

Biosolids Land Application and Regulatory Compliance

Des Moines Metro WRF
Land Application Program



Presentation Outline

- **Plant Details**

- Pre-Treatment
- Solids Processing and Handling
- Solids Sampling
- Solids Application
- Post Application Reporting

**Des Moines Metropolitan Wastewater
Reclamation Facility**

City of Des Moines Operating Agency

Average Flow – 57 MGD

Peak Flow - 200+ MGD

17 Separate Entities – 500,000 Residents

81,000 Wet Tons of Biosolids Produced

Anerobic Digestion

Belt Filter Presses Dewater solids to 18%

Cake

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Pre-Treatment Industrial Monitoring

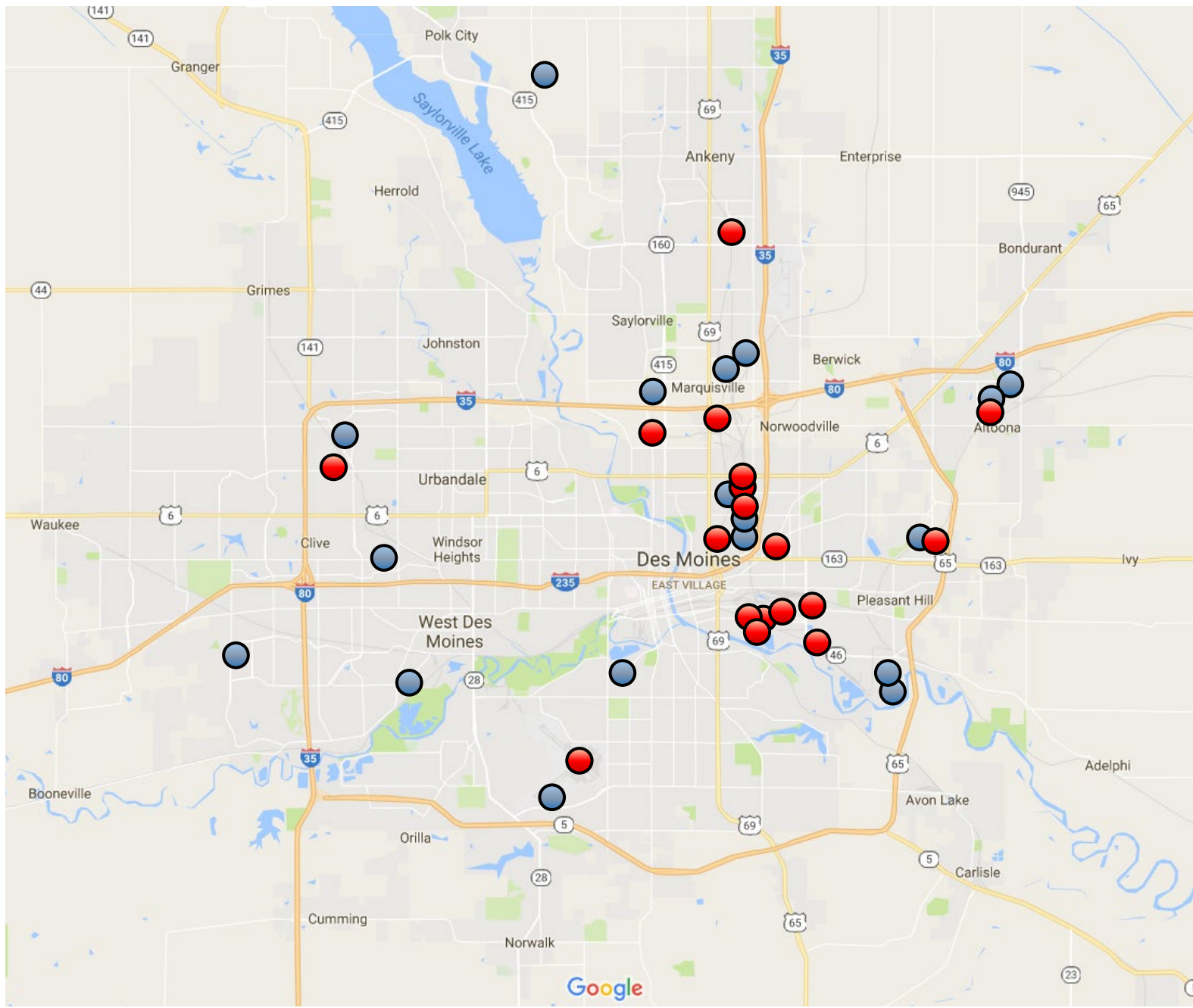
- 43 Business
- Food Processors
- Tire Manufacturing
- Agriculture Processors
- Equipment Manufacturing
- Metal Plating
- In addition, samples are taken at the influent and discharge of the plant to monitor pollutants and removal efficiency

PRETREATMENT PROGRAM SUMMARY Calendar Year 2020

Total No. of Significant Industrial Users	43	SIGNIFICANT INDUSTRIAL USERS	
Total No. of Categorical Industrial Users	23		
		Categorical	Noncategorical
Significant Industrial User Compliance			
No. of SIU's submitting BMR's		23	0
No. of SIU's submitting 90-day compliance reports		0	0
No. of SIU's submitting periodic compliance reports		23	20
No. of SIU's on compliance schedules		0	0
No. of SIU's meeting compliance schedules		0	0
No. of SIU's in significant noncompliance		1	0



Categorical IUs



Hauled Waste Receiving

- 21,000 Loads Per Year
- 90 Individual Costumers
- High Strength Waste
- Feed straight to the Digesters
- Loads are Screened Before Loading and Sampled at the Plant





**DES MOINES METROPOLITAN
WASTEWATER RECLAMATION FACILITY**
3000 Vandalia Road, Des Moines, Iowa 50317
Ph: (515) 323-8133 FAX: (515) 323-8063

INDUSTRIAL HAULED WASTE PROFILE FORM

GENERATOR INFORMATION

Company Name: _____
Mailing Address: _____
City: _____ State: _____ Zip: _____
Waste Generation Address: If same as above, check here: ☐ _____
City: _____ State: _____ Zip: _____
Authorized Official representing Waste Generator:
Name: _____ Title: _____
Telephone: _____ email: _____

WASTE DESCRIPTION & PRODUCTION INFORMATION

Common Name of Waste: Waste #1: _____
Waste #2: _____
Process Generating Waste: Waste #1: _____
Waste #2: _____

Are the wastes in a flowable state? ☐ YES ☐ NO (Wastes must be able to gravity-flow through a 4-inch diameter hose.)

Is the process by which this waste is generated subject to Federal Categorical Pretreatment Standards?

☐ YES ☐ NO

If yes, please identify process: _____

SIC Code(s) of Processes Generating the Waste(s): _____

Waste Type: ☐ Industrial Process Waste—Organic ☐ Unused or Off-Spec Product
(check all that apply) ☐ Industrial Process Waste—Inorganic ☐ Contaminated Groundwater
☐ Food Production/Processing Waste ☐ UST or Spill-Related Waste
☐ Pet/Livestock Food Manufacturing Waste ☐ Confined Livestock Operation Waste
☐ Biofuels Production Waste
☐ OTHER (please describe): _____

Anticipated Volume (gal): _____ per: ☐ Day ☐ Week ☐ Month

One-Time Disposal or On-Going/Continuous? ☐ One-Time ☐ On-Going/Continuous

Oil & Grease:	_____	mg/L	Barium:	_____	mg/L
pH:	_____	S.U.	Cadmium:	_____	mg/L
Phosphorus (T):	_____	mg/L	Chromium:	_____	mg/L
TKN:	_____	mg/L	Copper:	_____	mg/L
TSS:	_____	mg/L	Mercury:	_____	mg/L
Total Solids:	_____	%	Molybdenum:	_____	mg/L
Volatile Solids:	_____	%	Nickel:	_____	mg/L
Dissolved Solids (T):	_____	mg/L	Lead:	_____	mg/L
Chloride:	_____	mg/L	Selenium:	_____	mg/L
Cyanide:	_____	mg/L	Silver:	_____	mg/L
Total BETX:	_____	mg/L	Zinc:	_____	mg/L
TTOs (Sum of):	_____	mg/L			

Has this waste been analyzed for Priority Pollutants? ☐ YES ☐ NO (If yes, please provide lab data.)

DECLARATIONS & CERTIFICATIONS

Check all those which are likely to be present in your hauled waste stream(s).

☐ Acids and Alkalis	☐ Herbicides	☐ Plating Wastes
☐ Biological Wastes	☐ Inks / Dyes	☐ Pretreatment Sludges
☐ Chromium	☐ Mercury	☐ Radioactive Materials
☐ Corrosives: Strong Acids	☐ Nonhalogenated Solvents	☐ Reductants
☐ Corrosives: Strong Bases	☐ Noxious / Fuming Chemicals	☐ Resins
☐ Detergents	☐ Oil, Grease, and/or Fat	☐ Silver
☐ Explosive Chemicals	☐ Oils and fuels	☐ Solvents / Thinners
☐ Flammable Chemicals	☐ Organic Compounds	☐ Tars / Creosotes / Pitch
☐ Grit and Sand	☐ Oxidants	☐ Varnishes/Lacquers/Waxes
☐ Halogenated Solvents	☐ Paints / Pigments	☐ Zinc
☐ Heavy Metal Sludges	☐ Pesticides	☐ Other Wastes: (specify below)
☐ Hot Water (>150 F)	☐ Pickling Liquors	_____

I hereby certify the following: The wastes identified in this Hauled Waste Profile Form for considerations for disposal at the Des Moines Metropolitan WRF do not contain any pesticides or herbicides including Endrin, Methoxychlor, 2,4-D Lindane, Toxaphene, 2,4,5-TP (Silvex), Chlordane, or Heptachlor (and its Epoxide); does not contain PCBs; and does not contain any material at a concentration which would render it as hazardous as defined in 40 CFR 261.3.

Authorized Official's Initials: _____

SIGNATURE OF AUTHORIZED OFFICIAL

I have personally examined and am familiar with the information submitted in this document and attachments. To the best of my knowledge, the submitted information is true, accurate, and complete. I acknowledge that any changes from the stated pollutants, general pollutant concentrations, volumes, or other measures require immediate notification to and approval from the Des Moines Metropolitan WRA, and waste acceptance by the WRF is strictly limited to the wastes identified in this Hauled Waste Profile Form.

Name

Title

Presentation Outline

- Plant Details
- Pre-Treatment
- Solids Processing and Handling
- Solids Sampling
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Biosolids Processing and Handling

- 6 Anerobic Digesters – 5 Primary and One Secondary/Gas Holder
- Digester Feed – High Strength Waste, Primary and Waste Activated Sludge
- Solids are Dewatered on Belt Filter Presses to ~18% Solids
- Presses run 6 Days/24 hrs. per Week



Class B Land Application Requirements

- Vector Attraction Reduction
 - Volatile Solids Reduction – (>38%)67%
 - Incorporation of Solids into Soils
- Process to Significantly Reduce Pathogens
 - Time and Temperature
 - Typically 100 degrees for 30 days in our Anerobic Digesters
 - Fecal Coliform (2,000,000mpn) 1310mpn

Solids Storage

- After Dewatering the Solids are stored in a Covered Facility
- Solids are trucked through the plant to Storage
- Enough Storage for 30,000+ Wet Tons



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- Plant Details
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- **Solids Sampling**
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Solids Sampling

- Solids are tested after dewatering to insure they meet the standards for Land Application of Class B Biosolids
- The first analysis is for nutrients and pollutants
- The second analysis is the Fecal Coliform test
- We test for Fecal Re-Growth a minimum of 12 times a year due to the amount of solids produced

Analyte	Result	MRL	Batch	Method	Analyst	Analized	Qualifier
1G61201-01	BFP Cake - Monthly			Matrix:Sludge		Collected: 07/14/16 00:00	
Nitrogen, Ammonia	7720 mg/kg dry	94.5	1ZG0790	SM 4500 B,E	JDK	07/22/16 12:22	
Nitrogen, Organic	26400 mg/kg dry	21300	[CALC]	*** DEFAULT SPECIF	TJS	07/22/16 12:22	
pH, Soils	8.5 pH	0.1	1ZG0575	EPA 9045	JDK	07/18/16 15:14	I-03
% Solids	18.0 %	0.1	1ZG0608	SM 2540 G	SLK	07/19/16 8:09	
Nitrogen, Kjeldahl, total	34200 mg/kg dry	21300	1ZG0787	EPA 351.2	TJS	07/21/16 15:44	
Solids, total	18.0 %	0.1	[CALC]	SM 2540G	SLK	07/19/16 8:09	
Nitrogen, Nitrate	<5.6 mg/kg dry	5.6	1ZG0863	EPA 9056	MID	07/22/16 20:56	
Arsenic, total	2.55 mg/kg dry	0.90	1ZG0547	EPA 6020A	RVV	07/21/16 4:34	
Cadmium, total	<0.9 mg/kg dry	0.9	1ZG0547	EPA 6010B	DRB	07/19/16 22:27	
Chromium, total	34.9 mg/kg dry	2.7	1ZG0547	EPA 6010B	DRB	07/19/16 22:27	
Copper, total	226 mg/kg dry	2.7	1ZG0547	EPA 6010B	DRB	07/19/16 22:27	
Mercury, total	<0.6 mg/kg dry	0.6	1ZG0704	EPA 7471A	DRB	07/20/16 16:22	
Potassium Oxide	2230 mg/kg dry	109	[CALC]	*** DEFAULT SPECIF	DRB	07/19/16 22:27	
Potassium, total	1840 mg/kg dry	90	1ZG0547	EPA 6010B	DRB	07/19/16 22:27	
Molybdenum, total	11.2 mg/kg dry	0.9	1ZG0547	EPA 6010B	DRB	07/19/16 22:27	
Nickel, total	45.2 mg/kg dry	4.5	1ZG0547	EPA 6010B	DRB	07/19/16 22:27	
Phosphorus pentoxide	46000 mg/kg dry	206	[CALC]	*** DEFAULT SPECIF	DRB	07/19/16 22:27	
Lead, total	15.2 mg/kg dry	0.90	1ZG0547	EPA 6020A	RVV	07/21/16 4:34	
Phosphorus, total	20100 mg/kg dry	89.8	1ZG0547	EPA 6010B	DRB	07/19/16 22:27	
Selenium, total	6.60 mg/kg dry	0.90	1ZG0547	EPA 6020A	RVV	07/21/16 4:34	
Zinc, total	418 mg/kg dry	2.7	1ZG0547	EPA 6010B	DRB	07/19/16 22:27	

Pollutant Ceiling Concentration

Actual and Limits

Parameter	Mean	Min	Max	Limits
Aluminum	6795	5870	7720	
Arsenic	5.14	3.40	<6.28	75
Cadmium	<4.7	<1.2	<6.3	85
Chromium	53.6	41.1	72.3	3000
Copper	293	222	352	4300
Lead	20.6	15.2	31.9	840
Mercury	0.80	0.30	<1.30	57
Molybdenum	14.0	8.6	18.9	75
Nickel	29.1	23.4	37.1	420
Selenium	10.6	<4.23	26.4	100
Zinc	598	426	721	7500
TS	18.2	15.9	20.3	
Nitrogen, Ammonia	6490	2840	8170	
Nitrogen, Kjeldahl, total	52908	37900	60300	
Nitrogen, Nitrate	<5.5	<4.9	<6.3	
Nitrogen, Organic	46421	32300	55300	
pH	--	8.0	8.6	
Phosphorus	24642	20100	31000	
Phosphorus pentoxide	56421	46000	71000	
Potassium	3070	2520	3710	
Potassium Oxide	3714	3040	4490	

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Site Selection

- Both land owner and farm operator need to give permission
- Application sites are selected on several criteria
 - Location
 - Soil suitability
 - Slopes
- NRCS Web Soil Survey is a useful tool
 - <http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>





the mapunit.

Description of Tama, Eroded Setting

Landform: Interfluves

Landform position (two-dimensional): Shoulder, summit

Landform position (three-dimensional): Interfluve, side slope

Down-slope shape: Convex

Across-slope shape: Linear

Parent material: Fine-silty loess

Typical profile

Ap - 0 to 6 inches: silty clay loam

BA - 6 to 12 inches: silty clay loam

Bt1 - 12 to 20 inches: silty clay loam

Bt2 - 20 to 33 inches: silty clay loam

BC - 33 to 60 inches: silty clay loam

Properties and qualities

Slope: 5 to 9 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat):

Moderately low to moderately high (0.14 to 1.42 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Hydric soil rating: No

Minor Components



The WRF Land Application Program

- The solids are applied to agricultural ground as fertilizer
- The solids are staged at the application site
- The application rate is determined by the agronomic needs of the particular crop
- All solids are applied the same day as they are hauled



Application Rate

- Lab analysis is used to determine the application rate
- Rates are based on the Nitrogen requirements for the crop
- We use the Iowa State University Recommendations
- The things that have to be considered are-
 - Crop rotation
 - Previous Application
 - Are the solids going to be incorporated – rates are lower if incorporated with in 48 hours as more Nitrogen is captured
 - Information is compiled to help with this planning

Lab Results / PPM		NUTRIENT	ANALYSIS		LBS/DRY TON AVAIL			RATE:	TOTAL PLANT AVAILABLE			
TKN	56975	NITROGEN	LBS/T	% AVAIL	YR 1	YR 2	YR 3	DRY	NITROGEN (PAN) LBS/ACRE			
NH4	8038	ORGANIC	97.9	20%	19.6	9.8	4.9	TONS/ACRE	YR 1 Inc.	YR1 Uninc.	YR 2	YR 3
NO3	6	AMMONIA	16.1	1.0	16.1	0.0	0.0	1	36	28	9.8	4.9
Organic	48950	NITRATE	0.0	100%	0.0	0.0	0.0	2	71	55	19.6	9.8
		If Incorporated in 48 Hrs.	TOTAL		35.7	9.8	4.9	3	107	83	29.4	14.7
% Solids	17	If Not Incorporated in 48 Hrs.	TOTAL		27.6			4	143	111	39.2	19.6
								5	178	138	49.0	24.5
P2O5	70575	P AS P2O5	141.2	50%	70.6			6	214	166	58.7	29.4
K2O	4145	K AS K2O	8.3	100%	8.3			7	250	193	68.5	34.3
Zinc	615	ZINC	1.2	VARIES	1.2			8	285	221	78.3	39.2

Target Rate	Wet Tons/Acre	
No Carryover	Incorp.	Unincorp.
140	23	30
180	30	38

To covert Dry Tons/Acre to Wet Tons/Acre -- Devide Dry Ton Amount by %Solids (as a decimal)

Example $6 (DT) / .17 (17\%) = 35.29 \text{ Wet Tons/Acre}$

To Calculate Wet Tons/Acre -- Target Nitrogen Rate (Devided by) Lbs. Nitrogen per DT (Devided by) Percent Sloids (as Decimal)

Example - Bean to Corn 140 Lbs. Nitrogen $140 (\text{Lbs. N Desired}) / 23.7 (\text{Lbs. N per DT - if not inc.}) / .19 (19\% \text{ Solids}) = 31 (\text{Wet Tons per Acre})$

To Find <u>Tons</u> Needed Per Pass	Length	X	Width	÷	43560	x	Rate	Tons/Pass	÷	2	Tons/Unit	
Example	1200	X	25	÷	43560	x	33	22.72727273	÷	2	11.36363636	
This is the number of Spreaders Working in the field- Could be 1, 2, or 3												
To Find <u>Width</u> of a Pass	Tons/Unit	x	2		Tons/Pass	÷	Rate	x	43560	÷	Length	Width
Example	13	x	2		26	÷	33	x	43560	÷	1200	28.6

PRE-APPLICATION SITE INFORMATION

Land Owner: _____

Farm Operator: Kevin Van Winkle Ph# 515 971-0552

Site/Legal Description T77N R21W Sec 35, NW ¼ SW ¼

Jasper, Des Moines, 35

41.5168,-93.2532

Work Order #: _____

Field Name: W 109th St S .5 Mi. S. of F70 Eastside

Acres: 28

Previous Applications: N/A

Target Rate: 23

Crop Rotation: Bean to Corn

Soil PH/Test date: N/A

Setbacks (wells, waterways, tiles, occupied residences' etc.):

Lots of D slopes

Nutrient Value

- The solids are analyzed for nutrient value
- They are tested for the three macro nutrients needed by the crops
 - Nitrogen (N)
 - Phosphorous (P)
 - Potassium (K)
- Micro Nutrients used by the crops are also detected in the testing
 - Zinc (Z)
 - Molybdenum (Mo)
 - Copper (Cu)

Application Timing

- The WRF Land Application Program has operated in every month of the year
- Each season has it's own challenges
- Winter
 - Frozen ground has special regulations
 - Equipment problems in cold weather
 - Transportation during winter weather
 - Fewer hours of daylight
 - Benefit is low ground compaction

Application Timing

- Fall
 - Longest application season
 - Starts in late August
 - Continues until ground freezes
 - Normally a dryer time of year
 - Higher application rates on Corn Crop ground
 - Fair amount of daylight



The WRF Land Application Program

- The Solids are loaded out of storage with Rubber Tired Front-end Loader
- They are transported to the application site in trucks with end dump boxes
- We use both Semi Tractor-Trailers and Straight Trucks



Getting it Right

- GPS Mapping and Guidance
- Easy to get proper width every pass
- Can use on straight passes and contours
- A high level of precision is possible with GPS guidance
- Map help us accurately report application area
- Maps are given to the farmers and regulators



Verifying the Rate

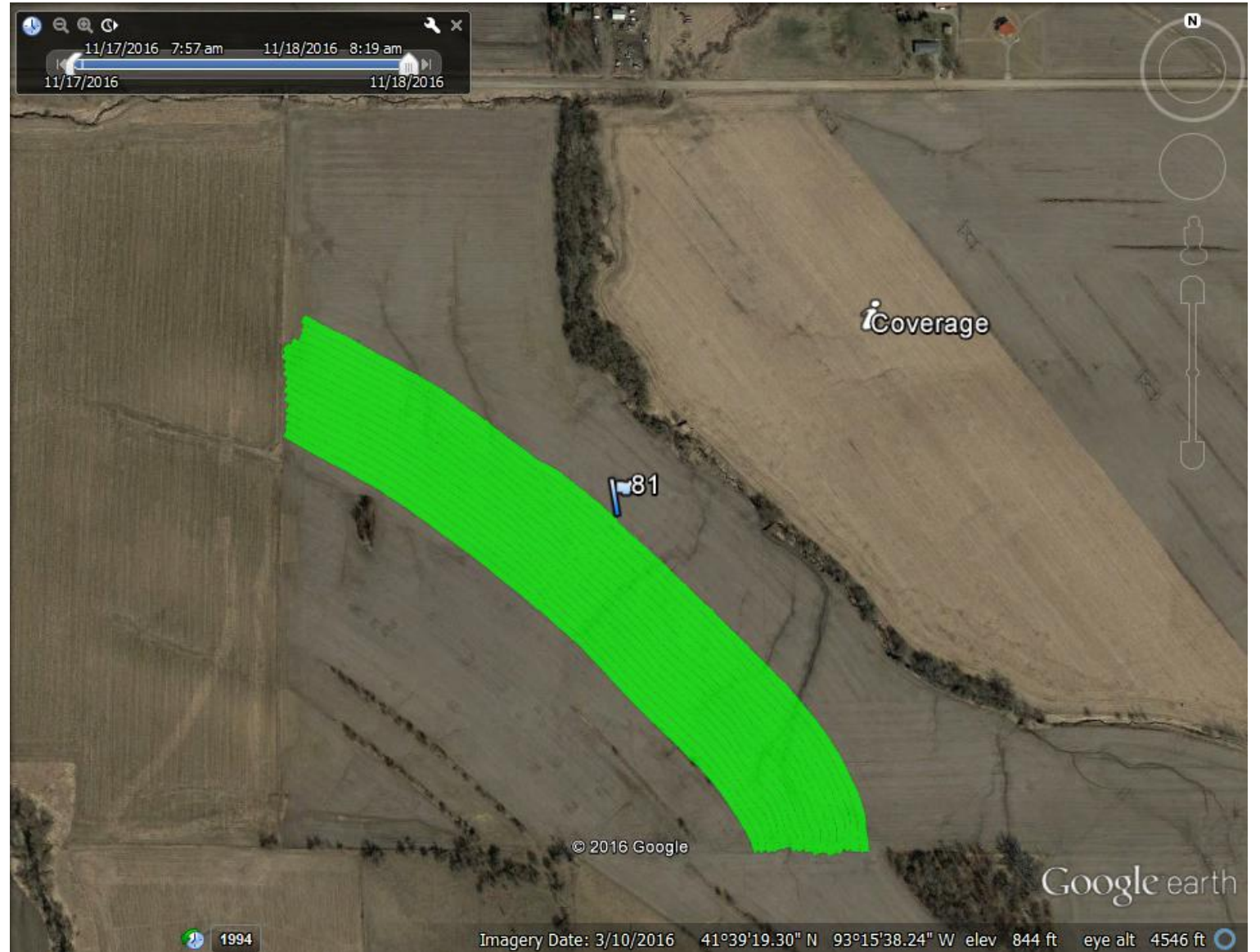
- Loader is equipped with scale
- Load Spreader box to consistent level
- Check scale for appropriate amount
- GPS tracks acres covered
- Could vary if passes get longer or shorter
- Material changes can affect consistency
- Spreader operation is manually controlled
- We normally maintain >95% accuracy
- Our rates have a 6-9% buffer

Improving Technology

- New unit will have scales on the applicator
- Allows for real time application rate monitor
- Interface with GPS mapping for rate specific maps
- Could do variable rate application
- Rate controllers are still not in the plan



Satellite Maps



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Reporting

Field Location	F70 E of Runnells - Machine Shed
Field Description	Jasper, Des Moines, Section 31
Township & Range	Lat: 41 31' 20.216, Long: 93 19' 27.743
Application Start Date	9/6/2016
Application End Date	9/12/2016

Total Acres Applied	35.7	Nutrients Lbs/Acre			Application C/Year		
Wet Tons Applied	1211	N	P2O5	K2O	2017		
Tons/Acre - Wet	33.9	178	353	46	N Careover		56
Tons/Acre - Dry	6.4				Future N Availability		
					2018	37	
					2019	19	



Metals (mg/kg) ppm			Lbs
	Applied	Limits	P/Ac
As	12.0	75	0.15
Cd	3.7	85	0.05
Cr	43.6	3000	0.56
Cu	302.1	4300	3.89
Hg	0.6	57	0.01
Mo	15.7	75	0.2
Ni	27.9	420	0.36
Pb	26.5	840	0.34
Se	22.0	100	0.28
Zn	559.9	7500	7.22

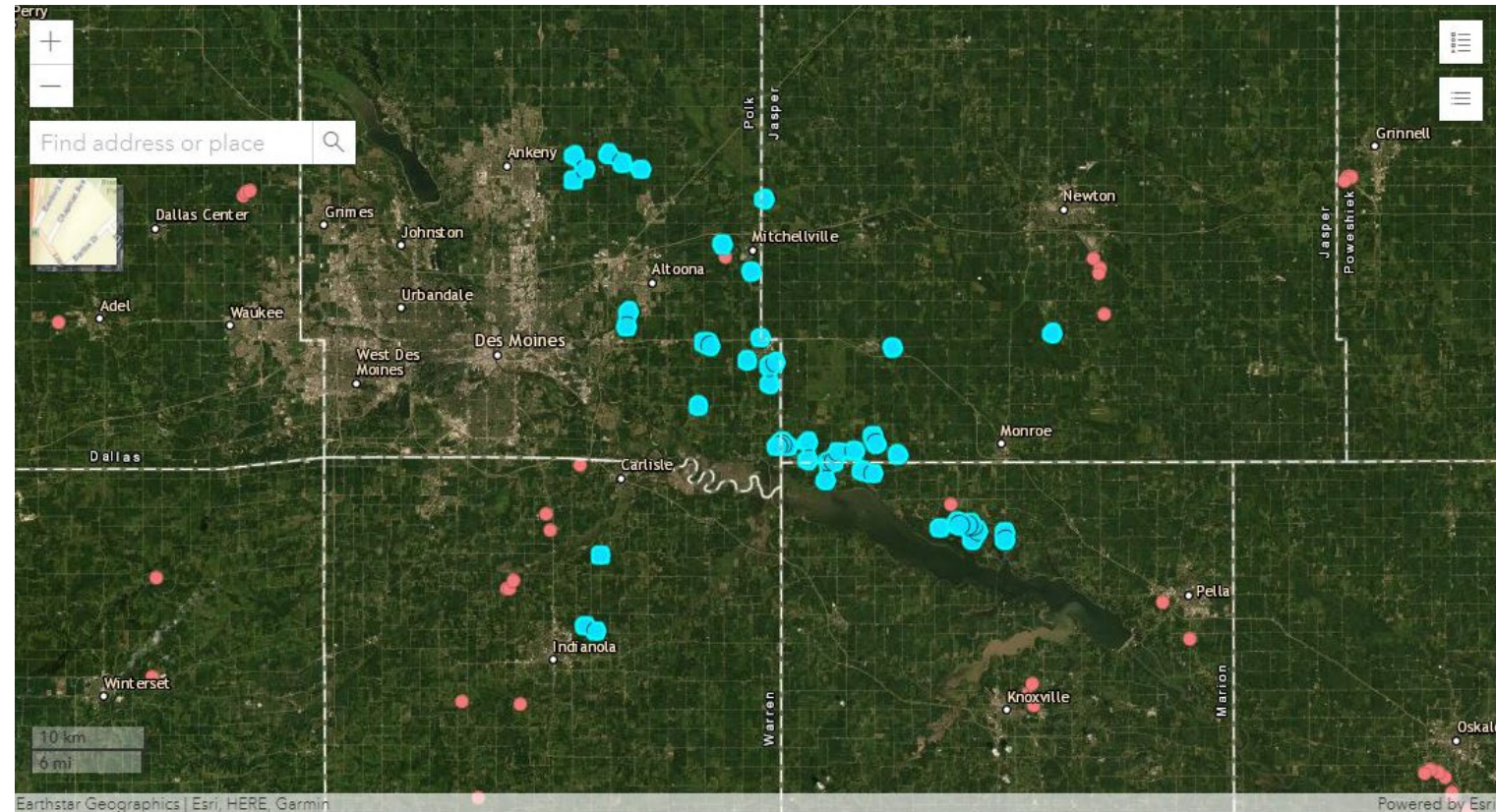
Fecal Coliform (MPN/dry gram)	
Applied	Limits
19716	2,000,000

Land Application Sites

The Iowa DNR tracks Biosolids application sites

The blue dots are DMMWRA sites

In 2020 we applied to 53 individual fields, for 19 different farmers, in 4 counties



Reports

- Reports are given to farmers
- Farmers are also given GPS map data
- We reference reports before future applications
- Nutrients carry over for up to 2 years
- Carry over credit must be accounted for in rate calculation
- Data from reports are compiled for DNR and EPA reports

Questions?

Brad Tingley

Plant Field Worker

Des Moines Metropolitan Wastewater Reclamation Facility

bwtingley@dmgov.org



FACULTATIVE SLUDGE LAGOON AND DEDICATED LAND DISPOSAL OPERATIONS

Presentation to the EPA - May 27, 2021



**Dublin San Ramon
Services District**

Water, wastewater, recycled water



**Dublin San Ramon
Services District**

Water, wastewater, recycled water

Levi Fuller

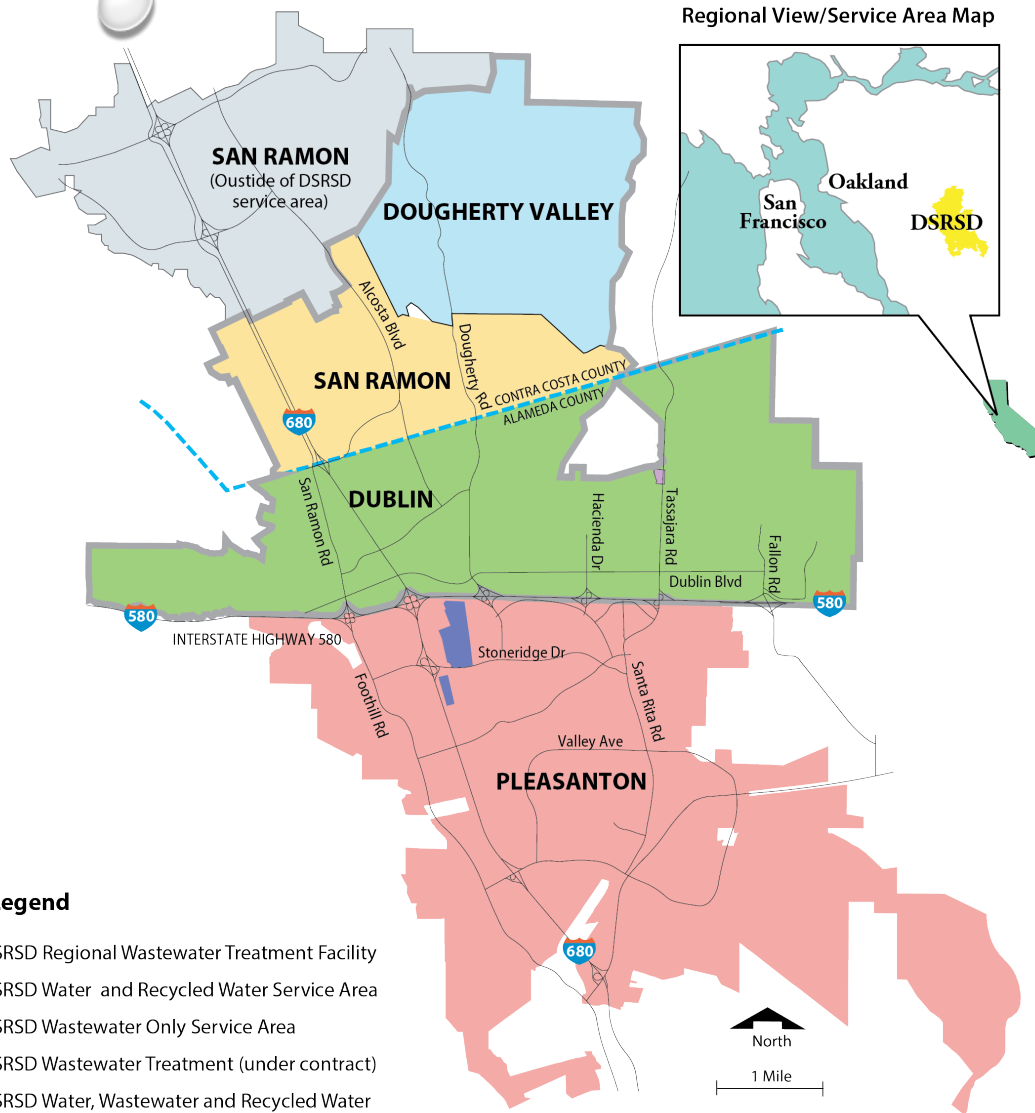
Wastewater Treatment Plant, Operations Superintendent

(925) 875-2300

fuller@dsrsd.com

Map Legend

- DSRSD Regional Wastewater Treatment Facility
- DSRSD Water and Recycled Water Service Area
- DSRSD Wastewater Only Service Area
- DSRSD Wastewater Treatment (under contract)
- DSRSD Water, Wastewater and Recycled Water Service Area
- Alameda Contra Costa County Dividing Line
- DSRSD Boundary
- Camp Parks (Parks RFTA) Boundary



DUBLIN SAN RAMON SERVICES DISTRICT

121 Full-Time Employees

Founded in 1953, DSRSD serves more than 188,000 people

WATER DISTRIBUTION SYSTEM

- City of Dublin ~ 9 MGD
- Serving ~ 89,000

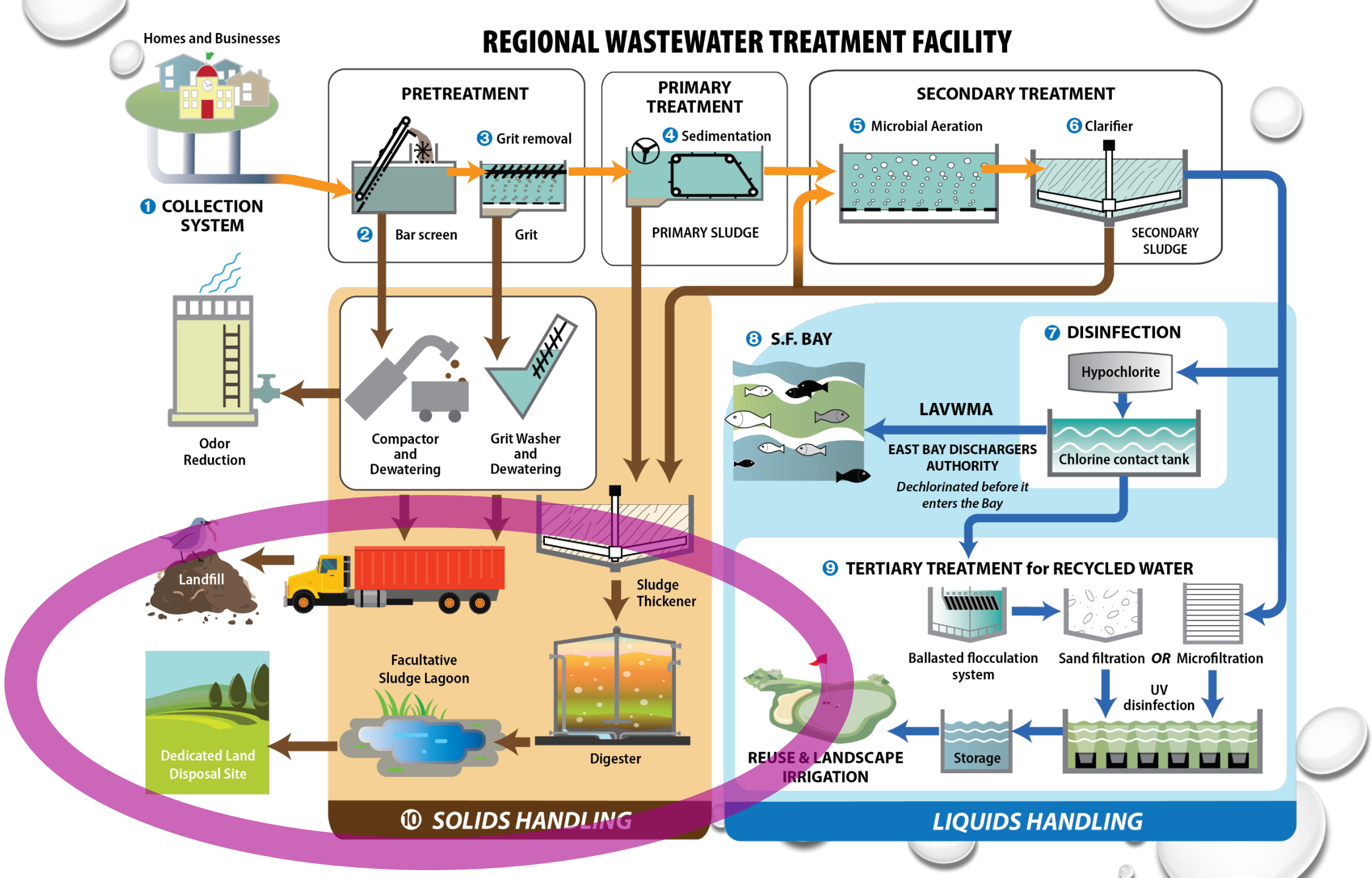
WASTEWATER TREATMENT

- Designed capacity 17.0 MGD
- ADWF 10.6 MGD
- Serving ~ 163,400
- 23 acre main wastewater plant
- 27 acres facultative sludge lagoons
- 55 acres dedicated land disposal unit

SAN RAMON VALLEY RECYCLED WATER PROGRAM

- CBWSF 16.2 MGD
- Microfiltration 2.5 MGD
- ~ 633 irrigation customers
- Annually recycle ~ 40% of wastewater effluent (landscape irrigation)

REGIONAL WASTEWATER TREATMENT FACILITY



DUBLIN SAN RAMON SERVICES DISTRICT BIOSOLIDS HARVESTING AND LAND APPLICATION

1. Biosolids Treatment
2. Conveyance of runoff by surface grading
3. Containment of surface water accumulation
4. Placement of biosolids
5. Removal of surface water by treatment prior to discharge under an NPDES permit
6. Diversion of surface water runoff from surrounding areas
7. Facility liner
8. Groundwater monitoring
9. Annual compliance reporting
10. Cover crop
11. Future challenges and concerns



BIOSOLIDS TREATMENT

Facultative Lagoons

Dedicated Land Disposal Area

STONERIDGE DRIVE

Digesters

Thickener





**DEDICATED LAND
DISPOSAL UNIT (DLD)**
55 acres

This aerial photograph shows a wastewater treatment facility. A large, dark, rectangular area on the left is outlined with a yellow dashed line and labeled 'DEDICATED LAND DISPOSAL UNIT (DLD) 55 acres'. To its right, there are several smaller, rectangular ponds. One of these is outlined with a yellow dashed line and labeled 'SIX FACULTATIVE SLUDGE LAGOONS (FSL), EACH ~ 4 ACRES SURFACE Each ~15 ft deep'. The other five lagoons are outlined with a blue dashed line. The facility is surrounded by industrial buildings and parking lots. A road is visible on the right side of the image.

**SIX FACULTATIVE
SLUDGE LAGOONS (FSL),
EACH ~ 4 ACRES SURFACE
Each ~15 ft deep**

ANAEROBIC DIGESTERS

- Adequate digestion is important in order to maintain effective treatment and minimize odors.
- Regulations require a minimum of 15 days of treatment (34 days at DSRSD)
- 503 requires minimum 38% volatile reduction, DSRSD achieves 55 to 65%
- Adequate treatment capacity
 - Proper size and number of digesters
 - Regular cleaning is important in order to maintain designed treatment capacity (every 5 to 7 years)
 - Effective sludge digestion results in less volatile load on facultative lagoons and dedicated land treatment unit.



VOLATILE REDUCTION

FACULTATIVE SLUDGE LAGOONS
32 to 36 % (3 to 5 years)

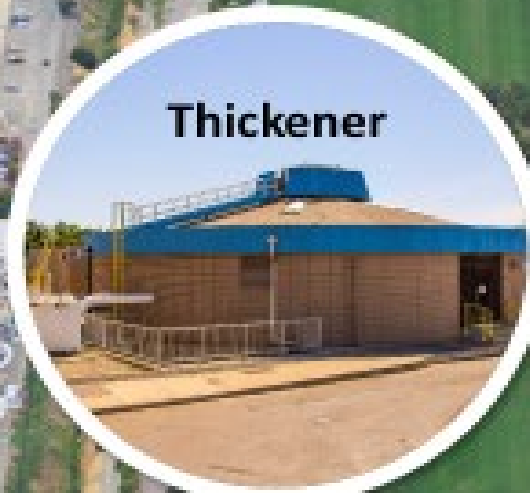
Dedicated Land Disposal Area

STONERIDGE DRIVE

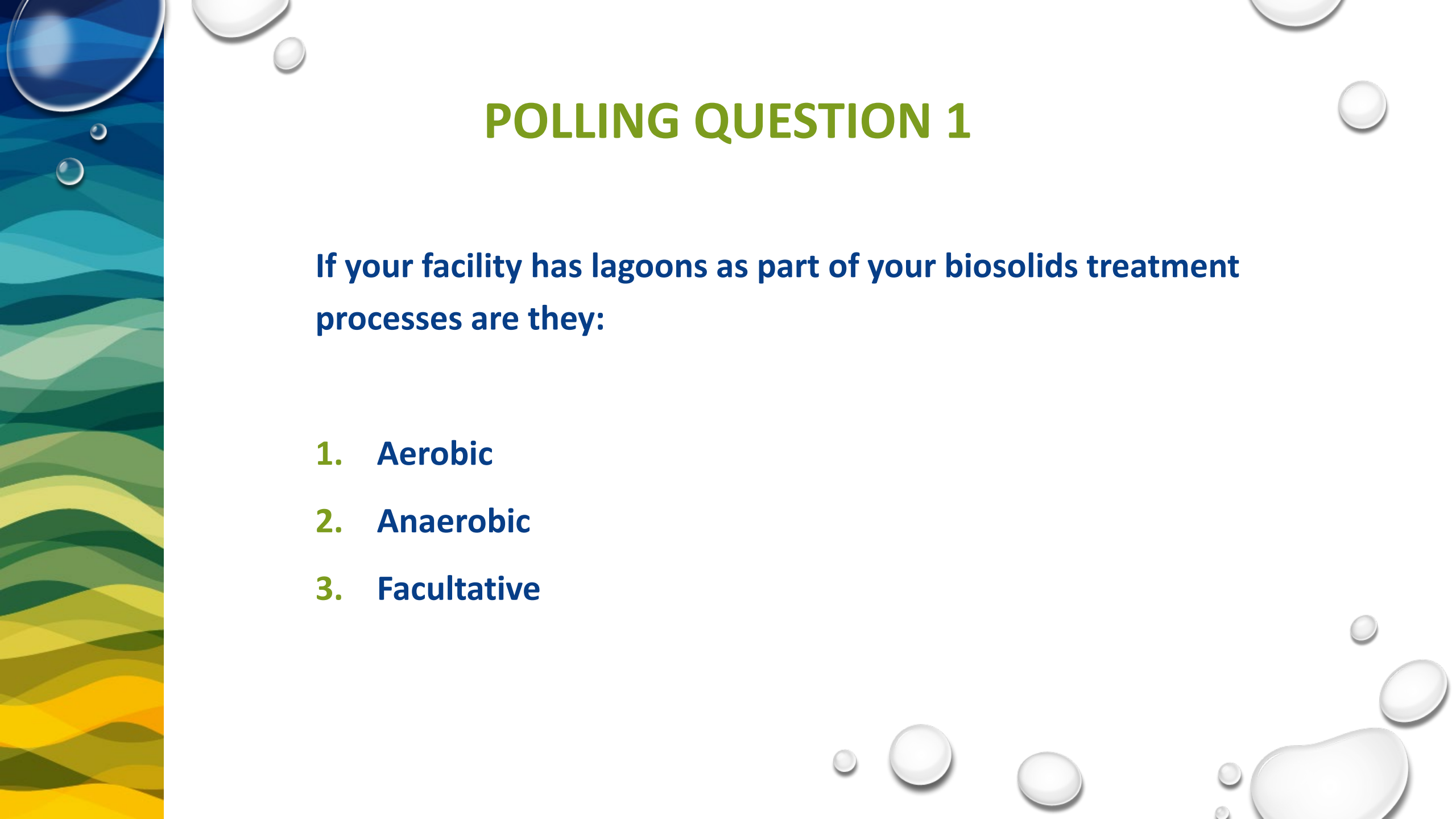


Digesters

ANAEROBIC DIGESTERS –
55% to 65% (20* to 34 Days)
*with largest Digester out of service



Thickener

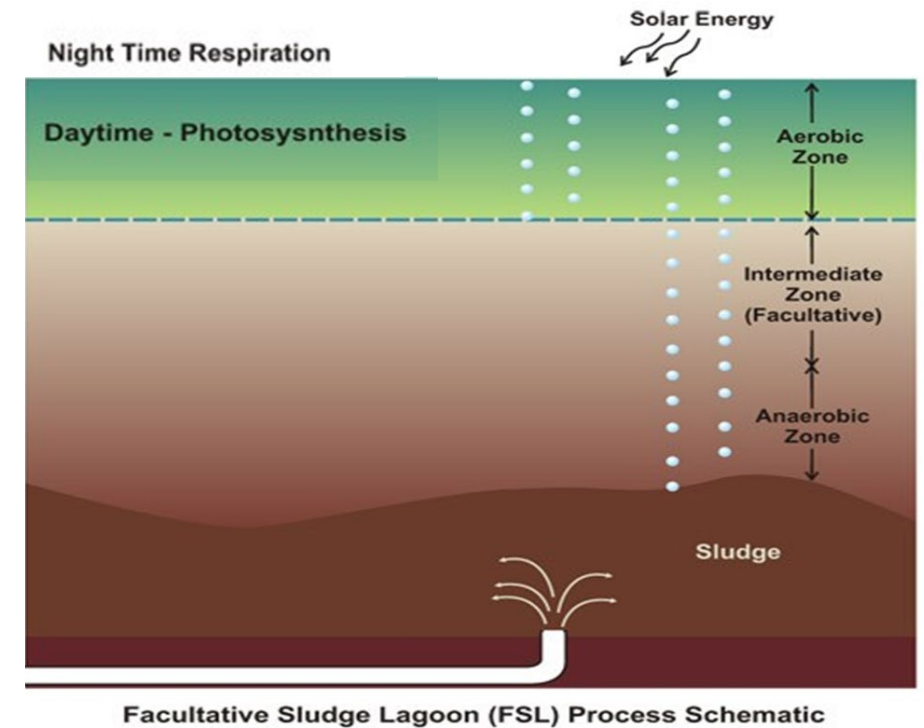


POLLING QUESTION 1

If your facility has lagoons as part of your biosolids treatment processes are they:

1. Aerobic
2. Anaerobic
3. Facultative

DSRSD FACULTATIVE SLUDGE LAGOONS



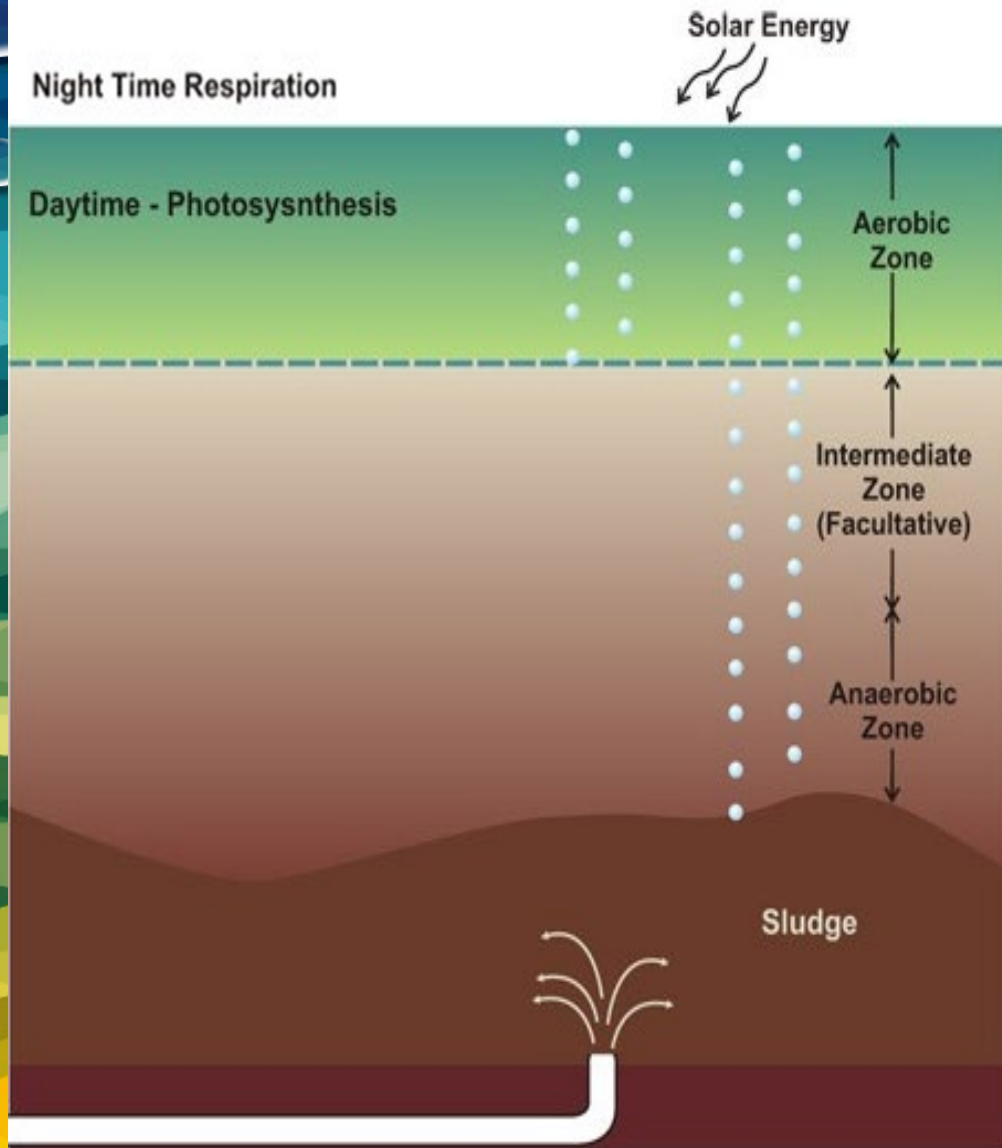
- 15 feet deep, average four acre surface area
- Sludge lays on the bottom and continues to undergo anaerobic bacteria decomposition for two to five years
- Water on the surface where algae and aerobic bacteria neutralizes odors from the anaerobic layer



POLLING QUESTION 2

If odor control is a major concern for your biosolids management process what method(s) do you use to minimize odors and determine how effective you are at odor control?

1. Metrics of odor complaints from utility phone or website.
2. Regular air monitoring of odors constituents at places surrounding your facility such as at the property line.
3. Reodorant sprays into the air at your facility
4. Air odor scrubbing equipment
5. Two or more of the above



Facultative Sludge Lagoon (FSL) Process Schematic

ODOR CONTROL

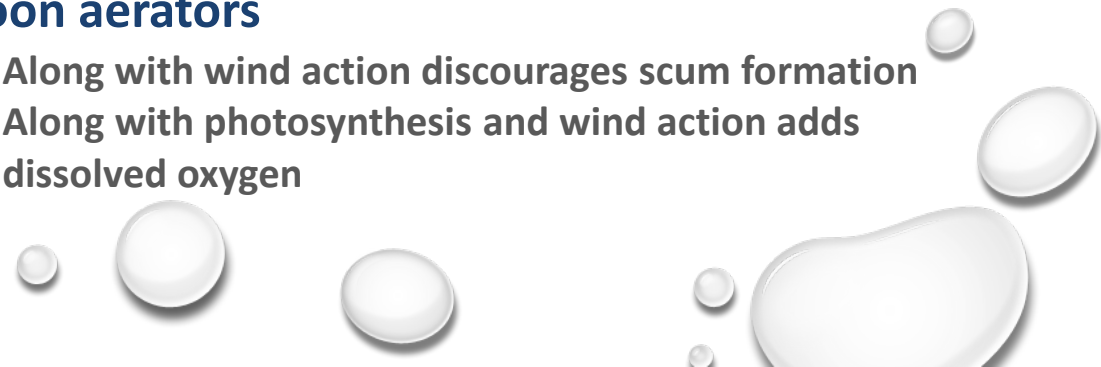


- **Volatile loading rate (for odor control)**
 - 20 lbs. volatile solids/ 1000 ft² surface area industry guideline
 - 15 lbs. volatile solids / 1000 ft² surface area DSRSD guideline
 - Currently 11 lbs. volatile solids / 1000 ft² surface area DSRSD
- **Algae generates oxygen for aerobic microbes during the day**
- **Mechanical surface aeration at night**
- **Target a minimum 4 ft cap water (aerobic zone)**
- **Odor control**
- **March 2000 “Stockyard Smell” – Up to 87 odor calls/day**
- **Last 18 years averaged four to eight odor calls/year**



FACULTATIVE SLUDGE LAGOONS - ODOR CONTROL

- **Weekly cap water measurements**
 - Ph (6 – 9)
 - Dissolved Oxygen (> 0.8 mg/l)
 - Conductivity (2700 – 4000) $\mu\text{S}/\text{cm}$
 - Color (Some shade of green)
- **Lagoon aerators**
 - Along with wind action discourages scum formation
 - Along with photosynthesis and wind action adds dissolved oxygen





BIOSOLIDS AT DSRSD

- In the spring and fall operators measure lagoon blanket
- Fall measurement targets FSL to be harvested in summer
- Stop feeding targeted FSL for 4 to 6 months
- For at least 15 years all bio-solids met Class “A” standards – Class “B” in what is required by regulations





BIO-SOLIDS HARVESTING

- SEPT** FSL Depth Measurements
- MARCH** FSL Depths, 503 and class "A" sampling
- MAY** DISC FIELD, prepare dredge, hire temp staff
- JUNE 1** Start sludge harvesting
- Place biosolids in the summer to provide greatest potential net evaporation and to minimize potential infiltration
- SEPT 30** Complete sludge harvesting
- OCT** PLANT COVER CROP (if desired)



BIOSOLIDS HARVESTING AND LAND APPLICATION



- DSRSD's solids operations produce Class A biosolids containing undetectable or extremely levels of pathogens prior to land application.
- Class A is not required for land application
- Drying, sunlight, and other natural processes cause pathogens to die rapidly when applied to soils.



Equipment	Operator Required ?
Dredge	Yes 
Booster Pump	Yes 
Fueling Vehicle	Yes 
Discing Tractor	Yes 
Injecting Tractor	Yes 
Hose Reel Tractor	Yes 

DREDGE OPERATIONS

- Daily operations sheet
- Daily sampling
- Density meter
- Flow meter
- The dredge operator, operates a boom, auger, and pump located on the dredge.
- Sludge is pumped from the dredge to an on-shore booster pump which conveys sludge to DLD hydrants
- Flow GPM: 300 - 375
- Sludge Density: 3% (+ or – 0.5 %)



DEDICATED LAND DISPOSAL AREA PREPARATION

- Start disking as soon as field dries out (spring)
- Disking breaks down large chunks of compacted soil and promotes moisture evaporation



DLD OPERATION

- DLD is divided into 14 quadrants for sludge injection
- Eight sludge hydrants each serving one or two injection quadrants
- Quadrants are injected in series.
Then...
 - Two weeks of natural evaporation
 - Disk to promote additional evaporation
- Typically, injection covers the field twice during harvesting season



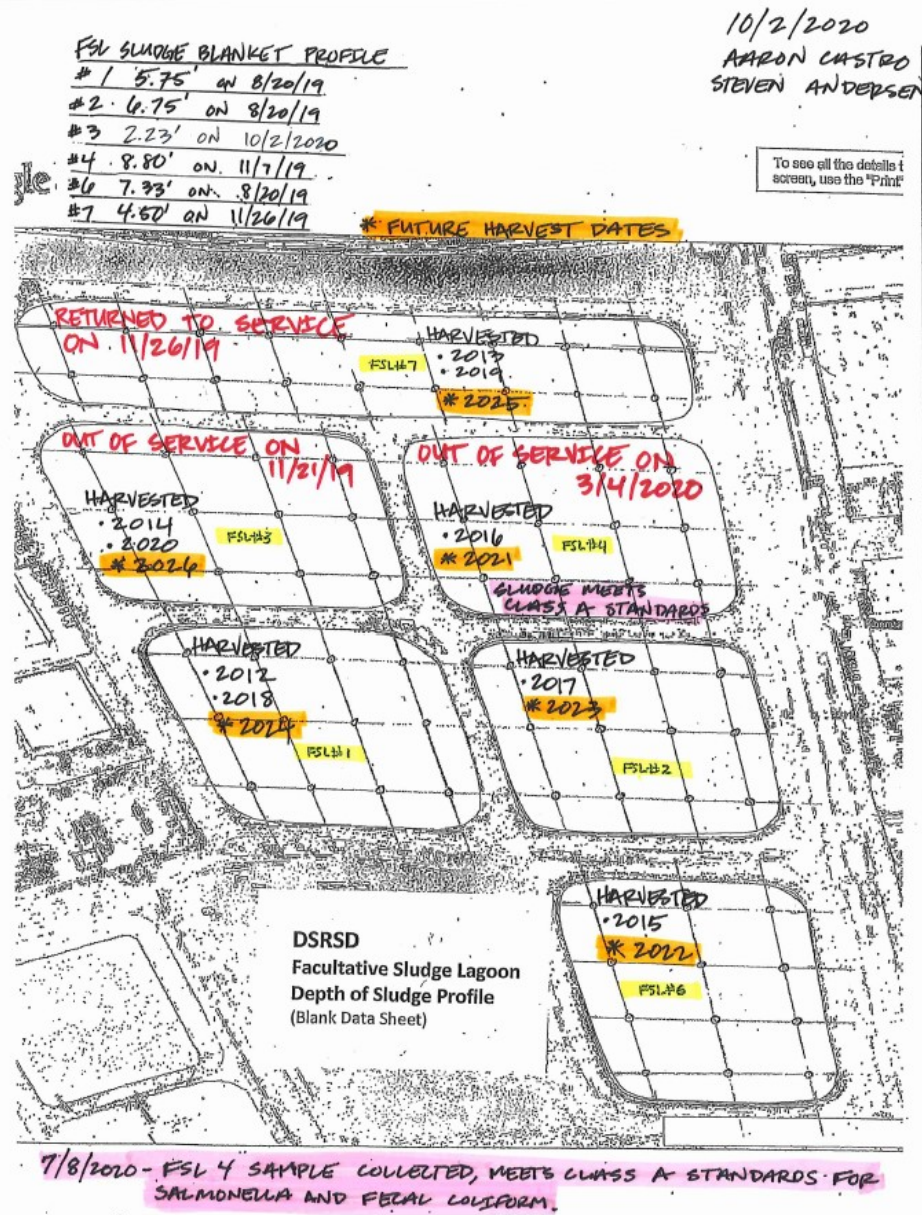
DLD OPERATION



SLUDGE INJECTION TRACTOR

- Tractor injector is lowered into the soil about 8" to 12"
- Injector tractor is set to a speed of 0.07mph. This allows for maximum dispersion of biosolids into the soil.
- Very dependent on soil type. DSRSD has clay soils. Sandy, silt, or loam will have greater evaporation and moisture depth penetration.
- On a normal season two complete injections passes are made across the DLD.
- Annually ~ 37,000 cubic yards are injected
- Each year biosolids harvesting requires ~ 80 - 10-hour workdays to complete





CURRENT STATUS: 2020 SEASON

Harvesting FSL #	3
Total sludge (including seed)	54,475
Total cubic yards to harvest	40,856
Cubic yards harvested to date	37,846
Total US dry tons to harvest	1,087.29
US dry tons harvested to date	1,007
US dry tons remaining to harvest	80.11
Total gallons of water applied to the DLD	9,343,324
Percent complete	93%
Days of harvesting completed to date	78
Average dry LBS harvested per day	26,821
Average US dry tons harvested per day	13.99
Average sludge density harvested to date	2.60%
Average gallons per day applied to the field	126,856
Estimated days remaining to finish harvesting	0

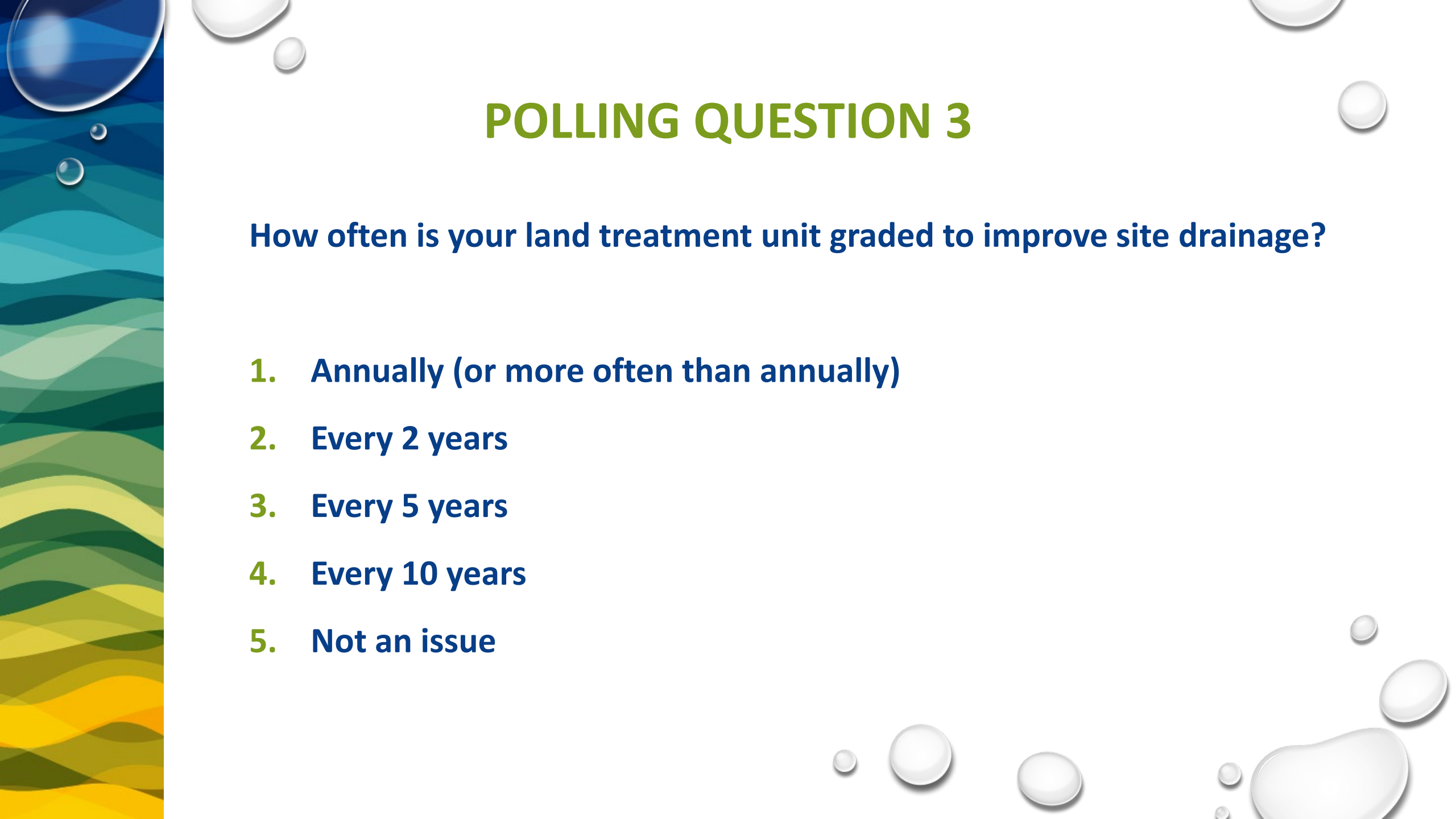
BIOSOLIDS HARVESTING AND LAND APPLICATION

1. Placement of biosolids
2. **Conveyance of runoff by surface grading**
3. Containment of surface water accumulation
4. Removal of surface water by treatment prior to discharge under an NPDES permit
5. Diversion of surface water runoff from surrounding areas
6. Facility liner
7. Groundwater monitoring
8. Annual compliance reporting
9. Cover crop
10. Future challenges and concerns



DIRECTED CONVEYANCE OF RUNOFF BY SURFACE GRADING





POLLING QUESTION 3

How often is your land treatment unit graded to improve site drainage?

- 1. Annually (or more often than annually)**
- 2. Every 2 years**
- 3. Every 5 years**
- 4. Every 10 years**
- 5. Not an issue**

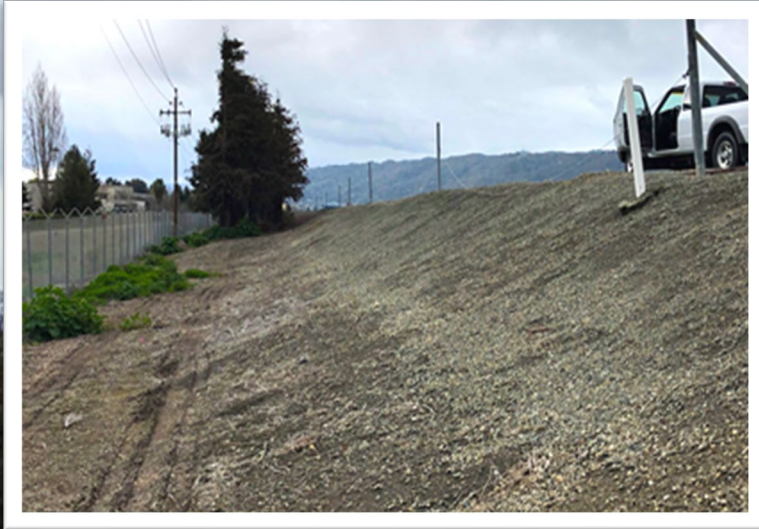
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GRADING OF DEDICATED LAND DISPOSAL AREA



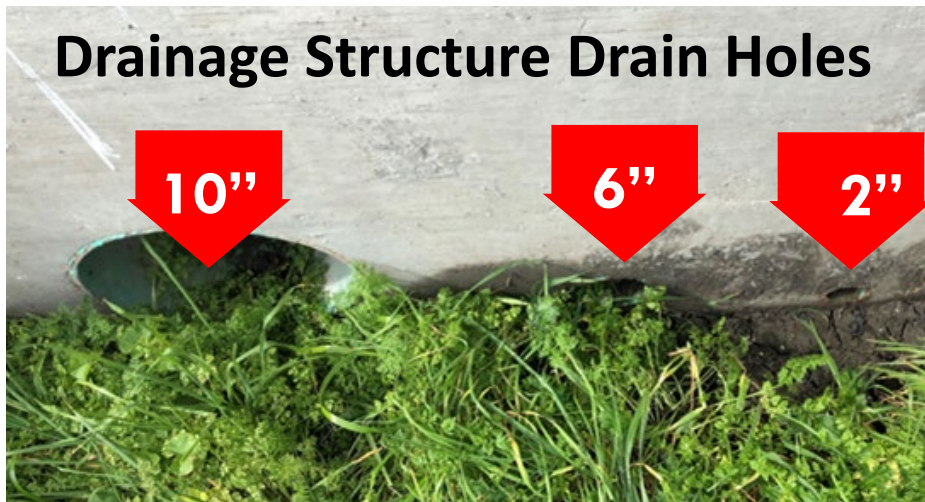
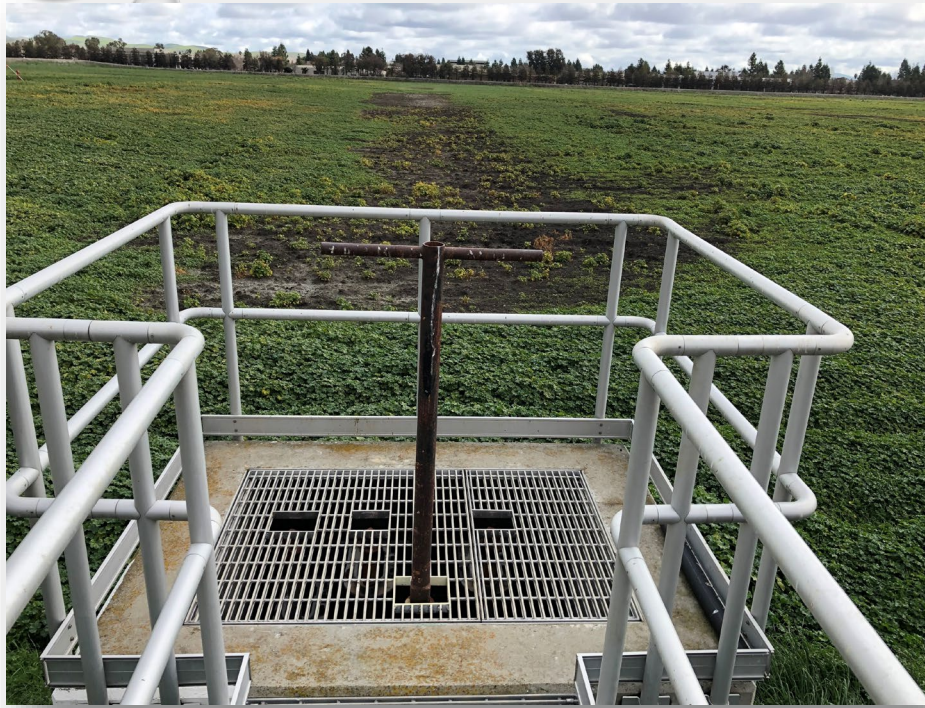


**CONTAINMENT OF
SURFACE WATER ACCUMULATION
DURING THE WINTER WITHIN
PERIPHERAL BERMS**

BIOSOLIDS HARVESTING AND LAND APPLICATION

1. Placement of biosolids
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Precipitation that falls on the DLD is drained back into the WWTP for full treatment.

INSPECTION OF DLD FACILITY BERMS



- **Inspect for:**
 - Water leaving or entering the site
 - Erosion or animal burrowing of containment levees
 - Evidence of ground movement
 - Road access and stability
 - Sludge or biosolids on the surface
 - Condition of DLD surface water drainage
 - Foul odors
 - Observe water foul and other animals
- **Photo of facility and berms are taken annually**
- **Inspection forms and facility photos are part on annual biosolids report**

BIOSOLIDS HARVESTING AND LAND APPLICATION

1. Placement of biosolids
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6. **Facility liner**
7. Groundwater monitoring
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10. Future challenges and concerns





LINER ANCIENT LAKEBED WITH CLAY SOILS

- DSRSD has native underlying soils with low permeability, ranging from 1×10^{-7} to 1×10^{-8} cm/sec (hydrogeologic study for Dublin San Ramon Services District Facultative Sludge Lagoon and Dedicated Land Disposal Area. Better than engineered liners.
- Sites with sandy, silt or loam soils may require an engineered liner to protect groundwater.

BIOSOLIDS HARVESTING AND LAND APPLICATION

1. Placement of biosolids
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6. Facility liner
7. **Groundwater monitoring**
8. **Annual compliance reporting**
9. Cover crop
10. Future challenges and concerns



ANNUAL BIOSOLIDS REPORT

2020 Annual/Semi-Annual Monitoring and Maintenance Report

Dublin San Ramon Services District
Dedicated Land Disposal Facility

February 22, 2021

Prepared for

Dublin San Ramon Services District



**Dublin San Ramon
Services District**

Water, wastewater, recycled water

Prepared by

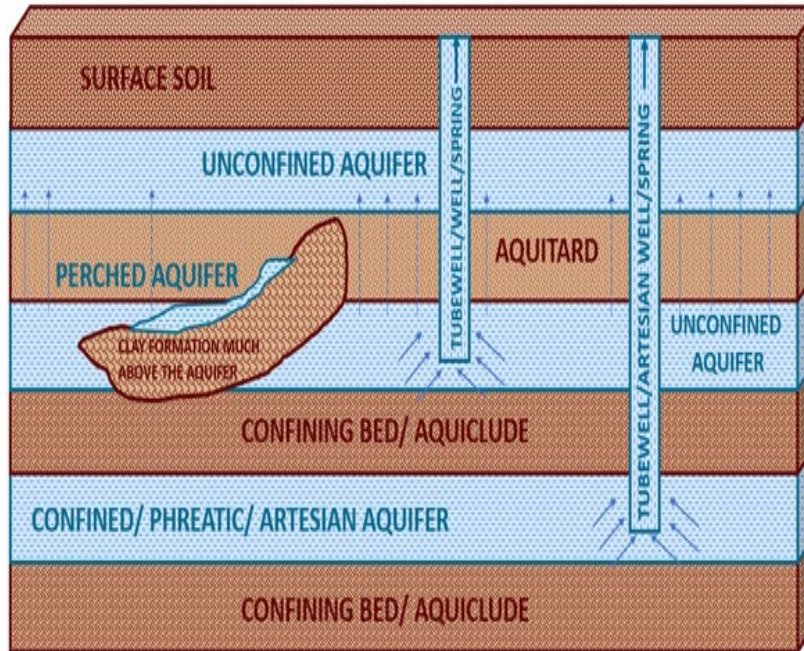


**Luhdorff &
Scalmanini**
Consulting Engineers

- Ground water sampling and analysis is contracted out to hydrogeologists
- Hydrogeologist look for trends of constituents of concern in the groundwater that might indicate that facility operation is negatively impacting groundwater
- Groundwater monitoring data, routine facility observations and maintenance work carried out by DSRSD staff are included in the annual report.
- Hydrogeologist's report on ground water sampling analysis is reviewed by District Staff (Operations, Laboratory and Engineering).

GROUNDWATER MONITORING

Geologic Formations – Groundwater Regime



- DSRSD maintains a network of 14 dedicated monitoring wells at the site
- The site is underlain by an aquiclude composed of silts and clays to a depth of approximately 42 feet (Upper Aquiclude)
- Underlying the Upper Aquiclude is a shallow aquifer, approximately 25 to 30 feet thick (Upper Aquifer)
- The monitoring well network targets these two distinct water bearing zone



GROUNDWATER MONITORING

SEMI-ANNUAL SAMPLING SCHEDULE

- Depth-to-groundwater measurements are obtained semiannually from the network of wells
- Groundwater quality samples are also collected semiannually from each monitoring well and analyzed for general water quality parameters and dissolved metals per the Order General water quality parameters consist of field parameters (temperature, specific conductance, pH, and turbidity) and laboratory analyses (total dissolved solids (TDS), chloride, nitrate as nitrogen, unionized ammonia, and total ammonia)
- The semi-annual dissolved metals suite comprises arsenic, barium, cadmium, copper, chromium, lead, mercury, nickel, vanadium, and zinc
- In addition to the required parameters listed above, dissolved oxygen, color, color intensity, odor, and odor intensity, have also been monitored and documented during purging activities

5-YEAR SAMPLING SCHEDULE

- The 5-year sampling schedule comprises of seven additional metals (antimony, beryllium, cobalt, selenium, silver, thallium, and tin), pesticides and PCBs, and chlorophenoxy herbicides



BIOSOLIDS HARVESTING AND LAND APPLICATION

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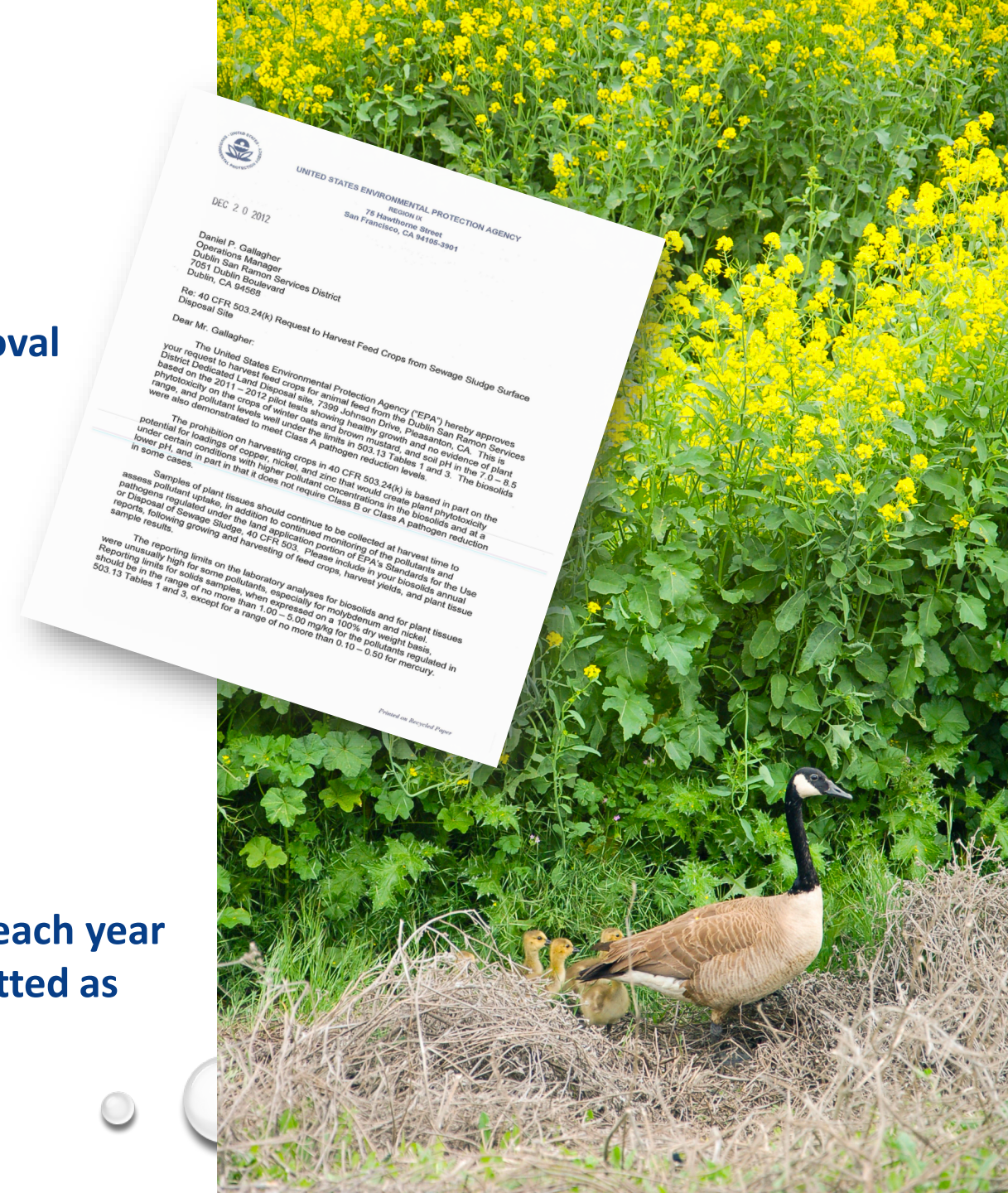


COVER CROP IMPROVES DLD SITE AESTHETICS



COVER CROP

- Conducted a pilot test on cover crops
- Submitted data to EPA and received approval to use as cattle feed
- Demonstrated no phytotoxicity in plant tissue (brown mustard and winter oats)
- Soil ph (7.0 – 8.5)
- All pollutants below the limit levels noted in 503 regulations
- Biosolids applied to DLD meet “class A” – This is not a requirement
- Tissue samples collected and analyzed in each year cover crop is grown and results are submitted as part of Annual Biosolids report.



BIOSOLIDS HARVESTING AND LAND APPLICATION

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FACILITY LOADING

- Land application is the low-cost alternative
- Odors and aesthetics are a constant concern
- Annually ~ 2000 dry metric tons of biosolids are pumped from the WWTP to the FSLs.
- Annually ~ 1000 dry metric tons of biosolids are harvested from the FSLs and injected into the DLD (3% Solids).
- Future – Increase land applied solids from 3% to ~ 5 to 6 %.
- Eventually will have to off haul biosolids (if allowed) at increased cost. New Technology?
- Landfill space in California is shrinking and getting more expensive

QUESTIONS?

Levi Fuller

**Wastewater Treatment Plant
Operations Superintendent**

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Diane Griffin

Regulatory Compliance Manager

(925) 875-2324

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**Dublin San Ramon
Services District**

Water, wastewater, recycled water



Resource Recovery & Electrical Energy (R2E2)

EPA Webinar Biosolids Disposal Methods Incineration

May 27, 2021

Bruce Bartel





Outline

- NEW Water
- R2E2 Processes
- Incineration
- Anaerobic Digestion
- Energy Recovery
- Questions

Who or What is NEW Water?



- Brand of the Green Bay Metropolitan Sewerage District (GBMSD)
- Two treatment facilities serving NE Wisconsin 24/7/365
- Governed by five member Commission

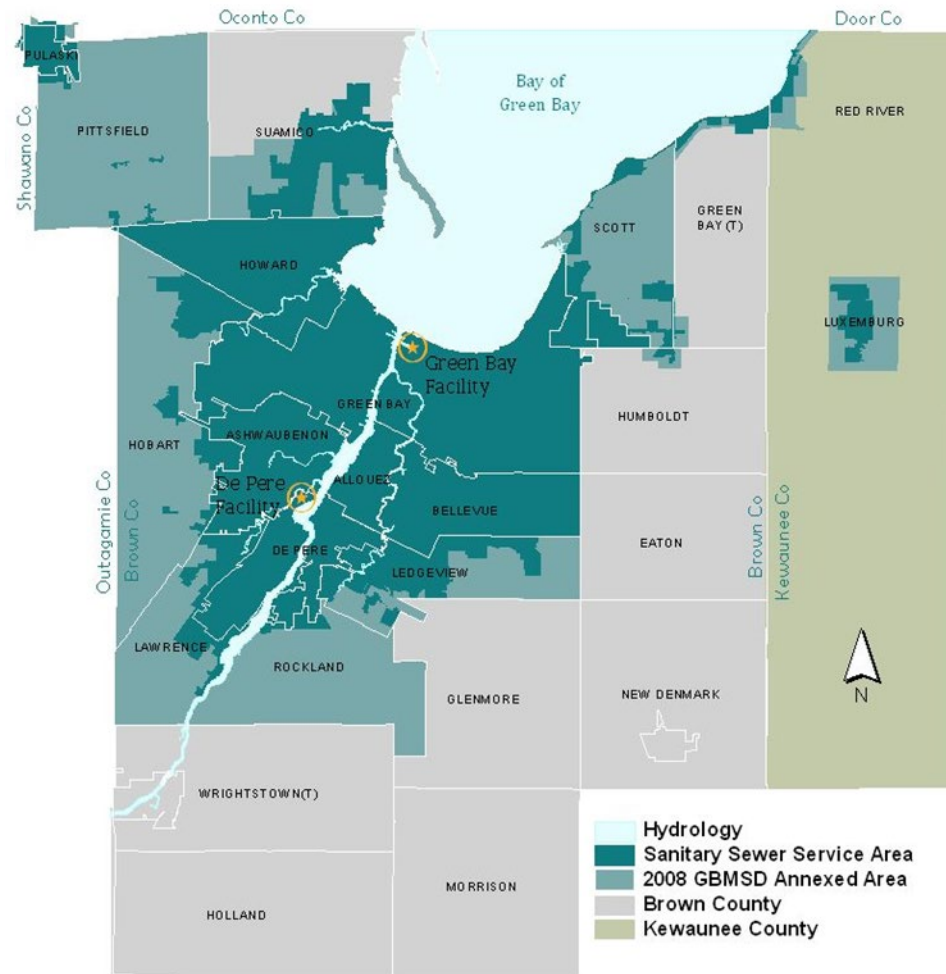


*Protecting our most valuable
resource, water.*

NEW Water
The brand of the Green Bay
Metropolitan Sewerage District 

About NEW Water

- Wholesale provider of wastewater conveyance and treatment services
- 15 municipal customers (232,000 people) and two direct industrial customers
- Service area of 285 square miles
- Third largest wastewater treatment plant in Wisconsin
- Treats 38 million gallons of wastewater per day on average



*33 million
gallons per day*





De Pere Facility

8 mgd



Outline

- NEW Water
- R2E2 Processes
- Incineration
- Anaerobic Digestion
- Energy Recovery
- Questions

R2E2



- Most cost-effective solution to replace solids handling at the Green Bay Facility
- Tools to treat wastewater as a resource

Background Information



Three main drivers:

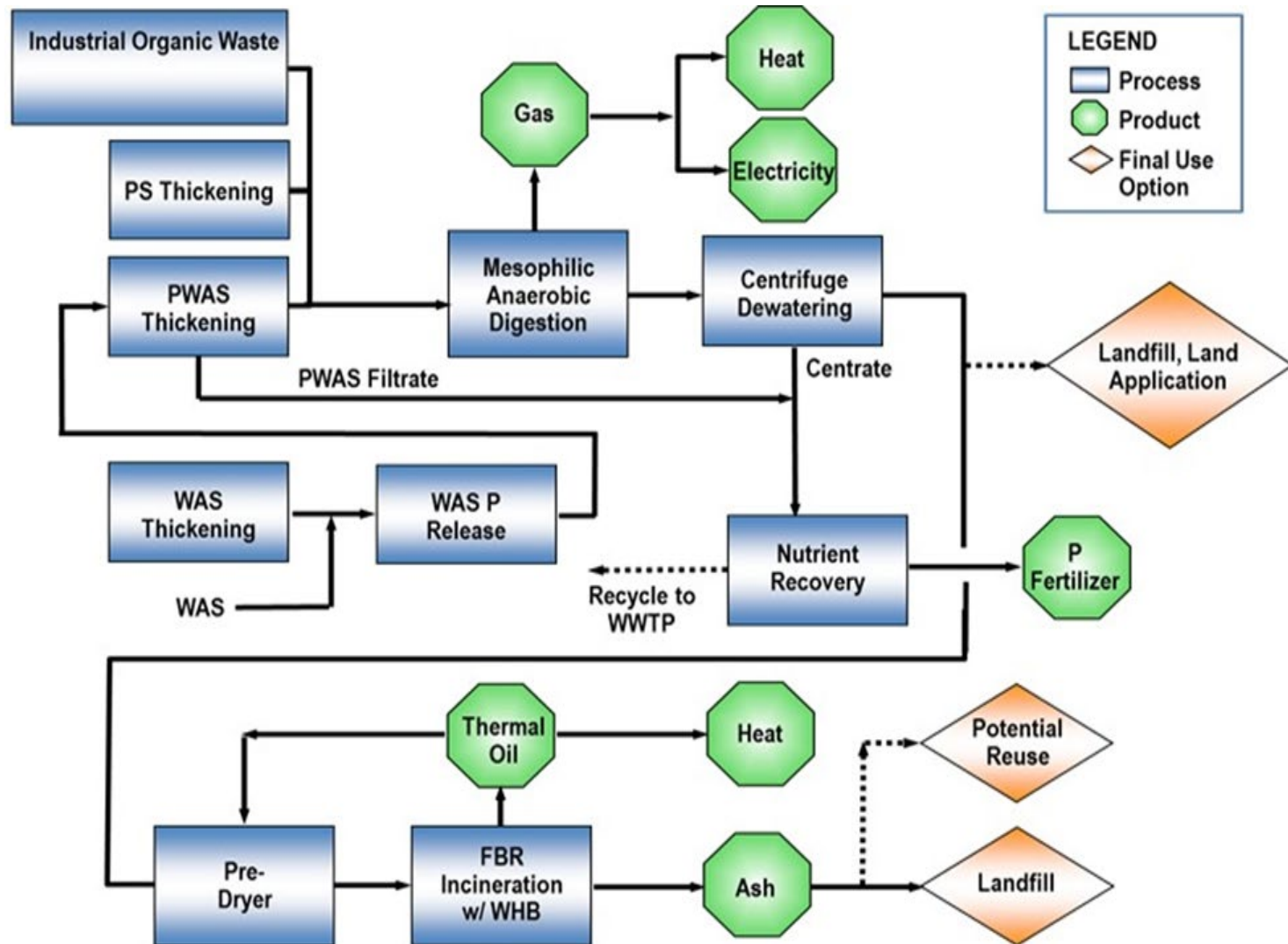
- Aging infrastructure
- Environmental regulations
- Increased capacity needs

R2E2

- R2E2: Solids & Digestion Facilities
 - Includes:
 - Anaerobic Digestion
 - New Solids Building
 - Centrifuge Dewatering
 - Dryer
 - Biogas Storage
 - Electrical Energy Generation
 - Nutrient Recovery
 - Fluid Bed Incineration
 - State of the Art Air Pollution Control



Process Flow Diagram





Poll Question 1



Outline

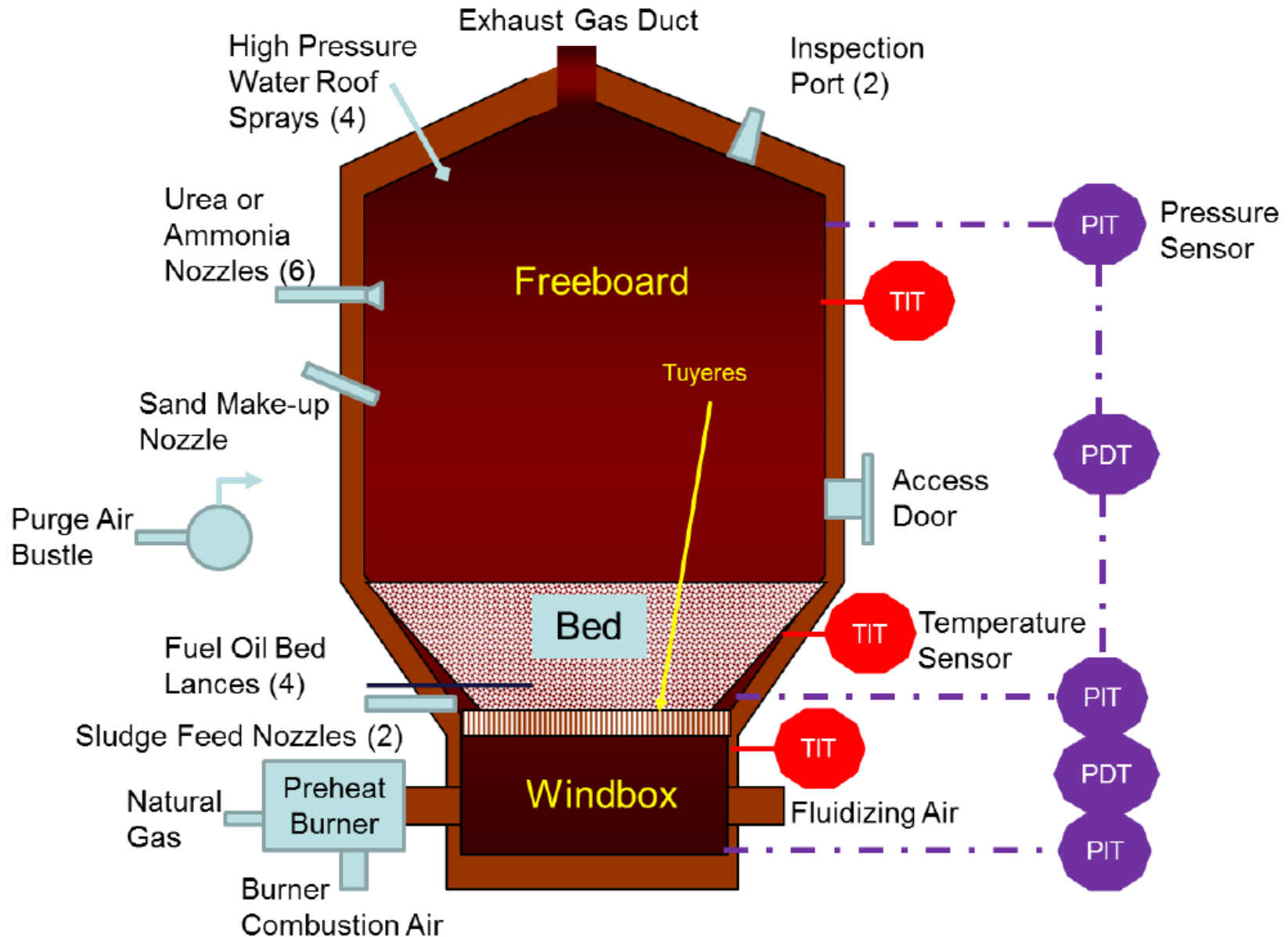
- NEW Water
- R2E2 Processes
- Incineration
- Anaerobic Digestion
- Energy Recovery
- Questions

Fluidized Bed Incinerator Overview

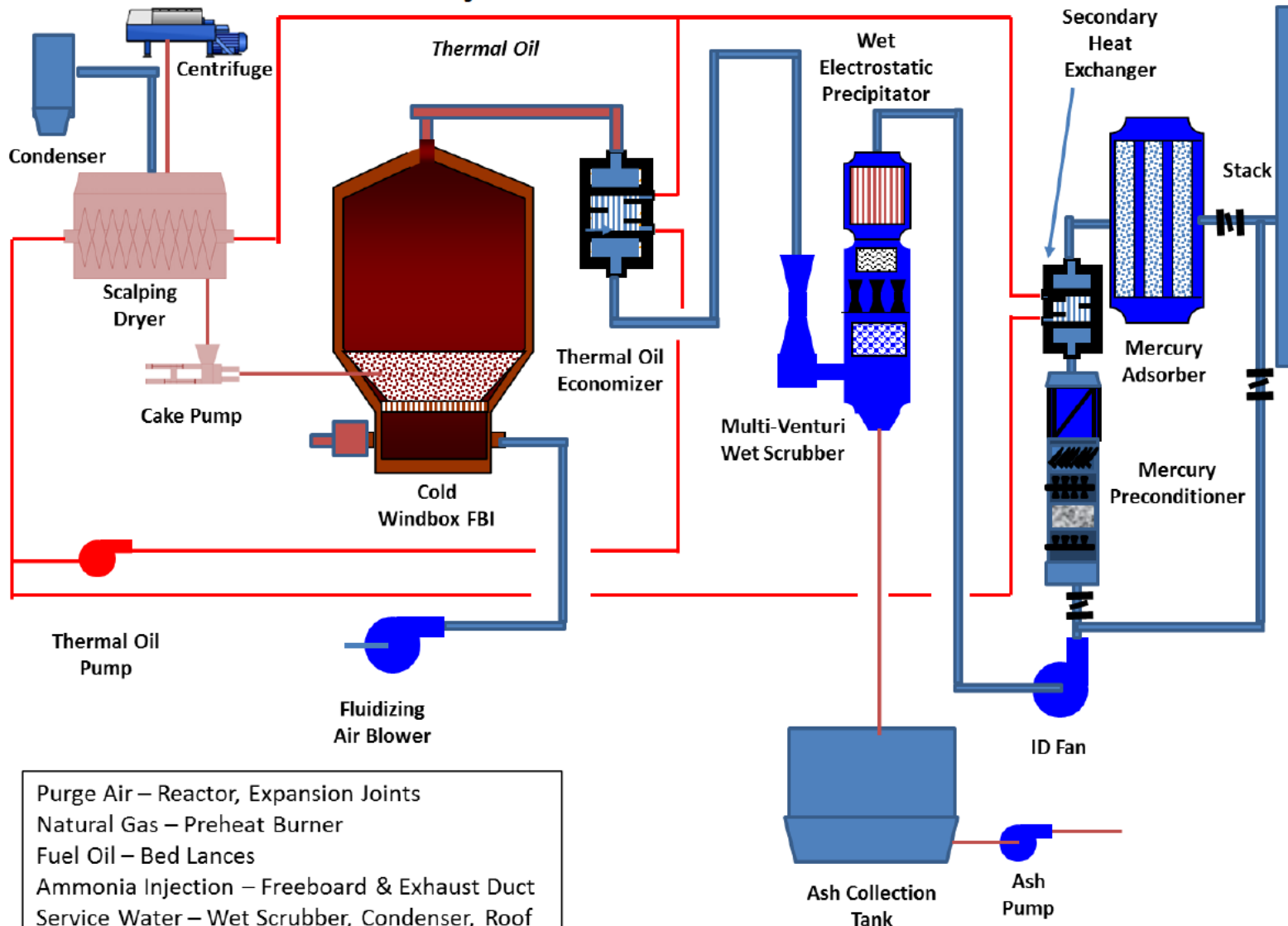
- High Temperature Fluid Bed System (HTFB)
- 51 DTPD Capacity
- Heat Recovery
- State of the art air pollution control equipment to reduce air pollutants and meet new standards



Fluidized Bed Incinerator



FBI System Overview





CAUTION
ELECTRIC SHOCK
Hazardous Area

centrisys
CENTRIFUGE SYSTEMS

centrisys
CENTRIFUGE SYSTEMS





Outline

- NEW Water
- R2E2 Processes
- Incineration
- Anaerobic Digestion
- Energy Recovery
- Questions

R2E2

- R2E2 Components
 - Anaerobic Digestion (mesophilic) for biogas production and solids reduction
 - Two Silo Shaped Digesters
 - 110 Feet Tall
 - 2.2 MGD Capacity Each
 - High Strength Waste Receiving









Poll Question 2



Outline

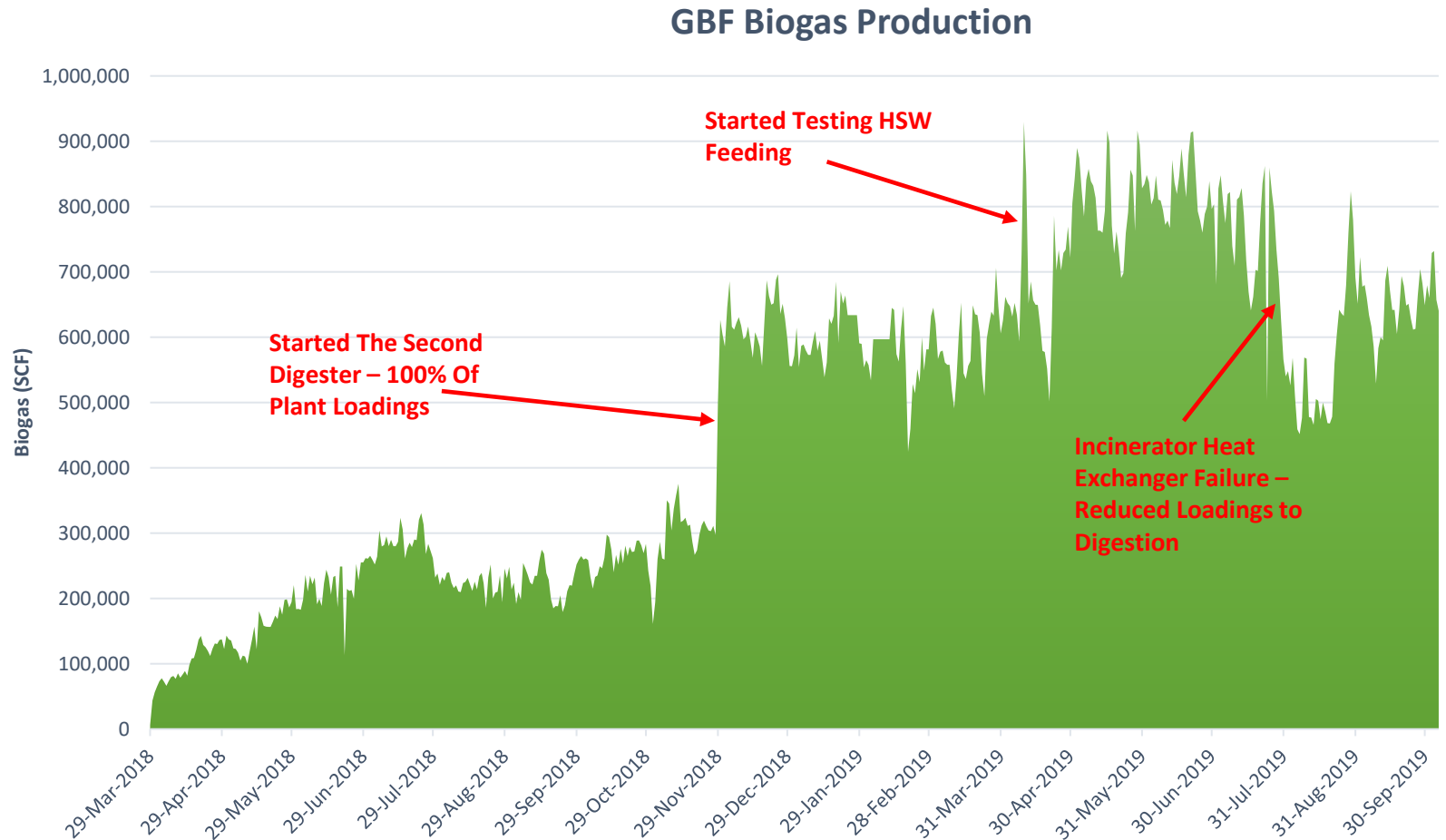
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- Energy Recovery
- Questions

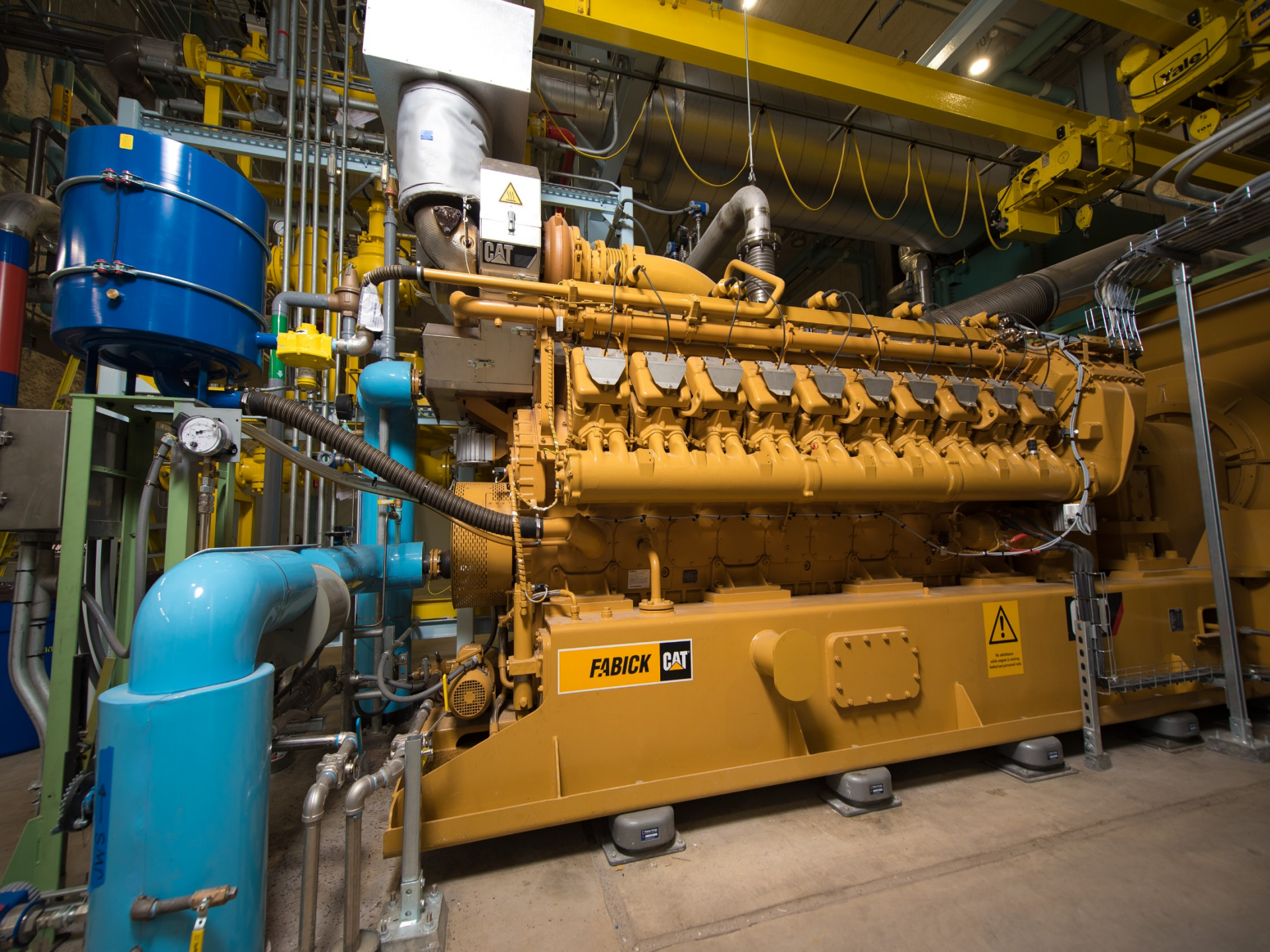
R2E2

- R2E2: Solids & Digestion Facilities
 - Energy Recovery:
 - Biogas to run two – 2.0 MGW I.C. Engines
 - Heat from the I.C. engines to heat the anaerobic digesters
 - Heat recovery from the fluid bed incinerator to run dryer
 - Autogenous incinerator operation
 - Nutrient harvesting to produce fertilizer product



Biogas Production





R2E2 Benefits



- Addresses the original project drivers:
 - Aging infrastructure
 - Environmental regulations
 - Increased capacity needs
- Lowest cost plan over a 20-year planning period
- Generate about 50% of NEW Water's energy needs



Energy Data

- **November 2018**

- Electricity Consumed – 3,088 MWH
 - Purchased – 2,863 MWH (93%)
 - Generated – 225 MWH (7%)
 - Biogas Utilized – 21%

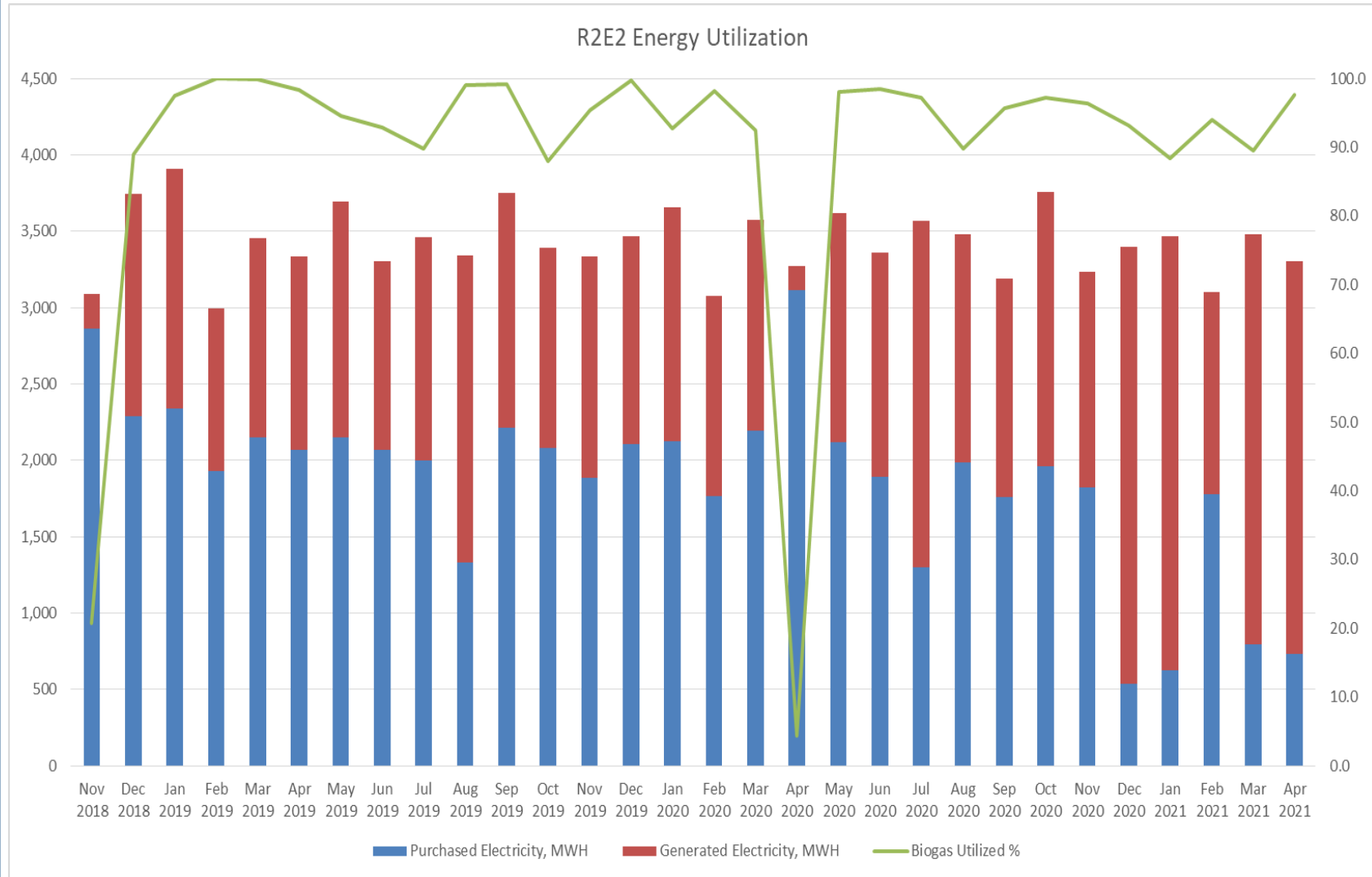
- **June 2020**

- Electricity Consumed – 3,359 MWH
 - Purchased – 1,893 MWH (56%)
 - Generated – 1,466 MWH (44%)
 - Biogas Utilized – 98%

- **April 2021**

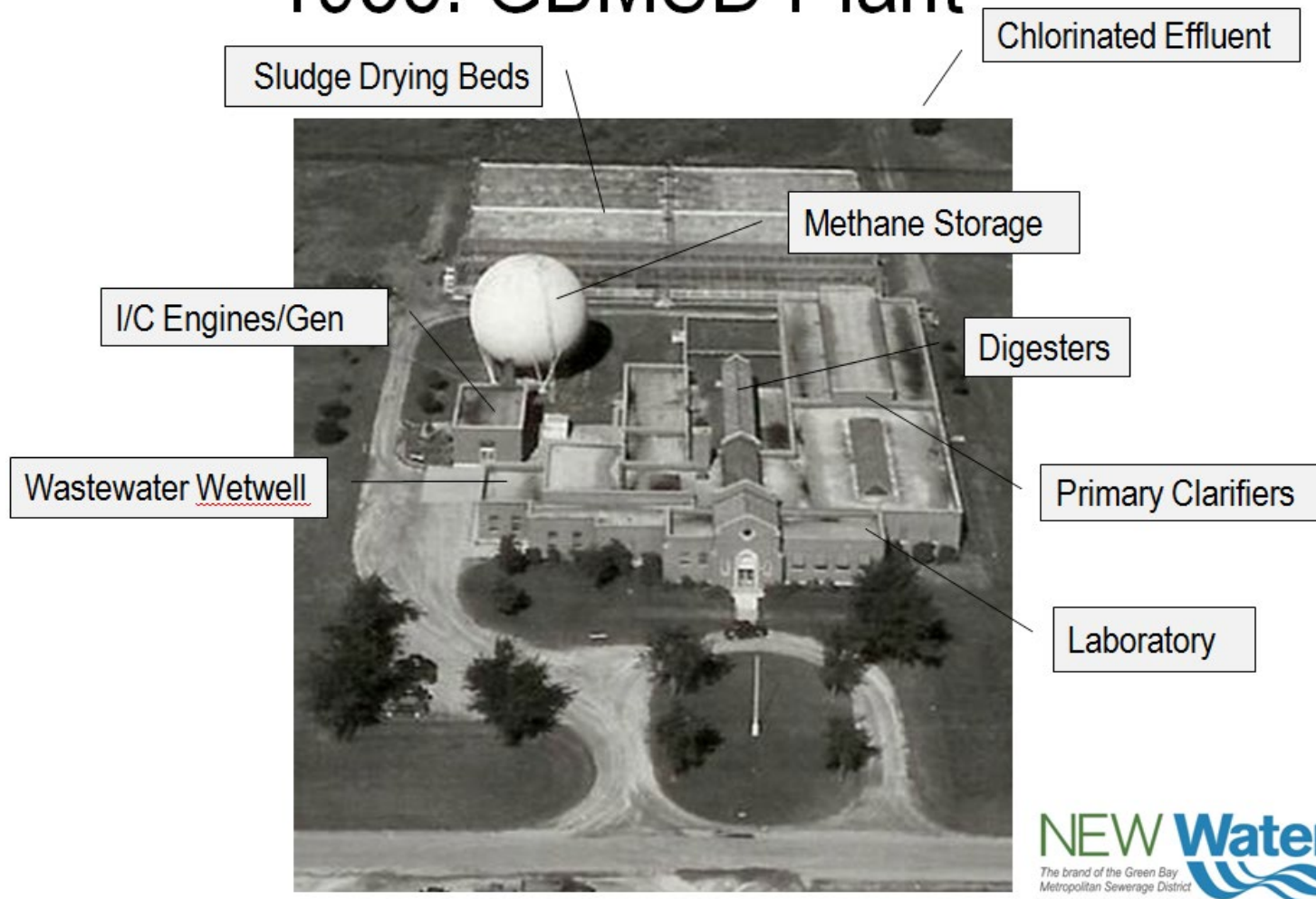
- Electricity Consumed – 3,306 MWH
 - Purchased – 729 MWH (22%)
 - Generated – 2,577 MWH (78%)
 - Biogas Utilized – 98%

Energy Data



Back to the Future: Resource Recovery & Electrical Energy (R2E2)

1935: GBMSD Plant



Thank You!

Questions / Comments?

Contact Information:

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Treatment Manager
bbartel@newwater.us
(920) 438-1006

For more information
please visit:
www.newwater.us

Stay connected with us:



Poll Question 1

What is the typical operating temperature for mesophilic anaerobic digesters?

- 35°C to 37°C (95°F to 98°F)
- 38°C to 40°C (100°F to 104°F)
- 28°C to 30°C (82°F to 86°F)

Poll Question 2

Which air pollution control device is primarily used for mercury emissions control?

- Multi-Venturi Wet Scrubber
- Adsorber (granulated activated carbon)
- Wet Electrostatic Precipitator (WESP)