



T·O ENGINEERS

DRAFT Memorandum

To: North Fork Special Service District
CC:
From: T-O Engineers
Date: February 3, 2022
Re: North Fork Special Service District (NFSSD) Future Improvements Memo

At the request of the North Fork Special Service District (NFSSD, District) board, T-O Engineers (T-O) has reviewed the 1/10/22 memo titled “Wastewater Treatment and Disposal Capacity” which was produced by Bowen Collins & Associates (BCA) on behalf Broad Reach Capital Partners, the owner of Sundance Resort (Resort). The memo outlined existing flow and loading characteristics and several recommended upgrades totaling approximately \$6.2 million to improve biological loading capacity and achieve design hydraulic capacity. After evaluating possible implementation strategies and redundancy requirements, this memo estimates the cost of improvements could be as high as \$8.8 million. However, the increased cost will allow for increased biological and hydraulic capacity beyond the original design, and as such the two cost estimates are not directly comparable.

T-O Engineers agrees with many of the recommendations proposed in the BCA memo including replacement of the fine screen, providing redundant on-shelf pumps, process air control modifications, adding reduced capacity blowers, pre-treatment to reduce biological loading, and additional discharge capacity, all which are necessary for continued process stability and plant reliability.

This memo outlines an implementation strategy and alternative improvements that we believe will provide similar results, correct existing operational deficiencies, provide redundancy, and increase operational flexibility. If implemented, the upgrades proposed in this memo may increase the existing 40,000 gallon per day (gpd) treatment capacity by up to 25% through installation of a DAF and relocation/upgrading the existing membranes. Addition of a 3rd membrane treatment train would increase capacity by 150% to 100,000 gpd while providing redundancy. Conceptual process flow diagrams, layouts, and cost estimates have been included as attachments. Peak week capacity maybe limited by pump sizes and piping constraints which have not been evaluated at this time. Where applicable, we have provided pros/cons of our proposed modifications vs. those proposed in the BCA memo.

History

Construction of the existing treatment facility was completed in 2008 with an annual average day design flow of 40,000 gpd, average day peak week design flow of 120,000 gpd, and peak hour design flow of 240,000 gpd. The facility has struggled to provide adequate treatment at higher flows due to stronger than anticipated waste concentrations and ongoing discharge of fats, oils, and grease (FOG) to the system. FOGs cause binding of the membranes, reduced treatment capacity, and increased operations and maintenance costs. Reduced treatment capacity created by high FOG levels and lack of a redundant treatment train preclude the introduction of increased flows to the facility, particularly during high use periods in the winter and summer months. These problems have been the topic of many studies; however, no comprehensive engineering has been completed to resolve the ongoing issues.

The facility has three separate treatment areas which include the headworks building, treatment building, and drain fields. The headworks building is adjacent to the Sundance Resort parking lot and includes a fine influent screen, raw influent wet well with two submersible pumps, and treated effluent (permeate) wet well with three pumps. The treatment building contains two Kubota membrane bioreactor (MBR) treatment trains and a single Huber dewatering screw press to dewater solids from the MBR process. Three 15,000 SF drain fields are currently developed and in alternating, intermittent use. Three additional 15,000 SF drain fields have been proposed, one of which has been previously permitted, but not constructed.

A 2021 upgrade added a grease trap, approximately 20,000 gallons of flow equalization capacity, and secondary influent wet well to help mitigate FOG issues and moderate peak flows. These upgrades were intended as the first phase in a series of modifications intended to improve treatment capacity at the facility, provide a redundant treatment train, and depending on effectiveness, allow for some minor expansion of Sundance Resort. Early data suggests the grease trap is capturing a portion of the FOG, and the equalization basins are providing more consistent flows to the treatment plant, however, additional data is required to assess long-term performance.

Recommended Upgrades to Existing Treatment Infrastructure

Existing infrastructure installed in 2008 has generally been mechanically reliable and has served the District well, however breakdowns have become increasingly frequent as the facility ages, and this has been exacerbated by continued FOG issues. The existing wet well fine screen has degraded to the point that it no longer functioning as intended and should be replaced as soon as possible to reduce flow through of solids and negative impacts to downstream equipment and processes. Existing pumps have generally been found to be reliable, however as they age it can be expected that maintenance/break downs will become more frequent. We do not recommend preemptively replacing existing pumps; however, we agree with BCA that it would be prudent to have on the shelf spares available. The treatment building's HVAC system has also been problematic, resulting in excessive moisture buildup inside the building.

The existing aeration system utilizes a single blower for both pre-air and reactor mixing which has made it difficult to optimize aeration, especially considering that the pre-air diffusers are located in the reactor basin with the membranes. We agree with BCA that this could be optimized by splitting the existing aeration scheme such that the existing blowers continue to be used for pre-air aeration and new, smaller blowers be installed for basin mixing (or visa vera). In addition, T-O recommends removing the

pre-air diffusers from the reactor basin to a dedicated basin to provide increased aeration and process control. One existing “purge” control valve has been observed to be non-functional and should be repaired or replaced to fully optimize plant automation.

The facility SCADA system is outdated and should be updated immediately. The NFSSD’s computer system current runs Windows XP (for which support ended in 2014) and much of the SCADA software has been unsupported for years, which has resulted in the loss of functionality of many features. The lack of consistent data logging has delayed or prevented optimizing plant operations and has at times contributed to or exacerbated plant failures. Although this outdated technology still allows the system to run, the District has been spending increasing amounts of time and money on IT support and maintenance to keep the system operating. Lack of consistent data logging also hinders production of evaluations that will be required prior to upgrades. Upgrading the SCADA system should occur as soon as possible to support efficient operation of the current system and will be required to support any future upgrades.

Recommended Upgrades to Existing Treated Effluent Disposal Infrastructure

Three existing drain fields have a permitted infiltration capacity of 45,000 gpd, which has historically met the treated effluent disposal needs of the District. Further increase in flows due to additional development will likely require additional disposal capacity, particularly during peak flows. The BCA memo noted that an additional 15,000 SF drain field has already been permitted, but has not yet been constructed, and that two additional 15,000 SF drain fields have been reserved for future expansion. Further increases to the hydraulic capacity of the plant would require additional drain fields. Terrain available for drain fields is sub-optimal, with steep slopes and shallow bedrock which generally results in higher construction costs and lowered infiltration efficiency. We believe that the BCA memo estimated cost of \$2.3 million to add 15,000 SF of drain field to be a reasonable budgetary estimate. With the potential to expand beyond current treatment capacity, T-O recommends budgeting for drain field expansion while working with DEQ on alternative discharge parameters that could provide more flexibility, less risk, and potential for increased future capacity.

The existing MBR system provides an extremely high-quality effluent that may be suitable for beneficial reuse. Beneficial reuse of treated effluent for irrigation is used widely throughout Utah including by the Heber Valley Special Service District, Ash Creek Special Service District, Cedar City, Roosevelt, Santaquin, Central Valley, and Tooele. Beneficial reuse for snowmaking has been gaining popularity and is currently used at many locations the United States including the Arizona Snowbowl (AZ), Soda Springs (CA), Bear Creek (PA), Carrabassett Valley (ME), and the Yellowstone Club (MT) which was permitted in 2021. Existing snowmaking infrastructure, including the new snowmaking water impoundment pond, at Sundance could be used for this purpose and would support Sundance’s green initiatives. Although Utah does not currently have the regulatory framework in place to allow beneficial reuse of treated wastewater through snowmaking, we believe the idea has merit and is worthy of discussion with the state.

Beneficial reuse via irrigation or snowmaking would require investment in additional treatment technologies such as disinfection via UV and/or chemical means as well as additional testing to meet state discharge requirements for Type I reuse (human exposure likely). Additional piping connections would need to be made to discharge treated effluent to the snowmaking pond and dedicated

snowmaking equipment may be required. This path may also provide indirect marketing benefits, as Sundance would be the first ski resort in Utah to reuse wastewater for snowmaking.

With any beneficial reuse, the existing 45,000 SF drain fields would likely remain active, and primarily be used in the spring and fall shoulder seasons when wastewater flows are lower, and irrigation or snowmaking are not feasible discharge options. The drain fields would also remain as a backup discharge point in the event of a process upset that resulted in the treated effluent not being classified as Type I.

Recommended Expansions to Existing Treatment Infrastructure

The existing facility does not provide state required redundancy at average day design flow rates above 40,000 GPD. More specifically, the MBR's being placed in the pre-air tank combined with limited access to the membranes and a complicated replacement and cleaning procedure often require the entire treatment train to be shut down for repairs or cleaning. When coupled with ongoing FOG issues, this has resulted in reduced treatment capacity and subpar effluent quality on a regular basis, particularly at higher flows.

Separating the pre-air chamber from the membrane tanks would provide many benefits to operational efficiency and increase process flexibility. Further, providing separation between the pre-air tank and the MBRs would allow for additional redundancy and the possibility of adding a third set of membranes at a reduced cost over installing a complete third treatment train. Separate membrane tanks could be designed with lower walls, making membrane removal possible without use of a 3rd party crane, greatly reducing the time and cost required for the chemical cleaning of individual membranes.

We agree with the BCA memo that primary treatment prior to the MBRs would greatly benefit the treatment process and improve treatment capacity by reducing TSS, BOD, and FOG loading to the MBRs. The BCA memo recommended primary treatment via the use of cloth disk filters, and although newer cloth disk filters have self-cleaning capabilities, we believe that FOG will present a binding issue and will create additional maintenance tasks for District staff. In addition, the space required to install the filters would present a challenge within the limited facility footprint and expansion of the headworks would further reduce parking at the Resort and may negatively impact other Resort activities. Solids from the disk filters would require new solids pumps, and piping would need to be installed to deliver solids to dewatering equipment in the treatment building, which based on previous experience is costly due to the steep slopes and impacts to State Route 92.

Utilizing a dissolved air floatation (DAF) system in lieu of disk filters would provide similar treatment abilities, improved performance with elevated FOG levels, and fit in the limited space available. DAFs are ideally suited to FOG and TSS removal (>90%), result in some BOD removal (typically 20-40%), and have a small footprint compared to other treatment options and relative to their treatment capabilities.

Summary

Overall BCA and T-O agree that the performance of the existing facility has been hampered by stronger than anticipated waste levels and that additional upgrades will be required if the plant is to operate at its designed hydraulic capacity and continue to accept higher concentrations of waste. Table 1 below provides a summary of the recommended improvements by BCA and T-O.

Table 1: Comparison of Recommended Upgrades to NFSSD Treatment Facility

Treatment Area	BCA	T-O Engineers
Headworks	Replace screen Provide on shelf spare pumps	Replace screen Provide on shelf spare pumps
Primary Treatment	Cloth disk filters, possibly located at lift station	DAF, located in the main WWTP building
Anoxic Chamber	Not addressed	Relocate and upsize Replace mechanical mixers
Pre-Air Chamber	Separate blowers	Separate blowers Relocate and upsize
Membranes	Not addressed	Provide separate chambers Add additional membranes
Disinfection	Not addressed	None, for drain fields UV or chemical disinfection for reuse
Disposal	Construct new drain fields	Drain fields, explore re-use
SCADA	Not addressed	Upgrade entire control system

The BCA memo outlined \$6.2 million in upgrades to achieve the design treatment capacity with the more concentrated waste being discharged to the facility, increase discharge capacity, and allow for continued expansion of Sundance Resort. T-O Engineers agrees that upgrades are necessary and proposed additions and alternatives that would benefit the facility while potentially increasing capacity beyond the BCA recommendations. We have outlined \$8.8 million worth of upgrades to the existing facility which at this point we believe will resolve existing treatment issues, add redundancy, and provide capacity for continued expansion of Sundance Resort. The process flow diagrams, layouts, and cost estimates included with this memo are conceptual in nature and subject to change substantially based on preliminary and final engineering.

Next Steps

The information provided by BCA and T-O to date has been largely conceptual. A formal engineering study will be required to fully understand the potential for biologic and hydraulic capacity increases and better understand the cost of associated improvements. Based on the information outlined in this memo, we propose the following steps:

1. Move forward with seeking funding based on the cost estimates available at this time.
2. Sundance Resort, NFSSD, other stakeholders, and any pertinent consultants should meet to determine the long-term growth plans for the Resort and surrounding area, project timeline, and other high-level details.
3. Perform a Future Flow Evaluation to officially outline anticipated growth and estimate future wastewater flows. With most of the anticipated growth in the area likely being driven by

Sundance Resort, T-O envisions this report being produced by Sundance Resort and their consultants with input from NFSSD and T-O Engineers at the 30%/60%/90% completion milestones.

4. Develop a Preliminary Engineering Report incorporating details agreed upon in the previous steps. The report will outline all information required to guide final design of any upgrades, provide detailed cost estimates, and include preliminary layouts. It is anticipated the preliminary engineering report will be produced by T-O Engineers on behalf of NFSSD, with Sundance Resort and the consultants providing review and input at the 30%/60%/90% completion milestones.

Understanding the unique relationship between Sundance Resort and North Fork Special Service District, we look forward to working in a collaborative manner with all parties. We understand our mutual goal is to provide an effective, robust, and operator friendly treatment facility that can meet the growing needs of Sundance Resort while supplying the required service to the community at a reasonable cost. We will provide a finalized copy of this draft memo at a later date.

DRAFT - Opinion of Probable Construction Cost

North Fork Special Service District
Wastewater Treatment Facility Upgrades



T-O ENGINEERS

MARK-UPS:	Percentage
MOBILIZATION	5%
OVERTIME ALLOWANCE	0%
ELECTRICAL / INSTRUMENTATION	20%
MECHANICAL	15%
ROCK EXCAVATION ALLOWANCE	1%
ALLOWANCE	10%
CONTINGENCY	20%
CONTR. INSURANCE / PROFIT	10%
ENGINEERING DESIGN	10%
CONSTRUCTION MGMT	3%

PROJECT : Wastewater Treatment Facility Upgrades

FACILITY : North Fork Special Service District
Sundance, UT

DATE : 2/3/2022

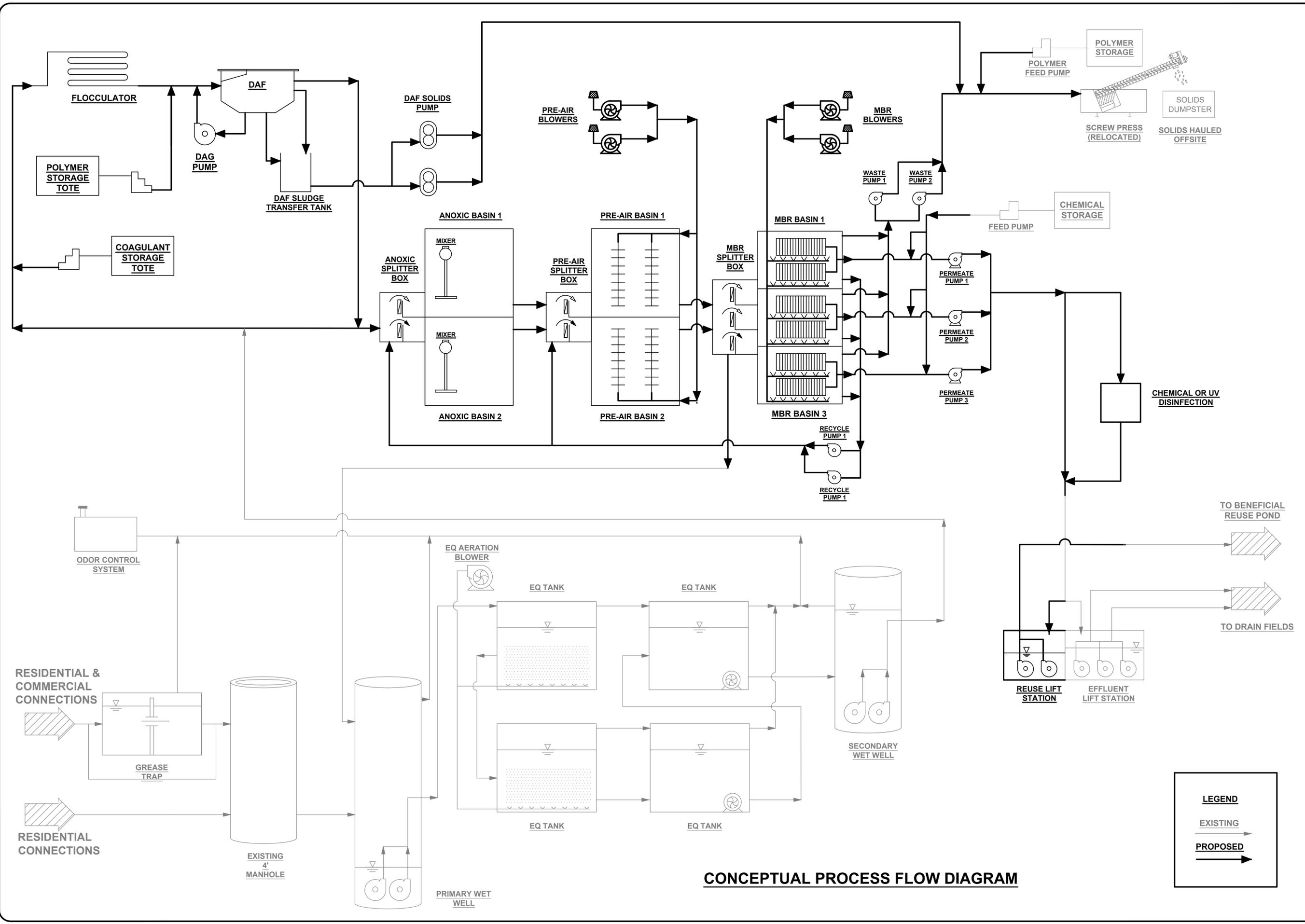
BY : C. Smith

LEVEL : Concept Level (+30%,-20%)

NO.	DESCRIPTION	QTY	Unit	Unit Cost	Installation	TOTAL	Comment
01 HEADWORKS							
1.	Fine Screen	1	ea	\$320,000	25%	\$400,000	
2.	Primary Lift Station Pump - Shelf Spare	1	ea	\$8,000	0%	\$8,000	
3.	Drain Field Effluent Pump - Shelf Spare	1	ea	\$8,000	0%	\$8,000	
02 TREATMENT AREA PROCESS IMPROVEMENTS							
4.	Pre-Air Blowers	2	ea	\$65,000	20%	\$156,000	Blowers, piping, controls, etc
5.	Upgrade HVAC System	1	ls	\$80,000	10%	\$88,000	
6.	Replace Pre-Air Control Valve	1	ea	\$3,500	20%	\$4,200	
7.	Upgrade SCADA System	1	ls	\$45,000	0%	\$45,000	
8.	Permeate Pump - Shelf Spare	1	ea	\$6,000	0%	\$6,000	
9.	RAS Pump - Shelf Spare	1	ea	\$6,000	0%	\$6,000	
10.	WAS Pump - Shelf Spare	1	ea	\$6,000	0%	\$6,000	
03 TREATMENT AREA CAPACITY IMPROVEMENTS							
11.	Expand Treatment Building	1,164	sf	\$600	0%	\$698,400	18' x 42', Concrete/CMU with metal roof
12.	Expand Treatment Building - Site Work	1	ls	\$50,000	0%	\$50,000	
13.	Treatment Building 2nd Story Exterior Access	1	ls	\$40,000	10%	\$44,000	Exterior staircase
14.	DAF	1	ea	\$270,000	30%	\$351,000	Includes flocculator & DAG pump (120 gpm rating)
15.	DAF Sludge Tank	1	ea	\$15,000	20%	\$18,000	
16.	DAF Sludge Transfer Pump	2	ea	\$17,000	25%	\$42,500	Includes isolation, control, and check valves
17.	DAF Chemical Systems	2	ea	\$9,000	20%	\$21,600	Polymer and coagulant
18.	Relocate Existing Blowers	2	ea	\$35,000	0%	\$70,000	Blowers, piping, controls, etc
19.	Relocate Anoxic Basins	1	ls	\$12,000	0%	\$12,000	Includes all piping modifications

NO.	DESCRIPTION	QTY	Unit	Unit Cost	Installation	TOTAL	Comment
20.	Anoxic Basin Mechanical Mixers	2	ea	\$15,000	10%	\$33,000	
21.	Relocate Pre-Air Basin	1	ls	\$75,000	0%	\$75,000	Convert MBR 1 to Pre-Air, install splitter boxes
22.	Construct New MBR Reactors	2	ea	\$45,000	0%	\$90,000	Includes demo of existing blower room
23.	New MBR Cassettes	2	ea	\$45,000	25%	\$112,500	Kubota EM200 cassettes
24.	Relocate Dewatering Press	1	ls	\$25,000	0%	\$25,000	Includes all piping modifications
25.	Relocate Dewatering Press - Structural	1	ls	\$65,000	0%	\$65,000	Structural reinforcement to second story
26.	New Permeate Pump	1	ea	\$17,000	20%	\$20,400	Includes isolation, control, and check valves
27.	New Portable Trash Pump	1	ea	\$5,500	0%	\$5,500	To pump down anoxic and pre-air basins
28.	Catwalk Modifications	1	ls	\$60,000	30%	\$78,000	
	04 DISPOSAL UPGRADES						
29.	UV Disinfection	2	EA	\$75,000	20%	\$180,000	Includes isolation, control, and check valves
30.	Beneficial Reuse Pump	2	ea	\$17,000	20%	\$40,800	Pump effluent to existing pond, includes valves
31.	Beneficial Reuse Piping	200	lf	\$80	0%	\$16,000	To existing piping to pond near headworks
32.	Regulatory Changes	300	hr	\$180	0%	\$54,000	Work with state to update reuse regulations
33.	Irrigation System	1	ls	\$50,000	0%	\$50,000	Tie in to existing irrigation and re-label
34.	Headworks Basin Modifications	1	ls	\$80,000	0%	\$80,000	Add basin divider for beneficial reuse sump
35.	Snowmaking Fan Gun	1	ea	\$50,000	20%	\$60,000	Includes piping to existing S.M pressure water
36.	Install New Drain Field	15,000	lf	\$60	0%	\$900,000	
A	SUBTOTAL					\$3,919,900	
B	MOBIL./DEMOBIL.	(% of A)				\$195,995	
C	OVERTIME ALLOWANCE	(% of A)				\$0	
D	ELECTRICAL / INSTRUMENTATION	(% of A)				\$783,980	
E	MECHANICAL	(% of A)				\$587,985	
F	ROCK EXCAVATION ALLOWANCE	(% of A)				\$39,199	
G	SUBTOTAL					\$5,527,059	
H	ALLOWANCE	(% of G)				\$552,706	
I	CONTINGENCY	(% of G)				\$1,105,412	
J	CONTR. PROFIT	(% of G)				\$552,706	
K	SUBTOTAL					\$7,737,883	
L	ENGINEERING DESIGN	(% of K)				\$773,788	
M	CONSTRUCTION MGMT	(% of K)				\$232,136	
N	FUTURE FLOW EVALUATION					\$25,000	
O	PRELIMINARY ENGINEERING REPORT					\$50,000	
	SUBTOTAL					\$8,818,807	
	TOTAL ESTIMATED COST					\$8,818,807	

01181107 - BOWS OPERATIONS/FUTURE UPGRADE/AUTOCAD/01 PROCESS FLOW DIAGRAM NFS582Z.DWG, 1/25/2022
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CONCEPTUAL PROCESS FLOW DIAGRAM

LEGEND

EXISTING →

PROPOSED →

NO.	REVISIONS	DATE	FILE NAME
A		1/25/2022	

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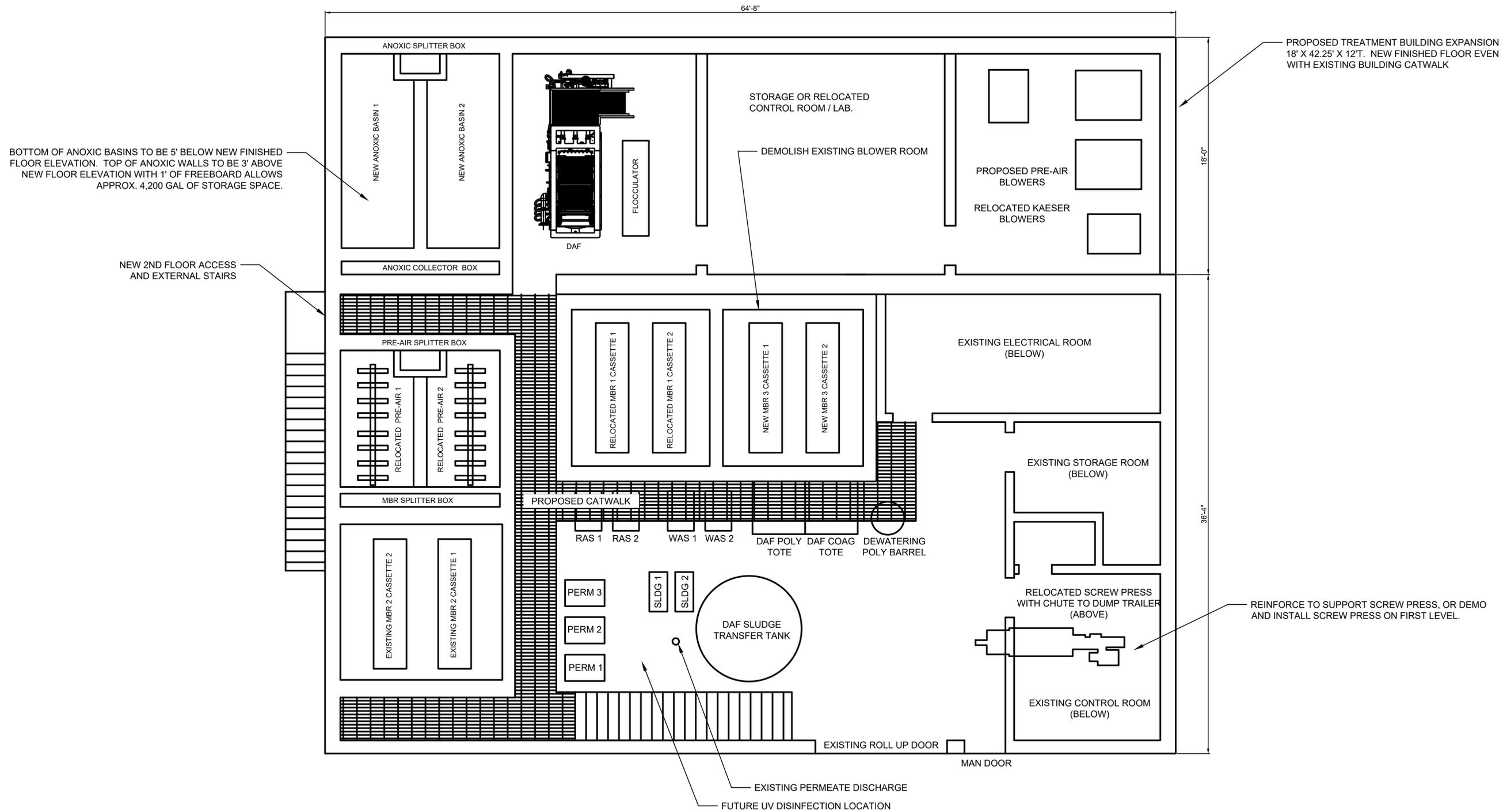
**NFSSD EQ TANK
 SUNDANCE, UT
 PROCESS FLOW
 DIAGRAM**

ATTENTION: 1/2" ON 22x34 SHEET or 1/2" ON 11x17 SHEET, THEN DRAWING IS NOT TO SCALE

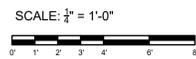
DATE: JANUARY 2022
 PROJECT: 181107
 SHEET **G0.1**

NOT FOR CONSTRUCTION

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TREATMENT BUILDING PRIMARY TREATMENT EXPANSION CONCEPTUAL LAYOUT



PROPOSED TREATMENT BUILDING EXPANSION
18' X 42.25' X 12'T. NEW FINISHED FLOOR EVEN
WITH EXISTING BUILDING CATWALK

REINFORCE TO SUPPORT SCREW PRESS, OR DEMO
AND INSTALL SCREW PRESS ON FIRST LEVEL.

E-FILE NAME	
DESIGNED	XX
DRAWN	DBS
CHECKED	CES
APPROVED	XX

REVISIONS	
NO.	DATE
A	1/25/22
B	2/1/22

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NFSSD EQ TANK
SUNDANCE, UT
CONCEPT LAYOUT

ATTENTION: 1/2
IF THIS BAR DOES NOT MEASURE
1" ON 22x34 SHEET or 1/2" ON
11x17 SHEET, THEN DRAWING IS
NOT TO SCALE

DATE: JANUARY 2022
PROJECT: 181107

SHEET C2.0

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