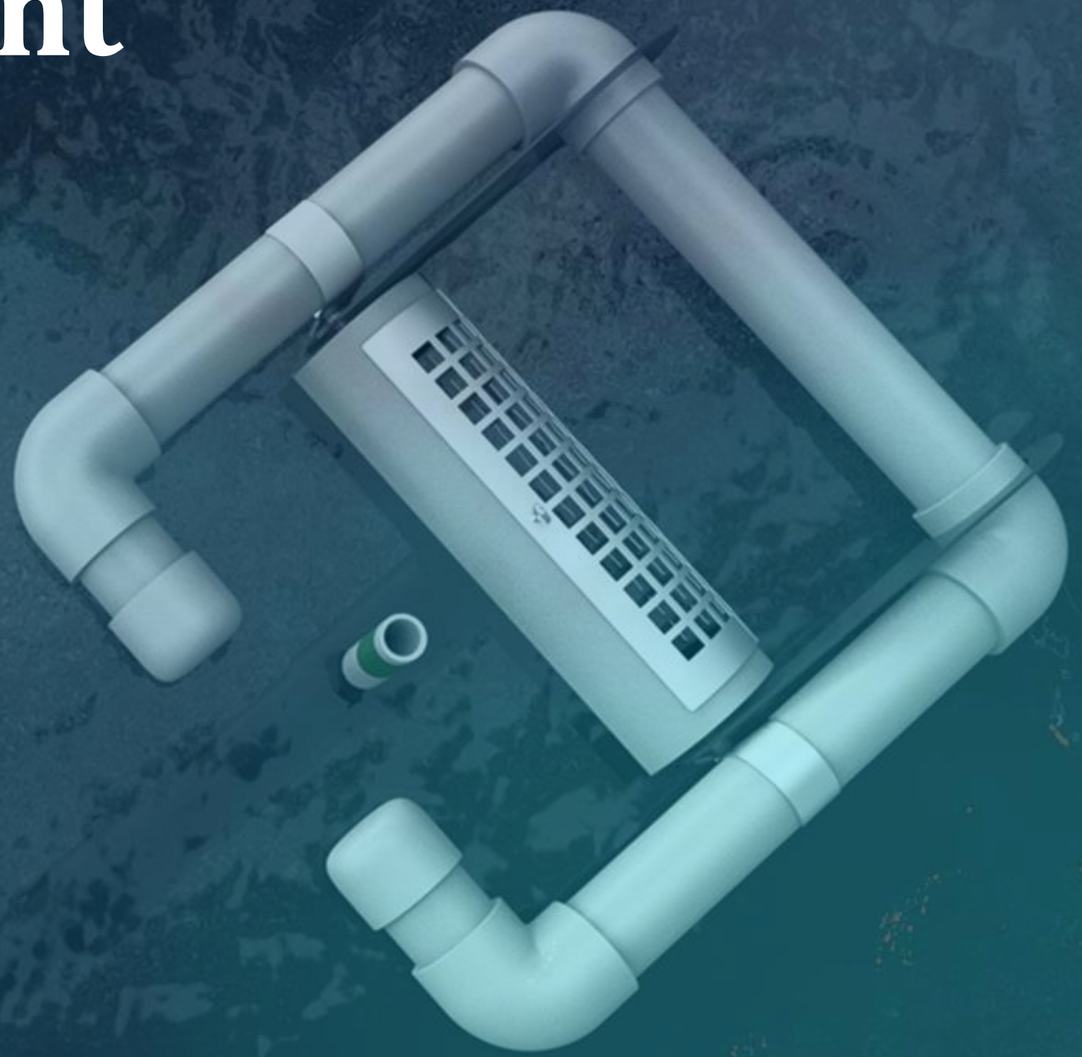
Process of Sediment Basin Design

Chase Goodwin

Territory Sales Manager

Faircloth Skimmer®



Sediment Basin



* From IECA Design Standards for Sediment Control Practices

Sediment Basin



* From IECA Design Standards for Sediment Control Practices

FAIRCLOTH SKIMMER









Sediment is the leading cause of water pollution in the US. We have laws to protect our water quality.

Introduction

Faircloth Skimmer®

- Frequent pollutants found in sediment:
  - **Total Phosphorus (TP)**
  - **Total Nitrogen (TN)**
  - **Metals**
  - **Oil and Grease (Hydrocarbons)**
  - **Bacteria (E. coli, Fecal Coliform)**
  - **PFOS**
- The most prominent pollutant is Total Suspended Solids (TSS)
- Best way to treat pollutants is to **remove them entirely.**

Construction General Permit (CGP)

The C&D rule's non-numeric effluent (runoff) limits are as follows (see 40 CFR 450.21):

a. Erosion and Sediment Controls: Design, install, and maintain effective erosion and sediment controls.

Effective Erosion and Sediment Controls:

I. Control stormwater volume and velocity within the site to minimize soil erosion

II. Control stormwater discharges, including both peak flowrates and total stormwater volume, to minimize downstream erosion.

III. Minimize sediment discharges from the site.

Sediment Basin



* From IECA Design Standards for Sediment Control Practices

Purpose of Sediment Basins



- Collect and temporarily store stormwater prior to controlled offsite discharge
- Provide time to promote gravitational settling of suspended sediment.

High Speed Representation of Sediment Settling in a Sediment Basin











During and Directly After Stormwater Event → Settling Process → Over Time → After Stormwater Event

Forebay and Inflow Channel

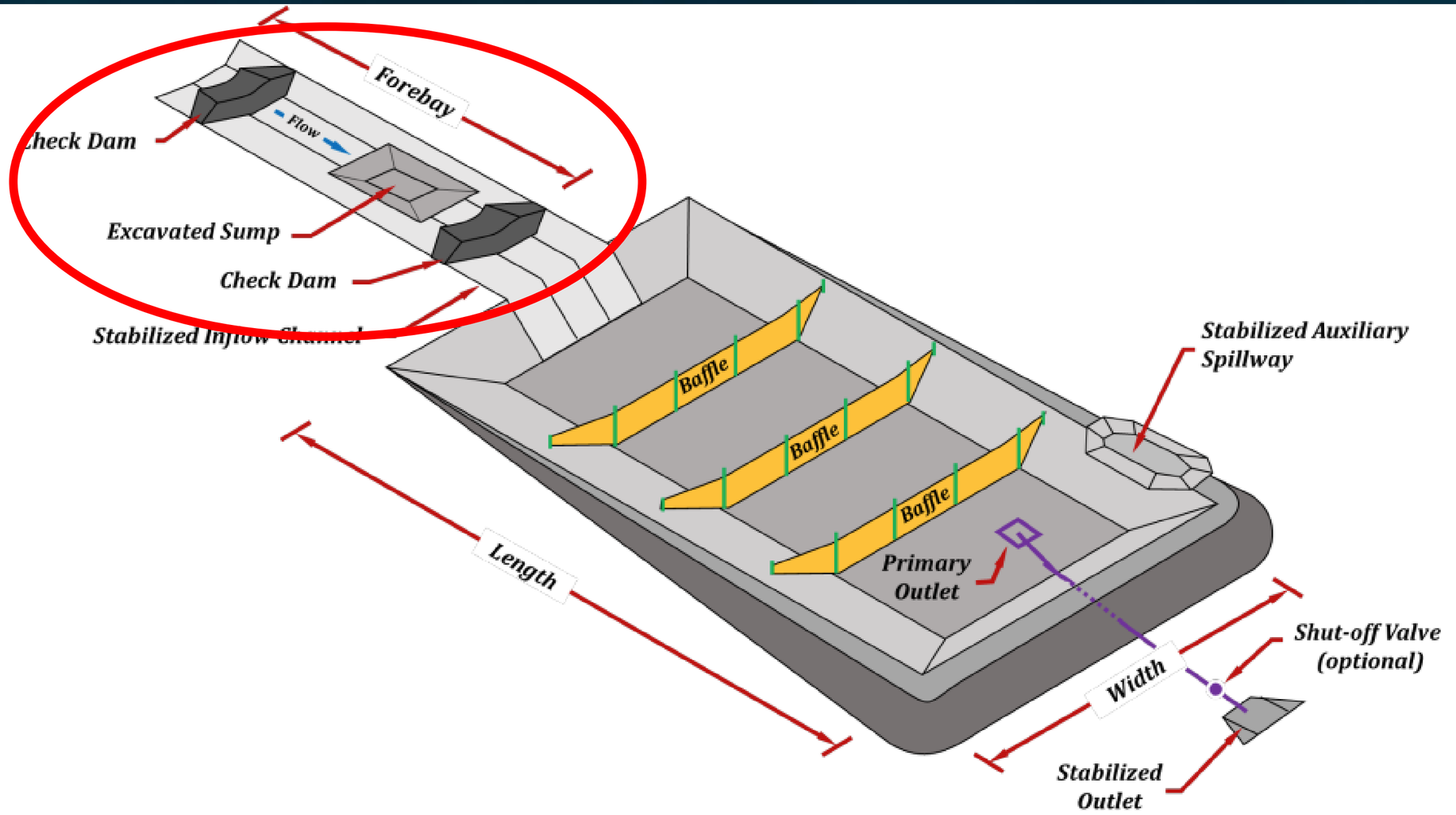
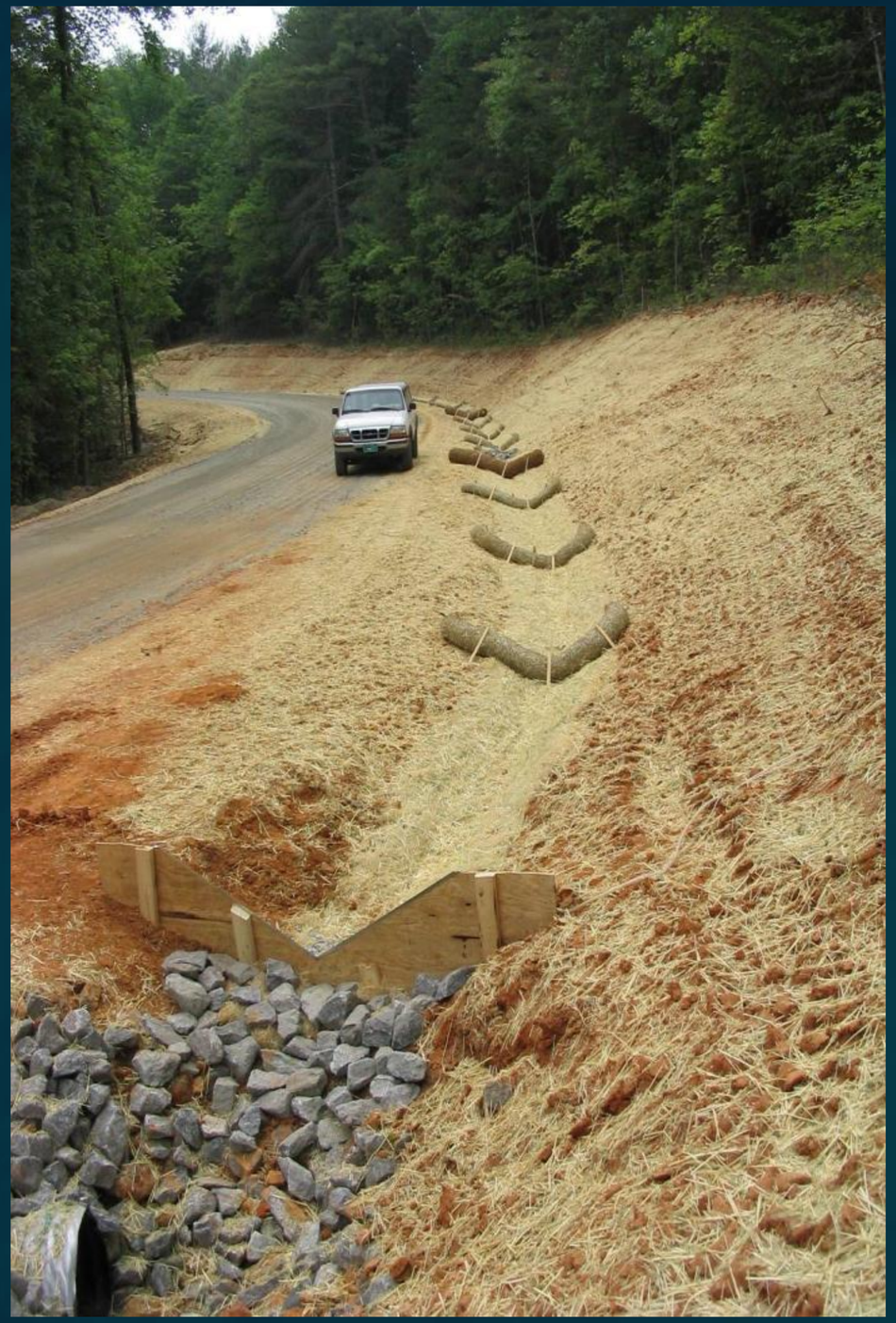


Figure 1. Typical sediment basin diagram with key elements.

© International Erosion Control Association, Standards and Practices Committee 2021



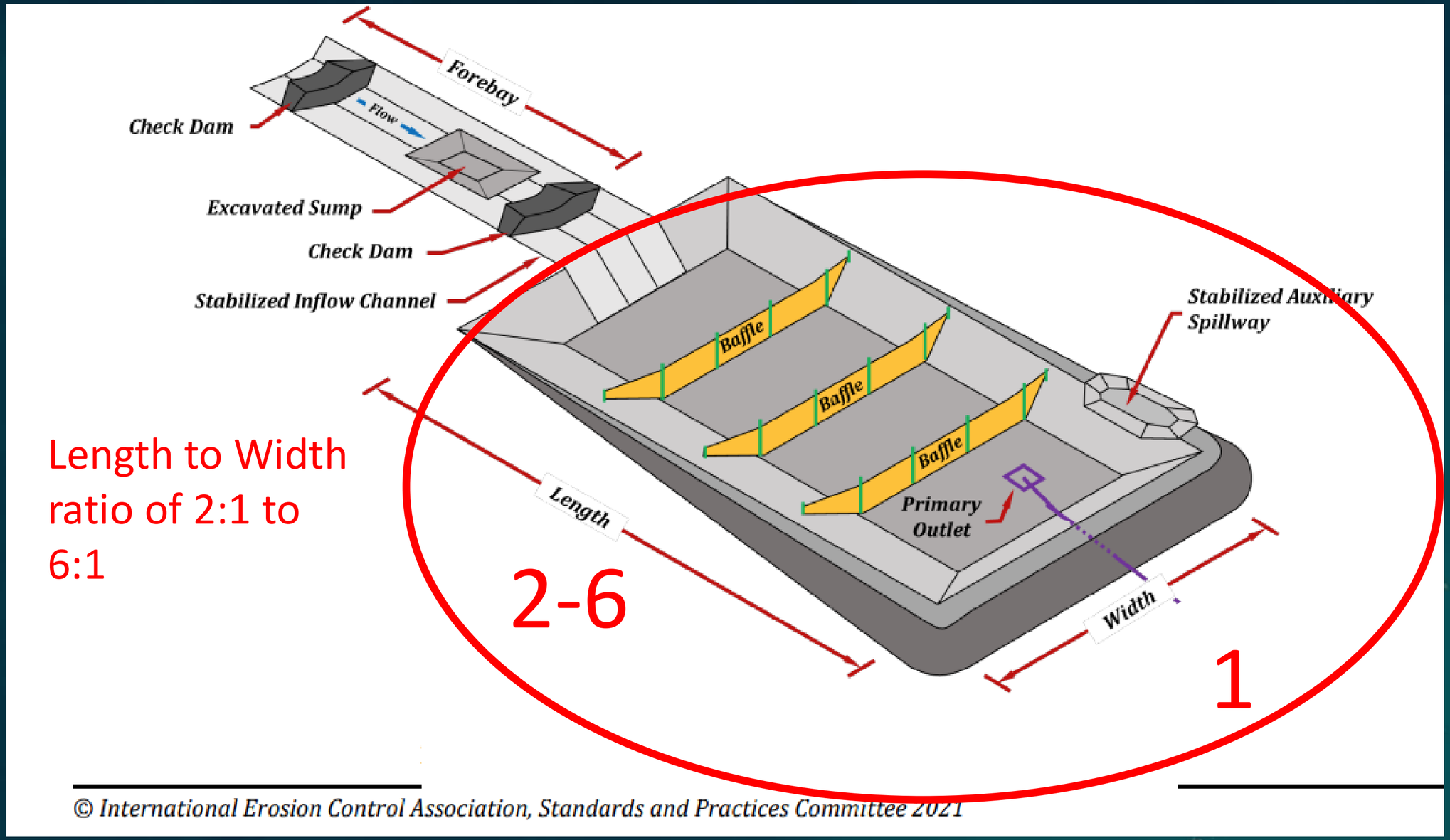
- Energy Dissipation
  - Reduces erosion
  - Prevents resuspension
  - Allows for sedimentation
- Sediment Capture
  - Heavier soil particles settle in early treatment areas
  - Maintenance of forebay more cost effective

Stabilized Inflow Channel





Basin Dimensions: Surface Area



Length to Width ratio of 2:1 to 6:1

© International Erosion Control Association, Standards and Practices Committee 2021

Benefits of Long, Narrow Basins



- Increased flow path length
- Improved settling efficiency
- Facilitates baffle installation

Basin Dimensions: Volume

IECA International Erosion Control Association REGION ONE
Protecting Soil and Water Resources

Design Standards for Sediment Control Practices

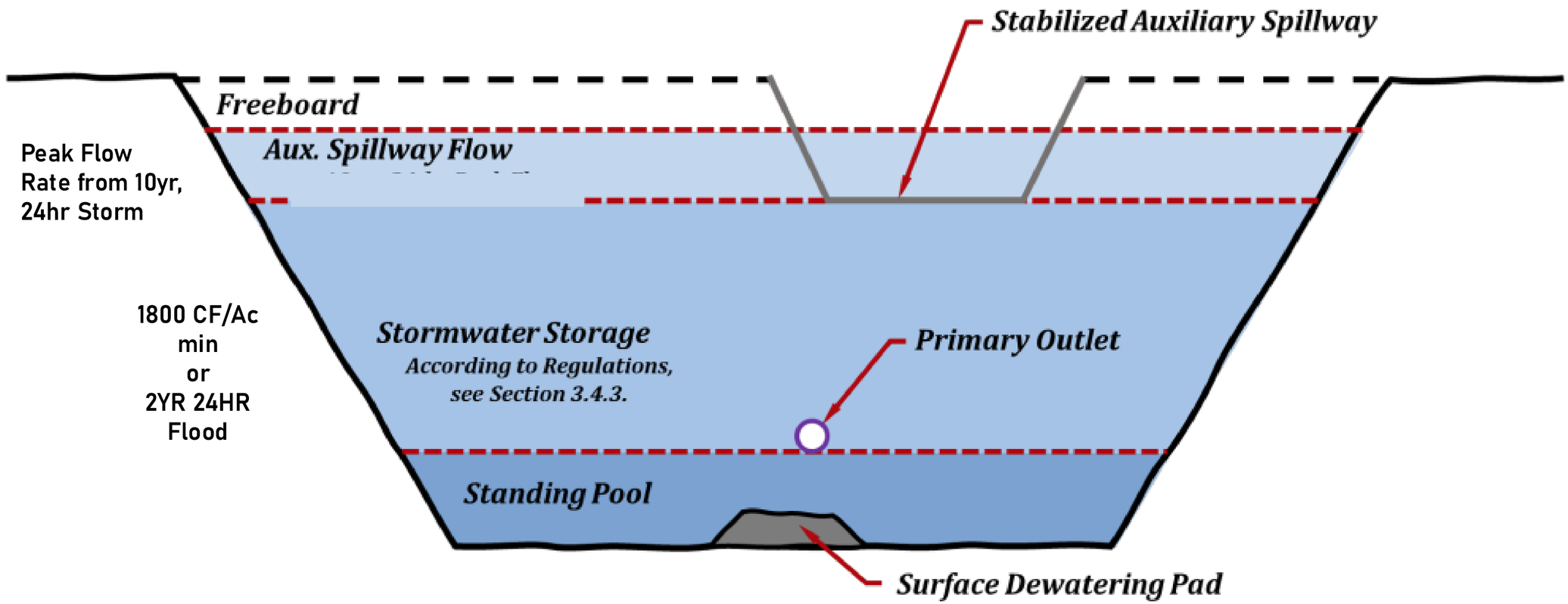
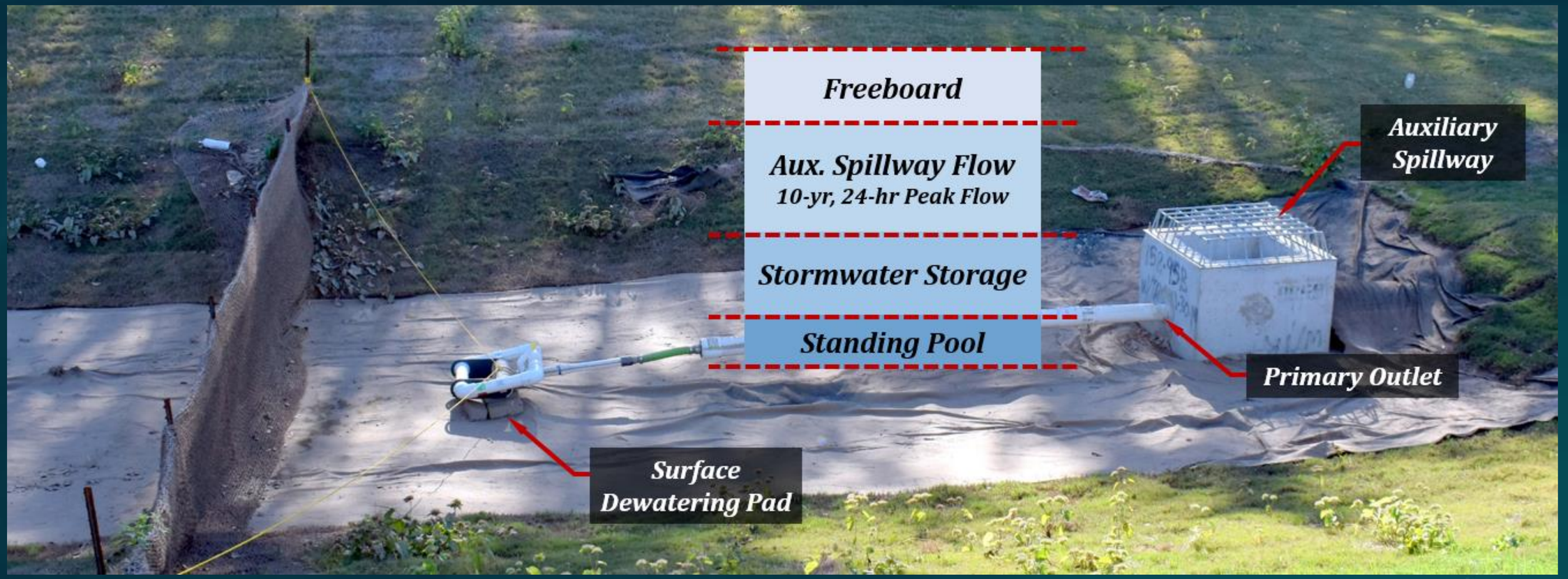


Figure 2. Sediment basin cross section.



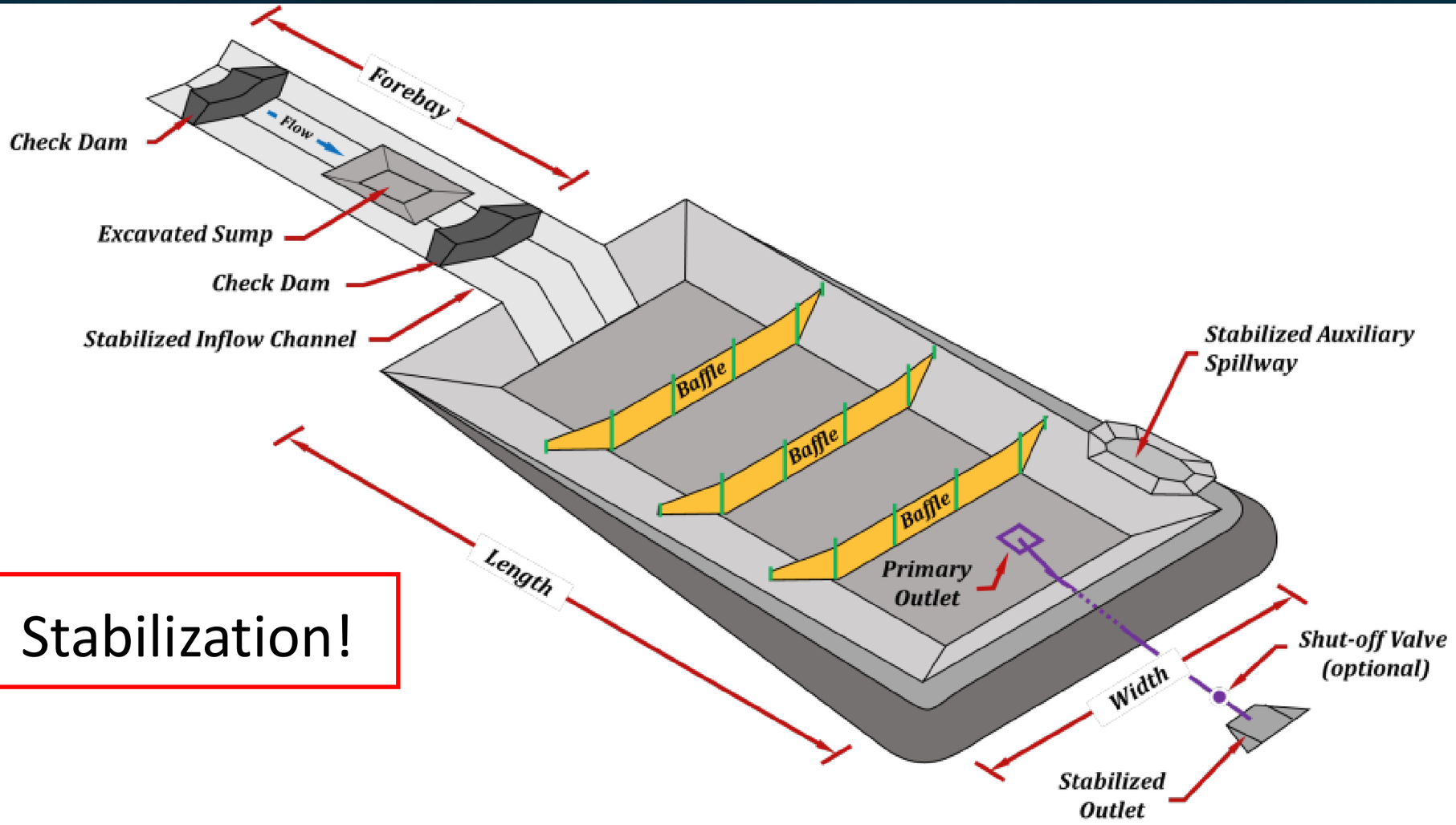
Sediment Storage: Min. 1,800ft^3 storage per acre drainage (adhere to local/state/federal guidelines)

Sediment Cleanout Level: 1/2 Sediment Storage

Dewatering Time: Minimum 2 days (48 hours), Maximum 5 days (120 hours)

Dewatering Rate = Stormwater Storage / Dewatering Time

Skimmer Sediment Basin Design



Stabilization!

Figure 1. Typical sediment basin diagram with key elements.

© International Erosion Control Association, Standards and Practices Committee 2021

Side Slope Stabilization





Skimmer Sediment Basin Design

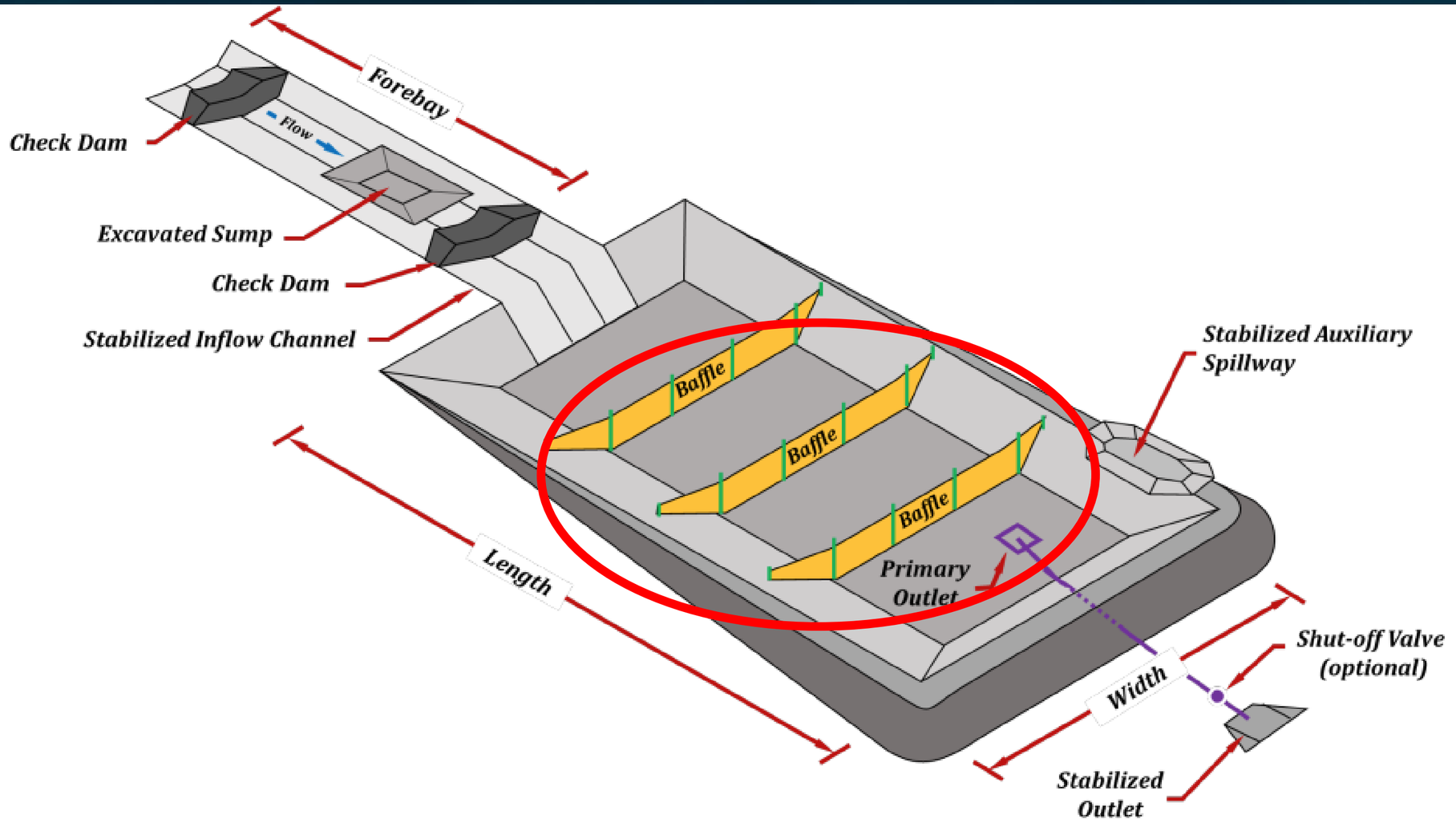


Figure 1. Typical sediment basin diagram with key elements.

© International Erosion Control Association, Standards and Practices Committee 2021

Benefits of Porous Baffles



- Reduce overall turbulence in basin
- Spread stormwater and sediment across entire width of basin


The baffle spreads the flow and creates non-turbulent conditions
ideal for settling sediment.

Guidance on Baffles:



- 3 baffles at equal spacing in Basin
- Configure baffles perpendicularly to the flow of water
- Anchor baffles into basin floor and side slopes





Drawbacks of Silt Fence/Plywood Baffles



Weir points create **increased turbulence,** which decreases sedimentation and resuspends already accumulated sediment

Skimmer Sediment Basin Design

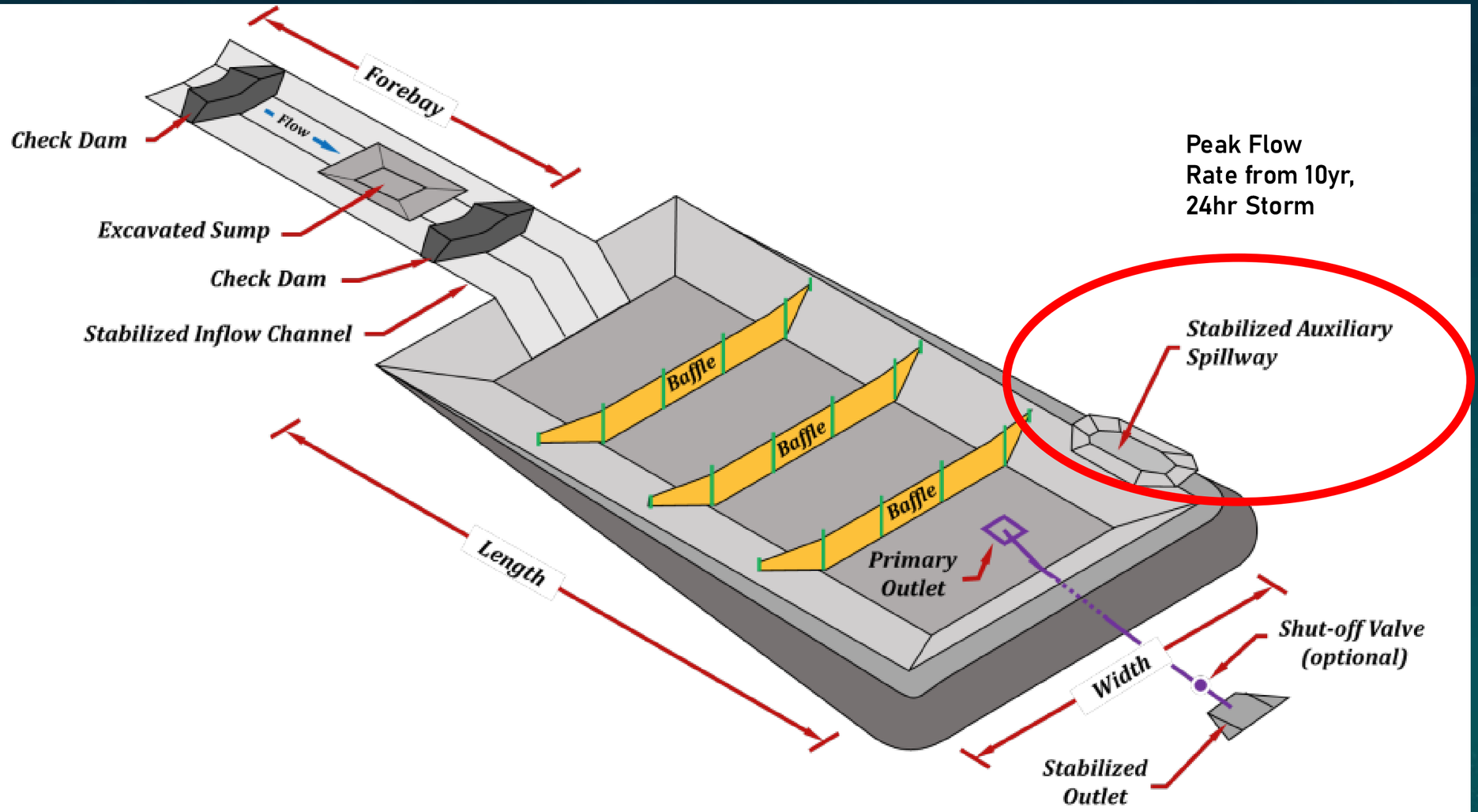


Figure 1. Typical sediment basin diagram with key elements.

© International Erosion Control Association, Standards and Practices Committee 2021

Basin Dimensions: Volume

IECA International Erosion Control Association REGION ONE
Protecting Soil and Water Resources

Design Standards for Sediment Control Practices

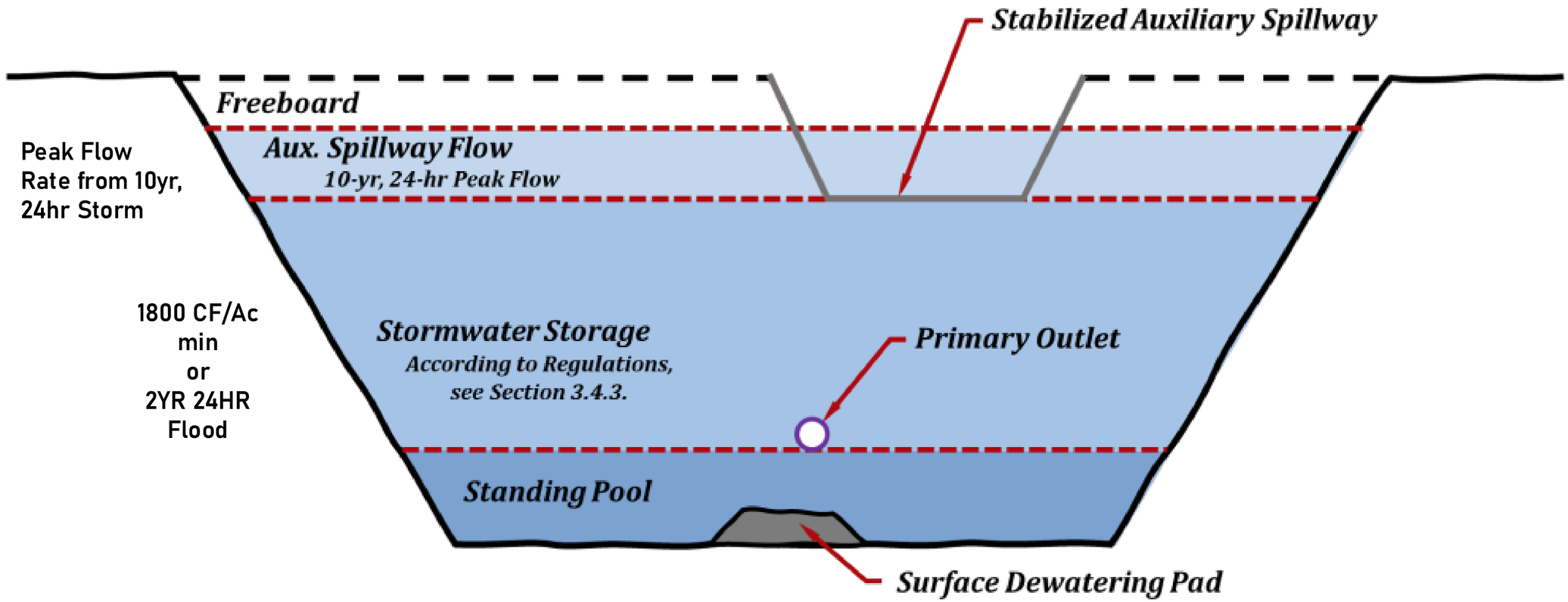


Figure 2. Sediment basin cross section.

Emergency Spillway



- Designed to handle the 10-year, 24-hour storm at a minimum in NC.

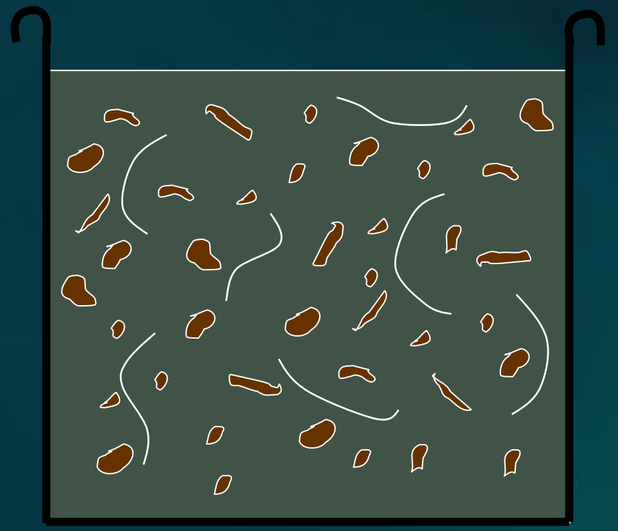


Flocculation



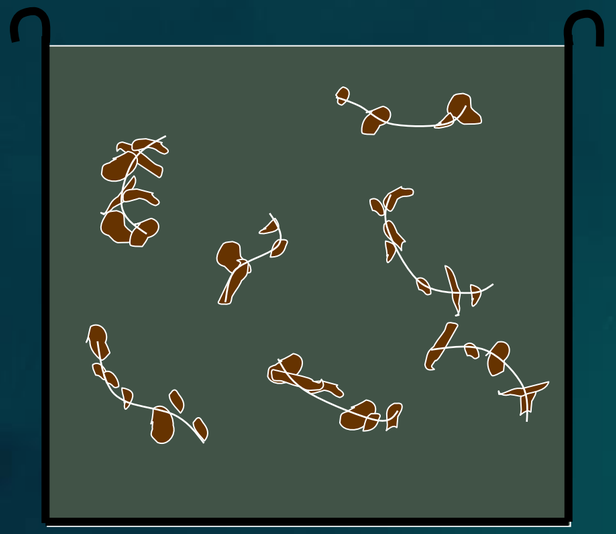
Flocculation

- Flocculants bind suspended sediment by attaching to several soil particles forming a larger aggregate or floc.



Flocculation

- The larger (and now heavier) aggregates then settle out of suspension.



PAM (Anionic Polyacrylamide)

- Extremely Low Toxicity
- Approved Use Under USEPA/CGP
- **Granular PAM** Used for Soil Stabilization
- **Floc Log** Form Used In Water Treatment





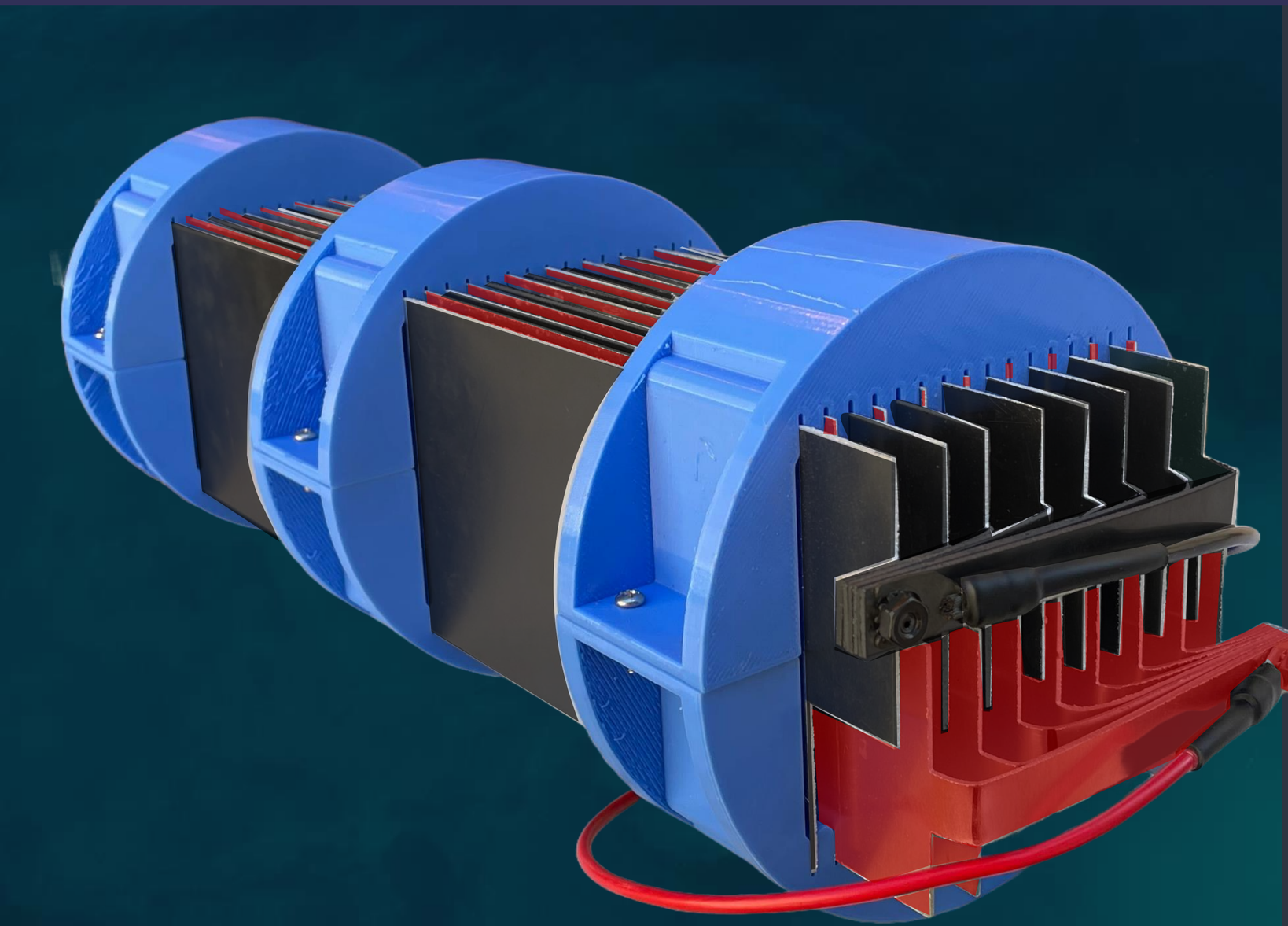


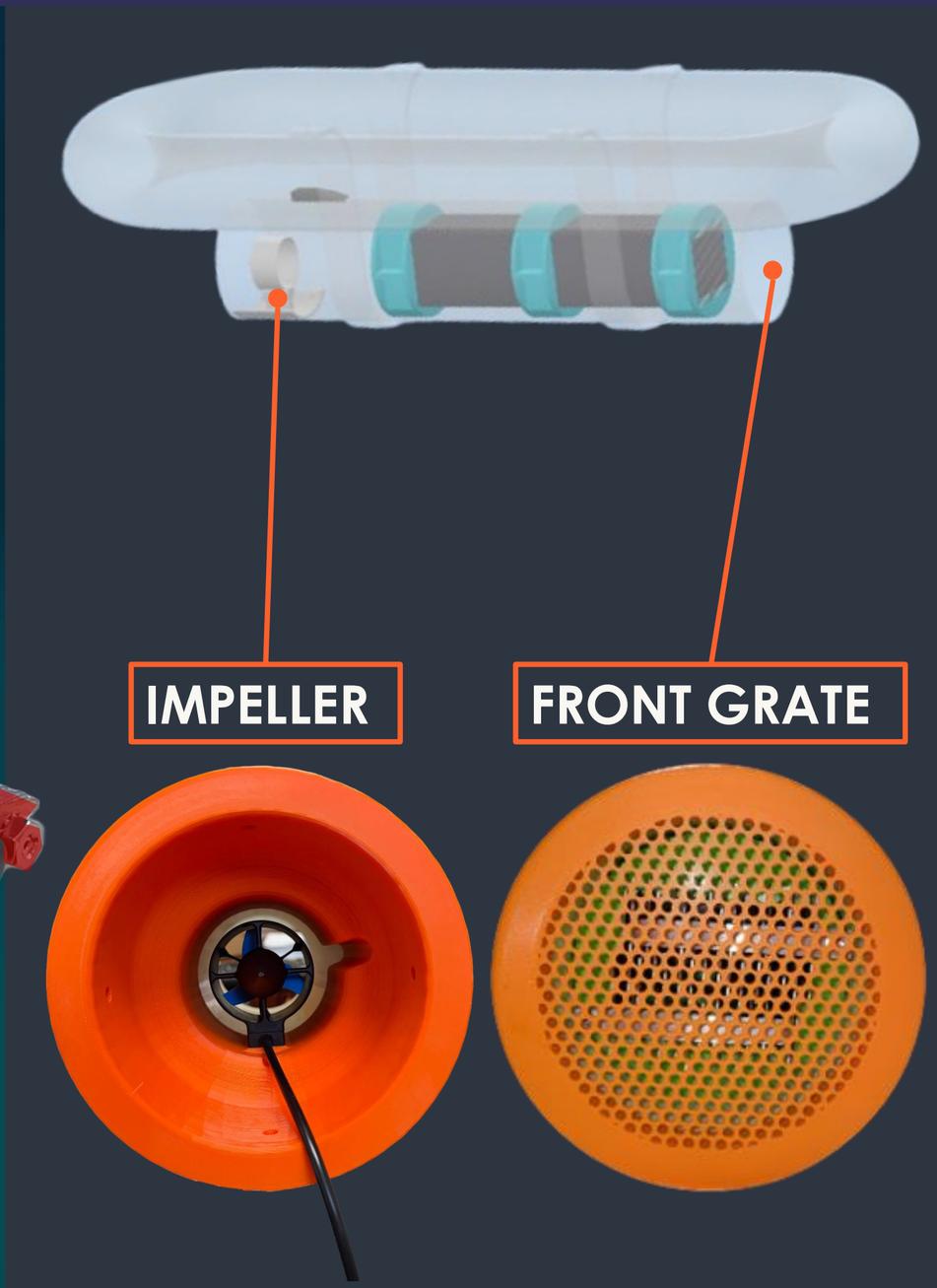
- Apply as far upstream as possible to give time for reaction
- Perform site and/or lab testing on soil to determine optimal PAM blend



Flocculation Process Over Time

THE ELECTRIC FLOC GENERATOR





Dewatering: Skimmers

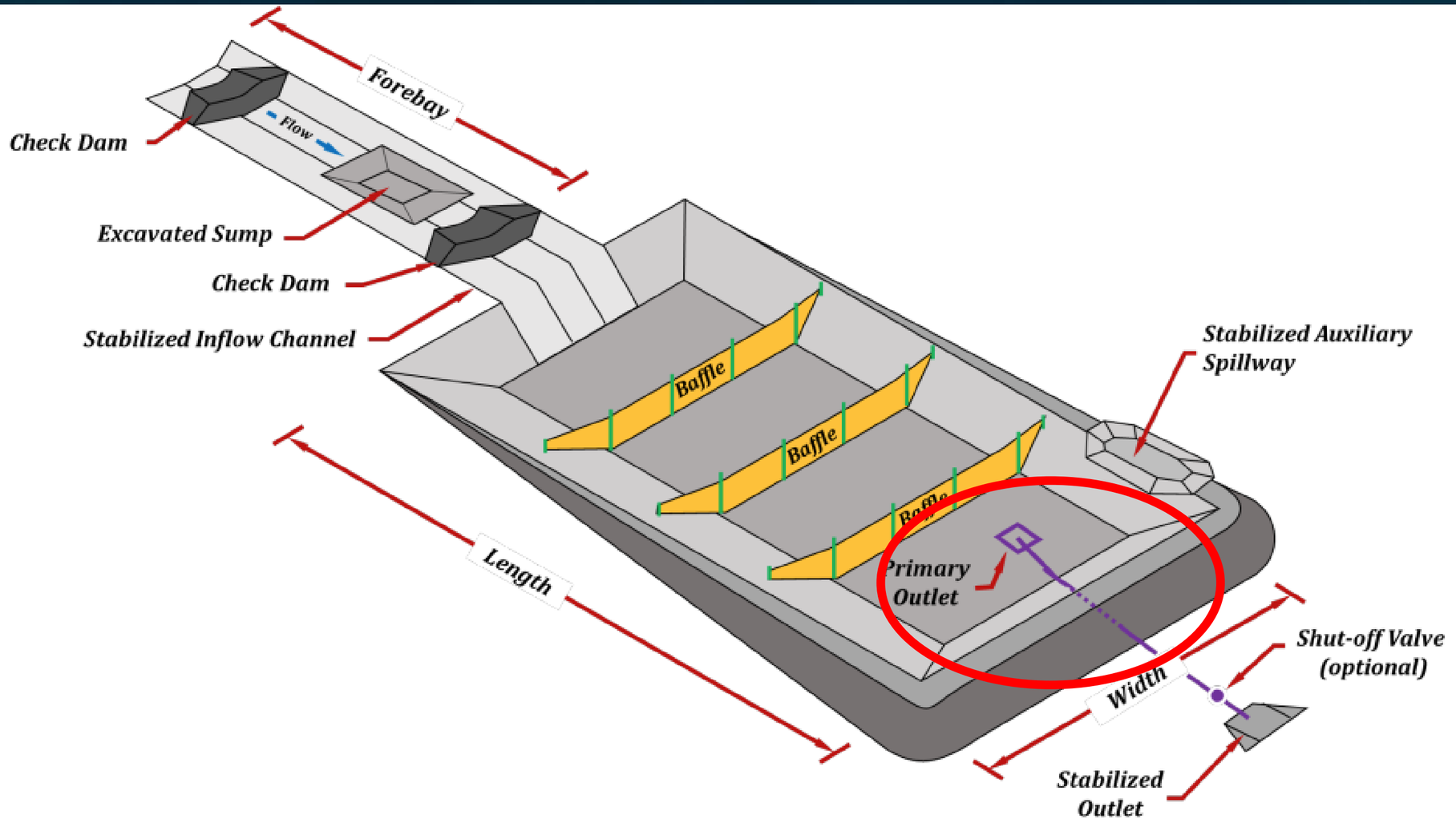


Figure 1. Typical sediment basin diagram with key elements.

© International Erosion Control Association, Standards and Practices Committee 2021

The C&D rule's non-numeric effluent limits are as follows (see 40 CFR 450.21):

f. Surface Outlets:
When discharging from basins and impoundments, permittees are required to utilize outlet structures that withdraw water from the surface, unless infeasible.

Source:
Code of Federal Regulations
450.21 Effluent limitations reflecting the best practicable technology currently available (BPT).
https://www.ecfr.gov/current/title-40/chapter-I/subchapter-N/part-450/subpart-B/section-450.21



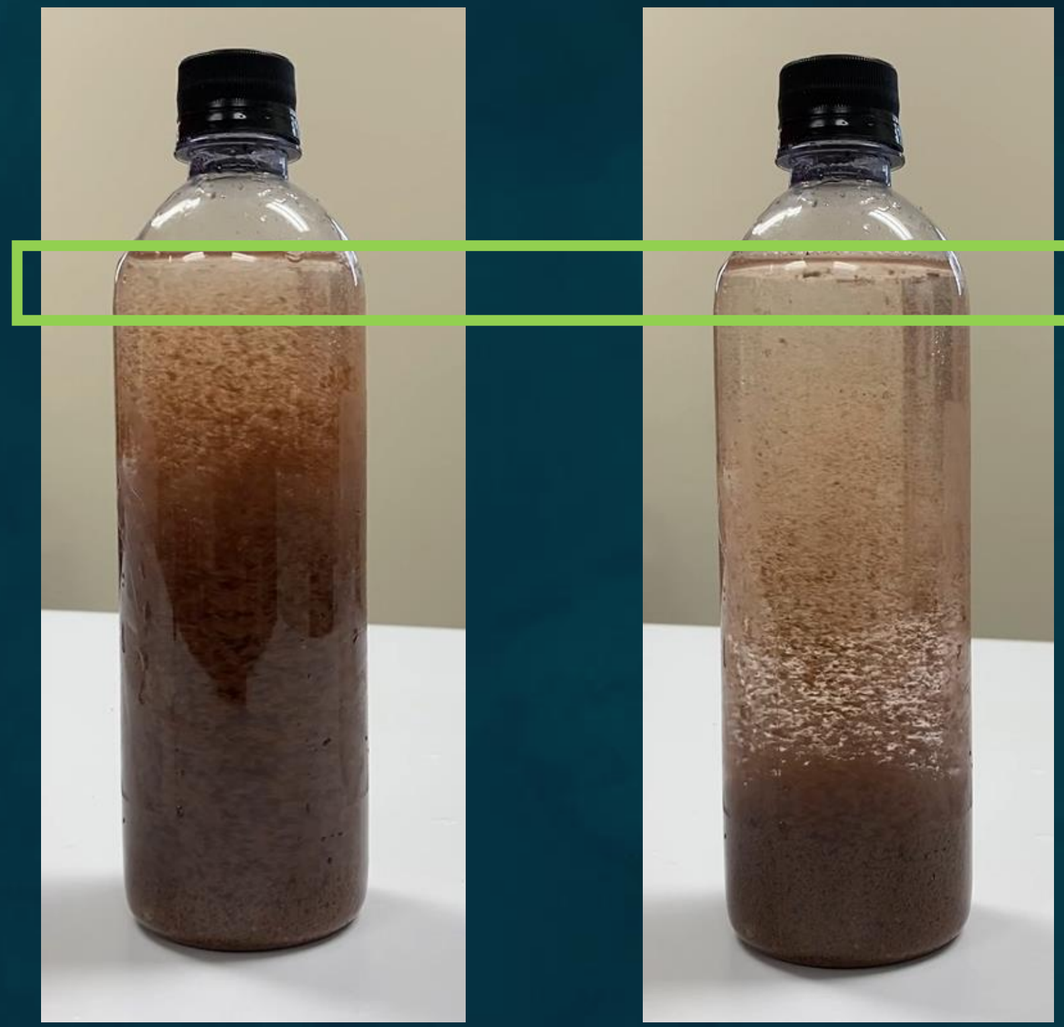






During and Directly After Stormwater Event → Settling Process → Over Time → After Stormwater Event

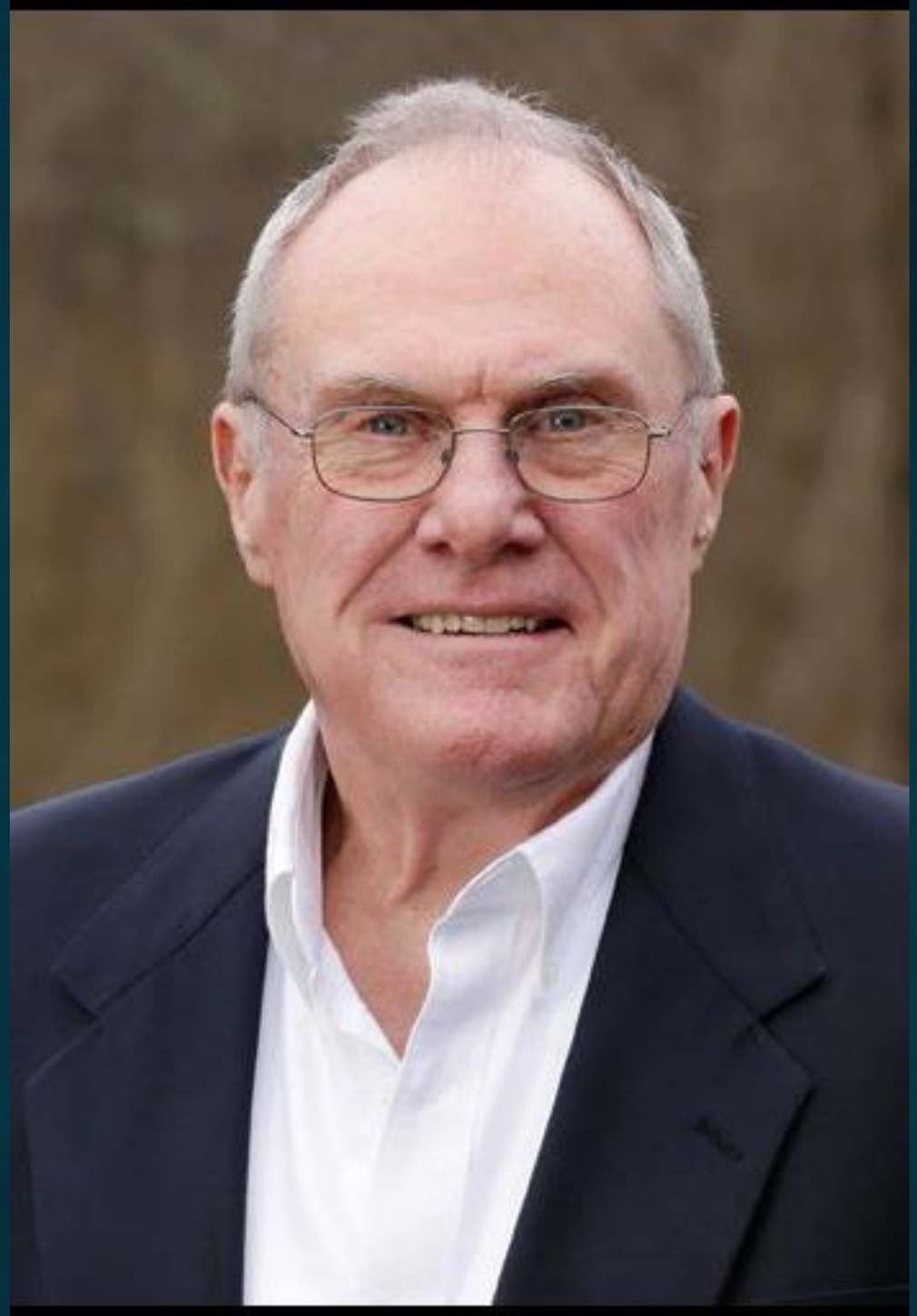
Water at the top of the basin is cleanest



Draining water from the surface ensures the cleanest water is being discharged off site.



Perforated Risers Drain from the top, middle, and bottom of the water column



Warren Faircloth

INVENTOR OF THE SEDIMENT BASIN SKIMMER

Skimmers!

The most vital part of sediment basin design!



A **sediment skimmer** is an erosion control device **floating on the surface** of basins and is designed to remove suspended sediment, debris, and pollutants from stormwater runoff before leaving a construction site or disturbed land area.

Effects of Design Changes on Sediment Retention Basin

By:
Melanie Sue Markusic (McCaleb)
Masters Thesis
Department of Soil Science
North Carolina State University





Trapping Efficiencies

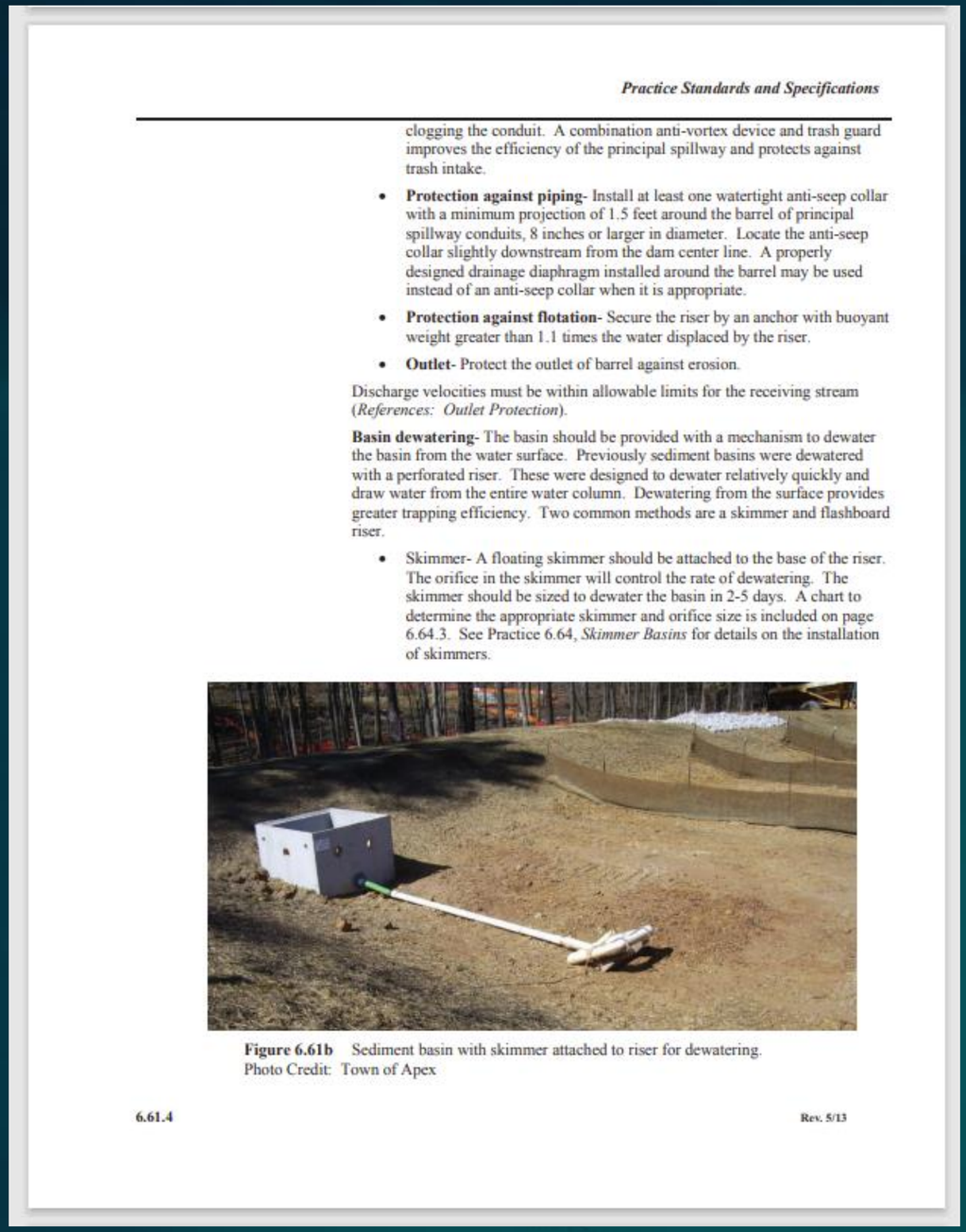
	Trapping Efficiencies	Particle Size Distribution		
		Sand	Silt	Clay
Standard 10-year Trap	37%	55%	25%	20%
Standard 10-year Trap14	46%	34%	36%	30%
Standard 10-year Trap with Silt Fence Baffles	45% (first 3 months) 36% (last 5 months)	36%	50%	14%
Standard 10-year Trap with 1m Standing Pool	36%	55%	20%	25%
Standard 25-year Trap	90%	75%	18%	7%
Skimmer Basin	99.8% 76% (not maintained)	62%	28%	10%

NORTH CAROLINA
Environmental Quality

Energy, Mineral, and Land Resources

NC Erosion and Sediment Control Planning and Design Manual

Chapter 6 — Sediment Basins



Practice Standards and Specifications

clogging the conduit. A combination anti-vortex device and trash guard improves the efficiency of the principal spillway and protects against trash intake.

- **Protection against piping**- Install at least one watertight anti-seep collar with a minimum projection of 1.5 feet around the barrel of principal spillway conduits, 8 inches or larger in diameter. Locate the anti-seep collar slightly downstream from the dam center line. A properly designed drainage diaphragm installed around the barrel may be used instead of an anti-seep collar when it is appropriate.
- **Protection against flotation**- Secure the riser by an anchor with buoyant weight greater than 1.1 times the water displaced by the riser.
- **Outlet**- Protect the outlet of barrel against erosion.

Discharge velocities must be within allowable limits for the receiving stream (*References: Outlet Protection*).

Basin dewatering- The basin should be provided with a mechanism to dewater the basin from the water surface. Previously sediment basins were dewatered with a perforated riser. These were designed to dewater relatively quickly and draw water from the entire water column. Dewatering from the surface provides greater trapping efficiency. Two common methods are a skimmer and flashboard riser.

- Skimmer- A floating skimmer should be attached to the base of the riser. The orifice in the skimmer will control the rate of dewatering. The skimmer should be sized to dewater the basin in 2-5 days. A chart to determine the appropriate skimmer and orifice size is included on page 6.64.3. See Practice 6.64, *Skimmer Basins* for details on the installation of skimmers.

Figure 6.61b Sediment basin with skimmer attached to riser for dewatering.
Photo Credit: Town of Apex

6.61.4 Rev. 5/13

Ohio Environmental Protection Agency

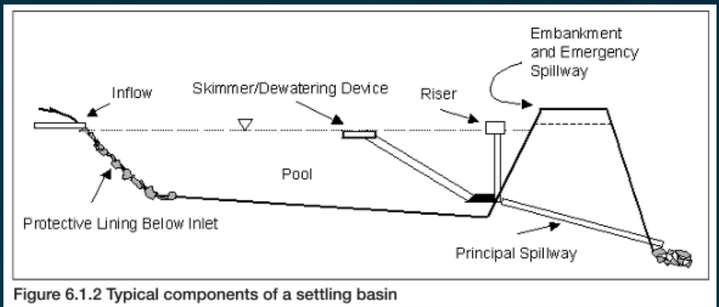


Figure 6.1.2 Typical components of a settling basin

Alabama Handbook for

Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas

Sediment Basin (SBN)



dhec
S.C. Department of Health and Environmental Control

SC DHEC Stormwater BMP Handbook
Sediment Control BMPs – Sediment Basins

Sediment Basins

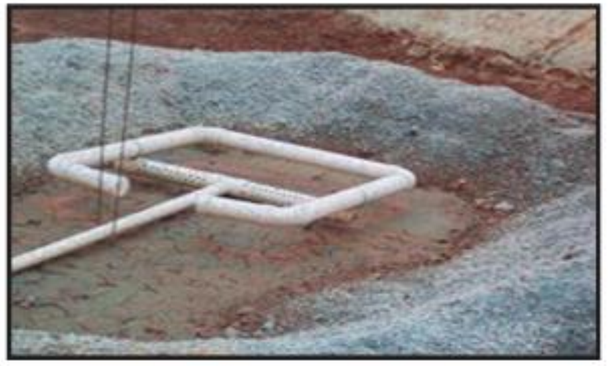


FEATURES
- Sediment Control
- Volume Control
- Velocity Control

SECTIONS
- General Design
- Forebays
- Porous Baffles
- Basin Dewatering
- Skimmers
- Spillways
- Permanent Pools

GSWCC

Floating Surface Skimmer **Sk**



Caltrans

Construction Site Best Management Practices (BMP) Manual

Sediment/Desilting Basin **SC-2**

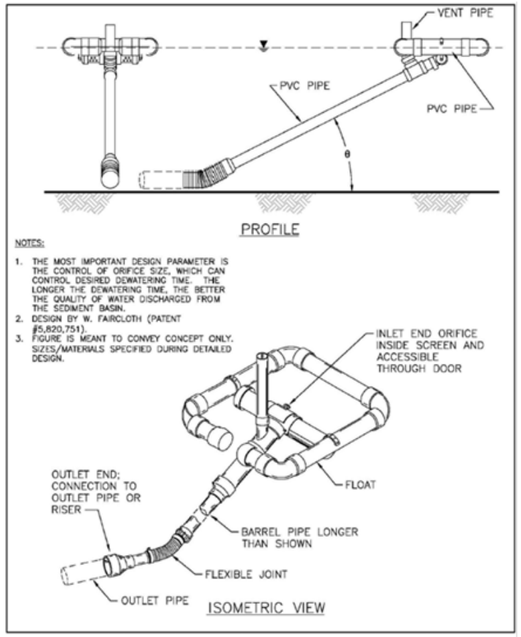
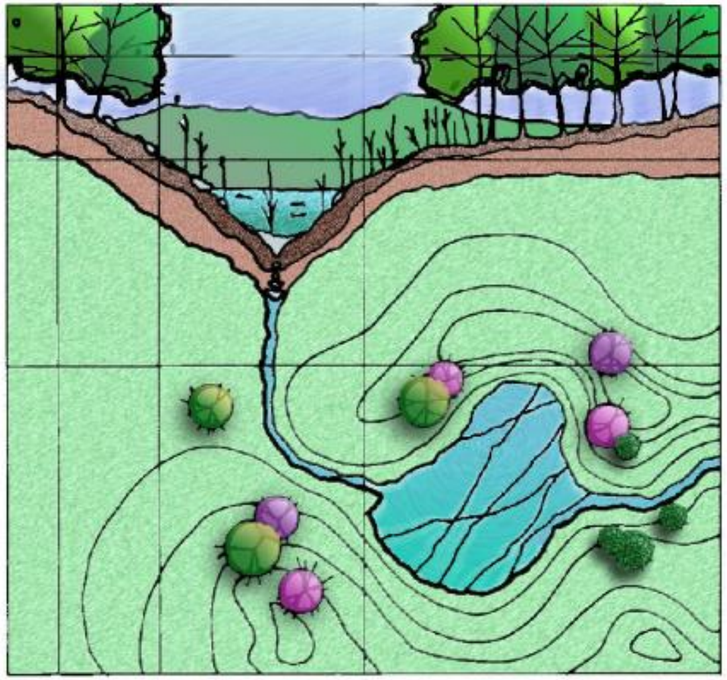


FIGURE 3: TYPICAL SKIMMER
NOT TO SCALE

NEW JERSEY DEPARTMENT OF TRANSPORTATION

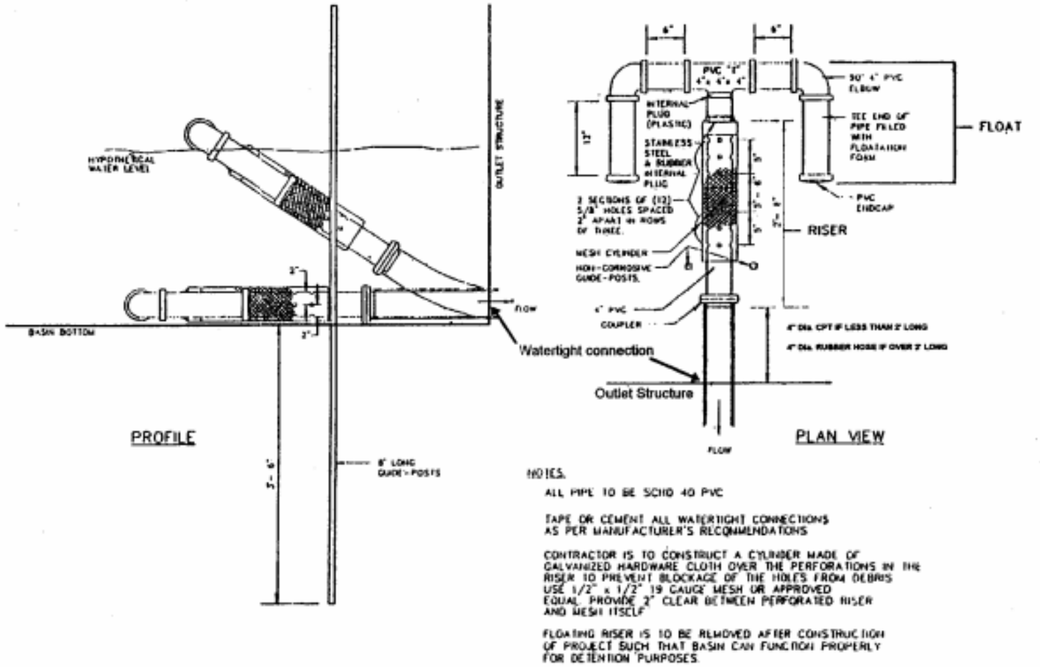
SOIL EROSION AND SEDIMENT CONTROL STANDARDS



2008 Edition

Dewatering Sediment Basins with Skimmer

NOTE: ALL PIPE AND TUBING IS SIZED AS PER ORIFICE DIAMETER.
(EXAMPLE SHOWN IS FOR A FOUR INCH DIAMETER ORIFICE)



FLOATING RISER DETAIL

pennsylvania

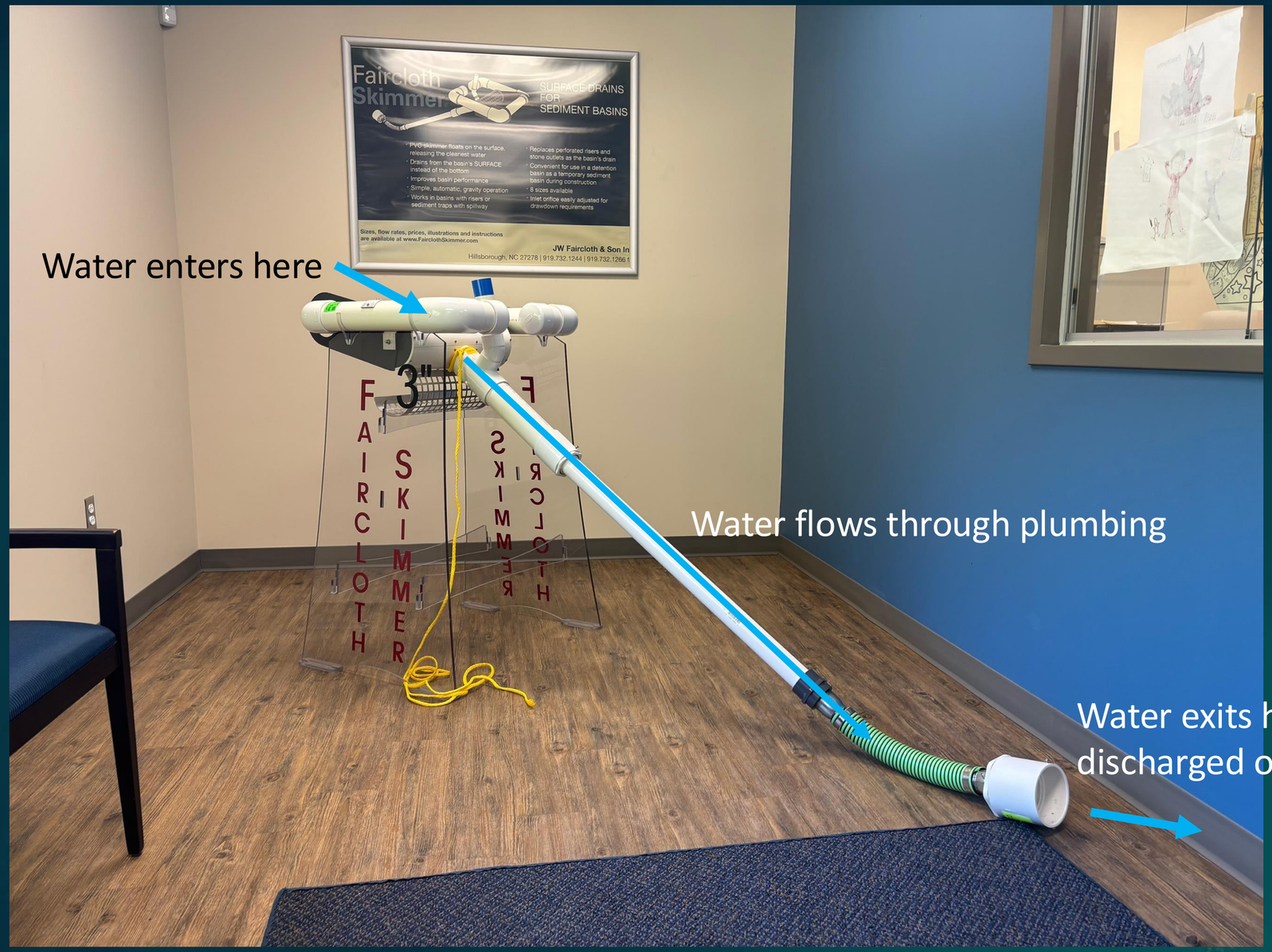
DEPARTMENT OF ENVIRONMENTAL PROTECTION

EROSION AND SEDIMENT POLLUTION CONTROL PROGRAM MANUAL

Skimmer Dewatering - **This device has a HIGH sediment removal efficiency and is an ABACT for HQ and EV watersheds.**

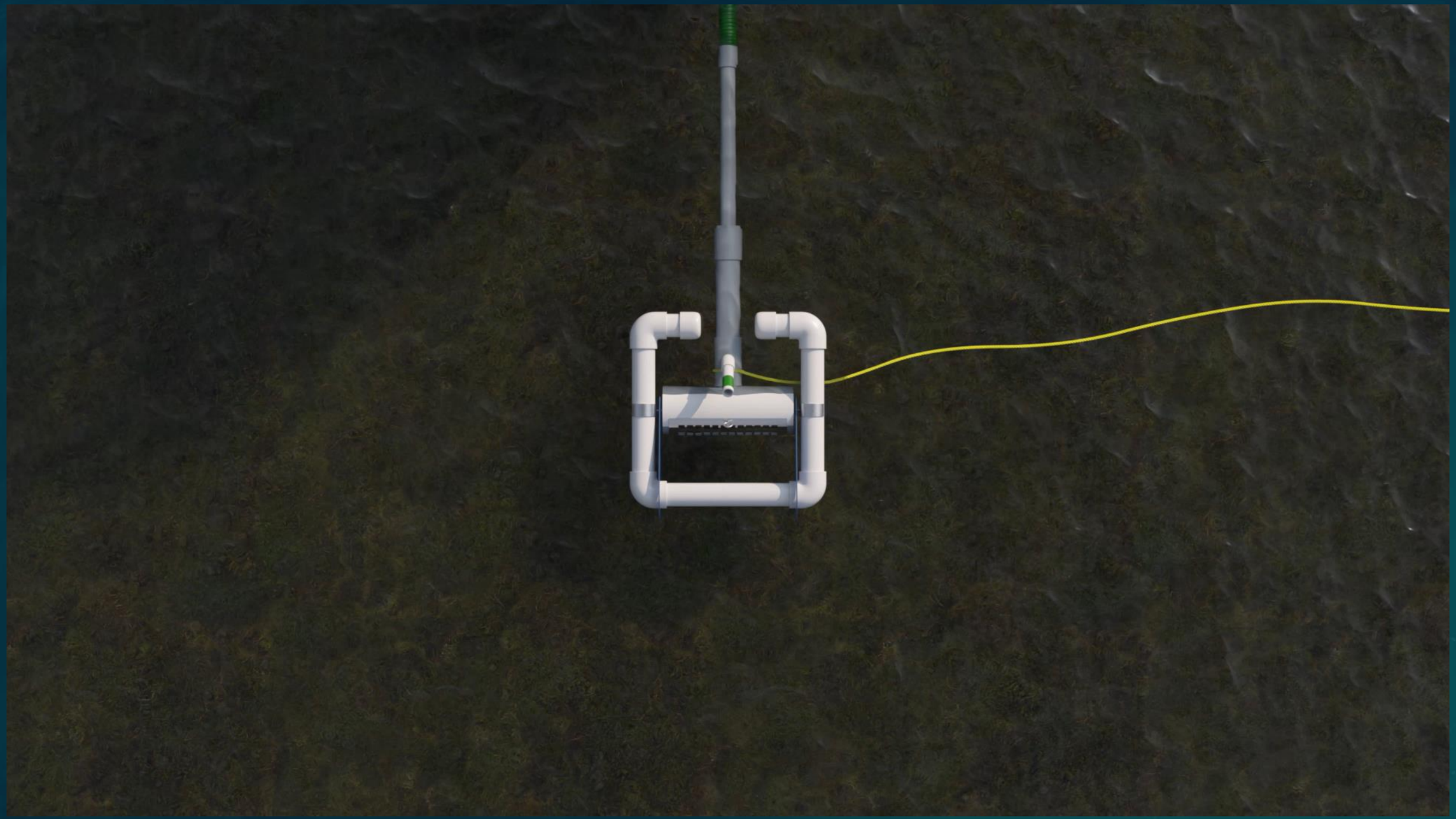


Chester County Conservation District

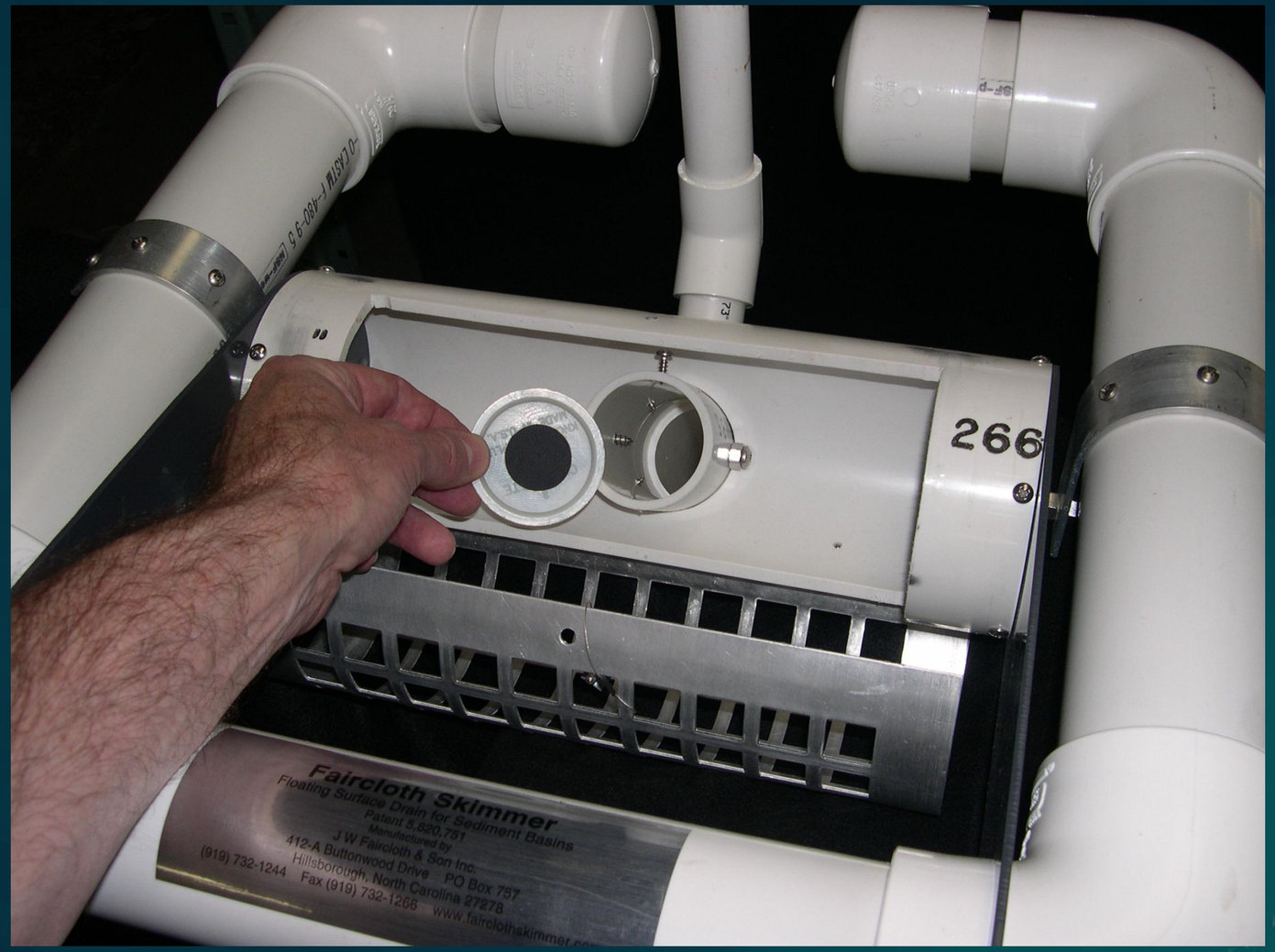

Faircloth Skimmer
SURFACE DRAINS FOR SEDIMENT BASINS
PVC skimmer floats on the surface, releasing the cleanest water
Drains from the basin's SURFACE instead of the bottom
Improves basin performance
Simple, automatic, gravity operation
Works in basins with risers or sediment traps with spillway
Replaces perforated risers and stone outlets as the basin's drain
Convenient for use in a detention basin as a temporary sediment basin during construction
8 sizes available
Inlet orifice easily adjusted for drawdown requirements
Sizes, flow rates, prices, illustrations and instructions are available at www.FairclothSkimmer.com
JW Faircloth & Son In
Hillsborough, NC 27278 | 919.732.1244 | 919.732.1266 f
Water enters here
Water flows through plumbing
Water exits here and is discharged offsite



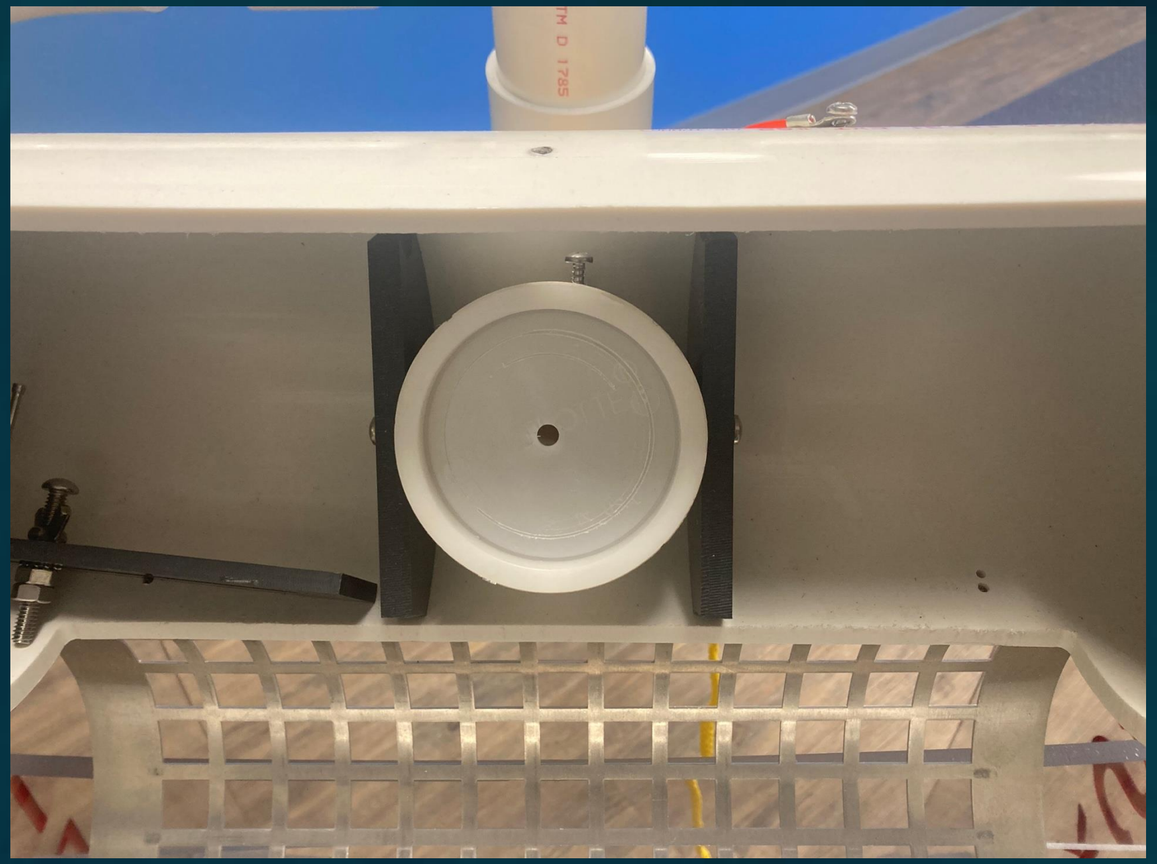
https://www.linkedin.com/posts/chase-goodwin-3125a622a_as-territory-sales-manager-for-faircloth-activity-7500649810169954304-ZVsd?utm_source=share&utm_medium=member_desktop&rcm=ACoAADllcD4BHBHpwzrBlQroXcXDKgGpHbaZH3k



Orifice

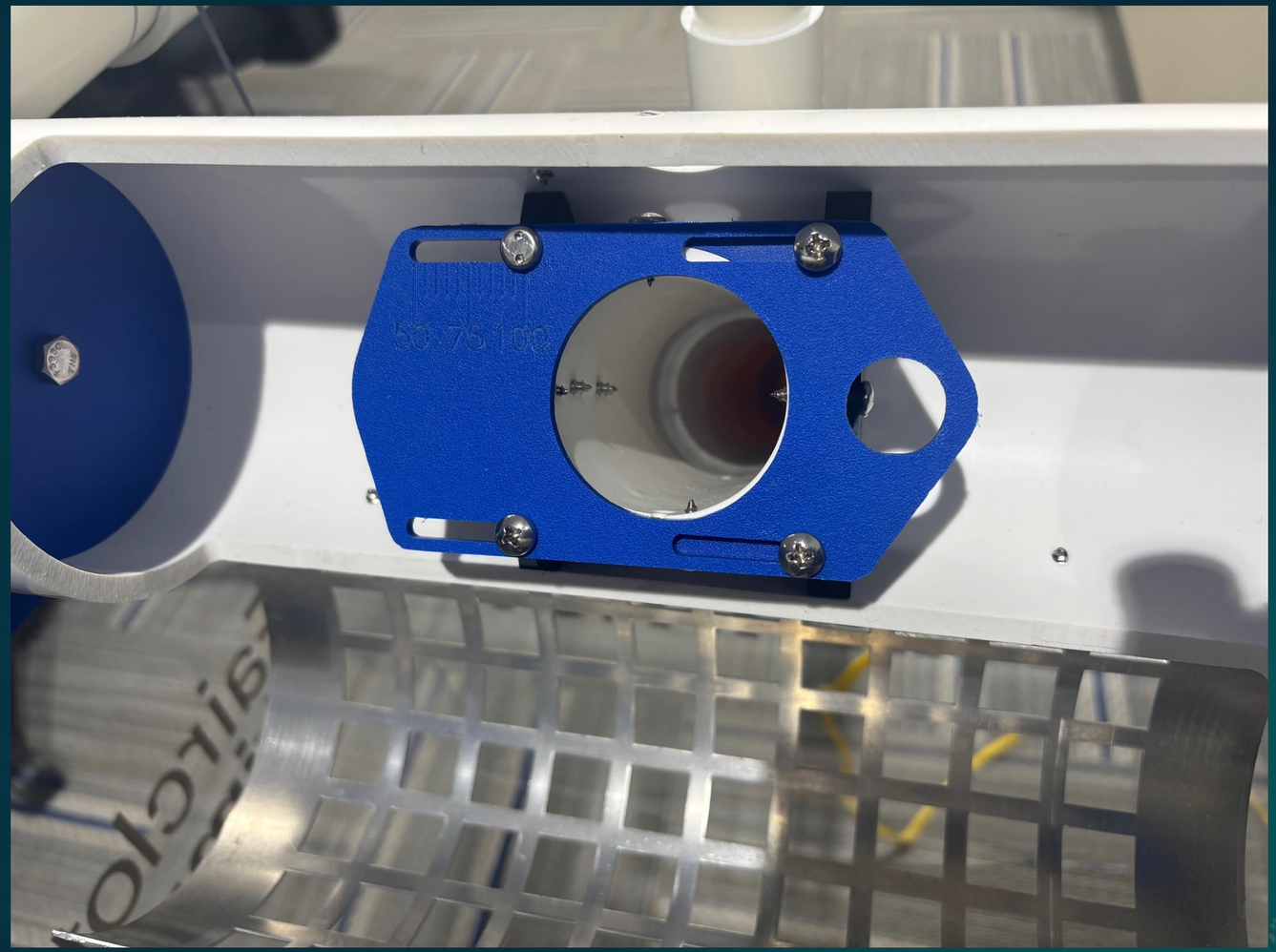

266
Faircloth Skimmer
Floating Surface Drain for Sediment Basins
Patent 5,620,761
Manufactured by
J W Faircloth & Son Inc.
412-A Buttonwood Drive PO Box 757
Hillsborough, North Carolina 27278
(919) 732-1244 Fax (919) 732-1266 www.fairclothskimmer.com

Old/Legacy Orifice Design





New Orifice Design:
Adjustable Orifice Gate



Flow Rates For Floating Orifice

Flow Capacities (in ft^3) For The Faircloth Skimmer®

Skimmer size	**1.5"**	**2"**	**2.5"**	**3"**	**4"**	**5"**	**6"**	**8"**
24 hours	1,782	3,928	6,605	9,517	19,063	30,526	52,645	92,585
2 day	3,564	7,856	13,210	19,034	38,126	61,052	105,290	185,170
3 day	5,346	11,784	19,815	28,551	57,189	91,578	157,935	277,755
4 day	7,128	15,712	26,420	38,068	76,252	122,104	210,580	370,340
5 day	8,910	19,640	33,025	47,585	95,315	152,630	263,225	462,925
6 day	10,692	23,568	39,630	57,102	114,378	183,156	315,870	555,510
7 day	12,474	27,496	46,235	66,619	133,441	213,682	368,515	648,095

Design/Installation/Inspection Considerations for Skimmers

Recommended to Put on the Plans

- Drawdown Time (2-6 days)
- Dewatering Volume (Calculated from total drainage area)
- Dewatering Rate = Dewatering Volume / Drawdown Rate
- Skimmer Size and Orifice Size
- Skimmer Manufacturer
- Barrel Length/Diameter

How to Size a Skimmer?

How to Size a Skimmer?

Use our Online Calculator!

How to Size a Skimmer?

Use our Online Calculator!

All you need is the **REQUIRED BASIN VOLUME** (sediment storage/stormwater storage/dewatering volume/…) and the **DEWATERING TIME** (2-5 days)

SIDE SLOPES: 1.5:1 OR FLATTER

MINIMUM HT: 18" FROM UPSLOPE SIDE

NOTE:
1. THIS DETAIL SHALL BE USED IN CONNECTION WITH LSP 180 AND LSP 182.

SEED AND MAT EXPOSED SOIL IMMEDIATELY

COMPACTED EARTHEN DIKE HAND TAPED IN 8" LIFTS WITH VEGETATION.

COMPACTED SOIL

18"MIN

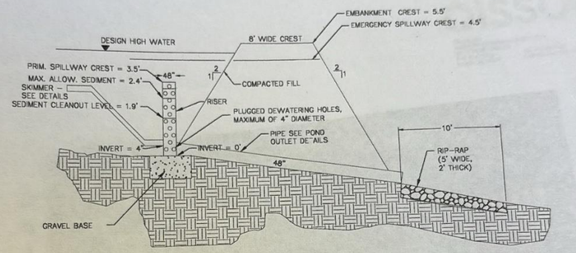
FLOW

PROVIDE INLET PROTECTION

4.5' MIN

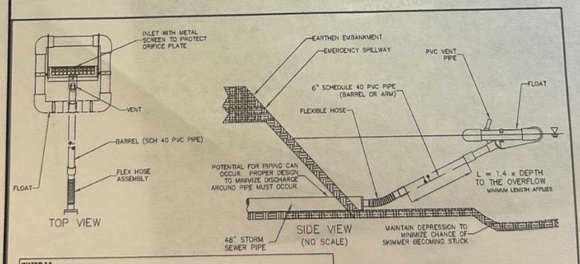
CHANNEL BEHIND DIKE SHOULD HAVE POSITIVE GRADE AND STABILIZED OUTLET

TEMPORARY DIVERSION DITCH
NTS



NOTE:
REFERENCE CITY OF LINCOLN FLOOD AND WATER QUALITY PROTECTION MANUAL, FIGURE 9-11.

TEMPORARY SEDIMENT BASIN
OUTLET/RISER STRUCTURE DETAIL
NOT TO SCALE



WATER 2.0				
Name	Skimmer Size	Sliding Orifice %	Required Basin Volume	Days to Drain
Sediment Basin	6 in.	70%	66,418	1

GENERAL NOTES:
1. FAIRCLOTH SKIMMER® FLOW RATES WERE USED AS THE BASIS OF DESIGN WHEN DETERMINING DRAINAGE CALCULATIONS. UTILIZING A PRODUCT FROM AN ALTERNATIVE MANUFACTURER WILL CREATE A SIGNIFICANT DEVIATION TO THE DESIGN AND MUST BE APPROVED AND RECALCULATED BY THE DESIGN ENGINEER.
2. PROPER ORIFICE OPENING MUST BE SELECTED TO ENSURE POND DRAINS IN CORRECT AMOUNT OF TIME. MODIFICATIONS MAY BE REQUIRED IF FIELD CONDITIONS WARRANT A CHANGE.
3. BARREL PIPE SHOULD BE 1.4 X DEPTH OF THE BASIN TO ENSURE PROPER FUNCTION.

DRAWN BY T. R. EVANS 08/24

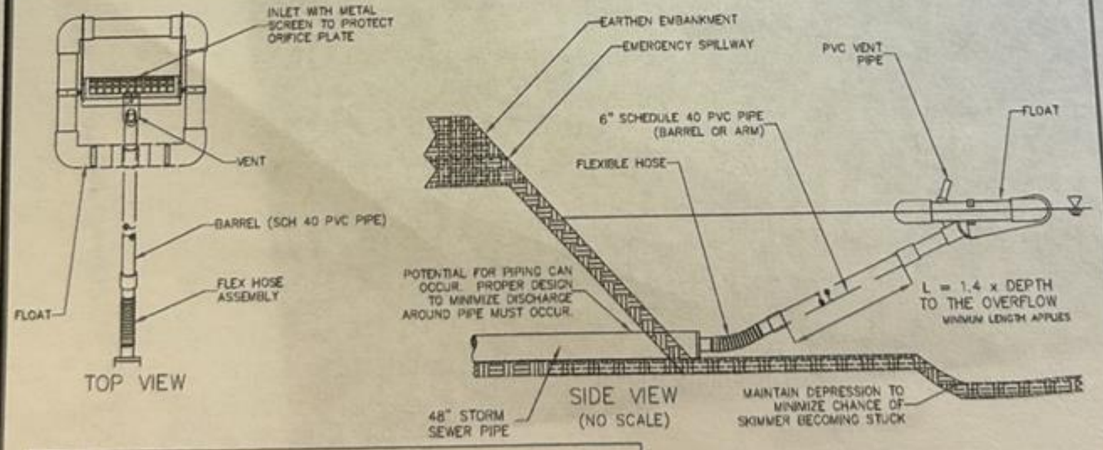
FAIRCLOTH SKIMMER® DISCHARGE SYSTEM WITH EMBANKMENT

FAIRCLOTH SKIMMER
WWW.FAIRCLOTHSKIMMER.COM
TELEPHONE: (919) 732-1244
FAX: (910) 732-1266
EMAIL: SALES@FAIRCLOTHSKIMMER.COM

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FILE: F:\2022\04001-045070\023-044024\0-DESIGN\AUTOCAD\FINAL PLANS\SHEETS\SDNT\25-EC-001 EROSION & SEDIMENT CONTROL DETAILS - SHEET 1 OF 3.DWG
FD11000
D11000

NOTE:
REFERENCE CITY OF LINCOLN FLOOD AND WATER QUALITY PROTECTION MANUAL, FIGURE 9-11.

TEMPORARY SEDIMENT BASIN
OUTLET/RISER STRUCTURE DETAIL
NOT TO SCALE



WATER 2.0				
Name	Skimmer Size	Sliding Orifice %	Required Basin Volume	Days to Drain
Sediment Basin	6 in.	70%	66,418	1

GENERAL NOTES:
1. FAIRCLOTH SKIMMER® FLOW RATES WERE USED AS THE BASIS OF DESIGN WHEN DETERMINING DRAINAGE CALCULATIONS. UTILIZING A PRODUCT FROM AN ALTERNATIVE MANUFACTURER WILL CREATE A SIGNIFICANT DEVIATION TO THE DESIGN AND MUST BE APPROVED AND RECALCULATED BY THE DESIGN ENGINEER.
2. PROPER ORIFICE OPENING MUST BE SELECTED TO ENSURE POND DRAINS IN CORRECT AMOUNT OF TIME. MODIFICATIONS MAY BE REQUIRED IF FIELD CONDITIONS WARRANT A CHANGE.
3. BARREL PIPE SHOULD BE 1.4 X DEPTH OF THE BASIN TO ENSURE PROPER FUNCTION.

DRAWN BY T. R. EVANS 08/24

FAIRCLOTH SKIMMER® DISCHARGE SYSTEM WITH EMBANKMENT

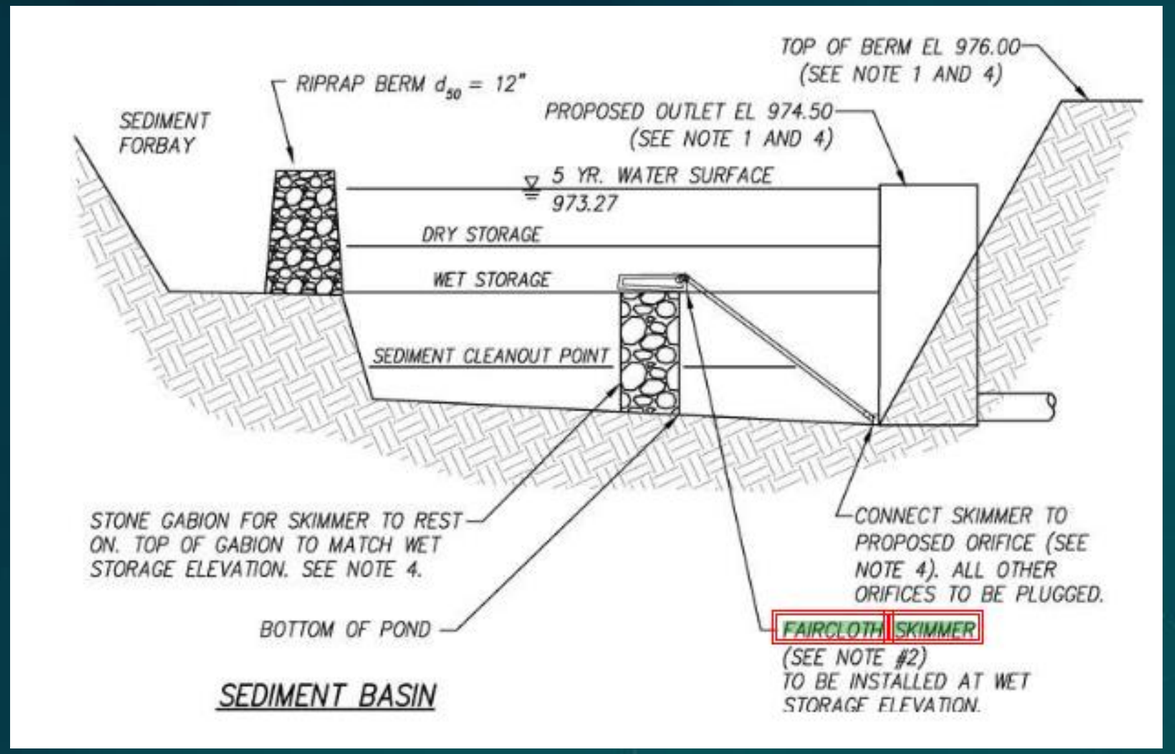
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FD11000
D11000

Installation

Rock/Stone Pad for Resting





Proper Vent Installation



VENT COLOR CODES

Skimmer Size	Color
1 ½″	Red
2″	Yellow
2 1/2″	Green
3″	Blue
4″	Orange
5″	Silver or Black
6″	White and unique shape of vent
8″	Distinguished by it size, Purple

Proper Skimmer Orientation





Proper Barrel Size



Improper Barrel Size



- Correct Orifice Size and Manufacturer

EVALUATING FLOATING SURFACE SKIMMERS

James E. (Jay) Sprague, CPESC
TRI/Environmental – Denver Downs Research Facility, Anderson, SC.
Joel Sprague, P.E. TRI/Environmental, Inc.
Benton Ruzowicz, CPESC, CESSWI Georgia Soil and Water Conservation Commission

- Each skimmer product (and each product size) has a unique performance, including the associated hydraulics, which is affected by the floatation, inlet, and drain design chosen. The discharge rate is dependent on the specific product design and can only be determined through product-specific testing.

Four Skimmers Evaluated for GSWCC









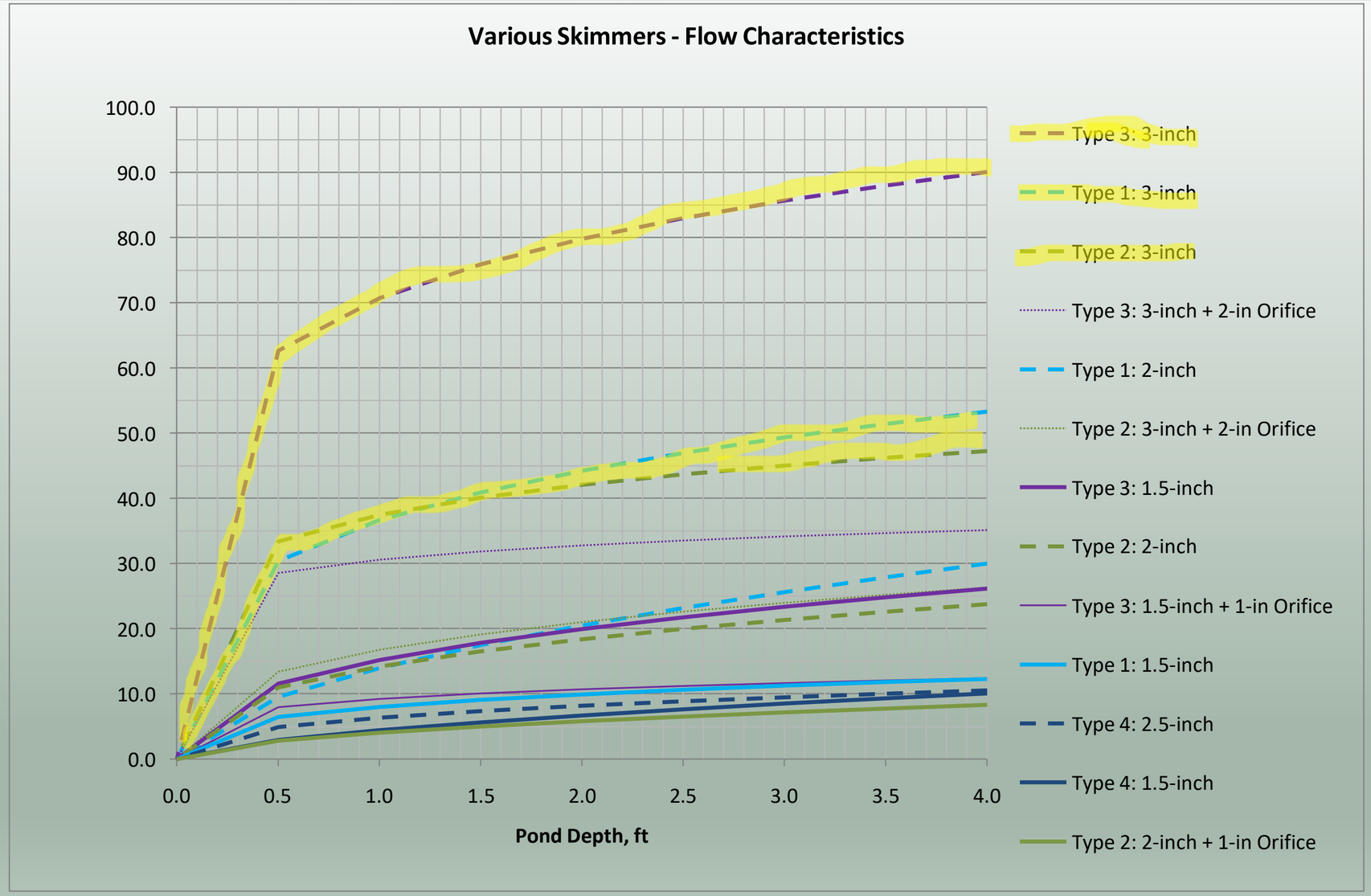


Figure 12. Summary Data Table – Skimmer Flow Rate, gal/min

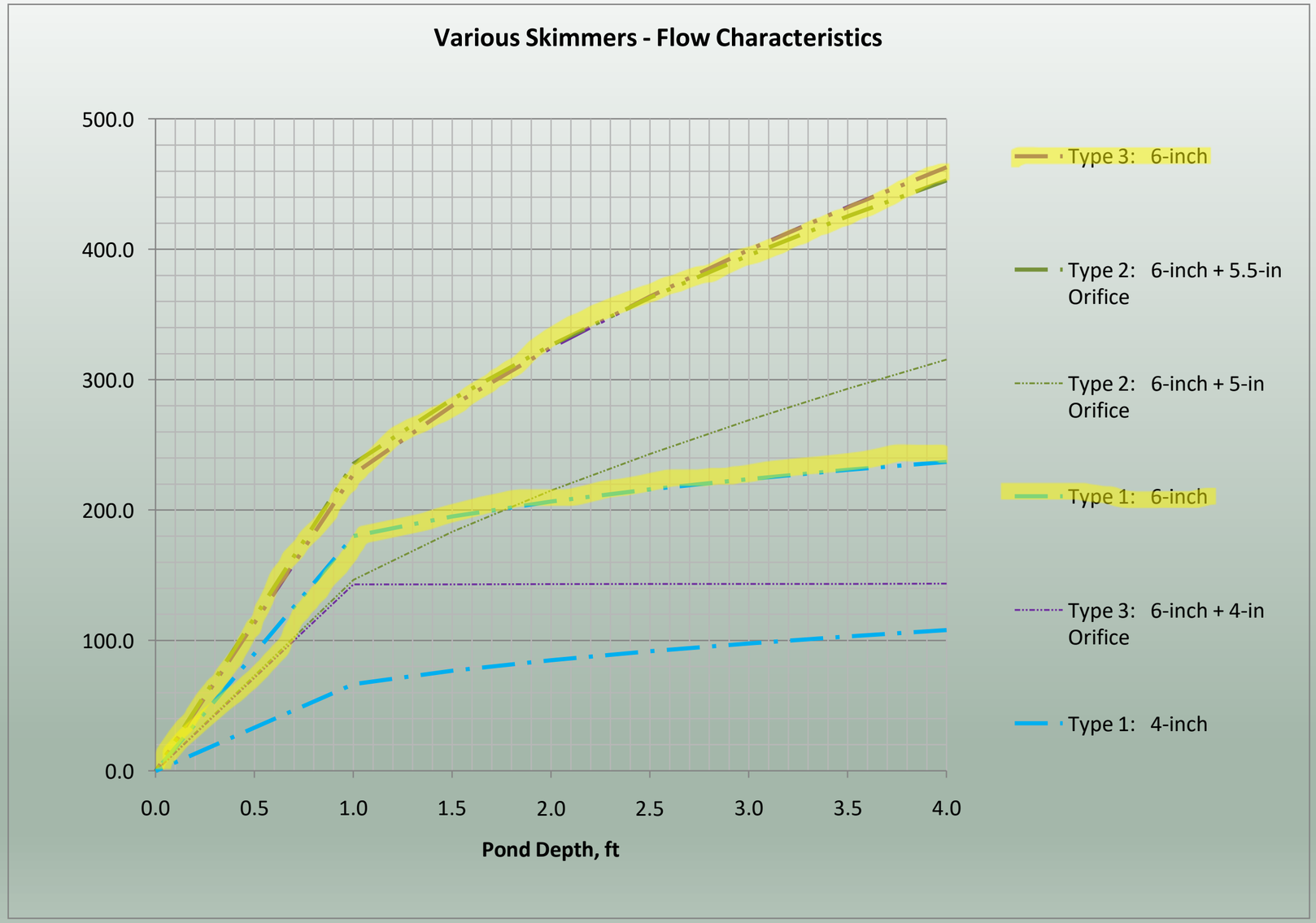
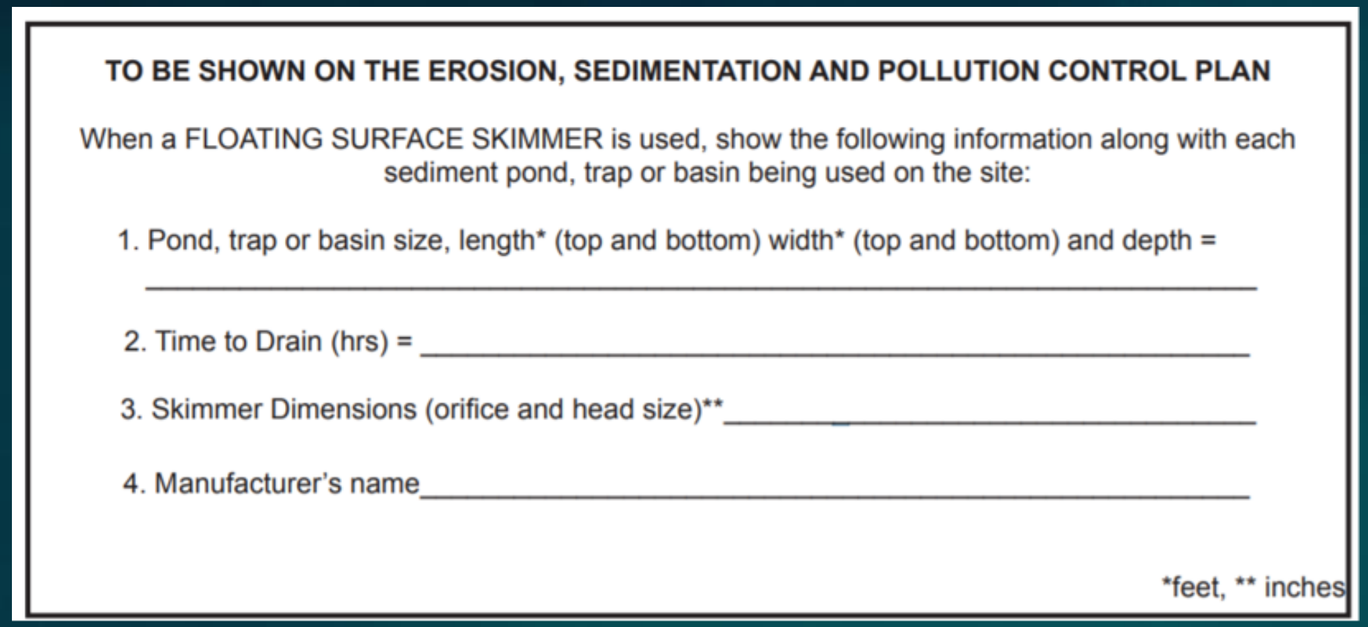


Figure 13. Summary Data Table – Skimmer Flow Rate, gal/min

Protect your design! Protect our infrastructure!

- Alternative skimmers flow at differing rates!
- Recommend a manufacturer.
- Use Faircloth Skimmers flow rates for your design and know that the best designed, highest quality, and easiest to maintain skimmer is installed on the project.



TO BE SHOWN ON THE EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN

When a FLOATING SURFACE SKIMMER is used, show the following information along with each sediment pond, trap or basin being used on the site:

1. Pond, trap or basin size, length* (top and bottom) width* (top and bottom) and depth = _____
2. Time to Drain (hrs) = _____
3. Skimmer Dimensions (orifice and head size)** _____
4. Manufacturer's name _____

*feet, ** inches

Manual for Erosion & Sediment Control in Georgia
- Georgia Soil & Water Conservation Commission

Questions?

Thank You!

Chase Goodwin
cgoodwin@fairclothskimmer.com
(239)791-6388