Minnesota Ground Water Association

April 20, 2016

Saint Paul's CHS Field

- Public-private partnership
- Brownfield redevelopment
- Sustainability focused
- *Rainwater harvesting across properties*

Partnership

Agencies

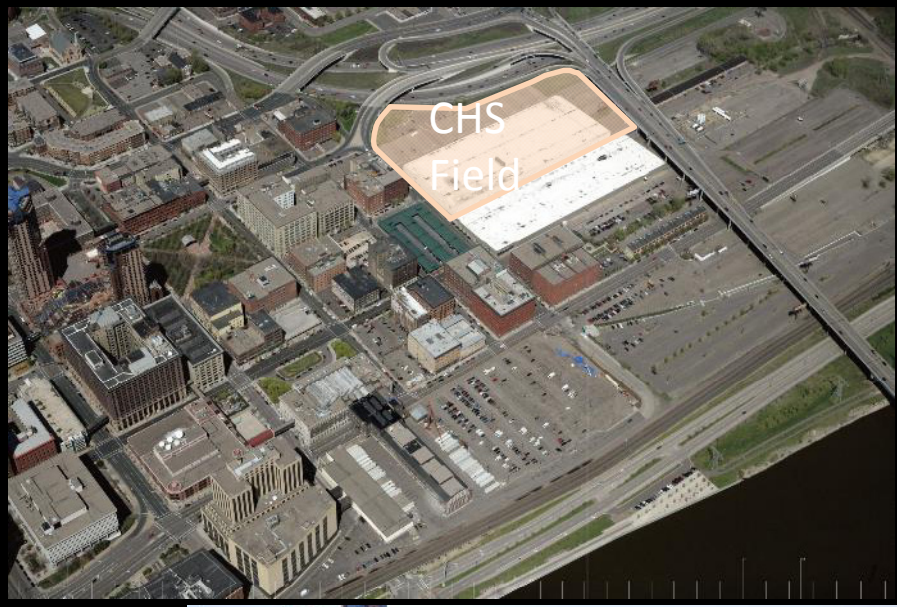
- Capitol Region WD
- Metropolitan Council
- Metro Transit

Project Team

- St. Paul Saints
- City of Saint Paul Parks and Rec.
- Ryan Companies
  - Schadegg Mechanical
  - Solution Blue, Inc.
  - Rainwater Management Solutions

Site Context

- Oldest part of city (Historic Lowertown)
- Industrial brownfield, 9 acres all impervious
- Destination site: near light rail line and Mississippi River



Ballpark Impact

- 180 events each year
  - 50+ Saints games
  - College partnership
  - Amateur baseball
  - Concerts
  - Community space
  - Rentable conference
  - Reception space
  - Movie nights
- 400,000 annual visitors
- 7,000 seats

Stormwater Regulatory Goals

Desire to exceed minimums

- Watershed District
  - Runoff rate
  - Quality (TSS)
  - Volume reduction
- City of Saint Paul
  - Runoff rate
  - Sustainable stormwater overlay
- Minnesota Sustainable Building Guidelines
  - Zero discharge for 1.25” event
  - Reduce TP
  - Reduce potable water consumption

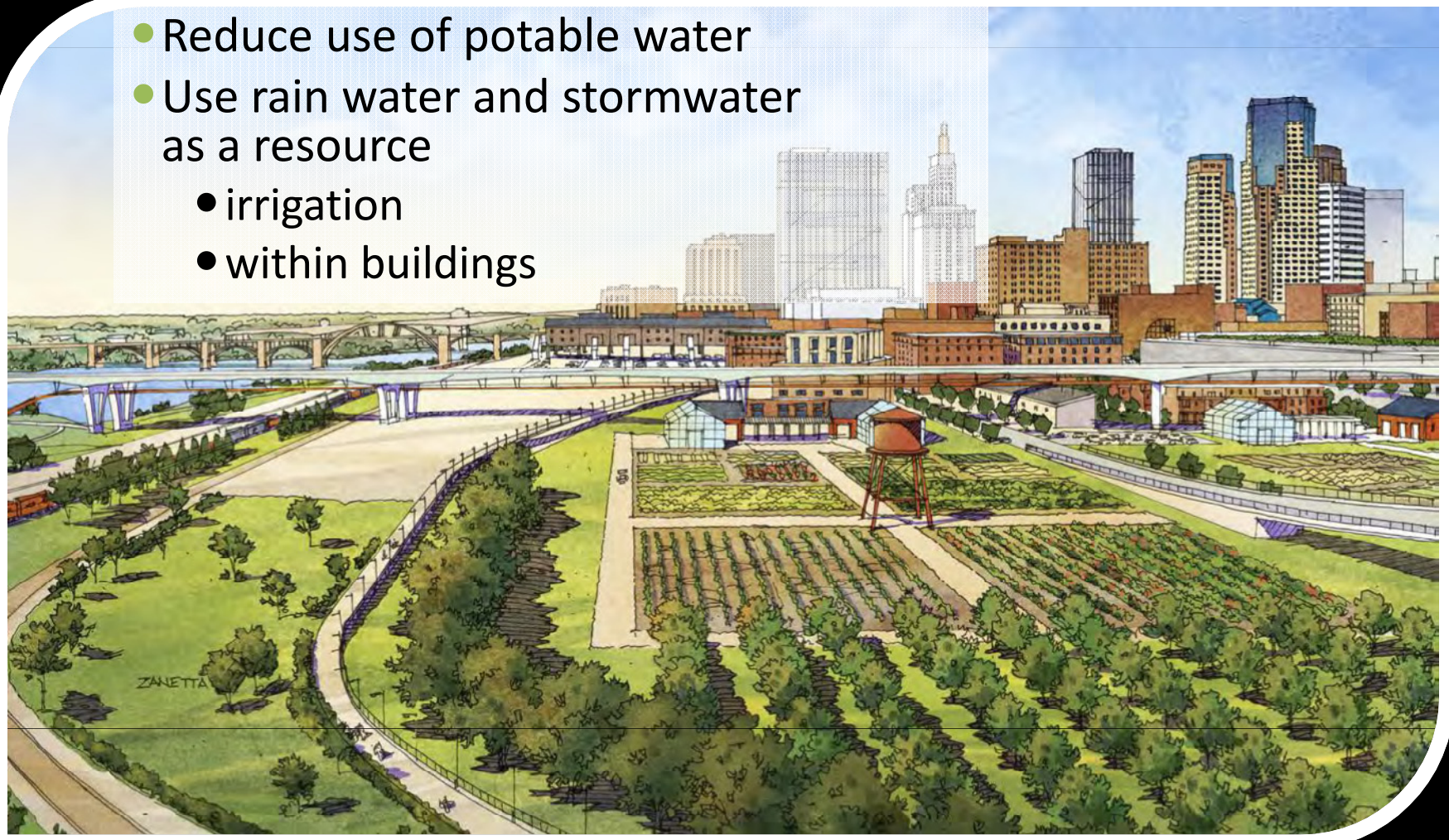
GOAL	Source	BASELINE	ENHANCED
Match existing 2 ,10 , 100-yr peak flow rates	CRWD	YES	YES
100-yr peak discharge of 1.64 cfs/acre	Saint Paul	YES, 1.64 cfs/acre	YES, less than 1.60 cfs/acre (additional retention provided by selected enhanced stormwater features)
Zero discharge from site for 1.25" event	B3	Most likely not practical because soil contamination - infiltration not allowed for majority of site.	Most likely not practical because soil contamination - infiltration not allowed for majority of site.
Infiltrate 1 inch (or filtrate 1.3 inch) off impervious surfaces	CRWD	YES, 1.3 inches of filtration	YES, 1.9 inches of filtration
90% TSS Reduction	CRWD	YES, analysis shows expected removals between 90-92%	YES, analysis shows expected removals between 92-95%
60% TP Reduction	B3	MAYBE, analysis shows expected removals between 56-62%	YES, analysis shows expected removals between 61-67%
Reduce potable water use for irrigation by 50%	B3	NO	Harvest rain from ballpark and OMF roofs to irrigate field and flush toilets. Potential to reduce water demand by 25-30%

Exceeding Standards

- 27,000 gallon rainwater harvesting cistern
- Tree trenches with Stockholm Soil
- Vegetated swale
- Rain garden in parking lot
- Underground filtration

Greater Lowertown Master Plan

- Reduce use of potable water
- Use rain water and stormwater as a resource
  - irrigation
  - within buildings



State Rules and Agencies

MN Rule Chapter 4715

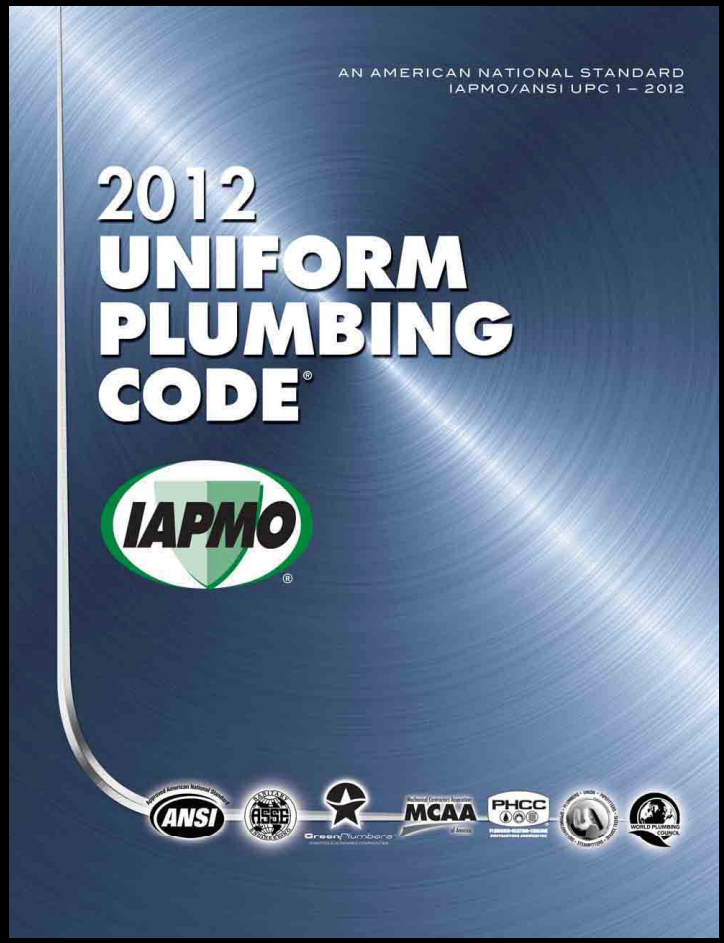
- Plumbing Code
- Department of Labor and Industry (DLI)

MN Rule Chapter 4720

- Public Water Supplies
- Department of Health

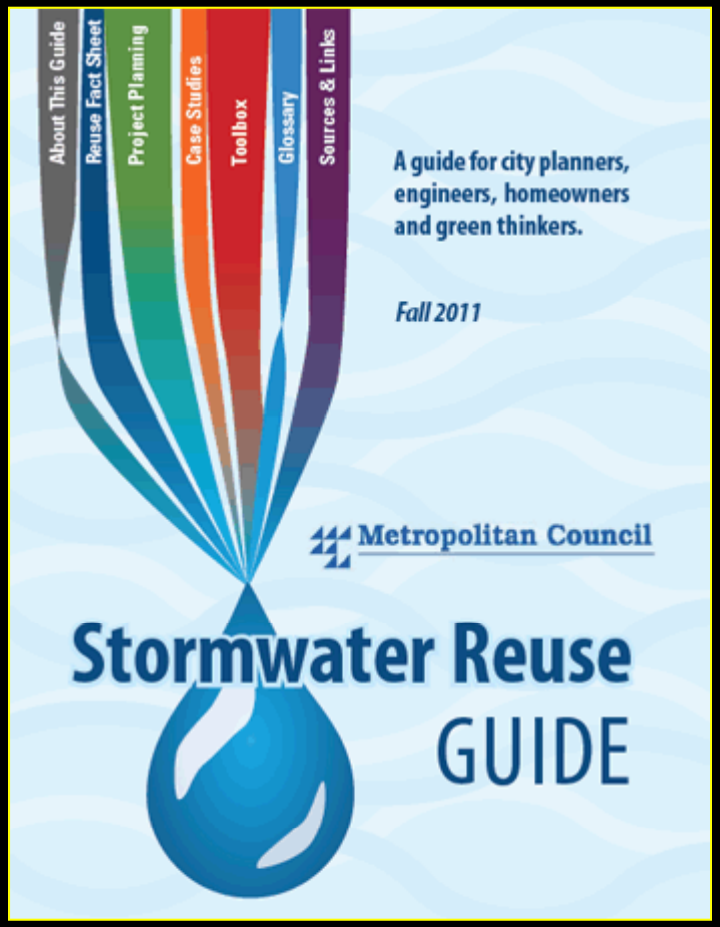
Code Considerations

- Plumbing Code
  - Silent on rainwater harvesting
  - Allows for Alternative Methods review
  - Provisions for First Class cities
- Public Water Supply
  - Treatment
  - Review



Challenges

- Lack of standards
- Multiple jurisdictions
- No defined process
- Limited agency capacity
  - Duties; authority
- Operation and maintenance oversight
- Water economics



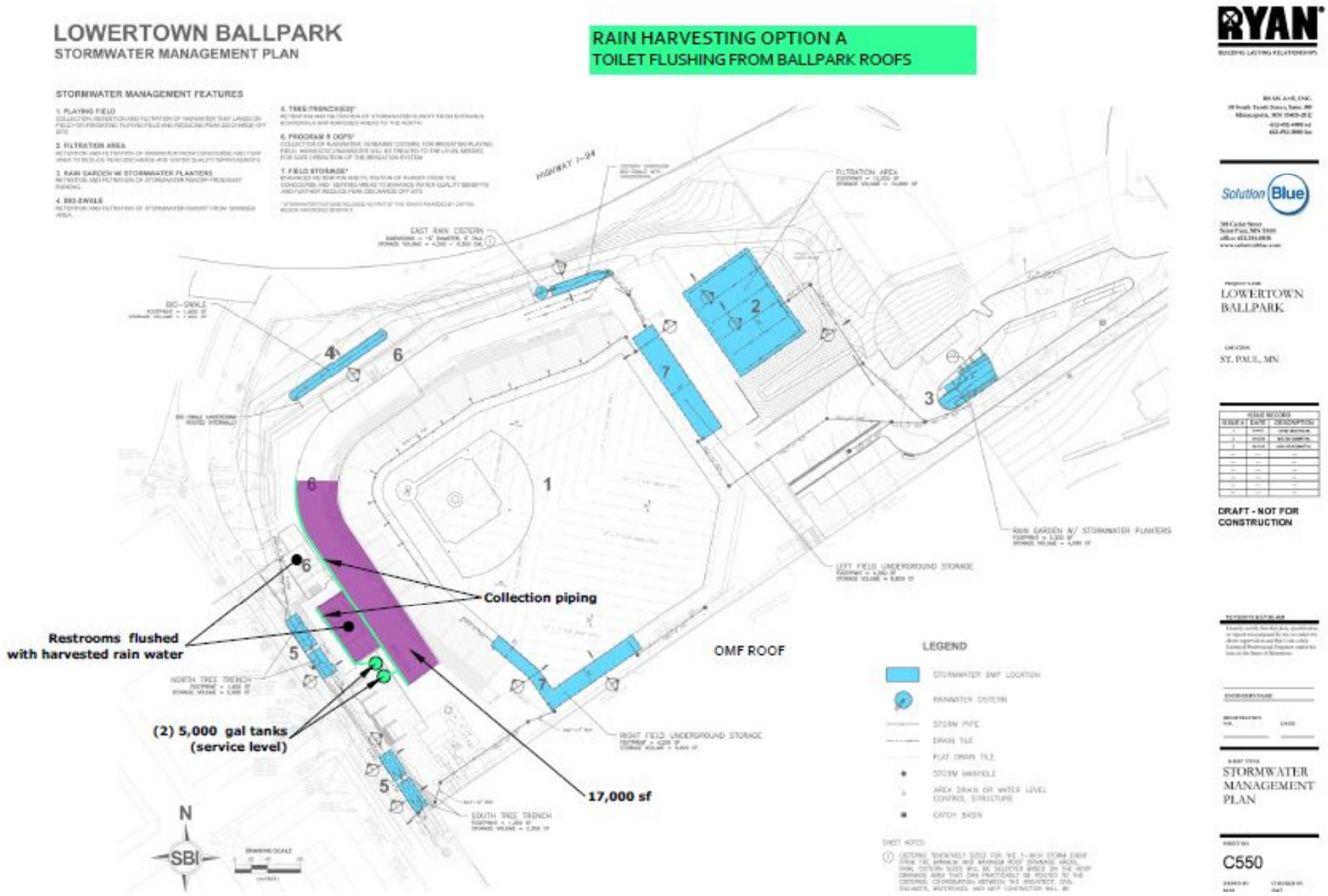
Stormwater “Double Play”

Design Charrette

- Facilitated by outside reuse expert (Stark Rainwater / RMS)
- Develop possible alternatives
- Schematic design and prelim cost estimates

MEP contractor not on project team yet

Pricing and Options



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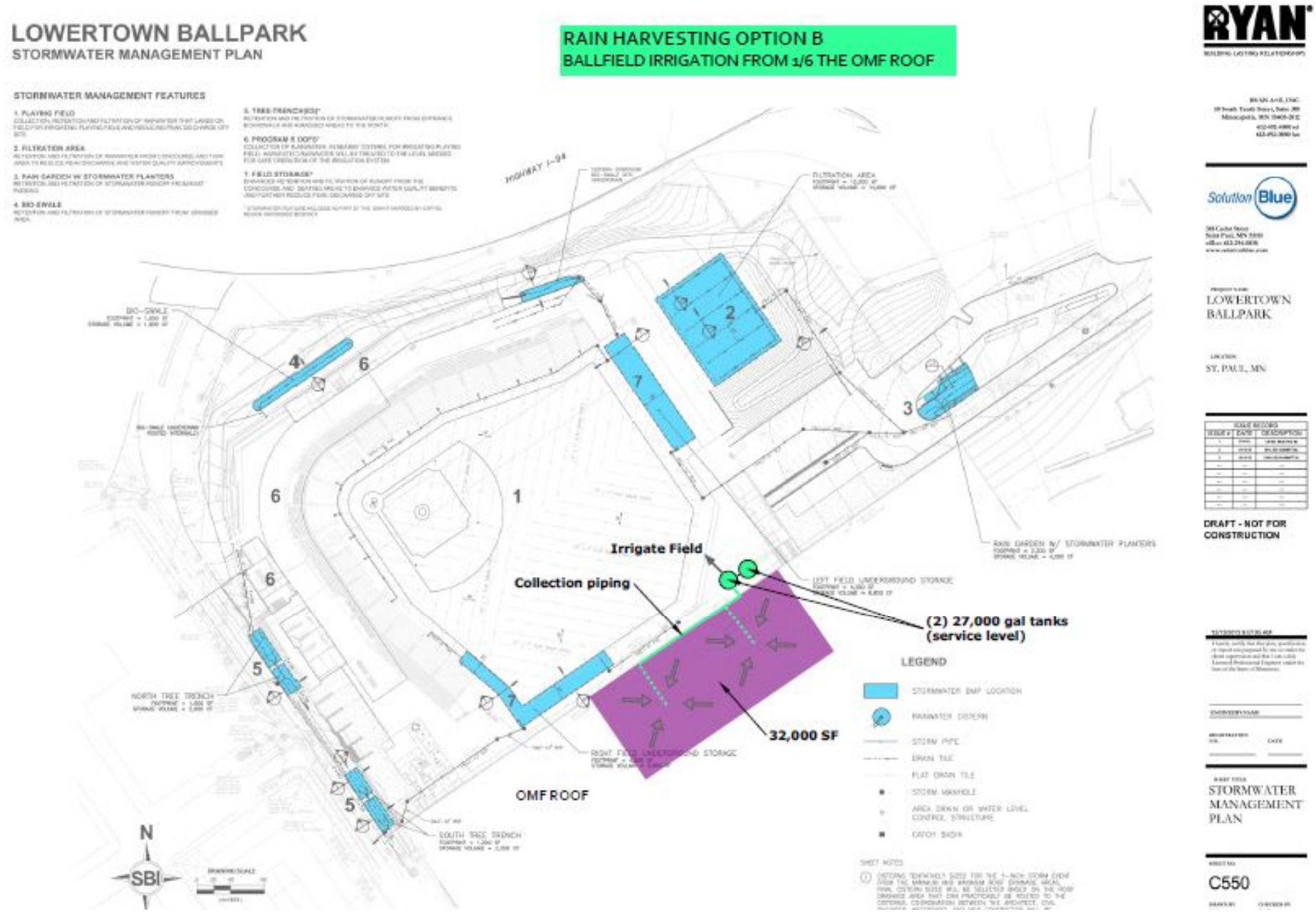

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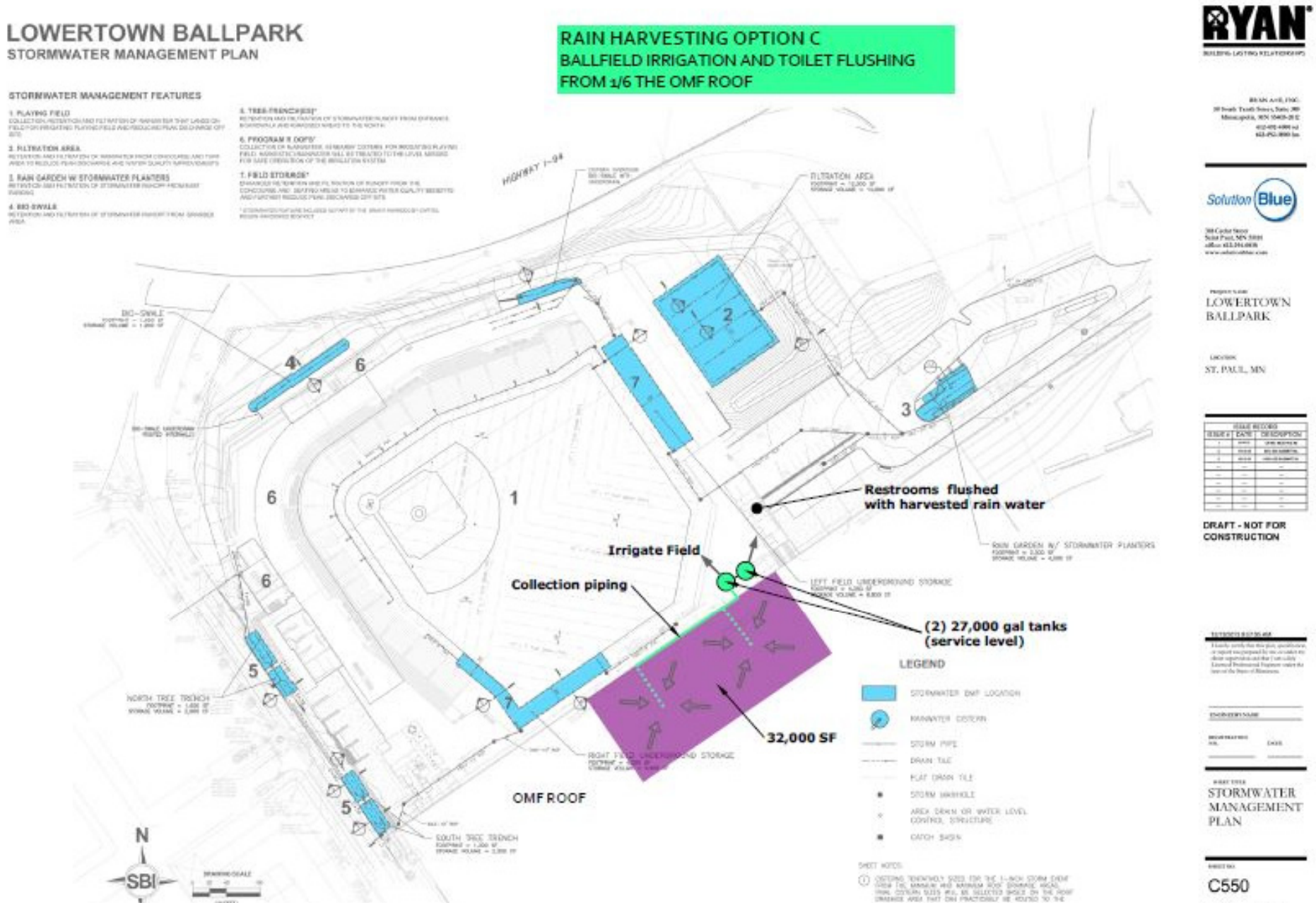
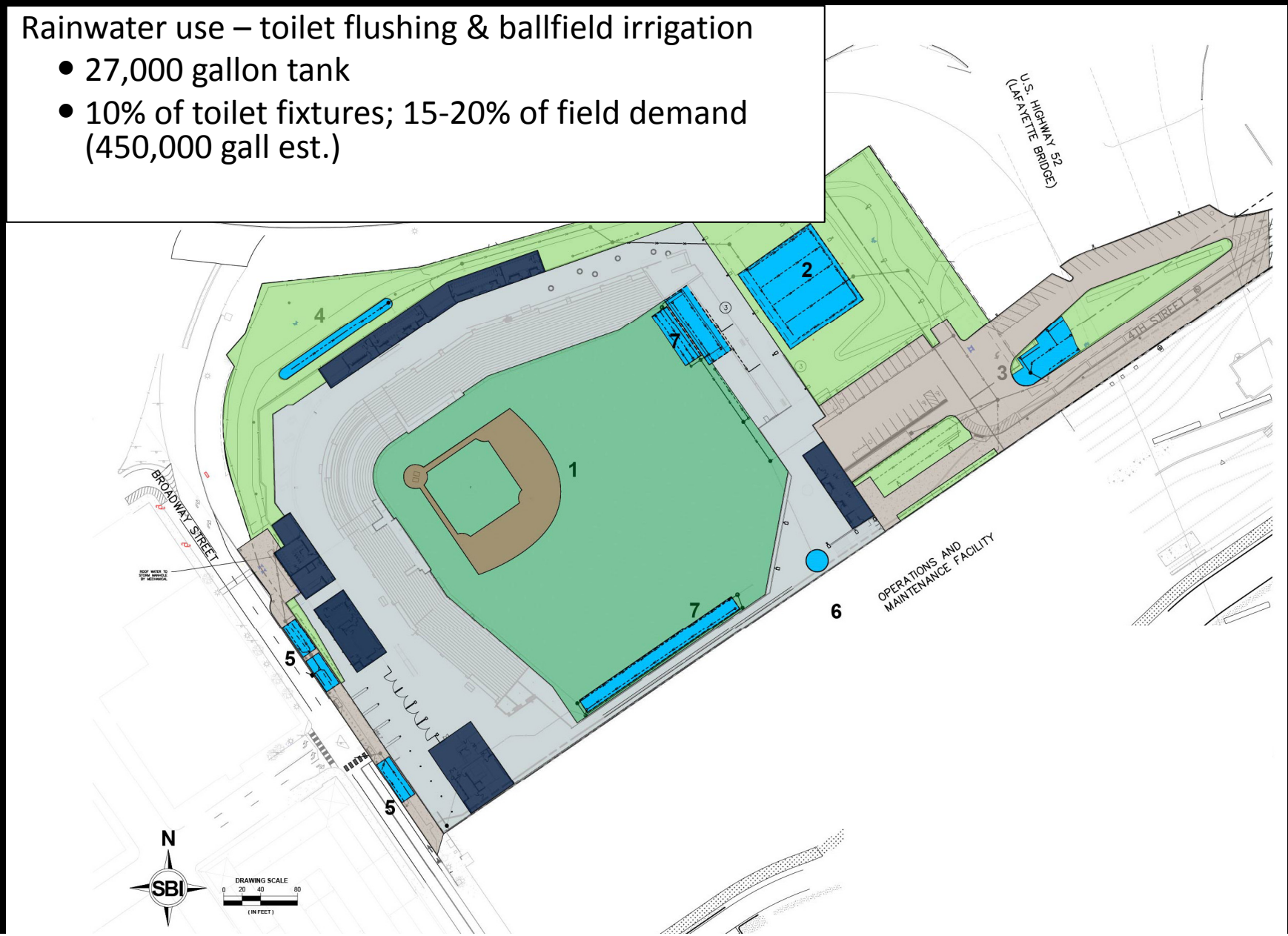


Preferred Alternative – Option C

Rainwater use – toilet flushing & ballfield irrigation

- 27,000 gallon tank
- 10% of toilet fixtures; 15-20% of field demand (450,000 gall est.)



Design Refinement: U of M tour

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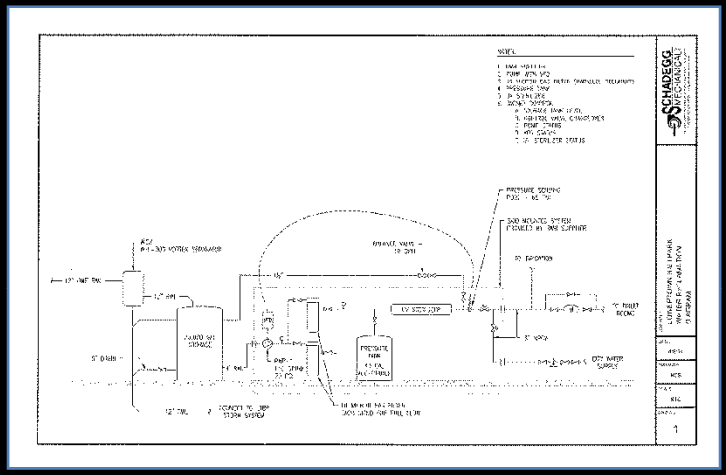
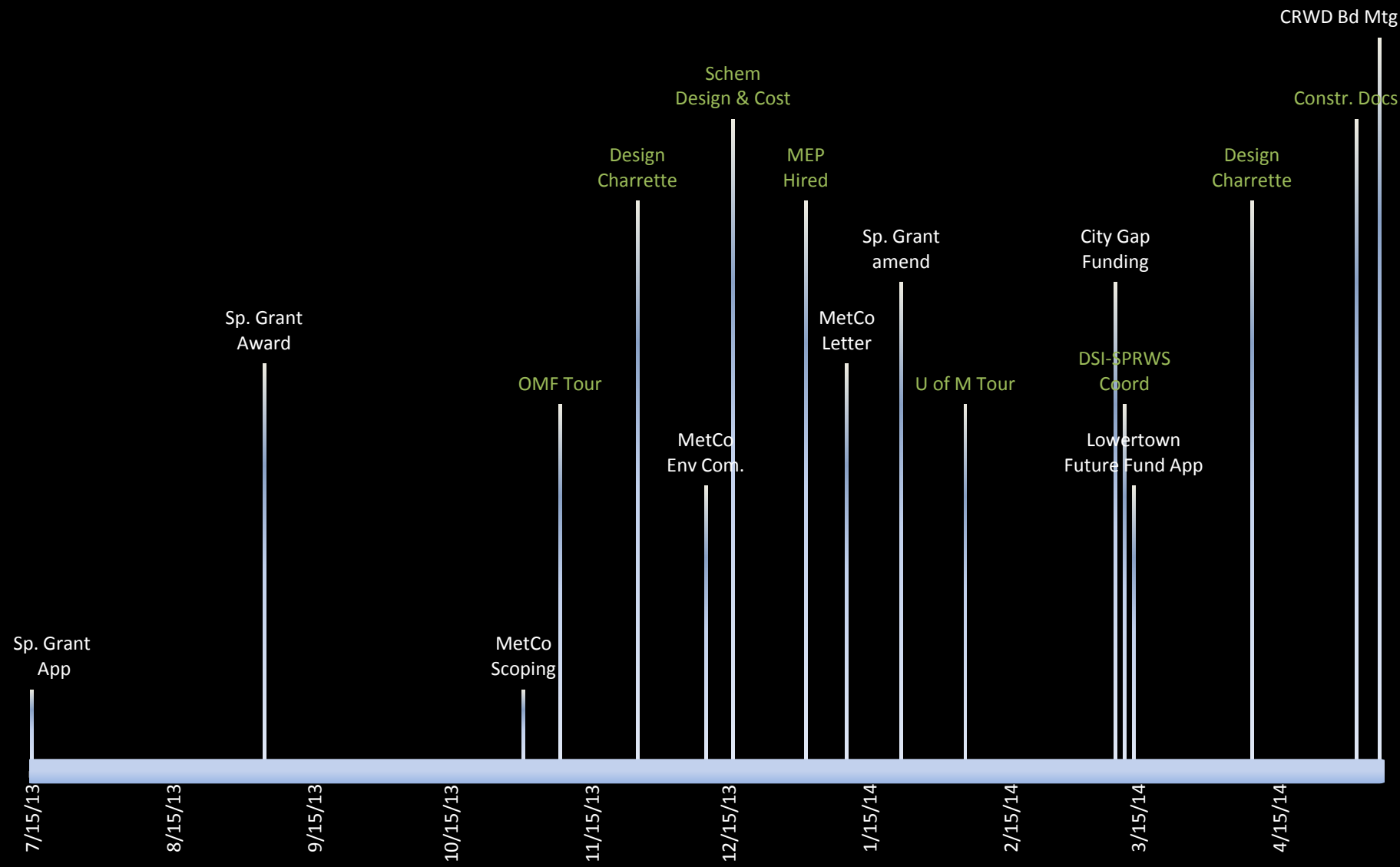
Vetting and Coordination

- State, local reviewers; funding partners; project team
- Facilitate transparency
- Receive comments, perspective, or technical input



Design Build Challenges



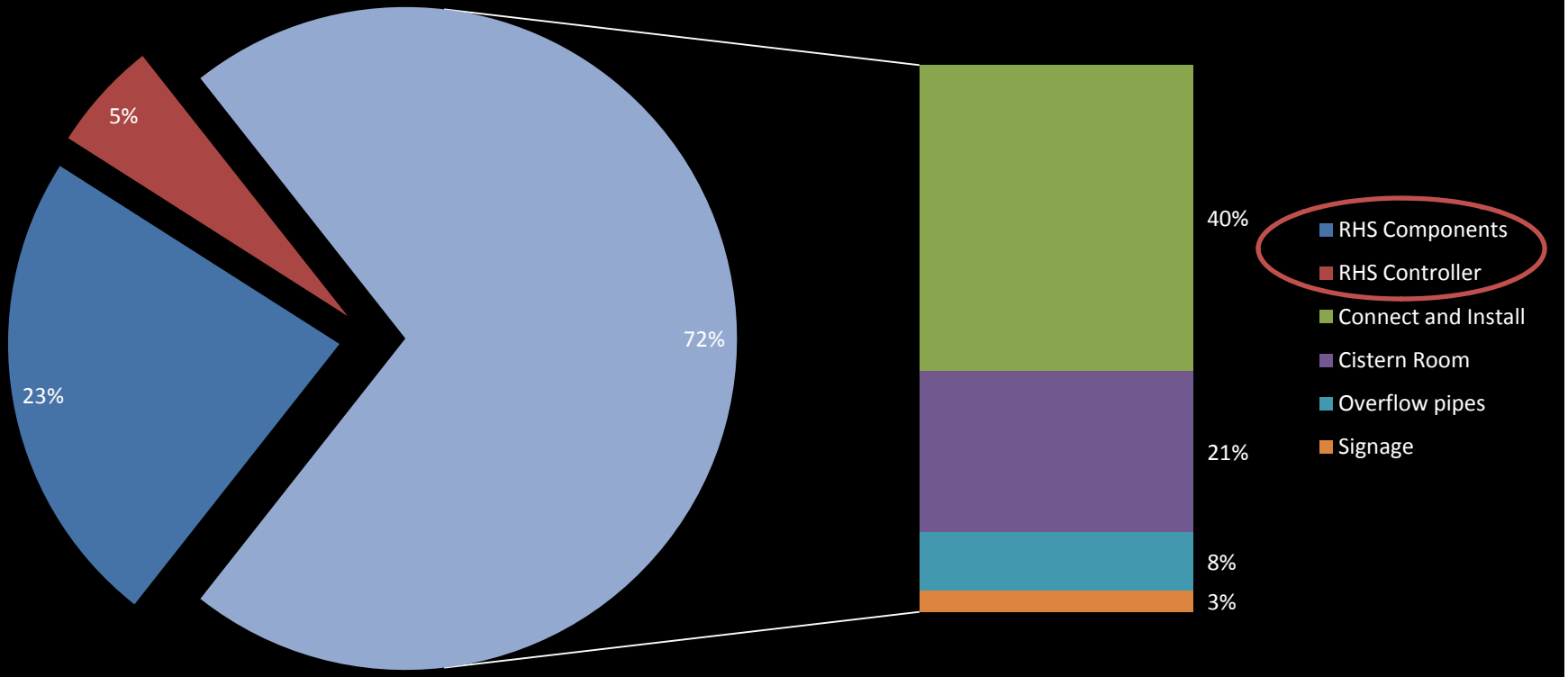
Enhanced Water Sustainability

- Total Ballpark cost …… $ 63,000,000
- Total cost*…… $ 487,000
  - **Rainwater harvesting system ……. $ 300,000**
  - Enhanced stormwater items …… $ 68,000
  - Design and Admin/Fees …… $ 75,000
  - Contingency …… $ 44,000

- Total grants …… $425,000

*Does not include cost to re-route OMF rain leaders

Rainwater Harvesting

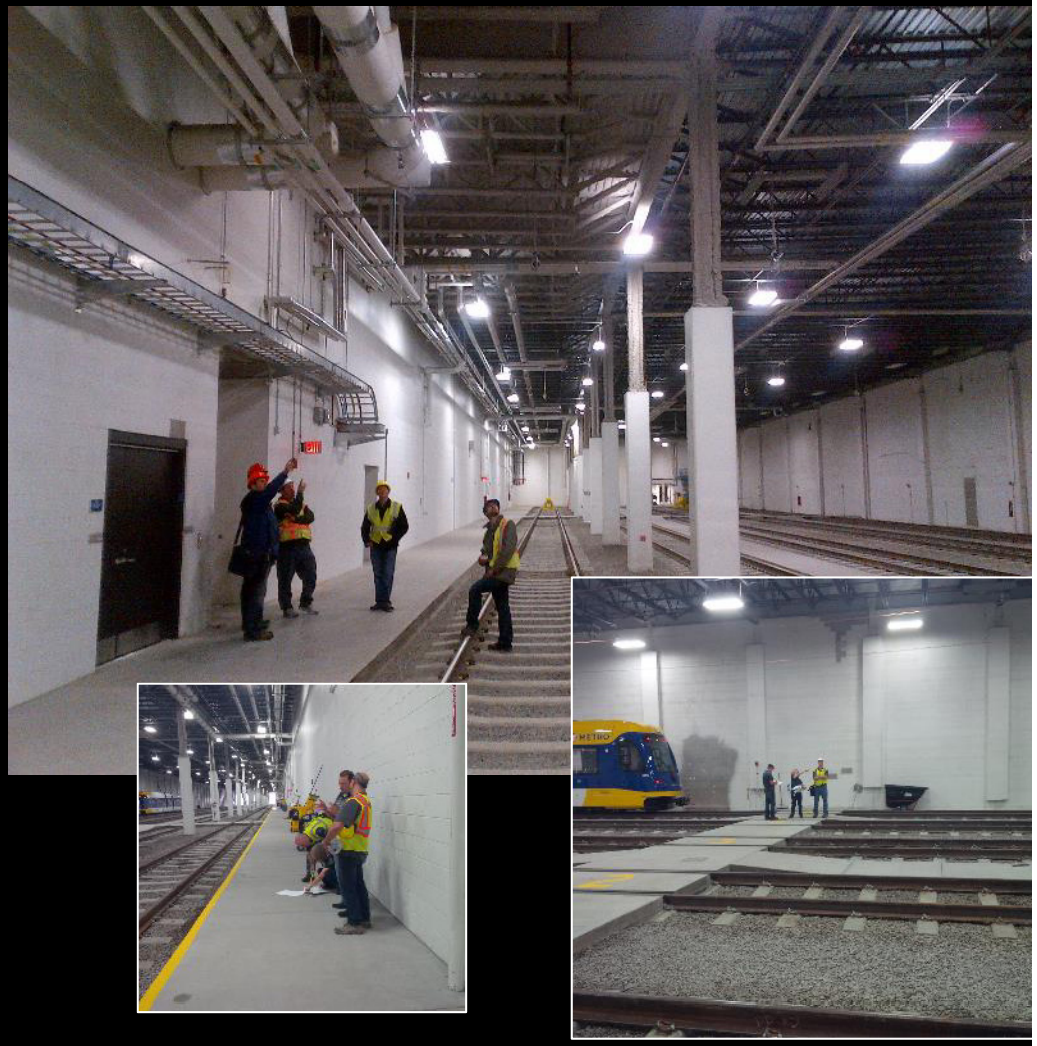


Rainwater Harvesting

Cistern size	27,000 gallons
Roof area captured	33,770 ft^2 (about ¾ acre)
Maximum rainfall captured by cistern	1.3 inches
Primary uses	Irrigation and toilets
Treatment provided	Vortex filter (pre-treatment), bag filters, UV disinfection
Annual potable water reduction	An estimated 450,000 gallons
Annual savings	>$1,600

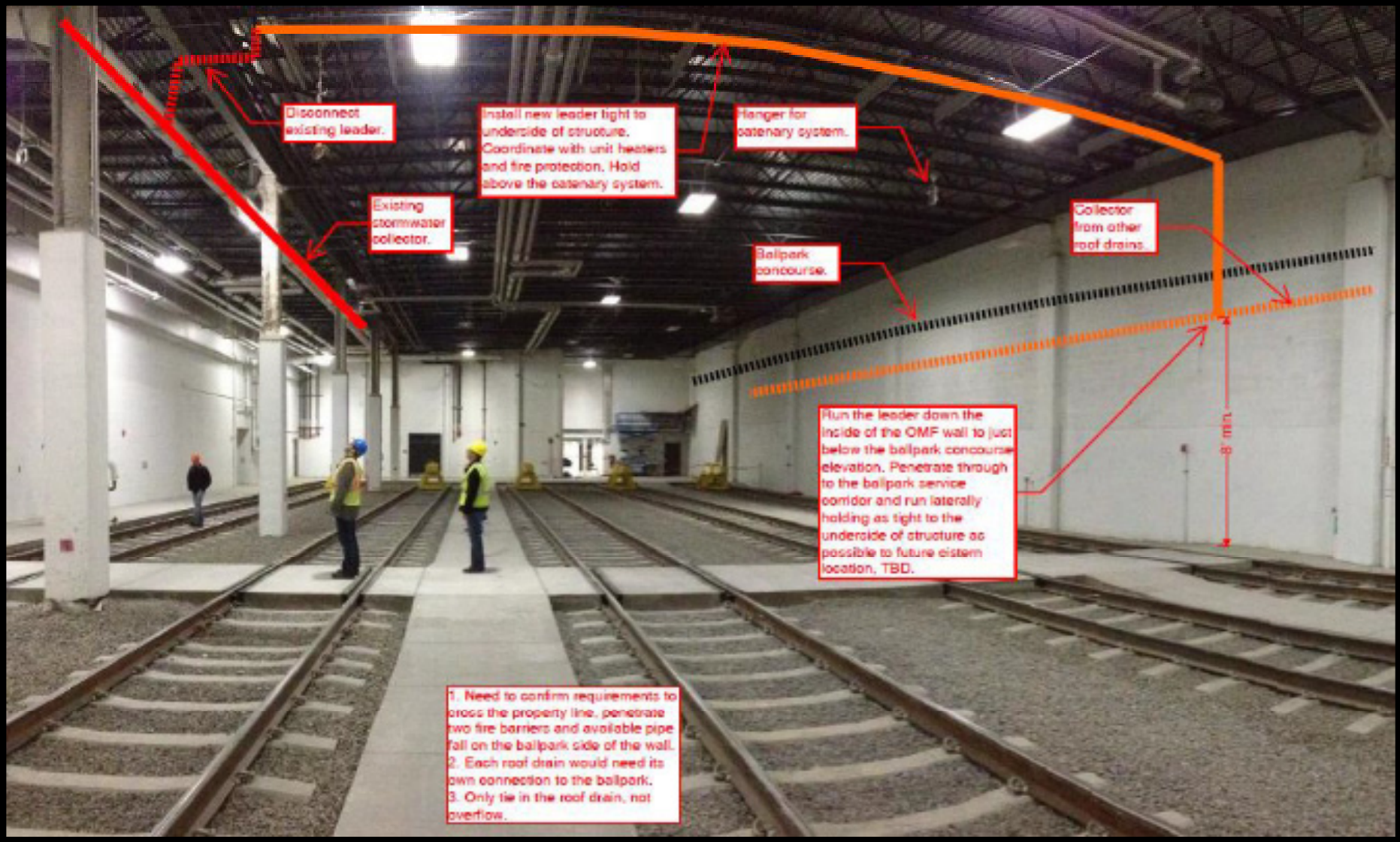
Metro Transit “OMF”

- Operation & Maintenance Facility
- 4-acre facility for storing light rail trains
- Roof drained away from CHS Field site
- Active electrical catenary near rain leaders



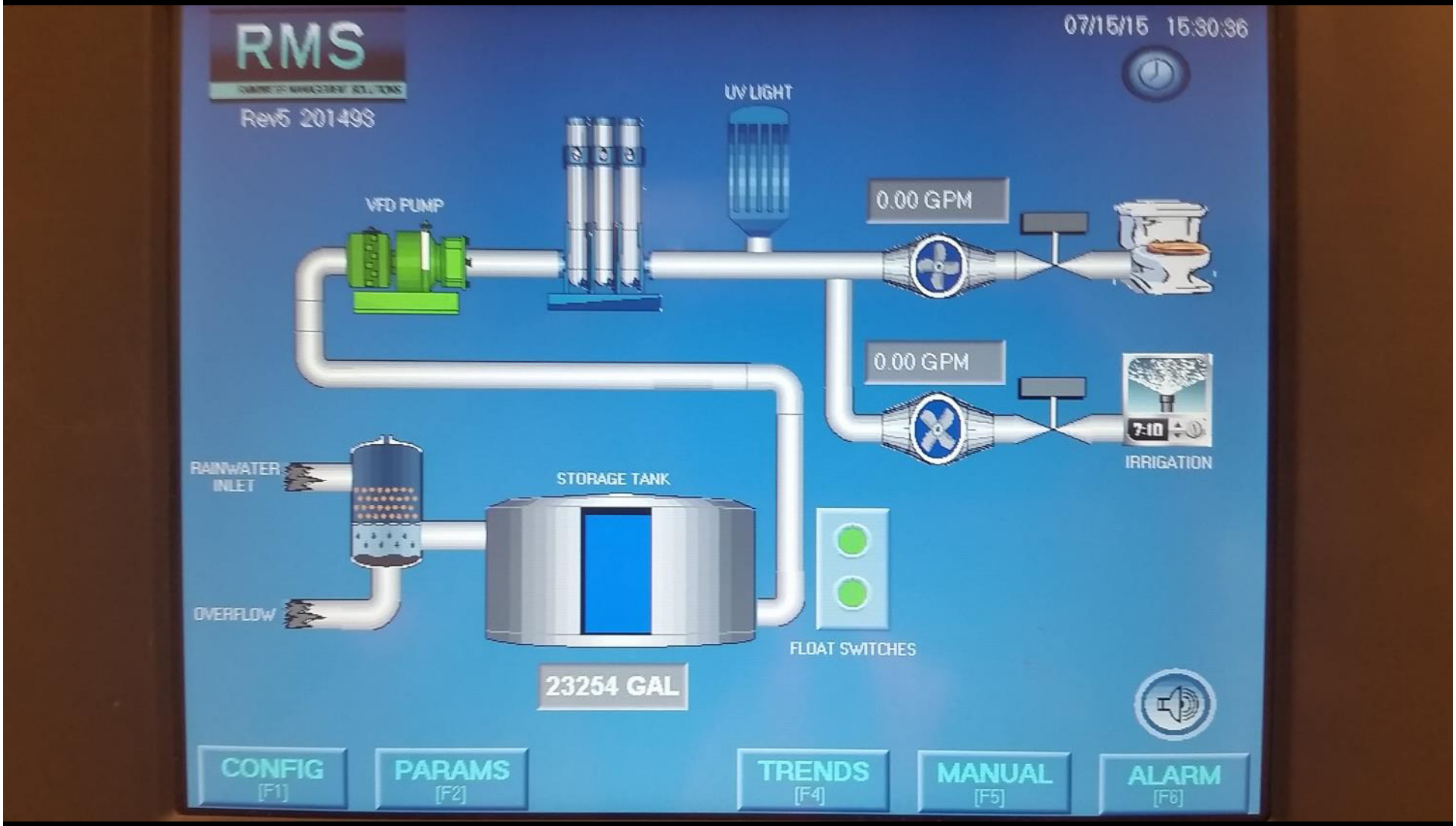
Metro Transit OMF Roof

Metro Transit OMF



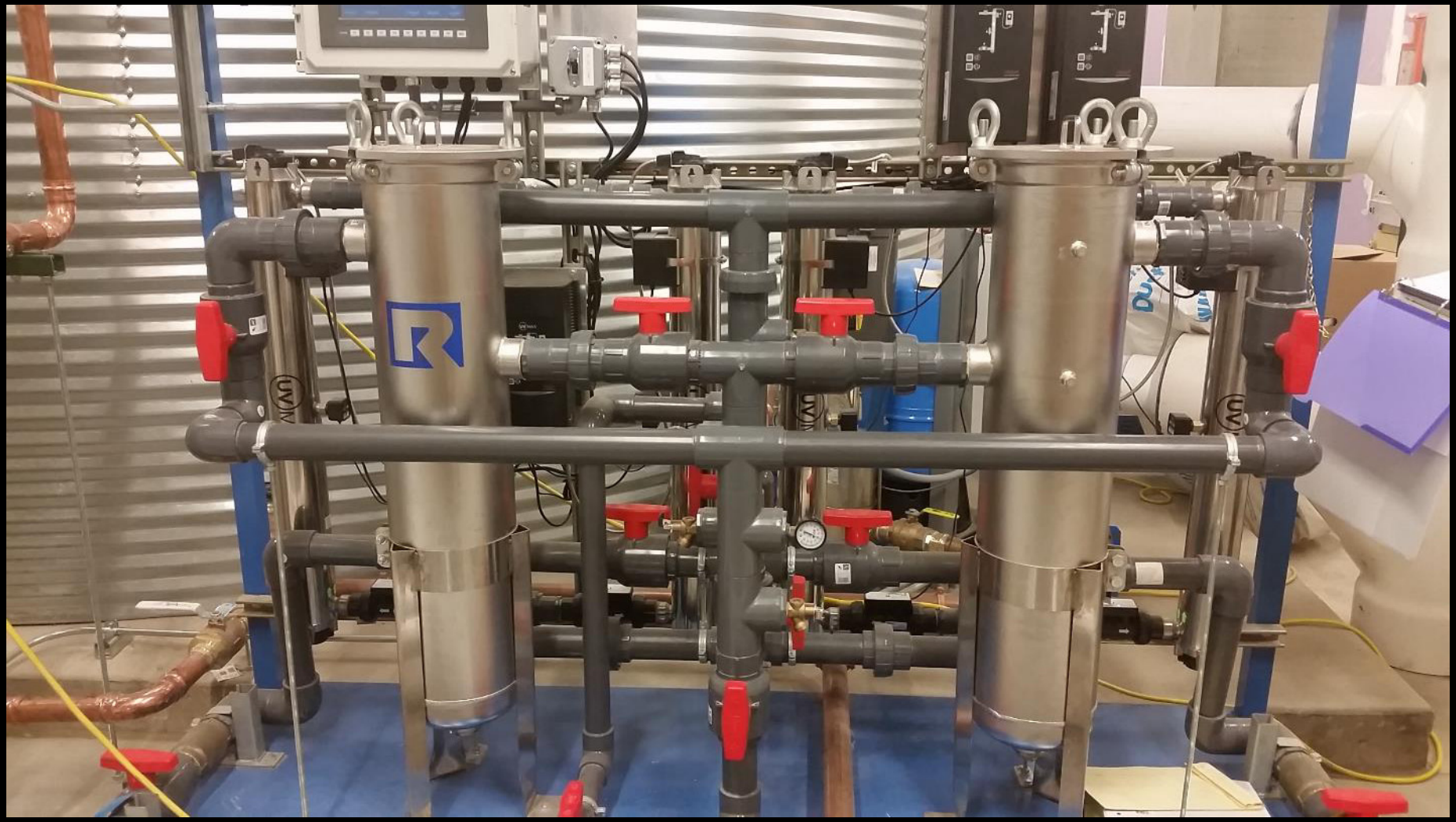
OMF Retrofit

Rainwater Harvesting



Rainwater Harvesting

The “Skid”



Water Quality Goals

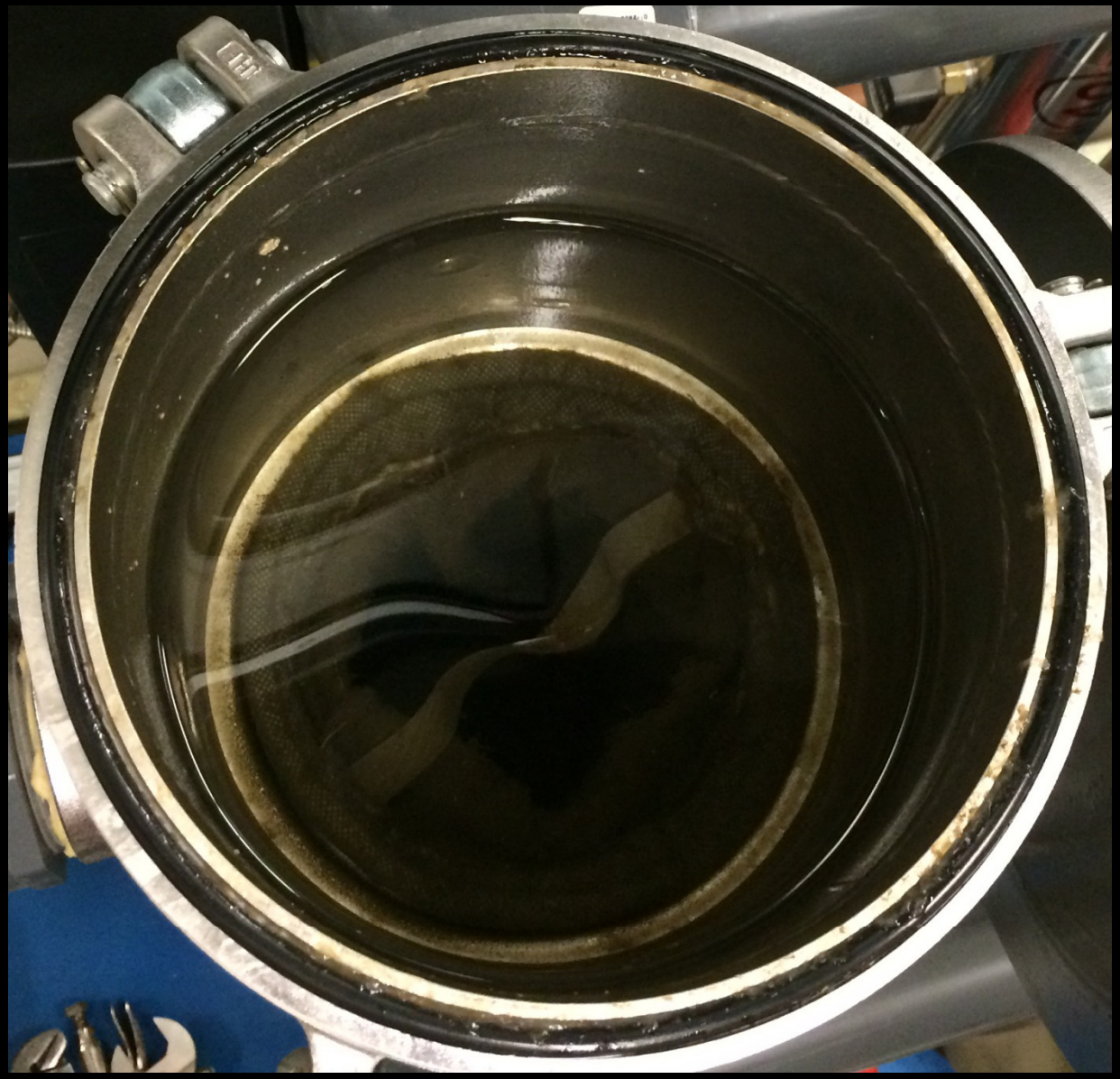
Parameter	Intended End-Use Quality Level
E. Coli	<2.2 MPN/100 mL
Turbidity	Less than 1 NTU
Odor	Non-offensive

Performance Results

- Operated August - October
- Water quality standards met
- Toilet reuse: 22,500 gallons
- Irrigation reuse: 118,500+ gallons

141,000 gal total (or 18,850 ft^3) reused/conserved

Water Quality Testing



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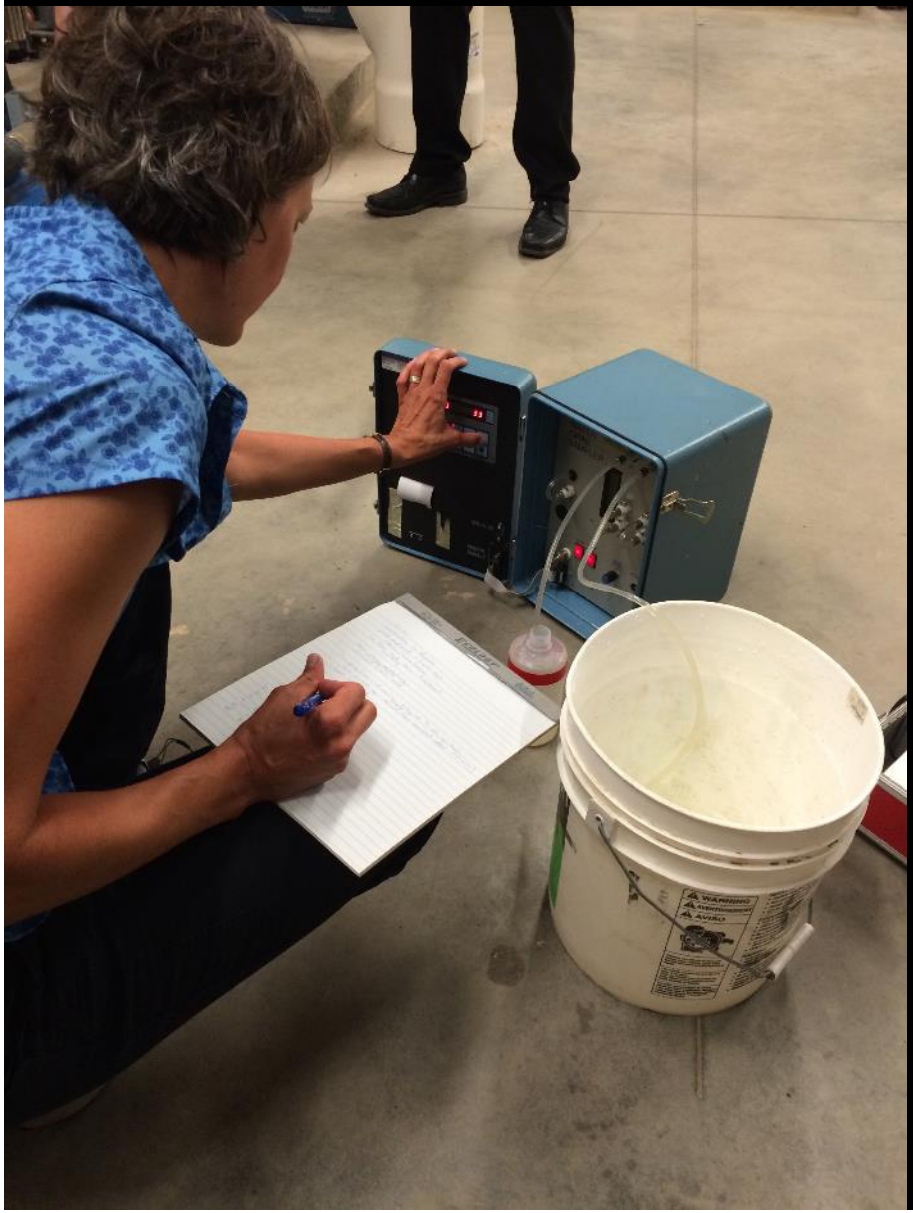
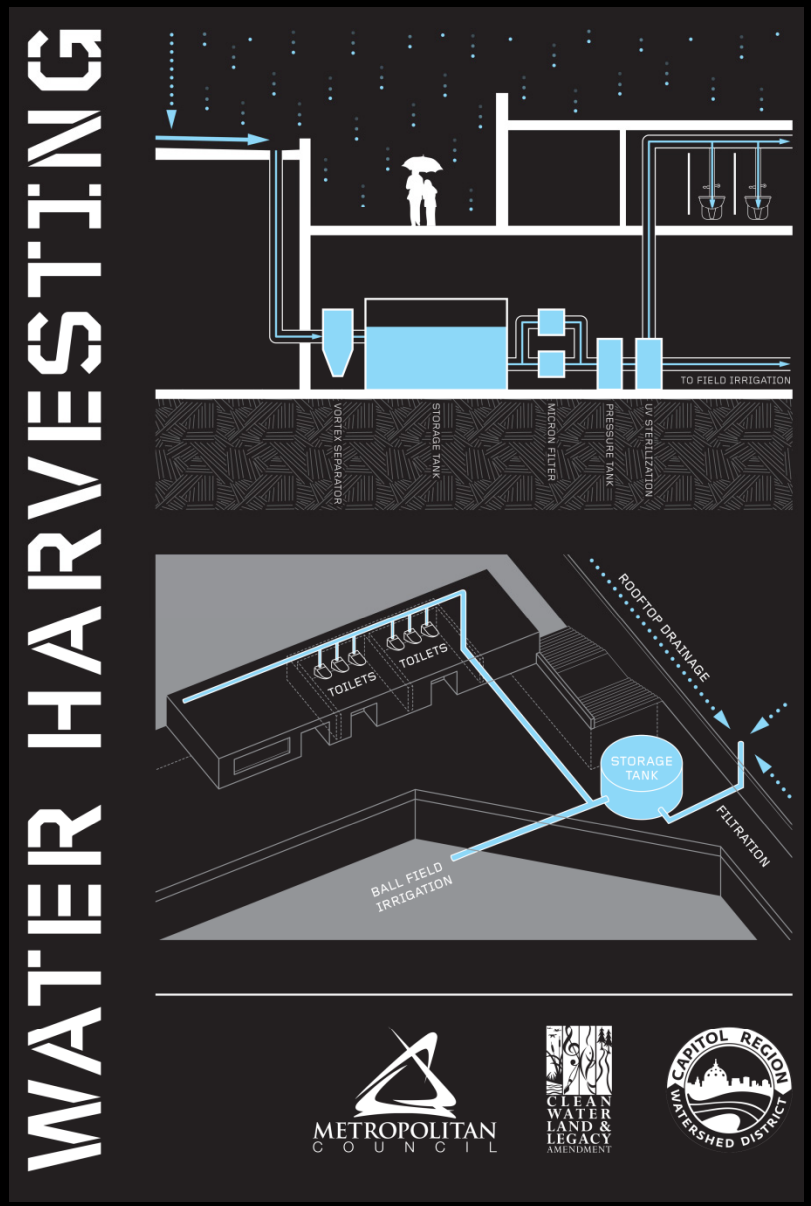


Visibility/Education



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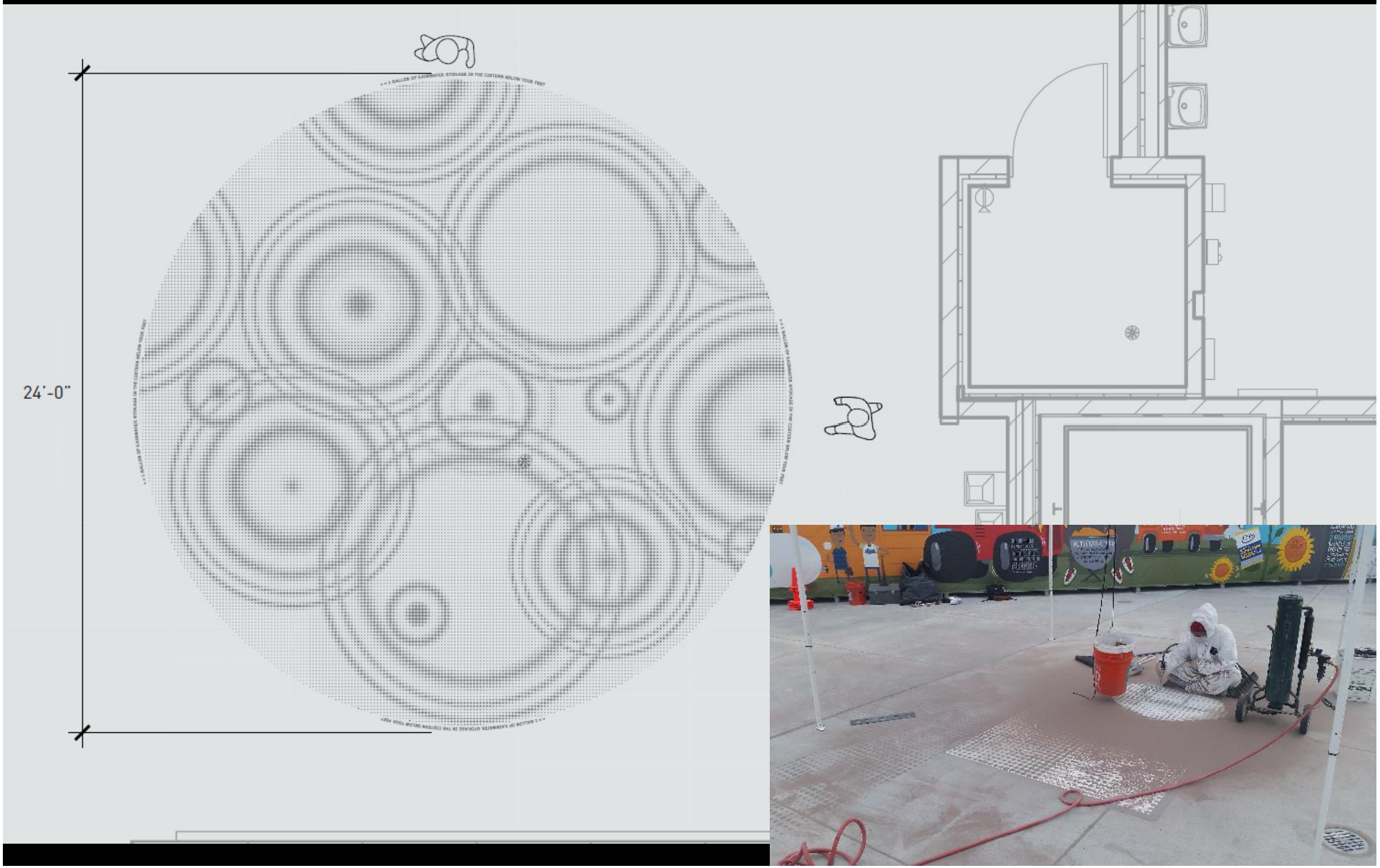


Promotion/Education

1st

Major sports venue to meet B3 Standards + MN SB 2030
LEED Silver Equivalent
- Use rainwater for toilet flushing and field irrigation

CHS FIELD: THE GREENEST BALLPARK IN AMERICA

1. DISTRICT ENERGY: CHS Field connects to one of the best district energy systems for heating and cooling loads. District energy is ~35% more efficient than traditional grid supply.

2. RENEWABLE ENERGY: Xcel Energy helped fund 100kW of solar arrays to supply 12.5% of the ballpark's power.

3. FIELD LIGHTING: Innovative fixtures focus light on the field, reducing spill into adjacent areas and the total number of fixtures by 40% compared to Midway Stadium.

4. BUILDING FOOTPRINT: 80% of interior spaces are below the concourse, requiring less open space and less energy to operate.

5. BUILDING REUSE: 230 foundation piers, 5,120 SFof concrete wall, and 168,000 SF of slab were reused in the ballpark.

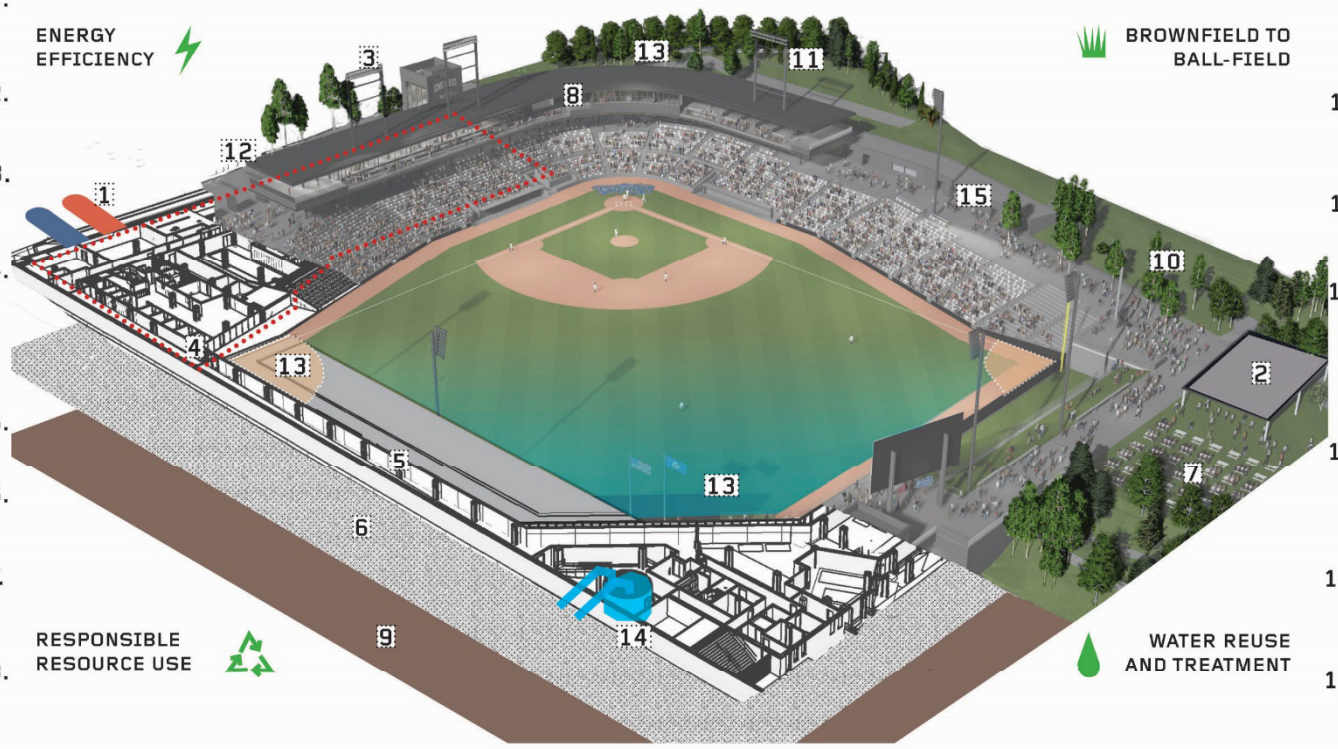
6. RECYCLED MATERIALS: Virtually all concrete from the existing Gillette building was crushed and used as structrual fill beneath the field.

7. REDUCING WASTE: Ryan diverted 98% of construction waste from landfills. The Saints are introducing composting and recycling with the goal of operating a zero-waste facility.

8. INDOOR ENVIRONMENTS: Low VOC finishes and occupant-sensor lighting were used in all interior spaces. Nearly all offices and the press box have access to natural light and air flow.

ENERGY EFFICIENCY

RESPONSIBLE RESOURCE USE



BROWNFIELD TO BALL-FIELD

WATER REUSE AND TREATMENT

9. SITE TRANSFORMATION: 8.5 acres of contaminated, impervious site were transformed into almost 60% green space with an environmental cap to minimize contaminated runoff.

10. GREEN SPACES: 135 trees and 138,800 SF of natural grass, including the playing field, will remove 22.5 tons of CO^2 from the atmoshpere each year.

11. COMMUNITY CONNECTION: Part of the site was turned into a neighborhood dog park and rain garden featuring local artwork.

12. SUSTAINABLE TRANSIT: CHS Field's urban location and walk score of 88/100 encourages fans to bike, walk, or use nearby bus and LRT lines to commute to games.

13. CLEAN STORMWATER: Virtually all stormwater runoff is treated through sand filters, tree trenches, or rain gardens to remove pollutants before entering the Mississippi watershed.

14. WATER RECLAMATION: A 27,000 gallon cistern collects rainwater for reuse in toilets and field irrigation, saving up to 450,000 gal. of H_2O each year.

15. RESPONSIBLE USE: Metered, dual-flush, and low-flow fixtures are installed in public restrooms and locker rooms to control water waste.

BENCHMARKS		ANNUAL SAVINGS			SITE BENEFITS		
1st major sports venue to: - meet B3 standards + MN SB 2030 - use rainwater for field irrigation	LEED Silver equivalent	~36 kWh/seat from renewables	~40 kWh/seat less operating energy	~65 gal/seat reused rainwater	88 neighborhood walk score	~60% more green space	~22.5 tons CO_2 sequestered annually

Questions

Minnesota Ground Water Association

April 20, 2016