


Davenport Compost Facility Odor Control Improvements

By

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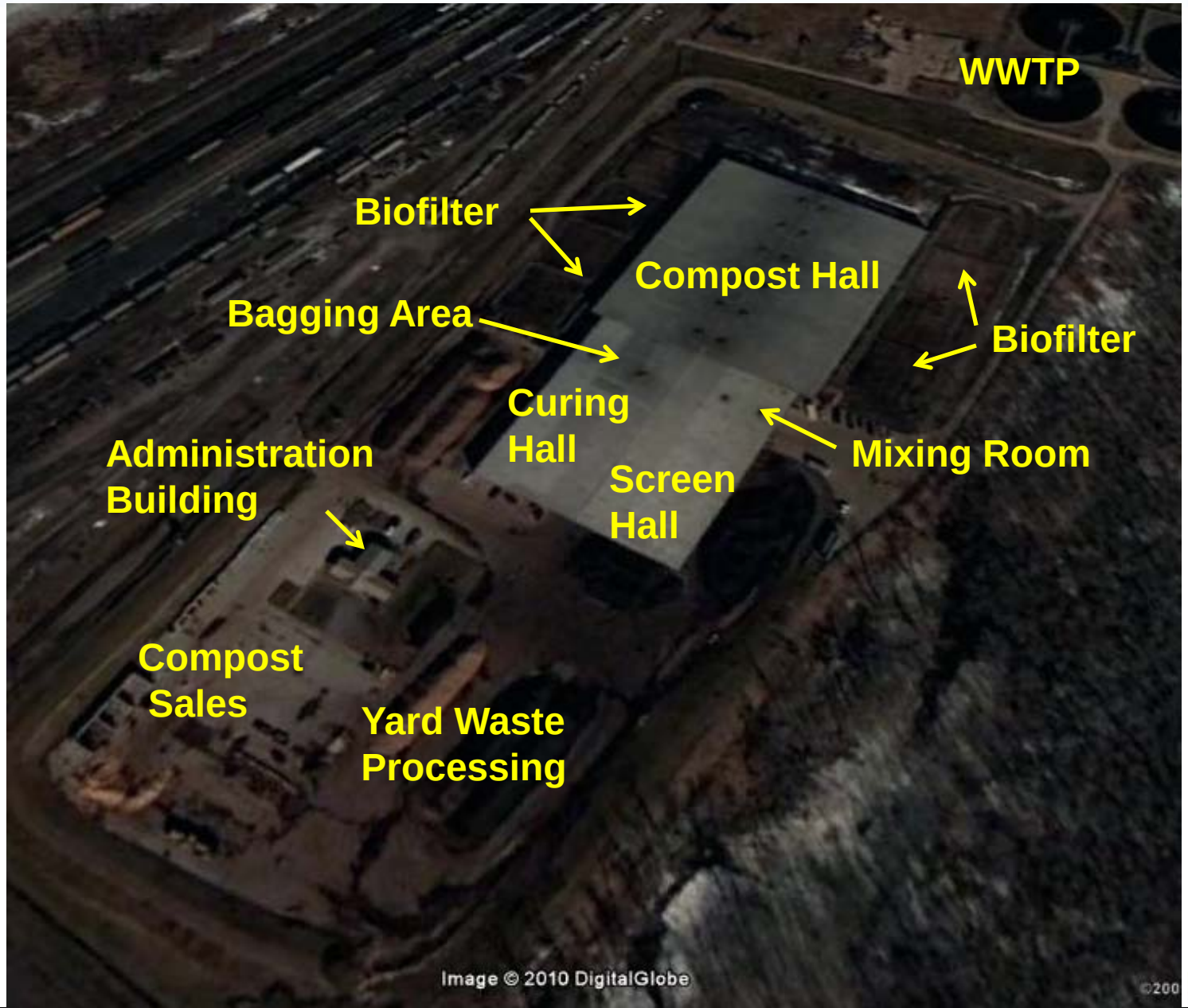
Davenport, Iowa
Composting Facility Overview

- Totally Enclosed Aerated Static Pile Composting
- Began Full Scale Operations in 1995
- Belt Filter Press Dewatering Digested Solids
- Average 16-18% Cake Solids
- 140 TPD Biosolids Capacity, 5 days per week
- Bulking Agents are Wood Chips, Shredded Brush and Shredded Tires
- Continuous Feed Mixing System
- Aeration Trench System
- Odor Control Biofilter System
- Capital Cost ~$8.7 Million in 1995

Davenport Compost Facility Key Features



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Totally Enclosed ASP Facility

Odor Control with Biofiltration

- 210,000 CFM Capacity
- 90% Odor Removal
- 8 Biofilter Cells

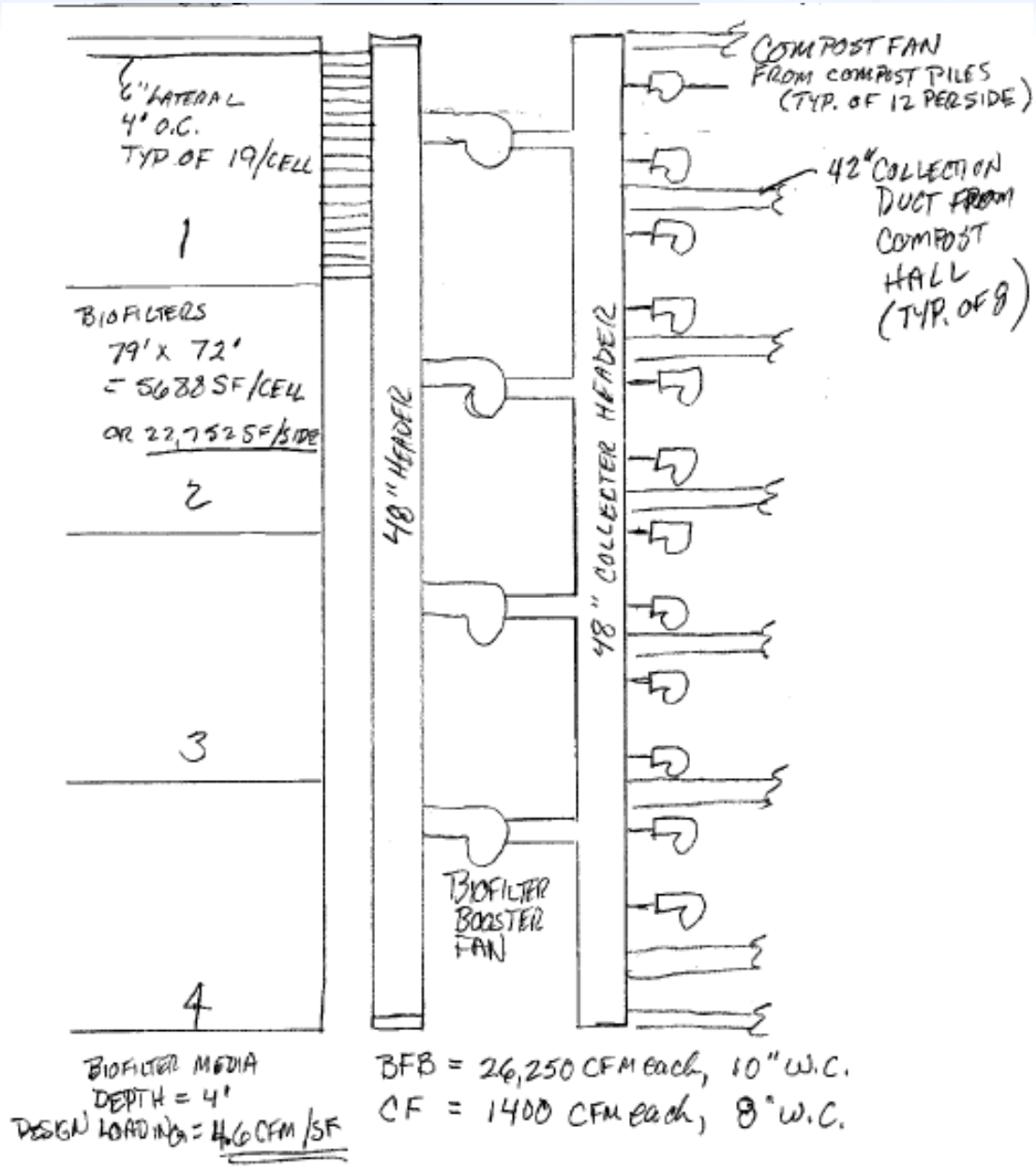
Davenport Composting Facility
Key Features of Success

- Enclosed with Odor Treatment Through Biofilters
- No Odor Complaints Since Start-Up in 1995
- In-floor Aeration System
- Ongoing Facility Maintenance/Upgrades

Goals of the Biofilter Odor Control System Upgrade Evaluation

- Scope was to evaluate alternatives outside the compost hall to the biofilter
- Evaluate alternatives for biofilter aeration plenum design
  - Better airflow distribution
  - More rapid media change-out
- Identify alternative media types
- Eliminate earthen berms between cells
- Reduce overall biofilter system footprint
- Evaluate repairs of main biofilter supply headers
- Evaluate life cycle costs of alternatives
- Provide recommendations

Schematic Sketch of Half of Existing System



Davenport Biofilter Maintenance Issues

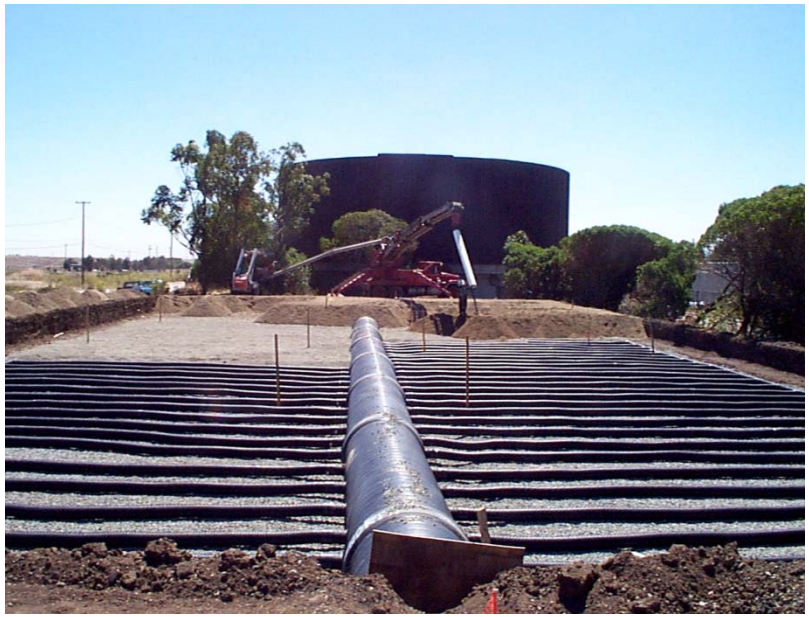
- Large system
  - Difficult to service, machinery access on the biofilter air distribution plenum
- Media change outs
  - Frequency
- Rock support base cementing
- Dust from compost building filling and weighting down air ducts
- Leaks in air headers
- Availability of wood chip media

Biofilter Improvements Options Evaluated

1. Existing biofilter with organic media
2. Manufactured floor with organic media
3. Manufactured floor with engineered inorganic media
4. Manufactured floor with lava rock media
5. HDPE pipe in concrete with organic media
6. HDPE pipe in concrete with lava rock media
7. HDPE pipe with risers and grates

Pipe in Gravel with Organic Media (Existing)

- Simplest approach is a piping system with rock fill
  - Similar to current system used at Davenport
- Issues with media change-out and plugging of stone plenum



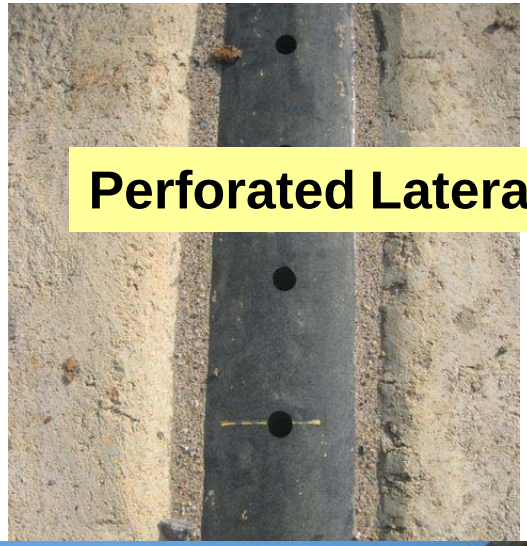
Manufactured Flooring Systems

Inland Empire Regional Composting Facility Installation

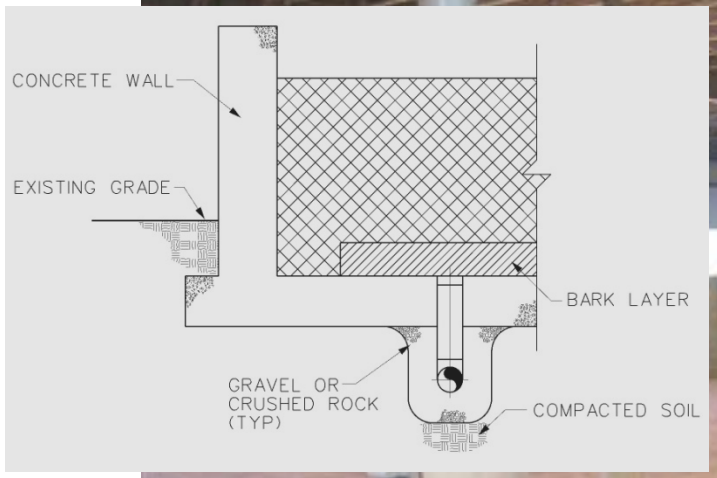
Manufactured Flooring

- Easy to install
- Corrosion Resistant
- Designed to withstand loader traffic
- Air pressure loss is minimal
- Concrete Trenches
- Costly
- Can be damaged during media change out

HDPE pipe in concrete



Aeration Floor Riser/Grate System



Other Media Options

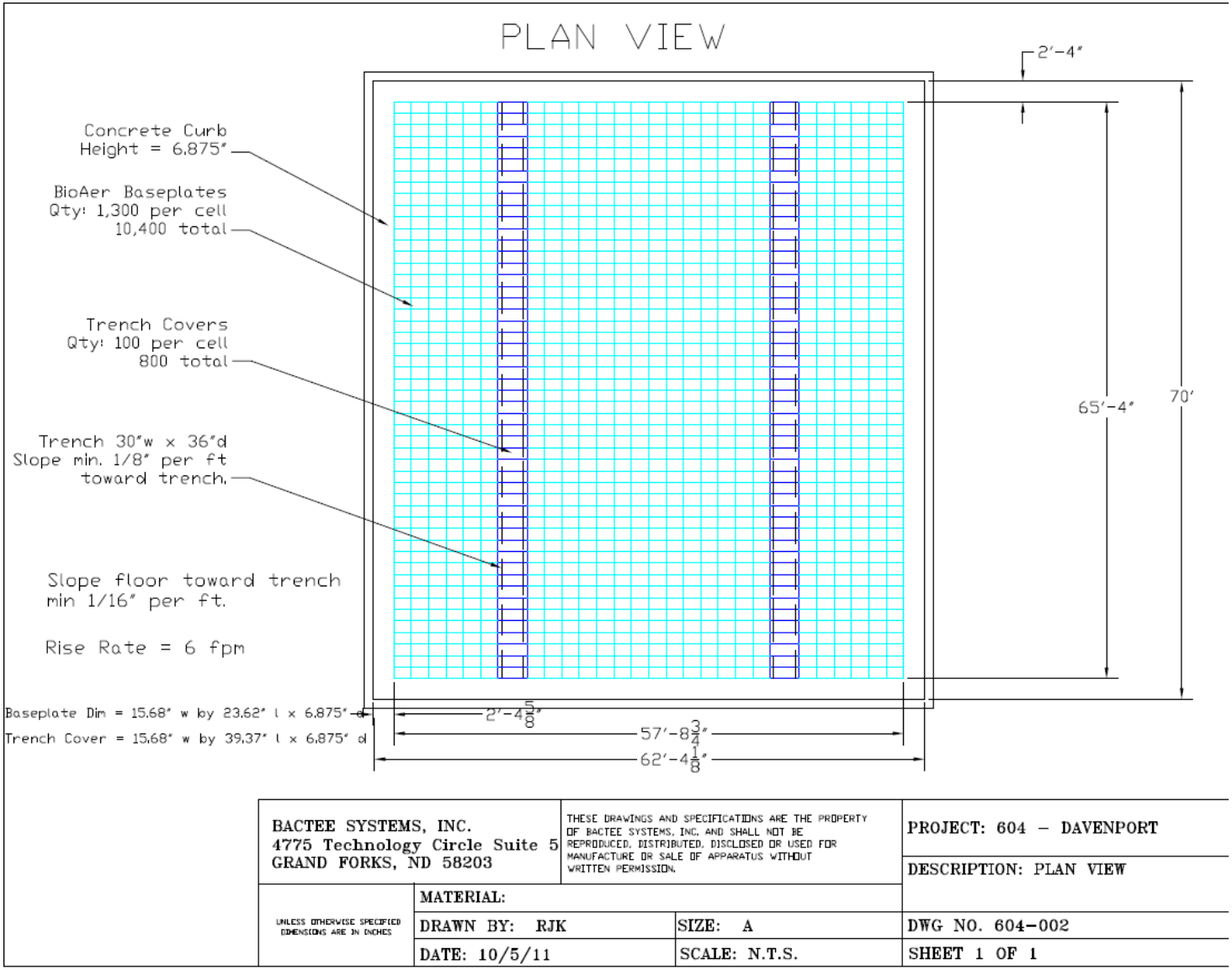
- “Inert media”
- Proprietary mineral based media
- 10 year prorated guarantee
- Additives
  - organics
  - nitrogen
  - potassium
  - phosphorous
  - carbon

Bark/Mulch versus Vendor Manufactured Media

- **Bark Mulch**
  - Need 60 seconds contact time
  - Media has to be replaced about every 2-3 years
  - Tends to have residual musty odor
  - Source quality control is more difficult
  - Not as forgiving

- **Vendor Manufactured Media**
  - Lower contact time and smaller footprint
  - Media guaranteed for 10 years
  - Lower residual odor
  - Limited vendors and more costly
    - Biorem

Bactee Proposal Organic Media Cell



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Biofiltration Options Analyzed

Option	Description of Option
1. Keep the existing filter.	Keep the existing filter and replace the media and rubber tire plenum support as necessary (every 4 to 5 years).
2. BacTee with organic media.	Demolish the existing biofilter, and install a new media support (BacTee) and organic media biofilter.
3. BacTee with engineered inorganic media.	Demolish the existing biofilter, and install a new media support (BacTee) and inorganic media biofilter.
4. BacTee with lava rock media.	Demolish the existing biofilter, and install a new media support (BacTee) and lava rock media biofilter.
5. HDPE pipe in concrete with organic media.	Demolish the existing biofilter, and install a new media support of HDPE pipe in concrete slab with holes drilled in crown of laterals and organic media biofilter.
6. HDPE pipe in concrete with lava rock media.	Demolish the existing biofilter, and install a new media support of HDPE pipe in concrete slab with holes drilled in crown of laterals and lava rock media biofilter.
7. Risers and grates in concrete with organic media.	Demolish the existing biofilter, and install a new media support of risers with stainless steel grates connected to HDPE pipe beneath concrete slab and organic media biofilter

Biofiltration Options Design Criteria Used

Option Number	Airflow (ft^3/min)	Loading Rate ($ft^3/min/ft^2$)	Media Depth (ft)	Nominal Gas Residence Time (sec)	Assumed Head Loss (inches W.C.)	Biofilter Media Volume (yd^3)	Biofilter Footprint (ft^2)
1	210,000	4.5	4.5	60	8	7,778	46,667
2	210,000	6	6.0	60	6	7,778	35,000
3	210,000	12	7.0	35	7	4,537	17,500
4	210,000	6	6.0	60	6	7,778	35,000
5	210,000	6	6.0	60	7	7,778	35,000
6	210,000	6	6.0	60	7	7,778	35,000
7	210,000	6	6.0	60	10	7,778	35,000

1. Keep the existing biofilter
2. BacTee with organic media
3. BacTee with inorganic media
4. BacTee with lava rock media
5. HDPE pipe in concrete with organic media
6. HDPE pipe in concrete with lava rock media
7. HDPE pipe risers and grates in concrete with organic media

Cost Summary of Options Analyzed

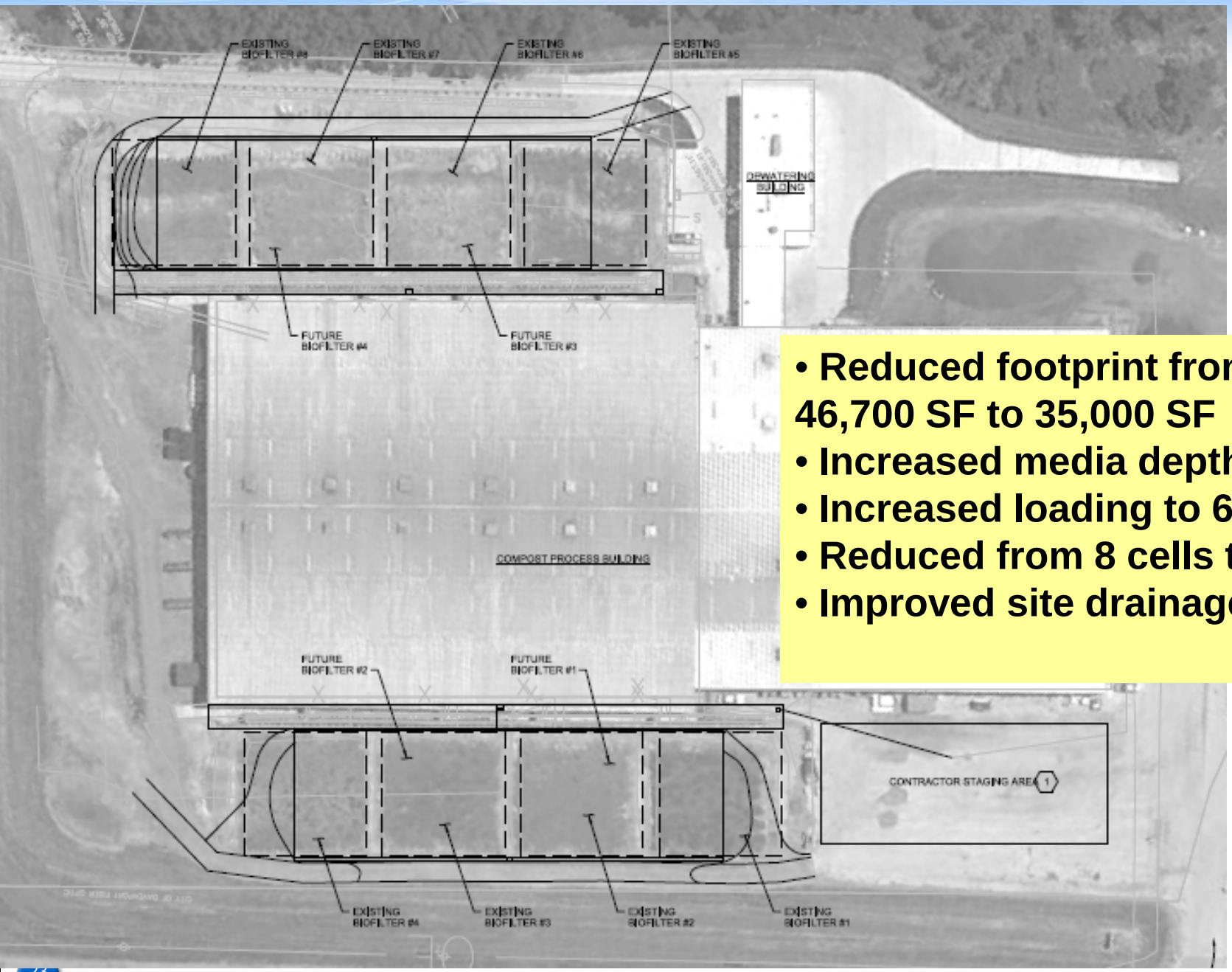
Option	Capital Cost	Annual O&M Cost	Media Replacement Frequency (yr)	30-Year Present Worth
1. Keep the existing biofilter	$206,000	$213,000	4	$6,049,000
2. BacTee with organic media	$1,961,000	$161,000	4	$6,316,000
3. BacTee with inorganic media	$3,471,000	$188,000	10	$11,003,000
4. BacTee with lava rock media	$2,365,000	$161,000	10	$6,497,000
5. HDPE pipe in concrete with organic media	$2,002,000	$187,000	4	$6,840,000
6. HDPE pipe in concrete with lava rock media	$2,229,000	$187,000	10	$6,921,000
7. HDPE pipe risers and grates in concrete with organic media	$5,428,000	$266,000	4	$12,044,000

How was option selected

- Eliminated engineered media, and pipe and riser options due to high capital and life cycle costs
- Eliminated lava rock due to lack of experience
- Cost analysis indicated HDPE pipe and engineered floor system costs similar
- Toured facilities to view operations and discuss with operators
- Considered non-cost factors

Made decision to select Option 5 – HDPE Pipe in Concrete with Organic Media (could test lava rock or other inorganic media in one cell at a time)

Site Plan of New Biofilters



- **Reduced footprint from 46,700 SF to 35,000 SF**
- **Increased media depth to 6 FT**
- **Increased loading to 6 CFM/SF**
- **Reduced from 8 cells to 4**
- **Improved site drainage**

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Conclusions

- Biofiltration is still very effective at treating compost odors
- Well designed air distribution systems are crucial
- Systems that allow faster media change-out are preferred
- Although inorganic media types are improving odor removal performance, capital costs still need to decrease
- Continual improvements of compost systems is crucial to overall facility performance and long term success
- Davenport retrofit design is complete and installation will be done in phases in 2013 and 2014


Davenport Compost Facility Odor Control Improvements

QUESTIONS?

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