

Ellsworth Bioenergy (EB)

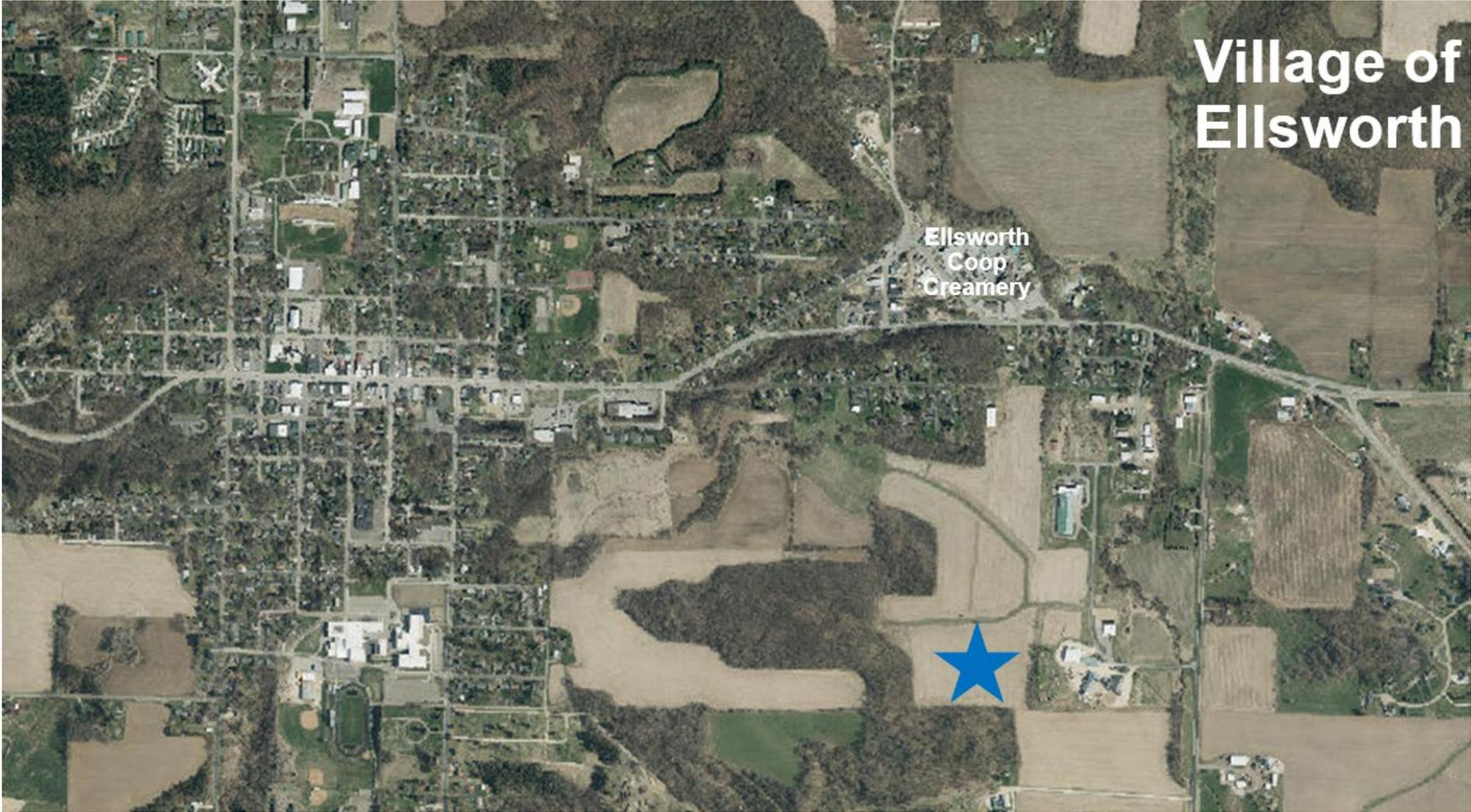
EB Team Introductions

- Emily Tweten
- Jørgen Fink (Bigadan)
- Søren Juul Jørgensen (Bigadan)
- Carin Theys (Bigadan)
- Mike McGinley (St Croix Sensory)
- Ray Davy
- Dean Doornink
- Bob Peplin

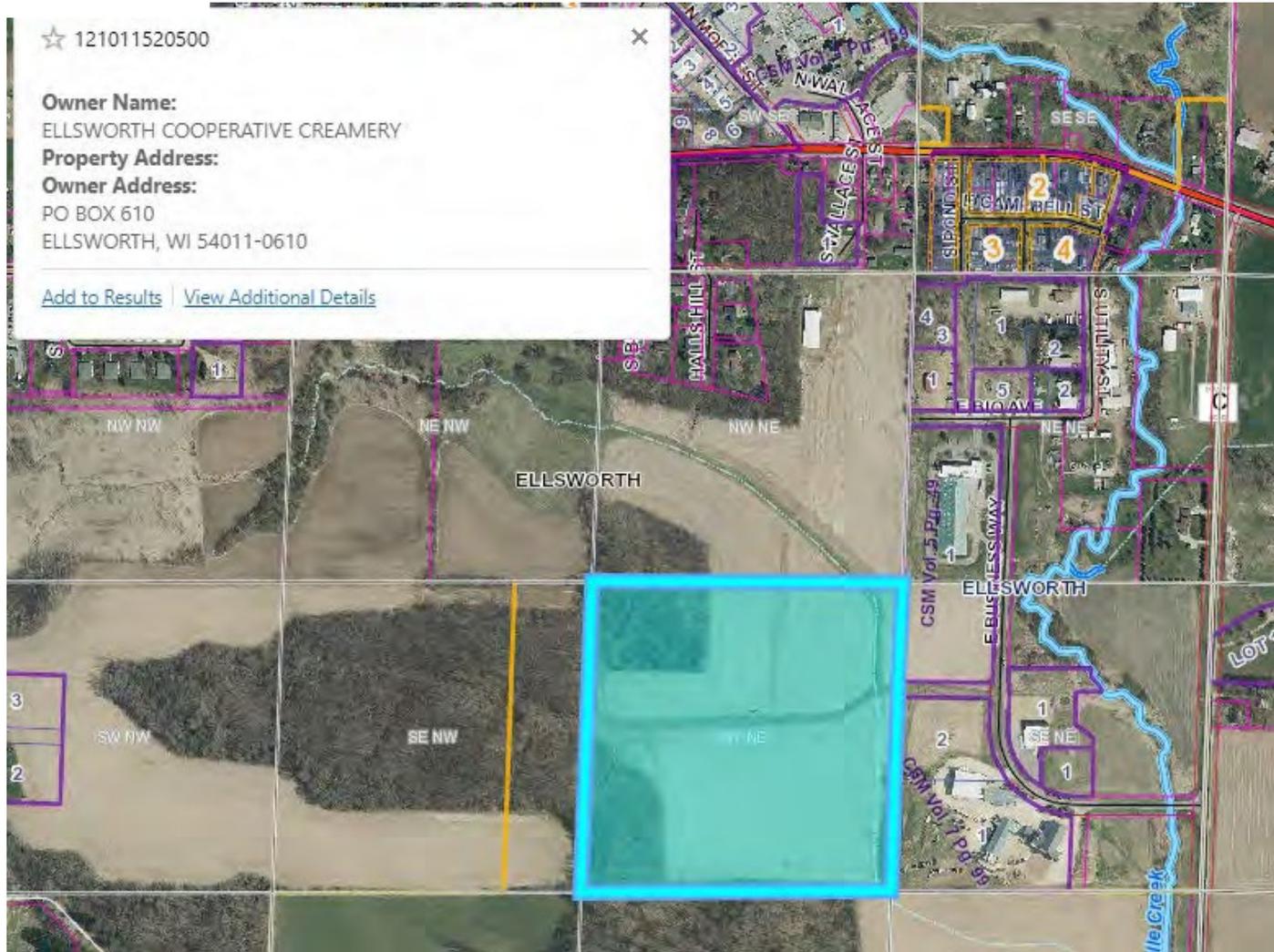




Ellsworth Site



Ellsworth Site



Bigadan & Ellsworth Bioenergy

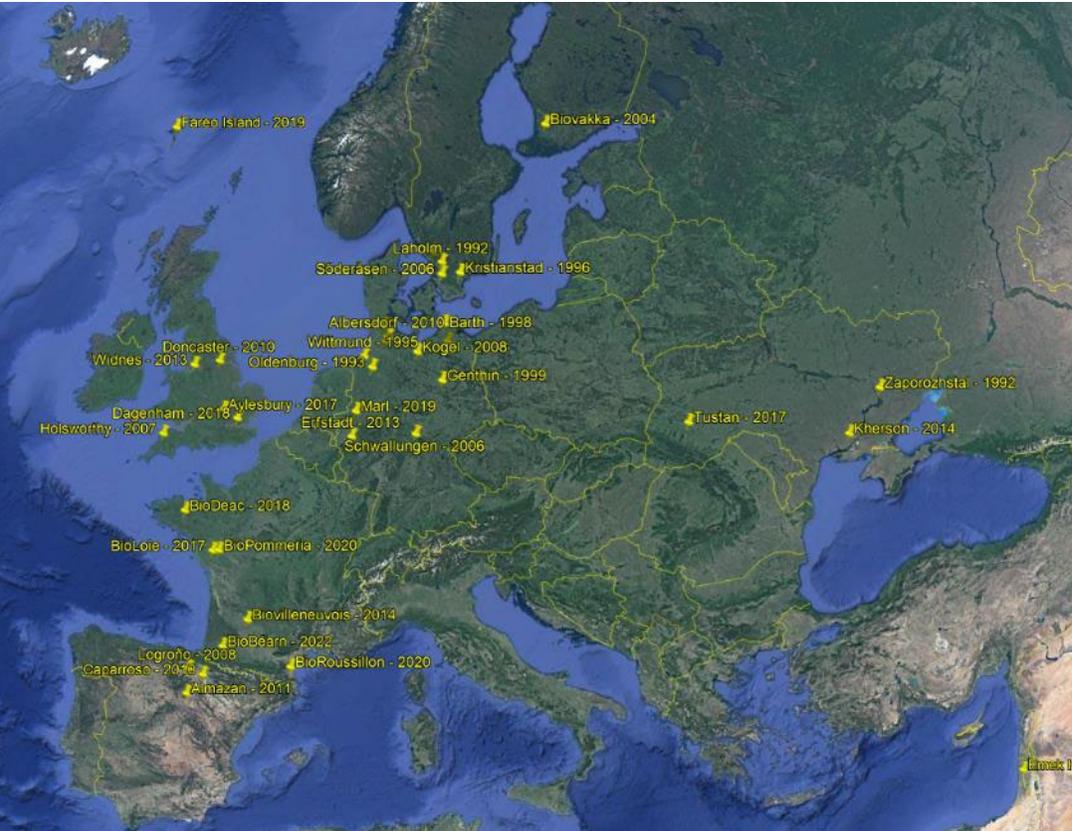


“By ensuring vital nutrients remain in circulation, together we nurture our soil for successful cultivation”

- Karsten Buchhave, Founder & Owner



Experience - Unique List of References



Bigadan owns and operates 11 biogas plants in Denmark processing 2.5 million tons of biomass per year generating 4,400,000 MMBTU with a total CO2 reduction of 600,000 tons.

40 years experience in:

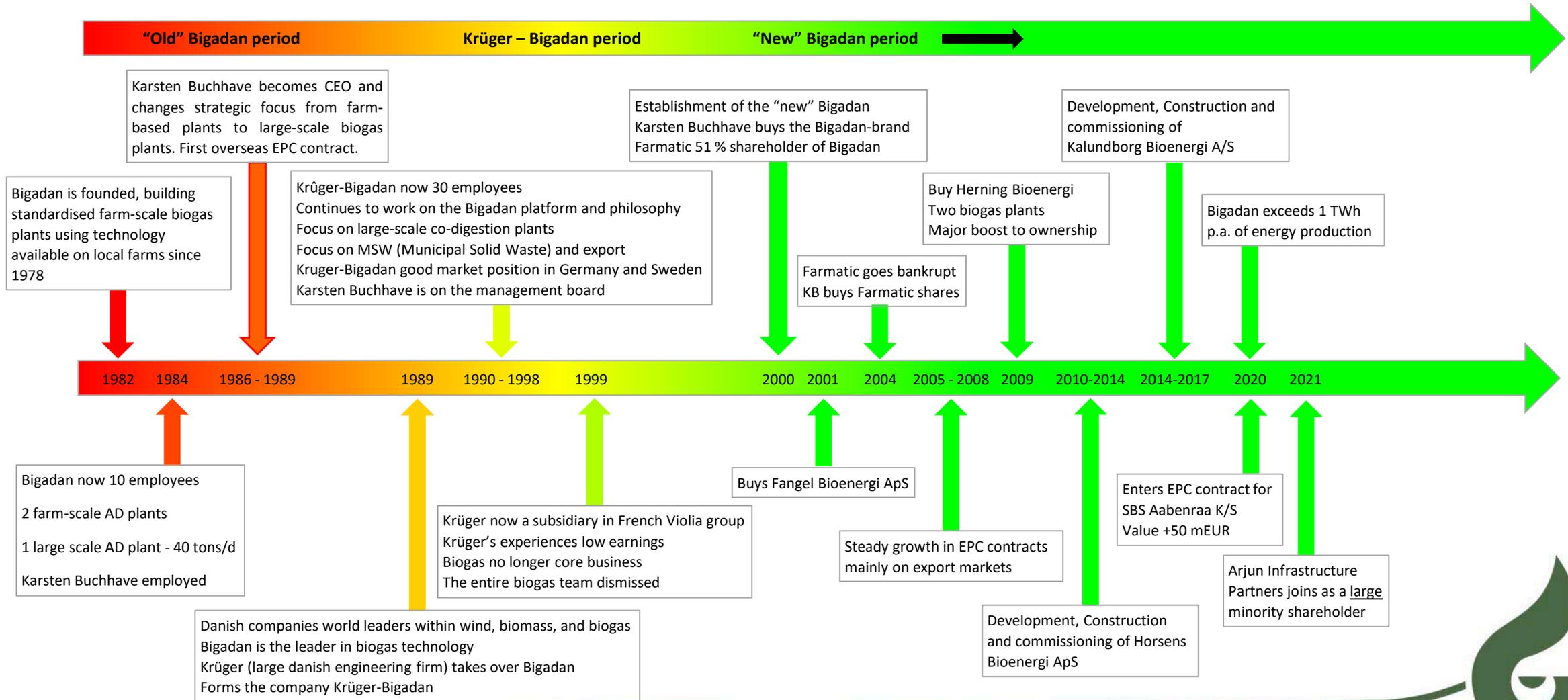
- Process design
- Plant design
- Construction
- Operation

More than 40 references worldwide

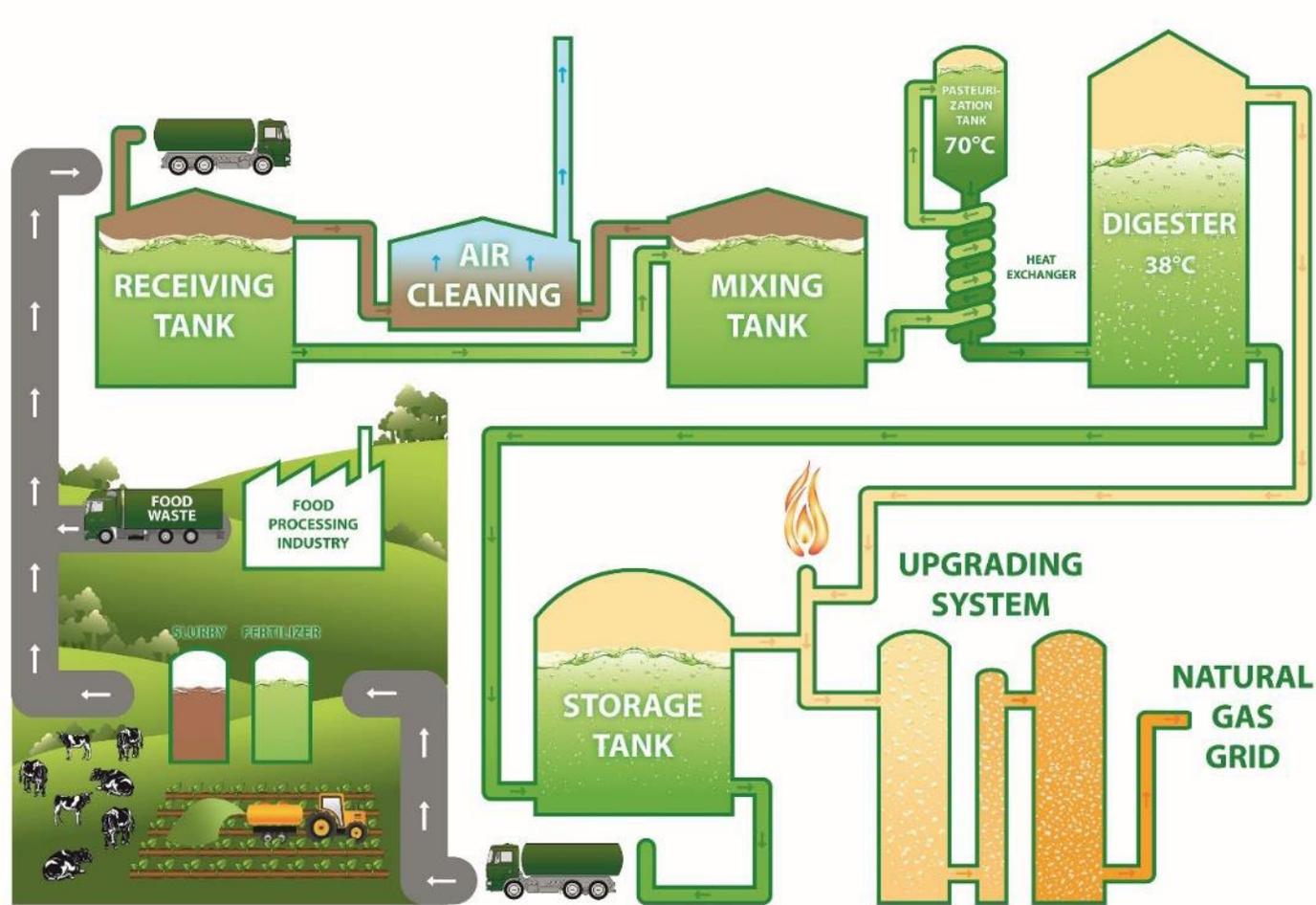
- From Finland in the **NORTH** to Israel in the **SOUTH**
- From Japan in the **EAST** to USA in the **WEST**
- References in 17 different countries



History of the Bigadan Group



Biogas System - Simplified Process Flow Diagram



Pasteurization temperature:
Min. 158 °F

Digester temperature:
~100-125 °F



Reference: Horsens Bioenergi, Denmark

- Operation August 2014 – continuous expansion
- Current Capacity: 350,000 tons/year
- Biomass: Co-digestion manure and food waste
- Biogas production: 0.25 - 0.75 million MMBTU / year – expected 1,000,000 MMBTU/yr in 2022
- Biogas utilization: Gas upgraded and injected into the natural gas pipeline and CNG sales to trucks at CNG filling station. From 2023 liquified food grade CO₂ and LNG Production



2014



2020



2022

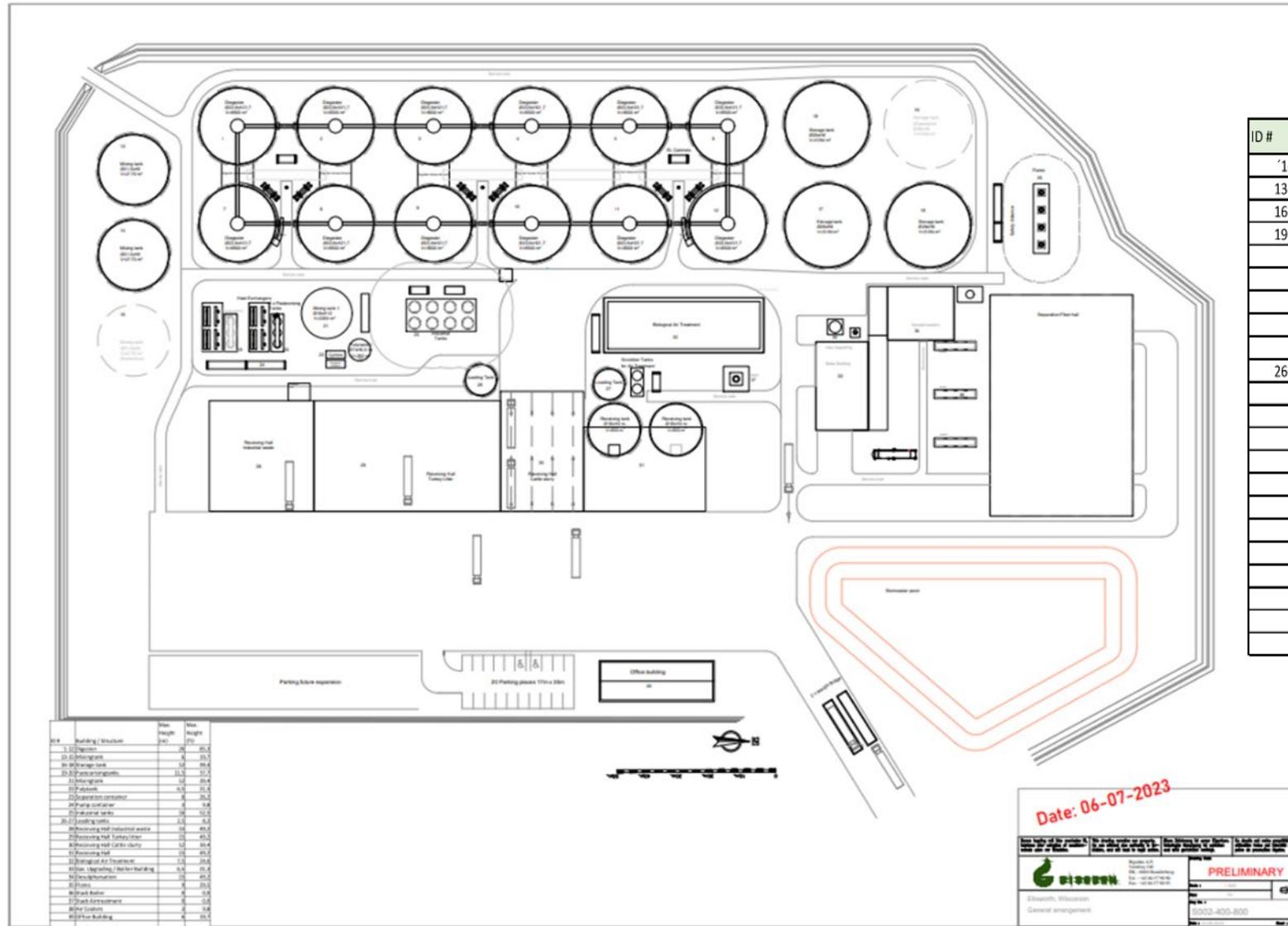


Reference: SBSA Aabenraa, Denmark

- Built in 2021-22
- Capacity: 1,000,000 tons/year
- Biomass input: Manure from dairy and hog farms, industrial organic waste from food processing industries
- Biogas capacity: ~1,400,000 MMBTU/year
- Biogas utilization:
Gas upgrading and injection into the natural gas pipeline.



Ellsworth Bioenergy



ID #	Building / Structure	Max. Height (m)	Max. Height (ft)
1-12	Digester	26	85,3
13-15	Mixingtank	6	19,7
16-18	Storage tank	12	39,4
19-20	Pasteurisingtanks	11,5	37,7
21	Mixingtank	12	39,4
22	Pultank	6,5	21,3
23	Separation container	8	26,2
24	Pump container	3	9,8
25	Industrial tanks	16	52,5
26-27	Loading tanks	2,5	8,2
28	Receiving Hall Industrial waste	15	49,2
29	Receiving Hall Turkey litter	15	49,2
30	Receiving Hall Cattle slurry	12	39,4
31	Receiving Hall	15	49,2
32	Biological Air Treatment	7,5	24,6
33	Gas Upgrading / Boiler Building	6,5	21,3
34	Desulphuration	15	49,2
35	Flares	9	29,5
36	Stack Boiler	0	0,0
37	Stack Airtreatment	55 - 65	180 - 213
38	Air Coolers	3	9,8
39	Office Building	6	19,7

Date: 06-07-2023

PRELIMINARY

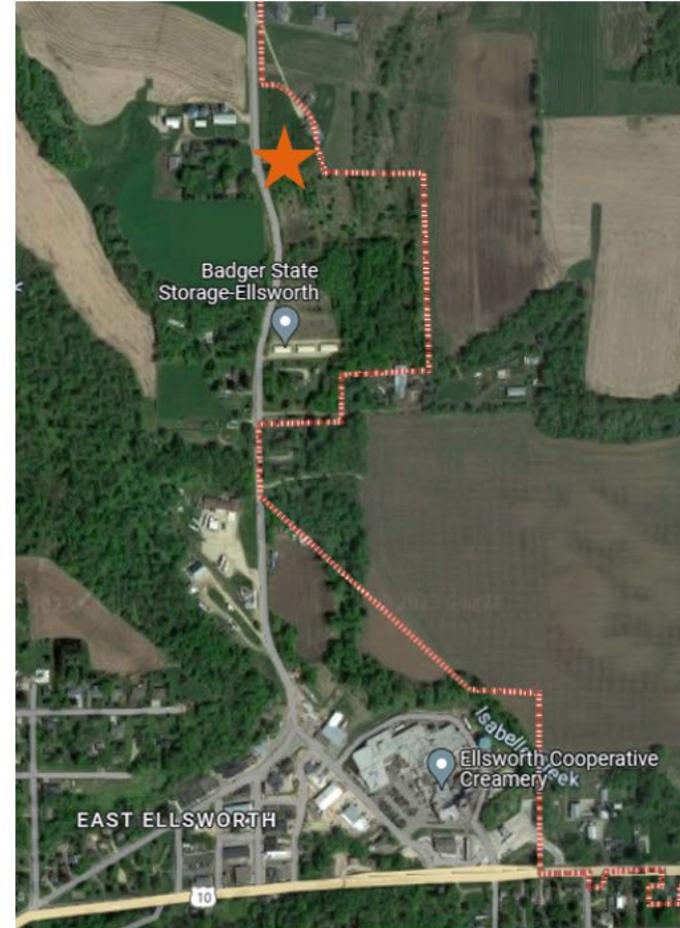
Ellsworth, Wisconsin
General arrangement

1800-400-800





**Northern Natural Gas
Town Border Station
(TBS)**



Odor Evaluation

Engineering Design for Management of Odors

- Maintain negative pressure within all buildings to create inward airflow
- All tanks are covered
- Biofilters/Carbon filtration
- Air Dispersion Modeling (WiDNR requirement)

Community Odor Plan for Ellsworth will initially include an Odor Assessment Report, setting a “base-line” for existing sources of odor and odor characteristics.

Include an initial education session to provide some general education about odor science, measurement, and community survey management.



Community Odor Plan

- Objectives:
 - Documenting existing odor in community
 - Documenting odors after construction
 - Implement process for ongoing odor complaint response
- Measure odors with Nasal Ranger field olfactometer
- Measure odors within the community on a weekly basis
 - Varied schedule (daytime, evening, weekend) over all 4 seasons
- Field team comprised of UWRF students
 - Trained and tested for odor sensitivity
 - Periodic auditing and oversight by Trinity Consultants/St. Croix Sensory

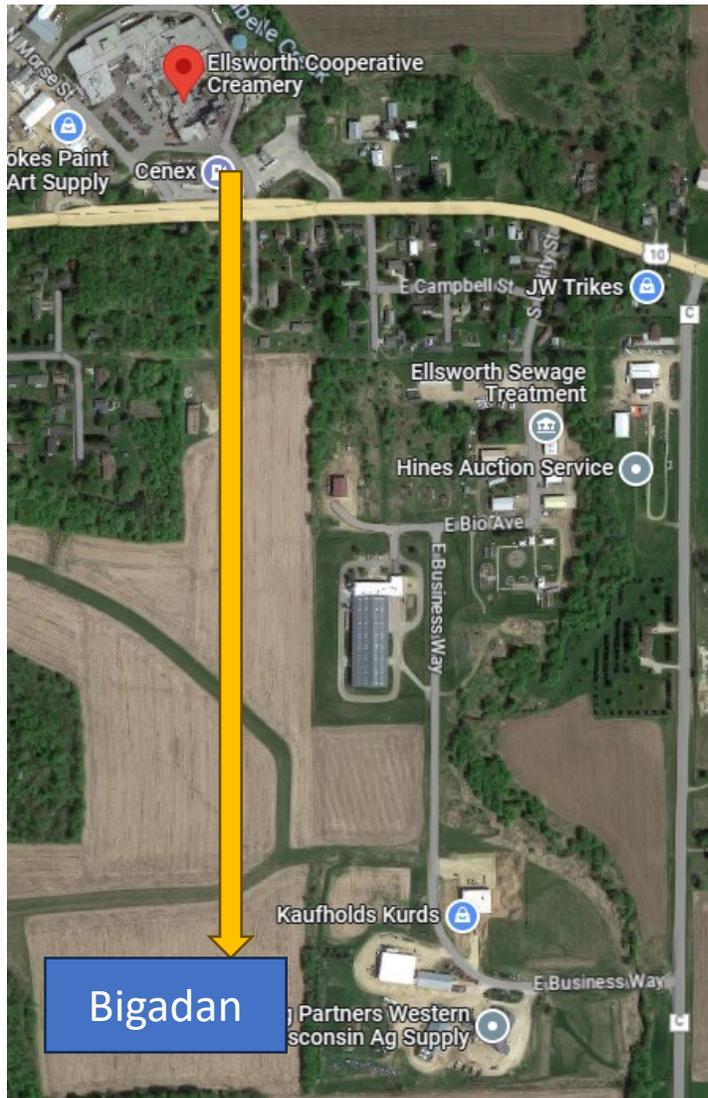


Community Odor Survey Experience

- Trinity Consultants and St. Croix Sensory are experienced at leading and managing objective community odor surveys
- Local community odor survey experiences
 - South St. Paul
 - Cannon Falls
 - Hennepin Energy Recovery Center



Odor Improvements from ECC



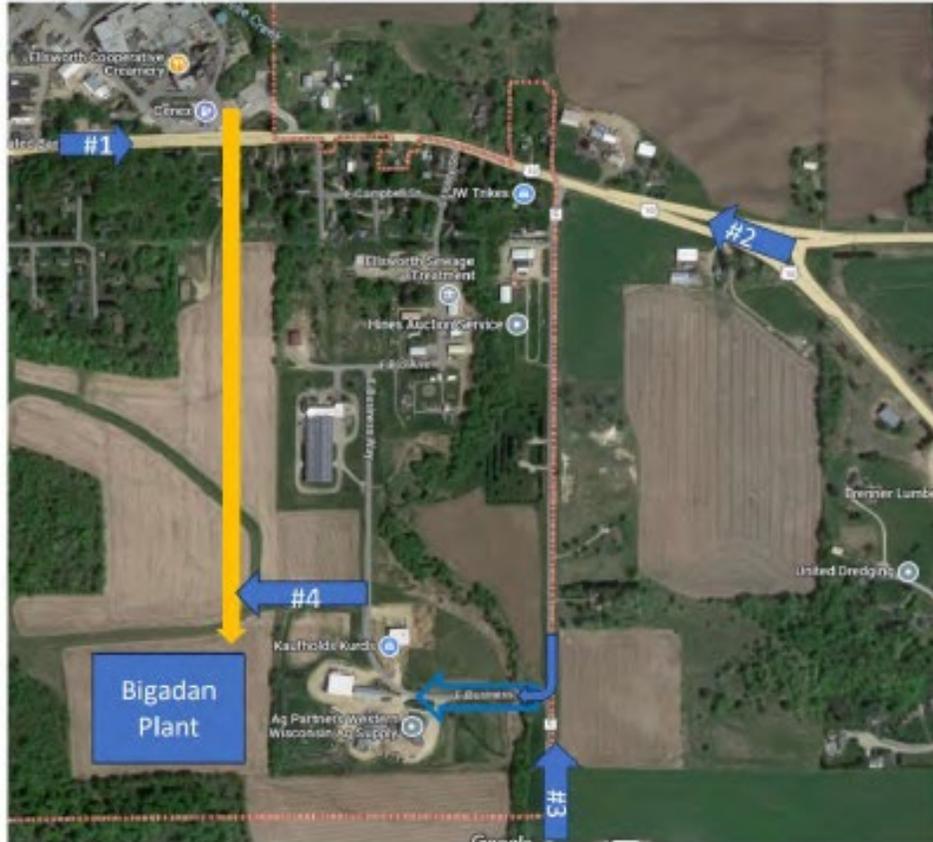
Pumped High
Strength
Flow from
ECC directly
to Bigadan

Odor Improvements from ECC:

1. Avoid truck loading operations to Viresco (Turtle Lake)
2. Instrumentation to divert high strength wastewater currently being treated in ECC's existing aerobic plant to Bigadan. Aerobic wwtp loading/odor potential greatly reduced



Traffic Patterns



Pumped high strength waste from ECC

Route-#1 Dairy (West)

Non-Posted: 5-9 trucks/day
Posted (6 wk): 25 trucks/day

Turkey Litter (West)
Non-Posted: 0 trucks/day
Posted (6 wk): 25 trucks/day

Routes #2 & #3

Dairy (East/South)
65-80 trucks/day

Turkey Litter (South)
0-25 trucks/day

JOT DAF Solids (East/North)
4 trucks/day

Food Processing (East)
25 trucks/day

Route-#4

Total
150 trucks/day (Incoming)
150 trucks/day (Outgoing)

*Streetsblog.org – 7,000-10,000
vehicles/day on Hwy 10 through the
Village*

Closing

Thank You

Q&A



Contact



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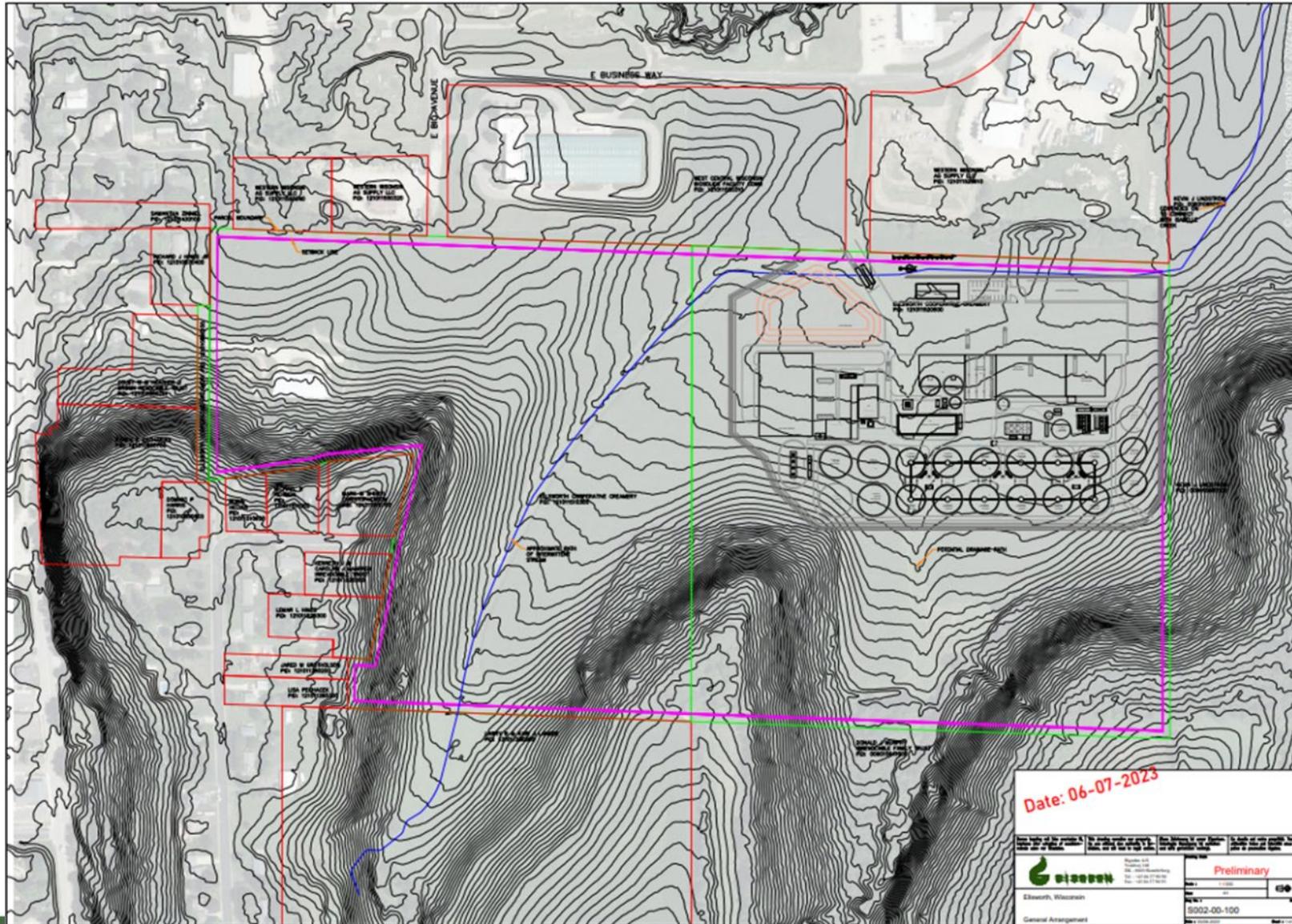
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Ellsworth Bioenergy





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<p>Bigdan 2500 - Aubenas Site Overview</p>	<p>Project: A1 Location: 2500 - Aubenas Date: 01/10/2010 www.bigdan.com</p>	<p>Drawing No: A1 (59-0015 rev)</p>	<p>Released</p> <p>2500-400-000</p>



Other Impacts

- The operation of EB would require approximately 8 million gallons per year (25- 75 gpm) of combined onsite rainfall collection and potable water to support the entire digestion process to become part of bio-fertilizer delivered to farms. No process discharge to the Village wwtp.
- Wastewater to Village's wwtp is domestic strength concentrations will be approximately 180,000 gallons per year, or less than 500 gallons per day, including shower facilities (Based on approximately 10 employee).
- Noise:
 - Truck traffic - Deliveries occurring primarily Monday – Friday: 6 am to 6 pm; Saturday: 8 am – 2 pm
 - Truck queueing not allowed
 - Process – Noise from slow speed digester's mixer & fan motors.



— Odor Management Plan

- Formal process to document odor complaints from Ellsworth citizens
- Bigadan is dedicated to practicing required guidelines in odor management planning to ensure sustainability.
- The Bigadan (EB) Odor Management Plan expresses its commitment to meet applicable State and local standards related to odor management planning and the development of a plant site specific odor control survey, prior to the plant's operation, that will help define discernable odors.

