



Hosted by:

**INFORMED
INFRASTRUCTURE**
The magazine for civil & structural engineers

Sponsored by:



StormTrap[®]

MODULAR CONCRETE
STORMWATER MANAGEMENT

Setting the Standard for Trash and Litter Capture

September 8, 2022

Introduction



Greg Williams, Ph.D. P.Eng.
Director of Water Quality Technology
StormTrap



John Shallahamer
Water Quality Solutions
Specialist – Southwest Region
StormTrap



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

NOT A NEW PROBLEM

- Trash/litter capture has long been an issue on the American landscape and in American waterways

Don't forget...
every litter bit hurts



KEEP AMERICA BEAUTIFUL



LIVE WEBCAST 9.8.22

SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

WHAT'S THE SOLUTION?

- Many solutions are needed to fully address the problem of trash in our waterways; new technology is one.
- Although numerous trash capture devices are available now, data on their effectiveness can be hard to find.



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

ADDRESSING THE SOLUTION AT ASTM

- Set up a new committee, E64 and two subcommittees
 - .01 Laboratory evaluation
 - .02 Field evaluation
- Then set up a Task Group and a Work Item and started developing a standard.



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

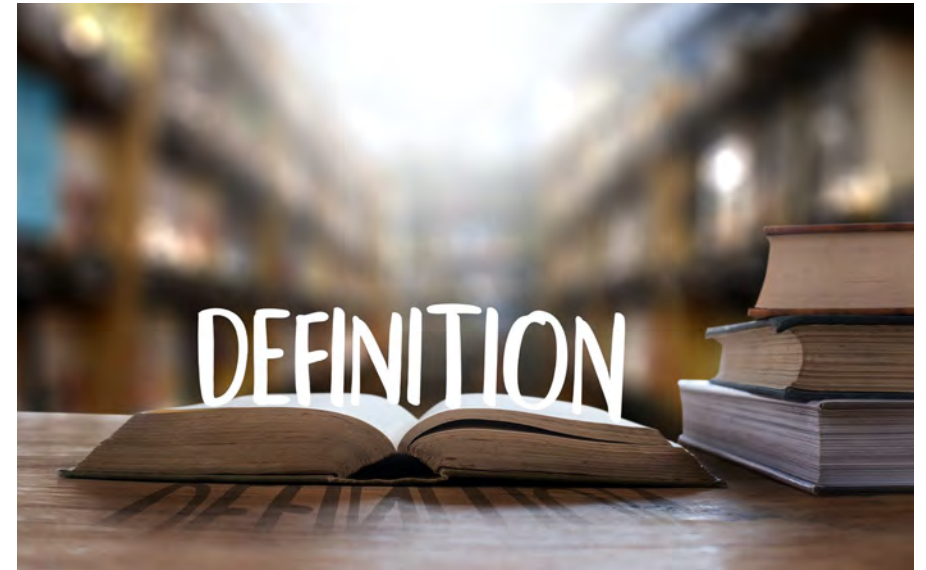
TODAY'S PRESENTATION

- Finding a solution involves two activities and each will be a section:
 - Defining terms
 - Intro to ASTM E3332



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

DEFINING TERMS





LIVE WEBCAST 9.8.22

SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

WHAT'S IN A NAME?

- There is a tendency to use the terms gross solids, trash, debris and litter interchangeably.
- These terms do have formal definitions, which will be presented on the next few slides.
- The ASTM standard (further defined in the next section) has adopted trash and debris.



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

GROSS SOLIDS

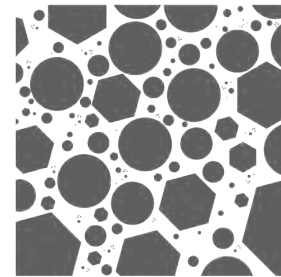
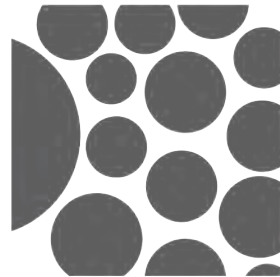
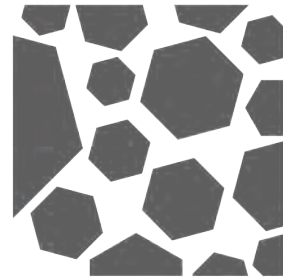
ASCE GUIDELINE - MONITORING STORMWATER GROSS SOLIDS

Pollutants

Litter (human made)

Organic Debris

Coarse Sediments



**Pollutant
Size**

* 4.75mm<
* CA uses cutoff of 5.0mm

4.75mm<

75 μ m<

**Pollutant
Examples**

Paper, plastic, styrofoam,
metal, glass

Leaves, branches, seeds,
twigs, grass clippings

Inorganic breakdown
products from soils,
pavement, building
materials, litter and organic
debris



TRASH

- The State of California have chosen to focus initially on trash:
 - “Trash” is defined in CA Government Code Section 68055.1(g), and the definition can be summarized as: man-made litter, >5 mm.
 - Not that ASCE defines litter as trash and CA defines trash as litter.
- Update: > 5 mm in at least 2 dimensions





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

DEBRIS

- In the stormwater context this is loose natural material
- Leaves are the biggest issue in this category.





LIVE WEBCAST 9.8.22

SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

WHAT ABOUT MICROPLASTICS?

- Microplastics are, by their definition, too small to be trash by our definition
- They are an inevitable part of the trash conversation, but are excluded from this standard since their treatment requirements will be significantly different
- This standard does address a major source of microplastics: plastic pellets, aka nurdles.



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

CONTAMINANT TERMS

- Gross pollutants is a broad term that includes everything, litter and trash are the same (in stormwater) and are man made; debris is natural
- Microplastics are a separate problem – the focus here is on particle > 5 mm.



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

TREATMENT OPTIONS

- There are many terms used for solutions to the trash in stormwater problem:
 - BMP
 - trash removal device
 - trash capture device
 - gross pollutant trap
 - gross solid removal device
 - full capture device
- ASTM has chosen to go with **trash capture device**



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

BENEFITS OF A STANDARD

- Most of the time when people think of standards, they think of consistency





BUT THERE IS MORE

- Standards for...

Manufacturers	Users
Provide a level playing field	Provide better solutions
Give clarity on what innovations may provide a competitive advantage	Decrease the effort of decision making
Allow for more cost certainty	Allow for more cost certainty
Create a broader market	



LIVE WEBCAST 9.8.22

SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

THE NEW ASTM STANDARD

- ASTM E3332 - Standard Test Method for Determining Trash and/or Debris Capture Performance of Stormwater Control Measures



LIVE WEBCAST 9.8.22

SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

KEY FEATURES OF E3332

- Introduces a reproducible trash 'recipe' based on work done by CalTrans in the early 2000s
 - Mass based, not volume
- Measures several parameters in addition to removal
- Primary CalTrans reference; CTSW-RT-05-73-18.1.



LIVE WEBCAST 9.8.22

SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

PERFORMANCE PARAMETERS

- The new standard will contain guidelines on testing for:
 - hydraulics
 - mesh blocking
 - trash capture
 - plastic bead capture
 - debris capture
 - scour
- The standard is “cafeteria style”
 - Allows for testing of only those parameters that are important, not all tests must be done to meet the requirements of the standard



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

HYDRAULICS

- The purpose of the hydraulics test is to establish a baseline
- Measure headloss at 5 flow rates, repeat to get an average





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

MESH BLOCKING

- The purpose of this test is to determine the impact of mesh blinding by taping off different percentages of the mesh area



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

TRASH CAPTURE

- The trash capture test is the heart of the standard
- A key component is a mass-based trash recipe that can be reproduced by anyone
- Since it is assumed all the devices can capture trash the focus is on quantifying how much can be captured and stored.





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

PLASTIC BEADS

- The test conditions are the same as the trash capture test, but
- The bead test includes
 - Buoyant beads to simulate hydrocarbon capture – use results carefully
 - non-buoyant beads so devices without a screen/filter may get different capture results than in the trash test





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

DEBRIS CAPTURE

- The debris test uses 90% artificial leaves and 10% trash
- A source of artificial leaves is recommended
- In both tests the big difference will be headloss, due to the shape difference





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

SCOUR TEST

- All these devices store captured trash until maintenance
- The scour test looks at the effect of high flow rates on trash retention
 - Offline systems are tested for scoured material after 5 minutes at 125% flow
 - Online systems are tested for scoured material after 5 minutes at 200% flow



LIVE WEBCAST 9.8.22

SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

WHAT THE STANDARD IS NOT

- The standard does not provide pass/fail criteria
 - Provides data for verification
- The next step is certification, where an Authority Having Jurisdiction (AHJ) allows the verified technology to be deployed in its jurisdiction



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

USING THE STANDARD

Stormwater manager specifies
that SCMs must have data from
E3332 testing



Manufacturers test to
the protocol and
present their data



One of the tested systems is
chosen and provides years of
predictable performance



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

CONTACT DETAILS

Greg Williams, Ph.D. P.Eng.
StormTrap
Director of Water Quality Technology
gwilliams@stormtrap.com



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

FROM THEORY TO PRACTICE





LIVE WEBCAST 9.8.22

SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

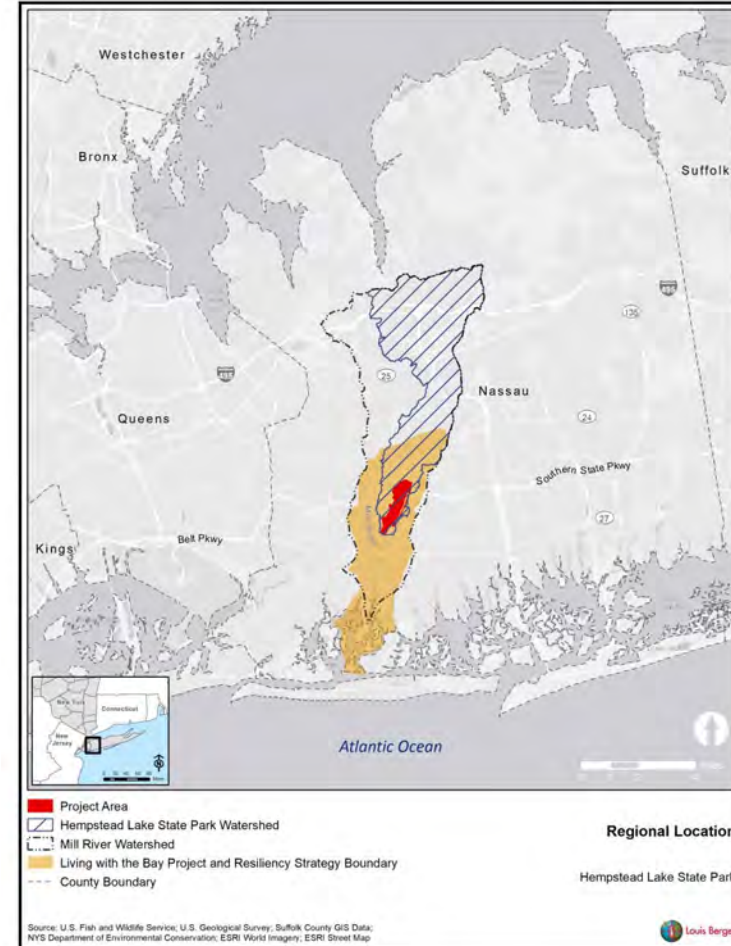
CASE STUDIES

1. Hempstead Lake State Park (HLSP) - Northwest and Northeast Ponds Enhancements Project (Hempstead, New York)
2. Hillcrest Community Park Green Infrastructure Project (HCPGI) (Concord, California)



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

HLSP OVERVIEW





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

HLSP OVERVIEW

- Dam breach in 2012 as a result of Hurricane Sandy
- Significant floatable deposits, sediment loads and oil residue apparent near many of the outfalls





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

HLSP OVERVIEW

- With nothing in place upstream to capture sediment and floatables, the NW and NE Ponds act as garbage retention basins





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

PROJECT GOALS

- Address stormwater flooding concerns
- Improve the water quality entering Hempstead Lake and decrease pollutant loads for downstream communities and waters flowing into the bay

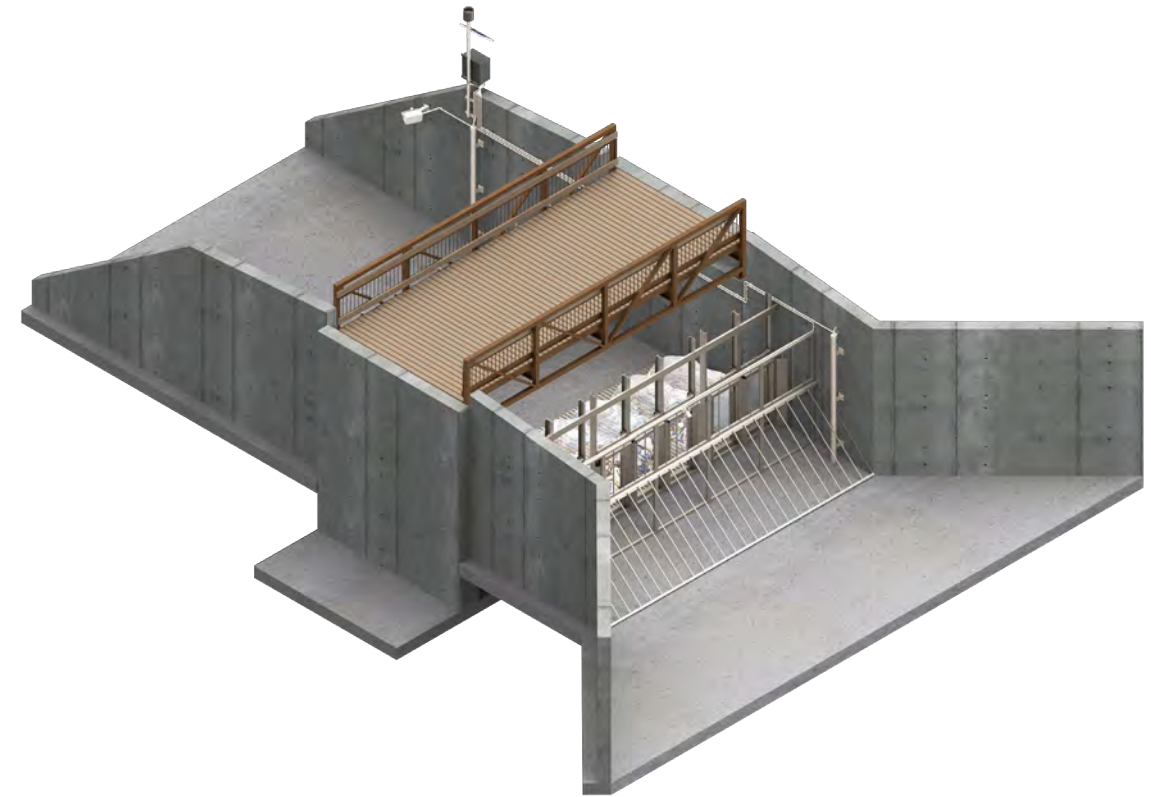




LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

SOLUTIONS

- Trash capture system that achieves the goal of improving water quality
- Capable of capturing bottles, plastic bags, and other floatable debris





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

DESIGN METHODOLOGY

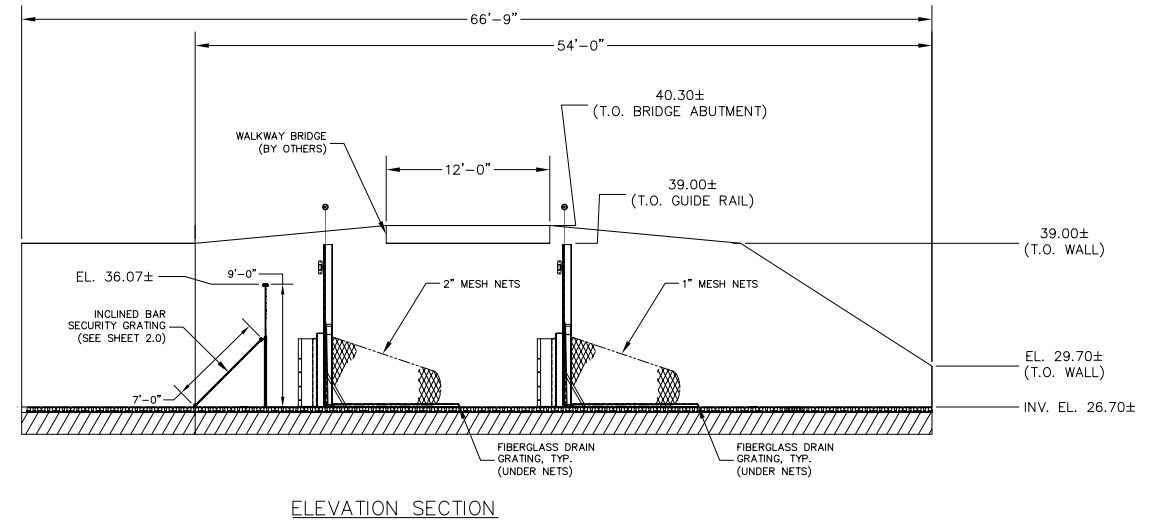
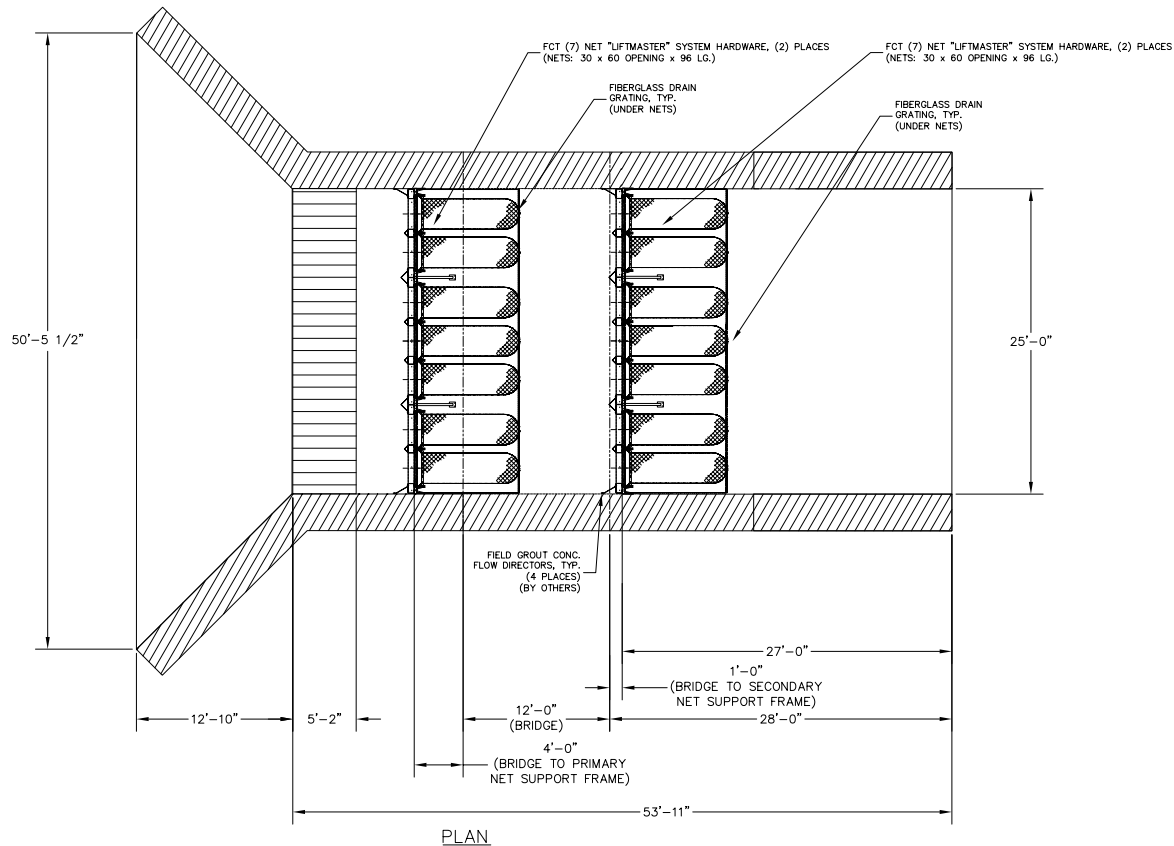
Key Design Aspects

- Capture bottles, plastic bags, and other floatable debris carried
- Fit within the confines of the concrete channel at the Mill Creek entrance to the NE Pond
- Sized for the 1- year storm event (437.5 cfs) – water quality flow
- Ability to bypass flows above the water quality design event
- Safe & easily maintained



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

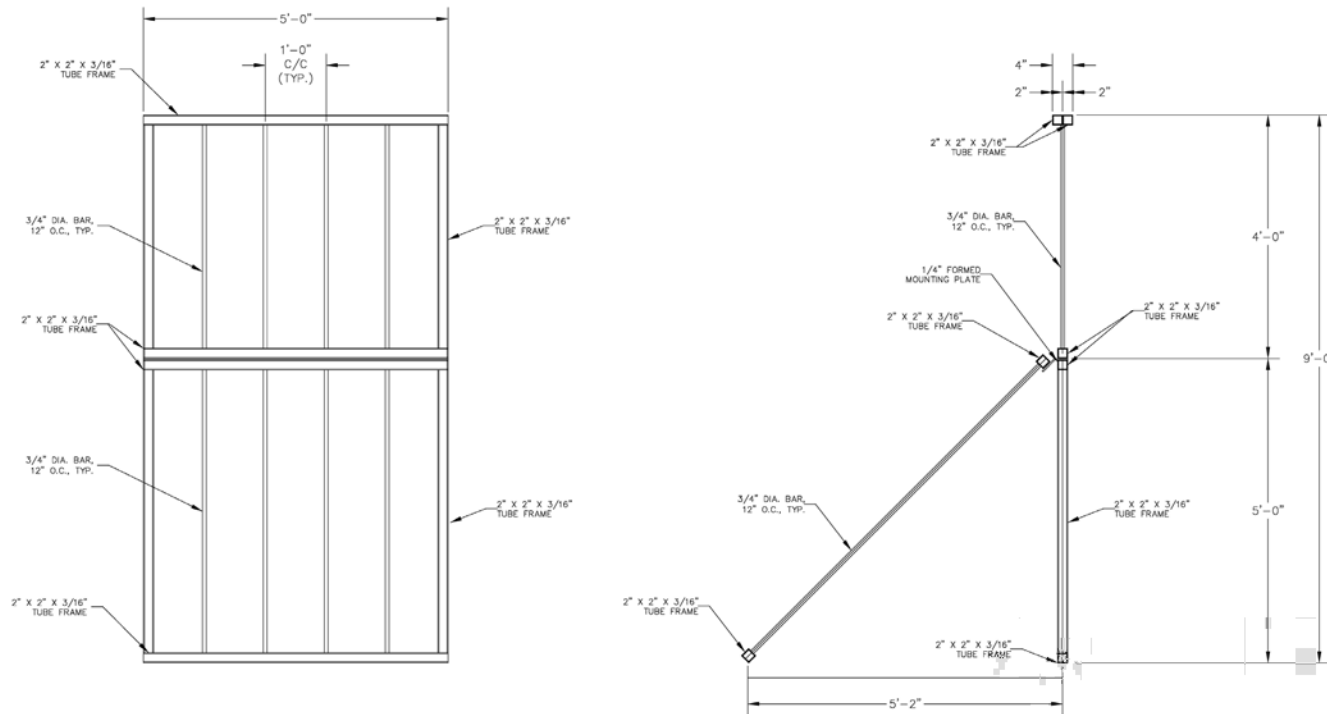
TRASHTRAP DESIGN



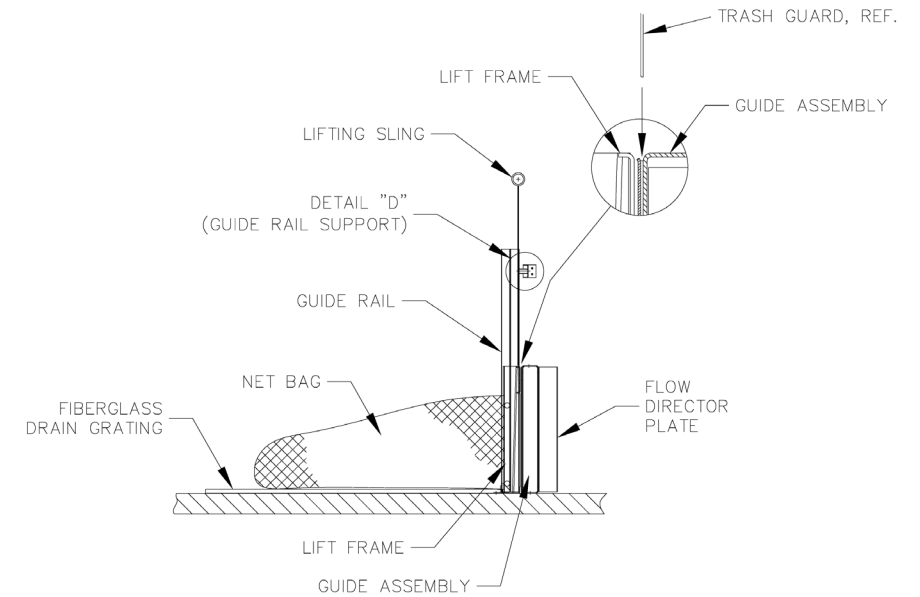


LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

TRASHTRAP DESIGN



INCLINED BAR SECURITY GRATING
(PRIMARY TRASHTRAP - 5 REO'D)



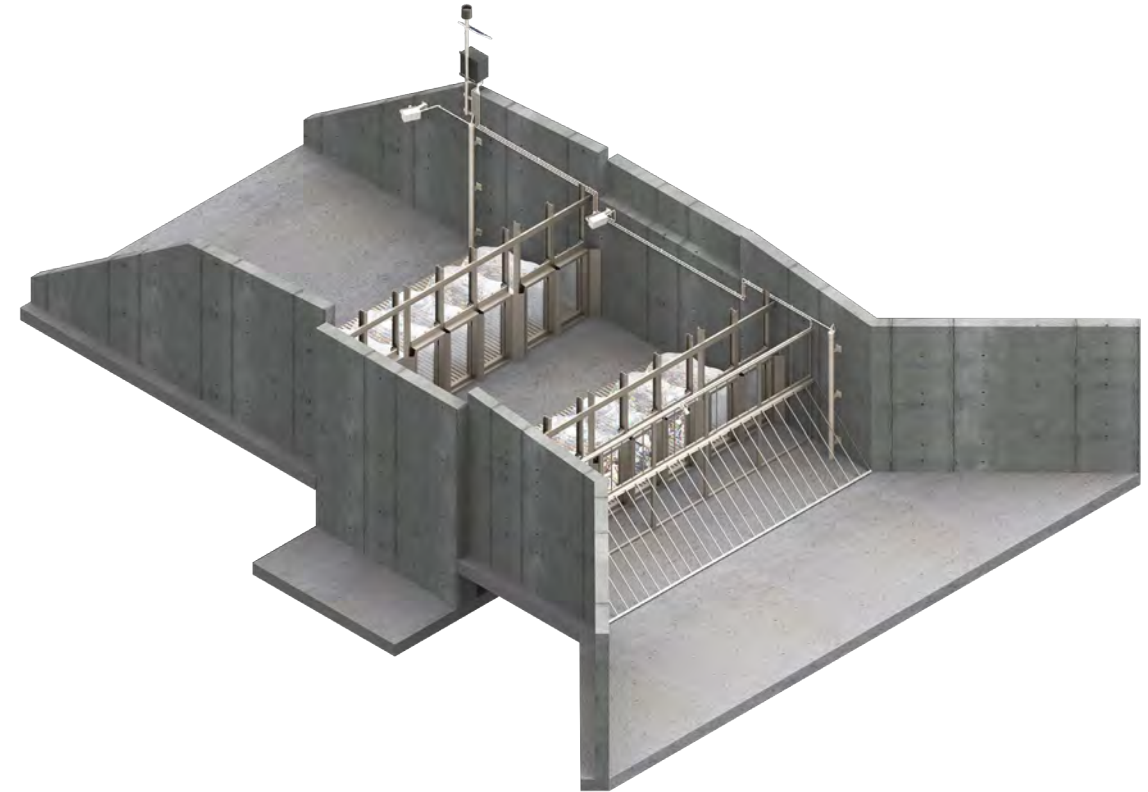
TYPICAL LIFT FRAME ARRANGEMENT



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

TRASHTRAP DESIGN

- Remote monitoring system measures
 - Water velocity
 - Water surface elevation
 - Capacity of nets
 - Time stamped photos
- Decreases the number of physical inspections required – ease maintenance
- Data is transmitted over secure cellular network





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

INSTALLATION





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

INSTALLATION





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

INSTALLATION





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

MAINTENANCE

- Inspection and maintenance frequency is site-dependent
- Maintained from an existing trail
 - Full nets: removed and disposed of in landfill
 - New nets: put back in system
- P4 Remote monitoring technology decreases the number of physical inspections required





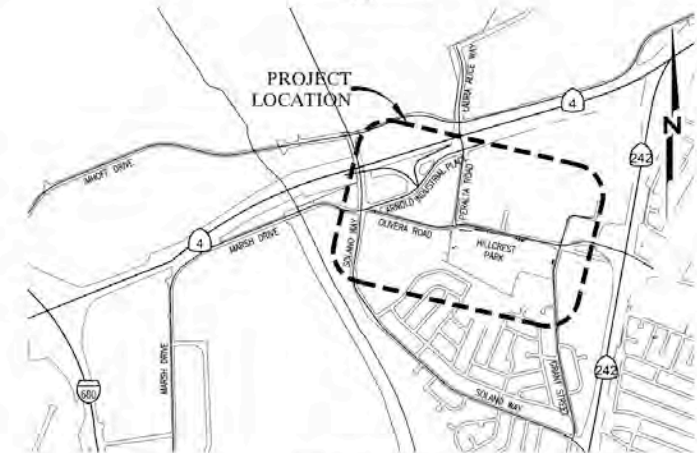
LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

HCPGI OVERVIEW

- Project is part of major initiative to reduce water-quality impacts of urbanization on receiving waters
- Involves preventing pollution at the source
 - Low Impact Development (LID)



LOCATION MAP
NTS



VICINITY MAP
NTS



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

HCPGI OVERVIEW

- Hillcrest Park regional-level project qualifies for Prop 1 grants
- Identified as a priority candidate project to receive substantial funding





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

PROJECT GOALS

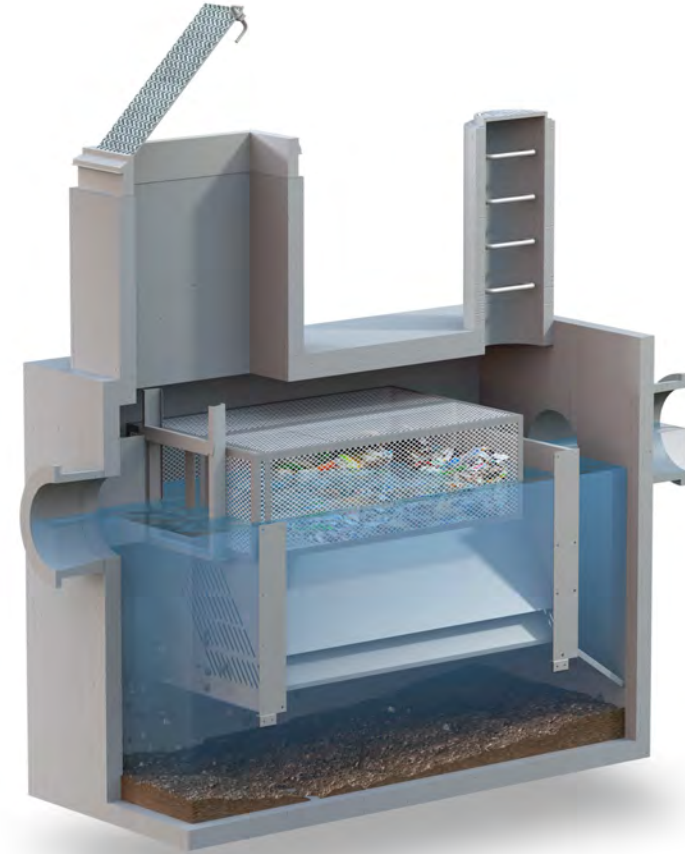
- Retrofit one of the City of Concord's largest parks with stormwater facilities to
 - mitigate water quality impacts
 - supplement water supply
- Collect trash, debris, and sediment within the existing storm drain system



LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

SOLUTIONS

- Installation of (2) full trash capture certified devices that collect
 - trash
 - debris
 - sediment
- Bioretention areas and underground stormwater detention will also be installed





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

DESIGN METHODOLOGY

Key Design Aspects

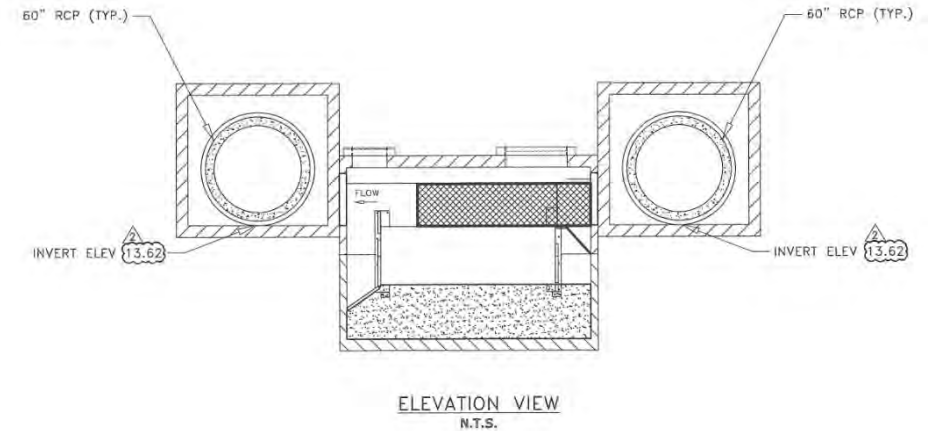
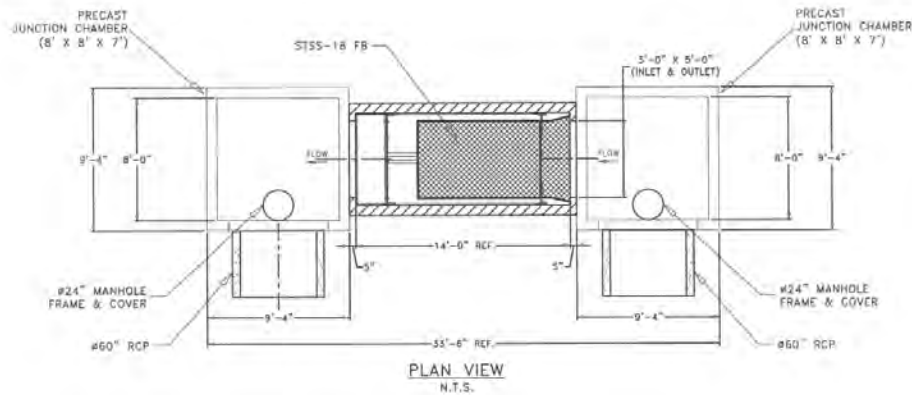
- CA State Water Resources Control Board - Certified Full Capture System
 - Capture all debris 5mm and larger
 - Verified by the Mosquito and Vector Control Association of California (MVCAC)
- Sized for the 1- year storm event:
 - East Trash Capture Site = 70 cfs
 - West Trash Capture Site = 70 cfs
- Integrate into shallow existing storm drain lines
- Must utilize basket for trash storage
 - Easily maintained with existing equipment (Vac Trucks)



LIVE WEBCAST 9.8.22
 SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

SITESAVER DESIGN

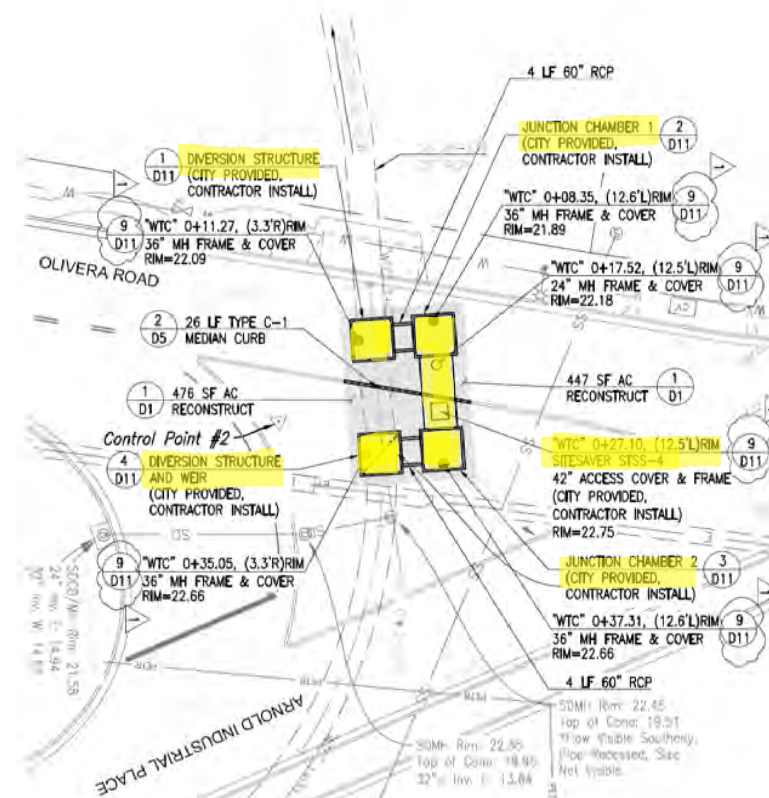
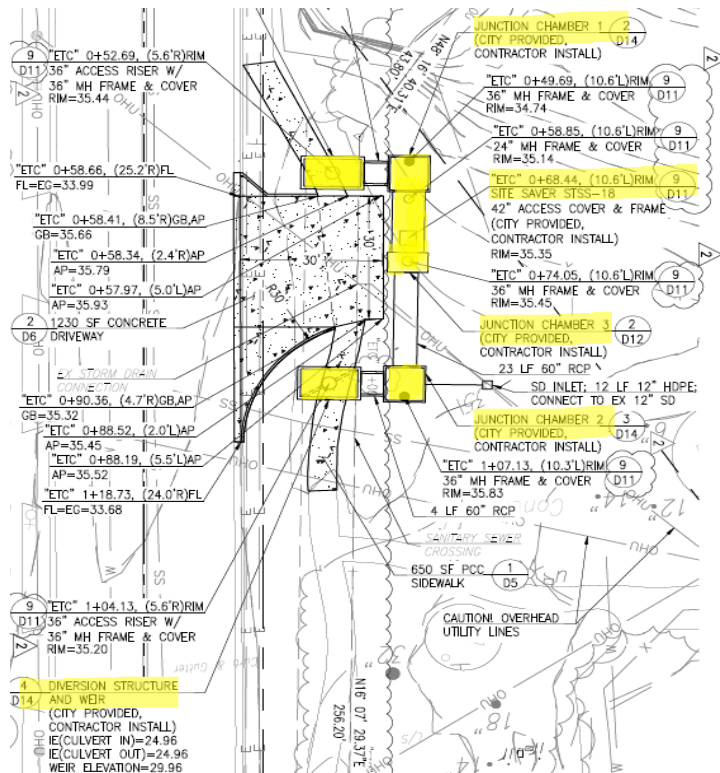
SYSTEM INFORMATION	
INLET TYPE:	60" RCP
OUTLET TYPE:	60" RCP
DESIGN FLOW:	70 CFS
PEAK FLOW:	70 CFS (OFFLINE)
TRASH CAPTURE:	100 T ³
HEAD LOSS (WD FLOW):	< 10"





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

SITESAVER DESIGN





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

INSTALLATION



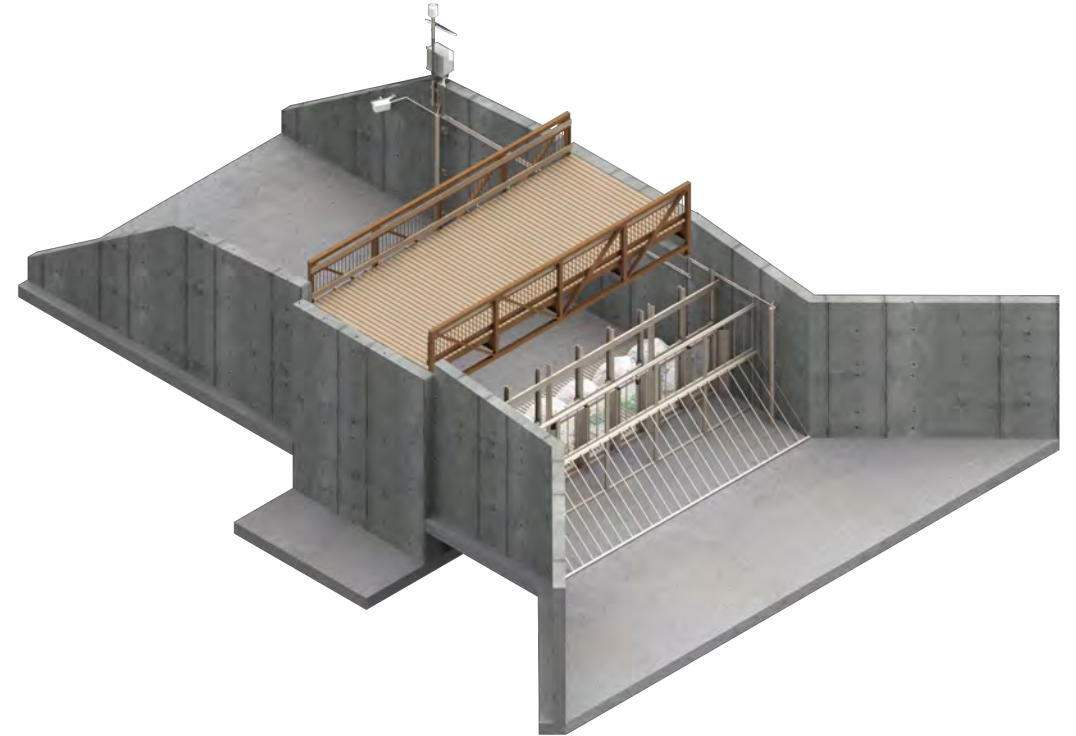
MAINTENANCE

- Frequency of inspections and maintenance is dependent on site
 - loading conditions
 - rainfall frequency
- Vacuum truck utilized to remove trash & sediment from the surface (no confined entry)
- No bag disposal with basket configuration





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE





LIVE WEBCAST 9.8.22
SETTING THE STANDARD FOR TRASH AND LITTER CAPTURE

CONTACT DETAILS

John Shallahamer

StormTrap

Water Quality Solutions Specialist –
Southwest Region

jshallahamer@stormtrap.com

Questions and Answers with:



Greg Williams, Ph.D. P.Eng.
Director of Water Quality Technology
StormTrap



John Shallahamer
Water Quality Solutions Specialist –
Southwest Region
StormTrap



Todd Danielson
Editorial Director
Informed Infrastructure

If you are viewing the
webcast LIVE, you may
now download the
Certificate of
Completion by clicking
the AIA button at the
bottom of the console

If you are viewing the
ARCHIVE, you must take
and pass the quiz below
this video to obtain a
Certificate of
Completion



INFORMED INFRASTRUCTURE

The magazine for civil & structural engineers

Check out
www.informedinfrastructure.com/v1education
to view other accredited
webcasts.

Thank You for Attending