

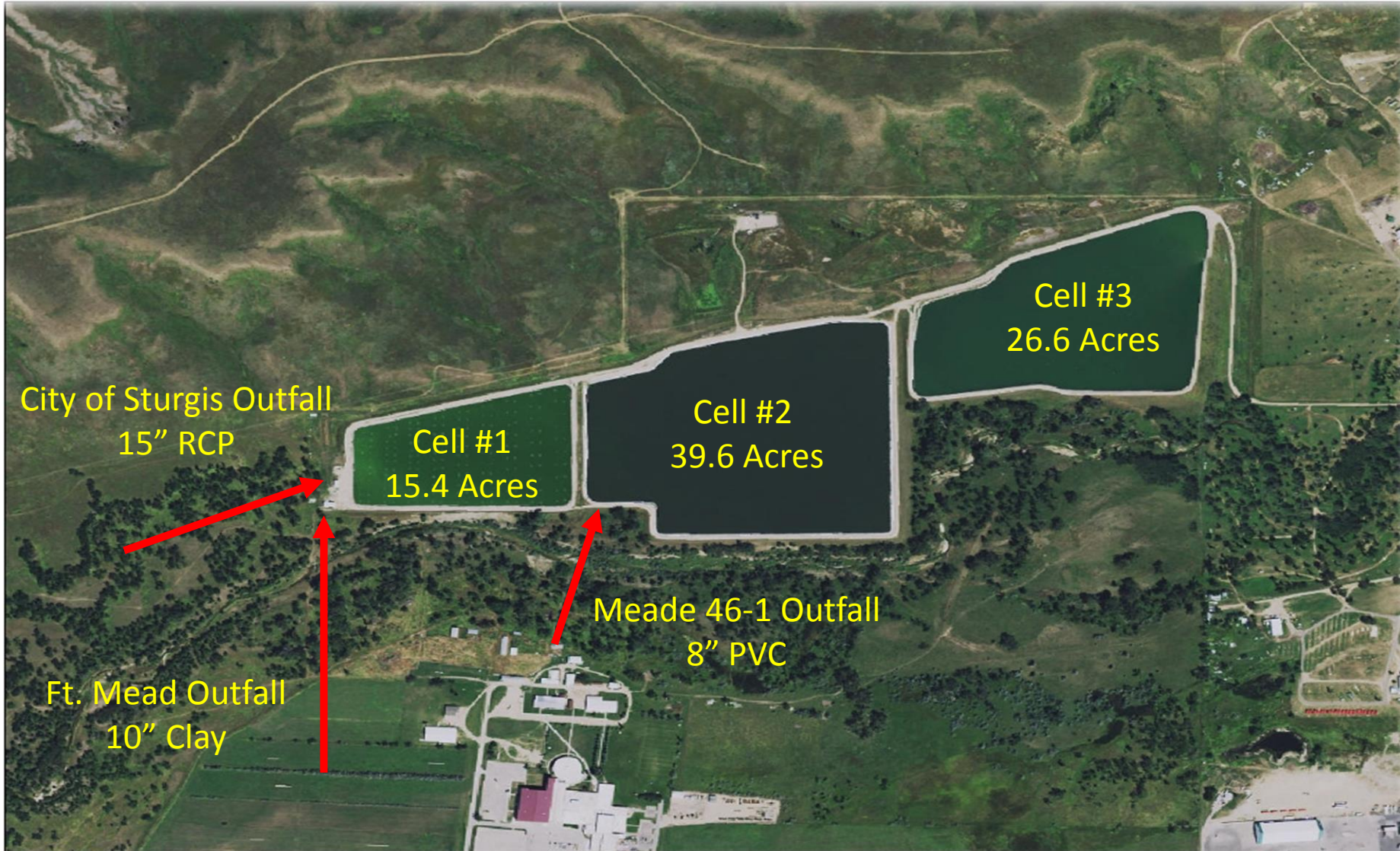
WASTEWATER FACILITY PLAN

CITY OF STURGIS, SOUTH DAKOTA



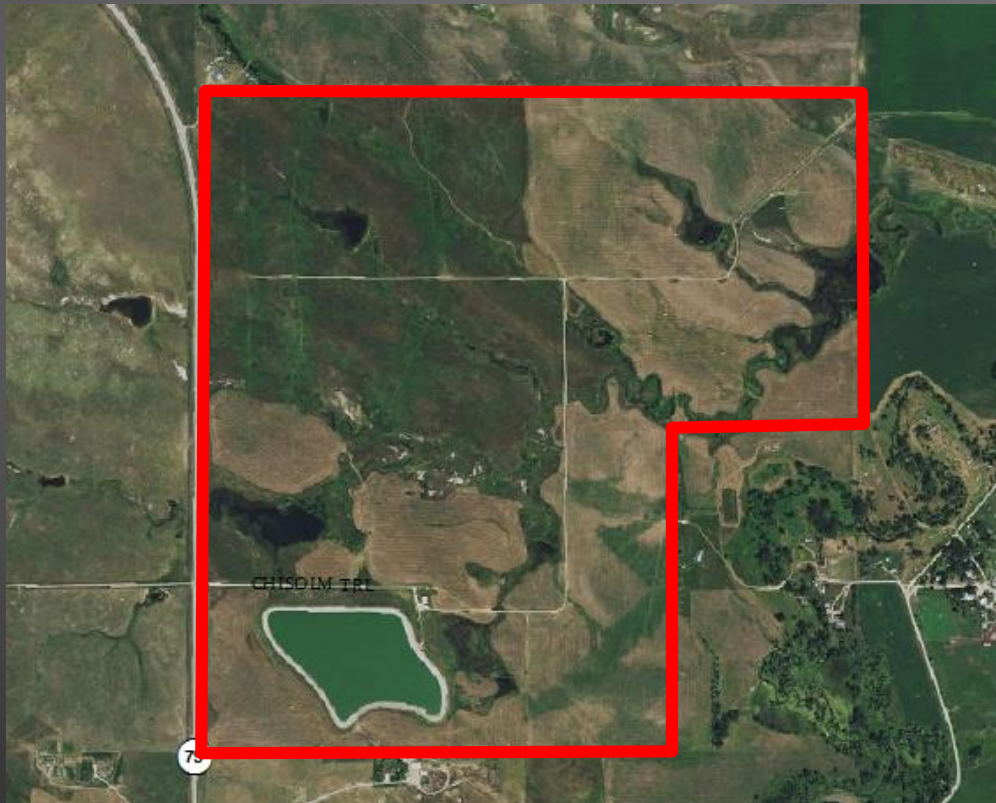
MAY 15, 2017

CURRENT TREATMENT



- The Original Treatment Facilities were constructed in 1963 and upgraded in 1995 after the the city received a Notice of Violation and Compliance Order by the SDDENR.
- The Basic Configuration of the Treatment Facilities is a series system consisting of an Aerated Pond (Cell #1) followed by two Storage Ponds (Cell #2 and #3).
- Cell #1 (Max. Depth 5 feet) Aeration system was sized at the time to handle the load through the Year 2014, and remove 80% of the BOD (Biochemical Oxygen Demand). BOD is a measurement of the amount of dissolved oxygen (DO) that is used by aerobic microorganisms when decomposing organic matter in water. Simply measures the amount of organic compounds in the water. Heavy Solids will settle to the bottom of this pond.
- Cells #2 (Max Depth 9 Feet) and Cell #3 (Max Depth 12 feet) operates as a series storage pond system or polishing ponds, where lower populations of anaerobic Micro-Organisms and a higher population of Aerobic organisms continue to break down the organic material, making it suitable for discharge or irrigation.
- In 1999 the City looked at options for upgrading the system that included
 - Alternative 1-Expanding Storage 1.5 Miles NE of the existing WWTF
 - Alternative 2-Expanding Storage on Property adjacent to the City of Sturgis Airport
 - Alternative 3-Constructing a total containment facility.

- In 2000 the City moved forward with Alternative No. 1 by purchased the Sundstrom Property and soon after began construction of the Pumping Station, Transfer Line and Cell #4.
- Alternative 1- Was estimated to handle the City's needs for 20 Years.
 - Additional 300 Acres of Irrigation
 - Cell #4 – Additional 30 Acres Storage



CURRENT PERMIT



- ◆ Issued April, 2007
- ◆ Set for renewal March 2012 **(Expired)**
 - Ongoing Negotiations with SDDENR
- ◆ Irrigation as disposal **(No Discharge)**
 - BOD 30 (Biochemical Oxygen Demand)
 - TSS 110 (Total Suspended Solids)

PLANNING & OPERATIONAL CONSIDERATIONS- FOR STURGIS WWTF

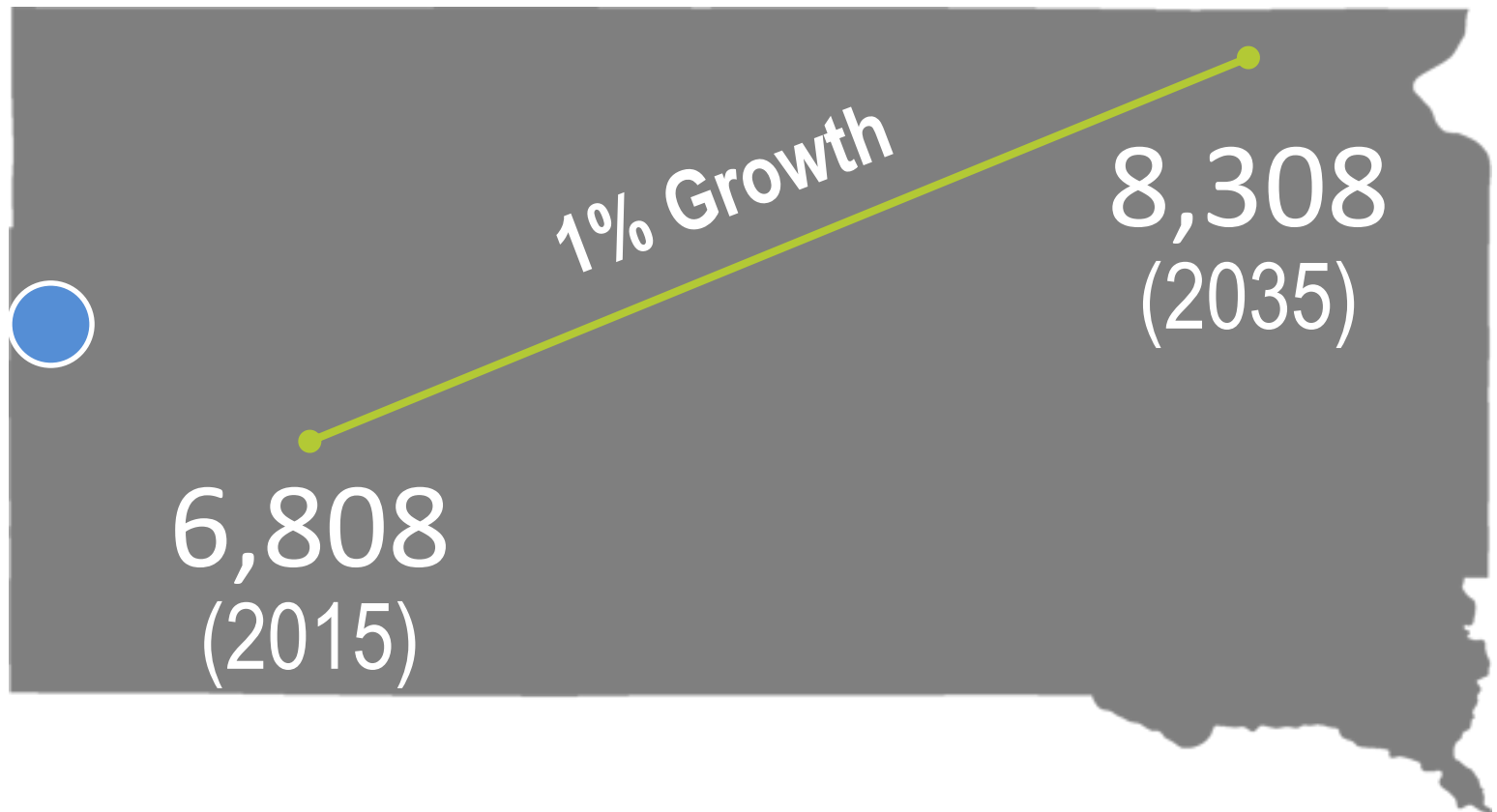
- Growth
- Regulations
- Aging Infrastructure



- Sturgis has all three



POPULATION



REGULATION



..... 1972 Clean Water Act



..... Surface Water Discharge Permit



..... Treatment & Monitor Water Quality for Permit Compliance

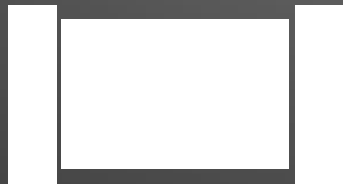
REGULATIONS



**Current
Permit**



**Emergency
Overflows**

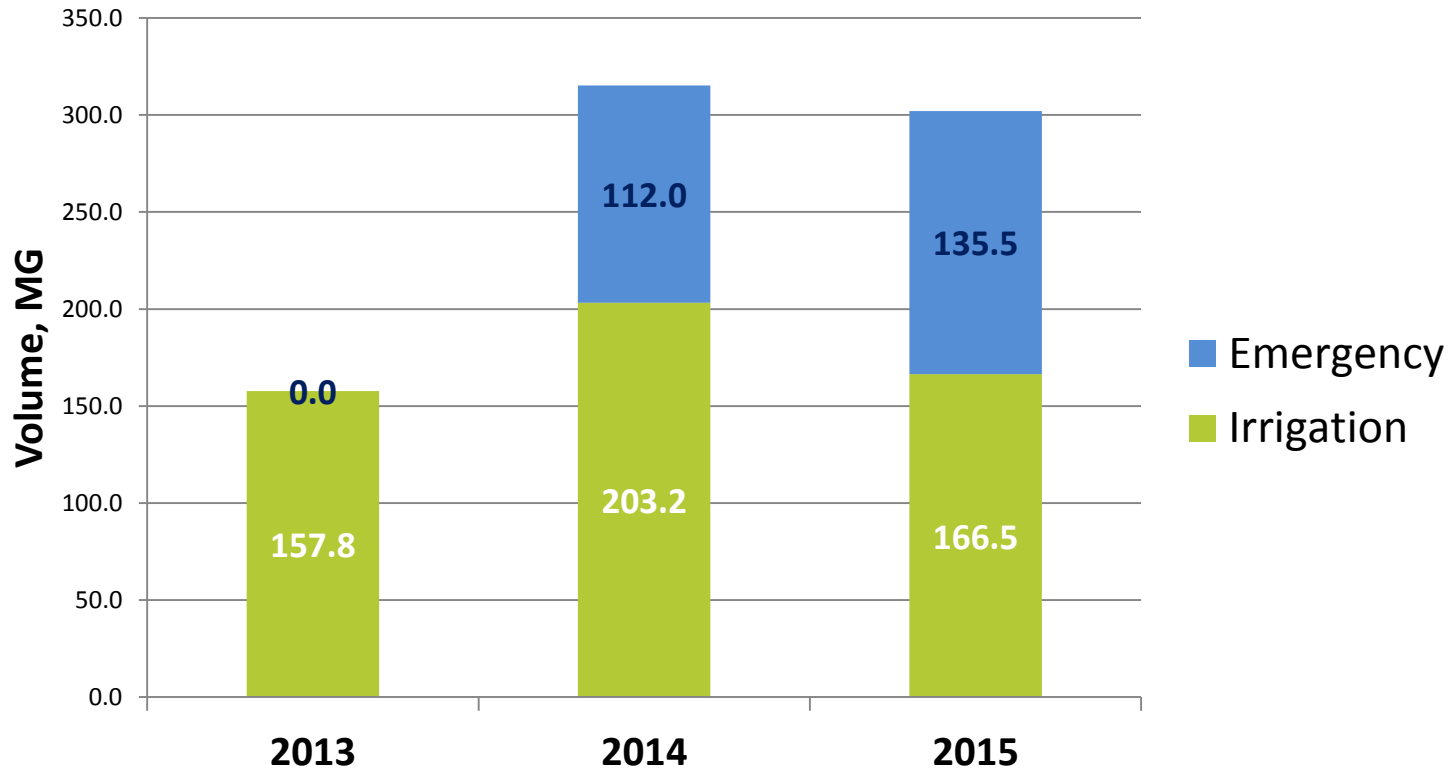


**Infiltration
& Inflow**



**New
Permit/
Regulations**

EMERGENCY OVERFLOWS +

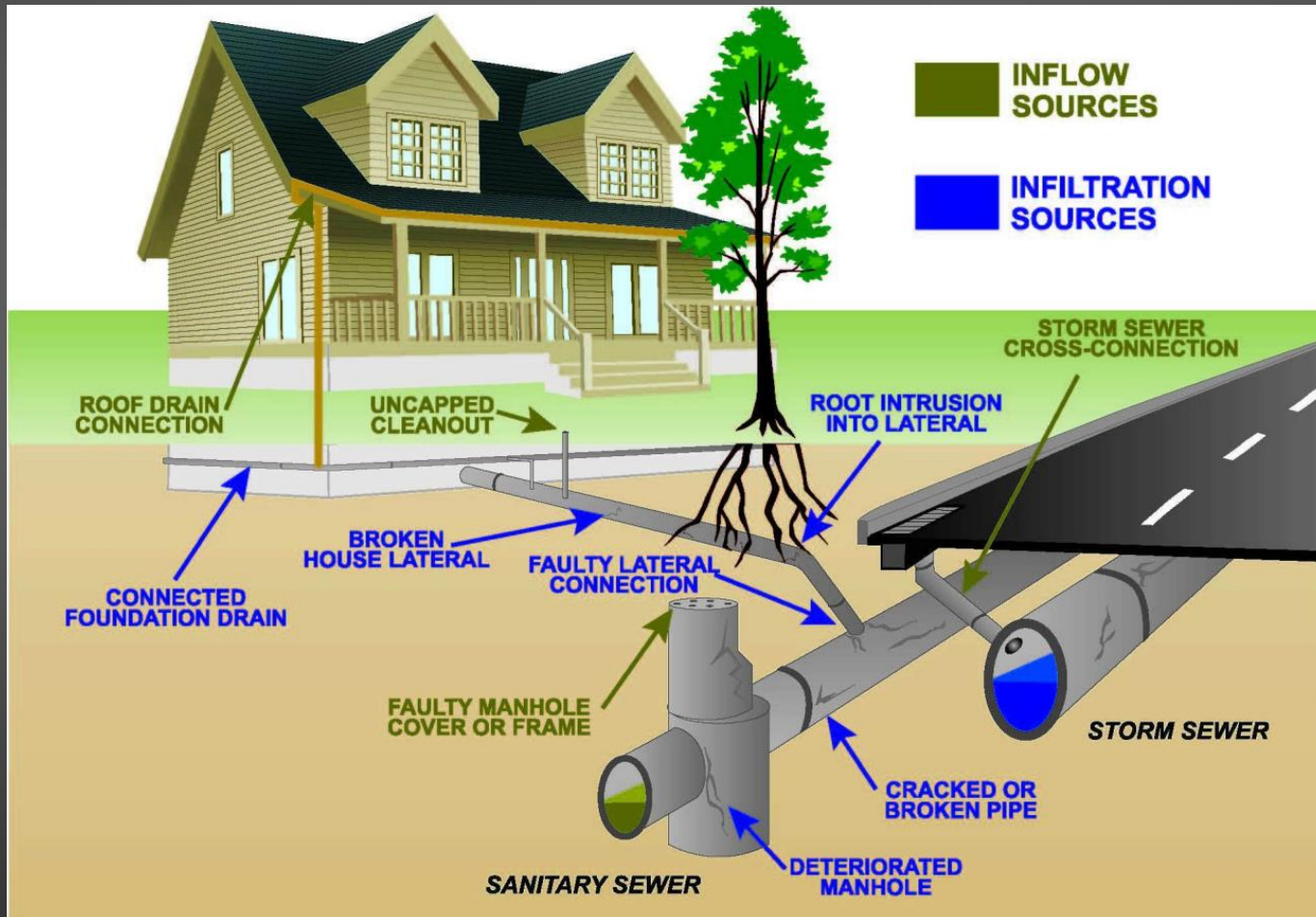


I&I EFFECTS



- Sewer flow **2x** water use 20 of 35 months
- Sturgis per capita flow **140 vs typical 100 gal/day**

I&I EFFECTS



NEW PERMIT/REGULATION

PERMIT	Current	5-Year Projected	20-Year Projected
Disposal	Irrigation	Bear Butte Creek	Bear Butte Creek
BOD (mg/L)	30	10	10
TSS (mg/L)	110	10	10
Fecal Coliform (colonies/100mL)	-	630	630
Ammonia (mg/L as N)	-	3.2-6.7	3.2-6.7
Total Nitrogen (mg/L)	-	-	10
Total Phosphorus	-	-	1

Phase 1

Phase 2

DO NOTHING

CURRENT TREATMENT SYSTEM

- No Capacity for New Development
- No Control Over Irrigation Disposal
- Overflows in Wet Years (Emergency Discharge)
- Permit Violations
- Cell 1 Full of Solids

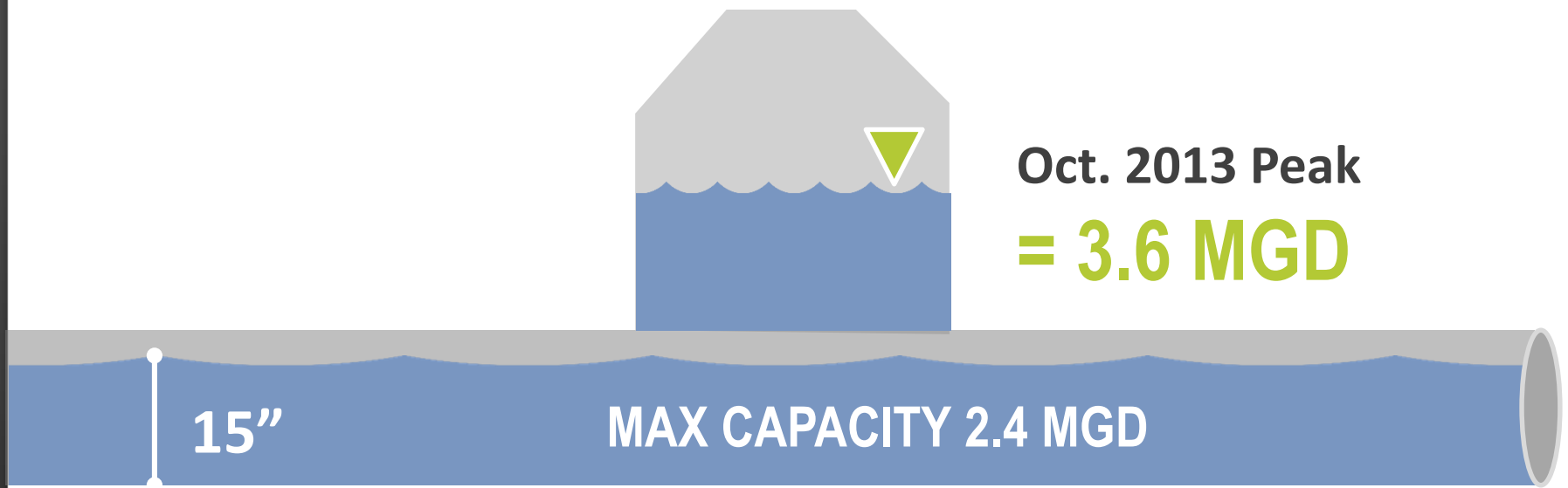
CELL 1 FULL OF SOLIDS



INFLUENT PIPE PROBLEMS

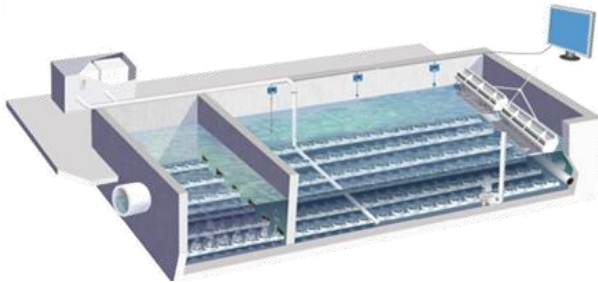
- **Under Capacity**
- **Emergency Installation**
- **Poorly Graded**
- **Shallow Bury**

INFLUENT PIPE REPLACEMENT

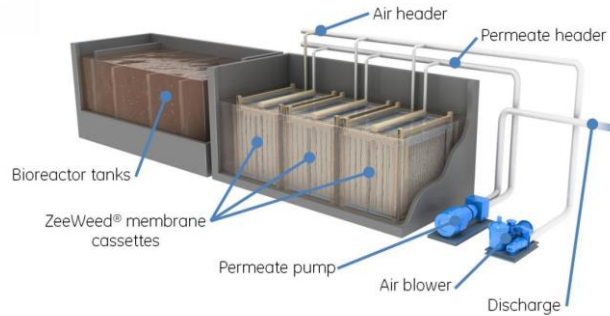


Working Together with AE2S

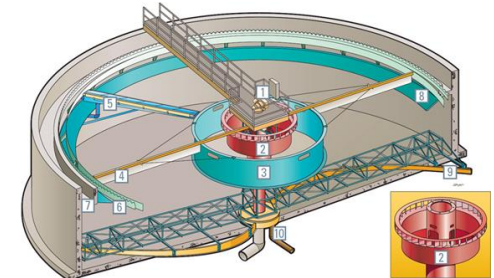
LIQUID TREATMENT ALTERNATIVES



➤ SAGR

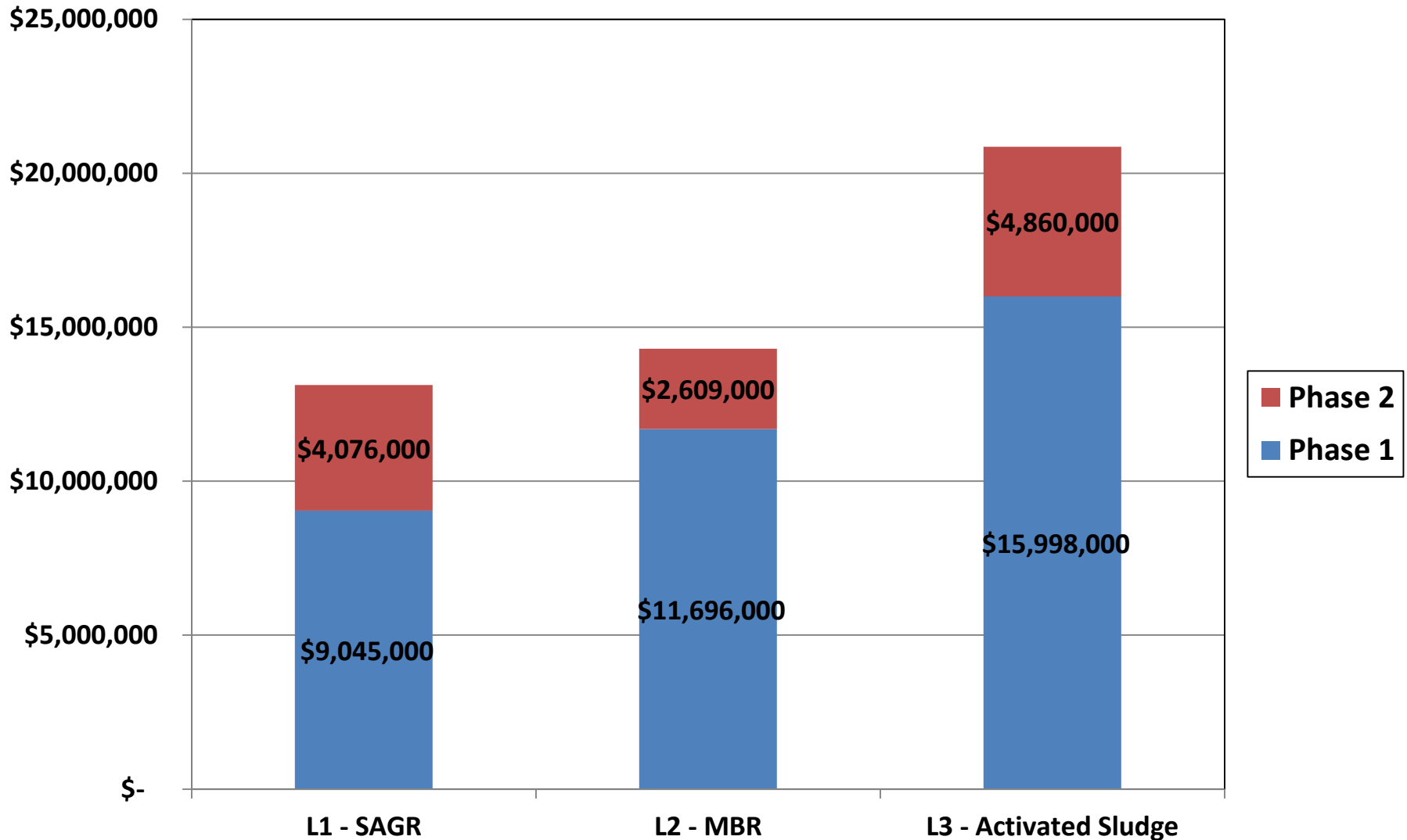


➤ MBR



➤ Activated Sludge

Capital Costs - Liquid Treatment



RECOMMENDATION

LIQUIDS

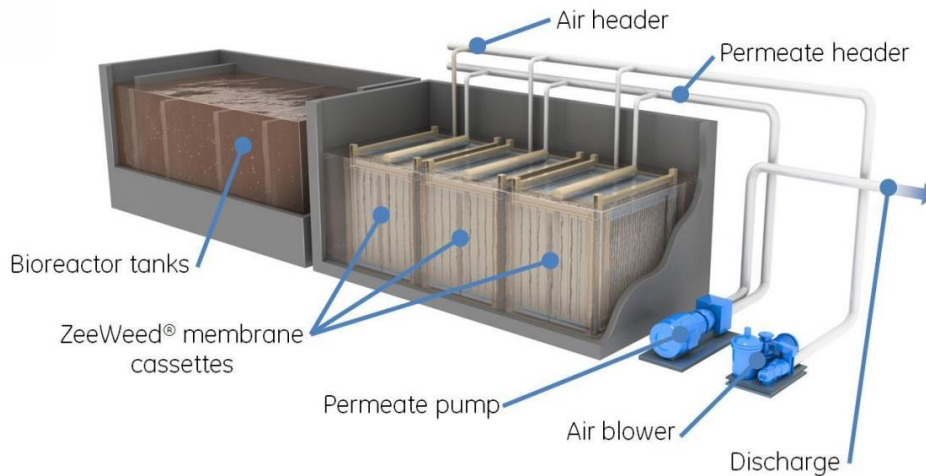
Selection Criteria	Weight	L1 - SAGR	L2 - MBR	L3 - Act. Sludge
Capital Cost	25%	1	2	3
OM & R Cost	10%	1	3	2
Operations Complexity	10%	1	3	2
Meeting Future Regulations	30%	3	1	2
Phasing Potential	15%	2	1	3
Footprint Size	10%	3	1	2
TOTAL	100%	2.0	1.7	2.4

LOW SCORE WINS: L2 - MBR

RECOMMENDATIONS

- **Membrane Bioreactor with Aerated Pond Sludge Treatment and Storage**
- **Influent Pipe Replacement**
- **Biosolids Removal from Cell 1**
- **Slip lining**

MEMBRANE BIOREACTOR (MBR)



System	
Rectangular Plug Flow Biological Treatment From Suspended Growth Membranes Scouring Air and Blowers for Membranes Small Volume and High Loading Capacity Membranes "Perfect Clarifier"	
Benefits Smallest Footprint Operational Flexibility Highest Removal Efficiency Simple Biology Very Capable of Meeting Future Permit Limits	Drawbacks Volatile waste solids Susceptible to Shock Loads Recurring Membrane Replacement High Energy Consumption High Mechanical Complexity Potential Foaming

SRF FUNDING PACKAGE

SRF FUNDING	
Clean Water SRF Loan*	\$16,247,000
Principal Forgiveness**	-\$1,600,000
Consolidated Grant	-\$400,000
LOAN BALANCE	\$14,247,000

*Loan term: 2.5% for 30 years

**Maximum principal forgiveness of 9.9%

SUMMARY OF PHASE 1 PROJECT COSTS

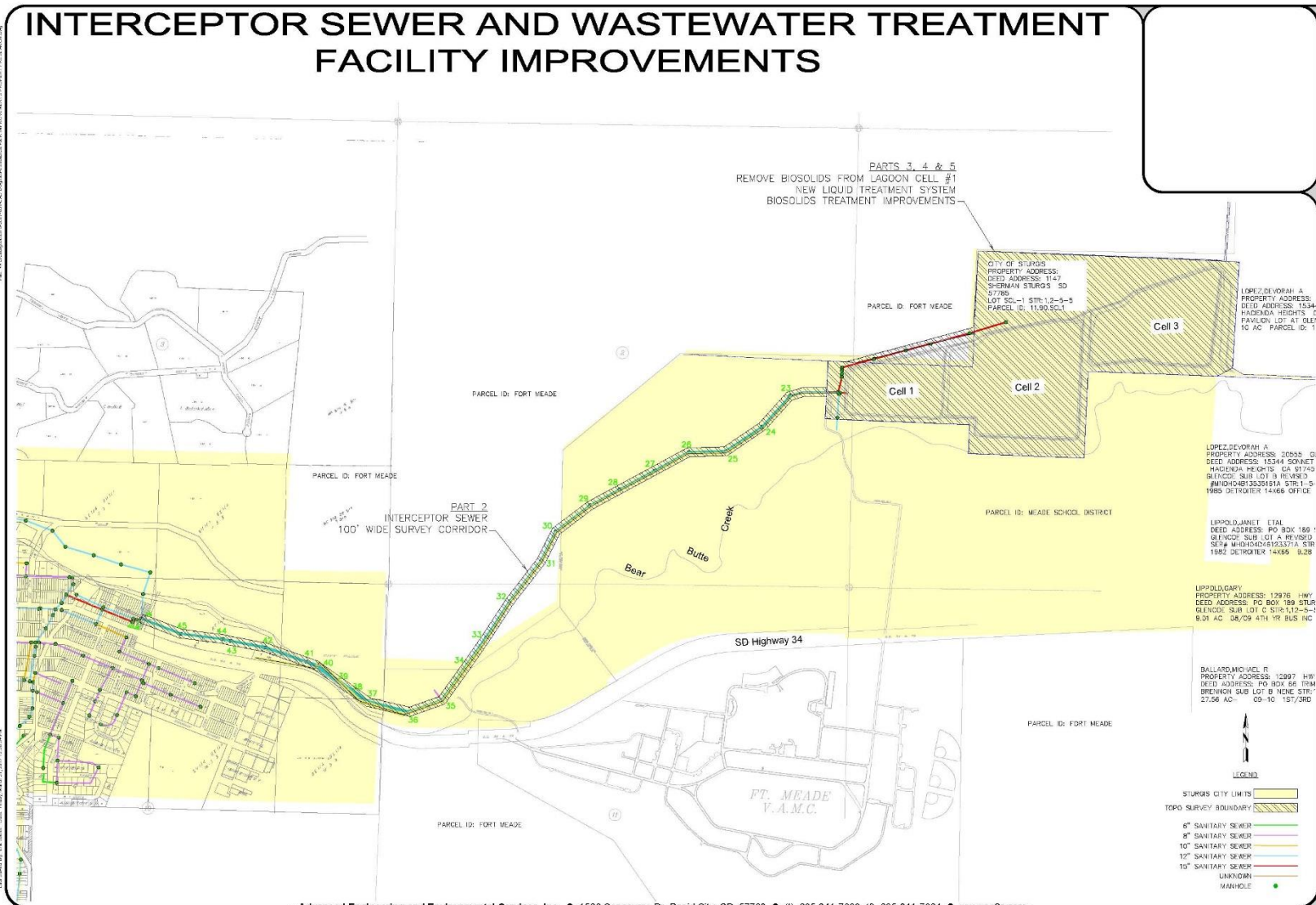
Work Item	Estimated Cost
SlipLine Collection Piping	\$1,500,000
Influent Pipe Replacement	\$1,768,000
Cell 1 Biosolids Removal	\$400,000
MBR Liquid Phase 1	\$11,696,000
Aerated Holding Pond Biosolids Alternative	\$1,283,000
Phase 1 Total Estimated Cost	\$16,647,000

PROJECT MAP

INTERCEPTOR SEWER AND WASTEWATER TREATMENT FACILITY IMPROVEMENTS

DATE: 11/20/2017
 DRAWN BY: J. J. JENSEN
 CHECKED BY: J. J. JENSEN
 PROJECT NO.: 17-001

DATE: 11/20/2017
 DRAWN BY: J. J. JENSEN
 CHECKED BY: J. J. JENSEN
 PROJECT NO.: 17-001



NO.	DATE	DESCRIPTION

WASTEWATER TREATMENT FACILITY UPGRADE
 CITY OF STURGIS
 STURGIS, SOUTH DAKOTA
 SEWER IMPROVEMENTS PROPERTY RESERVE

OWNER: CITY OF STURGIS
 PROJECT NO.: 17-001
 PROJECT TYPE: SEWER IMPROVEMENTS
 FIGURE: 1
 PREPARED BY: J. J. JENSEN
 CHECKED BY: J. J. JENSEN
 DATE: JAN 2017
 SHEET NUMBER: 001 OF 001
 SHEET: 1 OF 00
 DRAWING: UNKNOWN
1

LEGEND

- STURGIS CITY LIMITS
- TOPO SURVEY BOUNDARY
- 6" SANITARY SEWER
- 8" SANITARY SEWER
- 10" SANITARY SEWER
- 12" SANITARY SEWER
- 10" SANITARY SEWER
- UNKNOWN
- MANHOLE

PROJECT SCHEDULE

PROJECT SCHEDULE	2017					2018					2019					2020																																
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D												
TASKS	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Project Development and Funding	█																																															
Preliminary Design						█																																										
Final Design													█																																			
Bidding																		█																														
Construction																									█																							
Post Construction																																							█									

QUESTIONS?