Assessing Options for an Aging Trickling Filter Wastewater Treatment Plant

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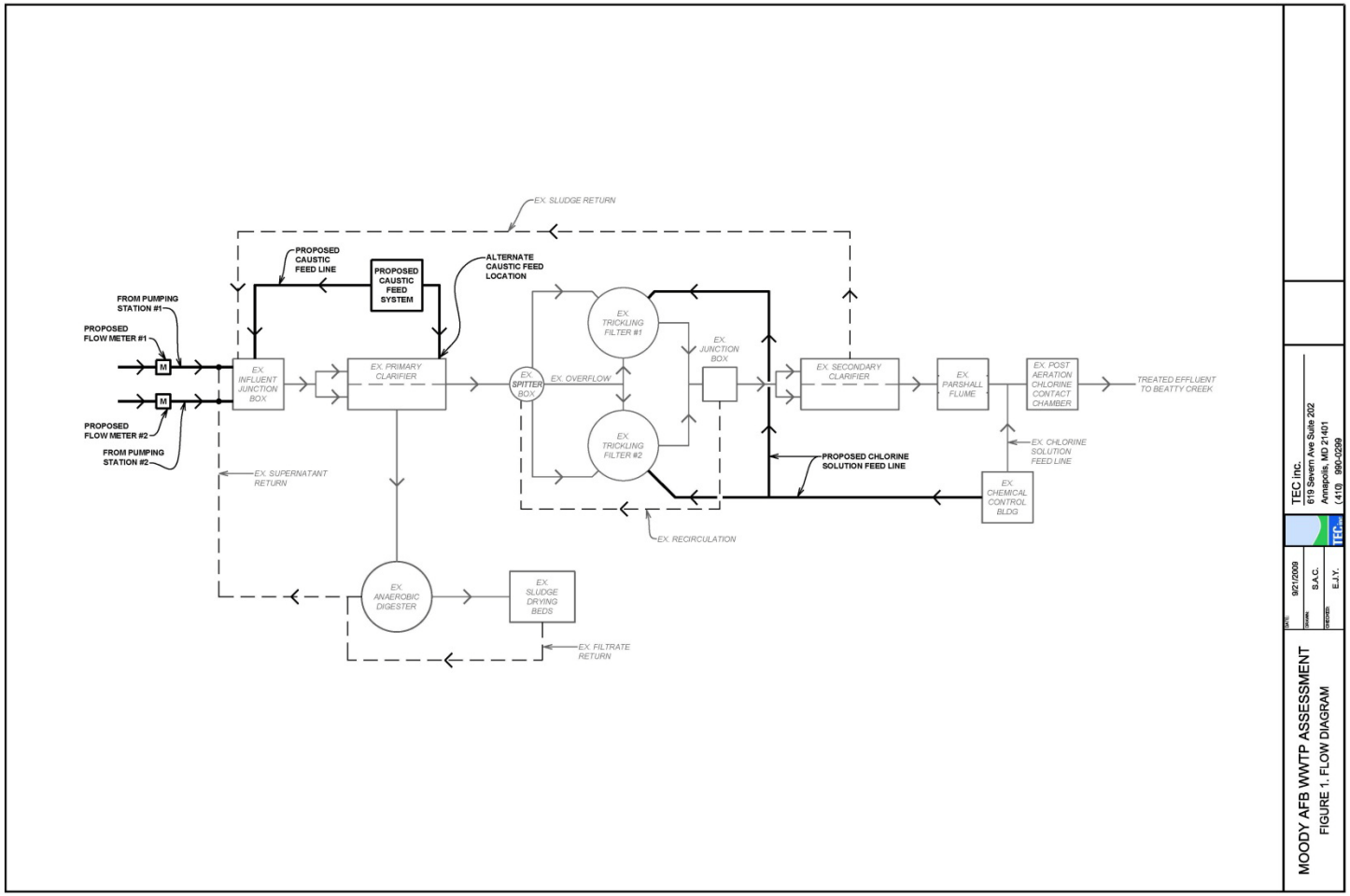
TEC Inc.

Overview

- Moody AFB, Georgia treats its own wastewater and discharges to a small creek under an NPDES permit
- Wastewater Treatment Plant (WWTP) uses low-rate trickling filter for biological treatment
- WWTP built in the 1940s & recently had problems with filter distributor arms
- Problems led Base to look into long-term solutions to the aging treatment plant

Existing / Standard WWTP



Overview

WWTP

- Design flow = 750,000 gallons per day (gpd)
- Actual flow ~ 400,000 gpd
- Actual flow consists of 300k gpd wastewater + 100k gpd excess water from the drinking water plant

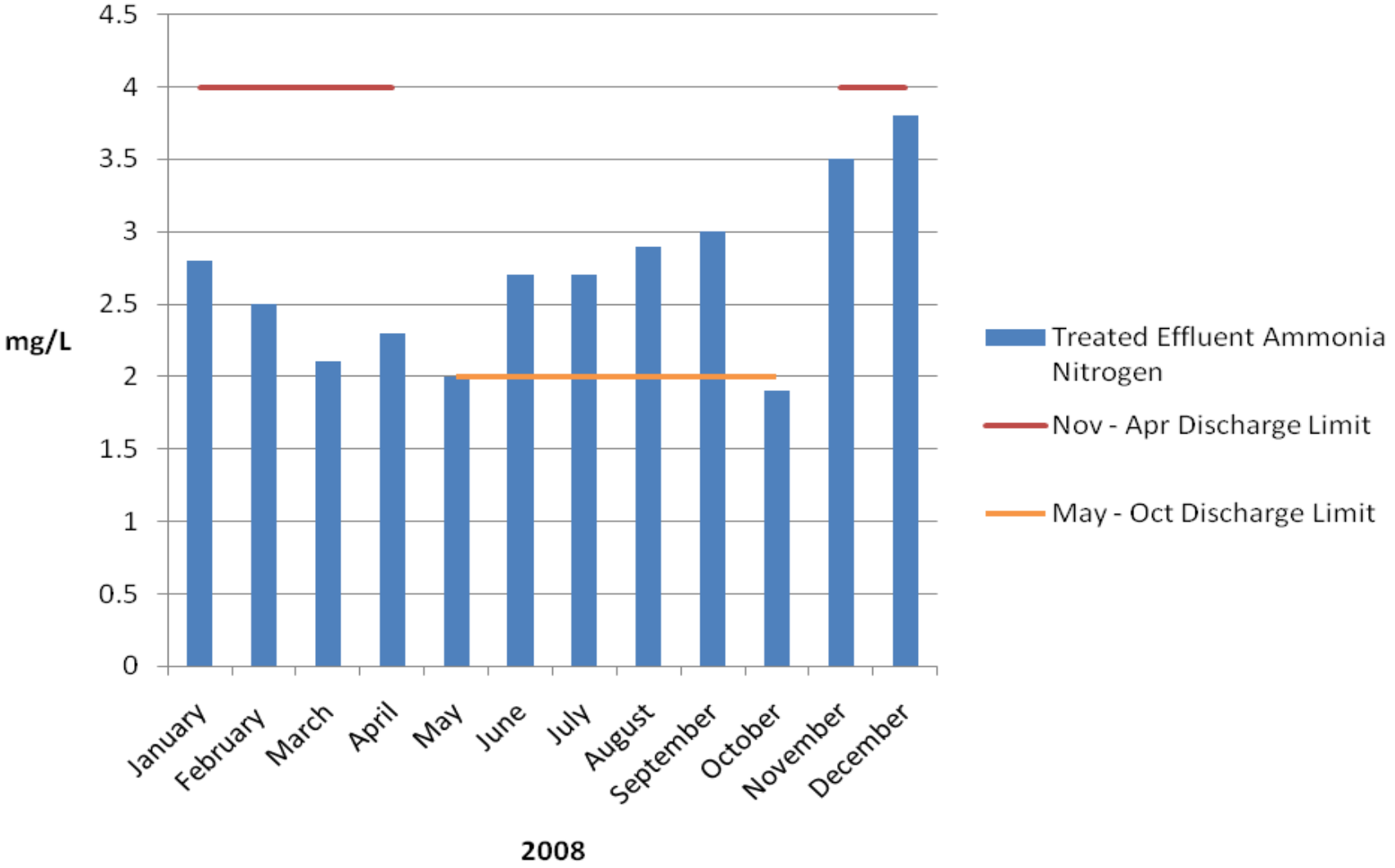
- WWTP built in the 1940s & recently having problems with filter distributor arms

Base wanted to plan for long-term solutions to the aging treatment plant

NPDES Limits

Effluent Characteristic	Discharge Limitations (mg/L unless noted)		Monitoring Requirements		
	Monthly Avg.	Weekly Avg.	Frequency	Type	Location
Flow (mgd)	0.75	1.125	Daily	Continuous	Effluent
BOD_5	15	22	2/week	Composite	Effluent
Fecal Coliform	200/100 ml	400/100 ml	1/week	Grab	Effluent
Suspended Solids	30	45	2/week	Composite	Effluent
Ammonia Nitrogen **May-Oct** **Nov-April**	 2.0 4.0	 3.0 6.0	 2/week 2/week	 Composite Composite	 Effluent Effluent
Tot. Residual Chlorine	-	-	Daily	Grab	Effluent

Ammonia N in Effluent



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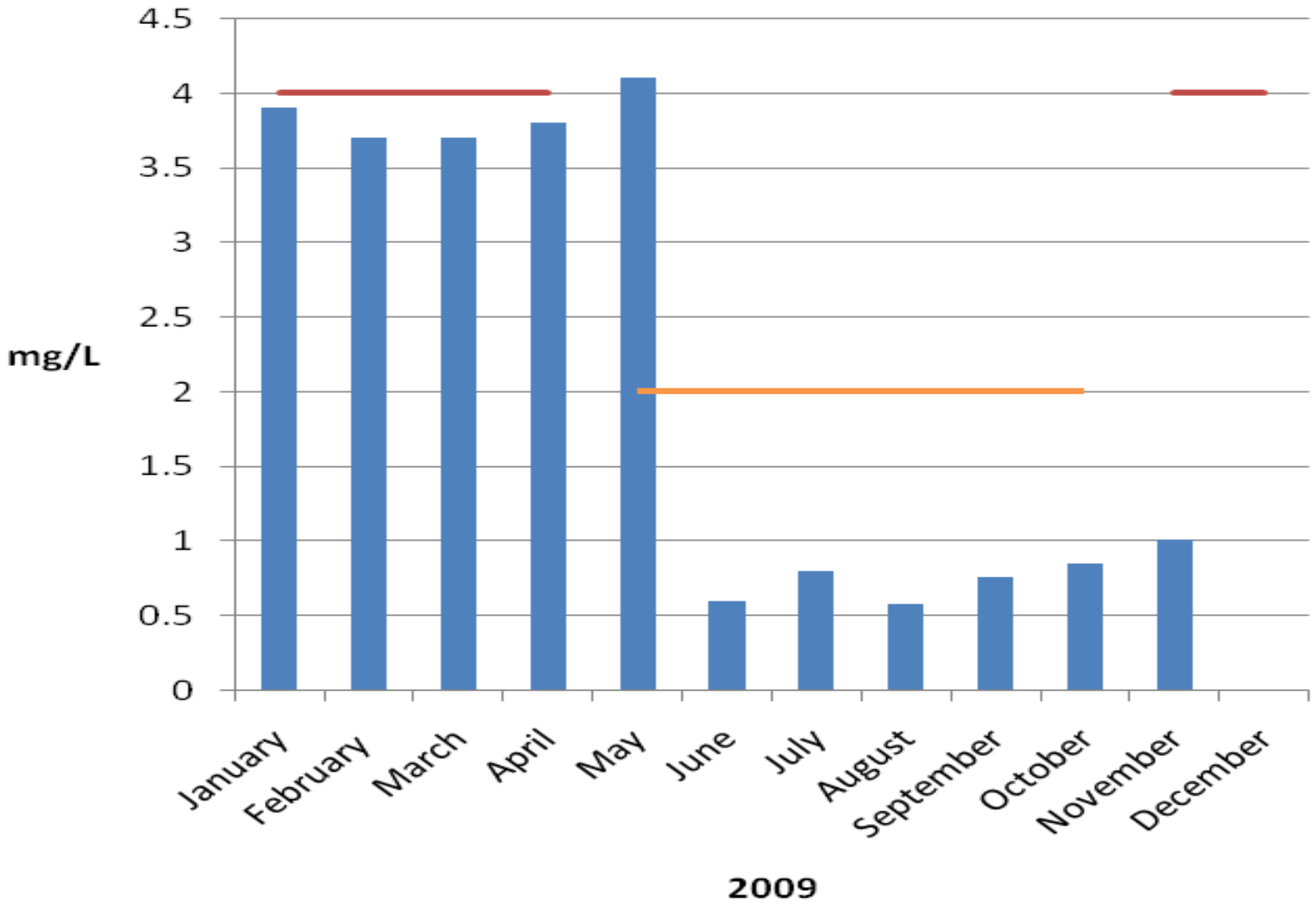


Regulatory Background (cont'd)

- Trickling Filter arm problems in 2007/2008 led to elevated ammonia-nitrogen discharge levels.
  - Exceeded NPDES permit limits 3 times in the summer of 2008
  - Base worked closely with GA regulators to avoid penalties while problem being fixed
- The base replaced the distributor assemblies (columns, bearings, arms, nozzles) in early 2009, which solved the ammonia problem.

Long Term Options

After acute problems resolved, Moody AFB was/is still operating a 70-year old plant and wanted long term options assessed.

TEC Inc. performed assessment of WWTP options in 2009/2010

1. Maintain existing plant
2. Replace plant with a new system
3. Connect to nearby municipal systems
   a) Lowndes County (adjacent)
   b) City of Valdosta (6 miles away)

Option 1 – Maintain Existing WWTP

- TEC Engineers assessed the WWTP
- Documented deficiencies with TEC's facilities management system (TECfms)
- Each deficiency includes a brief description, severity of deficiency, recommended solution, and cost estimate.
- Deficiencies listed in work packages, allowing for groups / project planning.
- TEC prioritizing work packages as immediate (1-2 years), short-term (in 5 years) and long-term (20 years).
- Includes new electrical and control systems

Immediate Repairs (1-2 yr)

$750,000

TEC Work Package Report
Upgrade Existing WWTP
Recommended Year 2011

Deficiency Summary

Asset Number	Def Num	Deficiency Name	Direct Cost	Direct Cost with Burden
1002	A10-31795	Floor discoloration	$594.00	$908.14
1002	B20-31793	Aging doors	$800.00	$1,223.09
1002	C10-31794	Discoloration/stains on walls and ceiling	$1,158.00	$1,770.42
1003	B20-31943	Aging door	$800.00	$1,223.09
1003	C10-31752	Replace ceiling/clean walls and floors	$5,100.00	$7,797.18
1004	D20-31941	No influent flow measurement	$40,000.00	$61,154.35
1004	G20-31942	missing handrail	$1,575.00	$2,407.95
1005	B20-31953	Windows and doors and poor condition	$1,640.00	$2,507.33
1005	B30-31645	Shingled roof to be replaced	$1,969.00	$3,010.32
1005	C10-31886	interior paint	$4,032.00	$6,164.36
1005	D50-31887	broken gas meter	$1,500.00	$2,293.29
1005	D50-31954	Aging electrical system to be replaced	$50,000.00	$76,442.94
1005	G20-31885	rehab exterior steps	$15,050.00	$23,009.32
1005	G30-31888	DIGESTER ROOF DETERIORATION	$200,000.00	$305,771.76
1005	G30-31889	Aging digester basin	$143,325.00	$219,123.69
1005	G30-31955	Gas piping	$750.00	$1,146.64
1013	A10-31803	Aging Floor	$1,520.00	$2,323.87
1013	B20-31959	Aging doors	$800.00	$1,223.09
1013	B30-31797	Deteriorating Roof	$2,030.00	$3,103.58
1013	C10-31801	Discoloration and stains on walls and ceiling	$2,475.00	$3,783.93
1013	D30-31958	Aging chlorine mixer	$2,500.00	$3,822.15
1013	D30-31960	Aging vent fans	$5,000.00	$7,644.29
1013	E10-31796	Breathing apparatus enclosure deterioration	$1,000.00	$1,528.86
1014	A10-31810	Floor discoloration	$713.00	$1,090.08
1014	B20-31811	Warped doors	$1,600.00	$2,446.17
1014	B30-31808	Aging Roof	$1,190.00	$1,819.34
1014	C10-31809	Discoloration and stains on walls and ceiling	$1,440.00	$2,201.56
SUBTOTAL			**$488,561.00**	**$746,940.78**

Short -Term Repairs (5 yr)

$2,900,000

TEC Work Package Report
Upgrade Existing WWTP
Recommended Year 2015

Deficiency Summary

Asset Number	Def Num	Deficiency Name	Direct Cost	Direct Cost with Burden
1004	B20-32557	Building 1004 Demolition/Reconstruction	$65,000.00	$99,375.82
1004	D20-31938	Yard hydrant in poor condition	$2,000.00	$3,057.72
1004	D20-31970	No capability to add chlorine to trickling filters	$2,500.00	$3,822.15
1004	D50-31944	Aging site electrical system	$250,000.00	$382,214.70
1004	D50-31962	Aging samplers	$12,000.00	$18,346.31
1004	F20-31947	Aging pumps	$36,000.00	$55,038.92
1004	F20-31967	Aging chain and flight for primary clarifiers	$80,000.00	$122,308.70
1004	F20-31968	Aging chain and flight for secondary clarifiers	$80,000.00	$122,308.70
1004	G30-31892	PRIMARY CLARIFIERS CONCRETE BASIN EROSION	$94,520.00	$144,507.73
1004	G30-31893	TRICKLING FILTER #1 CONCRETE BASIN EROSION	$175,000.00	$267,550.29
1004	G30-31894	TRICKLING FILTER #2 Concrete basin erosion	$175,000.00	$267,550.29
1004	G30-31895	SECONDARY CLARIFIERS Concrete basin erosion	$71,450.00	$109,236.96
1004	G30-31896	Chlorine Contact Tank Concrete Basin Erosion	$28,975.00	$44,298.68
1004	G30-31897	SEWAGE OUTFALL CONCRETE CHANNEL EROSION	$63,000.00	$96,318.10
1004	G30-31898	Rebuild sludge drying beds	$90,000.00	$137,597.29
1004	G30-31937	Scum valve replacement	$8,000.00	$12,230.87
1004	G30-31949	splitter box basin erosion	$8,200.00	$12,536.64
1004	G30-31951	Vent piping replacement - filter 1	$8,000.00	$12,230.87
1004	G30-31951	Vent piping replacement - filter 1	$8,000.00	$12,230.87
1004	G30-31952	Vent piping replacement - filter 2	$8,000.00	$12,230.87
1004	G30-31952	Vent piping replacement - filter 2	$8,000.00	$12,230.87
1004	G30-31965	Media replacement - filter 1	$300,000.00	$458,657.64
1004	G30-31966	Media replacement - filter 2	$300,000.00	$458,657.64
1013	D30-31961	Larger pump	$3,000.00	$4,586.58
SUBTOTAL			**$1,876,645.00**	**$2,869,125.22**

Example Short Term Repair

Primary Clarifiers chains $80,000

TEC Inc. Work Package Report

Deficiency Details

F20-31967 - Aging chain and flight for primary clarifiers

IMG_3622.JPG-Chain and flight at primary clarifier

Problem Statement:

The chain and flight mechanisms on the clarifiers are nearly 15 years old and are begining to show signs of aging.

Solution Statement:

Remove the existing mechanisms and replace with new mechanisms.

Code Reference:

Uniformat Classification	
Uniformat Code:	Mechanical Systems
Inventory Item:	Chain and flight for Primary Clarifiers

Deficiency Impacts	
Severity Rating:	Moderate
Impact Type	Mission
Impact Severity:	The deficiency will result in partial loss of facility operations (<50%)
Impact Mishap Probability:	Failure is predicted within a year after the inspection.
Distress Type:	Deteriorated

Deficiency Specifications	
Recommended Excecution Year:	2015
Deficiency Source:	FMS
Work Type:	Replace

Deficiency Cost	
Labor	$0.00
Materials	$80,000.00
Equipment	$0.00
Total	**$80,000.00**

Option 1 Summary (Maintain WWTP)

- Capital Costs = $3.8 million (not all at once)
- Annual Operating Costs = $225,000

Option 2 – Install a new Sequencing Batch Reactor Treatment System

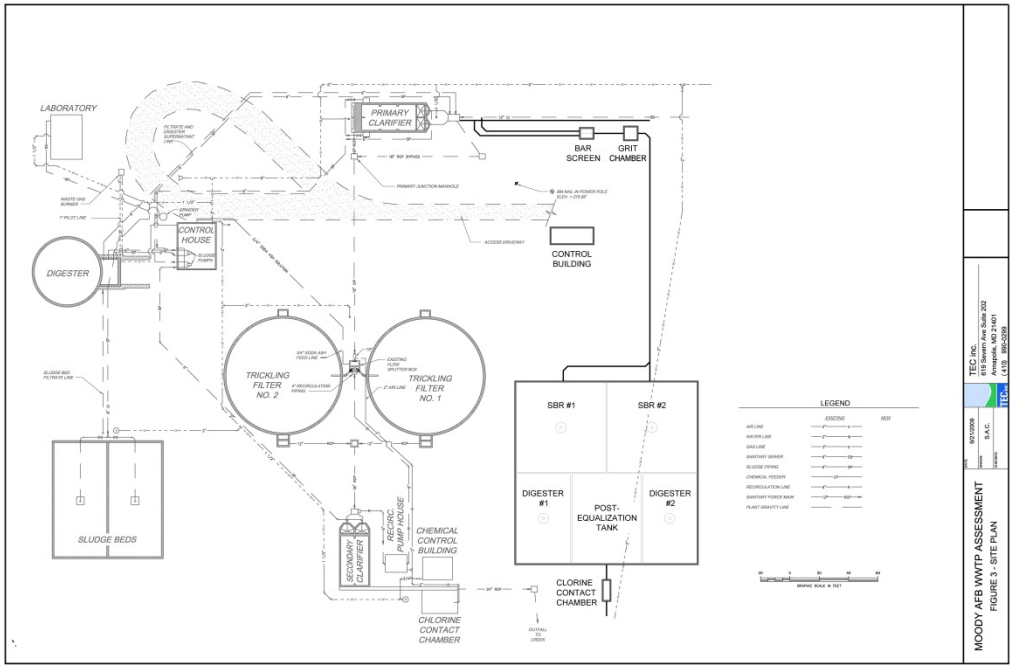
- Influent Flow Metering
- Influent Control/Splitter Chamber
- Mechanical Fine Screen System with Manual Coarse Screen Backup
- Two Sequencing Batch Reactor Tanks with Equipment
- One Post Equalization Tank with Effluent Pumps
- Two Aerobic Digester Tanks with Equipment
- Blower Building with Equipment
- New Chlorine Disinfection System
- New Control Building

Option 2 Costs

Table 12. Construction Cost Estimate - Install New SBR Plant	
Item	Cost Estimate
Mobilization/Demobilization	$50,000
Bonds and Insurances	$50,000
Allowance for Construction Sequencing	$25,000
Siteworks, earthwork and roadways	$150,000
Yard Piping	$250,000
Headworks (Influent chamber, flow meters, comminutor chamber)	$250,000
SBR, Post EQ, Digester, Blower room structure	$2,000,000
SBR digester equipment and controls	$1,000,000
Chemical feed equipment	$125,000
Post EQ Pumps	$60,000
Chlorine contact chamber	$80,000
Chlorination equipment	$40,000
New Control Building	$100,000
Electrical Construction	$450,000
Demolition and renovation of existing plant	$150,000
SUBTOTAL	$4,780,000
Miscellaneous and Contingency @ 20%	$956,000
Preliminary Construction Cost Estimate	$5,736,000
Engineering and Administration @ 30%	$1,720,800
Total Capital Cost	$7,456,800

Option 2 Summary (Maintain WWTP)

- Capital Costs = $7.5 million (not all at once)
- Annual Operating Costs = $272,000



Option 3 – Connect to Municipality

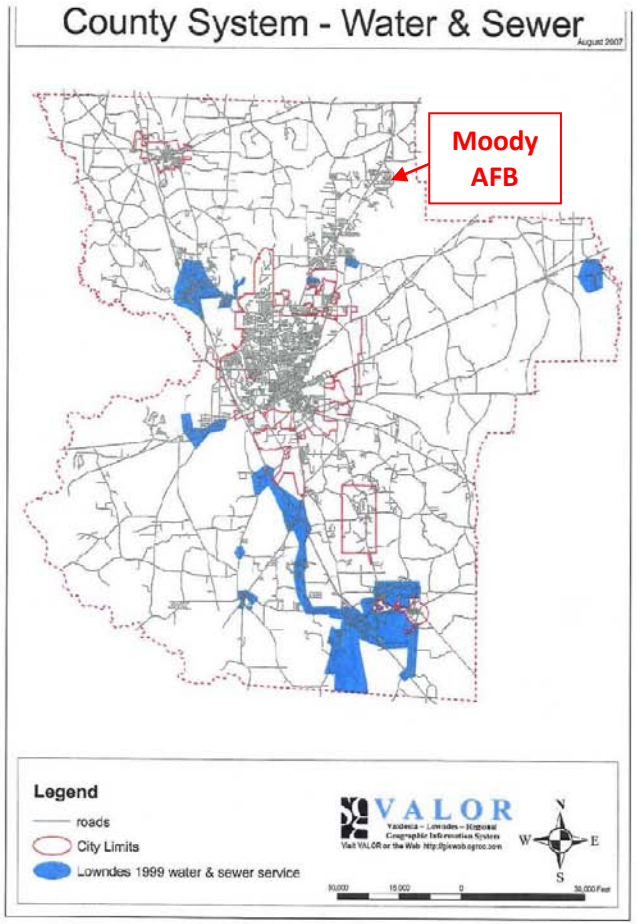
City of Valdosta

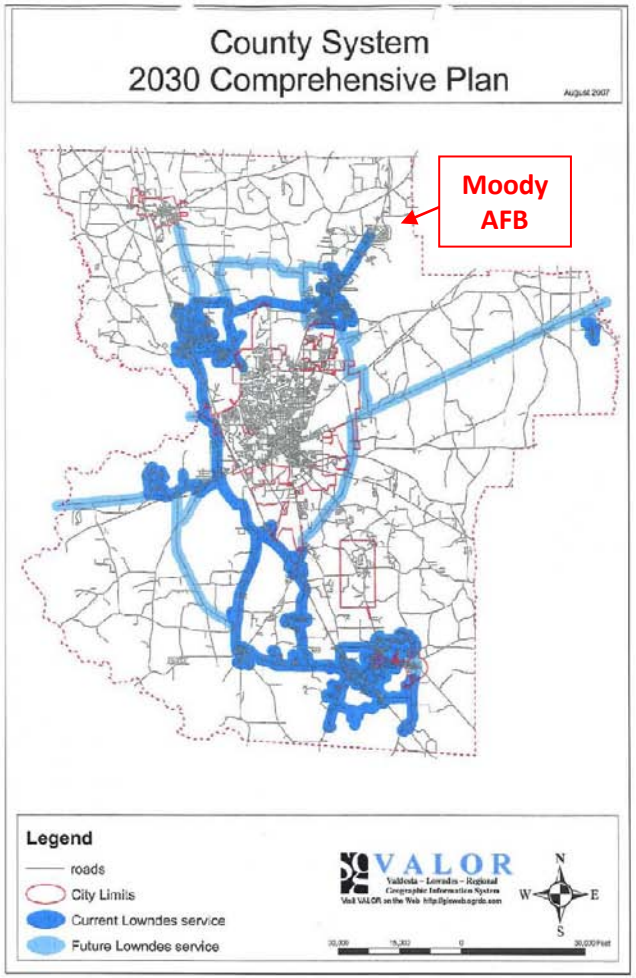
- Adequate capacity
- 6 miles away/expensive connection

Lowndes County

- Collection system adjacent to base
- Capacity in question
- Other requirements not attractive to base

Project Overview





Option 3 Summary (Connect to Municipality)

- County
  - Capital Costs = $2.01 million
  - Annual Operating Costs = $328,000
- City
  - Capital Costs = $2.44 million
  - Annual Operating Costs = $376,000

Cost Summary of Options

ALTERNATIVE		CAPITAL COSTS	ANNUAL O&M COSTS
Upgrade Existing Plant		$3.8 Million	$225,000
Install New SBR Plant		7.5 Million	$272,000
Connect to Local Municipality	Lowndes County	* $2.01 Million	** $328,500
	City of Valdosta	*$2.44 Million	$376,000

The Way Forward

- HQ ANG now has the information needed to make a decision as to what to do about the non-DLA approved contractors
  - Direct bases to submit waivers?
  - [illegible]
- Ea[illegible] C[illegible] compliance audit of their selected facility

ALTERNATIVE		CAPITAL COSTS	ANNUAL O&M COSTS
Upgrade Existing Plant		$3.8 Million	$225,000
Install New SBR Plant		7.5 Million	$272,000
Connect to Local Municipality	Lowndes County	* $2.01 Million	** $328,500
	City of Valdosta	*$2.44 Million	$376,000