (continued)

UNIT OPERATION	EQUIPMENT	DESCRIPTION
Disinfection	UV Disinfection System	Two Individual Units: Vertical Open Channel Siemens model VE-30-A300-AW UV disinfection system. Channel Size: 26″ wide x 17′ long x 81″ high at UV modules, 33″ high at discharge weir. Peak flow =3.2 MGD, UV dosage = 31,000 ultraviolet wastewater per square centimeter (uWs/cm²).
	Jib Crane & Chain Hoist	Coffing - Electrically operated 1000 # Capacity hoist and crane.
Canariis Packaged Washwater Pumping System	Pump Skid	Two – 7.5 HP Duplex Multi-Stage Skid-Mounted Pumps, Model DM-150-90 (CR15-4). Operating Conditions: Single Pump; Q = 75 gpm. Parallel Pumps: Q = 150 gpm. Shutoff Head = 116 psig.
	Hydropneumatic Tank	One – Wessels Model FXA700, 185 gallon bladder tank.
Sludge Dewatering	Sludge Feed Pumps	Two – 5 HP WEMCO Model SFE5-J-BFE2W Centrifugal Sludge Pumps. 560 gpm capacity at 17′ of head (one duty – one standby).
	BFP	5 HP Tower Belt Press Model TP17.43, 1.7-meter belt width. ROEDEOS Model L-1.1 polymer skid, polymer injection ring, inline mixer. 1.5 HP discharge belt conveyor.
	Sludge Drying Beds	Six total emergency drying beds, three paved and three sand.
Effluent Lift Station	Loadout Pumps	Three - 10 HP Flygt Model CP3127-411 submersible loadout pumps (two duty, one standby). Operating Conditions: Single Pump; Q=1,300 gpm @ 19′ TDH. Parallel Pumps: Q=990 gpm @ 26′ TDH.
Standby Generators	Plant Generator	150 kilowatt (kW) power generation, 480 Volt, 3-Phase.
	Blower Generator	350 kW power generation, 480 Volt, 3-Phase.

Figure 2-2 provides an aerial perspective of the WWTP and includes labeling of the various structures. Figure 2-3 is a one-line schematic showing how the liquids and solids move through the WWTP.

In the following subsections, the purpose of the unit operations is further described.

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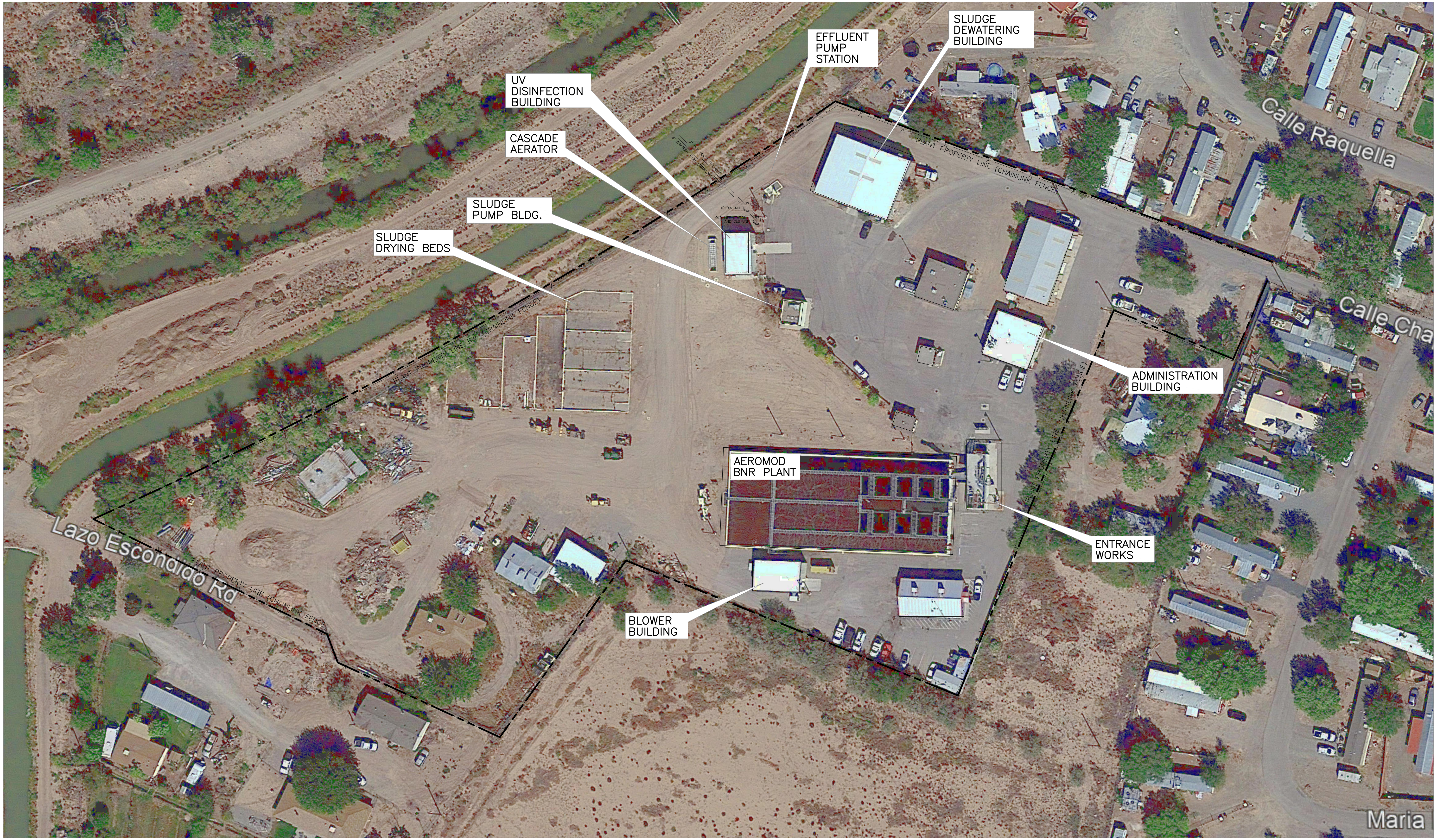

MOLZENCORBIN

WASTEWATER TREATMENT PLANT MASTER PLANNING DOCUMENT - TOWN OF BERNALILLO, NEW MEXICO

SITE MAP

FIGURE 2-2

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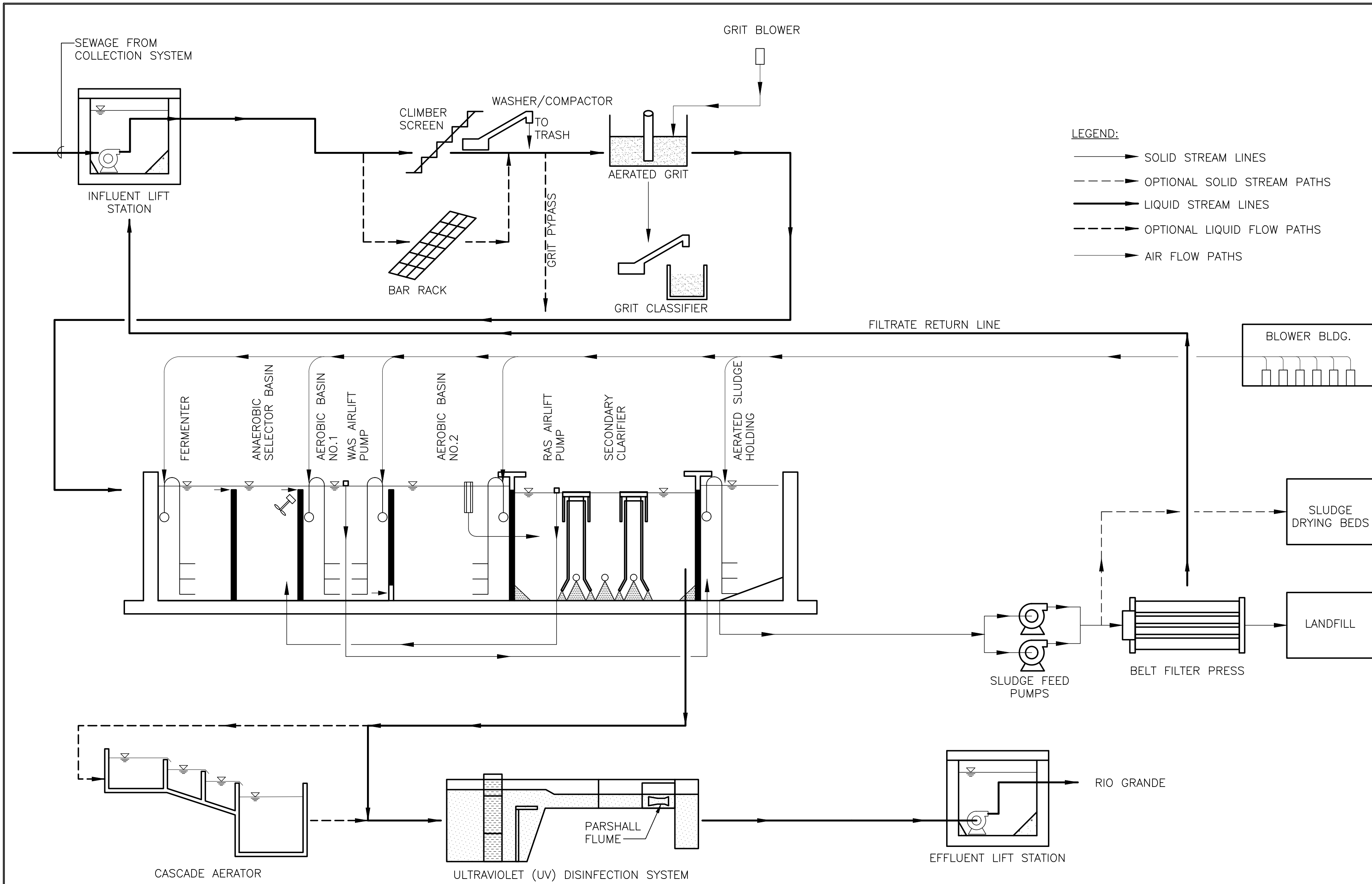
DWG. NAME: WBE-FIG2-3.dwg



WASTEWATER TREATMENT PLANT MASTER PLANNING DOCUMENT - TOWN OF BERNALILLO, NEW MEXICO

MOLZENCORBIN

PROCESS FLOW DIAGRAM

FIGURE 2-3

2.3.1 Influent Lift Station and Entrance Works

Raw sewage enters the plant through a manhole that transfers the flow via a 24-inch ductile iron pipe (DIP) into the influent lift station wet well. One or two of three submersible pumps draws the influent from the bottom of the wet well and transfers the sewage into a channel that diverts the flow into either a manual bar rack or a mechanical climber screen for initial removal of coarse solids and debris. Following the screening process, the waste is conveyed into the aerated grit chamber where the inorganic material such as sand, gravel, and other heavy sediment are lifted through an air lift pump out to a grit classifier. The classifier separates the solids into a bin for disposal and conveys the decanted water back to the influent lift stations wet well to reenter the treatment process. The sewage from the aerated grit chamber is piped via a 20-inch DIP to the Aero-Mod tank for biological treatment.

2.3.2 Biological Treatment (Aero-Mod)

The Aero-Mod Sequox® process is intended to provide nutrient (nitrogen and phosphorus), BOD, and TSS removal from the waste stream. The screened and de-gritted sewage starts by entering the BIO-P Fermenter Tank. The purpose of this basin is to solubilize particulates and convert complex substrates into more biologically available forms such as volatile fatty acids (VFAs) and orthophosphate. Increasing the proportion of VFAs in the preliminary effluent is known to aid in the promotion of polyphosphate accumulating organisms (PAOs) that facilitate the removal of phosphorus from the waste stream by enhanced biological phosphorus removal (EBPR).

Next, the fermented influent wastewater enters the Bio-P Anaerobic Tank where it is mixed with 100% of the returned activated sludge (RAS) flow and becomes activated sludge. The anaerobic tank is an essential component of EBPR and is intended to be free of nitrate and oxygen. If either of these are present in appreciably quantities (>0.2 mg/L) *heterotrophic* bacteria will use them to metabolize organic carbon for energy and cell growth and thus inhibit the PAO metabolism. Anaerobically, PAOs cleave phosphate from stored polyphosphates (polyP) and export it from the cell to generate energy for organic carbon uptake and carbon storage polymer synthesis. A significant portion of the organic carbon available in the influent has been utilized by the end of the Bio-P Anaerobic Tank.

Activated sludge leaving the Bio-P Anaerobic Tank is split into two parallel process trains that consist of two separate aeration stages. The Stage 1 Aeration Basins provide habitat for *heterotrophic* bacteria to grow using oxygen and organic carbon (e.g., BOD), as well as autotrophic bacteria that utilize oxygen to oxidize ammonium to nitrate (nitrification) for growth energy using inorganic carbon (e.g., carbon dioxide). Similarly, PAOs utilize oxygen to oxidize anaerobically generated carbon storage polymers for energy to uptake and replenish depleted polyP stores and growth.

After the Stage 1 Aeration Basin, the activated sludge enters the Stage 2 Aeration Basin. Aeration of the Stage 2 Aeration Basins is operated sequentially in 4-hour cycles with 2-hours on and 2-hours off to provide nitrogen removal. The off cycle provides anoxic conditions (no oxygen) that force heterotrophs to utilize nitrate for organic carbon oxidation to produce cell growth energy. However, as noted previously, very little soluble organic carbon is available after Stage 1 Aeration and the bacteria must rely on the consumption of their own cell tissue for organic carbon in a process called endogenous respiration. This approach to nitrogen removal has the distinct disadvantage that it results in the release of both ammonia and phosphorus from degraded cell tissues that are re-aerated in the on cycle to promote ammonia conversion to nitrate and phosphorus uptake. Endogenous respiration for nitrogen removal is typically only used when influent organic carbon is insufficient to support conventional nitrogen removal via pre-anoxic processes such as the Modified Ludzack-Ettinger.

Following biological treatment, the activated sludge is directed into the rectangular Secondary Clarifier tanks where the final liquid-solid separation process will occur. The clean supernatant from the Secondary Clarifiers is transferred via a 20-inch polyvinyl chloride (PVC) line for further processing. Settled activated sludge is recycled to the Bio-P Anaerobic Tank by air lift pumps on a timed basis. The duration and frequency of the airlift operations determines the rate of RAS pumping and the system was designed for a RAS ratio of 100% of the influent flow rate, and is not flow-paced.

Waste activated sludge (WAS) is conveyed via air lift pumps located in the Stage 1 Aeration Basins to one of two Aerobic Digestion tanks which are described in Section 2.3.4.

2.3.3 Treated Water Processing

Clarified supernatant from the Aero-Mod treatment train is conveyed to a Cascade Aeration system that is intended to supplement the clarified effluent with DO to meet the discharge requirements of 5 mg/L. Next, the water is piped to the Ultraviolet (UV) Disinfection channels via a 20-inch DIP where two individual 30 lamp UV modules are placed vertically into the concrete channels for disinfection. Following the UV modules, a 9-inch Parshall Flume measures the effluent flow that will be conveyed to the Effluent Lift Station via a 20-inch DIP. At the Effluent Lift Station, submersible pumps transfer the disinfected effluent from the wet well and discharge it into the Rio Grande. Disinfected effluent from the UV channels is also directed to the treatment plant's Washwater Pumping System that is housed in the UV Disinfection Building. This skid mounted dual-pump washwater system supplements the entire treatment plant's washwater demands for treatment and general washdown operations.

2.3.4 WAS Processing

Processing WAS at the Town's WWTP begins in the Aerobic Digestion basins, where air is introduced by coarse bubble diffusers to breakdown volatile suspended solids (VSS) by endogenous respiration to reduce the volume of solids requiring handling and disposal. The WAS pumping rate is timer based and is used to control the solids retention time (SRT) of the treatment process. The process was designed to operate at an SRT of 18 days, but the duration of pumping is not flow-paced based on the influent flow rate. The Aerobic Digestion tanks were designed to achieve 18.8% VSS reduction at an average SRT of 30 days.

From the Aerobic Digestion basins, the WAS is pumped via one of two centrifugal sludge pumps housed in the Sludge Pump Building. The WAS is conveyed to either the BFP or the Sludge Drying Beds for dewatering of the sludge. Dewatered sludge cakes are then transported via a hauling truck to a landfill for final disposal of the sludge. Leachate from the dewatering process is piped back to the influent lift station for treatment.

2.4 Capacity, Condition, and Service Life Assessments

2.4.1 Capacity Assessment

An assessment was performed to compare the design values of the major plant components to current operating conditions to identify any capacity limitations. Also, where applicable, the design conditions were compared to the *Recommended Standards for Wastewater Facilities. 2014 Edition*[3] (commonly called the "Ten States Standards") or other pertinent design references. Table 2-7 identifies the capacity comparisons made.

TABLE 2-7
CAPACITY ASSESSMENT OF EXISTING TREATMENT COMPONENTS

TREATMENT COMPONENT	PARAMETER	DESIGN	CURRENT	STANDARD
Influent Lift Station	Pumping Capacity	One Pump; Q=1,000 gpm. Two Pumps: Q=1,738 gpm.	Avg=438 gpm Max. Day=736 gpm Peak Hour=Unknown	N/A
Entrance Works	Screen Hydraulic Capacity	833.33 gpm (Avg. Day) 2833.33 gpm (Peak Hourly)	Avg=438 gpm Max. Day=736 gpm Peak Hour=Unknown	N/A
	Aerated Grit Hydraulic Capacity: Detention Time	Approximately 4-1/2 minutes @ Peak Hourly	Unknown for Peak Hourly	3 to 5 min. @ Peak Hourly Flow[3]
	Aerated Grit Aeration Capacity	54.5 cubic feet per minute (cfm)/ 1,000 ft^3	54.5 cfm/1,000 ft^3	20 cfm/1,000 ft^3[6]
	Aerated Grit Aeration Capacity	7.5 cfm/ft	7.5 cfm/ft	Minimum: 3 cfm/ft[2] Maximum: 8 cfm/ft[2]

TABLE 2-7
CAPACITY ASSESSMENT OF EXISTING TREATMENT COMPONENTS (continued)

TREATMENT COMPONENT	PARAMETER	DESIGN	CURRENT	STANDARD
Aeration Basins	Organic and Nitrogen Loading	2,502 lbs./day BOD_5 600 lbs./day TKN	1,751 lbs./day BOD_5 259 lbs./day TKN	N/A
	Aeration Tank Organic Loading	15 lb $BOD_5/d/1,000\ ft^3$	6.5 lb $BOD_5/d/1,000ft^3$	15 lb $BOD_5/d/1,000ft^3$(3)
	DO Concentration (mg/L)	2	2	2(3)
	Total Air Supplied (cubic feet of air per pound of 5-day biochemical oxygen demand [cf air/lb BOD_5])	1,583	2,262	2,050(3)
	Mixed liquor suspended solids (MLSS) (mg/L)	3,422.26 (Recommended Range of 2,500 to 3,500)	1,310-6,590	3,000 to 5,000(3)
Clarifiers	SWD (feet)	16	16	12(3)
	Freeboard (feet)	2	2	1(3)
	Surface Overflow Rate at Design Average Flow (gpd/square feet[sf])	375	206.25	700(3)
	Surface Overflow Rate at Design Peak Hourly Flow (gpd/sf)	1,000	unknown	1,000(3)
	Weir Loading Rate (gpd/linear feet[lf])	13,784	7,581	30,000(3)
	Peak Solids Loading Rate (lbs./day/sf)	32.6	unknown	35(3)

TABLE 2-7
CAPACITY ASSESSMENT OF EXISTING TREATMENT COMPONENTS (continued)

TREATMENT COMPONENT	PARAMETER	DESIGN	CURRENT	STANDARD
Disinfection	Disinfection Standard	200 cfu/100 mL *Fecal Coliform* or 126 cfu/100 mL *E. Coli*	47 cfu/100 mL *E. Coli*	N/A
Dewatering	Sludge Pump Capacity	560 GPM @ 17′ TDH	560 GPM @ 17′ TDH	N/A
	Sludge Feed (%)	2	2	2(3)
	BFP Hydraulic Loading Rate (GPM)	100	146	90 gal/min*m of belt width (153 GPM) (2)
	BFP Solids Loading Rate (lbs./hr)	1000.8	1461.3	900 lbs./hr*m of belt width (1,530 lbs./hr)(2)
Effluent Lift Station	Pumping Capacity	One Pump; Q=1,300 gpm. Two Pumps: Q=1,980 gpm.	Avg=438 gpm Max. Day=736 gpm Peak Hour=Unknown	N/A

The following sections discuss notable capacity concerns at the treatment plant. Particularly, there are no current means to measure the instantaneous incoming flow into the facility. This scenario makes drawing comparisons to the *Ten States Standards* highlighted peak characteristics difficult.

2.4.1.1 Influent Lift Station

As the influent lift station does not have a flow meter, the effluent flow data has been shown for average day and max day conditions. Peak hourly flows for the facility are unknown. However, given current flows versus design flows, the influent lift station appears to have sufficient capacity.

2.4.1.2 Entrance Works

Both the inlet screen and aerated grit chamber appear to have sufficient hydraulic capacity to handle the current flow conditions experienced at the treatment plant. However, from an operational standpoint, the aerated grit chamber is receiving an aeration rate on the high end of the recommended standards. For example, the supply of air to the grit chamber is nearing the maximum desirable air flow of 8 ft^3/min*ft for the 10-foot-long chamber. Additionally, the chamber does not meet a recommended length to width ratio of 3:1. Issues experienced with the aerated grit chamber removal efficiency may be attributed to short circuiting within the basin due to these design flaws.

<u>2.4.1.3 Aeration Basins</u>

The packaged treatment plant was designed to handle a total oxygen demand of 3,002 lbs./day for BOD_5 and 2,760 lbs./day for nitrogenous oxygen demand (NOD) at a flow rate of 1.2 MGD. *Ten States Standards* recommends a minimum air supply of 2,050 cf/lb BOD_5, while the system was designed to supply 1,583 cf/lb BOD_5 (slightly less than the recommended minimum). The treatment plant has been operating at less than the original design loading which has allowed the aeration system to supply 2,262 cf/lb BOD_5, meeting the *Ten State Standards* minimum air supply recommendations for treatment. As the flow and loading conditions into the plant continue to increase, the aeration capacity of the system will not likely be able to meet this minimum design recommendation.

A few potential concerns surfaced after evaluation of the design. The design did not account for the aeration system to provide 200% of the design average day oxygen demand as recommended by *Ten States Standards*, Section 92.332, Part F. Also, *Ten States Standards*, Section 92.332, Part D recognizes that the specific capacity of a blower should be sized for extreme conditions. The Bernalillo blowers account for temperatures up to 100 degrees Fahrenheit. Although the historically high temperature for the area is greater than 100 degrees Fahrenheit, the blowers are installed inside of a building with redundancy in the evaporative coolers.

The field data reported for MLSS was measured by a probe that yields great variability. In the future, a laboratory analysis on the MLSS should be conducted periodically. For the purpose of this document, a likely range for the current MLSS concentration can be assumed as 1,310 to 6,590 mg/L MLSS.

Although the original design of the aeration system met a few recommendations set forth by the *Ten States Standards*, such as a sustained DO concentrations of 2 mg/L and an NOD oxygen requirement of 4.6 lbs. O_2/lb TKN. The design failed to meet the BOD_5 oxygen requirement of 1.5 lbs. O_2/lb BOD_5 for the specific type of process that was implemented, an extended aeration process. Instead, the design used a factor of 1.2 lbs. O_2/lb BOD_5 which does not take into consideration the endogenous respiration requirements that would need to be accounted for in such an extended aeration process. Furthermore, instead of applying these factors to the peak organic loads as recommended in the *Ten States Standards*, the design applied these values to the average organic loading conditions, underrepresenting the amount of oxygen required for treatment.

2.4.1.4 Clarifier

The first design stipulation imposed on clarifiers by *Ten States Standards* is multiple settling units for plants whose average flows exceed 100,000 gpd (*Ten States Standards*, Section 71.1). The average flow rate used for design in 2008 was 1.2 MGD, so two clarifiers were installed, each containing four units.

Another design stipulation stated in Section 92.31 requires a minimum length of flow from inlet to outlet to be 10 feet. This requirement is satisfied by the structure having a 4x1 configuration with total dimensions of 80 feet by 20 feet. Continuing the subject of dimensions, *Ten States Standards*, Section 72.1 requires a minimum SWD of 12 feet for secondary clarification following a conventional activated sludge process. The Aero-Mod clarifier specifies a SWD of 16 feet and wall depth of 18 feet. This allows for 2 feet of freeboard. *Ten States Standards*, Section 72.7 states a minimum value of 1 foot of freeboard in the settling basin.

The allowable surface overflow rate is 1,000 gpd/sf at design peak hourly flow. Although no peak hourly flow data is available, the Aero-Mod clarifiers are meeting this standard when applying an assumed peaking factor of 3 to the average day conditions.

The peak solids loading rate into the clarifier per *Ten States Standards*, Section 72.232 is calculated based on the design maximum daily flow rate plus the design maximum return sludge rate and the design MLSS under aeration. The threshold value of 35 lb/d/ft^2 is not being exceeded with current conditions.

2.4.1.5 Disinfection

A separate document has recently been prepared for the Town's UV disinfection system describing design and capacity issues (Molzen Corbin, June 2021[4]). Although hydraulically, the UV system is underloaded, the effluent limits have been reduced from the original design and the currently installed UV system is limited in providing sufficient dose to achieve permit compliance.

2.4.1.6 Dewatering

The sludge dewatering facilities at the treatment plant consists of a BFP unit designed to handle WAS up to 2% solids at a loading rate of 1,000 lbs./hr. An evaluation of the solids handling operations suggest that the BFP is currently being loaded at an average of 1,461 lbs./hr and will be loaded at an average of 1,813 lbs./hr at the end of this planning period. Per the Town's staff, current solid wasting operations involve running the BFP for 7 hours a day, 4 days a week, producing an average waste of 5-1/2 to 7 tons per day of caked solids to be landfilled. This equates to a solid loading rate range of approximately 1,571 lbs./hr to 2,000 lbs./hr, which is above the maximum recommended loading rate of 1,530 lbs./hr.

Due to the excessive solids loading rates onto the belt of the filter press, it can be expected that the operation of this dewatering unit struggles to meet its intended treatment levels. Poor solids capture rate is indicative of a BFP being overloaded in terms of its solid loading capacity. This undesirable capture rate can lead to excess solids being transported back to the head of the plant, increasing both the plants solids inventory and the age of the sludge, which can adversely affect the performance of the remaining treatment plant operations. Furthermore, a poor solids capture rate also means that the cake product at the end of the belt may not meeting the anticipated solid concentration (%), the cake product may be wetter than desired, resulting in greater hauling costs for the sludge disposal program.

2.4.1.7 Effluent Lift Station

The upstream effluent flow meter does not log peak hourly data, but the average day and max day conditions are shown.

2.4.2 Condition Assessment

The condition of the treatment plant structures and process equipment were field-assessed by the Engineer in January 2021 and supplemented by interviews with the Chief Operator. The following components were evaluated for each unit operation:

- Condition of the concrete / structure and coating system.
- Condition of equipment and operational issues.
- Condition of piping and coating system.
- Condition of metal work.

Evaluation Summary forms of the physical condition for the facilities listed in Table 2-8 are included in Appendix A. A brief summary of specific equipment deficiencies or concerns is presented in the Table 2-8.

TABLE 2-8
SUMMARY OF TREATMENT FACILITY PHYSICAL DEFICIENCIES AND CORRECTIVE ACTION

Treatment Facility	Deficiency or Concerns	Corrective Action
Influent Lift Station	Elevated platform severely corroded.	Replace elevated platform.
	Influent manholes interior concrete surfaces very corroded.	Rehabilitate existing manhole concrete walls, floor, and interior exposed concrete surfaces.
	Control panel not reliable and requires frequent replacement of electrical components.	Update and replace control panel.
	Fall protection.	Provide fall protection: replace grating and provide safety anchors.
Entrance Works	Mechanical Stair Screen is out of service. Drive chain needs to be replaced. During winter, ice builds up on the stair screen and shut down unit.	Replace drive chain; provide freeze protection or replace installed stair screen with winter package type mechanical screen.
	Channel slide plates are not functional and do not shut off flow.	Replace slide plates with in-channel fabricated self-contained slide gates.
	During winter, ice builds up in channels.	Install insulated cover plates over open channels.
	Lack automatic sampler for compliance sampling of influent flow.	Provide insulated automatic sampler at entrance works.
Aerated Grit Chamber	Steel platform above aerated grit chamber is rusted and showing signs of corrosion.	Sand blast steel surfaces and apply protective coating.
	Grit blower is not reliable and has operating problems. Exposed piping is corroded.	Replace grit blower and associated piping.
Hydrogitter	Experience freezing problem in grit screw and water supply pipes.	Provide freeze protection for grit screw and water supply pipes.
Fermenter Basin and Anaerobic Basin	Fall protection.	Provide secondary fall protection.
	Access across basins on south section is a safety concern.	Provide elevated bridge from center bridge platform along east wall to south for safety reasons.
	Abundant algae growth.	Cover RAS troughs with solid plates.

TABLE 2-8
SUMMARY OF TREATMENT FACILITY PHYSICAL DEFICIENCIES AND CORRECTIVE ACTION (continued)

Treatment Facility	Deficiency or Concerns	Corrective Action
Aeration Basins	Fall protection.	Provide secondary fall protection.
	Abundant algae growth.	Consider covering Stage 2 basins.
	Leak at inlet pipe at east wall of structure.	Repair leak at inlet pipe penetration through wall.
	Grating panels are installed without hold-down anchor clips. This is a safety concern.	Install hold-down anchor clips on grating panels.
	Some grating panels and supports are damaged or broken.	Replace broken panels and support members.
	Some guard rail brackets are broken.	Replace broken guard rail brackets.
Cascade Aerator Structure	Designed to aerate flow upstream of UV disinfection system. Installed aeration system does not entrain sufficient oxygen to meet permit limits.	Install a different style of post aeration system that utilizes diffused or mechanical aeration.
Blower Building	Water sprays from south evaporative cooler onto blower enclosures. Blower covers are corroding.	Replace or repair water spray on evaporative cooler.
	West wall motorized inlet air louvers have operational problems. South gravity wall louver is rusted, and louvers cannot be adjusted.	Replace west wall motorized louvers. Replace south wall gravity wall louver.

TABLE 2-8
SUMMARY OF TREATMENT FACILITY PHYSICAL DEFICIENCIES AND CORRECTIVE ACTION (continued)

Treatment Facility	Deficiency or Concerns	Corrective Action
UV Disinfection System	Installed UV Disinfection system does not operate properly. Have problems with UV bulbs. Algae grows in the UV channels.	• Replace UV Disinfection system to reduce overall operations and maintenance costs to ensure compliance with NPDES permit requirements. • Provide pre-screening of inlet flow. • Replace open aluminum grating panels with solid cover to mitigate algae growth.
Effluent Lift Station	Jib crane concrete base is damaged.	Repair or replace concrete base for jib crane.
	Installed covers in wet well and valve pit are not adequate to ensure fall protection.	Install man-rated safety netting as secondary fall protection.
	Valve pit floods with rainwater.	Ensure grading around structure prevents inflow. Vactor out after heavy precipitation events.
BFP	BFP has been in service for approximately 13 years and system components are in poor conditions.	• Replace rollers and bearings. • Pneumatic control system. • Belt wash station. • Filter belt. • Belt drive motor. • Air compressor. • Booster pump. • Inline mixer.
Polymer System	Overall condition is poor; polymer base platform is corroded.	Replace polymer feed system.
Washwater Pumping System	Bladder tank for Washwater pump skid was removed. Washwater system is operated in manual mode only.	Replace Washwater pumping system, hydropneumatic tank, and controls.

Recommendations for addressing the deficiencies and concerns noted above are discussed in Sections 5.0 and 6.0 of this Report.

2.4.3 Service Life Assessment

The MP includes a Service Life Assessment for the major infrastructure components of the treatment units. The assessment is used to predict the remaining useful service life and year the treatment component will reach its useful life, based on the year placed in service. The anticipated service life for the major components is based on criteria established by guidelines from the NMED. The Service Life Assessment for the Bernalillo Wastewater Treatment Facility is presented in Table 2-9.

TABLE 2-9
SERVICE LIFE ASSESSMENT FOR WWTP INFRASTRUCTURE 2021

Infrastructure Component	Year Placed In Service	# of Years In Service Since 2021	Anticipated Service Life, Years	Remaining Useful Life, Years	Reaching Useful Life, Year
Influent Lift Station and Pumps	2008	13		-	
Concrete Structure	2008	13	50	37	2058
Sewage Pumps	2008	13	20	7	2028
Process Piping, Fittings, Valves	2008	13	40	27	2048
Entrance Works	2008	13		-	
Concrete Structure	2008	13	50	37	2058
Manual Bar Screen	2008	13	40	27	2048
Mechanical Stair Screen	2008	13	20	7	2028
Aerated Grit Chamber Equipment	2008	13	20	7	2028
Grit Blower	2008	13	20	7	2028
Hydrogritter (replaced)	2017	4	20	16	2037
Fermenter Basin & Anaerobic Basin	2008	13		-	
Concrete Structure	2008	13	50	37	2058
Fermenter Diffusers and Piping	2008	13	25	12	2033
Anaerobic Mixer	2008	13	20	7	2028
North and South Aeration Basins	2008	13		-	
Concrete Structure	2008	13	50	37	2058
Coarse Bubble Diffusers	2008	13	20	7	2028
Fine Bubble Diffusers (replaced)	2020	1	10	9	2030
Aeration Piping and Valves	2008	13	25	12	2033
North and South Clarifiers	2008	13		-	
Concrete Structure	2008	13	50	37	2058
Air Lift Pumps	2008	13	25	12	2033
North and South Aerobic Digesters	2008	13		-	
Concrete Structure	2008	13		5	
Aeration System	2008	13		20	

TABLE 2-9
SERVICE LIFE ASSESSMENT FOR WWTP INFRASTRUCTURE 2021 (continued)

Infrastructure Component	Year Placed In Service	# of Years In Service Since 2021	Anticipated Service Life, Years	Remaining Useful Life, Years	Reaching Useful Life, Year
Cascade Aerator Structure	2019	2		-	
Concrete Structure	2019	2		50	
Blower Building	2008	13		-	
Metal Building Structure	2008	13		50	
Blowers	2008	13		20	
Compressors	2008	13		20	
UV Disinfection Building	2008	13		-	
Concrete Structure	2008	13	50	37	2058
Jib Crane	2008	13	30	17	2038
UV Disinfection Equipment	2008	13	20	7	2028
Washwater Pumping Skid and Tank	2008	13	20	7	2028
Effluent Lift Station and Pumps	1980	41		-	
Concrete Structure	1980	41	50	9	2030
Sewage Pumps	2008	13	20	7	2028
Process Piping, Fittings, Valves	2008	13	40	27	2048
Jib Crane	2008	13	30	17	2038
Sludge Feed Building	2002	19		-	
Metal Building Structure	2002	19	35	16	2037
Sludge Pumps (replaced in 2020)	2020	1	20	19	2040
Process Piping, Fittings, Valves	2002	19	40	21	2042
Overhead Crane	2002	19	30	11	2032
BFP	2008	13		-	
Metal Building Structure	2008	13	35	22	2043
BFP Components	2008	13	20	7	2028
Polymer System	2008	13	20	7	2028
Water Booster Pump	2008	13	20	7	2028
Sludge Conveyor	2008	13	20	7	2028
Sludge Drying Beds	1980	41	50	9	2030
Yard Piping	2008	13		-	
Piping	2008	13	50	37	2045
Buried Valves	2008	13	35	22	2030
Administration and Laboratory Building	2008	13		-	
Building Structure	2008	13	50	37	2045
Plant Electrical	2008	13	20	7	2015
Plant Standby Generator Set	2004	17	30	13	2034
Blower Standby Generator Set	2008	13	30	17	2038

3.0 FUTURE CONDITIONS

3.1 Growth Projections

A key consideration in evaluating growth potential in a community is the available developable land. The Bernalillo Planning and Zoning Department provided information on vacant property within the Town limits. Zoning categories include:

- Special Use (SU).
- Rural Residential (RR).
- Single Family Residential (R1).
- Commercial Residential (CR).
- Commercial (C1).
- Light Industrial (M1).

Table 3-1 shows already platted / approved developments along with zoned vacant land.

TABLE 3-1
DEVELOPMENT IN BERNALILLO

ZONING TYPE	LOTS UNDEVELOPED		
PLAT OR DEVELOPMENT APPROVED			
SU	52		
RR	159		
R1	32		
M1	14		
ZONING TYPE	**ACRES**	**APPROX. LOTS**	**NOTES:**
DEVELOPABLE LAND			
SU	8.72	9	Assume 1 ac lots
RR	347.53	1,262	RR = 12,000 sf min lot
R1	8.03	58	R1 = 6,000 sf min lot
CR	22.48	163	CR = 6,000 sf min lot
C1	35.69	36	Assume 1 ac lots
M1	100	10	Assume 10 ac lots

3.1.1 Population Growth

As noted in Section 2.1, the Town of Bernalillo identifies with the DASZs 1062, 2421, 2422, 2423, 2424, and 2425 from the MRCOG DASZ 2040 Socioeconomic Forecast. Applying the annual growth rate of 1.084% results in a planning year population of 11,625 (Table 3-2).

TABLE 3-2
MRCOG POPULATION PROJECTIONS

YEAR	POPULATION
2016	8,878
2017	8,974
2018	9,072
2019	9,170
2020	9,269
2021	9,370
2022	9,471
2023	9,574
2024	9,678
2025	9,783
2026	9,889
2027	9,996
2028	10,104
2029	10,214
2030	10,325
2031	10,436
2032	10,550
2033	10,664
2034	10,780
2035	10,896
2036	11,015
2037	11,134
2038	11,255
2039	11,377
2040	11,500
2041	11,625

Over the 20-year planning period of this document (2021 to 2041), the population is projected to increase by 2,255 people. At approximately 2.56 people/household[(1)], there would need to be around 880 houses added. As shown in Table 3-1, there is sufficiently zoned residential land to support this growth.

3.1.2 Commercial Growth

As identified in Table 3-1, the Town has a sizeable amount of land zoned for CR, C1, and M1 to support significant commercial development. It is assumed that commercial development will occur as it has historically to meet the demands associated with residential growth.

3.1.3 Industrial Growth

In consultation with the Town's Planning and Zoning Department, the industrial customers who may impact the WWTP are Bosque Brewing, Kaktus Brewing, and a potential future cannabis processing facility.

The Bosque Brewing facility, which is already connected to the Town's sewer system, is currently operating at about 65% capacity (13,000 barrels/year of beer). This MP will account for full capacity operation of the brewery (20,000 barrels/year of beer).

Kaktus Brewing (operating at 400 barrels/year with brewing capacity for 500 barrels/year) is served by a septic system but has expressed an interest in connecting to the Town. For planning purposes, their wastewater will be accounted for in the flow, loading, and solids projections.

The Town has been approached by developers interested in siting a cannabis processing facility in Bernalillo. The City of Portland, Oregon provides good information on their Environmental Services, Cannabis Industry webpage[5]. For Bernalillo, a possible facility is likely to involve a cannabinoid extraction process and an industrial kitchen (food production with cannabinoid oil). It is recommended that the Town update the sewer ordinance to require any extraction processes be closed loop systems (i.e., no discharge from the extraction process into the sewer system). Any kitchen facility should have a grease trap and a sampling manhole to monitor for any discharges containing higher than domestic strength waste. Additional surcharges should be levied for high strength waste.

3.2 Future Flows, Loads, and Solids Projections

3.2.1 Flow Projections

Over the 20-year planning period ending in 2041, it can be expected that the Town's wastewater flow into the treatment plant will be increasing at a rate that coincides with the expected population increase outlined in Section 3.1.1. In Section 2.1.3 of this planning document, a value of 70 gal/capita/day was established based on the average wastewater flow seen at the treatment plant over the years 2018 to 2020. A review of the Town's Water Conservation Plan does not suggest a reduction in the established 70 gal/capita/day planning value is warranted.

In addition to the population increase, it is safe to assume that the commercial growth in the area will experience a similar expansion. Although this expansion will likely increase the flow into the plant, the planning value of 70 gal/capita/day should account for those flows as it was produced including all current commercial users. The potential industrial customers mentioned previously are not expected to generate significant volumes of wastewater. Modest flows have been accounted for from the breweries and the cannabis processing facility.

Using the per capita flow value with the projected population at the end of the planning period and accounting for the industrial discharges, an average wastewater flow of approximately 0.83 MGD can be expected at the treatment plant at the end of this planning period. Additionally, to characterize the variability of flow that will be experienced at the treatment plant, a peaking factor was developed using an approach defined in the *Ten States Standards* which projected a peak hourly wastewater flow of approximately 2.74 MGD at the end of this planning period.

3.2.2 Loading Projections

In addition to an increase in the wastewater flow to the plant, an increase in the loading conditions at the plant will be experienced throughout the planning period. This average increase can be estimated using the planning values established in Section 2.1.3 of this planning document for the residential and commercial users. For the industrial customers:

- Bosque Brewing has been assumed to have wastewater scaled in quantity / characteristics based on historic wastewater sampling results for full capacity operations.
- Kaktus Brewing loadings were prepared assuming a similar wastewater to Bosque's, but scaled to the magnitude of their brewery.
- The cannabis processing facility was assumed to have domestic strength waste based on the Town updating their sewer ordinance.

Peak loading values for the various constituents were established using methods derived from the *Ten States Standards*. Table 3-3 presents the projected average and peak loadings of BOD_5, TSS, TKN, and TP. To mitigate the potential impact of yet to be defined potential industrial customers, it is recommended that the Town update their sewer ordinance to be protective of the treatment plant.

TABLE 3-3
PROJECTED ORGANIC LOADS

PARAMETER	AVERAGE CONCENTRATION (MG/L)	AVERAGE LOADING (LBS./DAY)	PEAK LOADING (LBS./DAY)
BOD	374	2,576	5,152
TSS	243	1,677	3,354
TKN	52	358	537
TP	8.8	61	92

3.2.3 Solids Projections

An evaluation of the current and future solids loading capacities was conducted using the current average loading conditions listed in Table 2-2 and the projected loading conditions spelled out in Table 3-3. As expected, similar to the increased organic loading and wastewater flow into the system, a comparable increase in the solids generated at the treatment plant can be expected. This increase in the biomass production can be attributed to both the increase in organic loading to the plant and the increased flow regimen experienced, Table 3-4 presents these findings.

TABLE 3-4
CURRENT / FUTURE
SOLID LOADING PROJECTIONS

SLUDGE PRODUCTION	CURRENT LOADING	FUTURE LOADING
Solids Loading, lb TSS/day	1,373	2,032
Solids Loading, lb VSS/day	1,167	1,737

Section 6.0 of this master planning document goes into detail on the existing solids processing equipment's capacities and the feasibility for their continued use into the future.

3.3 Future Permitting

The NMED Surface Water Quality Bureau (SWQB) defines the WQS for rivers, streams, lakes, and other surface waters through criteria imposed by NMAC 20.6.4. The criteria set forth in this code protects the water body for its intended use, designated by the NMAC, while also establishing antidegradation provisions to preserve the quality of the water source. This code was approved by the New Mexico's Water Quality Control Commission (WQCC) and has been in effect as of May 22, 2020. The Comprehensive Assessment and Listing Methodology (CALM) details how the SWQB evaluates surface water quality data to determine if WQS set forth by the NMAC are being met.

The EPA provides approval for tribes throughout the United States to administer WQS programs under Section 518(e) of the Clean Water Act (CWA) to be treated similarly to a state entity. The Pueblo of Sandia is one of the 74 tribes that was deemed eligible to administer a WQS program and are approved to regulate certifications under CWA Section 401 as of August 1993. The most recent update, effective March 9th, 2010, highlights the Pueblo of Sandia's surface WQS including, designated use criteria, antidegradation benchmarks, and other policies and regulations that establish requirements for waters of the tribe.

The NMED SWQB is in the process of completing their CALM for large rivers like the Rio Grande. Once the procedure has been adopted, the State will be able to assess the Rio Grande for nutrient impairment. The timeline for finalizing the evaluation method is unknown as of the publishing of this MP.

Additionally, once the nutrient assessment is completed, it will take more time to finalize the total maximum daily load (TMDL) and implement this into permits. Planning for total nitrogen (TN) or TP limits is not practical in this MP. It is noted, however, that the Aero-Mod treatment process is configured for both TP, and TN removal. This MP assumes that if nutrient limits are added to the NPDES permit, compliance will be attainable through minor to moderate process modifications.

Current permitting limits the discharge of effluent into the Rio Grande at 800,000 gallons per day or 0.8 MGD. Based on the flow projections for this planning period, it is expected that this threshold will be exceeded proximate to the year 2038. As the Town of Bernalillo gets closer to meeting and exceeding this permit limitation, an anti-degradation review with the SWQB and the Pueblo of Sandia will be necessary to increase the permitted discharge into the Rio Grande.

Assuming continued landfill disposal of the Town's sludge, permitting by the NMED SWB will remain in effect as discussed in Section 2.2 of this master planning document. Upon alteration of the wasting protocols and/or wasting quantities, prior to any waste being placed in a landfill, the SWB must be made aware of and approve the proposed changes. This notification must acknowledge the changes or deviations from the terms and requirements of the approved DMP and must be accepted and implemented by the proposed disposal facility. Furthermore, if the Town decides to pursue an alternate disposal method such as land application through composting or surface disposal at a dedicated disposal location, additional permitting through the EPA will be required.

4.0 OPERATIONS AND STAFFING EVALUATION

4.1 WWTP Staffing

4.1.1 Responsibilities

The primary responsibilities of the WWTP staff are to operate and maintain the facility properly, protect the State's water quality, and safeguard the community's monetary investment. The staff should have a technical understanding of the treatment processes, of process monitoring requirements to operate the facility, and make appropriate process adjustments to ensure compliance of the WWTP's disposal requirements.

The Utility Operator Certification is governed under State Statutory Authority of the Utility Certification Act, NMSA 1978, Title 20, Chapter 7, Part 4. Wastewater treatment facilities in the State of New Mexico are classified in four groups (Level 1 – 4 with Level 4 being the highest). The level required for any wastewater treatment facility is based on the population served and the type of treatment plant process. For the Town of Bernalillo, based on the population requirement, of under 10,000 people and for operating a nitrogen and phosphorus removal facility, a Wastewater Level 3 is required. However, after the population served exceeds 10,000 people, a Wastewater Level 4 certified operator will be required.

4.1.2 Current Staffing

The Town's wastewater department is currently staffed with five people. The duties of the current staff include:

- Facility maintenance / housekeeping.
- Equipment maintenance.
- Permit reporting.
- Operate and maintain 10 Collection System Lift Stations.
- Operate and maintain Detention Center sewage receiving station.
- Maintain gravity collection system.

- Respond to utility line spots from one-calls requests.
- Address sewer service orders .
- Address sewer backups.
- Review sewer service taps on new installations.
- Operate Laboratory and perform compliance and process control analyses.

4.1.3 Comparable Staffing

NMED regulations do not mandate a specific number of operators and only addresses wastewater certification level required for type of treatment facilities, etc. In order to estimate the staff size, two communities of similar population, treatment process, and equipment were selected to create a comparison. Table 4-1 describes the facilities as operated by the Town, the Village of Los Lunas, and the City of Espanola. The table also includes: average flow, population, total number of staff, operator level certification, and lab certification.

TABLE 4-1
COMPARABLE WASTEWATER DEPARTMENT STAFFING

Facility	Approx. Average Daily Flow MGD	Approx. 2020 Population	Total Number of Staff	Operator Certification Levels				Without Certification	Lab Tech Certification Levels			Comments
				4	3	2	1		3	2	1	
Bernalillo WWTP. Facilities include two lift stations, entrance works, secondary aeration process with clarifiers, UV disinfection, sludge pumping and dewatering, aerobic digester, sludge hauling. Staff also handles collection system: 10 lift stations, Detention Center sewage receiving station, collection system maintenance.	0.63	9,370	5	2	1	0	0	1	0	1	0	
Los Lunas WWTP. Facilities include two WWTPs, two entrance works, conventional aeration process with clarifiers, MBR plant, UV disinfection, sludge pumping, sludge thickening, sludge dewatering, aerobic digester and sludge hauling. Also run process lab tests in house. Staff also responsible for the Village's 21 lift stations.	1.4	16,061	11	2	1	1	1	6	1	0	1	Two staff members have dual certification as Operators and Lab Techs.
Espanola WWTP. Facilities include influent lift station, entrance works, conventional aeration process with clarifiers, UV disinfection, sludge pumping, sludge thickening (centrifuge), aerobic digester and sludge drying beds. Also run process lab tests in house. Staff responsible for all of collection including lift stations.	0.9	10,044	12	1	0	0	0	7	0	0	0	1 - Superintendent 1 - Office Manager 2 - Lab Techs 3 - Operators 2 - Collections 3 - Open Positions

4.1.4 Recommended Staffing

Based on a plant of this size and complexity along with the responsibility for maintenance of the collection system, it is recommended that the wastewater department should have approximately 10 to 11 staff members: six to seven operators (three or more certified), two certified laboratory technicians, and two staff members for the collections system.

4.2 WWTP Operations

4.2.1 Current Operations

The Town's WWTP operators do not currently conduct extensive process control sampling or system performance data tracking aside from what is required by their NPDES permit. This is not uncommon at small facilities with limited staffing. However, such practices make process troubleshooting and response to process upsets problematic as it is more difficult to establish any root causes. The following is a list of data that is collected by the WWTP Operators:

- Influent Sampling Parameters:
    - BOD_5, COD, TSS, TKN, Ammonia, Nitrate, Phosphorus.
- Activate Sludge:
    - MLSS in the aeration basins (probe based measurement).
    - Aeration Basin DO and Temperature.
    - Digester MLSS (probe based measurement).
    - Sludge Age.
- Effluent Sampling Parameters:
    - Flow, BOD_5, COD, DO, TSS, pH, TKN, Ammonia, Nitrate, Phosphorus, Arsenic, Adjusted Gross Alpha Values.
    - TSS of the Belt Press Cake.

4.2.2 Recommended Operations

To better track treatment process performance and evaluate issues of concern associated with operation, it is recommended that a more robust sampling program be established. In addition to a more inclusive sampling plan, a thorough maintenance logging / record keeping protocol can assist in the evaluation of process performance from year to year and can help identify necessary seasonal operational adjustments to maintain treatment effectiveness. The following is a list of a few recommendations that can help facilitate a more comprehensive sampling plan:

- Oxidation-Reduction Potential (ORP) is a helpful parameter for evaluating and achieving the necessary conditions within each individual biological treatment basin. These conditions are unique to the task that is being accomplished within the basin (nitrification, denitrification, biological phosphorous release, biological phosphorus removal, etc.) and the ORP value can help identify if the proper conditions are being met. An understanding of the ORP within each of the treatment basins is useful in identifying if the plant is operating as intended.
- In-basin pH values:
    - Anaerobic selector.
    - Stage 2 aeration basins when the air is on and off.
    - Digester basins when the air is on and off.
- SRT is a direct measurement of how old the sludge is in the system, and it has major implications on aeration demands and sludge production values. As the seasons change, the microorganisms that facilitate the treatment processes adapt and work faster and/or slower depending on the seasonal temperatures. It would be beneficial to experiment with varying SRT values and track the systems performance over time to have a better understanding of where the system operates best and when to adjust.
- Effluent temperature values are another crucial indicator of treatment process performance and should be evaluated on a consistent basis.
- Effluent salinity can provide insight into what steps may be necessary to implement an effluent reuse program in the future.
- Solids handling information:
    - Polymer usage for BFP.

- TSS of RAS and WAS.

It would be beneficial for treatment plant operations to establish an asset management plan that recognizes each piece of equipment within the facility, identifies preventative maintenance procedures for the equipment, tracks the maintenance completed on each piece of equipment, and provides clear and concise direction on what needs to be updated and when that update should take place.

4.3 WWTP Controls System

4.3.1 Current Control System

4.3.1.1 Entrance Works

The existing process of raw water at the Entrance Works incorporates the use of pumps, bar screens, a blower and other raw water processing equipment controlled and monitored by three control panels.

- Influent Pump Station – There are three 10 HP submersible pumps that lift the influent raw sewage coming into the plant up to a channel where it flows through either a manual bar rack or a mechanical climber screen to remove the larger items from the wastewater. These pumps are operated from controls in the Influent Pump Control Panel that receives information from floats in the wetwell and starts the required number of pumps to keep the level in the wetwell within a specific range. The controls also alternate between the pumps each time they are called to run to achieve evenly matched operation of each pump over time.

  The control panel contains the pump starters and operator interface devices that allow the operator to manually start and stop a particular pump as well as to provide the following indication of equipment status and alarm conditions:
  - HIGH and LOW Wetwell Level Alarms.
  - OVERTEMP Alarm for each pump.

- SEAL FAIL Alarm for each pump.
- GROUND FAULT Alarm for each pump.
- RUN Indication for each pump.
- Elapsed Run Times for each pump.

Dry contacts are available for pump RUN indication and the various alarms which allow information from the panel to be monitored from a future Supervisory Control and Data Acquisition (SCADA) system once connected.

- Screen / Press Equipment – The Screen / Press Control Panel interfaces with the Mechanical Stair Screen and the automated Screw Press equipment. Although the single panel controls both systems independently, a repeat cycle timer is incorporated to activate both systems when clogging of the screen causes the channel differential level across the screen to reach a predetermined setpoint.

  Pushbuttons, switches, and indication lights are provided on the exterior of the panel as follows:
  - An Elapsed Time Meter for both the Screen and Press.
  - Screen RUNNING.
  - Screen Over-Torque Alarm.
  - Press RUNNING.
  - Press Over-Torque Alarm.
  - Press Motor Overload Alarm.

  Dry contacts are available for RUN indications and the various alarms which allow information from the panel to be monitored from a future SCADA system. The panel also includes an Allen-Bradley MicroLogix 1000 program logic controller (PLC) that can be accessed should additional information need to be monitored by the SCADA system.

- Grit System Equipment – The Grit Removal System consists of an airlift pump, a dewatering screw, and a blower which removes grit from the influent sewage. The system uses a 24 hour timer to automatically start the removal cycle and separate cycle timers for the dewatering screw and the airlift pump to allow them to run for a preselected period of time. The blower operates continuously when manually switched on from a control operator on the front of the panel.

Pushbuttons, switches, and indication lights are provided on the exterior of the panel as follows:

- A Hand-Off-Auto switch to allow manual operation of the system.
- A Cycle Start pushbutton.
- An Elapsed Time Meter for both the Blower and Dewatering Screw.
- An Emergency STOP pushbutton.
- A Blower Jam/Overload indication light.
- A Dewatering Screw Jam/Overload indication light.
- A Blower RUN indication light.
- A Dewatering Screw RUN indication light.
- A Blower OFF/ON switch.
- An Airlift Valve OPEN pushbutton.
- An Airlift Valve CLOSE pushbutton.
- A Dewatering Screw START pushbutton.
- A Dewatering Screw STOP pushbutton.

Dry contacts are available to allow information from the panel to be monitored from a future SCADA system and consist of:

- Blower RUN indication.
- Dewatering Screw RUN indication.
- Blower Jam/Overload Alarm.
- Dewatering Screw Jam/Overload Alarm.

4.3.1.2 Biological Treatment System

The system which controls the removal of organics, nitrogen, phosphorous, and suspended solids from the sewage; the injection of air into the process stream to encourage the breakdown of solids; and the separation of the solid material from the liquid is handled by the equipment incorporated in this portion of the plant. The system is inclusive of a set of blowers powered from variable frequency drives (VFDs), instruments that measure dissolved solids, and settling basins which allow the solids to separate from the liquid so they can be pumped to a further dewatering process where additional liquid can be extracted.

The system at the Bernalillo Wastewater Treatment Facility, which provides all of these process functions, is designed and supplied by Aero-Mod, Inc. This is a complete activated sludge processing system specifically designed to remove nutrients from the liquid stream and provide adequate liquid / solid separation.

Aero-Mod furnished a control panel with an Allen-Bradley PLC that monitors all aspects of the treatment operation and controls the equipment utilized during the biological treatment process. The control panel incorporates a color touchscreen Operator Interface Panel (OIP) accessible from the exterior of the panel which allows the operator to monitor the status of all equipment, acknowledge alarms, check on process variables, and manually control some aspects of the process. Currently, this functionality as well as the color display screens is also available to the Plant Manager by way of a workstation located in his office.

4.3.1.3 Disinfection Building

- UV Disinfection System – While the solids are directed to aerated storage and dewatering equipment, the liquid is sent through a disinfection process. UV light has proven to inactivate bacteria to a level where the effluent water that leaves the plant and is pumped to the Rio Grande meets government mandated quality standards. The Bernalillo Wastewater Treatment Facility employs a UV system manufactured by Siemens that incorporates two banks of UV bulbs to provide the disinfection.

The unit has a control panel with an Allen-Bradley MicroLogix 1100 PLC programmed to control and monitor the system. There is a small OIP on the front of the control panel which allows operations and maintenance personnel to monitor the status of the system and to inspect system alarms. The panel is also used to start and stop the system and make select adjustments to its operation.

An ultrasonic level transmitter positioned over a Parshall Flume on the flow stream to the Effluent Pump Station measures the plant discharge flowrate and sends this signal to the UV controller to adjust the intensity of the UV bulbs. The PLC in the control panel can be accessed and provide status and alarm data should a future SCADA system be installed and connected.

- Washwater Pump Skid – Within the Disinfection Building, a washwater pumping skid provides non-potable water for washdown of certain plant process equipment and to be used with the plant's belt press dewatering equipment. The skid incorporates two 7.5 HP pumps and is controlled from a pump control panel mounted on the skid. The panel is equipped with four pressure switches and has the following pushbuttons, switches, and indication lights on the front of the panel:
  - Pump 1 Power ON/OFF switch.
  - Pump 2 Power ON/OFF switch.
  - Pump 1 Hand-Off-Auto switch.
  - Pump 2 Hand-Off-Auto switch.
  - Pump 1 Elapsed Run Time Meter.
  - Pump 2 Elapsed Run Time Meter.
  - Suction Pressure LOW Alarm.
  - System Pressure LOW Alarm.
  - Combination Motor Overload Alarm.

Dry contacts are available for the three alarms which can provide this information to a future SCADA system once installed and connected.

4.3.1.4 Effluent Pump Station

The control panel for the three 10 HP submersible Effluent Pump Station pumps just outside the Disinfection Building is a duplicate of the one being used for the Influent Pump Station pumps. The control panel contains the pump starters and operator interface devices that allow the operator to manually start and stop a particular pump as well as to provide the following indication of equipment status and alarm conditions:

- HIGH and LOW Wetwell Level Alarms.
- OVERTEMP Alarm for each pump.
- SEAL FAIL Alarm for each pump.
- GROUND FAULT Alarm for each pump.
- RUN Indication for each pump.
- Elapsed Run Times for each pump.

Dry contacts are available for pump RUN indication and the various alarms which allow information from the panel to be monitored from a future SCADA system once connected.

4.3.1.5 Sludge Pump Building

There are two 5 HP pumps in this building that are used to pump WAS from the aerated sludge holding tanks to the Sludge Processing and Belt Press Building. Electromagnetic flowmeters are employed to measure the discharge flowrate from the pumps. There is an existing control panel with an Allen-Bradley SLC 5/03 PLC programmed to monitor and control the pumps and record the flow values. The PLC is tied to two VFDs, one for each pump, to control the speed of the pumps and thus modulate the flowrate.

There are only two indication lights on the front of the Sludge Pump Control Panel, one for Pump 1 RUNNING and one for Pump 2 RUNNING. There is also an OIP on the front of the panel which allows the operator to view equipment status and alarms and to manually control the pumps. Points connected to the PLC are as follows:

- Pump 1 RUNNING indication.

- Pump 2 RUNNING indication.
- Pump 1 M/A Switch in Auto.
- Pump 2 M/A Switch in Auto.
- Pump 1 Flow.
- Pump 2 Flow.

This information could be connected to by accessing the data registers in the SLC 5/03 PLC so that it can be accessed by a future SCADA system.

4.3.1.6 Sludge Processing and Belt Press Building

There are three control panels in this building that interface with the Belt Press, the Polymer Injection Pumping System, and the Sludge Pumps in the Sludge Pump Building.

- Remote Sludge Pump Control Panel – This panel provides a remote control station that interfaces with the Allen-Bradley SLC 5/03 PLC in the Sludge Pump Building and allows the operator to increase and decrease pump speeds for Sludge Pump 1 and Sludge Pump 2. This provides a way to control the two sludge pumps and the flowrates of sludge to the belt press without having to walk to the Sludge Pump Building. There are also two indication lights on this panel which illuminate when a particular pump is running.

  The Remote Sludge Pump Control Panel also allows control of two valves on the discharge of the aerated sludge holding basins. There is a North Basin and a South Basin. These valves allow the operator to choose which basin they wish the sludge pumps to pump from. On the front of the control panel, there are indicating lights and a selector switch for each valve as follows:
  - North Basin Discharge Valve #1 OPEN Indication.
  - North Basin Discharge Valve #1 CLOSED Indication.
  - South Basin Discharge Valve #2 OPEN Indication.
  - South Basin Discharge Valve #2 CLOSED Indication.
  - North Valve #1 FAULT Alarm.

- South Valve #2 FAULT Alarm.
- North Basin Discharge Valve #1 in REMOTE Mode.
- North Basin Discharge Valve #1 in LOCAL Mode.
- South Basin Discharge Valve #2 in REMOTE Mode.
- South Basin Discharge Valve #2 in LOCAL Mode.
- North Basin Discharge Valve #1 OPEN/CLOSE selector switch.
- South Basin Discharge Valve #2 OPEN/CLOSE selector switch.

All of these points can be tied into a future SCADA system to allow monitoring and control of the valves remotely from a workstation.

- <u>Belt Press Control Panel</u> – This panel provides all control and monitoring of belt press equipment including control of the polymer feed system. This includes:
  - Air Compressor ON/OFF selector switch.
  - Air Compressor RUNNING indication light.
  - Washwater Booster Pump START/STOP pushbuttons.
  - Washwater Booster Pump RUNNING indication light.
  - Belt Drive START/STOP pushbuttons.
  - Belt Drive RUNNING indication light.
  - Belt Drive Elapsed Time Meter.
  - A rheostat to adjust Belt Drive Speed.
  - Discharge Conveyor START/STOP pushbuttons.
  - Discharge Conveyor RUNNING indication light.
  - Polymer System START/STOP pushbuttons.
  - Polymer System RUNNING indication light.
  - Sludge Pump START/STOP pushbuttons (out of service and not used).
  - Sludge Pump RUNNING indication light (out of service and not used).
  - A rheostat to adjust Sludge Pump Speed (out of service and not used).
  - Emergency STOP pushbutton.
  - Belt BREAK/OVERTRAVEL Alarm light.
  - Air Pressure LOW Alarm light.

- Polymer LOW Alarm light.
- Conveyor ZERO SPEED Alarm light.

This panel does not have a PLC and there are only a couple of dry contacts for a future SCADA system to connect to. Additional modifications to the panel will need to be made to provide adequate information to be accessed from the SCADA system.

- Polymer Feed System – There is a separate panel that the Belt Press Control Panel connects to which regulates the amount of polymer being injected into the sludge before it is dewatered by the belt press equipment. The panel connects to a diaphragm type chemical feed pump and provides some manual control over the polymer pump as well as indicate certain status information and alarms. These include:
  - Polymer Pump HAND/OFF/LOCAL/REMOTE switch.
  - Polymer Pump ON indication light.
  - Make Up Water LOCAL/OFF/REMOTE switch.
  - Make Up Water ON indication light.
  - A rheostat to manually control the speed of the polymer pump.
  - Polymer LOW Alarm light.

  There are a couple of dry contacts from this panel that can be connected to a future SCADA system such as:
  - Polymer Pump ON.
  - Polymer LOW Alarm.

4.3.1.7 Office Alarm Annunciator Panel

There is an annunciator panel inside the conference room in the Office Building that has indication lights displaying the following information:

- Generator #1 Automatic Transfer Switch (ATS) Power Failure.
- Generator #2 ATS Power Failure.
- Generator #1 Shutdown Failure.

- Generator #2 Shutdown Failure.
- Blower Failure.
- Influent Channel High Level Alarm.
- Washing Pressure Alarm.
- UV Failure.
- Bar Screen General Alarm.
- Effluent High Level Alarm.

Should a future SCADA system be installed at the plant, this panel can be removed.

4.3.2 Recommended Control System

4.3.2.1 SCADA System Upgrade

Other than the existing Aero-Mod biological treatment system and a few alarms connected to the Office Alarm Annunciator Panel in the Office meeting room, there is no consolidated integration of process equipment at the plant. Installing a new SCADA system would allow monitoring of the status and alarms of major equipment at each building, pump station, and valve station onsite. During the installation and configuration of the SCADA system, it may be desired to replace some of the existing package systems and/or pump control panels with new ones. These could then be designed to offer greater access to the data within that system by the SCADA software. If this approach is not pursued, new PLCs would need to access the limited points available in existing panels on order to provide monitoring and manual control of the existing equipment throughout the plant.

- New PLC Control Panels – Although there are one or two small package system PLCs located within the plant, these do not provide the interface needed to properly monitor and maintain the plant equipment. Therefore, three new PLC panels would need to be installed and connected to major plant components. The location of these panels would be as follows:

- The Entrance Works – This PLC would interface with status and alarm points available in the Influent Pump Control Panel, the Grit Classifier Control Panel, and the Screen / Press Control Panel. An Influent Flow Meter could also be installed on the discharge of the Influent Pumps to measure the amount of raw water being pumped into the headworks equipment.

- The Disinfection Building – A PLC should be installed in this building to provide connections to the Effluent Pump Station Control Panel, the UV Disinfection Control Panel PLC, the Washwater Pump Skid, and the existing flow meter measuring the effluent being discharged from the plant into the river.

- Sludge Processing and Belt Press Building – A PLC located in this building would tie into the Belt Press Control Panel, the Polymer Feed Control Panel, the Remote Sludge Pump and Basin Valve Control Panel, and could connect to data stored in the Sludge Pump Control Panel in the Sludge Pump Building by way of a new fiber optic cable installed between the two buildings.

The data points that would connect to the new PLCs is detailed in Section 4.3.1 – Current Control System within each subsection. Available points that are easily connected to are clearly identified in these sections.

Since there is an existing fiber optic cable network installed at the plant tying together all the major buildings with the Office, the SCADA system could connect to this communication method and have a high speed, high bandwidth path for data to reach a set of servers that would be located in the Office. Fiber optic cable is very robust and is impervious to lightning and other electromagnetic interference.

- <u>SCADA Servers and Operator Interface Equipment</u> – In order to display the status of equipment operating around the plant, log and store this information for trending purposes, display and log various critical alarms, and allow manual control of some of the equipment, a server, along with a uninterruptible power supply (UPS), interfacing with a fiber optic patch panel connected to the PLCs in the plant is mandatory. The server could be placed in a rack in the Maintenance Room of the Office and then connected to a workstation in the Plant Manager's office. The rack would also house the network firewall equipment to provide a secure interface with the Internet. A connection to the Internet is important and would allow operations and maintenance personnel to monitor alarms on a 24/7 basis.

4.3.3 Control System Costs

Table 4-2 presents a summary of the Control System Costs.

TABLE 4-2
CONTROL SYSTEM COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
SCADA IMPROVEMENTS				
Area 01 – Entrance Works	LS	1	$ 85,000	$ 85,000
Area 03 – UV Disinfection Building	LS	1	$ 30,000	$ 30,000
Area 04 – Sludge Pump Building	LS	1	$ 5,000	$ 5,000
Area 05 – Sludge Processing and Belt Press Building	LS	1	$ 30,000	$ 30,000
Area 11 – Office Building	LS	1	$ 30,000	$ 30,000
Plant System Integration	LS	1	$ 70,000	$ 70,000
			Subtotal:	$ 250,000
Undefined Elements 30.00%				$ 75,000
			SCADA IMPROVEMENTS TOTAL:	**$ 325,000**

5.0 LIQUID TREATMENT FACILITIES

Included in the following subsections are cost estimates for various liquid treatment improvements at the WWTP. The costs are presented on an improvement-by-improvement basis and do not account for Professional Services (e.g., Design, Bidding, Construction Administration, Construction Observation, etc.), Contractor General Conditions (e.g., Mobilization, Bonds, Insurance, Demobilization, etc.), or NMGRT. In Section 7.0, the improvements have been packaged into recommended projects for implementation which include these costs.

It also needs to be stated, that construction costs are highly variable at the time of writing this MP. The COVID-19 pandemic has created significant issues for material pricing and availability. A 30% multiplier has been applied to all estimates to account for undefined elements, contingencies, and some inflation. The Town should prepare an update to any cost estimate prior to pursing project funding.

5.1 Influent Gravity Sewer Interceptor

5.1.1 Gravity Interceptor Lines

The collection system piping outside of the plant site is beyond the scope of this planning effort. Once entering the WWTP, the existing 21-inch and 24-inch main interceptor piping is relatively new. In 2001, the 24-inch main interceptor collapsed and underwent an emergency repair with slip lining of a 21-inch HDPE pipe. The remainder of the influent piping is ductile iron and was installed as part of the 2008 plant upgrade project.

Given the corrosion and collapse that occurred previously, it is recommended that the Town have this piping inspected with a closed circuit television (CCTV) camera soon and then again every 7-10 years. With no recent camera footage, a determination cannot be made about the need for improvements. However, piping generally has a service life of about 50 years and this piping is 20 years old, or less. It is likely suitable for continued use for the remainder of the planning period.

5.1.2 Conveyance Manholes

The manholes on the influent interceptor to the plant are extremely corroded. These manholes are located just upstream of the influent wet well and are subject to extreme cases of variable turbulence dependent on the flow of sewage coming into the plant. Due to the high turbulence and the presence of hydrogen sulfide in the sewage, sulfuric acid attack via Microbially Induced Corrosion (MIC) can be attributed to the extensive corrosion of both the metal covers and the underlying concrete structure identified at these manholes.

In-situ manhole rehabilitation generally incorporates the removal of any structurally deficient concrete and coating systems, rebuilding of the deteriorated concrete surface and replacement of any deficient members, followed by installation of a new liner using slip lining (e.g., fiberglass reinforced plastic [FRP] insert), cured-in-place liners, grout-in-place liners, or epoxy coatings which will provide a high level of future corrosion resistance. In-situ manhole rehabilitation is more cost effective because it avoids costs associated with excavation, however, if the corrosion is too severe then the manholes will need to be replaced.

5.1.3 Influent Interceptor Costs

Table 5-1 presents a summary of the Influent Interceptor Costs.

TABLE 5-1
INFLUENT INTERCEPTOR COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
GRAVITY INTERCEPTOR LINES				
CCTV Existing 21″ and 24″ Sewer Lines.	LS	1	$10,000	$ 10,000
			Subtotal:	$ 10,000
			Undefined Elements 30.00%:	$ 3,000
			GRAVITY INTERCEPTOR TOTAL:	**$ 13,000**

TABLE 5-1
INFLUENT INTERCEPTOR COSTS (continued)

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
CONVEYANCE MANHOLES				
By-Pass Pumping for Manhole Work Including Pump Rental, Installation, Removal, Services, and Delivery / Pickup.	Days	20	$ 750	$ 15,000
Manhole Wall Rehab, Category 3 (Rebar Visible / Crumbling Concrete, 1″ to 2″ ASTM D4258 and SSPC-SP13 Prep, Pointing with Tnemec Series 215 Surfacing Epoxy, 1-3 DFT Zebron Low Temp Epoxy Primer, 125 DFT Zebron #386 Lining).	VLF	34	$ 700	$ 23,800
Manhole Bench Rehab, Category 3 (Rebar Visible / Crumbling Concrete, 1″ to 2″ Strongseal Lining + Zebron Coating as Above).	SF	102	$ 95	$ 9,690
Subtotal:				$ 48,490
Undefined Elements 30.00%:				$ 14,600
CONVEYANCE MANHOLES TOTAL:				**$ 63,100**

5.2 Main Plant Lift Station

5.2.1 Submersible Sewage Pumps

All three of the submersible sewage pumps located in the influent lift station wet well were installed in 2008 but have been repaired or overhauled since. These types of pumps typically have a service life of at least 20 years in this type of application, making them feasible for continued use until at least the year 2028.

From a capacity standpoint, two pumps operating will produce approximately 1,738 gpm or 2.5 MGD. Based on the growth projections, the peak flow may surpass this capacity (around 2032). It is suggested that when the pumps are replaced, they be upsized to a 15 HP pump (Flygt NP 3153-436). One pump will be capable of approximately 1,200 gpm at 28 feet of TDH while two pumps will produce about 1,950 gpm at 36 feet TDH. At the time the pumps are replaced, it is recommended that the pump control panel be replaced and VFDs be installed to allow the pumps to ramp up and down. Installing an ultrasonic transducer in the wet well will allow these new pumps to vary flow and maintain a set elevation in the wet well. This modification will also be better for the downstream biological treatment process in providing a consistent stream of influent wastewater versus cycling and sending slugs of flow.

An estimate (see Section 5.2.4) has been prepared for replacing the pumps based on service life with slightly a larger capacity to meet the 20 year peak flow (2.74 MGD). The estimate also includes replacing the control panel and making changes to the level sensing to facilitate flow pacing into the WWTP.

5.2.2 Steel Platform and Grating

The steel grating / access platform located directly above the influent lift station wet well at the davit crane for pump removal is severely corroded due to its materials of construction (primed steel), location, and the highly corrosive nature of the influent sewage. This platform needs to be replaced as it is creating a safety hazard for all who must stand up there during pump removal.

Furthermore, no fall protection exists for the removable aluminum grating sections above the wet well. Some of these panels must be removed for extraction of the submersible pumps. When that grating is removed, the primary fall protection device is no longer in place and a secondary means of fall protection should be in place.

Modification / improvements include the complete removal and replacement of the primed steel platform and railing system with a new one that utilizes aluminum materials to match the adjacent and which has better corrosion resistance properties. Additionally, the installation of fall protection anchorage for accessing the wet well has been included. A breakdown of the costs associated with these improvements is detailed in Section 5.2.4.

5.2.3 Control Panel

The main plant lift station control panel causes issues for the plant operators, requiring frequent replacement of electrical components and untimely faults / tripping of the system. With no definitive reason for the deterioration of the electrical components, it is hypothesized that the culprit of the corrosion and failure of the electrical components is attributed to hydrogen sulfide gas intrusion. Although not well documented, in the appropriate environments (humidity and temperature), hydrogen sulfide gas can interact and form chemical reactions with the electronics inside the control panel. These interactions lead to the corrosion of the electrical components within the panel and the ultimate failure of the control panel itself.

Given the age of the existing panel, it is recommended that it be replaced. At the time of the panel replacement, the incoming conduit gas seals should also be replaced. As noted above for the sewage pumps, VFDs should be installed for the pumps and a control loop to an ultrasonic transducer for level sensing. The existing floats will serve as backup should the transducer fail.

5.2.4 Main Plant Lift Station Costs

Table 5-2 presents a summary of the Main Plant Lift Station Costs.

TABLE 5-2
MAIN PLANT LIFT STATION COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
SUBMERSIBLE SEWAGE PUMPS AND CONTROLS				
Bypass Pumping Including Pump Rental, Installation, Removal, Services, and Delivery / Pickup.	Days	10	$ 750	$ 7,500
Removal and Replacement of the Existing Influent Wet Well Pumps with New Larger 15 HP Flygt NP3153-436 Pumps.	EA	3	$ 50,000	$ 150,000
Removal and Replacement of Pump Control Panel. New Panel to Include Level Setpoint Control, MiniCAS, and VFDs.	LS	1	$ 75,000	$ 75,000
Installation Of Ultrasonic Level Transducer In Influent Wet Well.	EA	1	$ 10,000	$ 10,000
Subtotal:				$ 242,500
Undefined Elements 30.00%:				$ 72,800
SUBMERSIBLE SEWAGE PUMPS AND CONTROLS TOTAL:				**$ 315,300**

TABLE 5-2
MAIN PLANT LIFT STATION COSTS (continued)

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
STRUCTURAL MODIFICATIONS				
Reapply Coating / Paint to Exposed Piping and Valves Directly Above the Wet Well.	LS	1	$ 7,500	$ 7,500
Remove and Replace Steel Grating / Access Platform and Railing Above Influent Lift Station Wet Well Near Pump Davit Crane with an Aluminum Platform and Railing System.	LS	1	$ 20,000	$ 20,000
Installation of Fall Protection Anchorage for Access to Influent Wet Well.	LS	1	$ 10,000	$ 10,000
			Subtotal:	$ 37,500
			Undefined Elements 30.00%:	$ 11,300
			STRUCTURAL MODIFICATIONS TOTAL:	**$ 48,800**

5.3 Entrance Works

5.3.1 Flow Measurement

As noted in the capacity assessment (Section 2.4.1), to better account for the wide variability of sewage flow into the plant over the course of a day, an influent flow measurement device is crucial. A flow measurement device would eliminate the guess work involved with trying to evaluate the peak hourly flow capacities of the equipment associated with the entrance works facilities, ensuring they are not being hydraulically overloaded. Furthermore, having an instantaneous measurement of the flow coming into the plant at any given time allows for comparisons to be drawn against the secondary treatment processes hydraulic and solid loading capacities for peak instantaneous flows.

The *Ten States Standards*(3) identify that an influent flow measurement device is recommended at all treatment facilities where the design peak hourly flow is 350 gpm or greater. Traditionally, flow measurement has been accomplished via Parshall flumes in gravity flow situations and with electromagnetic flow meters for pressurized installations.

At the Bernalillo WWTP, the entrance works open channel flow configuration does not lend itself for addition of a gravity flow measurement flume. However, the influent lift station that feeds directly into the entrance works, converges to an 8-inch pressurized DIP line on the north side of the entrance works structure that has potential to be outfitted with an electromagnetic flow meter. The costs for installing this flow meter have been included in Table 4-2, located in Section 4.3.3.

5.3.2 Isolation Slide Plates

In the entrance works open channels, slide plates are used to isolate either the manual screen or the mechanical screen channels as well as for bypassing the aerated grit. These slide plates are extremely hard to remove and they do not completely isolate the flow of sewage from the offline channel. To remedy this issue, it is recommended that these isolation slide plates be replaced with more reliable, in-channel, prefabricated, self-contained slide gates.

5.3.3 Manual Bar Screen

Used primarily as a backup for the mechanical screen, the manual bar screen is in good condition for operation into the future. Frequent cleaning of this screen is necessary to maintain its designed hydraulic capacity and to avoid flooding as a result of clogging the screen.

5.3.4 Mechanical Screen

Installed in 2008, the mechanical stair screen is still within its designed service life of 20 years. However, it has not been in operation due to the chain for the drive system being broken. The WWTP recently began receiving quotes to replace this drive chain with a newer one but has yet to move forward with the procurement. Upon replacement of this drive chain, the mechanical screen can be placed back into operation as intended throughout the remainder of its service life.

During the planning period, the mechanical screen will need to be replaced. The existing stair screen has experienced numerous operational problems since its initial installation. Any replacement screen should include a cold weather package to mitigate the freezing problems that have occurred with the existing screen. At the time the Town elects to replace the screen, another style of screen should be considered with a cold weather package. Possible alternatives include:

- Rotating Rake Style Screen with Separate Washer / Compactor::
  - Duperon Flex Rake Screen.
  - Lakeside Equipment Raptor FalconRake Screen.
  - Huber RakeMax Screen.
- Inclined Semi-Cylindrical Screen with Integral Washer / Compactor:
  - Lakeside Equipment Raptor Fine Screen.
  - Huber Micro Strainer Rotamat Screen.
  - Parkson Hycor Helisieve Screen.

5.3.5 Aerated Grit Chamber

Issues with the aerated grit chamber at the treatment facility were highlighted in Section 2.4.1 of this report. The air being supplied to this basin is on the high end of recommended design standards and the basin configuration may be leading to short circuiting. In an over-aerated condition, the grit particles remain in suspension and are less likely to settle out to the bottom of the basin. In addition, the square geometry of this basin is not ideal.

The grit blower and grit chamber equipment will reach the end of their service life around 2028. Pricing has been prepared (see Section 5.3.7) for this equipment replacement. Additionally, it was mentioned in Table 2-7 that the steel platform above the aerated grit chamber is rusting and showing signs of corrosion. This will be replaced with the aerated grit equipment package.

5.3.6 Grit Classifier

The Amwell hydrogritter, grit washing system was replaced in 2017. Since initial startup of this grit washing system, there have been operational issues that have led to improper functionality of the system. These operational concerns can be attributed to the poor grit removal being accomplished in the aerated grit chamber as discussed previously. Furthermore, operators have noted freezing conditions in winter months leading to complete shutdown of the unit all together. These concerns can be addressed by insulating all the associated waterlines that are experiencing freezing during the harsh months of winter. Replacement of this equipment is likely to be needed at the very end of the planning period.

5.3.7 Entrance Works Costs

Table 5-3 presents a summary of the Entrance Works Costs:

TABLE 5-3
ENTRANCE WORKS COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
SCREENING AND INFLUENT CHANNEL MODIFICATIONS				
Replace Channel Slide Plates with Channel Gates / Operator.	EA	6	$ 16,000	$ 96,000
Installation of Cover Plates Over Open Channels.	LS	1	$ 15,000	$ 15,000
Removal and Replacement of the Mechanical Stair Screen with a Cold Weather Package Rake-Style Screen.	LS	1	$ 300,000	$ 300,000
Removal and Replacement of the Screenings Washer / Compactor.	LS	1	$ 82,000	$ 82,000
Subtotal:				$ 493,000
Undefined Elements 30%:				$ 147,900
SCREENING AND INFLUENT CHANNEL MODIFICATIONS TOTAL:				**$ 640,900**
GRIT CHAMBER MODIFICATIONS				
Removal and Replacement of Aerated Grit Chamber Equipment.	LS	1	$ 220,000	$ 220,000
Removal and Replacement of the Aerated Grit Blower Package.	LS	1	$ 34,800	$ 34,800
Installation of Freeze Protection Insulation for “Hydrogritter” Piping.	LS	1	$ 15,000	$ 15,000
Subtotal:				$ 269,800
Undefined Elements 30%:				$ 81,000
GRIT CHAMBER MODIFICATIONS TOTAL:				**$ 350,800**
GRIT CLASSIFIER REPLACEMENT				
Removal and Replacement of the “Hydrogritter” Grit Separator with a Weather Packaged Grit Separation Unit.	EA	1	$ 147,000	$ 147,000
Electrical Control Package for Automatic Operation of the Installed Grit Classifier.	LS	1	$ 35,000	$ 35,000
Subtotal:				$ 182,000
Undefined Elements 30%:				$ 54,600
GRIT CLASSIFIER REPLACEMENT TOTAL:				**$ 236,600**

5.4 Biological Treatment Process

The existing biological treatment process is a proprietary design marketed by Aero-Mod, Inc. (Manhattan, KS) called Sequox® which consists of preliminary-treated influent hydrolysis, an anaerobic selector, primary aeration basins, secondary aeration basins, and rectangular secondary clarifiers. The process is intended to remove phosphorus (P) by EBPR and nitrogen (N) by sequential aeration as well as BOD_5 and TSS.

Biological stabilization of municipal wastewater is accomplished by microorganisms that utilize the resources available in the influent wastewater for growth. For example, BOD_5 is removed by *heterotrophic* organisms (organic carbon lovers) that utilize the organic matter under aerobic (aerated) conditions for growth. N and P removal mechanisms are more complex and are well beyond the scope of this document. However, two issues with the current design are worth noting. First, N removal requires the conversion of influent NH_3-N to NO_3-N by organisms that use inorganic carbon (CO_2) as their carbon source followed by the conversion of NO_3-N to nitrogen gas by organisms that use organic carbon (BOD_5). The Town's existing process relies on the first step occurring in the primary aeration basins and the second step in the secondary aeration basins. Unfortunately, there is little to no organic carbon available in the secondary aeration basins and the NO_3-N converting microbes must rely on endogenous respiration for their organic carbon, which is very inefficient for this purpose. Second, P removal requires cyclically exposing the sludge to anaerobic and anoxic or aerobic conditions. This requires special attention and management of the environmental conditions that develop within a WWTP to maintain optimum performance. The use of airlifts for RAS pumping introduces excess air into the process which results in oxygen being recycled into the anaerobic selector, thus inhibiting the PAO metabolism.

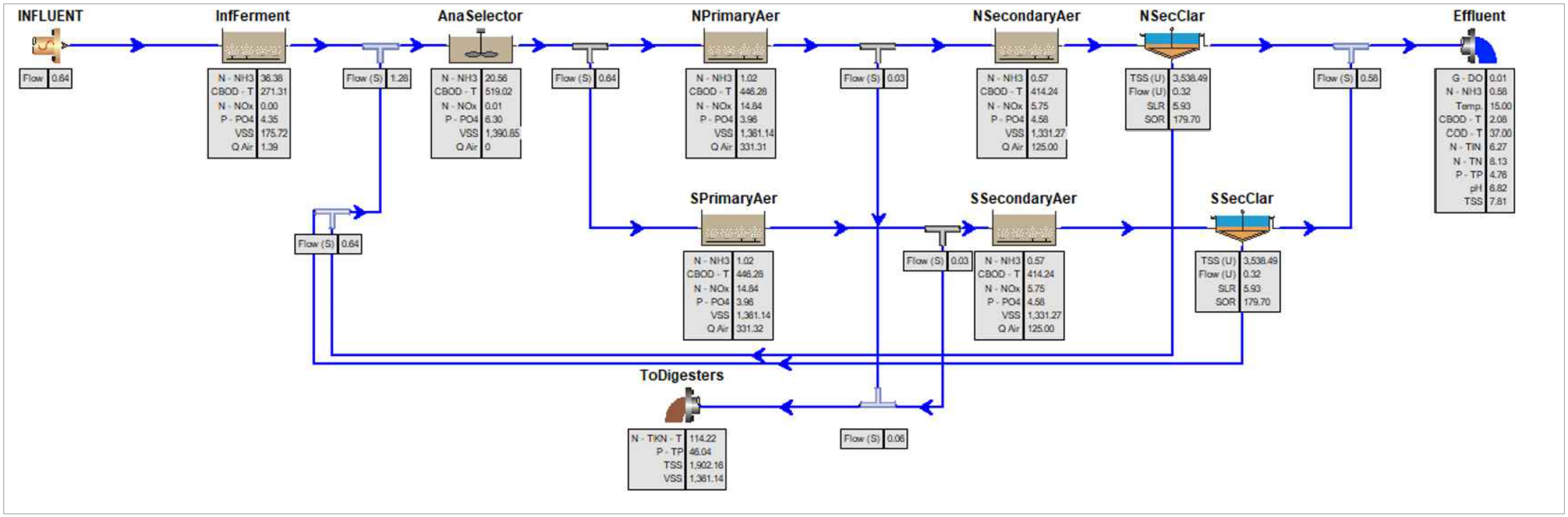
Another complication arises when EBPR and N removal are attempted simultaneously, as is the case in Bernalillo, since P removing microbes grow (and die) relatively quickly and N removing microbes grow much more slowly. Typical SRTs for P removal only range from 8 to 12 days, whereas N removal SRTs are 12 to 20 days. Furthermore, the optimum SRT varies with temperature and many facilities do not vary their SRT seasonally despite large swings in the average operating temperature.

5.4.1 BioWin Modeling

A BioWin model was prepared to aid in the evaluation of the biological treatment process performance using the projected future conditions. A BioWin flow sheet of the treatment process is shown in Figure 5-1.

The model default conditions were utilized due to a lack of detailed influent sewage characterization that would have been required to warrant changes. Additionally, diurnal curves were prepared for flow and loading to the plant to approximate the dynamic conditions which occur throughout the day. Using the facility's design SRT of 18 days, scenarios were run for 2021 (current), 2031, and 2041. Each scenario was run for approximately three SRTs to evaluate performance over time and at varying temperatures. The goals for the model runs were to determine:

- Aeration demand, particularly peak conditions;
- Solids production; and
- Effluent quality performance versus permit requirements.



WASTEWATER TREATMENT PLANT MASTER PLANNING DOCUMENT - TOWN OF BERNALILLO, NEW MEXICO

MOLZENCORBIN

BIOWIN SCHEMATIC

FIGURE 5-1

5.4.2 Aeration Capacity

The plant was designed for influent BOD load of 2,500 lb/d but has exceeded that even at influent flows approximately half of the design flow. It was also noted previously in Section 2.4.1.3 that the capacity of the aeration system does not appear to account for diurnal fluctuations and peaking of the influent loading (BOD_5 and TKN).

The BioWin model was utilized to calculate the process aeration requirements for current (2021), 2031, and 2041. Ancillary aeration requirements were also noted in the Aero-Mod Operation and Maintenance (O&M) Manual for the digesters, periodic mixing of the fermenter basin, and the RAS / scum air lift pumps associated with the final clarifiers. The modeling for current (2021) shows the process aeration demands plus original design ancillary aeration requirements are essentially at the capacity of the blowers which can deliver about 3,434 scfm. The future scenarios (2031 and 2041) show the need for more air to maintain treatment efficacy. Table 5-4 shows the summary of the modeling results for air requirements plus the original design ancillary aeration requirements.

Hand calculations were also performed to verify the BioWin modeling results. Assuming a 25%-30% process aeration savings from denitrification (which is reasonable given the activated sludge basin configuration), the calculated aeration demands align well with the modeled results.

TABLE 5-4
BIOWIN AERATION RESULTS

Year	Process Aeration (SCFM)			Ancillary Aeration (SCFM)			Total Required (SCFM)
	Minimum	Average	Maximum	Digesters	Fermenter	Clarifiers	
2021	1,113	1,796	2,741	521	76	160	3,498
2031	1,496	2,183	3,354	521	76	160	4,111
2041	1,602	2,368	3,633	521	76	160	4,390

5.4.3 Solids Production

The BioWin modeling effort was utilized to determine the waste solids production from the biological treatment process for current, year 2031, and year 2041. The model's prediction for current sludge production matches quite closely with the actual dewatering operations being performed by the Town. Preliminary hand calculations for the solids production were also performed as another form of model verification and they aligned well with BioWin results. The solids projections for the facility are presented in Table 3-4 from Section 3.2 and are utilized in the equipment evaluations in Section 6.0.

5.4.4 Effluent Quality

When applying sufficient air to meet the oxygen demands for the activated sludge system, the BioWin modeling results show that the Aero-Mod treatment process will continue to produce a very high effluent quality for the projected flows and loads.

- BOD_5: 6-10 mg/L
- TSS: 10-15 mg/L
- TN: 7-10 mg/L
- TP: 3-6 mg/L

5.4.5 Nutrient Removal

Although the current permit does not include effluent limits for nutrient removal, only monitoring, there is potential for the Town to receive limits in the future. There are several metrics by which WWTPs can be assessed for viability of nutrient removal and influent composition is one of the key driving considerations. An influent BOD_5 to N ratio of at least 4:1 and an influent BOD_5 to P ratio of at least 30:1 are considered requirements for successful removal of N and P using biological processes. Considering the historic data from 2018-2020 (presented in Section 2.1.1) and the projected flows and loads, the Town has influent characteristics that should promote successful biological nutrient removal:

- BOD_5:N = around 6:1
- BOD_5:P = around 40:1

Biological nutrient removal can be challenging to consistently maintain, particularly with the variable nature of BOD, N, and P concentrations / loads coming into the plant. A detailed process control strategy will need to be implemented if the Town ends up with nutrient limits. The Minnesota Pollution Control Agency published a helpful guide on Biological Nutrient Removal in 2011. A copy of this guide has been emailed to the Town as a reference.

5.4.6 Process Alternatives

The future design conditions were provided to Aero-Mod so they could evaluate and provide recommendations for improvements to their proprietary Sequox® treatment process. Their recommendations are found in Section 5.4.6.1.

In the event that the Town's permit changes to include total nutrient removal at stringent levels (TN<7 mg/L and TP<3 mg/L), the Sequox® process may struggle to provide consistent compliance. A possible modification of the existing basinage has been presented in Section 5.4.6.2.

5.4.6.1 Sequox®

Aero-Mod reviewed the future design conditions for the WWTP and independently modeled the biological treatment process. Their conclusions were that the existing basinage was adequate from a treatment perspective, but additional air delivery was needed for proper operation and compliance.

The recommended upgrades from Aero-Mod took into consideration the need for more aeration capacity, as well as some improvements that have been made to the Sequox® process since the Town's plant was constructed. In summary, the proposed modifications include:

- The fermenter and the anaerobic selector basins would remain as is. However, the submersible mixer in anaerobic selector tank may need be replaced for service life reasons depending on when construction were to occur.

- Make changes to the existing aeration header configuration. Currently, there are separate blowers and air delivery lines for the fine bubble diffusers and the coarse bubble diffusers / air lift pumps. In the new configuration, a single, common air header would be utilized. To control the air delivery, air flow meters would be installed to the first stage aeration basins and actuated positioning valves with air flow meters would be installed on the air delivery lines to the digesters and to the second stage basins.
- The existing fine bubble diffusers are insufficient for the needed air flow rates. New drop aerators with six diffusers per drop (WA-PF6-2) would replace all of the existing four diffuser drops (WA-PF4-2). Also, the air drop piping will be upsized from 1.5 inch diameter to 2 inch diameter.
- The ancillary aeration requirements were updated by Aero-Mod to be in accordance with their current design standards. The digesters would be allocated 1,552 scfm of air flow (meeting the *Ten States Standards*(3) recommendations for 30 scfm/1,000 cf of basin volume) and would allow for both basins to be aerated simultaneously. The fermenter mixing and clarifier air lifts have been combined into a single air requirement of 181 scfm. Combined with the process air demands, a total air flow capacity to the Aero-Mod structure was determined to be about 5,000 scfm.
- New Insite DO probes would be installed in the first stage aeration basins and the second stage aeration basins to serve in the aeration control loop.
- Provide a new Master PLC control panel to replace the existing.
- Blower Building Improvements (pricing included in Section 5.5):
    - The six existing 50 HP blowers would be replaced with four new 125 HP units with greater capacity. New VFDs would also be needed for the larger blowers.
    - The Master PLC and blower VFDs should be installed in an air conditioned space to promote longevity. During design, a space could either be identified in the existing blower building to be enclosed or a separate room could be constructed outside, but adjacent to the existing building.

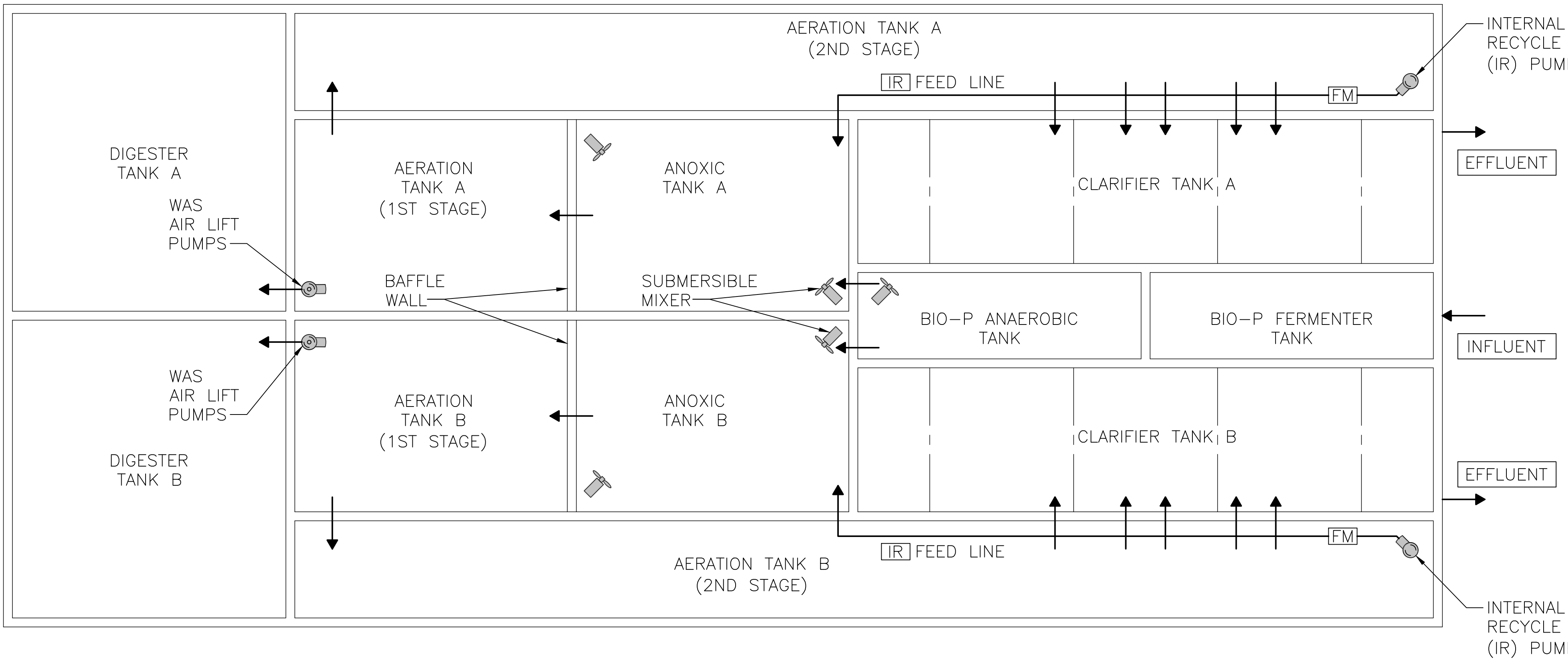
Appendix B includes some figures from Aero-Mod reflecting the proposed modifications. Budgetary costs for these Aero-Mod improvements are noted in Section 5.4.8.

5.4.6.2 Anaerobic / Anoxic / Oxic (A2O) Process

If the Town is faced with nutrient limits beyond the capabilities of the Sequox® process, it would be possible to convert the existing basinage into an A2O process. To accomplish this configuration:

- Side stream fermentation of RAS is frequently used to boost influent organic carbon availability for EBPR. Sending 25% to 50% of the RAS flow to the Bio-P Fermenter Tank may be beneficial because it will ensure that an adequate supply of organic carbon is fed into the Bio-P Anaerobic Tank while simultaneously reducing inhibitory nitrate loading.
- The anaerobic selector tank would remain as is. However, the submersible mixer may need be replaced for service life reasons depending on when construction were to occur.
- The current Stage 1 aeration basins would be bisected to create an anoxic reactor immediately following the anaerobic basin. A baffle wall would be installed in the middle of the Stage 1 basin to create this zone. The anoxic basin would have the fine bubble diffusers removed and mixers installed.
- The current Stage 2 aeration basins would have the coarse bubble diffusers removed and replaced with fine bubble diffusers. These basins would no longer cycle but would instead receive continuous air. At the end of these basins, internal recirculation pumps would be added with discharge piping routing nitrified mixed liquor back to the beginning of the anoxic reactors (previously the first half of the State 1 aeration basins). The typical rate for an internal recycle in the A2O configuration is 1Q-3Q (Q being the influent flow rate).
- A new Master Process PLC with human machine interface (HMI) and system integration would be needed to automate this process configuration.

Figure 5-2 presents a schematic layout of what this configuration would look like. A modification of this magnitude would require a significant construction project and has complexities associated with maintaining effluent compliance while basins are being modified.



A20 PROCESS LAYOUT

FIGURE 5-2

A change in the process such as switching to A2O would likely only be considered if the Town were to receive stringent nutrient limits in a future permit. The A2O process allows for greater operator control and adjustability, enabling optimization to achieve lower nutrient limits. A budgetary cost estimate for making this conversion is included in Section 5.4.8 The costs for changing out the blowers would be in addition to this estimate and is presented in Section 5.5. The air demands are expected to be similar to those calculated for the Aero-Mod Sequox® process.

5.4.7 Miscellaneous Improvements

As described in Section 2.4.2, a condition assessment was performed for the WWTP as part of this MP. Table 2-7 and Appendix A present a listing of deficiencies identified for the biological treatment process structure. Suggested improvements to address these deficiencies include:

- Install secondary fall protection at locations where primary fall protection is prone to removal. This would likely consist of a man-rated post anchored to the existing concrete walls with an anchor point on top for connecting a lanyard.
- Install an access bridge on east side of tankage to connect the basin walkways.
- Repair leak at inlet pipe on east wall.
- Add hold down anchor clips to grating panels.
- Repair damaged and/or broken grating panels, handrail, brackets, etc.
- Algae control:
    - Floating balls: Numerous manufacturers offer ballasted balls for floating cover applications. These are often utilized in lagoon-based treatment systems for algae control or can be used to cover reuse water impoundments to minimize evaporation losses. At the Bernalillo plant, the algae growth seems to be most problematic in the second stage aeration basins and in the clarifiers. The floating balls are not likely to interfere with treatment in the second stage aeration basins but could cause problems in the clarifiers. The cost estimate in Section 5.4.8 includes budgetary pricing for covering the second stage aeration basins.
    - Cover entire structure: It would not be feasible to construct an overhead cover system for only a portion of the Aero-Mod package. Building a shade structure over all of

the basins would need to cover about 17,500 square feet. High level pricing assembled with information from RS Means CostWorks puts this around $500,000-$750,000. If the Town wishes to pursue this improvement further, additional information can be provided prior to design.

- Cover RAS Troughs: Algae accumulation and possible growth appears evident in the RAS troughs from clarifiers to the anaerobic selector. Covering the open grating panels with a solid cover system will help to minimize the algae problems in this area.

5.4.8 Biological Treatment Process Costs

Table 5-5 presents a summary of the Biological Treatment Process Costs.

TABLE 5-5
BIOLOGICAL TREATMENT PROCESS COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
MISCELLANEOUS IMPROVEMENTS				
Installation of Secondary Fall Protection. Posts Mounted to Concrete Walls with Lanyard Tie-Off Anchor.	EA	20	$ 5,000	$ 100,000
Add Access Bridge on East Side of Basins, Extending from the Existing Stair Platform to the Walkway Platform Near Southeast Side.	LS	1	$ 50,000	$ 50,000
Cover RAS Troughs with Solid Plates to Minimize Algae Growth.	LS	1	$ 10,000	$ 10,000
Ballasted Floating Ball Cover for the Second Stage Aeration Basins.	LS	1	$ 27,000	$ 27,000
Install Anchor J-Clips on Grating Sections.	LS	1	$ 10,000	$ 10,000
Replace / Repair Broken Metal on Grating Panels, Supports, and on Handrail Brackets.	LS	1	$ 15,000	$ 15,000
Repair Leak Around Inlet Pipe from Entrance Works on East Side of Structure.	LS	1	$ 10,000	$ 10,000
Subtotal:				$ 222,000
Undefined Elements 30.00%:				$ 66,600
MISCELLANEOUS IMPROVEMENTS TOTAL:				**$ 288,600**

TABLE 5-5
BIOLOGICAL TREATMENT PROCESS COSTS (continued)

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
AEROMOD CAPACITY IMPROVEMENTS				
Fermenter and Anaerobic Basins:				
Replace Submersible Mixer.	LS	1	$ 100,000	$ 100,000
First and Second Stage Aeration Basins:				
Demolition, Basin Cleaning, Pumping for Air Drop Replacement.	LS	1	$ 150,000	$ 150,000
Replace All Stage 1 Air Drops.	LS	1	$ 300,000	$ 300,000
Replace DO Probes.	LS	1	$ 25,000	$ 25,000
Air Piping Flow Meters and Actuated Valves.	LS	1	$ 75,000	$ 75,000
Clarifiers:				
None.	LS	1	$ 0	$ 0
Sludge Holding Basins:				
Air Piping Flow Meters and Actuated Valves.	LS	1	$ 75,000	$ 75,000
Controls Package Upgrade:				
New Master PLC.	LS	1	$ 50,000	$ 50,000
			Subtotal:	$ 775,000
			Undefined Elements 30%:	$ 232,500
			AEROMOD CAPACITY IMPROVEMENTS TOTAL:	**$ 1,007,500**
A2O CONVERSION IMPROVEMENTS				
Fermenter and Anaerobic Basins:				
Replace Submersible Mixer.	LS	1	$ 100,000	$ 100,000
First Aeration Basin Modifications:				
Demolition, Basin Cleaning, Pumping.	LS	1	$ 150,000	$ 150,000
Installation of the Concrete Baffle Walls.	LS	1	$ 150,000	$ 150,000
Aeration System Modifications with New Fine Bubble Diffusers. Including Air Flow Meters, Actuated Valves, DO Probes.	LS	1	$ 250,000	$ 250,000
Submersible Mixers for New Anoxic Zones.	EA	4	$ 75,000	$ 300,000
Access Platform Modifications for Submersible Mixer Jib Hoists, Concrete Walkways to Basin Exterior North and South For Mixer Transport.	LS	1	$ 150,000	$ 150,000
Second Stage Aeration Basins:				
Demolition, Basin Cleaning, Pumping.	LS	1	$ 200,000	$ 200,000
Aeration System Modifications with New Fine Bubble Diffusers. Including Air Flow Meters, Actuated Valves, DO Probes.	LS	1	$ 600,000	$ 600,000
Submersible Internal Recycle Pump Installed in Each of the Two Basins. Shelf Spare Pump. Piping with Flow Meter to Set the IR Rate. Jib Hoist Bases For Pump Removal.	LS	1	$ 350,000	$ 350,000

TABLE 5-5
BIOLOGICAL TREATMENT PROCESS COSTS (continued)

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
Controls System Package:				
New PLC, HMI, and System Integration for Automatic Operation of the System.	LS	1	$ 200,000	$ 200,000
Subtotal:				$ 2,450,000
Undefined Elements 30%:				$ 735,000
A2O CONVERSION IMPROVEMENTS TOTAL:				**$ 3,185,000**

5.5 Aeration Equipment / Blower Building

5.5.1 Blowers

There were six Kaeser PD blowers installed in 2008 to support the aeration demands associated with the Aero-Mod treatment process and the aerobic digesters. All six of the aeration blowers have needed to be rebuilt over the past couple of years to stay in operation. Although the blowers are currently operating as intended, the 20-year service life of the equipment will be met in the year 2028, triggering the near-term replacement of this equipment.

As noted in Section 5.4, in evaluating the air demands for the future flows and loads to the WWTP, the existing blowers do not have sufficient capacity. When the blowers are replaced, they should be replaced with fewer, but larger capacity units to support the projected future conditions (flows / loads / higher ambient temp). The air demands will be similar for either the Sequox® or A2O process.

Given the tight space constraints within the existing blower building, it is proposed to replace the six existing blowers with four new units of a larger capacity (three duty, one standby). Each of the new blowers should be rated for 1,667 scfm at 7.6 psi with a 125 HP motor.

5.5.2 Electrical Components

The VFDs associated with the aeration blowers were installed at the same time of the blowers themselves. Since installation, two of the six VFDs have been replaced as issues began to present themselves with the electrical components. Replacement of the remaining four blower VFDs in the near future may be prompted by equipment failures. Ultimately, four new VFDs will be needed for the replacement blowers.

5.5.3 Building

Additionally, issues with the evaporative cooler on the south end of the building have led to the corrosion of some of the blower enclosures as water from this evaporative cooler has been spraying directly onto the enclosures. Other Heating, Ventilation, and Air Conditioning (HVAC) issues include:

- The west wall motorized inlet louver has operational problems and should be replaced.
- The south wall gravity louver is rusted, and the flights can no longer be adjusted. Louver should be replaced.

As noted in Section 5.4.6.1, the Master PLC and blower VFDs really should be installed in an air conditioned space to promote longevity. During design, a space could either be identified in the existing blower building to be enclosed or a separate room could be constructed outside, but adjacent to the existing building.

5.5.4 Blower and Building Costs

Table 5-6 presents a summary of the Blower and Building Costs.

TABLE 5-6
BLOWER AND BUILDING COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
BLOWER PACKAGE MODIFICATIONS				
Removal of Six Existing Blowers and Replacement with Four Larger Units.	EA	4	$ 175,000	$ 700,000.00
Install four New Blower VFDs.	EA	4	$ 25,000	$ 100,000.00
Subtotal:				$ 800,000
Undefined Elements 30.00%:				$ 240,000
BLOWER PACKAGE MODIFICATIONS TOTAL:				**$ 1,040,000**
BLOWER BUILDING MODIFICATIONS				
Create Air Conditioned Room or Construct an Adjacent Building to House VFDs and Master PLC.	LS	1	$ 200,000	$ 200,000
Remove and Replace the Southern Evaporative Cooling Unit.	LS	1	$ 20,000	$ 20,000
Remove and Replace the Western Motorized Louver and Operator.	LS	1	$ 15,000	$ 15,000
Remove and Replace the Southern Gravity Louver and Operator.	LS	1	$ 15,000	$ 15,000
Subtotal:				$ 250,000
Undefined Elements 30.00%:				$ 75,000
BLOWER BUILDING MODIFICATIONS TOTAL:				**$ 325,000**

5.6 Post-Treatment Aeration

5.6.1 DO Saturation

In considering a post-treatment aeration system, particular attention needs to be paid to the site conditions which impact DO saturation. Three common factors that influence DO saturation are pressure (site elevation), water temperature, and salinity. Table 5-7 presents the DO saturation values across the range of effluent temperatures experienced at the Bernalillo WWTP (accounting for elevation and salinity also).

TABLE 5-7
DO SATURATION

TEMP (^{O}C)	DO SOLUBILITY (mg/L)	DO SOL @ SITE ELEV. (mg/L)	DO SOL @ SITE ELEV. AND SALINITY (mg/L)
13	10.6	8.8	8.68
14	10.4	8.6	8.49
15	10.2	8.5	8.31
16	10.0	8.3	8.13
17	9.8	8.1	7.96
18	9.6	8.0	7.80
19	9.4	7.8	7.64
20	9.2	7.6	7.49
21	9.0	7.5	7.35
22	8.9	7.4	7.21
23	8.7	7.2	7.07
24	8.6	7.1	6.94
25	8.4	7.0	6.81
26	8.2	6.8	6.69
27	8.1	6.7	6.57
28	7.9	6.6	6.45

5.6.2 Cascade Aeration

As noted in the NPDES permit (Table 2-5), the Town has a DO concentration requirement on the effluent discharged into the Rio Grande of at least 5 mg/L. The JMS LPCA currently installed on site, with 3 feet of drop, has failed to produce effluent DO limits close to this permit requirement. Calculations were performed using the cascade aeration guidance provided in Metcalf & Eddy(2) which identified a needed drop height of 12 to 15 feet to raise the effluent DO from 0.5 mg/L to 5.0 mg/L. This amount of elevation is not available within the existing hydraulic profile and another pump station would be required to achieve this condition. It is recommended that cascade post-treatment aeration not be pursued further for permit compliance.

5.6.3 Diffused / Mechanical Aeration

A more conventionally applied option to meet the stringent DO requirements is to provide supplemental oxygen into the effluent stream via mechanical aeration or submerged diffusers. Post-treatment aeration basinage is typically designed for a contact time of 10-20 minutes at peak flow conditions(2). For a mechanical aerator requiring high oxygen transfer efficiencies, a submerged turbine aerator system, such as Aeration Industries AIRE-O_2 Triton aerator, would be a good fit. Similar to this aerator, the Town has an Aeration Industries Triton mixer installed in the Aero-Mod anaerobic basin. For diffused-air aeration, fine bubble diffusers with a blower are common. A concrete tank with either aeration style could be integrated within the existing hydraulic profile.

Preliminary sizing suggests that for a 15 minute contact time at a peak flow of 2.74 MGD, a basin with internal dimensions of 24 feet long by 16 feet wide by 10 feet SWD will suffice. The depth has been limited to avoid dewatering associated with construction. Two feet of freeboard should be added to prevent splashing outside of the basin. It is also recommended to integrate a manually cleaned wedge wire fine screen at the end of this post aeration basin to aid in the removal of larger algae clumps and windblown debris prior to the UV disinfection system.

Consideration was given for adding diffused air directly into the effluent pipe as it leaves the Aero-Mod clarifiers, but there is insufficient contact time.

5.6.4 Pipeline Flash Reactor

Another option to meeting the post-treatment DO requirements is to provide supplemental oxygen into the effluent stream via a pipeline flash reactor system. This type of system separates a side stream of the treated effluent and utilizes either atmospheric oxygen or a source of pure oxygen to create a highly oxygenated side stream. The side stream is then reintroduced to the bulk effluent through a mixing device that ensures thorough blending of the two streams. These types of systems lend themselves to small installation footprints, making them desirable for retrofitting into an existing system. Although a promising upcoming technology, further investigation and exploratory work must be done to evaluate the efficacy of such a system.

5.6.5 Post-Treatment Aeration Costs

Table 5-8 presents a summary of the costs for a mechanical style Post-Treatment Aeration System.

TABLE 5-8
POST-TREATMENT AERATION COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
POST-TREATMENT AERATION MODIFICATIONS				
Dirt Work for Post-Aeration Structure.	CY	500	$ 80	$ 40,000
Concrete Work for Post-Aeration Structure.	CY	80	$ 1,200	$ 96,000
Electrical Work.	LS	1	$ 40,000	$ 40,000
Mechanical Aeration Equipment – Aeration Industries AIRE-O2 Triton Aerator.	LS	1	$ 140,000	$ 140,000
Post-Treatment Wedge-Wire Fine Screen Installation.	LS	1	$ 7,500	$ 7,500
Civil Site Work.	LS	1	$ 20,000	$ 20,000
			Subtotal:	$ 343,500
			Undefined Elements 30%:	$ 103,100
			POST-TREATMENT AERATION TOTAL:	**$ 446,600**

5.7 UV Light Disinfection Building

5.7.1 UV Light Disinfection Equipment

As highlighted in the UV Disinfection TM delivered to the Town of Bernalillo June of 2021[(4)], improvements to the current disinfection system are necessary to meet discharge permits going into the future. The TM recommends a complete replacement of this system as it is lacking in manufacturer support and availability of spare parts and more importantly, it is incapable of delivering the required dosage to meet the *E. coli* limit of 47 cfu/100 mL imposed in the NPDES permit. Furthermore, the TM recommends some minor improvements that can be made to the system that could help in attaining the goals set out by the permit. Refer to the TM for a more detailed discussion on the proposed improvements on the facilities disinfection system.

5.7.2 Washwater Pumping System

Located in the UV Disinfection Building, the washwater pumping system was placed into operation in 2008 when the Aero-Mod plant was constructed. Initially designed to operate automatically with a hydropneumatic bladder tank, operators have removed the bladder tank altogether and operate the system manually. The intent of the bladder tank is not only to supplement the small nuisance flows of hydrants and other small fixtures around the plant, but it also serves as a surge protection device for the washwater pumping systems components. Operation of the washwater system without the bladder tank can lead to premature wearing of the pumps and overall replacement before they have reached their intended service life.

Although still operational, the two-pump system has recently had one of its pumps replaced in 2017 while the other pump is from the original 2008 construction. As the service life of the system is getting closer, it can be expected that the remaining pump will also need a similar replacement. To mitigate the pressure surges associated with typical operation, it is recommended that the bladder tank be reconnected to this pumping system for its continued use. Overall, the packaged skid will be reaching its intended service life by the year 2028. Operators have noted issues with the washwater pumps losing their prime. Review of the Design Drawings suggest that the initial installation of these pumps positioned the inlet of the pump header about 1.5 feet above the maximum water elevation in the UV channel. These types of multistage centrifugal pumps installed for the washwater system are intended to operate with a flooded suction, thus each time the pumping system is shut down, the pumps are losing their prime. To mitigate the concerns with these pumps losing their prime, modifications to the washwater pumping layout are necessary.

To create a flooded suction, the packaged skid must be set at an elevation that would allow for the suction inlet of the pump header to be just below the maximum water elevation in the UV channel. Setting the skid directly outside, adjacent to the UV Building at grade elevation or just below would accommodate this requirement. In addition, a structure to house the pumping skid would need to be installed to protect the skid from the elements, the hydropneumatic tank would remain inside the UV Disinfection Building.

Another option to mitigate the pump suction issues is to install an automatic vacuum priming system on the pump skid. This type of system utilizes a compressor type unit that creates a vacuum inside of the suction piping and removes any air that is built up in the system. Simultaneously, as the air is being removed from the system, the water level in the piping rises at a rate normalized by the rate at which air is removed until each pump is fully flooded. The vacuum priming system operates independently of the pump skid, cycling on and off only when air is reintroduced into the suction line and ensuring the pumping system maintains its prime.

Furthermore, the 2-inch suction and discharge lines to and from the packaged washwater system are diminutive and will require upsizing to satisfy the increased washwater demands associated with the solids handling modifications. The discharge line from the pumps to the Solids Handling Building will need to be increased to at least a 4-inch line, this 4-inch line can tie into the existing 2-inch washwater connections for the Entrance Works and yard hydrants throughout the plant. The suction line requires a bit more ingenuity to facilitate these upgrades and includes options dependent on other improvements selected. Any new suction line should also include a strainer to remove solids ahead of the pumps and the downstream washwater appurtenances.

- If effluent reuse is pursued, a reuse storage tank lends itself well to incorporating a suction line from the tank directly to the pump skid suction line.
- During the UV equipment replacement project, the floor slab could be saw-cut to install a larger diameter suction line outside of the building to facilitate the flooded suction.
- Otherwise, it may be necessary to draw the washwater from the flooded 20-inch DIP just prior to UV disinfection. This scenario is not ideal due to the washwater being un-disinfected.

5.7.3 Disinfection Building Costs

Table 5-9 presents a summary of the Disinfection Building Costs.

TABLE 5-9
DISINFECTION BUILDING COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
UV SYSTEM MODIFICATIONS				
Removal of Existing Siemens UV System and Replacement with SUEZ UV System.	LS	1	$ 594,000	$ 594,000
Channel Modifications to Facilitate UV Upgrades and Solid Covers Over Open Channel Sections.	LS	1	$ 30,000	$ 30,000
Subtotal:				$ 624,000
Undefined Elements 30.00%:				$ 187,200
UV SYSTEM MODIFICATIONS TOTAL:				**$ 811,200**
WASHWATER BOOSTER PUMPING MODIFICATIONS				
Remove and Replace the Existing Washwater Booster Pumping System with a Larger Packaged Canariis Washwater Pumping Skid, Suction Line Strainer, and Hydro-Pneumatic Tank System.	LS	1	$ 77,000	$ 77,000
Construct FRP Structure Adjacent to UV Building to House the New Packaged Washwater Pumping Skid, Including Civil Site Work.	LS	1	$ 90,000	$ 90,000
Remove and Replace Existing 2″ Washwater Discharge Line from Pumping Skid to Solids Handling Building with Larger 4″ Line, Connect to Existing 2″ Yard Piping.	LS	1	$ 15,000	$ 15,000
Remove and Replace Existing 2″ Washwater Suction Line from UV Channel with Larger 4″ Line to Pump Suction in FRP Housing.	LS	1	$ 35,000	$ 35,000
Subtotal:				$ 217,000
Undefined Elements 30.00%:				$ 65,100
WASHWATER BOOSTER PUMPING MODIFICATIONS TOTAL:				**$ 282,100**

5.8 Effluent Lift Station

5.8.1 Effluent Pumps

Even though regular tracking and records of the instantaneous peak hourly flow leaving the plant are not available, using the anticipated influent peak flow at the end of this planning period of 2.74 MGD, it is expected that the capacity of the submersible effluent pumps (1,980 gpm, 2.85 MGD) will be capable of handling the future discharge flows. However, although the hydraulic capacity of these pumps is sufficient till the end of this planning period, the pumps themselves will be nearing their 20-year service life in the year 2028 and may require replacement. The control panel should also be replaced at the same time as the pumps.

5.8.2 Effluent Lift Station Miscellaneous

The concrete structures for the wet well and valve vault were installed 1980 and will achieve their service life (50 years) in 2030. Concrete can certainly last longer than 50 years and the structures appear to be in suitable condition. In Section 5.8.3 are costs for entire replacement or just rehabilitation of the wet well and valve vault.

If the Town elects to just rehabilitate the wet well and valve vault, safety netting should be installed beneath the covers for secondary fall protection. The existing covers cannot be retrofitted to include the safety grates which are typical for new cover systems. Water accumulation was also evident in the valve vault during the site visit. The Town should verify the grading surrounding the effluent pumping structure is sloped to ensure runoff flows away from the structure. After heavy rainfall events, the operation staff should vactor out the vault to prevent standing water. Finally, the jib crane for pump removal has some damage and cracking at the concrete base. During design of the Town's next capital improvements project, a structural engineer should perform a field evaluation and make recommendation for repairs which may include sealing the cracks or full base pedestal replacement.

5.8.3 Effluent Lift Station Costs

Table 5-10 presents a summary of the Effluent Lift Station Costs.

TABLE 5-10
EFFLUENT LIFT STATION COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
COMPLETE REPLACEMENT				
Effluent Lift Station Replacement:				
Remove and Replace Existing Effluent Loadout Pumps with 12 HP Flygt Model NP3153.095-416 Pumps and Existing Control Panel with a New 24 V Float Panel.	LS	1	$ 166,000	$ 166,000
Dirt Work for New Wet Well and Valve Vault.	CY	500	$ 80	$ 40,000
Wet Well and Valve Vault Concrete Structure	LS	1	$ 60,000	$ 60,000
Miscellaneous Process Piping, Valves, Fittings, and Appurtenances.	LS	1	$ 30,000	$ 30,000
Jib Crane.	LS	1	$ 30,000	$ 30,000
Demolition of Existing Effluent Lift Station.	LS	1	$ 30,000	$ 30,000
Civil Site Work.	LS	1	$ 15,000	$ 15,000
			Subtotal:	$ 371,000
			Undefined Elements 30.00%:	$ 111,300
			EFFLUENT LIFT STATION REPLACEMENT TOTAL:	**$ 482,300**
REHABILITATION				
Effluent Pumping Modifications:				
Remove and Replace Existing Effluent Loadout Pumps with 12 HP Flygt Model NP3153.095-416 Pumps and Existing Control Panel with a New 24 V Float Panel.	LS	1	$ 149,400	$ 149,400
Structural Modifications:				
Installation of Safety Netting Fall Protection Beneath Effluent Wet Well and Valve Pit Cover System.	LS	1	$ 2,500	$ 2,500
Jib Crane Concrete Pedestal Crack Repair.	LS	1	$ 7,500	$ 7,500
			Subtotal:	$ 159,400
			Undefined Elements 30.00% :	$ 47,900
			EFFLUENT LIFT STATION REHABILITATION TOTAL:	**$ 207,300**

5.9 Effluent Reuse

As water scarcity becomes more prevalent, the pursuit of non-potable effluent reuse around the state has growing interest. The Bernalillo WWTP is physically located near two potential sites that could facilitate the reuse of the effluent produced at the treatment plant. The Rotary Park (approximately 9 acres of grass surfacing), located just east of the treatment plant and a 30 acre plot of agricultural land directly south of the plant. Utilizing effluent as a non-potable resource for either one of these locations could help offset the impacts associated with using potable water for a non-potable purpose.

5.9.1 Water Rights Considerations

The prospect of effluent reuse was posed to Ms. Carole Cristino of Lee Wilson & Associates to understand the water rights implications. According to Ms. Cristano, there is no compelling water rights reason to pursue effluent reuse; but the Town could elect to implement a reuse project with little adverse impact to their water rights holding.

5.9.2 Permitting

Implementing an effluent reuse program could help eliminate the need for expanding the NPDES permitted capacity of the plant, avoiding an anti-degradation review. In the future, as the discharge into the Rio Grande is nearing its permitted capacity of 0.8 MGD, a reuse program would allow the plant to continue to operate under the current permitted capacity.

The Town would be required to obtain a new permit through the NMED Ground Water Quality Bureau (GWQB) for any land application or irrigation. Design criteria for above ground, non-potable reuse of reclaimed wastewater is well established in New Mexico by the NMED GWQB Guidance: *Above Ground Use of Reclaimed Domestic Wastewater, January 2007* (See Appendix C) and numerous permits from the NMED GWQB. The quality of reclaimed wastewater required is broken into classifications based on the end use and the potential for public health impacts. Based on the potential end uses of park or crop irrigation, the only classifications that are considered for this MP are Class 1A and Class 1B. Class 1A can be used for nearly any above ground non-potable reuse application except irrigation of food crops where the reclaimed wastewater touches the edible portion of the food crop. Class 1B can be used for irrigation of landscaping, but there are restrictive requirements, such as setbacks from public access, that are dependent on the type of irrigation employed. Based on plant performance, the Town consistently produces a Class 1B reclaimed wastewater. The Town could produce a Class 1A reclaimed wastewater most of the time with the addition of tertiary filtration and chlorinating the portion of the post UV effluent as it enters storage.

TABLE 5-11
STATE OF NEW MEXICO RECLAIMED WASTEWATER STANDARDS

WATER QUALITY PARAMETER	CLASS 1A LIMIT (AVERAGE/MAX)	CLASS 1B (AVERAGE/MAX)
BOD	10/15 mg/L	30/45 mg/L
TSS / Turbidity	3/5 nephelometric turbidity unit (NTU)	30/45 mg/L
*Fecal coliform*s	5/23 cfu/100 mL	100/200 cfu/ 100 mL
Total Residual Chlorine / UV Transmissivity	Monitor	Monitor

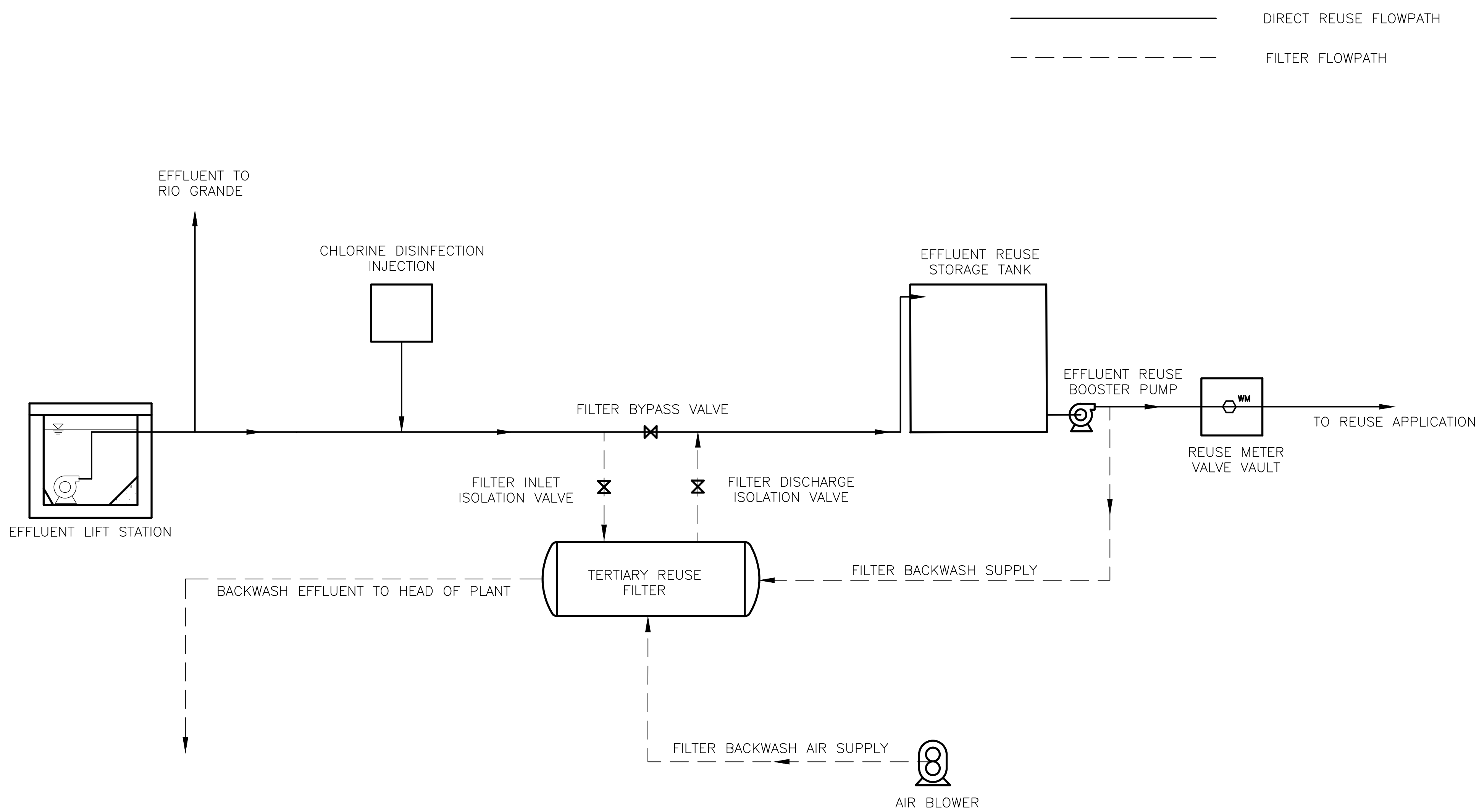
Operating under an additional permit carries with it additional sampling, reporting, and permit renewals. The Ground Water Discharge Permit (GWDP) would require a Notice of Intent to Discharge and a New Discharge Permit Application.

5.9.3 Improvements

Regardless of targeting Class 1A or Class 1B effluent, the pursuit of effluent reuse will require a chlorine dosing system, a storage tank, booster pumping station, and distribution piping. Adding a low dose of chlorine (typically in the form of 10%-12.5% Sodium Hypochlorite) helps to maintain a residual (around 1 mg/L) in the effluent to minimize biological growth in the distribution piping. Storage tank sizing would require refinement based on the reuse customers, but a 500,000 gallon ground storage tank will likely be sufficient to meet off-hour irrigation discharge while also minimizing stagnation. A booster pumping station would draw out of the ground storage tank and pressurize the effluent for the end user. A couple of pumps on VFDs with a hydropneumatic tank, similar to the Town's washwater pump station, would be appropriate. The sizing and length of piping for distribution is difficult to solidify at this level of planning. However, rough estimates have been made for delivery to the park and adjacent agricultural land. High level, budgetary costs for these elements have been included in Section 5.9.4.

Should the Town elect / need to produce a Class 1A effluent, tertiary filtration would need to be incorporated into the treatment system. As only a portion of the effluent is likely to be reused, a filtration system could be added on only the flows directed to reuse. Compliance sampling for the GWDP would need to occur after the filtration and chlorine addition to meet the Class 1A requirements.

Figure 5-3 presents a one-line schematic of the major components for an effluent reuse system integrated at the end of the WWTP.



WASTEWATER TREATMENT PLANT MASTER PLANNING DOCUMENT - TOWN OF BERNALILLO, NEW MEXICO

MOLZENCORBIN

EFFLUENT REUSE TERTIARY FILTER ONE-LINE SCHEMATIC

FIGURE 5-3

5.9.4 Effluent Reuse Costs

Table 5-12 presents a summary of the Effluent Reuse Costs:

TABLE 5-12
EFFLUENT REUSE COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
Class 1B Effluent Reuse Costs				
Installation of a 500K Gallon Effluent Reuse, Welded Steel Ground Storage Tank, Including Concrete Ring Wall.	LS	1	$ 750,000	$ 750,000
Site Work, Grading, Overflow Pond.	LS	1	$ 250,000	$ 250,000
Installation of a Cannaris Packaged Irrigation Pumping Skid and Hydro-Pneumatic Tank System Including Control Panel and Pump VFD’s.	LS	1	$ 120,600	$ 120,600
8″ Distribution PVC Piping to the Rotary Park. Including All Trenching, Backfilling, Installation, Surface Removal / Replacement.	LF	1,500	$ 175	$ 262,500
8″ Distribution PVC Piping to the Agricultural Land. Including All Trenching, Backfilling, Installation, Surface Removal / Replacement.	LF	1,000	$ 100	$ 100,000
NaOCL Chemical Dosing Skid and Storage Tank, Including Electrical Work.	LS	1	$ 100,000	$ 100,000
NaOCL FRP Storage Building Including Mechanical, Electrical, Architectural, and All Associated Work.	LS	1	$ 126,000	$ 126,000
			Subtotal:	$ 1,709,100
			Undefined Elements 30.00%:	$ 512,800
			CLASS 1B EFFLUENT REUSE TOTAL:	**$ 2,221,900**
Adder to Achieve Class 1A Effluent Reuse				
Tertiary Filter for Class 1A Reuse Treatment Requirements.	LS	1	$ 800,000	$ 800,000
Filtration Building Including Mechanical, Electrical, Structural, Architectural, and All Associated Work.	LS	1	$ 350,000	$ 350,000
Backwash Management.	LS	1	$ 150,000	$ 150,000
Civil Site Work.	LS	1	$ 80,000	$ 80,000
			Subtotal:	$ 1,380,000
			Undefined Elements 30.00%:	$ 414,000
			CLASS 1A EFFLUENT REUSE ADDER TOTAL:	**$ 1,794,000**

5.10 On-Site Electrical Generators

5.10.1 Plant Generator Set

Housed in its own structure, the existing emergency generator is located just north of the Aero-Mod biological treatment basins. This generator set was installed in the year 2004 with the intent of supplying standby power to the primary treatment and effluent disinfection processes in addition to the already supplied power for pumping needs throughout the plant. This generator is 17 years into its 30-year service life and will be needing complete replacement by the year 2034. An evaluation of the entire treatment plants electrical loading demands outside of the aeration requirements, produced an anticipated maximum loading of 115 kW, 35 kW less than the currently installed generator set. Depending on which improvements and process modifications are implemented, an evaluation of the emergency generation requirements should be conducted to verify the proper sizing for the replacement generator in the future.

5.10.2 Blower Package Generator Set

Installed in 2008 with the Aero-Mod upgrades, a dedicated emergency generator was installed to supply power to the process blowers and aeration equipment in the event of an electrical failure. This generator has functioned as intended over its 13-year life and has 17 more years until it meets its intended service life of 30 years. Although the electrical demands for the aeration system are going to increase with the necessary upgrades to the aeration blowers highlighted in Section 5.4.2, preliminary sizing suggests that a load of 280 kW would be required to implement the upgrades, 70 kW less capacity than the currently installed generator. From a capacity standpoint, the generator appears to be sufficient until its intended service life replacement in 2038.

5.10.3 Electrical Generator Costs

Table 5-13 presents a summary of the Electrical Generator Costs.

TABLE 5-13
ELECTRICAL GENERATOR COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
Plant Standby Generator Replacement				
Removal and Replacement of the 150 kW Diesel Fueled Standby Electrical Engine Generator Set.	LS	1	$ 35,000	$ 35,000
Building Modifications.	LS	1	$ 25,000	$ 25,000
Subtotal:				$ 60,000
Undefined Elements 30.00%:				$ 18,000
PLANT STANDBY GENERATOR REPLACEMENT TOTAL:				**$ 78,000**
Blower Package Generator Replacement				
Removal and Replacement of the 350 kW Diesel Fueled Standby Electrical Engine Generator Set.	LS	1	$ 90,000	$ 90,000
Civil Site Work.	LS	1	$ 15,000	$ 15,000
Subtotal:				$ 105,000
Undefined Elements 30.00%:				$ 31,500
BLOWER PACKAGE GENERATOR REPLACEMENT TOTAL:				**$ 136,500**

6.0 SOLIDS HANDLING FACILITIES

As noted at the beginning of Section 5.0, the budgetary costs presented in Section 6.0 are on an improvement-by-improvement basis and do not account for Professional Services, Contractor General Conditions, or NMGRT. In Section 7.0, the improvements have been packaged into recommended projects for implementation which include these costs.

Construction costs are highly variable at the time of writing this MP. The COVID-19 pandemic has created significant issues for material pricing and availability. A 30% multiplier has been applied to all estimates to account for undefined elements, contingencies, and some inflation. The Town should prepare an update to any cost estimate prior to pursing project funding.

6.1 Biological Stabilization

6.1.1 Aerobic Sludge Holding Basins

The two-basin system was designed for a total volume of 388,100 gallons of sludge with a maximum MLSS concentration of 1.2%, providing a volatile solids reduction of about 18.8% over a period of 30 days. The system was originally designed to handle up to 1,311 lbs./day or 13,095 gallons of sludge per day from the sludge holding basin. The projected solids production at the end of this planning period of about 2,032 lbs./day or 20,300 gallons of sludge will limit the retention time in the sludge holding basins. The increased loading will cause the system to operate at an SRT of about 19 days.

Also, as noted in Section 5.4.6.1, Aero-Mod has updated their recommended air flow to be provided to the sludge holding basins from 521 scfm to 1,552 scfm. The 521 scfm appears to come from an aeration rate of 20 scfm/1,000 ft^3 in one basin only. The updated air requirements account for 30 scfm/1,000 ft^3 applied to both basins. No changes will be needed to the diffused aeration infrastructure but actuated positioning valves with air flow meters would be installed on the air delivery lines to the digesters. Costs associated with the air delivery piping modifications are covered in Section 5.4.8.

6.1.2 Miscellaneous

During the field visit it was apparent that some of the aerobic digester walls were experiencing delamination of the coating system. This type of separation can lead to further intrusions and overall deterioration of the coating system, impacting the integrity of the underlying concrete structure. To eliminate any concerns with the failure of the coating system, it is recommended that the areas of concern be patched up with a similar corrosion resistant coating system. Costs associated with the rehabilitation in the sludge holding basins are detailed in Section 6.1.3.

6.1.3 Biological Stabilization Costs

Table 6-1 presents a summary of the Biological Stabilization Costs.

TABLE 6-1
BIOLOGICAL STABILIZATION COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
Structural Modifications				
Drain Basins, Pumping, Sludge Removal, Cleaning.	LS	1	$ 100,000	$ 100,000
Blast and Recoat Aerobic Digestion Basin Walls Where Delamination of Coating System is Occurring.	LS	1	$ 100,000	$ 100,000
			SUBTOTAL:	$ 200,000
			Undefined Elements 30.00%:	$ 60,000
			SLUDGE STABILIZATION REHABILITATION TOTAL:	**$ 260,000**

6.2 Sludge Pump Building

6.2.1 Sludge Pumps

Housed in a separate building, both centrifugal screw-flow sludge pumps were replaced in 2020. Each of these pumps are sized to handle a WAS flowrate of 560 gpm, much more than the anticipated 181 gpm belt press feed rate expected at the end of this planning period. Hydraulically speaking, the sludge pumps are suited for continued use throughout the period of this planning document. Although these pumps are hydraulically capable, they will be reaching the end of their intended service life near the end of this planning period and will need to then be replaced.

It has been noted in past operations that the WAS pumps tend to lose their prime upon operation. These types of centrifugal pumps are intended to be operated with a flooded suction, which is the case when the digesters are operating at full capacity. However, when draw down from the digesters is occurring and the level of WAS in the digester is depleted, there is opportunity for these pumps to lose their prime and stop operating as intended.

6.2.2 Sludge Pumping and Building Costs

Table 6-2 presents a summary of the Sludge Pumping and Building Costs.

TABLE 6-2
SLUDGE PUMPING AND BUILDING COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
Pump Replacement				
Removal and Replacement of the Existing WEMCO Screw-Flow Pumps With Two New WAS Feed Pumps.	LS	1	$ 100,000	$ 100,000
			SUBTOTAL:	$ 100,000
			Undefined Elements 30.00%:	$ 30,000
			SLUDGE FEED PUMP REPLACEMENT TOTAL:	**$130,000**

6.3 Solids Handling Building

6.3.1 BFP

As highlighted in the capacity assessment of this report (Section 2.4.1.6) the BFP is being overloaded and may be leading to operational issues within the overall treatment process. Initially installed in 2008 with the Aero-Mod improvements, operators have had to replace both the lower and upper belts twice over the length of its operation. The rollers, bearings, pneumatic control system, conveyor belt, air compressor, tension cylinders, steering cylinders, containment seals, doctor blades, wear bars, air filter, steering valves, over travel switches, and overall structure appear to be in poor physical condition (Section 2.4.1). The current solids dewatering operations at the treatment plant require major improvements to maintain the anticipated treatment needs into the future.

Installation of a redundant BFP at the treatment plant will ensure the anticipated solids production throughout the life of this planning period can be dewatered and handled appropriately. This redundant piece of equipment can be housed in the current solids handling building with minor layout adjustments and can be sized to handle the increased anticipated loading capacity at the end of this planning period. This will allow the new piece of equipment to be the primary dewatering device while the original BFP can be used as a backup / peaking dewatering system.

6.3.2 Polymer Blend and Feed Equipment

Currently, the blending and delivery of polymer for the plants dewatering operations is accomplished via a skid mounted liquid polymer preparation unit. This unit was installed along with the BFP in 2008 and has facilitated the activation and introduction of polymer into the liquid sludge prior to being laid out on the belt for dewatering. The overall physical condition of this skid mounted system is extremely poor and is in need of complete replacement for continued use.

Also, there is no washwater connection for flushing the activated polymer lines, leaving them constantly gummed up with polymer and potentially reducing the effectiveness of the dewatering process. To further the ineffectiveness of the polymer and sludge mixing, the dilution water for the activation of the neat polymer is from the plants washwater system rather than a potable source. This leads to the polymer interacting with other competing ions that may exist in solution and weaking the overall bond between the polymer and sludge.

In addition to a complete replacement of this polymer delivery system, it is recommended that the current polymer delivery layout be modified to include a flush line for the activated polymer lines. Allowing for the flushing / cleaning of these clogged lines may improve the overall effectiveness of the delivery of activated polymer into the sludge for dewatering. Furthermore, it would be beneficial to facilitate the dilution of neat polymer to activated polymer with a potable water source.

If a redundant dewatering device is installed to meet future solid generation demands, a completely new polymer blending and feed system would need to be installed for the specific design requirements.

6.3.3 Miscellaneous

During the site visit, it was apparent that the exterior wall of the building was experiencing some rusting from the exhaust fan of the building's heating system. This type of corrosion is typical for metal buildings which are constantly exposed to oxygen and moisture. In this case, the moisture is being directly exhausted onto the building's exterior panels via the heating systems exhaust duct. To prevent further rusting near this exhaust duct, it is recommended that the exhaust pipe be extended above the roof such that any exhaust fumes are not directly in contact with the metal surfaces. Furthermore, the application of a protective coating where the metal structure has begun to deteriorate will prevent further decay of the integrity of the structure, see cost breakdown in Section 6.3.4.

6.3.4 Solids Handling Costs

Table 6-3 presents a summary of the Sludge Handling Costs.

TABLE 6-3
SLUDGE HANDLING COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
BFP Modifications				
Installation of a New 2.2 Meter BFP Unit Including Air Compressor, Booster Pump, Polymer / Sludge In-Line Mixer, Control Panel, and Drainage Sump.	LS	1	$ 660,000	$ 660,000
Upgrades to Existing BFP Unit Including, One Set of Belts, One Set of Containment Seals, One Set of Plow Lift Cylinders, One Set of Steering Cylinders, One Set of Tension Cylinders, One Set of Doctor Blade Cylinders, One Set of Steering Valves and Paddle Arms, One Set of Over Travel Switches and Paddle Arms, One Set of Doctor Blades, One Air Filter, and Replacement of Ten UHMW Wear Bars.	LS	1	$ 80,000	$ 80,000
Replacement of Existing BFP Rollers and Bearings.	LS	1	$ 50,000	$ 50,000
Upgrades to the BFP Control System.	LS	1	$ 30,000	$ 30,000
			SUBTOTAL:	$ 820,000
			Undefined Elements 30.00%:	$ 246,000
			BFP MODIFICATIONS TOTAL:	**$ 1,066,000**
Install Completely New Polymer Delivery Skid and Feed Lines for the Incorporation of the New Larger BFP Unit.	LS	1	$ 44,000	$ 44,000
Install Completely New Polymer Delivery Skid for the Existing BFP.	LS	1	$ 44,000	$ 44,000
Modify Existing Washwater Piping to Incorporate the Flushing of the Activated Polymer Feed Lines to the Existing BFP.	LS	1	$ 25,000	$ 25,000
Modify Existing Polymer Dilution Water Connections to Facilitate the Dilution of Neat Polymer with Potable Water.	LS	1	$ 25,000	$ 25,000
			SUBTOTAL:	$ 138,000
			Undefined Elements 30.00%:	$ 41,400
			POLYMER FEED SYSTEM MODIFICATIONS TOTAL:	**$ 179,000**

TABLE 6-3 (continued)
SLUDGE HANDLING COSTS

ITEM	UNIT	QTY	UNIT PRICE	AMOUNT
Solids Handling Building Modifications				
Extend Air Exhaust Piping Vertically Above the Roof of the Structure.	LS	1	$ 30,000	$ 30,000
Blast Rusted Surface and Recoat Exterior Metal Wall.	LS	1	$ 25,000	$ 25,000
SUBTOTAL:				$ 55,000
Undefined Elements 30.00%:				$ 16,500
SOLIDS HANDLING BUILDING MODIFICATION TOTAL:				**$ 71,500**

6.4 Solids Post Processing

6.4.1 Sludge Drying Beds

Installed in the original construction of the plant in 1980 and more recently renovated in 2002, the sludge drying beds consist of three paved and three sand beds with a total surface area of 13,443 ft². Based on discussions with plant personnel, the sludge drying beds have not been utilized in over 10 years except for a backup to the BFP during periods of high demand. Additionally, as highlighted in the 2004 PER of the WWTP, the drying of liquid sludge in these drying beds is not desirable as the Town of Bernalillo is determined to reduce WWTP odors.

With the proposed installation of a second BFP in Section 6.3, the need for the sludge beds as a backup dewatering process goes away. The beds could be repurposed and used for a composting operation. Composting is a potentially cost effective and environmentally friendly alternative for the further stabilization and beneficial reuse of the sludge produced at the treatment plant. To implement such a system, land application requirements set out by the EPA Part 503 Biosolids Rule must be followed to meet either a Class A or Class B biosolid product. During the composting process, the organic matter present in sludge undergoes biological degradation to a stable end product.

A properly operated composting facility usually produces a Class A, humus-like material without detectable levels of pathogens that can be applied as a soil conditioner and fertilizer. The three most common composting methods are: aerated static-pile, windrows, and in-vessel composting. All three composting methods require the use of bulking agents. Wood chips, sawdust, leaves and yard waste, and shredded tires are commonly used.

- An **aerated static-pile composting** system simply puts the compost mixture onto a perforated platform, allowing a blower to draw air through the pile. The air is usually put to the aeration basins or a biofilter for odor control. The static-pile method takes up a fairly small footprint and controls odor, but it is more expensive, more energy intensive, and requires more operation.

- A **windrow composting** system places parallel rows of the compost mixture. A specialized machine is used to rotate the windrows, as a way of aerating them and maintaining the aerobic biodegradation within the pile. Such a system could be relatively inexpensive, but the efficiency drops off during cold weather and there is a potential of causing odor problems.

- **In-vessel composting** systems are quite effective and efficient. However, there is a significant investment necessary for the equipment to move the feedstock materials, achieve mixing / blending, conveyance for container loading, container dumping, and leachate management.

Composting is one of several methods for treating biosolids to create a marketable end-product that is easy to handle, store, and use. However, for WWTPs, a composting process also has some disadvantages, including: 1) increase in labor requirements; 2) purchase of specialized equipment for the composting operations; 3) land requirements may be significant to store equipment and for compost processing; 4) additional process monitoring and record-keeping requirements; 5) need to find available “bulking” agents (wood chips, tree branches, etc.); 6) final disposal of end-product needs to be identified and may include farmers willing to use the product, placement at municipal parks / greenspace, or giving away / selling the product to the community.

If the Town chooses to explore composting, a windrow style system using the existing sludge drying beds would be a good starting point. Budgetary costs for some drying bed rehab and mixing equipment is included in Section 6.4.3.

6.4.2 Landfill Disposal

Currently, dewatered sludge cakes are disposed of at a Waste Management Landfill in Rio Rancho at a rate of about $35 per ton. Disposal operations of dewatered biosolids at this landfill are anticipated throughout the life of this planning period as the primary method or as a supplement to any other solid processing operations conducted at the plant. Any further biosolids disposal operations pursued shall conform with the requirements set out by the EPA's Part 503 Biosolids Rule for either surface disposal or land application methods.

6.4.3 Solids Post Processing Costs

Table 6-4 presents a summary of the Solids Post Processing Costs.

TABLE 6-4
SOLIDS POST PROCESSING COSTS

ITEM	UNIT	QUANT	UNIT PRICE	AMOUNT
Post-Processing Modifications				
Improvements to the Existing Six Sludge Drying Beds for Use in a Windrow Style Composting System.	LS	1	$ 150,000	$ 150,000
Procurement of a Windrow Compost Turner.	LS	1	$ 60,000	$ 60,000
SUBTOTAL:				$ 210,000
Undefined Elements 30.00%:				$ 63,000
SOLIDS POST PROCESSING UPGRADES TOTAL:				**$ 273,000**

7.0 RECOMMENDATIONS

Sections 5.0 and 6.0 of this MP identified numerous items to be addressed in the WWTP's liquid treatment and solids handling facilities, respectively. The need for improvements ranges from service life replacements, capacity upgrades, safety, differed maintenance, and equipment failures. The individual improvements were presented with high level, budgetary costs. In this Section 7.0, the individual improvements are prioritized and packaged into proposed projects for phased implementation.

7.1 Prioritization and Phasing

Table 7-1 presents a summary of the recommended improvements for the WWTP as described previously in the planning document.

On October 26, 2021, a meeting was held with representatives from the Town's Administration, Public Works Department, and WWTP Operations staff. The purpose of the meeting was to review the contents of this MP, particularly the recommended improvements. The consulting engineering staff present at the meeting and Town representatives collaborated to select preferred options where alternatives existed, prioritize needs, and package the improvements into defined projects. In the following subsections, the prioritized projects are defined, and the cost estimates have been expanded to account for Professional Services, Contractor General Conditions, and NMGRT (at the rates currently applicable until December 31, 2021).

The WWTP SCADA Improvements project is currently in design and is scheduled to be advertised for Bids soon. As the funding and project implementation is already underway, this Scope of Work is not noted in the priorities which follow in this Section.

TABLE 7-1
SUMMARY OF RECOMMENDED WWTP IMPROVEMENTS

CATEGORY	IMPROVEMENT	BUDGETARY COST	BASIS OF NEED
Control System	WWTP SCADA Improvements	$ 325,000	Improved Operation
Influent Gravity Sewer Interceptor	CCTV Ex. 21″ and 24″ Gravity Lines	$ 13,000	Determine Condition
	Conveyance MH Rehab	$ 63,100	Poor Condition, Corrosion
Main Plant Lift Station	Submersible Sewage Pumps and Controls Replacement	$ 315,300	Capacity, Service Life
	Structural Modifications	$ 48,800	Safety
Entrance Works	Screening and Influent Channel Modifications	$ 640,900	Operations, Service Life
	Grit Chamber Modifications	$ 350,800	Service Life, Sizing
	Grit Classifier Replacement	$ 236,600	Service Life
Biological Treatment Process	Miscellaneous Improvements	$ 288,600	Operations, Safety
	AeroMod Capacity Improvements	$ 1,007,500	Capacity, Service Life
	A20 Conversion	$ 3,185,000	Stringent Nutrient Limits
Aeration Equipment and Blower Building	Blower Package Modifications	$ 1,040,000	Capacity, Service Life
	Blower Building Modifications	$ 325,000	Condition, Operations
Post-Treatment Aeration	Post-Treatment Aeration Modifications	$ 446,600	Compliance
UV Disinfection Building	UV Disinfection Equipment Replacement	$ 811,200	Compliance
	Washwater Booster Pumping Modifications	$ 282,100	Operations, Capacity, Service Life
Effluent Lift Station	Complete Replacement of LS	$ 482,300	Service Life
	Rehabilitation of LS	$ 207,300	Service Life
Effluent Reuse	Class 1B Effluent Reuse	$ 2,221,900	Water Conservation
	Adder for Filtration for Class 1A Effluent Reuse	$ 1,794,000	Water Conservation
Electrical Generators	Plant Generator Replacement	$ 78,000	Service Life
	Blower Generator Replacement	$ 136,500	Service Life
Sludge Stabilization	Structural Modifications	$ 260,000	Condition
Sludge Pump Building	Pump Replacement	$ 130,000	Service Life
Solids Handling Building	BFP Modifications	$ 1,066,000	Capacity, Condition, Service Life
	Polymer Feed System Modifications	$ 179,000	Operations, Service Life
	Solids Handling Building Modifications	$ 71,500	Condition
Solids Post Processing	Improve Drying Beds for Composting	$ 273,000	Operations

7.1.1 Priority 1 – UV Disinfection Equipment Replacement

The Town is currently under an Administrative Order from the EPA for exceedances of their permitted E. coli limits. Replacement of the UV disinfection equipment was identified as the highest priority as it impacts compliance of the WWTP. Design for this project has been started. Table 7-2 presents the probable construction, professional services, and project costs.

TABLE 7-2
UV DISINFECTION EQUIPMENT REPLACEMENT PROJECT COSTS

ITEM	AMOUNT
CONSTRUCTION COSTS	
UV Disinfection Equipment Replacement	$ 811,200
Contractor General Conditions (Mobilization, bonds, insurance, demobilization, construction surveying/staking, SWPPP)	$ 121,700
Subtotal Construction Costs:	$ 932,900
NMGRT (7.1875%):	$ 67,100
Probable Construction Costs	$ 1,000,000
PROFESSIONAL SERVICES COSTS	
Design Phase	$ 100,000
Bidding and Construction Administration	$ 45,000
Construction Observation (3 months)	$ 51,000
Additional Services	N/A
Subtotal Professional Services:	$ 196,000
NMGRT (7.8750%):	$ 15,500
Probable Professional Services Costs	$ 211,500
PROBABLE PROJECT COSTS:	**$ 1,211,500**

7.1.2 Priority 2 – Post-Treatment Aeration

The Town is also currently under an AO from the EPA for exceedances of their permitted DO limits. As noted in Section 5.6.2, the installed cascade aeration system failed to improve the DO concentration in the effluent. Installation of a new technology for post-treatment aeration was identified as the second highest priority as it impacts compliance of the WWTP. Per the schedule identified in the Town's response to the AO, these improvements should be operational by September 2023. Table 7-3 presents the Probable Construction, Professional Services, and Project Costs.

TABLE 7-3
POST-TREATMENT AERATION PROJECT COSTS

ITEM	AMOUNT
CONSTRUCTION COSTS	
Post-treatment Aeration Modifications	$ 446,600
Contractor General Conditions (Mobilization, bonds, insurance, demobilization, construction surveying / staking, SWPPP)	$ 67,000
Subtotal Construction Costs:	$ 513,600
NMGRT (7.1875%):	$ 37,000
Probable Construction Costs:	$ 550,600
PROFESSIONAL SERVICES COSTS	
Design Phase	$ 66,100
Bidding and Construction Administration	$ 55,000
Construction Observation (4 months)	$ 68,000
Additional Services (Survey)	$ 15,000
Subtotal Professional Services:	$ 204,100
NMGRT (7.8750%):	$ 16,100
Probable Professional Services Costs:	$ 220,200
PROBABLE PROJECT COSTS:	**$ 770,800**

7.1.3 Priority 3 – Biological Treatment Capacity Expansion

The top priority projects were identified to address existing compliance issues. The third priority project is intended to expand the biological treatment capacity of the WWTP. As noted in Section 5.4, the oxygen needed to achieve treatment of the current influent sewage loadings is at the capacity of the existing equipment. It will be important to upgrade the biological treatment process soon to ensure compliance as growth and development continue to occur. In addition to addressing capacity limitation, this project also corrects various operational and safety concerns around the AeroMod treatment structure. Table 7-4 presents the Probable Construction, Professional Services, and Project Costs.

TABLE 7-4
BIOLOGICAL TREATMENT CAPACITY EXPANSION
PROJECT COSTS

ITEM	AMOUNT
CONSTRUCTION COSTS	
AeroMod Capacity Improvements	$ 1,007,500
Miscellaneous Improvements around AeroMod Basins	$ 288,600
Blower Package Modifications	$ 1,040,000
Blower Building Modifications	$ 325,000
Contractor General Conditions (Mobilization, bonds, insurance, demobilization, construction surveying / staking, SWPPP)	$ 399,200
Subtotal Construction Costs:	$ 3,060,300
NMGRT (7.1875%):	$ 220,000
Probable Construction Costs:	$ 3,280,300
PROFESSIONAL SERVICES COSTS	
Design Phase	$ 393,700
Bidding and Construction Administration	$ 125,000
Construction Observation (10 months)	$ 170,000
Additional Services (Survey)	$ 20,000
Subtotal Professional Services:	$ 708,700
NMGRT (7.8750%):	$ 55,900
Probable Professional Services Costs:	$ 764,600
PROBABLE PROJECT COSTS:	**$ 4,044,900**

7.1.4 Priority 4 – Influent Gravity Sewer Rehabilitation and Assessment

The Priority 4 project is small from a monetary perspective compared to the other projects, but it is still of high importance. It is known that the manholes inside the WWTP site are corroded and in need of rehabilitation. The state of gravity sewer piping is unknown and in need of video inspection and assessment. Since all sewage from the Town's collection system goes through this infrastructure, it is a high priority to implement this project. Table 7-5 presents the Probable Construction, Professional Services, and Project Costs.

TABLE 7-5
INFLUENT GRAVITY SEWER REHABILITATION AND ASSESSMENT PROJECT COSTS

ITEM	AMOUNT
CONSTRUCTION COSTS	
CCTV Ex. 21″ and 24″ Gravity Lines	$ 13,000
Conveyance MH Rehab	$ 63,100
Contractor General Conditions (Mobilization, bonds, insurance, demobilization, construction surveying / staking, SWPPP)	$ 15,300
Subtotal Construction Costs:	$ 91,400
NMGRT (7.1875%):	$ 6,600
Probable Construction Costs:	$ 98,000
PROFESSIONAL SERVICES COSTS	
Design Phase	$ 14,700
Bidding and Construction Administration	$ 27,500
Construction Observation (2 months)	$ 34,000
Additional Services	N/A
Subtotal Professional Services:	$ 76,200
NMGRT (7.8750%):	$ 6,100
Probable Professional Services Costs:	$ 82,300
PROBABLE PROJECT COSTS:	**$ 180,300**

7.1.5 Priority 5 – Entrance Works Improvements

The Priority 5 project entails equipment replacements and improvements to the Entrance Works structure. Proper functionality of the mechanical screening equipment and the grit removal system to take out nuisance materials prior to downstream treatment units is essential from an operations standpoint and to maximize infrastructure service life. Table 7-6 presents the Probable Construction, Professional Services, and Project Costs.

TABLE 7-6
ENTRANCE WORKS IMPROVEMENTS PROJECT COSTS

ITEM	Amount
CONSTRUCTION COSTS	
Screening and Influent Channel Modifications	$ 640,900
Grit Chamber Modifications	$ 350,800
Contractor General Conditions (Mobilization, bonds, insurance, demobilization, construction surveying / staking, SWPPP)	$ 148,800
Subtotal Construction Costs:	$ 1,140,500
NMGRT (7.1875%):	$ 82,000
Probable Construction Costs:	$ 1,222,500
PROFESSIONAL SERVICES COSTS	
Design Phase	$ 146,700
Bidding and Construction Administration	$ 75,000
Construction Observation (6 months)	$ 102,000
Additional Services	N/A
Subtotal Professional Services:	$ 323,700
NMGRT (7.8750%):	$ 25,500
Probable Professional Services Costs:	$ 349,200
PROBABLE PROJECT COSTS:	**$ 1,571,700**

7.1.6 Priority 6 – Solids Handling and Washwater Improvements

The Priority 6 project is intended to address capacity concerns with the solids handling facilities at the WWTP. Like the previous described projects, this is very important to the long-term function and operation of the treatment plant. The operation staff is already pushing the throughput capacity of the existing BFP for management of the solids produced from the biological treatment process. Fortunately, running this equipment for longer durations and/or more days per week is an option to bide time until the improvements can be constructed. When the solids handling capacity is increased with this project, the washwater pumping station will also require replacement. Table 7-7 presents the Probable Construction, Professional Services, and Project Costs.

TABLE 7-7
SOLIDS HANDLING AND WASHWATER IMPROVEMENTS
PROJECT COSTS

ITEM	AMOUNT
CONSTRUCTION COSTS	
BFP Modifications	$ 1,066,000
Polymer Feed System Modifications	$ 179,000
Solids Handling Building Modifications	$ 71,500
Washwater Booster Pumping Modifications	$ 282,100
Contractor General Conditions (Mobilization, bonds, insurance, demobilization, construction surveying / staking, SWPPP)	$ 239,800
Subtotal Construction Costs:	$ 1,838,400
NMGRT (7.1875%):	$ 132,200
Probable Construction Costs:	$ 1,970,600
PROFESSIONAL SERVICES COSTS	
Design Phase	$ 236,500
Bidding and Construction Administration	$ 105,000
Construction Observation (8 months)	$ 136,000
Additional Services (Survey)	$ 20,000
Subtotal Professional Services:	$ 497,500
NMGRT (7.8750%):	$ 39,200
Probable Professional Services Costs:	$ 536,700
PROBABLE PROJECT COSTS:	**$ 2,507,300**

7.1.7 Priority 7 – Main Plant Lift Station Improvements

The main plant lift station improvements were identified to be the Priority 7 project. These Scope elements are intended to address safety concerns, future capacity limitations, and improved biological treatment operations. Table 7-8 presents the Probable Construction, Professional Services, and Project Costs.

TABLE 7-8
MAIN PLANT LIFT STATION IMPROVEMENTS PROJECT COSTS

ITEM	AMOUNT
CONSTRUCTION COSTS	
Submersible Sewage Pumps and Controls Replacement	$ 315,300
Structural Modifications	$ 48,800
Contractor General Conditions (Mobilization, bonds, insurance, demobilization, construction surveying / staking, SWPPP)	$ 54,700
Subtotal Construction Costs:	$ 418,800
NMGRT (7.1875%):	$ 30,200
Probable Construction Costs:	$ 449,000
PROFESSIONAL SERVICES COSTS	
Design Phase	$ 53,900
Bidding and Construction Administration	$ 55,000
Construction Observation (4 months)	$ 68,000
Additional Services	N/A
Subtotal Professional Services:	$ 176,900
NMGRT (7.8750%):	$ 14,000
Probable Professional Services Costs:	$ 190,900
PROBABLE PROJECT COSTS:	**$ 639,900**

7.1.8 Priority 8 – Effluent Lift Station Improvements

In Section 5.8, two alternatives were presented for improvements to the effluent lift station. Due to the age of the existing structure and constructability considerations, the Town elected to plan for the complete replacement of the effluent lift station. Table 7-9 presents the probable construction, professional services, and project costs.

TABLE 7-9
EFFLUENT LIFT STATION IMPROVEMENTS PROJECT COSTS

ITEM	AMOUNT
CONSTRUCTION COSTS	
Complete Replacement of LS	$ 482,300
Contractor General Conditions (Mobilization, bonds, insurance, demobilization, construction surveying / staking, SWPPP)	$ 72,400
Subtotal Construction Costs:	$ 554,700
NMGRT (7.1875%):	$ 39,900
Probable Construction Costs:	$ 594,600
PROFESSIONAL SERVICES COSTS	
Design Phase	$ 71,400
Bidding and Construction Administration	$ 75,000
Construction Observation (6 months)	$ 102,000
Additional Services (Survey)	$ 20,000
Subtotal Professional Services:	$ 268,400
NMGRT (7.8750%):	$ 21,200
Probable Professional Services Costs:	$ 289,600
PROBABLE PROJECT COSTS:	**$ 884,200**

7.1.9 Priority 9 – Sludge Stabilization Improvements

The coatings in the aerated sludge holding tanks are showing areas of delamination. The Priority 9 project suggests repairing the basin coatings for ensuring the longevity of the concrete structure. Table 7-10 presents the Probable Construction, Professional Services, and Project Costs.

TABLE 7-10
SLUDGE STABILIZATION IMPROVEMENTS PROJECT COSTS

ITEM	AMOUNT
CONSTRUCTION COSTS	
Structural Modifications	$ 260,000
Contractor General Conditions (Mobilization, bonds, insurance, demobilization, construction surveying / staking, SWPPP)	$ 39,000
Subtotal Construction Costs:	$ 299,000
NMGRT (7.1875%):	$ 21,500
Probable Construction Costs:	$ 320,500
PROFESSIONAL SERVICES COSTS	
Design Phase	$ 32,100
Bidding and Construction Administration	$ 45,000
Construction Observation (3 months)	$ 51,000
Additional Services	N/A
Subtotal Professional Services:	$ 128,100
NMGRT (7.8750%):	$ 10,100
Probable Professional Services Costs:	$ 138,200
PROBABLE PROJECT COSTS:	**$ 458,700**

7.1.10 Priority 10 – Equipment Service Life Replacements

The Priority 10 improvements consist of replacing equipment for service life purposes. Table 7-11 presents the Probable Construction, Professional Services, and Project Costs.

TABLE 7-11
SERVICE LIFE REPLACEMENT PROJECT COSTS

ITEM	AMOUNT
CONSTRUCTION COSTS	
Grit Classifier Replacement	$ 236,600
Plant Generator Replacement	$ 78,000
Blower Generator Replacement	$ 136,500
Pump Replacement	$ 130,000
Contractor General Conditions (Mobilization, bonds, insurance, demobilization, construction surveying / staking, SWPPP)	$ 87,200
Subtotal Construction Costs:	$ 668,300
NMGRT (7.1875%):	$ 48,100
Probable Construction Costs:	$ 716,400
PROFESSIONAL SERVICES COSTS	
Design Phase	$ 86,000
Bidding and Construction Administration	$ 45,000
Construction Observation (3 months)	$ 51,000
Additional Services	N/A
Subtotal Professional Services:	$ 182,000
NMGRT (7.8750%):	$ 14,400
Probable Professional Services Costs:	$ 196,400
PROBABLE PROJECT COSTS:	**$ 912,800**

7.1.11 Deferred Improvements

There are additional improvements described in Sections 5.0 and 6.0 that are not noted in the priority projects above. This is primarily due to the significant needs identified which will be required for compliance, capacity, and equipment replacements.

The A2O conversion of the biological treatment process is not likely necessary unless stringent nutrient limits are imposed upon the WWTP. As the timeline for potential nutrient limits being established and integrated into the Town's permit is unknown, this scope is not considered an urgent need.

The effluent reuse improvements currently fall into the category of a want versus a need. The Town expressed interest in putting their treated effluent to a beneficial use, but it is a lesser priority than the needs identified for the plant.

Finally, implementing a composting operation at the WWTP was also identified as a want versus a need. Concerns exist for the potential odors that could impact the adjacent residential neighborhoods. Additionally, the Town continues to struggle with hiring sufficient staffing for the wastewater division and implementing a composting operation would require even more manpower.

Things may change in the future and these identified projects may elevate in priority.

7.2 Potential Funding Sources

There are many funding programs available for the types of wastewater infrastructure projects described in this planning document from both state and federal sources. Each program carries with it different requirements which must be met for funding eligibility. Some of the most common programs are included in Table 7-12.

TABLE 7-12
FEDERAL AND STATE FUNDING PROGRAMS

PROGRAM	FUNDING TYPE	MATCH REQUIRED	ADDITIONAL CONDITIONS OR REQUIREMENTS
FEDERAL PROGRAMS			
EPA Water Infrastructure Finance and Innovation Act (WIFIA)	Loan	No	• $5 million minimum project size. • National Environmental Policy Act (NEPA), Davis-Bacon, and American Iron and Steel Act (AIS) apply. • Cover up to 49% of project costs.
Bureau of Reclamation WaterSMART Grants	Grant	Yes	• 25%-50% match depending on program. • Nationally competitive program. • Focused on reuse or irrigation activities.
HUD – Community Development Block Grant (CDBG)	Grant	Yes	• Maximum $750,000 award. • Income thresh holds apply. • NEPA, Davis-Bacon, and AIS apply.
NMED – Clean Water State Revolving Fund (CWSRF)	Loan	No	• NMED approved design and specs. • Debt capacity is assessed. • Dedicated revenue source for repayment.
USDA – Rural Development Water and Environmental Programs	Grant + Loan	No	• Approved PER document. • Debt capacity is assessed. • Dedicated revenue source for repayment.
STATE PROGRAMS			
Capital Outlay Project Appropriations	Grant	No	• Infrastructure Capital Improvement Plan (ICIP) project listing. • Capital outlay request process. • Depends on status of state budget.
Municipal Bonds	Loan	No	• Ballot election. • Bond counsel expenses. • Debt capacity is assessed.
New Mexico Finance Authority (NMFA) – Public Project Revolving Fund (PPRF)	Loan	No	• Debt capacity is assessed. • Applicants with MHI lower than state average receive special interest rate.
NMED – Rural Infrastructure Program (RIP)	Loan	No	• Debt capacity is assessed. • Can be combined with PPRF. • $2 million maximum loan.
NMFA – Water Project Fund	Grant + Loan	Yes	• Limited to Effluent Reuse Projects. • Asset Management Plan Required. • Consent for additional debt.

8.0 REFERENCES

1) Mid Region Council of Governments of New Mexico. Data Analysis Sub Zone 2040 Socioeconomic Forecast. Webpage retrieved May 17, 2021. https://www.mrcog-nm.gov/196/DASZ-Datasets.
2) *Wastewater Engineering Treatment and Resource Recovery, Fifth Edition. Metcalf & Eddy, Inc. 2014*.
3) *Recommended Standards for Wastewater Facilities. 2014 Edition. "Ten States Standards." Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers.*
4) *Wastewater Treatment Plant Ultraviolet Radiation Disinfection. Molzen Corbin. June 2021*.
5) City of Portland, Oregon, Environmental Services, Cannabis Industry. Webpage retrieved July 10, 2021. https://www.portlandoregon.gov/bes/article/632681.
6) *Centrifugal Compressor Engineering Manual, Third Edition, Revis L. Stephenson & Harold Nixon, October 1986.*

APPENDIX A

PHYSICAL CONDITION EVALUATION OF EXISTING STRUCTURES AND EQUIPMENT

APPENDIX A

PHYSICAL CONDITION EVALUATION OF EXISTING STRUCTURES AND EQUIPMENT

The following structures are included:

1. Influent Lift Station and Pumps
2. Entrance Works Structure
3. Entrance Works Aerated Grit Chamber and Hydrogritter Grit Washer
4. Fermenter Basin and Anaerobic Basins
5. North and South Aeration Basins
6. Clarifiers
7. Aerobic Digester Basin
8. Cascade Aerator Structure
9. Ultraviolet Disinfection System
10. Effluent Lift Station and Pumps
11. Waste Activated Sludge Feed Pumps
12. Belt Filter Press
13. Washwater Pumping System
14. Sludge Drying Beds

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Influent Lift Station and Pumps

Condition of Concrete and Structure
- Walls: Fair to good condition
- Aluminum Platform at Wet Well: good condition
- Piping exterior: good condition
- Valve operation: good condition
- Valve body: corroded; good condition.
- Corrective Action: none

Condition of Coatings:
- Walls: Fair to good condition
- All looks good, including beneath the grates.
- Corrective Action: none

Condition of Pumps:
- Three pumps
- Good condition
- Replaced all 3 pumps about 3 years ago.
- Corrective Action: none. Evaluate further based on pumping demand requirements.

Condition of Miscellaneous Metals:
- Handrail: good
- All good except for the coated steel grating that is located directly above the influent lift station wet well (see attached photo).
- Corrective Action: replace elevated steel platform and steel handrail.

Equipment Capacity (flow rate, head, motor size, etc):
- Flygt Model NP3127-421
- 10 hp, 1750 rpm, 460VAC/3/60
- Single pump design Q = 1,000 gpm @ 26ft TDH
- Parallel (2x) pumps operating Q = 869 gpm @ 30.8ft TDH
- 6x8 discharge elbow

Wet Well Size:
- Surface Area: 10ft x 10ft
- High Water: 6ft (to turn pump on)

Operational Issues:

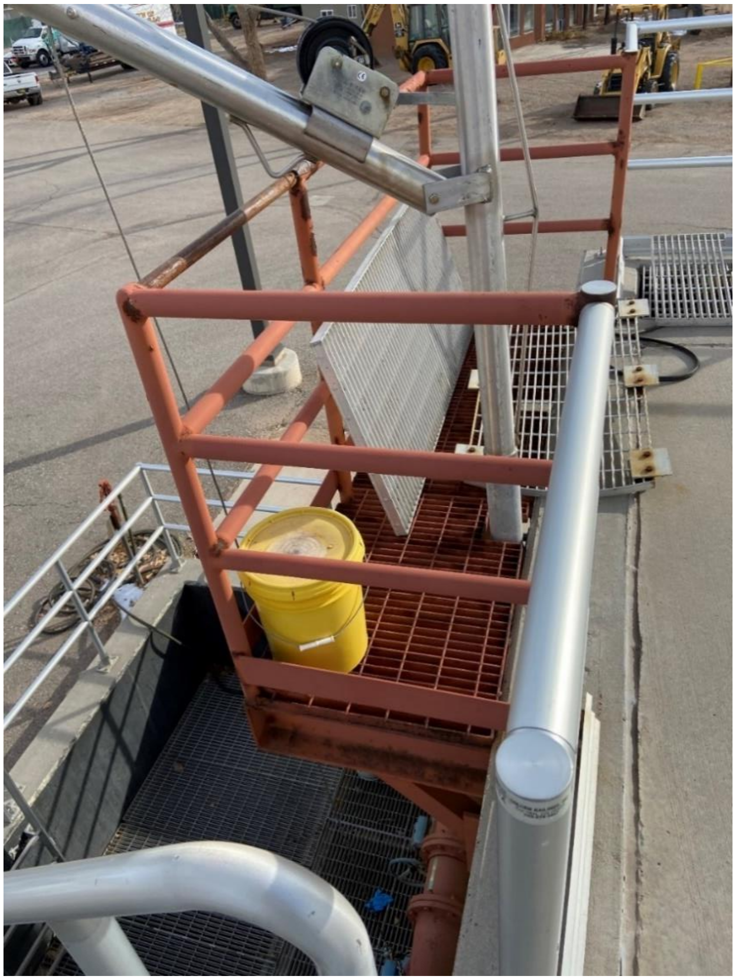
- Manholes conveying raw sewage to the plant at WWTP site are very corroded. , will likely need to rehab these. 6' diameter MH's at a depth of approximately 15-20'.
- Corrective Action: rehab existing manhole concrete walls, floor, and other surfaces.

Electrical:

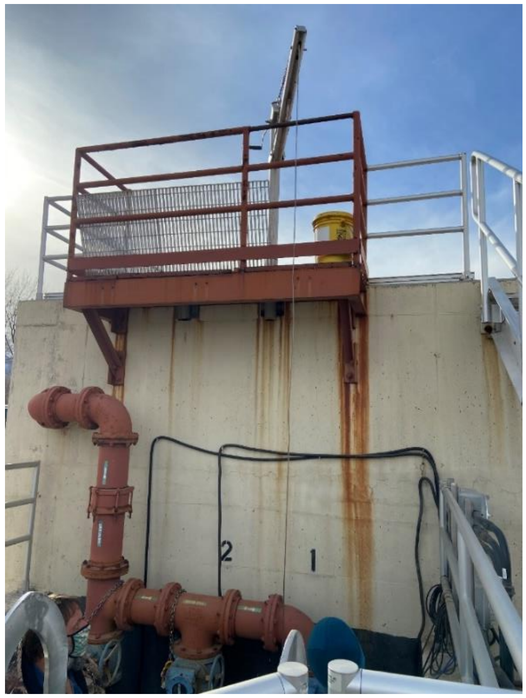
- Control Panel:
    - Frequently replacing starters, relays, and phase monitor; replaced to many times. Operator suggest to replace control panel.
- Pump station controls may become outdated in the near future (see photos for panel).
- Corrective Action: replace control panel.

Additional Notes:

- Safety Concerns: no fall protection under removable grating sections in wet well



CORRODED STEEL HANDRAIL AND GRATED PLATFORM ABOVE WET WELL



CORRODED STELL PLATFORM AND HANDRAIL ABOVE WET WELL

EXISTING INFLUENT PUMP STATION CONTROL PANELS

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Entrance Works Structure

Condition of Concrete:
- West Wall: horizontal cracks – minor – not structural concern.
- South Wall: horizontal cracks – minor – not structural concern.
- East Wall: horizontal cracks – minor – not structural concern.
- North Wall: horizontal cracks – minor – not structural concern.
- Overall, the condition is good. Minor cracks horizontally around perimeter of exterior (see attached photo) no apparent seepage. Minor cracking on the deck of the structure.

Condition of Coatings:
- Fair to good condition
- Looks good
- Corrective Action: none

Mechanical Stair Screen:
- Removed from service.
    - Tried to replace link chain; not able to connect chain.
    - Per supplier, replacement chain is correct size.
- Screening compactor works well; new auger recently installed.
- When unit was in operation, experienced freezing and icing conditions on stair screen metal steps which shutdown mechanical screen.
- Corrective Action: Need to replace mechanical stair screen with new mechanical screen and include winter package to avoid freezing and icing problems.

Currently, the "Climber Screen" is down (not operational). The Vulcan chains are in need of replacement. Chains have been purchased, but the Town cannot get them to fit around the gear operators. There is no apparent tension adjustment for the belt to be fit around the gears.

Mechanical Stair Screen Equipment
- Vulcan Stair Screen
- Model No. ESR 23-358-3
- Average Daily Flow: 1.2 mgd
- Peak Hourly Flow: 2.4 mgd
- Channel Width: 2ft
- Channel Depth: 5ft
- Average Daily Water Level: 1ft – 6in
- Bar Rack Clear Spacing: 3mm
- Angle of Setting: 50 degrees from horizontal
- Motor: 2hp
- Wash Press Model: EWP 150-600

Manual Bar Screen:

- Good condition; not corroded.
- Channel slide plates in manual bar screen channel are extremely hard to remove. Plates do not completely seal off sewage from entering the dry channels (see photo).
- Corrective Action: Replace slide plates with in-channel prefabricated self-contained gates.

Condition of Miscellaneous Metals:

- Channel Slide Plates
  - Very difficult to remove and re-install to completely seal.
  - In closed position, plates do not seal in closed position, leak at bottom channel seal.
  - 5 stop plates total.
  - Corrective Action: Replace slide plates with in-channel prefabricated self-contained gates.
- Steel platform above aerated grit chamber are rusting and are corroded (see photos).
  - Corrective Action: Sand blast steel surfaces and apply protective coating.
- Elevation steel platform and steel handrail over influent wet well, north side of structure.
  - Very corroded; needs to be replaced.
  - Corrective Action: Replace elevated platform and handrail.

Other Needs:

- Permanent Automatic Sampler (winter package). Required for plant operations, monitoring, and reporting purposes. Install on top of entrance works structure. Will require to power extension to this location.
- Freezing in the screening channel has been occurring.
  - Corrective Action: Install insulated cover plates over open channels.

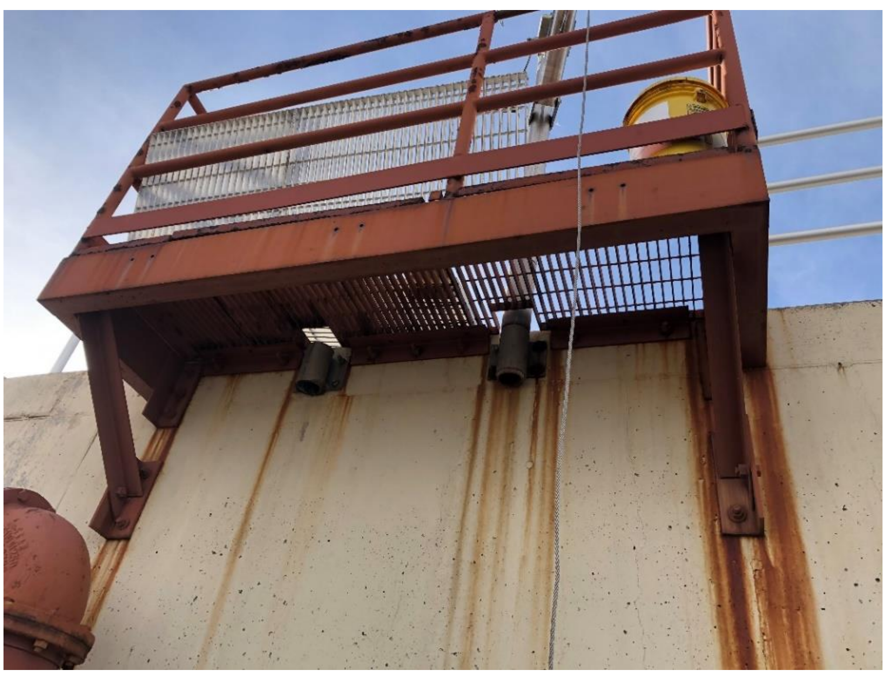
EAST WALL: HORIZOTAL CRACKS IN ENTRANCE WORKS STRUCTURE

SLIDE PLATES DO NOT EFFECTIVELY SHUTOFF FLOW IN SCREENING CHANNEL IN CLOSED POSITION. MECHANICAL STAIR SCREEN STEPS ICE UP.

MECHANICAL STAIR SCREEN ON TOP OF STRUCTURE WITH WASH PRESS AND SIDE DISCHARGE CHUTE TO DUMP CONTAINER ON GROUND LEVEL

STEEL PLATFORM ABOVE AERATED GRIT CHAMBER IS RUSTED AND CORRODED


STEEL STRUCTURAL MEMBERS ARE CORRODED



ELEVATED STEEL PLATFORM AND STEEL HANDRAIL OVER INFLUENT WET WELL ARE CORRODED

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Entrance Works – Aerated Grit Chamber and Hydrogritter Grit Washer

Condition of Concrete: Fair to good condition

Condition of Miscellaneous Metals:

- Top steel plate platform over aerated git chamber: corroded; coating system worn off.
- The steel deck over the aerated grit is rusting and corroded (see photo).
- Corrective Action: Sand blast and apply protective coating on steel surfaces.

Condition of Equipment:

- Air Compressor/Blower
  - Unit replace three times; not reliable.
  - Sound enclosure removed; not used.
  - Unit not too noisy.
  - Power to solenoid valve to shut off air to grit chamber is disconnected. Assume solenoid valve is in open position with power disconnected. Air supply is continuous to aerated grit chamber.
  - Corrective Action: Evaluate capacity for future flows and determine if replacement is necessary.
- Air lift pumping system
  - Replaced once.
  - Does not work adequately, makes grit classifier inoperable and not used.
  - Continue to have problems with bottom foot valve.
  - Exposed air piping: grit piping coating system corroded; elbow corroded.
  - Corrective Action: Evaluate capacity for future flows and determine if replacement is necessary.
- Hydrogritter
  - Experience freezing problems in grit screw and water supply lines.
  - Corrective Action: Provide freeze protect on hydrogritter and water lines.

Equipment Capacity (flow rate, head, motor size, etc.):

A. Grit System

- Manufacturer: Amwell
- I.D. No. S.O. 99710-4
- Model: DIFFUSAMIX GRIT SYSTEM
- Tank Size: 10ft x 10ft x12ft SWD

- Design Flow:
    - 1.2 mgd average dry weather flow
    - 2.4 mgd maximum dry weather flow
    - 2.7 mgd maximum wet weather flow
    - 75 scfm air inlet volume
    - 5.0 psig discharge pressure

- <u>Aerated Grit Chamber Size</u>
    - Surface Area: 10ft x 10ft
    - Side Water Depth: 17ft – 3in

B. Blower
- Hardy Systems Corp Model: HPP-MD3003-5HP-2FS-2
    - 3003-21L1 Tuthill MD Pneumatic blower
    - 2” BBF silencer base
    - 5 hp; 460V/3/60
    - 2” inlet filter silencer
    - 2” discharge
    - Discharge pressure gauge
    - 2” discharge pressure relief valve
    - Sound enclosure
    - Design parameters
        - 75 scfm (94 icfm)
        - 5.0 psig pressure
        - 90 degrees F inlet temperature
        - 2198 rpm speed
        - 80 dBA estimated noise
    - Dewatering Screw
        - ¾ hp; 460V/3/60
        - 1800 rpm
        - Belt drive

C. Hydrogritter Grit Washer
- Stainless steel fabrication
- Manufacture: Amwell
- 2.5 x 4
- 12” grit washer: 20 degrees incline
- Model DSC Dewater Screw Conveyor
- Reducer: SCXT225
- Motor: ¾ hp; 230/460/3
- Design Flows:
    - 1.2 mgd average dry weather
    - 2.4 mgd maximum dry weather
    - 2.7 mgd maximum wet weather

Operational Issues with Hydrogritter:

- Has never been functional due to the poor operation of the air lift pumps in the aerated grit chamber.

RUSTED STEEL PLATFORM ABOVE AERATED GRIT CHAMBER

HYDROGRITTER – FREEZING CONDITIONS CAUSE OPERATIONAL PROBLEMS AND SHUTDOWN OF UNIT DURING WINTER OPERATIONS\

HYDROGRITTER DOES NOT FULLY FUNCTION DUE TO POOR PREFORMANCE FROM AIR LIFT PUMPS IN AERATED GRIT CHAMBER

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Fermenter Basin and Anaerobic Basin

Condition of Concrete: fair to good condition

Condition of Coatings: fair to good condition

Condition of Equipment:

- Serious algae built up throughout the treatment unit structure: walls, pipes, submerged metal skimmer.
- Mixers are in fair condition. May not get sufficient mixing with just one mixer in service. Mixer periodically trip out.
- Recently added troughs to direct RAS to the anaerobic selector rather than the fermenter.

Condition of Miscellaneous Metals:

- Good condition

Operational Issues:

- Evaluate further after based on review of hydraulic and process capacities.

Basin Sizes:

- Fermenter Basin: 12ft wide x 39ft–4in x 18ft-0in wall height
- Anaerobic Basin: 12ft wide x 39ft–4in x 18ft-0in wall height
- Side Water Depth: 16ft
- Volume: 56,549 gallons each basin

Equipment:

- Mixer (Aire-O2 Process Aerator): 3 hp

Additional Notes:

- Operators would like to have an additional elevated bridge spanning the fermenter from clarifier to clarifier and extension of the current stairway access platform on the east side (see photo).
- Corrective Action: provide elevated bridge for safety reasons.

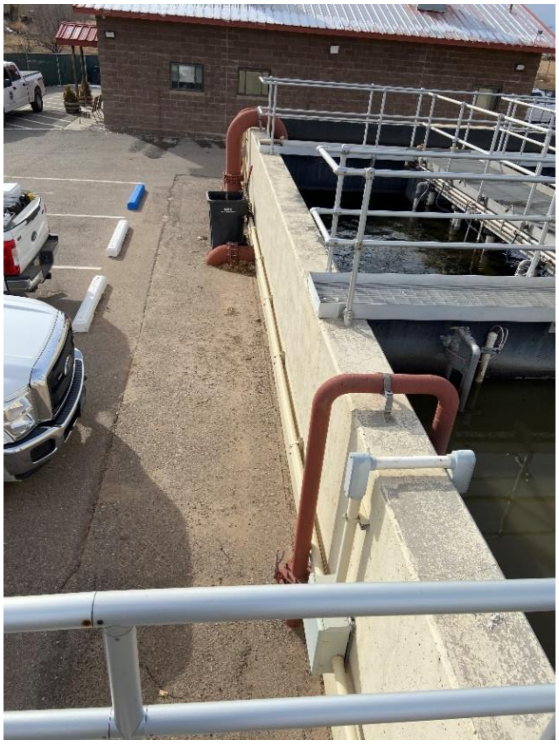
Other Issues

- How to deal with algae growth on walls and other metal surfaces.
- How to deal with safety concerns regarding fall protection into deep basins.
- Corrective Action: to be determined.

VIEW OF FERMENTER BASIN AND RAS INLETS FROM AERATION BASINS.
ANAEROBIC BASIN IS ON WEST SIDE OF FERMENTER BASIN.

ANAEROBIC SELECTOR BASIN WITH MIXER

EXISTING STAIR PLATFORM FOR EXTENDING ELEVATED WALKWAY TO EXISTING WALKWAY BRIDGE BETWEEN SOUTH CLARIFIER AND SOUTH AERATION BASIN



LOOKING SOUTH FOR PLATFORM EXTENSION FROM NORTH DIRECTION TO ENABLE OPERATORS TO REACH BRIDGES ACROSS FERMENTER BASIN

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

North and South Aeration Basins

Condition of Equipment:

- Diffusers: Frequently replaced. Keep new diffusers in stock at plant.
- Air Actuators: plastic tubes crack and break due to sunlight; plastic tubes not ultraviolet resistant (see photo).
    - Corrective Action: To be determined.
- Access between treatment basins is a safety concern; need to go around aeration basins to get to fermenter basins.
    - Suggest extending walkway platforms from clarifiers to fermenter basins.
    - Suggest replacing east stair landing to south fermenter basin and connect to existing walkway platform.
    - Corrective Action: provide elevated walkway for safety reasons.
- Serious algae built up throughout the treatment unit structure: walls, pipes, submerged metal skimmer.

Condition of Concrete:

- Leaking around inlet pipe on the east wall of the structure (see photo).
- Superficial cracking around the structure.
- Corrective Action: repair leak at inlet pipe on east wall.

Condition of Coatings:

- Fair to good condition.
- Some delaminating occurring on basin walls (see photos).
- Corrective Action: rehab of wall coatings maybe required.

Condition of Miscellaneous Metals:

- Grating Sections: installed without hold-down clips; safety hazard.
- Center grating support keeps breaking off; welded connection; not anchored (see picture). This is located on the southside at intersection of west to south walkways.
- Broken metals on grating supports and on handrail brackets (see photo).
- Corrective Action: Install hold-down clips on grating sections for safety; repair broken metal work.

Operational and Other Issues:

- Field DO probes require frequent calibration.
- How to deal with algae growth on walls.
- How to deal with safety concerns regarding fall protection into deep basins.
- Corrective Action: to be determined.

Design Information:

- Manufacturer: Aeromod
- Activated Sludge Treatment Design Parameters

	Influent	Effluent
Flow, mgd	1.20	
BOD5, mg/l	250	10.0
BOD5, lbs/day	2,502	100.1
BODL, mg/l	366	-------
TSS, mg/l	250	10.0
TSS, lbs/day	2,502	100.1
Ammonia-N, mg/l	60	0.3
Ammonia-N, lbs/day	600	3.0
Total Nitrogen, mg/l	-------	8.0
Total Nitrogen, lbs/day	-------	80.1
Phosphorus-P, mg/l	8	15.0
Phosphorus-P, lbs/day	80	15.0

- Dissolved Oxygen Analyzer: model 1000CE
- Optical Dissolved Oxygen Senor: model 10

Stage 1 Aeration Basin Size:

- Number of Tanks: 2
- Length: 77ft
- Width: 26ft-8in
- Height: 18ft
- Side Water Depth: 16ft
- Volume: 490,718 gallons total

Stage 2 Aeration Basin Size:

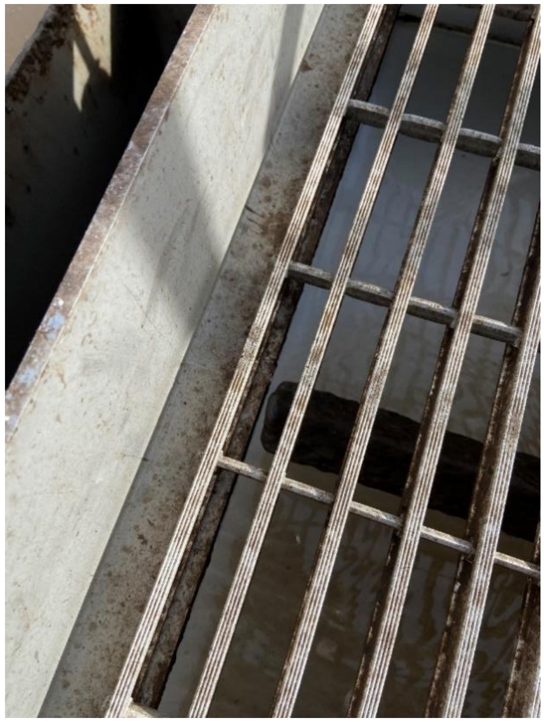
- Number of Tanks: 2
- Length: 158ft-3in
- Width: 13ft-6in
- Height: 18ft
- Side Water Depth: 16ft
- Volume: 511,363 gallons total

VIEW OF SOUTH AERATION BASIN

AIR ACTUATOR PLASTIC TUBE LINES ARE NOT ULTRAVIOLET RESISTANT

LEAK THROUGH EAST WALL OF STURCTURE AT INLET PIPE

EXAMPLE OF DELAMINATING COATING ON BASIN WALLS



WELDING DISCONNECT ON BRACKET UNDER RAS TROUGH GRATING PANEL

BROKEN WELDED CONNECTION ON HANDRAIL POST BRACKET

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Clarifiers

Condition of Concrete:
- Fair to good condition.
- Superficial cracking around structure.
- Corrective Action: none

Condition of Coatings:
- Fair to good condition.
- Some delaminating occurring on walls.
- Corrective Action: rehab wall coatings maybe required.

Condition of Equipment:
- Inlet screen from aeration basins: good condition.
- Submerged stainless steel metal works: good condition.
- Air Lift Pumps (RAS): good condition.
- Skimmers: good condition. Fine screens on air supply to skimmers foul up and need continuous attention to keep clean.
- RAS Trough: good condition. Algae growth on metal surfaces a maintenance problem.
- Corrective Action: none

Components:
- Split-Clarator Clarifier
    - Air Lift Pumps
    - RAS Timer
    - WAS Timer

Basin Sizing Information:
- Number of Clarifiers: 2
- Length: 80ft
- Width: 20ft
- Total Surface Area: 3,200sf
- Total Weir Length: 296ft
- Wall Height: 18ft
- Side Water Depth: 16ft

Clarifier Capacity:

- 1.20 mgd
- Design Flow: 375 gpd/sf
- Sludge Loading Rate
  - Design Flow: 21.4 lbs/day/sf
  - Maximum Flow: 32.6 lbs/day/sf
- Capacity of Sludge Storage: 1.0 hrs
- Retention Time
  - Design Flow: 7.7 hrs
  - Maximum Flow: 2.9 hrs

Operational and Other Issues:

- How to deal with algae growth on walls and metal surfaces.
- How to deal with safety concerns regarding fall protection into deep basins.
- Corrective Action: to be determined.

VIEW OF CLARIFIER AND WALKWAY BRIDGE

VIEW OF CLARIFIER WALKWAY BRIDGE WITH RAS TROUGH UNDER BRIDGE TO FERMENTER BASIN

VIEW OF CLARIFIER BRIDGE WITH AIR SUPPLY TO SUBMERGED SKIMMERS

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Aerobic Digester Basin

Condition of Concrete:
- Fair to good condition.
- Superficial cracking around the structure.
- Corrective Action: repair leak at inlet pipe on east wall.

Condition of Coatings:
- Fair to good condition.
- Some delaminating occurring on basin walls (see photos).
- Corrective Action: rehab of wall coatings maybe required.

Condition of Equipment:
- Diffusers: Frequently replaced. Keep new diffusers in stock at plant.

Condition of Miscellaneous Metals:
- Fair to good condition
- Corrective Action: none

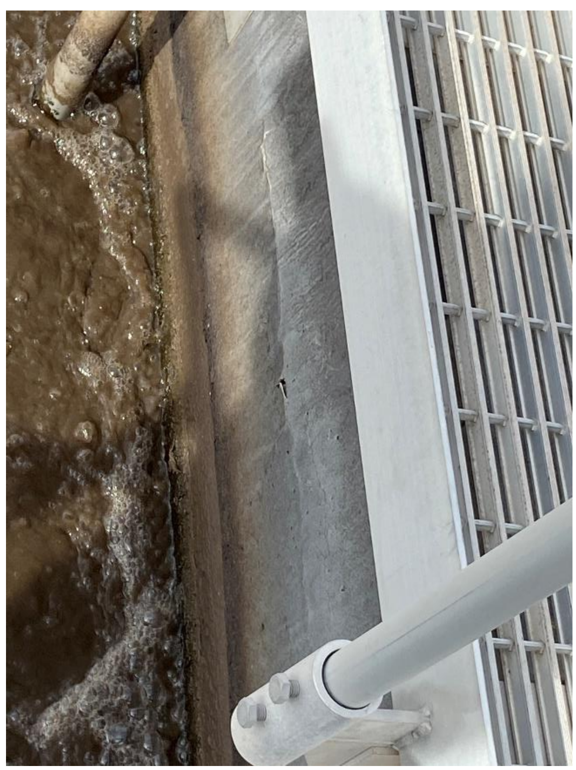
Basin Sizing Information:
- Number of Tanks: 2
- Wall length: 38ft
- Wall Width: 41ft – 4in
- Wall Height: 18ft
- Side Water Depth: 16ft – 6in
- Volume: 388,100 gallons

- Aerobic Digester Design Parameters

Volume, % of Aeration Tank	39.0
Maximum MLSS, mg/l	12,000
Maximum MLSS, %	1.2%

Operational and Other Issues:
- Field DO probes require frequent calibration.
- How to deal with algae growth on walls.
- How to deal with safety concerns regarding fall protection into deep basins.
- Corrective Action: to be determined.

VIEW OF DELAMINATION OCCURING IN AEROBIC DIGESTER BASINS



VIEW OF DELAMINATION OCCURING IN AEROBIC DIGESTER BASINS

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Blowers and Blower Building

Condition of Building:

- Cooling System
  - Motorized wall louvers and actuators not working properly.
  - West Evaporative Cooler
    - Unit was replaced.
    - Having problems with inlet louvers; not adequate to meet cooling requirements.
  - South Evaporative Cooler
    - Unit over sprays water through wall louvers into building from fan in cooler unit.
- Concrete floor: good condition.
- Metal building: good condition.
- Corrective Action: replace motorized wall louvers; replace south evaporative cooler unit.

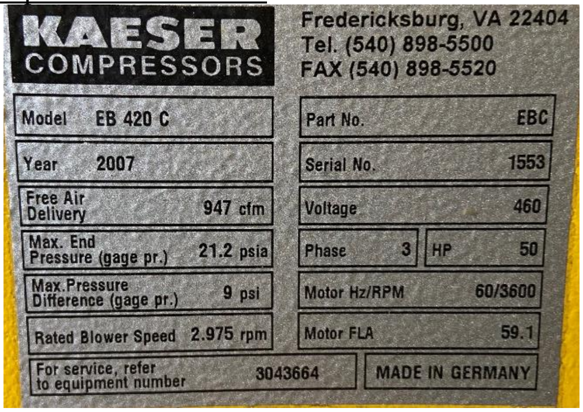
Condition of Blowers:

- All 6 blowers have been rebuilt.
- Water spray from south evaporative cooler is getting on blower enclosure; covers are corroding.
- Corrective Action: address water spray onto blower enclosures.

Blower Information:

- Manufacture: Kaeser
- Model No. EB420C
- 50 hp; 460V/60hz
- Inlet flow: max load = 790 icfm; design point = 825 icfm; standard = 650 sfcm

Air Compressor Information:



Operational Issues:

- 2 of the 6 blowers VFDs have been replaced and are still problematic (see photo).

Additional Notes:

- Blowers are on separate emergency generator: Unit #1
- Laboratory Building, etc. are on separate emergency generator: Unit #2

MOTORIZED WALL LOUVERS - ACTUATOR NOT WORKING PROPERLY

WATER SPRAYS THROUGH LOUVER FROM SOUTH COOLER UNIT THROUGH WALL INTO BUILING AND BLOWER ENCLOSURE

BLOWER ENCLOSURE CORRODING FROM OVER SPRAY FROM SOUTH COOLER UNIT THROUGH WALL

VIEW OF BLOWER UNITS ON HOUSER PAD

BLOWER VFD CABINETS WITH OLD VFD UNIT AND REPLACED VFD UNIT

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Cascade Aerator Structure

Condition of Concrete: Good condition; recently constructed.

Condition of Coatings: Walls not coated.

Condition of Metals: Good condition; recently constructed.

Design Purpose and Operational Issues:

- The structure was designed to aerate flow upstream of the UV disinfection system to meet discharge permit requirements. The cascade aerator was removed from service because of design problems.
- This newly constructed structure is currently being bypassed and has not functioned to meet its design purpose.
- The structure was modified multiple times in efforts to attain higher DO levels with no success.
- A determination has been made that the cascade aeration system will be unable to meet the Town's DO requirements.
- Corrective Action: Install a new post treatment aeration system using mechanical or diffused aeration.

CASCADE AERATOR STRUCTURE AND FLOW CONTROL PLATES WITH AERATION FINGERS TO OUTLET BOX

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Ultraviolet Disinfection System

Condition of Concrete: Good Condition

Condition of Coatings: Good Condition

Condition of Miscellaneous Metals: Good Condition

Equipment Information and Capacity:

- Manufacturer: Siemens
- Model: Vertical Open Channel VE-30-A300-AW
- Average Flow: 3.2 mgd
- Ultraviolet Transmittance at 253.7 nm: Normally 65% with lamp output at 80%
- UV Dosage: greater than 31,000 uWs/cm2 at peak flow
- Jib Crane: Coffing
  - Capacity: 1,000 pounds
  - Hoist: electric operator, chain
- Air Compressor: Westward

Operational Issues:

- Currently, only one UV channel is in operation. UV bulbs in the second channel need to be replaced and have been removed from the channel (see photo).

Evaluation of Installed UV System:

- Molzen Corbin prepared a technical memorandum report (June 2021) for the installed UV system.

- UV System Description:
- Open-channel, low-pressure high intensity vertical UV lamp system with an air-driven automatic quartz sleeve wiping system.
- External chamber used for chemical cleaning of quartz sleeves.
- UV system consists of two redundant channels; one channel is currently used due to the plant operating at approximately half of the design flow.
- Channel Size: 26 inches wide x 81inches high at UV modules; 33 inches high at weir: total length 17 feet.
- Finger weir designed to limit water level changes to a maximum of 1 inch depth.

- Each channel covered with 1-1/2-inch aluminum grating sections.
- Portions of channel adjacent to the UV modules have 3/16-inch aluminum checker plate for mitigating operator exposure to harmful UV light.
- Each channel designed to accommodate one UV module.
- Each module consists of 30 lamps with each lamp placed individually in a quartz sleeve.
- Modules are designed such that operators can change the lamps and quartz sleeves with the remainder of the system in place and in operation.
- Modules to be removed from channels are lifted out with a 1/4-ton free standing jib crane.

UV System Conditions and Operational Concerns:

- Extensive algal growth occurs within the main process basins.
- Algae is manually cleaned from the process basin equipment but do not typically settle well in basins. Remaining suspended in flow from the basins flow through the UV channels.
- Large clumps of algae are visible floating in the channel.
- Particles in the flow could be potentially causing problems with effective disinfection performance.

  Installed UV system not adequate due to lack of support from manufacturer and unavailability of spare parts.

UV - Corrective Action:

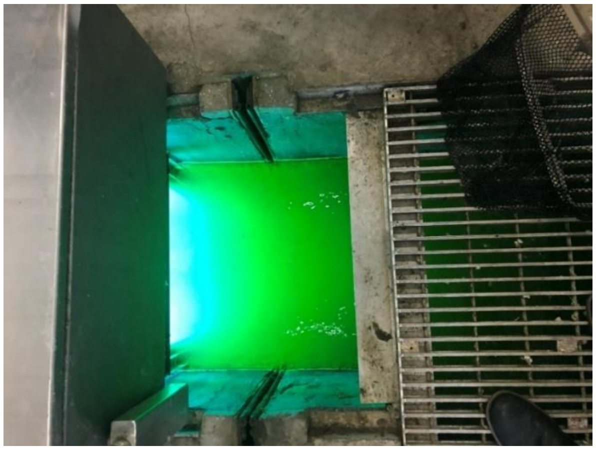
- Pre-screening of flow with fine stainless steel mesh screens to collect any suspended solids larger than the mesh to remove large clumps of algae in the flow before flow passed through the UV disinfection channel.
- Replace installed opened aluminum grating to avoid increase the potential algal growth within the UV channels. Solid covers over the channels can help mitigate algal growth within the channel.
- Install baffles in channels to reduce hydraulic short circuiting. Submerged- perforated baffles could be placed in the channel prior to the UV module.
- Baffles within the channel would promote a more plug-flow like condition within the channel and can reduce density and eddy currents.

- Replace the installed UV system to reduce overall operations and maintenance costs and ensure compliance with NPDES permit requirements.
- Recommended Replacement UV System: Suez, Aquaray 40® HO Generation 2 Vertical Lamp.

Other Issues:

- Building: Spiders and midge flies cause a large housekeeping issue for the operators, particularly in the summer months.
- Fall protection around deep channels.
- Corrective Action: to be determined.

UV CHANNELS – GREEN COLOR DUE TO ALGAE IN FLOW



OPEN GRATING SECTIONS ALLOW LIGHT PENETRATION FOR ALGAL GROWTH

UV BULBS NEEDING REPLACEMENT (LIFTED OUT OF CHANNEL)

VIEW OF PARSHALL FLUME IN CHANNEL

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Effluent Lift Station and Pumps

Condition of Concrete:
- Fair to good condition
- Jib Crane Base: broken

Condition of Coatings:
- Fair to good condition

Condition of Equipment:
- Pumps: installed in shallow wet well; can see top of pumps
- Generally good condition.

Condition of Miscellaneous Metals:
- Wet Well Cover: hinge anchor on wall is loose.

Operating Condition:
- Fair; mostly reliable

Equipment Capacity:
- Flygt Model CP3127-411
- 10 hp, 1750 rpm, 460VAC/3/60
- Single pump design Q = 1,300 gpm @ 19ft TDH
- Parallel (2x) pumps operating Q = 990 gpm @ 26ft TDH
- 6x8 discharge elbow

Other Issues:
- No fall protection under wet well cover.
- No fall protection under valve pit cover panels.
- Valve pit: flooded from rainwater.

Corrective Action:
- Repair jib crane concrete base: to be determined.
- Replace covers on wet well and valve pit with fall protection covers.
- Provide means to drain or pump out rainwater from valve pit.
- Pumps: to be determined.

Wet Well Size:
- Surface Area: 6.5ft x 6.5ft
- High Water Level: 5ft (to turn pump on)

EFFLUENT LIFT STATION WITH JIB CRANE FOR PUMP REMOVAL

WET WELL PUMP COVER (NO FALL PROTECTION)

RAINWATER IN VALVE PIT

VALVE PIT COVER WITHOUT FALL PROTECTION

VIEW OF JIB CRANE AT LIFT STATION

JIB CRANE - BROKEN CONCRETE BASE

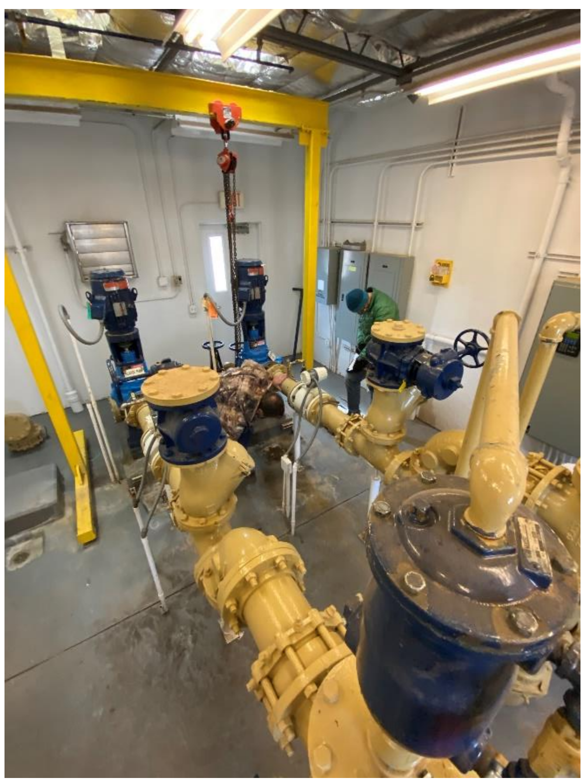
Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Waste Activated Sludge Feed Pumps

Sludge Pump Information and Capacity:
- Wemco Pumps – WSF Screw Flow Type.
- Two-pump installation; centrifugal pumps.
- Function: Pump waste activated sludge to belt filter press.
- Motor: 5hp, 460V, 3 phase.
- Pumps do not hold prime.

Other Equipment:
- Knife gate valves installed for sludge service; cast iron body; valves are corroding.
- Some minor rust/corrosion on pump piping and motors
- Building in good condition; some drywall issues.
- Heater is down, needs replacement.

WASTE ACTIVATED SLUDGE PUMPS AND DISCHARGE PIPING WITH FLOW METER



WASTE ACTIVATED SLUDGE PUMPS LAYOUT WITH OVERHEAD HOIST

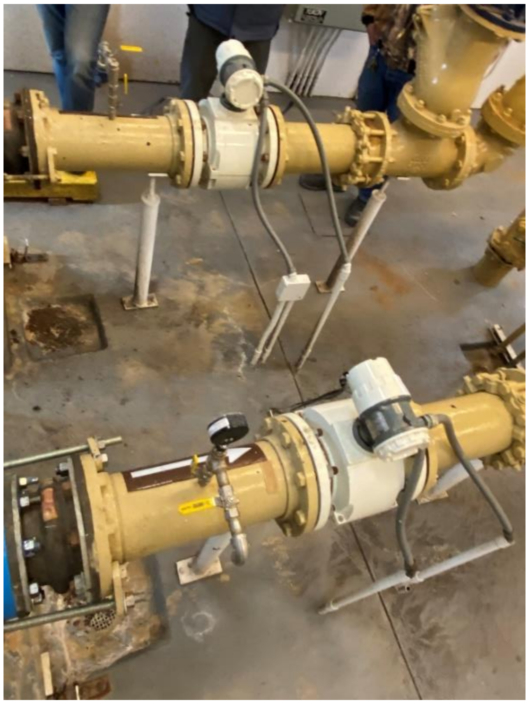
WASTE ACTIVATED SLUDGE PUMPS DISCHAGE TO BELT FILTER PRESS

WASTE ACTIVATED SLUDGE DISCHARGE PIPING WITH KNIFE GATE VALVES

WASTE ACTIVATED SLUDGE PUMP NO. 1 – FEED TO BELT FILTER PRESS

WASTE ACTIVATED SLUDGE PUMPS - RECENTLY REPLACED

WASTE ACTIVATED SLUDGE SUCTON TO PUMP
SUPPLY SOURCE FROM AEROBIC DIGESTER



WASTE ACTIVATED SLUDGE FLOW METER FROM EACH PUMP

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Belt Filter Press

Belt Filter Press Equipment and Capacity: Constructed in 2008

- Manufacturer: Charter Machine Company
- Tower Belt Press Model No. TP17.43
- Belt Width: 1.7 meters
- Includes:
    - Gravity Dewatering Zone
    - Wedge Zone
    - High Pressure/Shear Zone
    - Cake Discharge Zone
    - Rollers
    - Roller Bearings and Seals
    - Belt Tensioning
    - Belt Tracking
    - Pneumatic Control System
    - Belt Wash Stations
    - Filter Belts
    - Drive Motor
    - Safety Features
    - Electrical Control Panel
    - Belt Drive Motor: 5hp; 460volt, 3-phase, 60hz
    - Booster Pump: G&L; Capacity: 75 gpm at TDH 175ft, Model SSH-C; Motor: 10hp, 3-phase
    - 4” Adjustable Inline Mixer (to blend polymer with sludge)
    - 4” Polymer Injection Ring
    - Discharge Belt Conveyor: 1.5hp; 460volt, 3-phase, 60hz
    - Air Compressor: Emglo, Model K15E17, single stage, 1.5hp, tank 17 gallons

BFP System Condition and Condition of Components:

- Belt Filter Press and components have been in service for approximately 13 years.
- Corrective Action: replacement to be determined.
    - Rollers: poor condition; rollers wearing out
    - Bearings: poor condition; bearings starting to corrode
    - Pneumatic Control System: poor condition
    - Belt Wash Station: poor condition; replace belt twice; upper and lower belts
    - Filter Belt: poor condition
    - Belt Drive Motor: poor condition
    - Air Compressor: poor condition
    - Booster Pump: poor condition
    - Conveyor Belt: poor condition
    - Inline Mixer: poor condition
    - Miscellaneous Metals: fair to poor condition; some corrosion

Polymer System Equipment and Capacity:

- ROEDOS Model: L-1.1
- Liquid Polymer Preparation Unit
- Includes:
    - Panel Mounted Polymer System, Air Compressor, and Control Panel
    - Liquid Polymer Electronic Metering Pump: Model C13; 8.0 gph, 60 psi, adjustable knobs
    - Polymer Storage Tank
    - Mechanical Mixer
    - Polymer Dilution Panel with mounted Polymer Feed Pump and Electrical Control Panel

Polymer System Condition and Condition of Components:

- Overall condition of Polymer System: poor condition; polymer system has been in service for approximately 13 years.
- Polymer base platform is corroded.
- Polymer line clog with gummy polymer in line. Polymer line does not have washwater connection for flushing out line.
- Corrective Action: replacement to be determined.

Operational Comments or Issues:

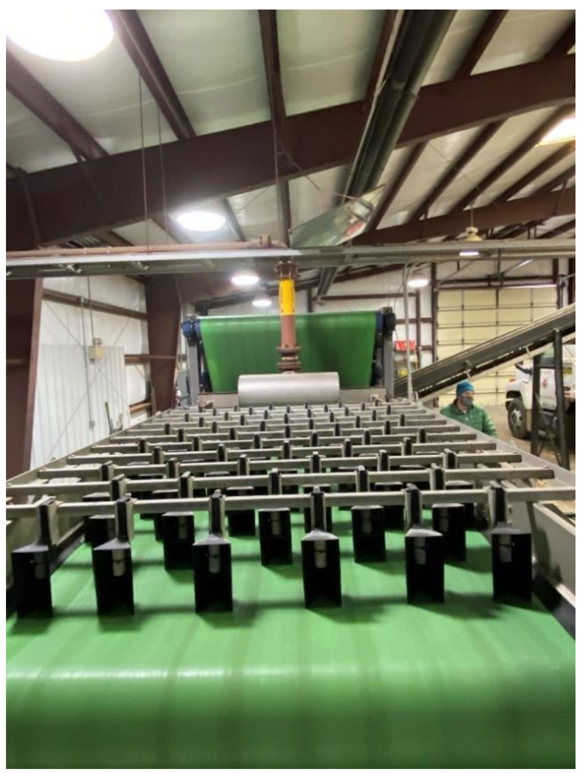
- BFP run daily; 5 days per week; can get by running 3 days per week; 6 hours per day.
- Building wall rusting from gas heater exhaust through wall.

EAST VIEW OF POLYMER SYSTEM AND BELT FILTER PRESS AREA IN BUILDING

BELT FILTER PRESS

ENLARGED VIEW OF BELT FILTER PRESS FRONT SECTION

ENLARGED VIEW OF BELT FILTER PRESS BACK SECTION



BELT FILTER PRESS BELT TOP BELT WITH WEDGES
FOR DISTRIBUTION OF FEED SLUDGE

CONVEYOR FOR LOADING CAKE SLUDGE TO DUMP TRUCK

POLYMER PANEL WITH MOUNTED METERING PUMP
AND ELECTRICAL CONTROL PANEL

POLYMER UNIT METAL BASE IS CORRODED

POLYMER MIXER AND MIX TANK

CORROSION ON BUILDING EXTERIOR WALL FROM HEATER EXHAUT VENT

Washwater Pumping System

Condition of Equipment:

- Washwater Booster Pumps (Skip Mounted)
  - Pumps lose their prime
  - One pump replaced about 3 years ago.
- Bladder Tank: removed by operators.
- Operator run washwater pumps on manual mode without bladder tank.
- Skid frame: rusted.
- Operating Condition: poor

Equipment Information:

- Manufacturer: Canariis Packaged Washwater Pumping System
- Number of Pumps: 2
- Duplex Multi-stage pumps
- Pump Model: DM-150-90 (CR15-4)
- Capacity at Duty Point: 75 gpm
- Motor: 7.5 hp; 460VAC/3/60
- Pump Shutoff: 116 psig
- Pump Sequence: 0 to 75 gpm; Pump 1 or Pump 2
- Continuous Pumping: 76 to 150 gpm; both pumps running
- 3” suction and discharge
- Constant pressure/variable flow system, Cal-Val pressure reducing check valve on each pump discharge. Cla-Val Model: 90A-01KCKXWC
- Bladder Tank Model:FXA700; 185 gallons; 200# ASME rating (removed by operators)

WASHWATER BOOSTER PUMP SKID WITHOUT BLADDER TANK

WASHWATER BOOSTER PUMP STATION – SKID MOUNTED

WASHWATER BOOSTER PUMP ON SKID FRAME

Town of Bernalillo Wastewater Treatment Plant – Master Plan
Physical Condition Evaluation of Existing Structures and Equipment

Sludge Drying Beds

Condition of Equipment:
- 6 Drying beds in total.
  - 3 sand
  - 3 paved
- Only used as a backup for the BFP, has not been utilized in over 10 years.

Additional Notes:
- Used only for backup emergency reasons only.
- Operator want to keep beds for back up.

Corrective Action: none

SLUDGE DRYING BEDS – WEST END

SLUDGE DRYING BEDS – CENTER SECTION

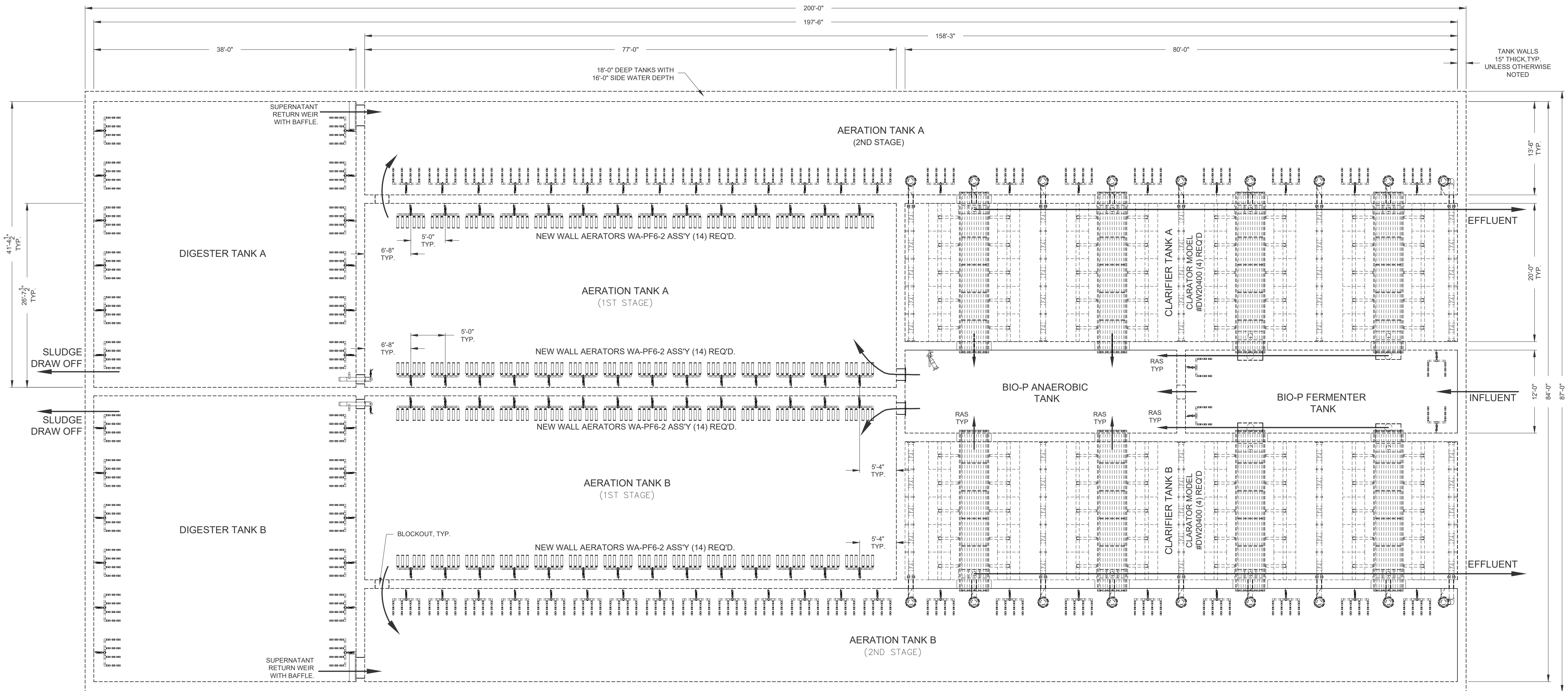
SLUDGE DRYING BEDS – EAST SECTION

APPENDIX B

AERO-MOD PROPOSED MODIFICATION FIGURES

NOTE:

1. ALL TANK PIPING REQUIREMENTS SHOWN ON TANK PIPING LAYOUT.

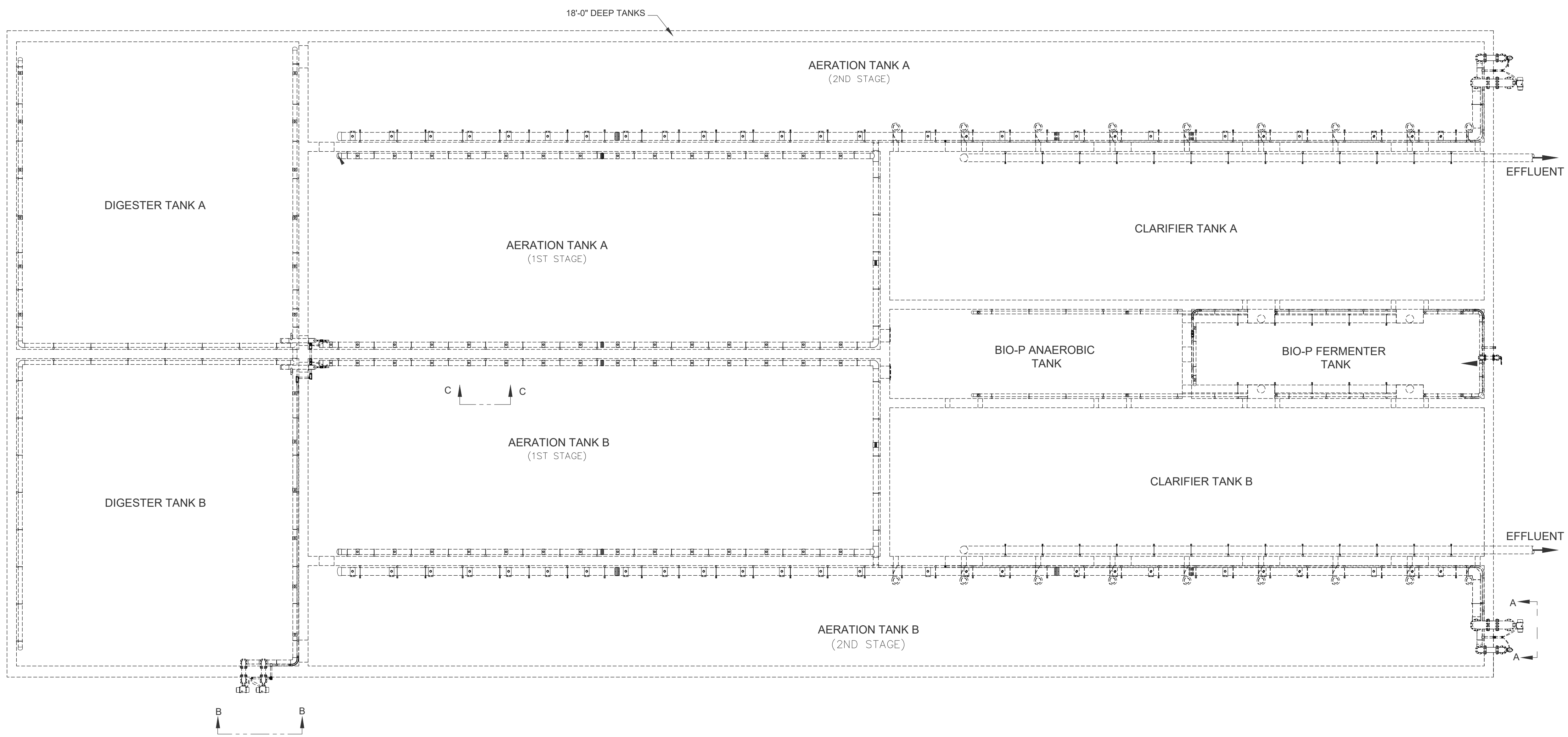


REV:	Revision	By:	Date:

Aero - Mod, Inc.

7927 U.S. Highway 24
Manhattan, Kansas 66502
PHONE: (785) 537-4995

DRAWING BY: JB		DATE: 09/16/21
CK BY:	APVD. BY:	SCALE: NTS
TITLE: EQUIPMENT PLANVIEW UPGRADE, BERNALILLO, NEW MEXICO		



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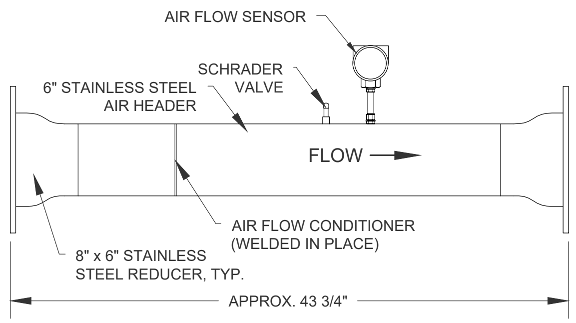
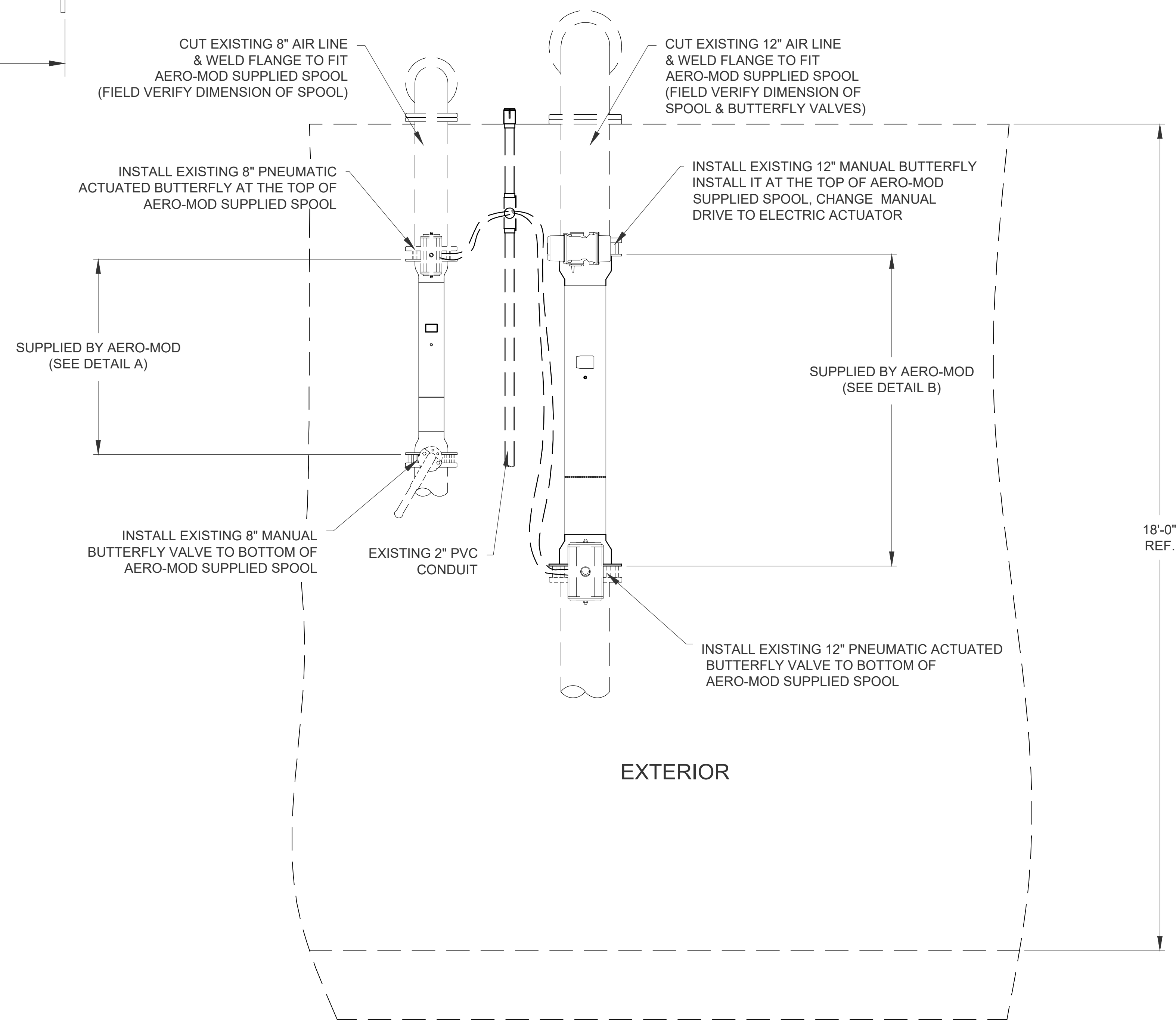
Manhattan, Kansas 66502
PHONE: (785) 537-4995

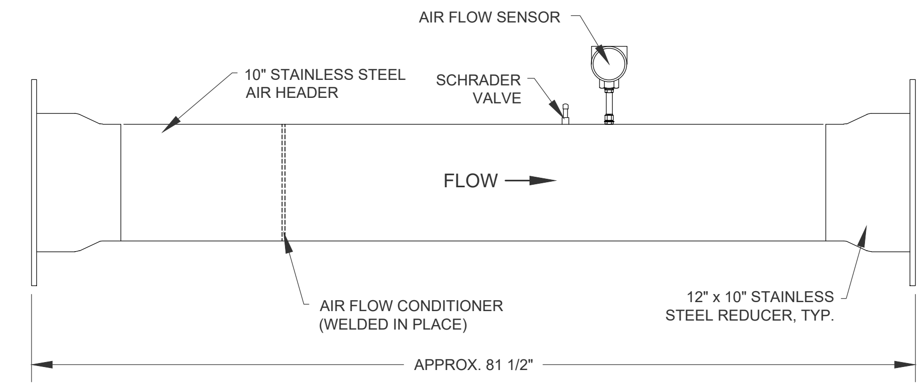
DRAWING BY: JB		DATE: 09/16/21
CK BY:	APVD. BY:	SCALE: NTS
TITLE: TANK PIPING LAYOUT PLANVIEW UPGRADE, BERNALILLO, NEW MEXICO		



DETAIL A



VIEW A-A



DETAIL B

REV:	Revision	By:	Date:

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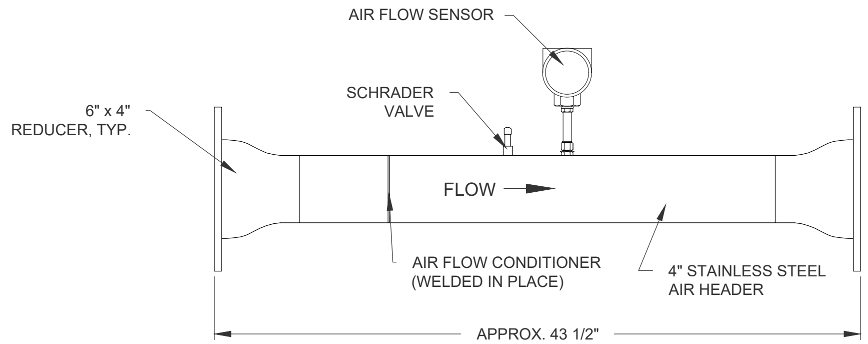
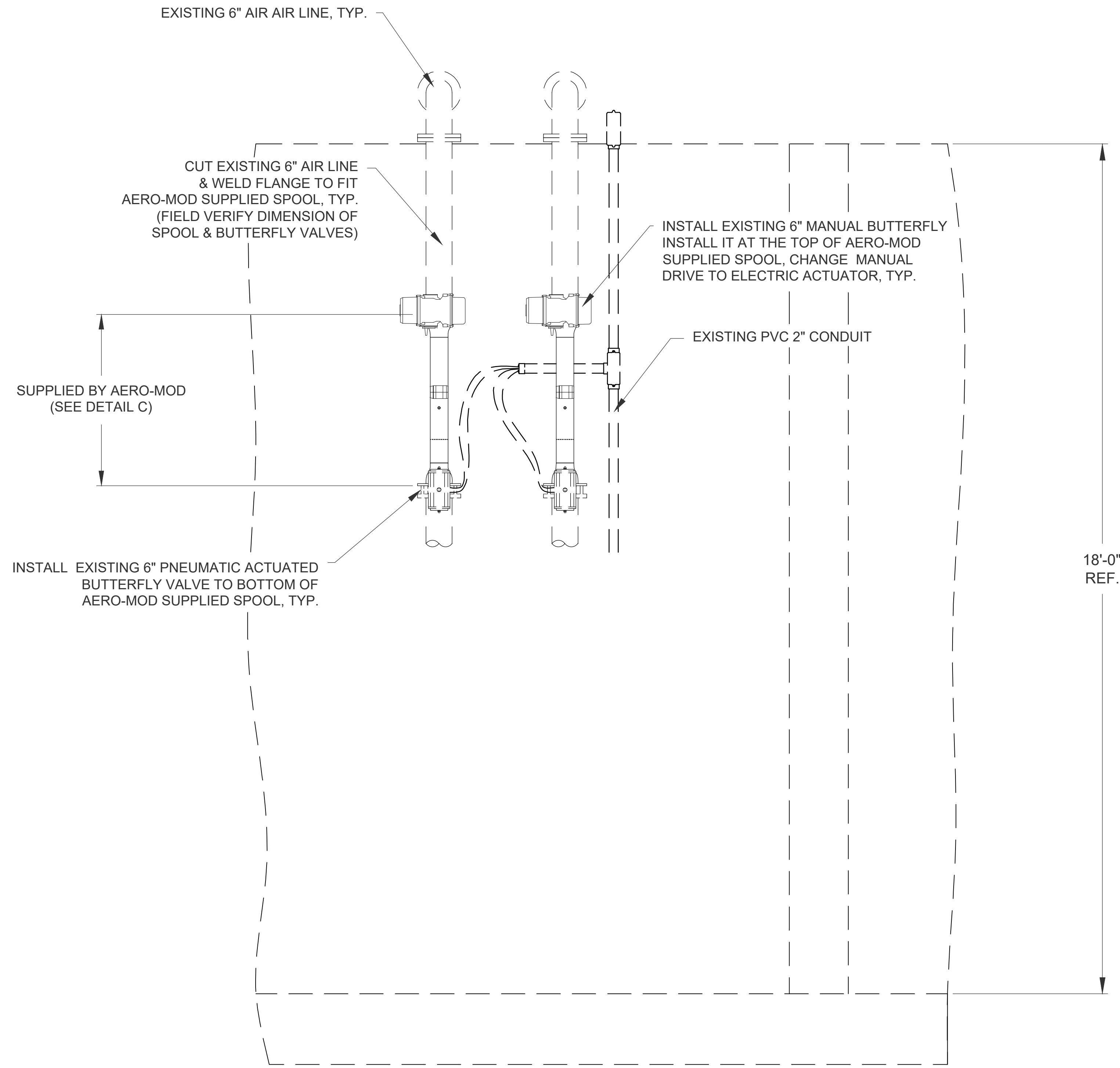
7927 U.S. Highway 24
Manhattan, Kansas 66502

PHONE: (785) 537-4995

DRAWING BY: JB		DATE: 12/21/06
CK BY:	APVD. BY:	SCALE: NTS
TITLE: VIEW A-A UPGRADE, BERNALILLO, NEW MEXICO		



DETAIL C



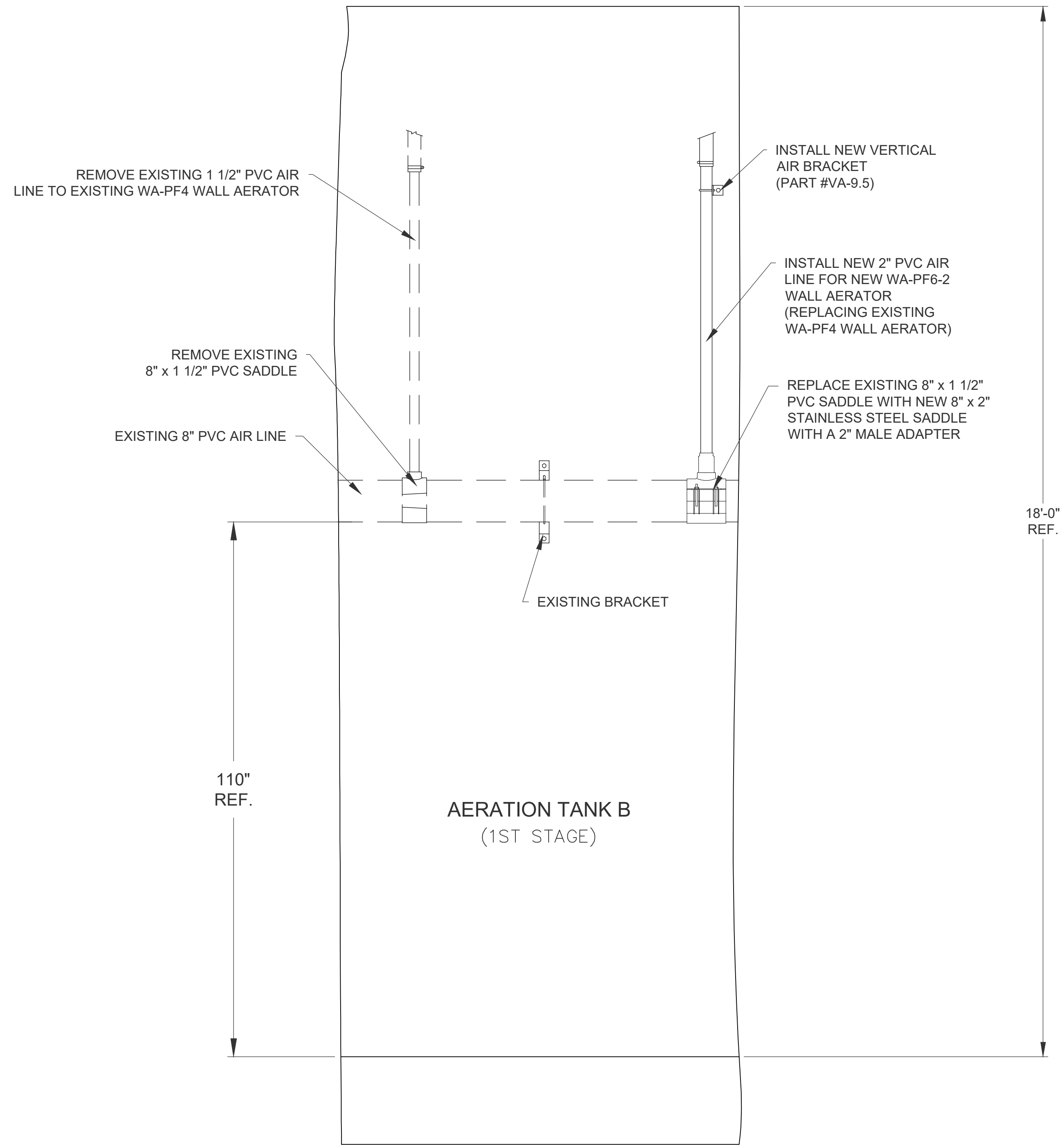
VIEW B-B

REV:	Revision	By:	Date:

Aero - Mod, Inc.

7927 U.S. Highway 24
Manhattan, Kansas 66502
PHONE: (785) 537-4995

DRAWING BY: JB
DATE: 12/21/06
CK BY:
APVD. BY:
SCALE: NTS
TITLE: VIEW B-B
UPGRADE, BERNALILLO, NEW MEXICO



SECTION VIEW C-C

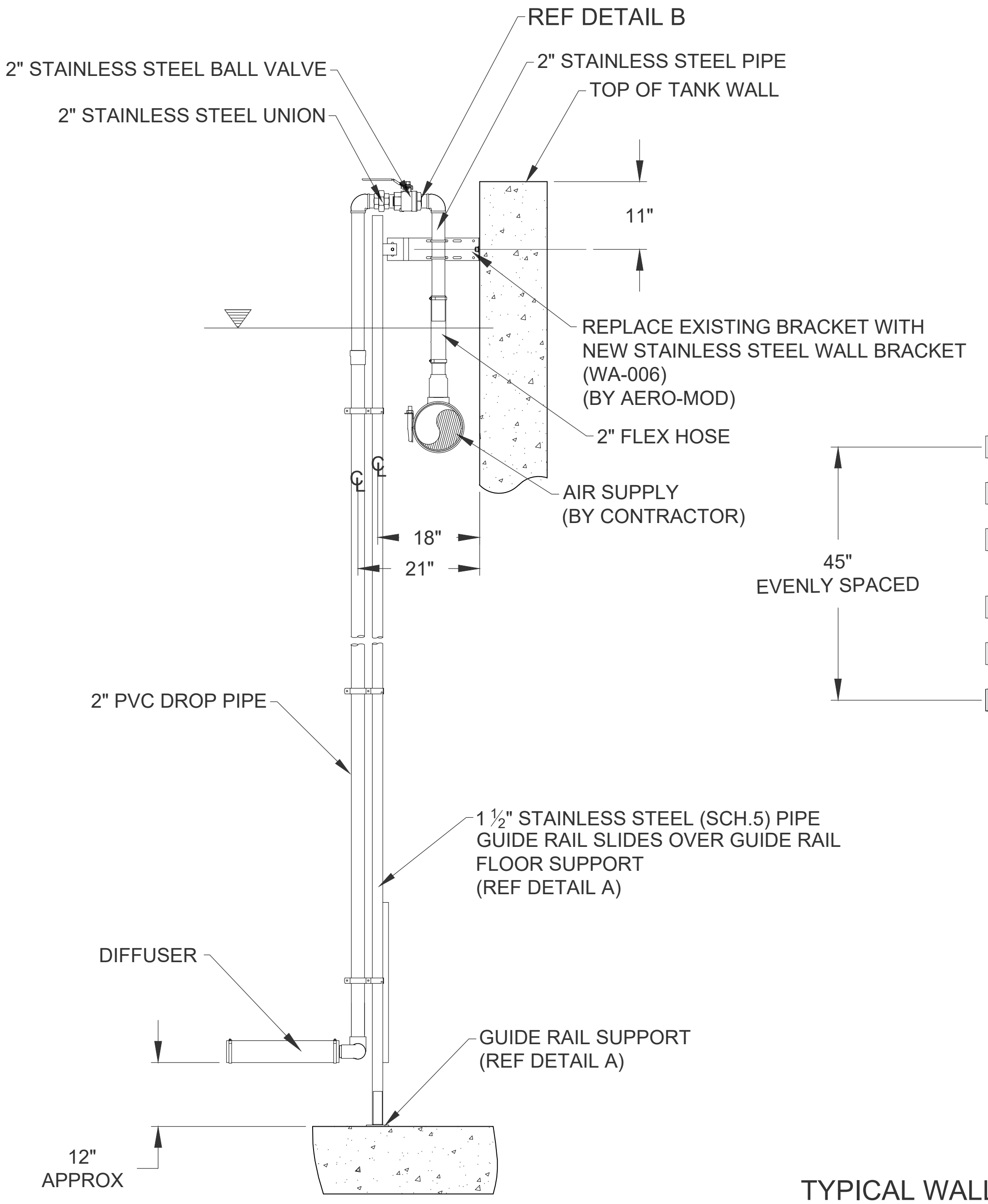
REV:	Revision	By:	Date:

Aero - Mod, Inc.

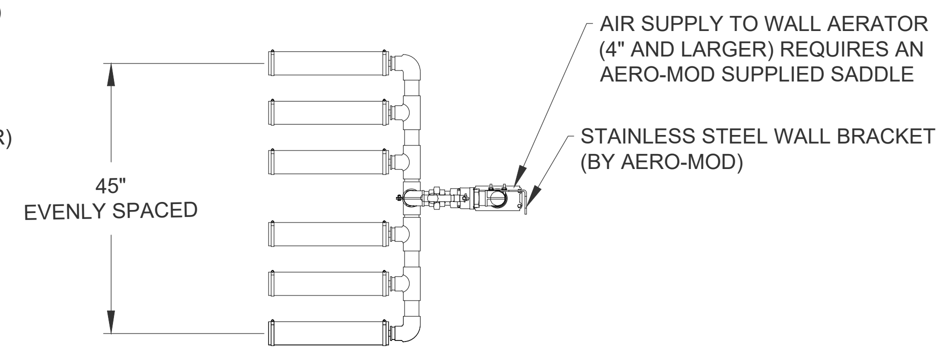
7927 U.S. Highway 24
Manhattan, Kansas 66502

PHONE: (785) 537-4995

DRAWING BY: JB		DATE: 09/16/21
CK BY:	APVD. BY:	SCALE: NTS
TITLE: SECTION VIEW C-C UPGRADE, BERNALILLO, NEW MEXICO		

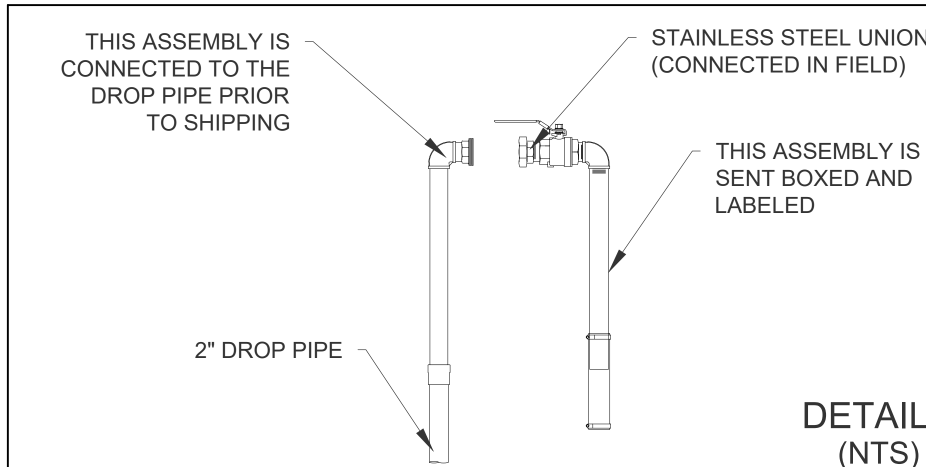


SIDE VIEW

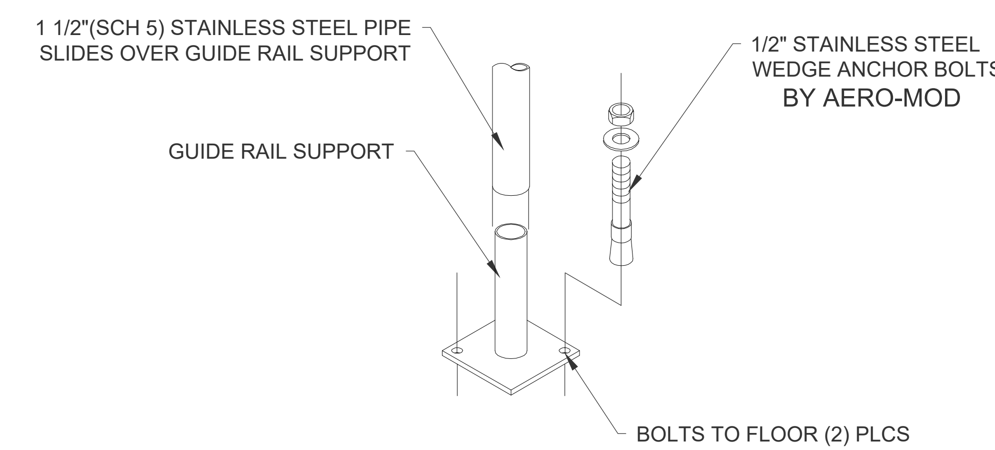


TOP VIEW

TYPICAL WALL AERATOR, WA-PF6-2



DETAIL B
(NTS)



DETAIL A

Aero - Mod, Inc.

7927 U.S. Highway 24
Manhattan, Kansas 66502

PHONE: (785) 537-4995
FAX: (785) 537-0813

DRAWN BY: JB		DATE: 12/22/15
CK BY:	REV'SD. BY:	SCALE: NTS
TITLE: WALL AERATOR MODEL WA-PF6-2 EQUIPMENT DETAIL		

APPENDIX C

NMED GWQB GUIDANCE:
ABOVE GROUND USE OF RECLAIMED DOMESTIC WASTEWATER

NMED GROUND WATER QUALITY BUREAU GUIDANCE:

ABOVE GROUND USE OF RECLAIMED DOMESTIC WASTEWATER

January 2007

PURPOSE

This document provides guidance for the above ground use of reclaimed domestic wastewater necessary to ensure protection of public health and the environment. The New Mexico Environment Department (NMED) has developed this guidance document to promote the safe use of reclaimed wastewater to offset the use of limited potable water resources in the State. This guidance document is intended to provide direction for any person seeking to submit an application for a Ground Water Discharge Permit that includes the above ground use of reclaimed wastewater. This document is used by NMED technical staff to ensure consistency in the application review process and in the development of permit requirements. This guidance document will also be made available to the regulated community and their consultants to provide a basis for future facility planning.

Ground Water Discharge Permit applications for above ground use of reclaimed domestic wastewater that follow this guidance document will be approved. However, applicants may make alternative demonstrations to NMED that the existing or proposed discharge of reclaimed domestic wastewater at a specific facility is protective of public health and the environment. NMED encourages the development and implementation of new processes and equipment, and will favorably consider them on a case by case basis.

The generator of the reclaimed wastewater is responsible for discharges of reclaimed wastewater unless this responsibility is assumed by a separate entity pursuant to an approved Ground Water Discharge Permit. Implementation of the requirements for existing dischargers will be determined on an individual facility basis at the time of permit renewal and/or modification.

Finally, the discharge of reclaimed wastewater may also be regulated by the New Mexico Construction Industries Division (CID). For example, the use of reclaimed wastewater for indoor plumbing (e.g., toilet flushing, fire suppression) requires approval from CID.

DEFINITIONS

The following definitions are used in this guidance document:

<u>Agronomic Rate</u>: the rate of application of nutrients to plants that is necessary to satisfy the plants' nutritional requirements while strictly minimizing the amount of nutrients that run off to surface waters or which pass below the root zone of the plants.

<u>Class 1A Reclaimed Wastewater</u>: the highest quality reclaimed wastewater described in this guidance document and can be most broadly utilized except for direct consumption. [approved uses listed in Table 1]

<u>Class 1B Reclaimed Wastewater</u>: the second highest quality reclaimed wastewater described in this guidance document and is suitable for uses in which public exposure is likely. [approved uses listed in Table 1]

<u>Class 2 Reclaimed Wastewater</u>: reclaimed wastewater suitable for uses in which public access and exposure is restricted. [approved uses listed in Table 1]

Class 3 Reclaimed Wastewater: reclaimed wastewater suitable for uses in which public access and exposure is prohibited. [approved uses listed in Table 1]

Domestic wastewater: wastewater containing human excreta and water-carried waste from typical residential plumbing fixtures and activities, including but not limited to wastes from toilets, sinks, bath fixtures, clothes or dishwashing machines and floor drains.

Dwelling unit: a structure which contains bedrooms.

Establishment: a structure used as a place of business, education, or assembly.

Flood Irrigation: land application of reclaimed wastewater by ditches, furrows, pipelines, low flow emitters and other non-sprinkler methods.

Food Crops: any crop intended for human consumption.

Grab Sample: an individual sample collected in less than 15 minutes.

Major WWTP: any treatment plant with a maximum design capacity of 1,000,000 gallons or more per day.

Minor WWTP: any treatment plant with a maximum design capacity of less than 1,000,000 gallons per day.

Monthly Geometric Mean: value calculated by taking the sum of the logarithms (sum log x) of each of the data points from the previous calendar month, dividing the sum by the number of data points and then taking the anti-logarithm of the result (10^y = anti-logarithm of 'y').

NTU: nephelometric turbidity units, measured by a nephelometer.

Occupied establishment: any establishment that is occupied regularly at the time of irrigation.

Peak hourly flow: the highest hourly flow rate within a 24 hour period.

Reclaimed wastewater: domestic wastewater that has been treated to the specified levels for the defined uses set forth in this guidance document and other applicable local, state, or federal regulations.

Spray Irrigation: land application of reclaimed wastewater by dispersing it in the air utilizing equipment which provides a low trajectory application and which minimizes misting of the reclaimed wastewater.

3-hour Composite Sample: three effluent portions collected no closer together than one hour (collected between 8:00 am and 4:00 pm) and composited in proportion to flow.

6-hour Composite Sample: six effluent portions collected no closer together than one hour (collected between 8:00 am and 4:00 pm) and composited in proportion to flow.

24-hour Composite Sample: twenty-four effluent portions collected no closer together than one hour and composited in proportion to flow.

30-day Average:

> *For fecal coliform bacteria*: the geometric mean of the values for all effluent samples collected during a calendar month.
>
> *For other than for fecal coliform bacteria*: the arithmetic mean of the daily values for all effluent samples collected during a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

BACKGROUND

This guidance document supersedes the New Mexico Environmental Improvement Division (NMEID) 1985 Policy for the Use of Domestic Wastewater Effluent for Irrigation and NMED's 2003 Policy for the Above Ground Use of Reclaimed Domestic Wastewater. This guidance document establishes reclaimed wastewater quality levels, site restrictions, management practices, and uses for different categories of reclaimed wastewater that are approvable by NMED. Unless an alternative demonstration is proposed by the applicant and accepted by NMED, NMED will propose Ground Water Discharge Permit conditions for above ground discharges of reclaimed wastewater based on the recommendations set forth in this guidance document. While the requirements set forth in this guidance document are deemed protective of public health and the environment, the guidance document does not prevent communities from adopting more stringent requirements.

WASTEWATER TREATMENT PROCESSES

The specified quality levels for Class 1B, Class 2, and Class 3 assume a minimum of conventional secondary wastewater treatment plus disinfection. Class 1A assumes treatment to remove colloidal organic matter, color, and other substances that interfere with disinfection, thereby allowing for the use of the reclaimed wastewater for urban landscaping adjacent to dwelling units or occupied establishments.

GENERAL ABOVE GROUND USE PERMIT CONDITIONS

A. ALL APPROVED USES

1. Whenever reclaimed wastewater is used for any use approved in this guidance document, the wastewater should meet the minimum requirements set forth in this guidance document, unless a demonstration is made that an alternate requirement offers an equivalent protection of public health. The burden of proof for an alternative demonstration rests upon the discharger.
2. Whenever reclaimed wastewater other than Class 1A is used in areas with public access, it should be applied at times and in a manner that minimizes public contact.
3. Whenever reclaimed wastewater is used in areas with restricted public access, the public should be excluded from entering the area.
4. Reclaimed wastewater should only be used for soil compaction or dust control in construction areas where application procedures minimize aerosol drift to public areas.
5. Reclaimed wastewater quality requirements should be measured at the discharge point of the wastewater treatment plant.
6. Signs (in English and Spanish) should be placed at the entrance to areas receiving reclaimed wastewater, and other locations where public access may occur stating: "**NOTICE – THIS AREA IS IRRIGATED WITH RECLAIMED WASTEWATER – DO NOT DRINK**"; "**AVISO – ESTA ÁREA ESTÁ REGADA CON AGUAS NEGRAS RECOBRADAS – NO TOMAR**". Alternate wording may be approved by NMED.
7. All piping, valves and outlets should be color-coded in purple pursuant to the latest revision of the New Mexico Plumbing and Mechanical Code to differentiate piping or fixtures used to convey reclaimed wastewater from piping or fixtures used for potable or other water. All valves, outlets, and sprinkler heads used in reclaimed wastewater systems should be of a type that can only be operated by authorized personnel. Those

portions of reclaimed wastewater systems that are underground and were installed prior to the adoption of this guidance document are exempt from the purple color-coding requirement if all accessible portions of the reclaimed wastewater system are colored purple or clearly labeled as being part of a reclaimed wastewater distribution system.

8. Reclaimed wastewater systems should have no direct or indirect cross connections with potable water systems pursuant to the latest revision of the New Mexico Plumbing and Mechanical Code. For reclaimed wastewater systems that were installed prior to the adoption of this guidance document, the absence of cross connections may be demonstrated via hydrostatic testing or as-built drawings, supported by an affidavit under oath that no cross connection exists.
9. Above ground use of reclaimed wastewater should not result in excessive standing or pooling of wastewater, and should be applied at the appropriate agronomic rate. Irrigation should not be conducted at times when the receiving area is saturated or frozen.
10. The discharge of reclaimed wastewater should be confined to the area designated and approved for receiving the wastewater. Irrigation should be postponed at times when windy conditions may result in drift of reclaimed wastewater outside the designated area of application.
11. Treatment facilities that provide reclaimed wastewater to parks, golf courses, schools and other areas where human exposure is likely must have an emergency storage pond or alternate disposal method where reclaimed wastewater can be diverted during periods when conditions are unfavorable for approved uses or when the quality requirements defined in this guidance document cannot be met.

B. IRRIGATION OF FOOD CROPS

1. Reclaimed wastewater should not be used for the spray irrigation of food crops.
2. Reclaimed wastewater should not be used for surface irrigation of food crops except where there is no contact between the edible portion of the crop and the wastewater, and the wastewater should have a level of quality no less than Class 1B Reclaimed Wastewater (Table 2).

C. IRRIGATION OF FODDER, FIBER AND SEED CROPS

1. Reclaimed wastewater used for the irrigation of pasture to which milking cows or goats have access should have a level of quality no less than Class 2 Reclaimed Wastewater (Table 2).
2. Except pasture for milk-producing animals, reclaimed wastewater used for the irrigation of fodder, fiber and seed crops should have a level of quality no less than Class 3 Reclaimed Wastewater (Table 2).

D. IRRIGATION OF LANDSCAPES

1. Reclaimed wastewater used for irrigation should be applied such that direct and windblown spray is confined to the area designated and approved for application.
2. Reclaimed wastewater used for the irrigation of freeway landscapes and landscapes in other areas where the public has similarly limited access or exposure should have a level of quality no less than Class 2 Reclaimed Wastewater (Table 2). Public access to the irrigation site must be restricted during the period of application.

3. Reclaimed wastewater used for the irrigation of parks, playgrounds, schoolyards, golf courses, cemeteries and other areas where the public has similarly open access should have a level of quality no less than Class 1B Reclaimed Wastewater (Table 2), and the irrigation system should have low trajectory spray nozzles. *Areas which are spray irrigated and located within 100 feet of a dwelling unit or occupied establishment should only receive Class 1A Reclaimed Wastewater* (Tables 2 & 3).

CLASSIFICATION AND USES OF RECLAIMED WASTEWATER

This guidance document identifies four classes of reclaimed wastewater (Class 1A, Class 1B, Class 2, and Class 3) based on reclaimed wastewater quality and the likelihood of public exposure. Table 1 presents the approved uses.

Table 1. Approved Uses for Reclaimed Wastewater by Class

Class of Reclaimed Wastewater	Approved Uses
Class 1A	All Class 1 uses. *No setback limit* to dwelling unit or occupied establishment.
	Backfill around potable water pipes
	Irrigation of food crops[1]
Class 1B	Impoundments (recreational or ornamental)
	Irrigation of parks, school yards, golf courses [2]
	Irrigation of urban landscaping [2]
	Snow making
	Street cleaning
	Toilet flushing
	Backfill around non-potable piping
Class 2	Concrete mixing
	Dust control
	Irrigation of fodder, fiber, and seed crops for milk-producing animals
	Irrigation of roadway median landscapes
	Irrigation of sod farms
	Livestock watering
	Soil compaction
Class 3	Irrigation of fodder, fiber, and seed crops for non-milk-producing animals
	Irrigation of forest trees (silviculture)

[1] Irrigation of food crops should only be allowed for food crops when there is no contact between the edible portion of the crop and the wastewater. Spray irrigation is prohibited for food crops.

[2] If reclaimed wastewater is applied using spray irrigation, the setback limitation of Table 3 "Spray Irrigation" should be observed.

Class 1A reclaimed wastewater may be used for any purpose except direct consumption, food handling and processing, and spray irrigation of food crops. Class 1B reclaimed wastewater may be used where public exposure is likely, and where the appropriate setback requirements are met (Table 3, page 9). Class 2 and Class 3 reclaimed wastewater may be used where public access is restricted with correspondingly less stringent requirements for treatment and disinfection. Any reclaimed wastewater treated to higher quality than the lower classes may be used for the purposes established for the lower classes. *Other uses of reclaimed wastewater not included in Table 1 will be evaluated on a case by case basis by NMED to determine the appropriate water quality classification for the given use.*

WASTEWATER QUALITY LEVELS AND MONITORING PROTOCOL

This section identifies minimum wastewater quality levels and monitoring frequencies for the various classes of reclaimed wastewater. The frequency of wastewater quality monitoring is patterned after U.S. Environmental Protection Agency (USEPA) requirements for discharges of treated and disinfected wastewater to surface waters. Monitoring requirements are dependent on the quality of reclaimed wastewater produced at the treatment plant and the design capacity of the treatment plant. For example, a “major” wastewater treatment plant (having a maximum design capacity of 1 million gallons or more per day) producing Class 1A Reclaimed Wastewater has the most stringent monitoring requirements. The wastewater quality levels and monitoring frequencies for the various classes of reclaimed wastewater are presented in Table 2. In the event that a facility proposes alternative wastewater quality levels and/or monitoring frequencies, it is the responsibility of the facility owner/operator to demonstrate that the alternative proposal provides an equivalent measure of public health protection as the measures set forth in this guidance document.

Table 2. Wastewater Quality Requirements and Monitoring Frequencies by Class of Reclaimed Wastewater

Class of Reclaimed Wastewater	Wastewater Quality Parameter	Wastewater Quality Requirements		Wastewater Monitoring Requirements	
		30-Day Average	Maximum	Sample Type	Measurement Frequency
Class 1A	BOD_5	10 mg/l	15 mg/l	Minimum of 6-hour composite	3 tests per week for major WWTP[1]; 1 test per 2 weeks for minor WWTP
	Turbidity	3 NTU	5 NTU	Continuous	Continuous
	Fecal Coliform	5 per 100 ml	23 per 100 ml	Grab sample at peak flow	3 tests per week for major WWTP; 1 test per week for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak flow	Record values at peak hourly flow when Fecal Coliform samples are collected
Class 1B	BOD_5	30 mg/l	45 mg/l	Minimum of 6-hour composite	3 tests per week for major WWTP[1]; 1 test per 2 weeks for minor WWTP
	TSS	30 mg/l	45 mg/l	Minimum of 6-hour composite	3 tests per week for major WWTP[1]; 1 test per 2 weeks for minor WWTP
	Fecal Coliform	100 organisms per 100 ml	200 organisms per 100 ml	Grab sample at peak flow	3 tests per week for major WWTP; 1 test per week for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak flow	Record values at peak hourly flow when Fecal Coliform samples are collected

Table 2. Wastewater Quality Requirements and Monitoring Frequencies by Class of Reclaimed Wastewater (continued)

Class of Reclaimed Wastewater	Wastewater Quality Parameter	Wastewater Quality Requirements		Wastewater Monitoring Requirements	
		30-Day Average	Maximum	Sample Type	Measurement Frequency
Class 2	BOD_5	30 mg/l	45 mg/l	Minimum of 6-hour composite for major WWTP; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP
	TSS	30 mg/l	45 mg/l	Minimum of 6-hour composite for major WWTP; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP
	Fecal Coliform	200 organisms per 100 ml	400 organisms per 100 ml	Grab sample at peak hourly flow	1 test per week for major WWTP; 1 test per month for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak hourly flow	Record values at peak hourly flow when Fecal Coliform samples are collected
Class 3	BOD_5	30 mg/l	45 mg/l	Minimum of 3-hour composite for major WWTP[5]; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP
	TSS	75 mg/l	90 mg/l	Minimum of 3-hour composite for major WWTP; Grab sample for minor WWTP	1 test per week for major WWTP; 1 test per month for minor WWTP
	Fecal Coliform	1,000 organisms per 100 ml	5,000 organisms per 100 ml	Grab sample at peak hourly flow	1 test per week for major WWTP; 1 test per month for minor WWTP
	TRC or UV Transmissivity	Monitor Only	Monitor Only	Grab sample or reading at peak hourly flow	Record values at peak hourly flow when Fecal Coliform samples are collected

Note: *E*. coli may be used in place of Fecal Coliform as an indicator organism, once an equivalency has been established.

ACCESS RESTRICTIONS AND SET-BACK REQUIREMENTS

Table 3 presents the access controls and setback distances necessary to minimize direct and indirect public exposure to reclaimed wastewater. Setback distances recommended in this guidance document are in all cases the distance from the edge of any area receiving reclaimed wastewater to well casings, dwelling units, or occupied establishments.

In addition to the setbacks described in Table 3, all water supply wells within 200 feet of a wetted irrigation area must be evaluated for adequate well head construction and irrigation practices to ensure protection of ground water. NMED may impose additional setbacks as needed to make certain that the application of reclaimed wastewater does not threaten ground water resources.

Table 3. Access Restrictions and Set Back Requirements

Class of Reclaimed Wastewater	Spray Irrigation	Flood Irrigation and Surface Drip Irrigation
Class 1A	• No access control • No setback to dwelling unit or occupied establishment • Low pressure/low trajectory irrigation system only	• No access control
Class 1B	• No access control; irrigate at times when public exposure is unlikely • 100 ft set-back from dwelling unit or occupied establishment • Low pressure/low trajectory irrigation system only	• No access control; irrigate at times when public exposure is unlikely
Class 2	• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate or other NMED approved access controls • 100 ft set-back from dwelling unit or occupied establishment • Low pressure/low trajectory irrigation system only	• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate, or other NMED approved access controls
Class 3	• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate • 500 ft set-back from dwelling unit or occupied establishment • Low pressure/low trajectory irrigation system only	• Access restricted by perimeter fencing using 4-strand barbed wire and locking gate • 100 ft set-back to dwelling unit or occupied establishment.