



The Milorganite® Heat Drying Process

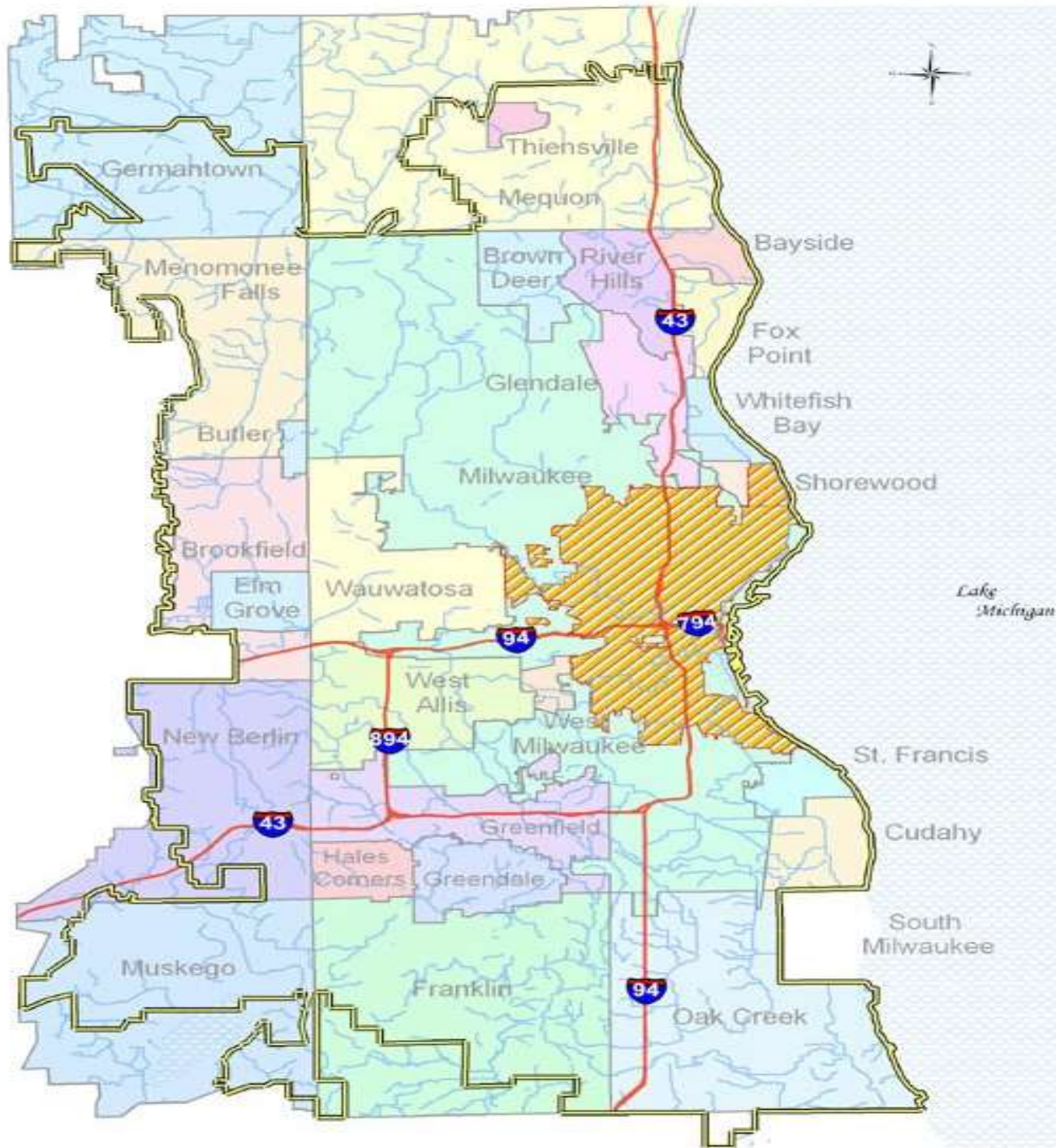
Milwaukee Metropolitan Sewerage District

Sid Arora, PE

March 21, 2017

35th Spring Biosolids Symposium
Stevens Point, WI

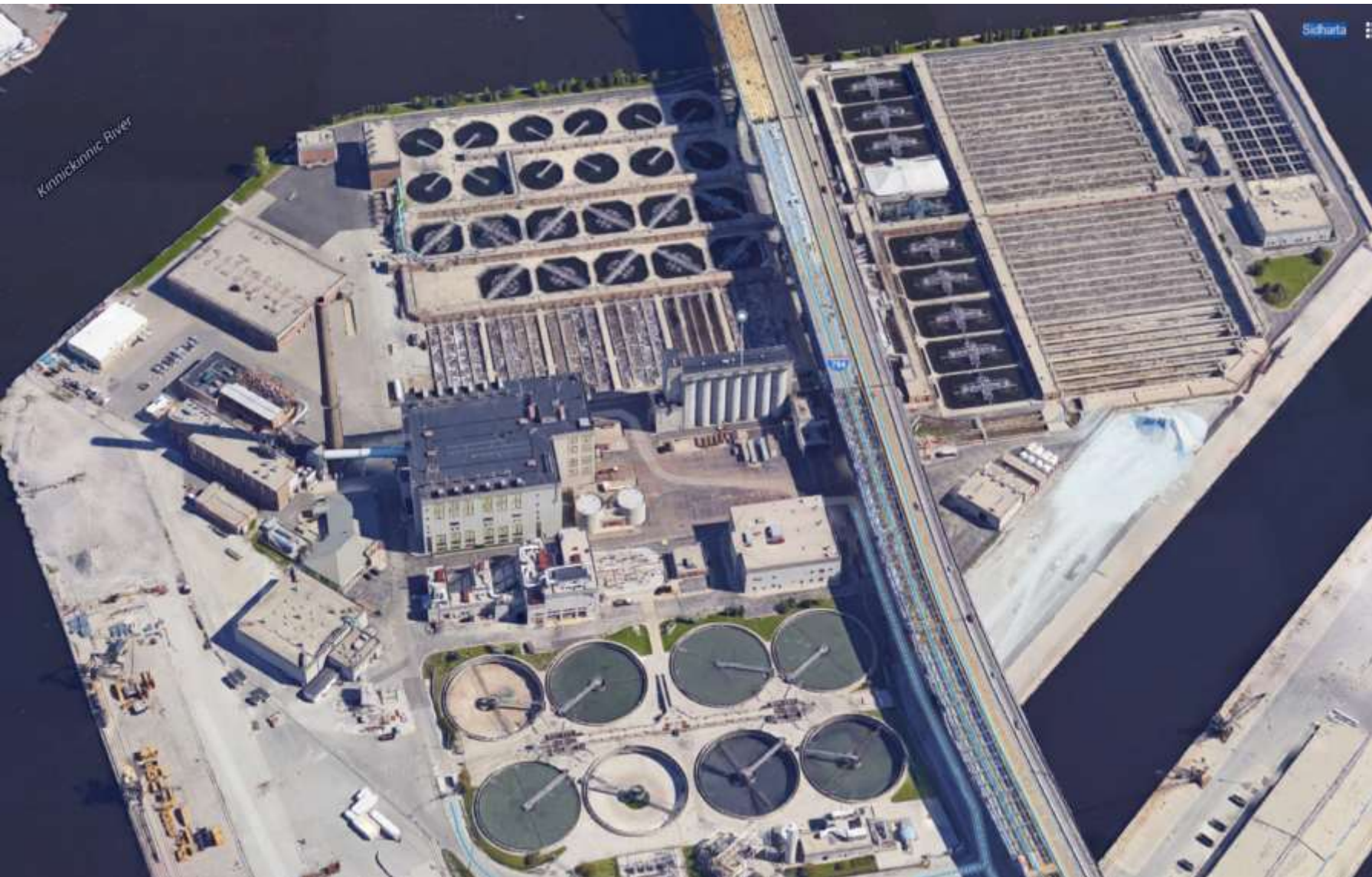




MMSD Serves:

- 1.1 Million Customers
- 28 Municipalities
- 411 Square Miles

Jones Island Water Reclamation Facility



300 MGD Full Treatment Capacity

95 MGD Annual Average

Liquid Treatment Processes

Preliminary/Primary/
Secondary/Disinfection

Solids Handling & Disposal

Interplant solids Pipe
Thickening (GBTS)
Dewatering (BFP)
Drying
MILORGANITE Fertilizer

South Shore Water Reclamation Facility



300 MGD Full Treatment Capacity

90 MGD Annual Average

Liquid Treatment Processes

Preliminary/Primary/
Secondary/Disinfection

Solids Handling & Disposal

Interplant pumping of solids

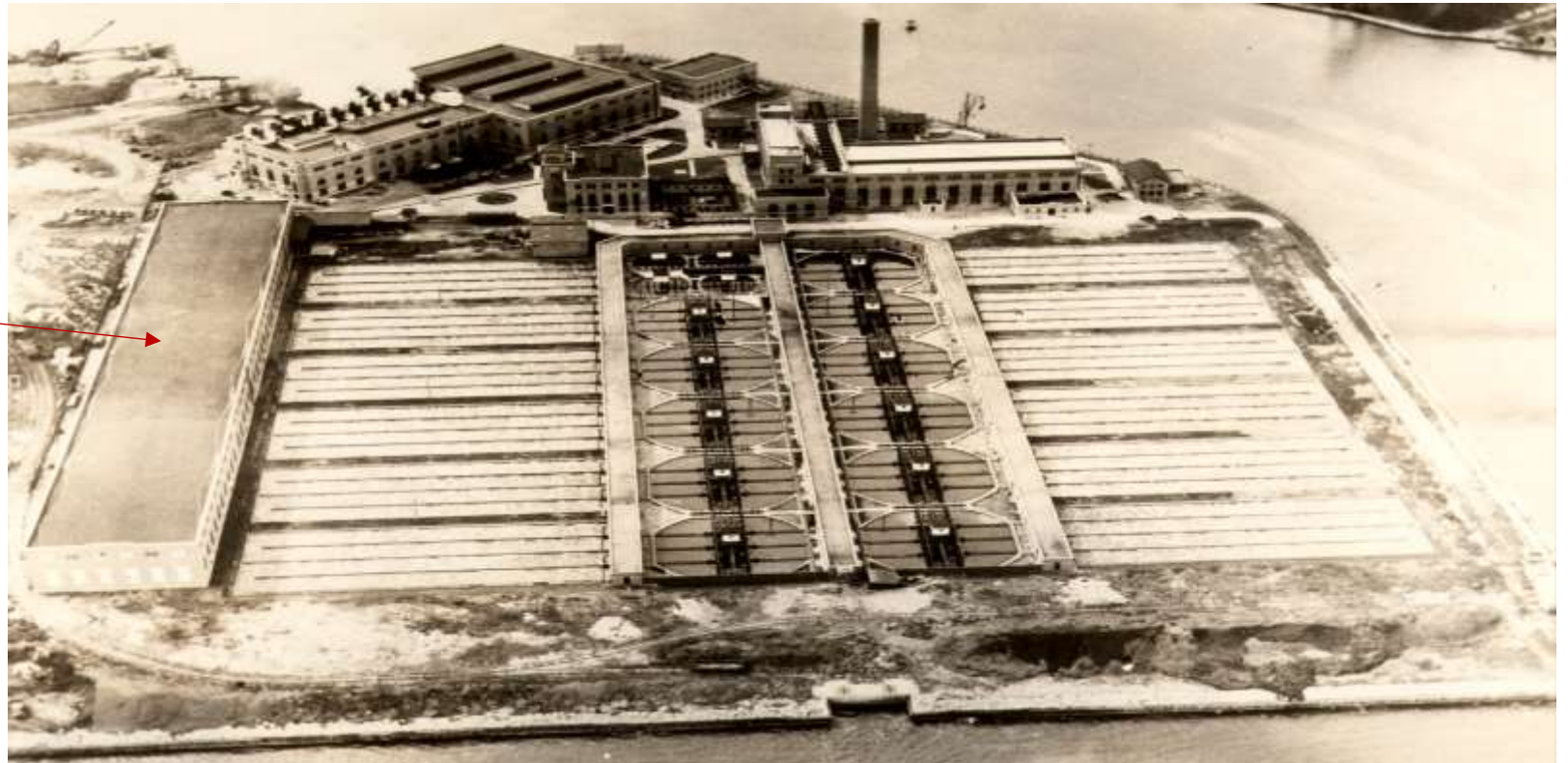
GBTs and Plate and Frame Digesters

Methane 1.3 MMCF

Jones Island

- Completed in 1925
- First municipal activated sludge treatment facility
- National civil engineering landmark

Original
Dryer House



Milorganite®

- Since 1926
- Marketed as a commercial fertilizer
- Markets developed with turf science and professional turf care





Biosolids Technology Fact Sheet

Heat Drying

DESCRIPTION

Heat drying, in which heat from direct or indirect dryers is used to evaporate water from wastewater solids, is one of several methods that can be used to reduce the volume and improve the quality of wastewater biosolids. A major advantage of heat drying versus other biosolids improvement methods, however, is that heat drying is ideal for producing Class A biosolids.

Class A biosolids, as defined in 40 CFR Part 503, are biosolids that have met “the highest quality” pathogen reduction requirements confirmed by analytical testing and/or the use of a Process to Further Reduce Pathogens (PFRP) as defined in 40 CFR Part 257. One advantage of Class A biosolids is that they are approved for unrestricted

users for many years. They can be directly applied to agricultural fields, lawns, etc. or mixed with other ingredients prior to application.

APPLICABILITY

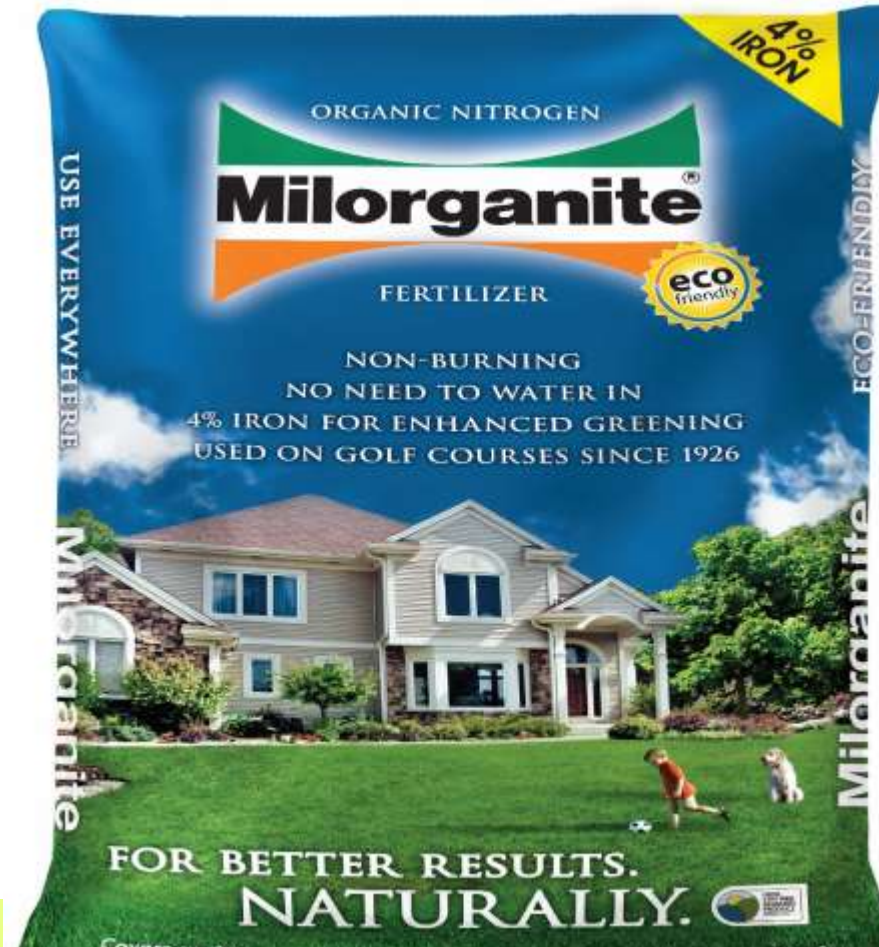
Heat drying is an effective biosolids management option for many facilities that desire to reduce biosolids volume while also producing an end-product that can be beneficially reused. For example, the Milwaukee Metropolitan Sewage District (MMSD) has been heat-drying wastewater solids and marketing the end-product as a fertilizer since the 1920s (USEPA 1979). The technology has gained popularity since the mid-1980s, as many large urban wastewater solids generators, especially on the east coast, have shifted from ocean disposal to land-based bene-



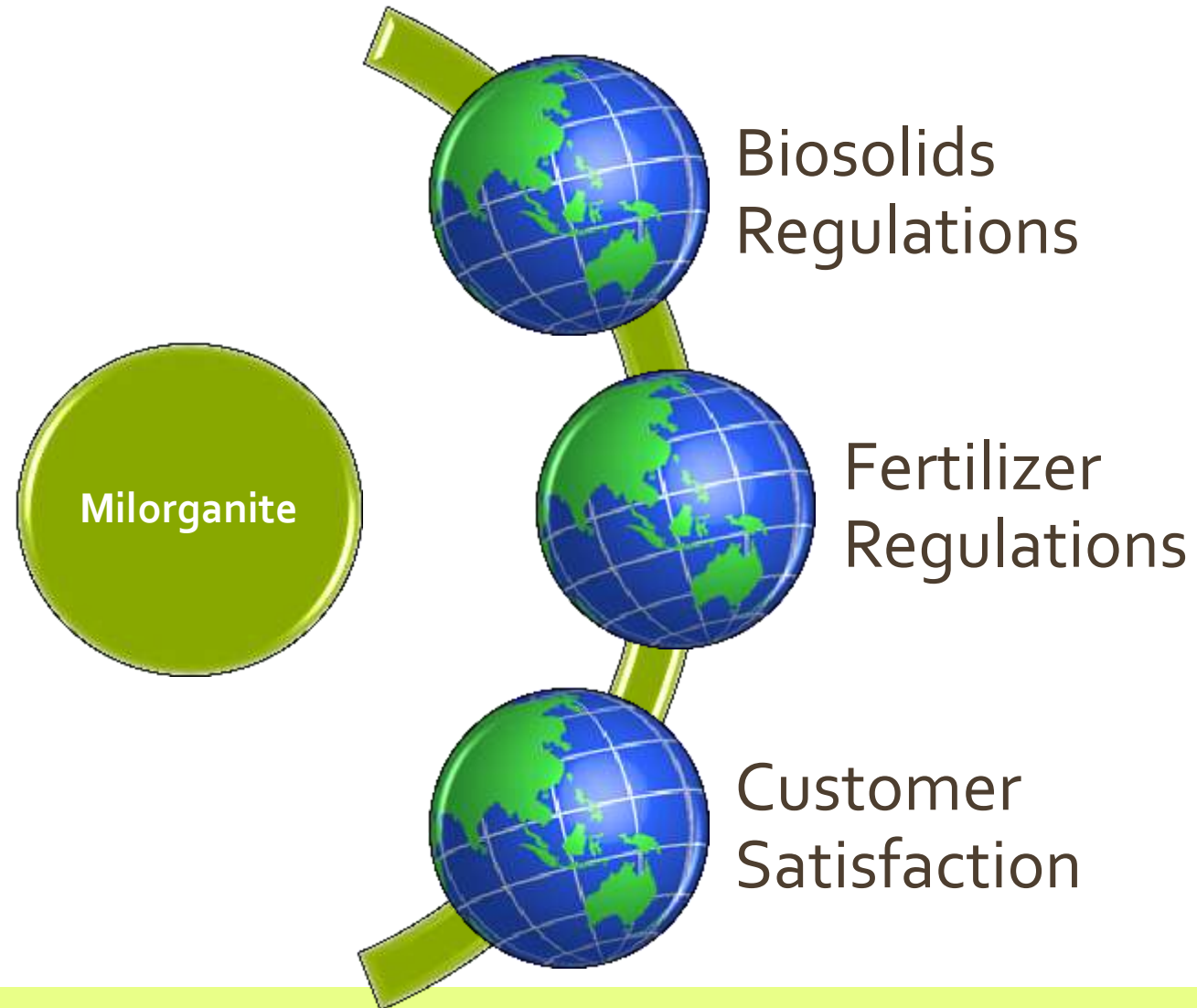
Current Products

- Retail
 - 36 pound bag
 - 5 pound bag
- Professional
 - 50 pound bag
 - 50 pound bag greens grade
 - 1,000 pound bag
- Blending
 - Truck
 - Railcar

- Classic
 - 5-2-0
 - 6-2-0
- Greens Grade
 - 6-2-0
 - 5-2-0
- SGN



Life in the Fertilizer Marketplace



Product Consistency

- Compliance with Regulations
- Performance
 - Nutrients
 - Precise sizing to match fertilizer spreaders
- Over time
- Throughout the country



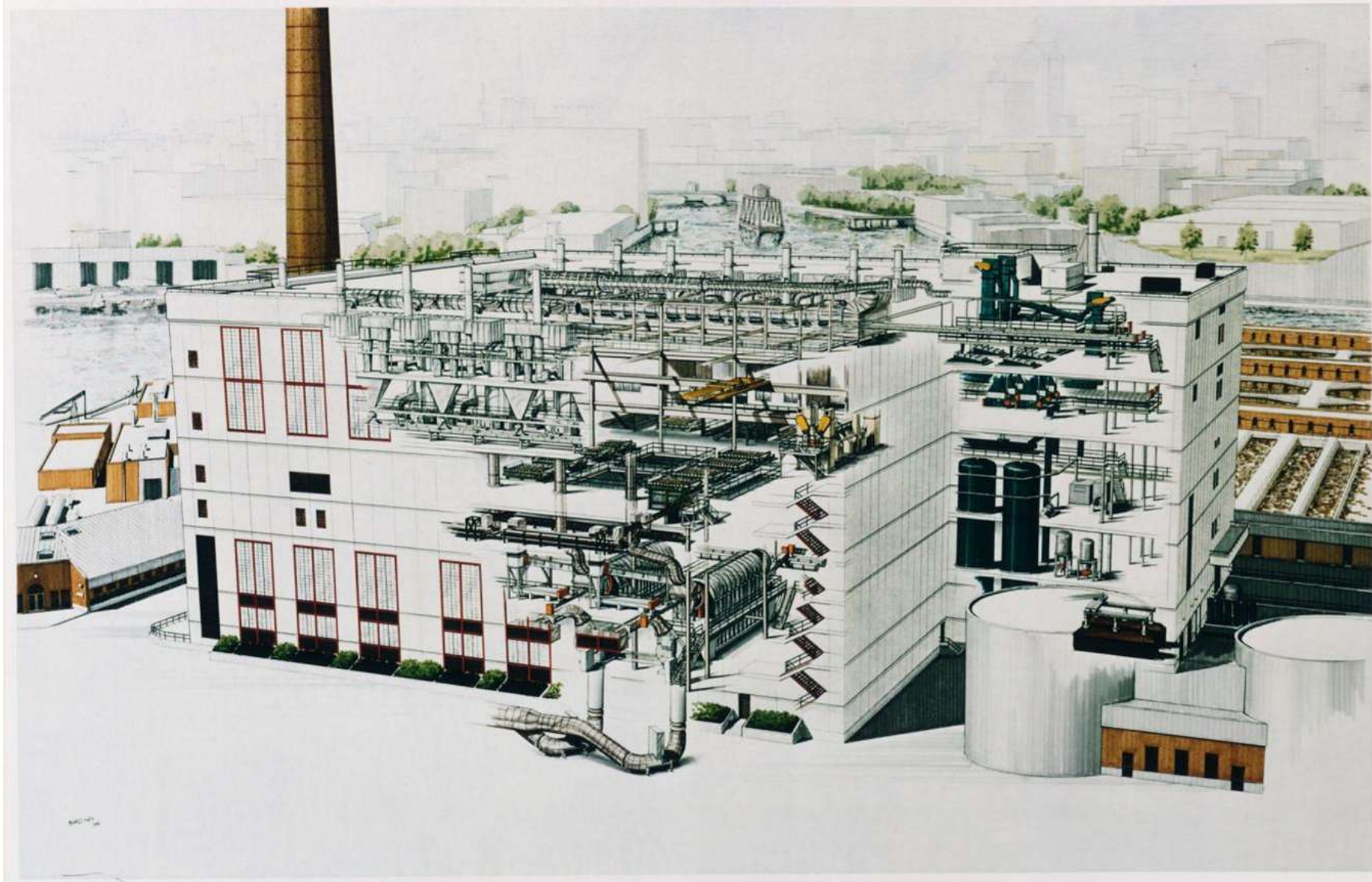
How do we achieve consistency with variable inputs?

Massive amounts of recycling!

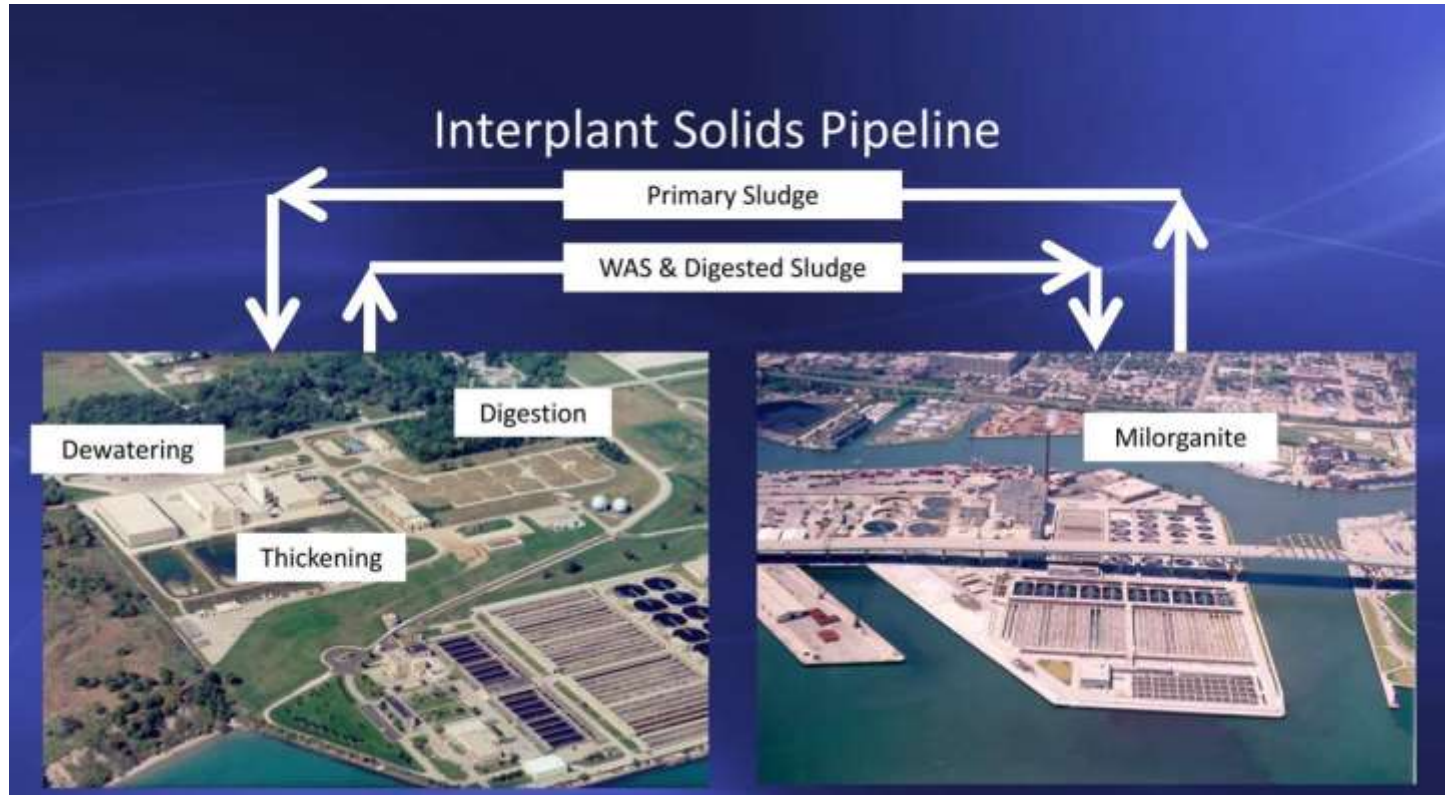
Recycling Systems

- Continuous
 - Dryer to dryer
 - Central recycling bins
 - Sizing to recycling bins
- Intermittent
 - Dryer discharge screw failure
 - Single dryer

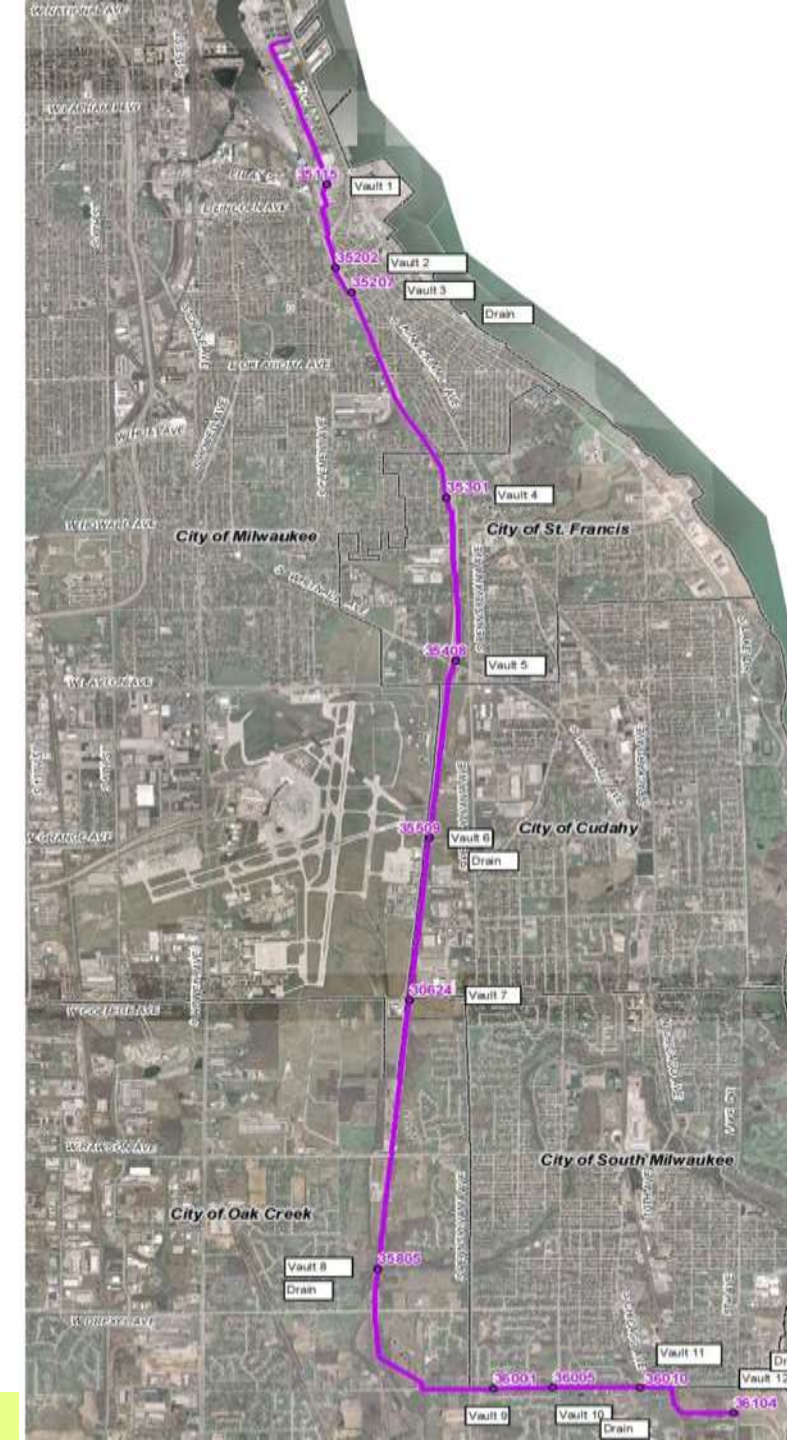
Dewatering and Drying Facility



Biosolids From the Two WRFs



- Two Plants are 12 miles apart
- 4 ISP lines: 2-14" and 2-12"
- Ductile iron force mains





Four Gravity Belt Thickeners

Purpose:

To thicken Jones Island WAS(JIWAS) and portion of South Shore WAS (SSWAS) and Digested Sludge (SS DSD)

Feed Concentration = **1% Solids**

Thickened Concentration = **4-5% Solids**

Ferric Chloride is added for conditioning the sludge prior to GBT thickening

Mannich Polymer for Thickening



24 Belt Filter Presses

Ashbrook Presses

Purpose: To dewater Blended Sludge (BSD) made of JI WAS, SS WAS and SS DSD

SS DSD is 25-35% of the total Blended Sludge

Feed Concentration = 3.2 %

Dewatered Cake = 18%


Ferric Chloride is added for conditioning the sludge

Mannich Polymer is added for Solids Liquid separation

12 Rotary Dryers

- Davenport Dryers- Single Pass- Rotary Drum
- Purpose: To Heat Dry BFP Cake into solid pellets commercially sold as Milorganite
- Throughput 18 tons/dryer/day
- Energy for Drying can come from either sources:
 - Waste Heat from GE Turbines
 - Waste Heat from Solar Turbines
 - Natural Gas Burners
 - Combination of NG and WH
- Future Energy Requirement be met by
 - LFG Burners
 - Combination of LFG and WH





Dryer Enclosure

Rotatory Drum

Dryer Furnace
Temperature
Measurement



Dryer Drum from
Inside the furnace.
Openings in dryer
drum allow heat to
enter the inside of
dryer drum and
contact the product.



Blue=Dryer Exhaust

Green = Product moving through Dryer Drum.

Red =Heat to the dryer by Turbine WH or NG Burner.

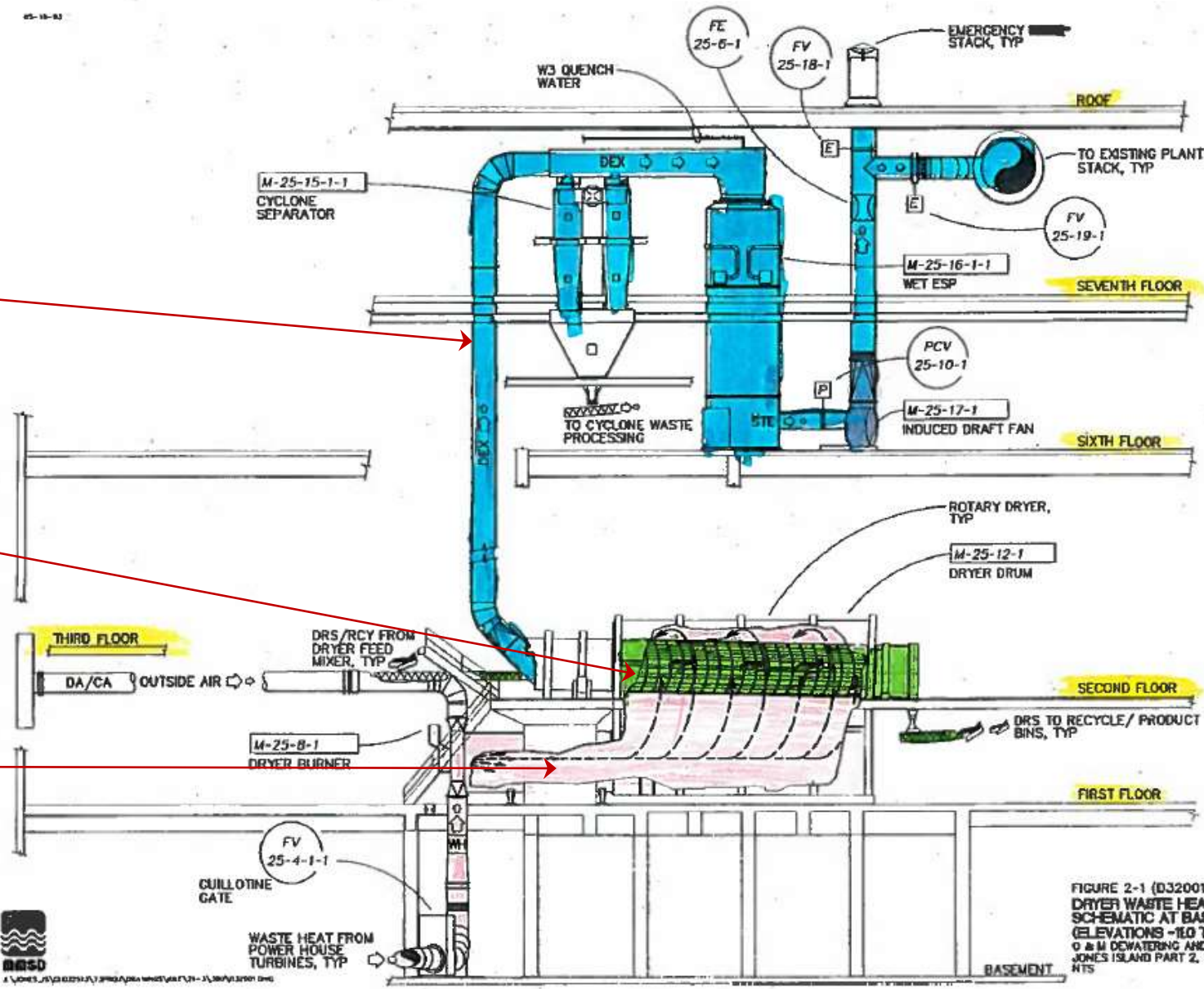


FIGURE 2-1 (D32001)
 DRYER WASTE HEAT AND EXHAUST SYSTEM
 SCHEMATIC AT BASEMENT THROUGH ROOF
 (ELEVATIONS -1.0 THROUGH 126.0)
 O & M DEWATERING AND DRYING FACILITY
 JONES ISLAND PART 2, VOLUME 21.3
 HTS



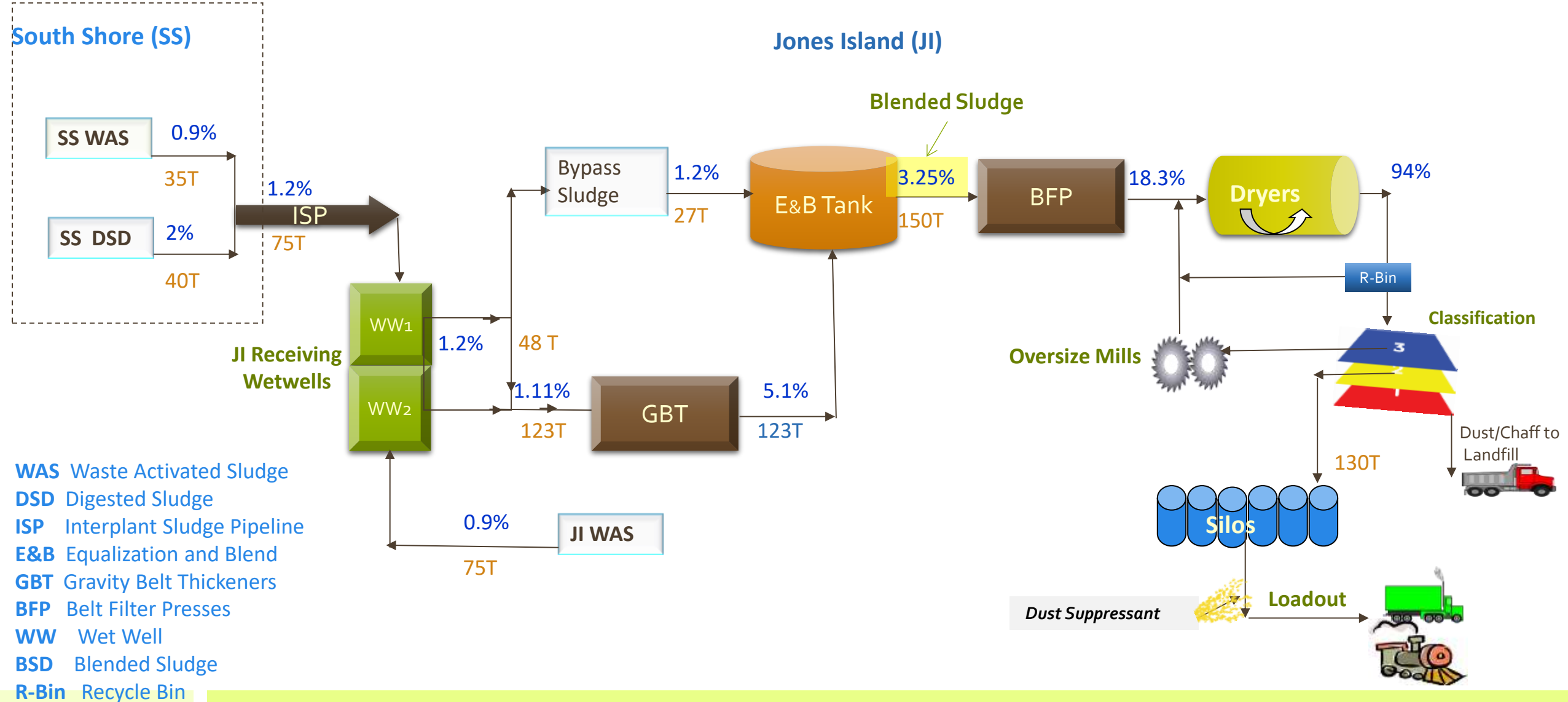
Silos and Loadout



- 14 Storage Silos and 4 Day Tank
- Capacity of each Silo = 1000 tons
- Silo Temperature Alarms = 105 HI Alarm 115 HI HI Alarm
- Empty Silos are used for Thermal Control (Nitrogen Purge for Emergency)
- Silos used to store and hold product until WPDES permit limits are confirmed
- Dust suppressant is added to Milo prior to distribution to railcars or trucks, rate 1.8 gallon/ton
- 75% to packaging, 25% to bulk orders

Typical Biosolids Process per Day

%TS and Mass (Dry tons per day)





Jones Island - Dryer and Recycle System



RCY TU1 Active

RCY TU2 Active

RCY TU3 Active

Bin 2499 °F **HI-HI**
 6.7 ton

Bin 3838 °F **HI-HI**
 1.9 ton **LO-LO**

Bin 1161 °F
 5.3 ton

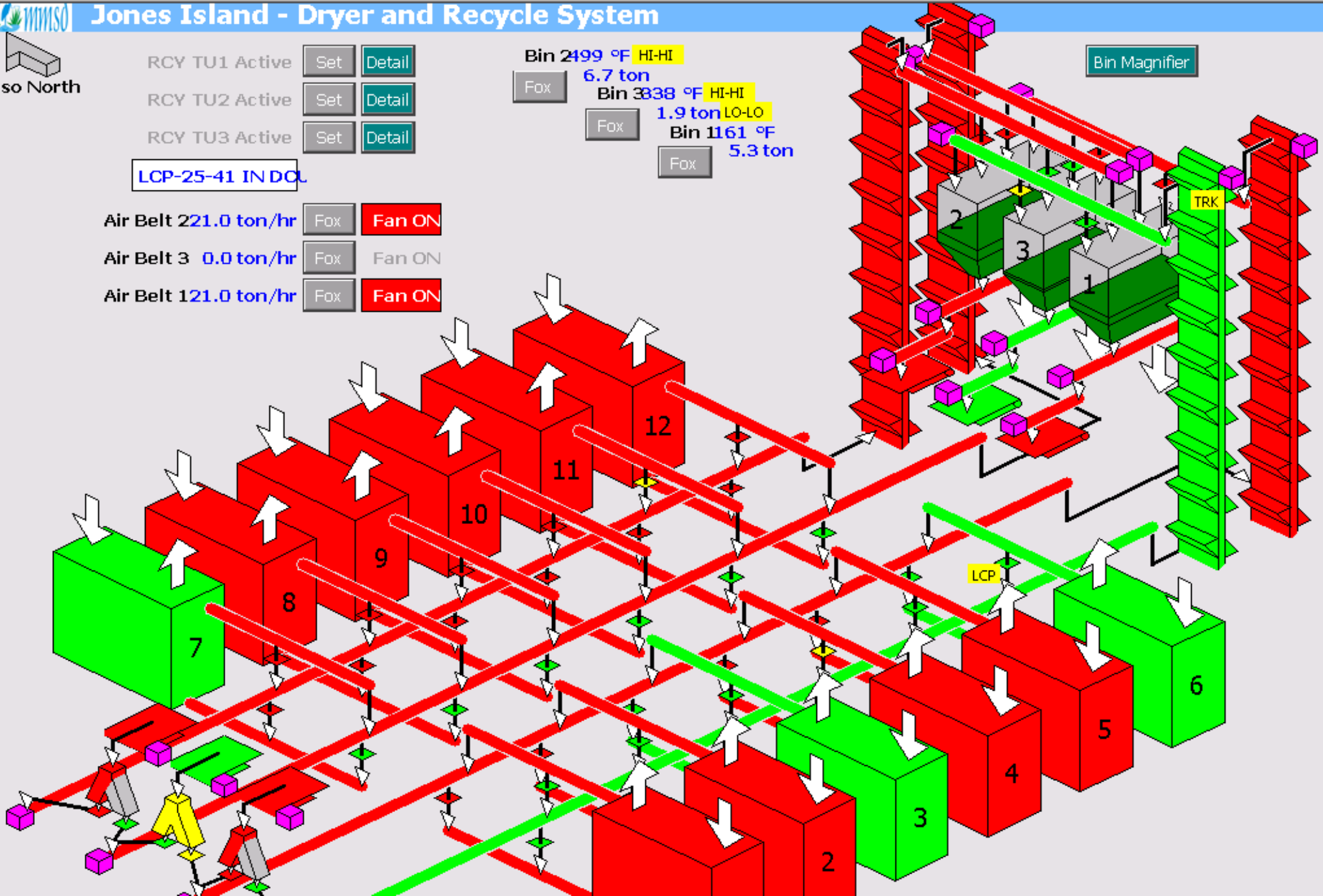
LCP-25-41 IN DCL

Air Belt 221.0 ton/hr

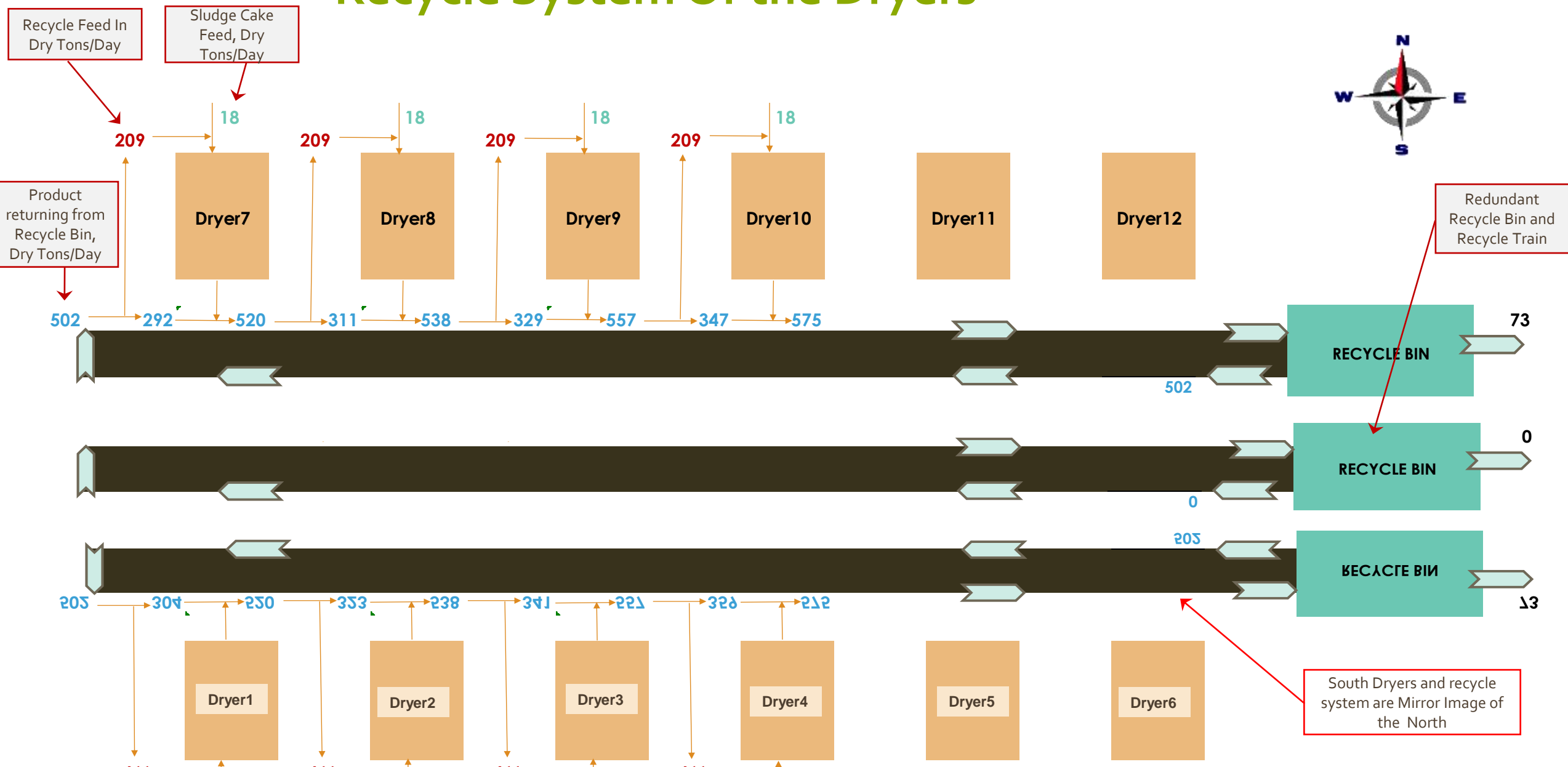
Air Belt 3 0.0 ton/hr

Air Belt 121.0 ton/hr

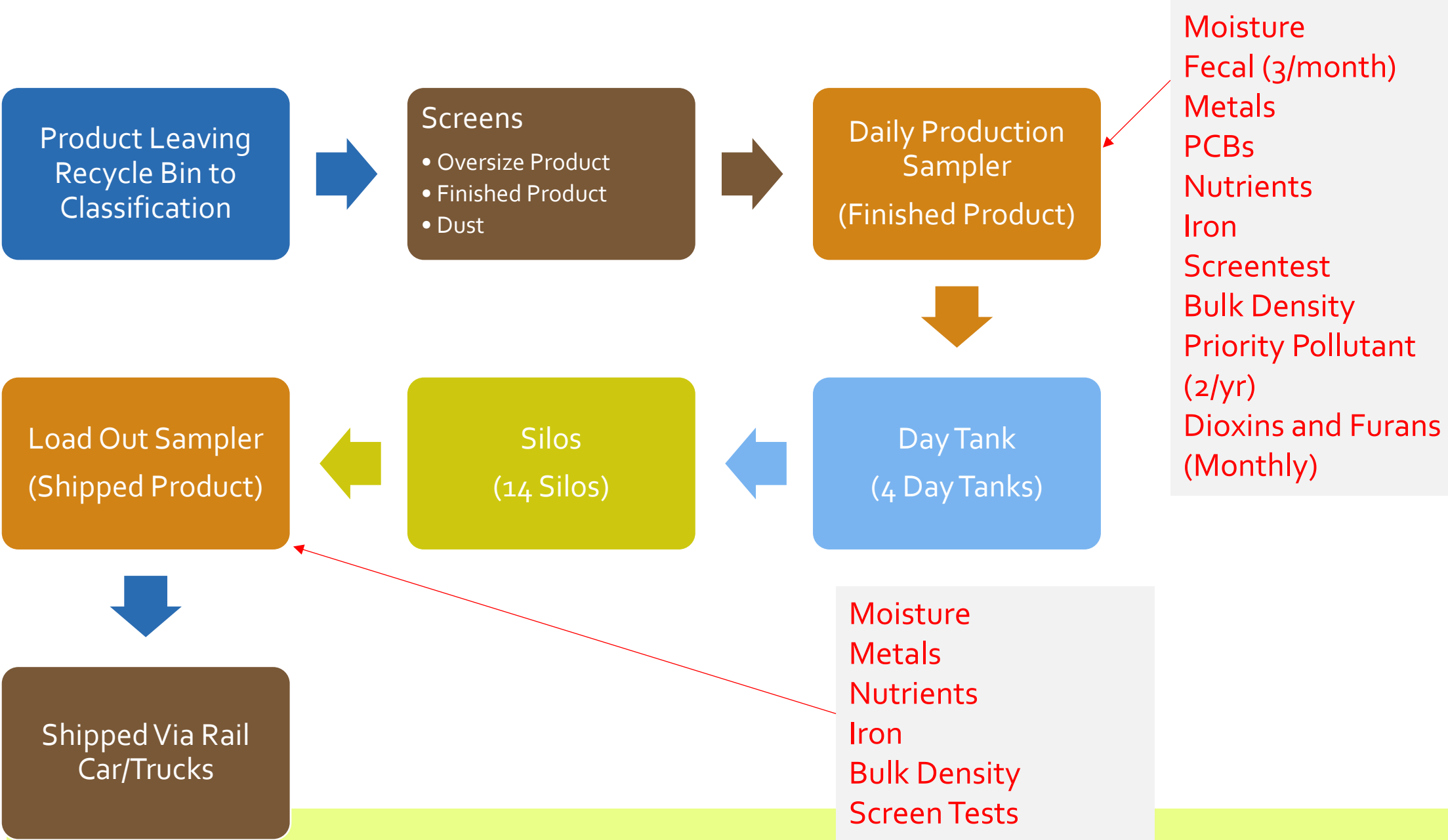
Bin Magnifier



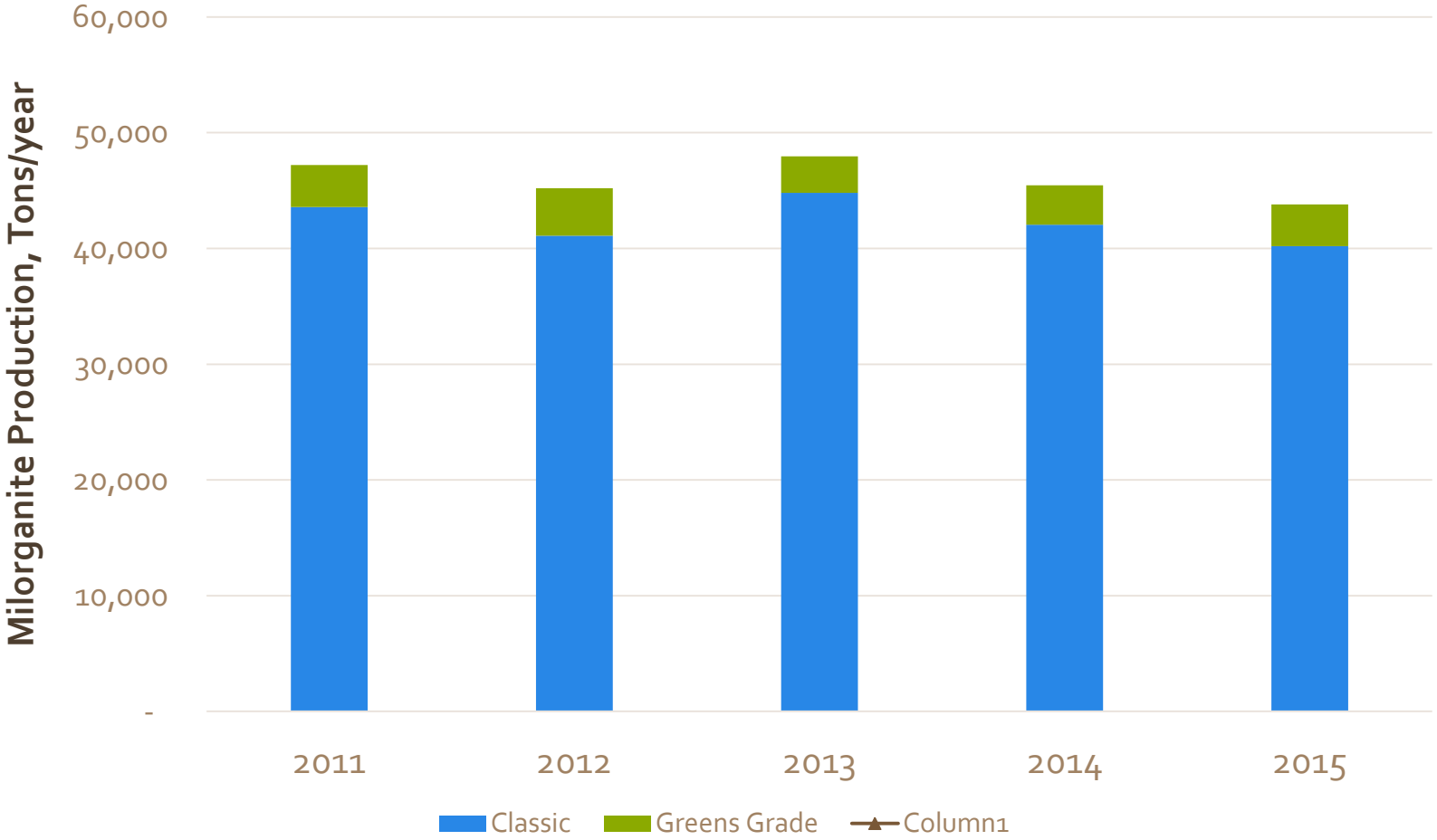
Recycle System Of the Dryers



Milorganite Process Control Sampling Locations

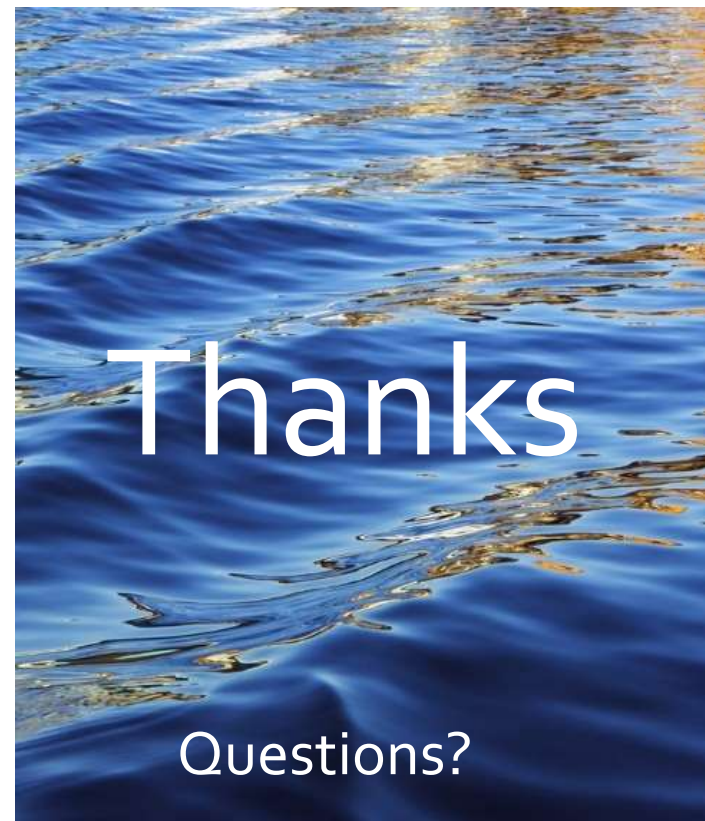


Milo Production-5 Years



Product Quality

- Nitrogen= 5-6%
- Iron = 4%
- Phosphorus=4-5%
- PCB<1 ppm
- Moisture= 5%
- Bulk Density= 52 lb/cuft
- Fecal<0.22 MPN/g TS
- Metals within WPDES limits
- Particle Size Distribution



Thanks

Questions?