STORMWATER

(CLOSED CONVEYANCE STORMWATER DRAINAGE SYSTEM)

CITY OF SUFFOLK
DEPARTMENT OF PUBLIC WORKS
ROADWAY OPERATIONS
ENGINEERING TECH.

THYWENSTON (TY) SWAIN

SINCE 2007 – 12 YRS

CERTIFICATIONS :

- **STORMWATER MANAGEMENT**
- **EROSION AND SEDIMENT CONTROL**

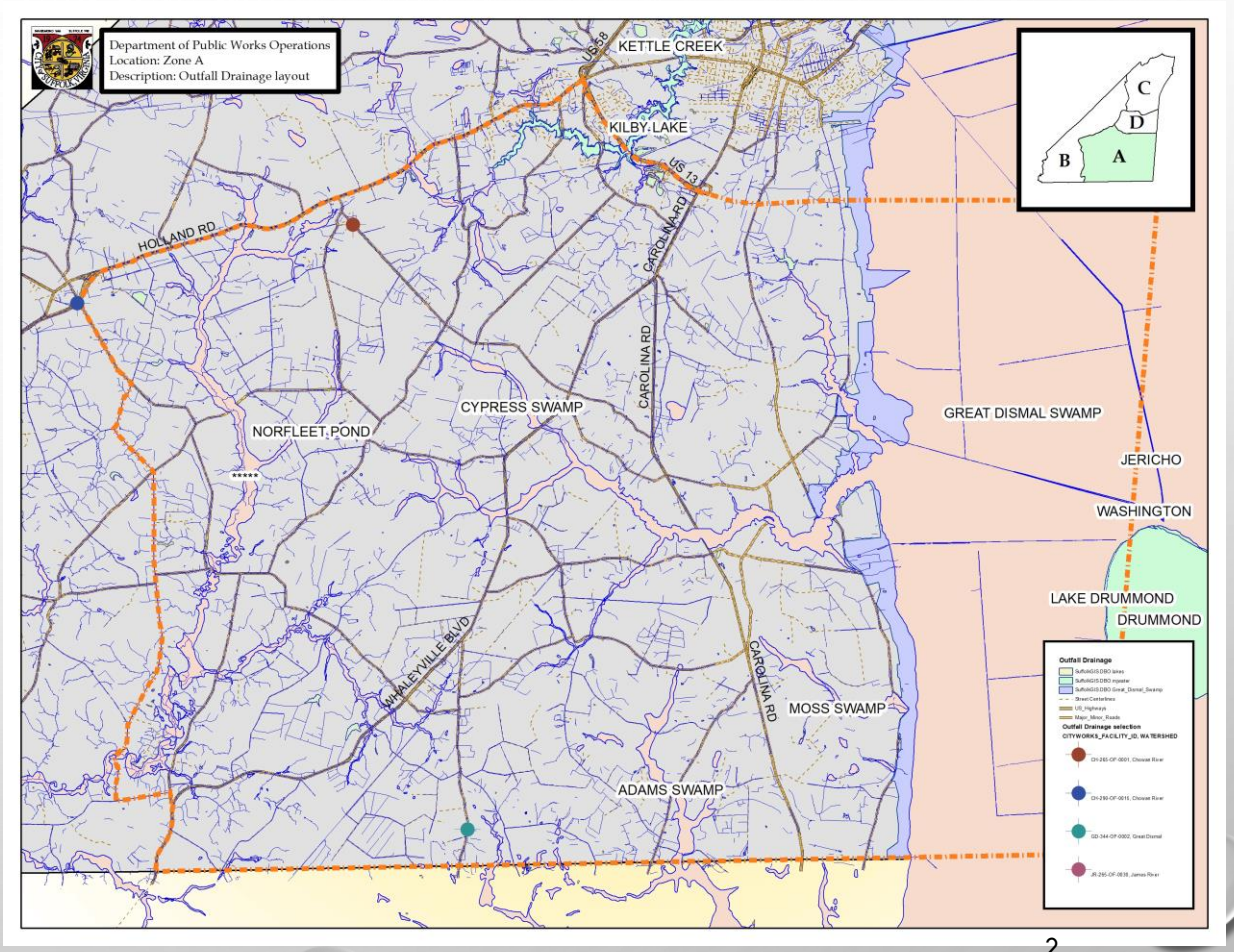
JOB DESCRIPTION:

- **CAPITAL PROJECT**
  - SURVEYING/ LAYOUTS/DRAFTS
- **CONFLICT EVALUATIONS/INVESTIGATING**
  - PAVEMENT ASSESSMENT
  - BMP'S, OUTFALLS, STORMWATER, ETC.)
- **PIPELINE REHABILITATION PROJECTS -INSPECTION**
- **LAND RECORDS – RESEARCH**

SOFTWARE (PHOTO-OBSERVATIONS-SUMMARY-RECOMMENDATION)

- ARCGIS
- AUTOCAD LT
- MS OFFICE

CLASS A CDL



Suffolk
VIRGINIA
It's a good time to be in Suffolk

NANSEMOND 1646 SUFFOLK 1742
19 74
CITY of SUFFOLK, VIRGINIA

THINGS TO KNOW:

- 379TH LARGEST CITY IN THE UNITED STATES
- POPULATION OF **87,061**
- LAND **399.15** SQ MI
- PHASE II, MS4 PROGRAM
- 719 BMPS IN SUFFOLK
- ROADWAY OPERATIONS
  - 38 – BMPS

PROGRAM OVERVIEW

- MS4
- STORMWATER LEGISLATIONS
- STORMWATER MANAGEMENT PROGRAM
- WATERSHED
- POLLUTION PREVENTION
- STORMWATER INFRASTRUCTURE
- STORMWATER DRAINAGE
- STORMWATER CONTROL MEASURES
- BMP'S

MS4 PROGRAM OVERVIEW

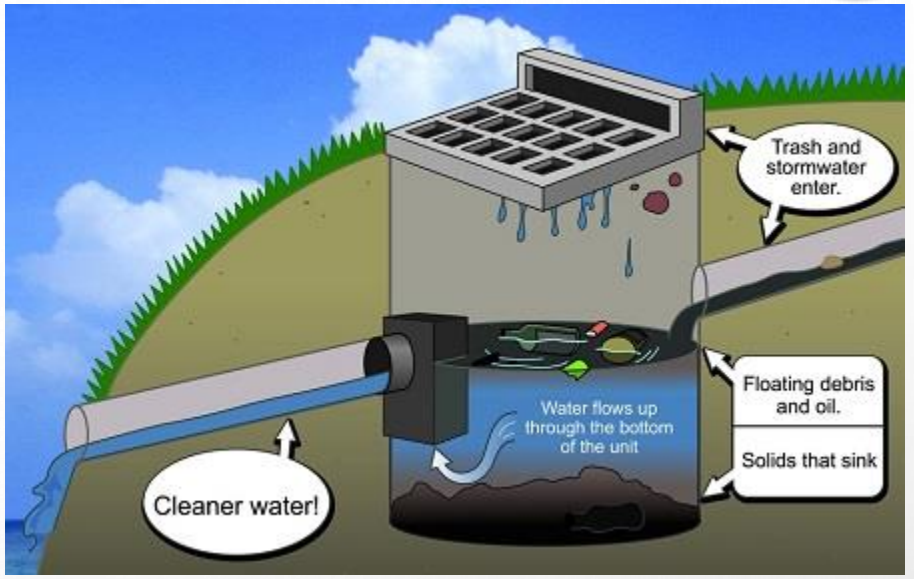
The Department of Public Works Engineering is responsible for the administration of the City of Suffolk's Stormwater Management Program. Discharges from Municipal Separate Storm Sewer Systems (MS4s) are regulated under the Virginia Stormwater Management Act and the Clean Water Act. The City of Suffolk is a Phase II (small) MS4 operator permitted under the Virginia Stormwater Management Program (VSMP). Our permit requires us to work to reduce pollutants leaving our storm sewer system as much as possible.

An MS4 is a conveyance or system of conveyances that is:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.;
- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.);
- Not a combined sewer
- Not part of a Publicly Owned Treatment Works (sewage treatment plant).
- **Example: ditches, catch basins, stormwater pipe**

What categories may be included in the Stormwater program?

The storm water program may include Preventive and General Maintenance Repair of the Storm water facilities including certain storm water ponds in residential neighborhoods, Street Sweeping, GIS Updating and Maintenance, Plan Review & Approval Process, Infrastructure Site Inspection, and Capital Improvements Projects



Since we have done a poor job
Congress passed regulations and laws

STORMWATER LEGISLATIONS

THE FEDERAL WATER POLLUTION CONTROL ACT (1948)

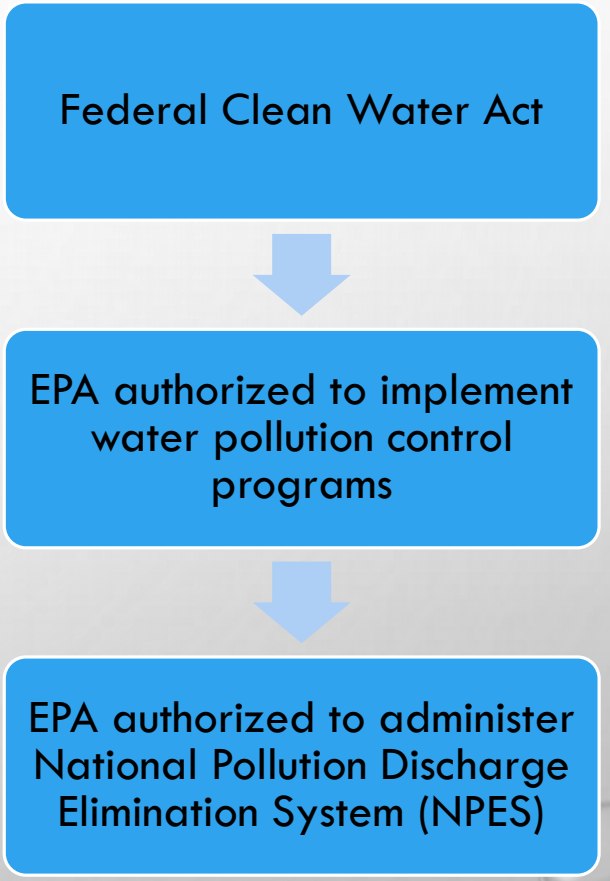
- First major US law to **address water pollution.**
- The act set precedent for a federal authority to regulate water quality.

THE CLEAN WATER ACT (1972)

- Congress **passed major amendments** to the Federal Water Pollution Control Act.
  - Created US Environmental Protection Agency (EPA)
  - Established the National Pollutant Discharge Elimination System (NPDES) Permit Program
    - ✓ Which is administrated by Virginia Pollutant Discharge System (VPDES)
  - Stormwater discharges from land disturbing activities (construction sites)

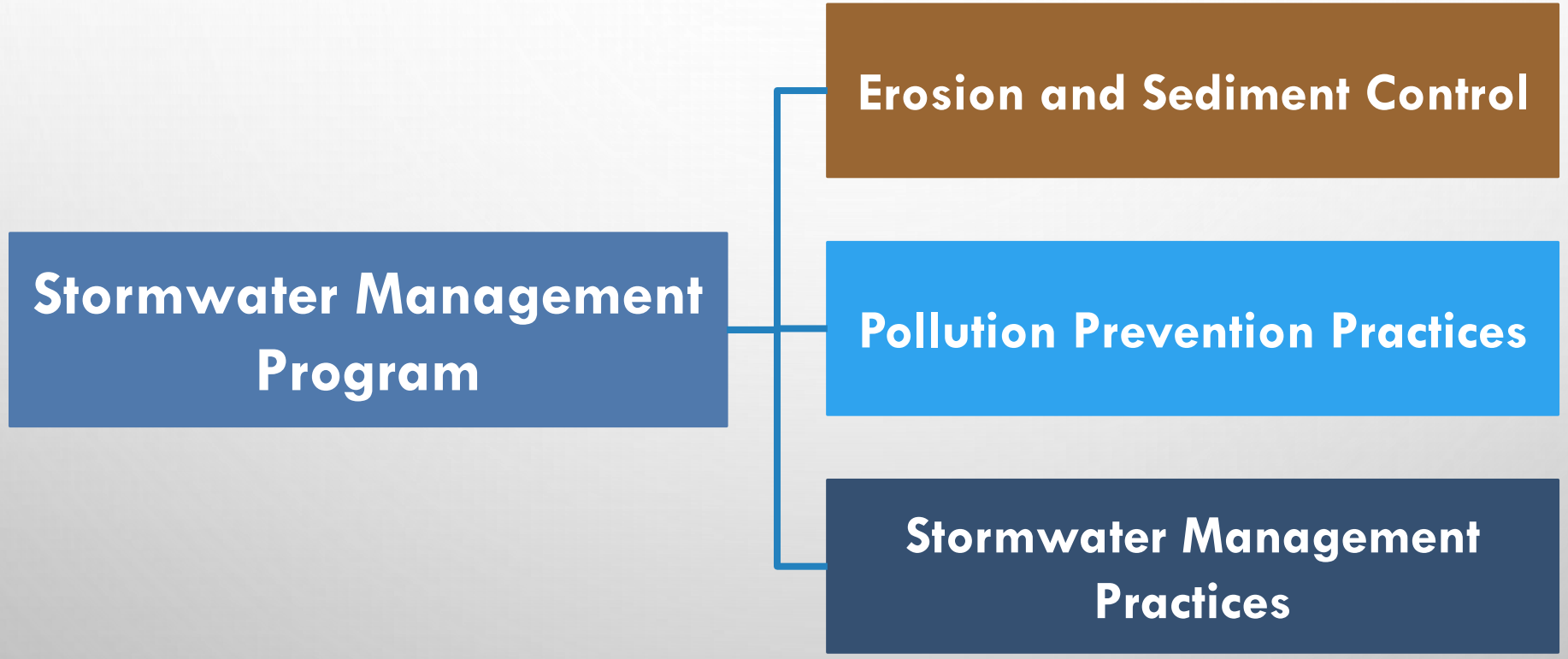
THE CHESAPEAKE BAY PRESERVATION ACT (1988)

- **Passed to protect the water quality and its tributaries, and other state waters.**
  - Local programs are required to identify and designated certain lands within their jurisdiction that pose a particular threat to water quality if carelessly developed or mismanaged.
  - The fist requirement for nutrient runoff control in the post-construction phase.
  - BMP's are required in preservation areas to limit the discharge of phosphorous.



Virginia Stormwater Management Program

provides an overview of the various State regulations which address water quality and nonpoint source pollution, as well as the interrelationship among the agencies.



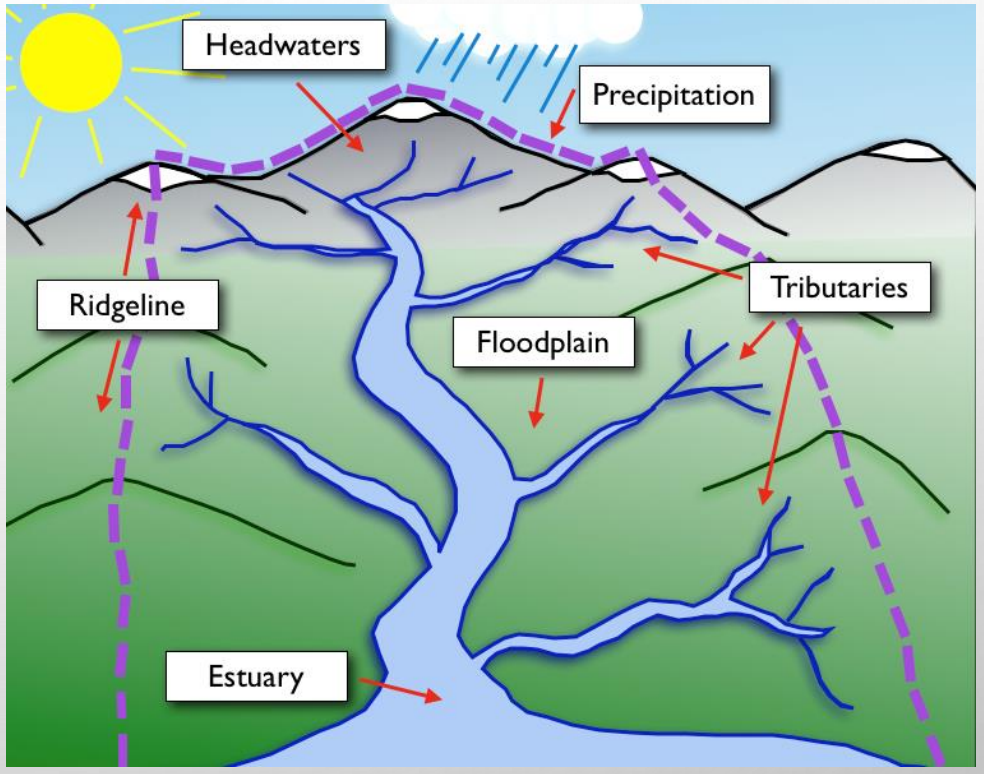
WATERSHED

WATERBODIES OF U.S. :

- TRADITIONAL NAVIGABLE WATERS (TNW)
- INTERSTATE WATERS
- TERRITORIAL SEAS
- IMPOUNDMENTS OF JURISDICTIONAL WATERS
- **TRIBUTARIES**
- **ADJACENT WATERS**

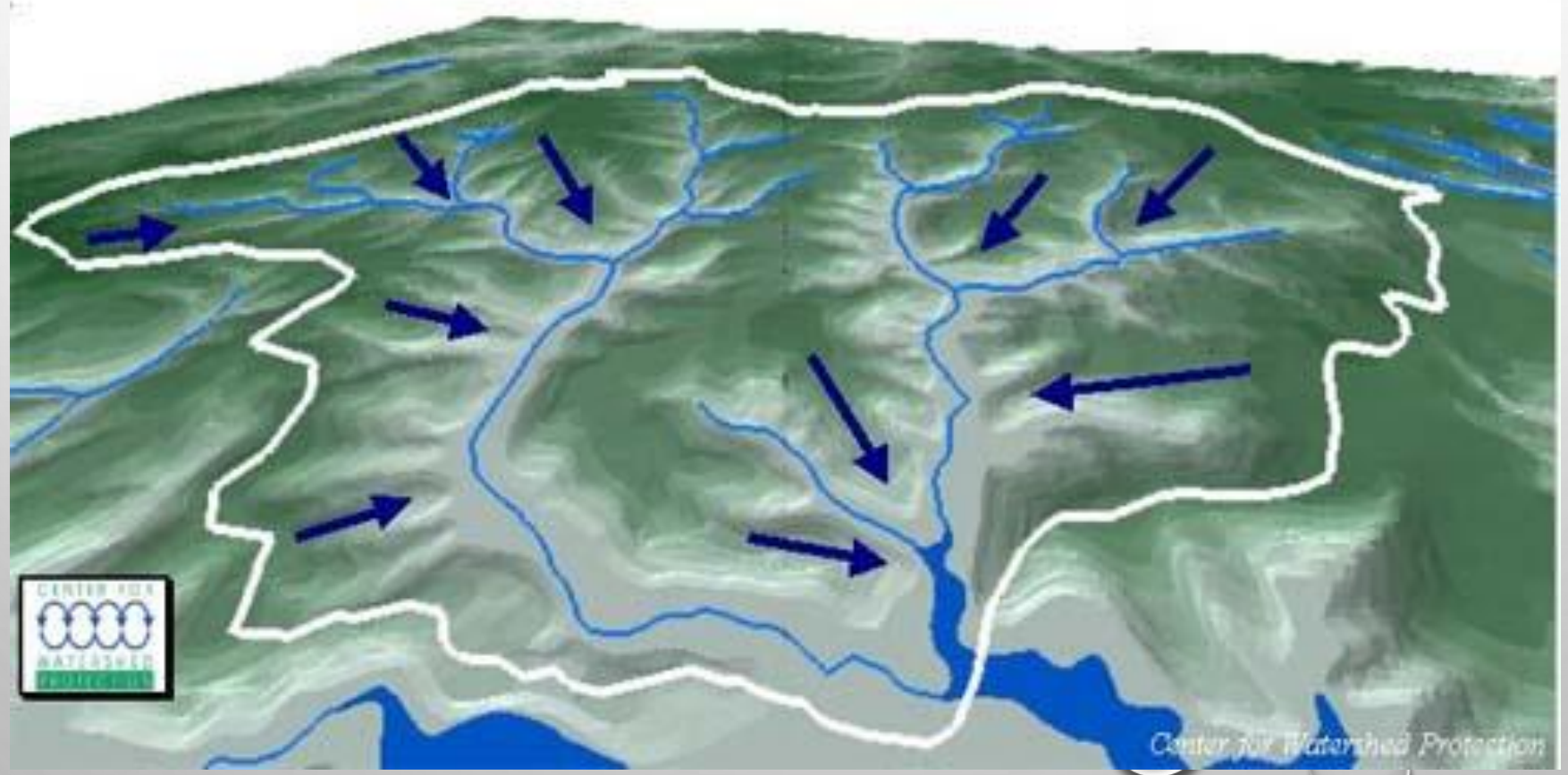
CITY OF SUFFOLK:

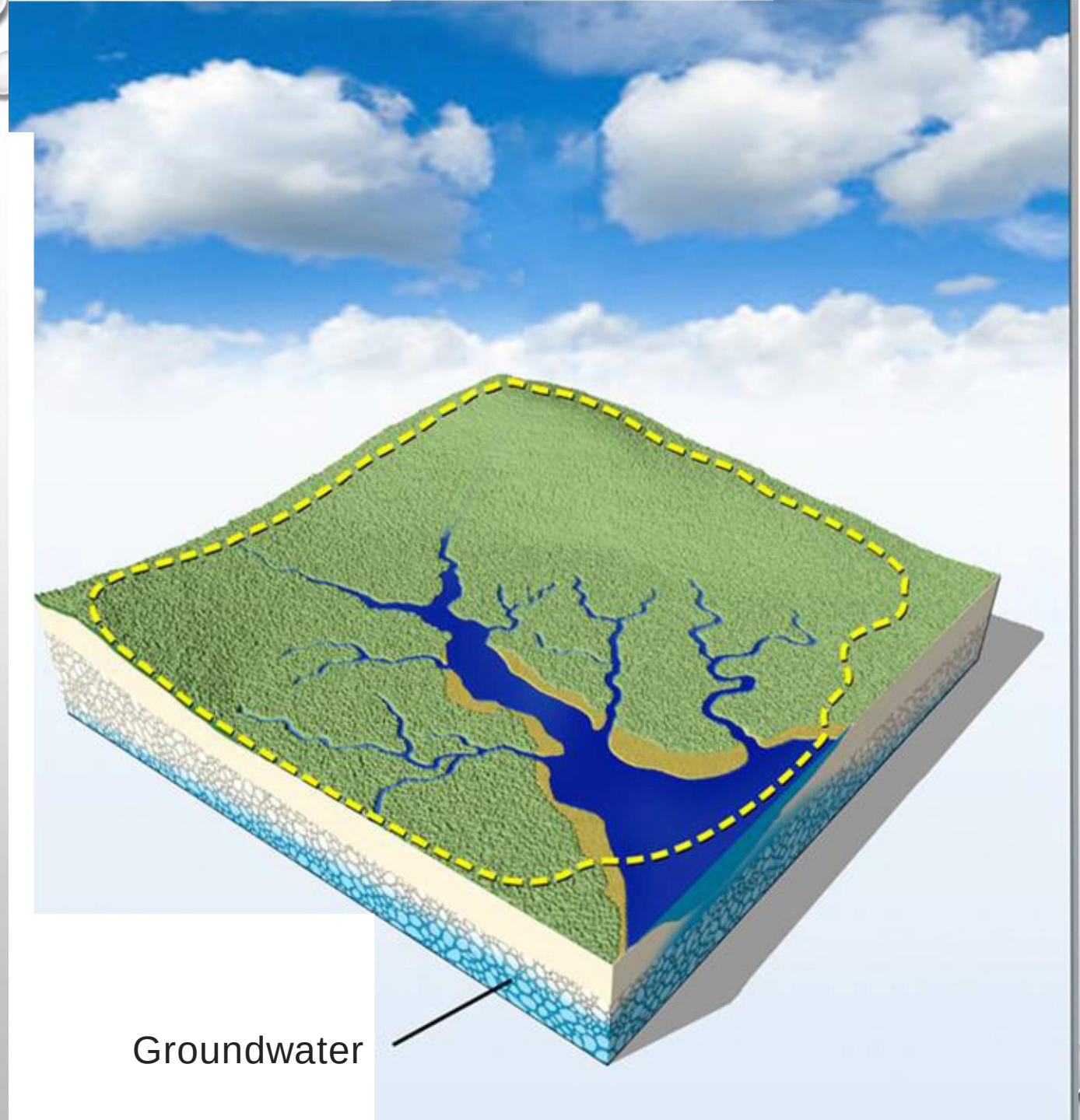
- CHUCKATUCK CREEK
- BENNETTS CREEK
- HOFFLER CREEK
- CHOWAN RIVER
- GREAT DISMAL SWAMP
- **NANSEMOND RIVER**
- **JAMES RIVER**
- **CHESAPEAKE BAY**



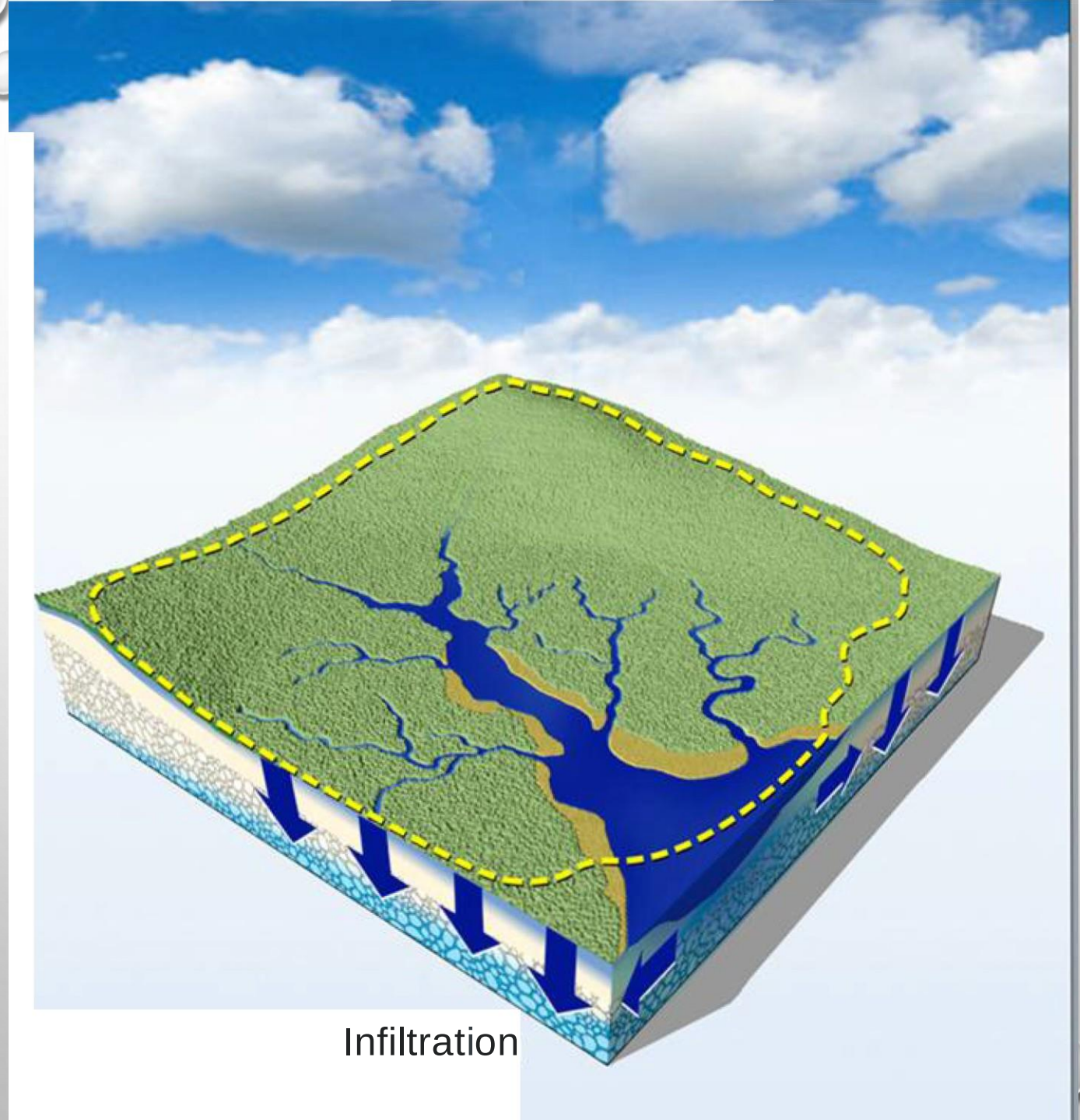
What Is a Watershed?

A watershed is the area of land that drains to a particular point along a stream

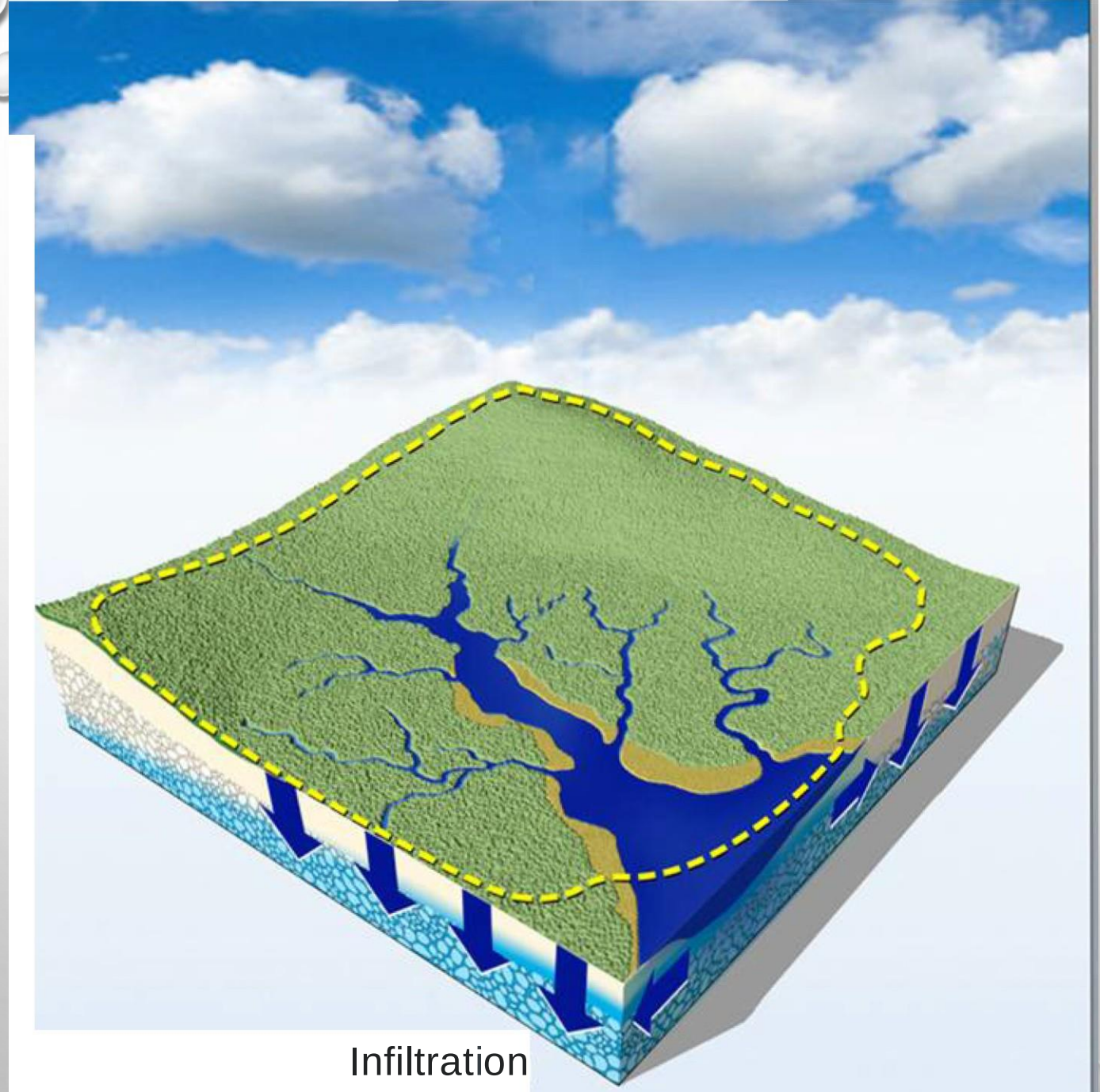




The watershed boundaries will be considered for stormwater drainage system designs.



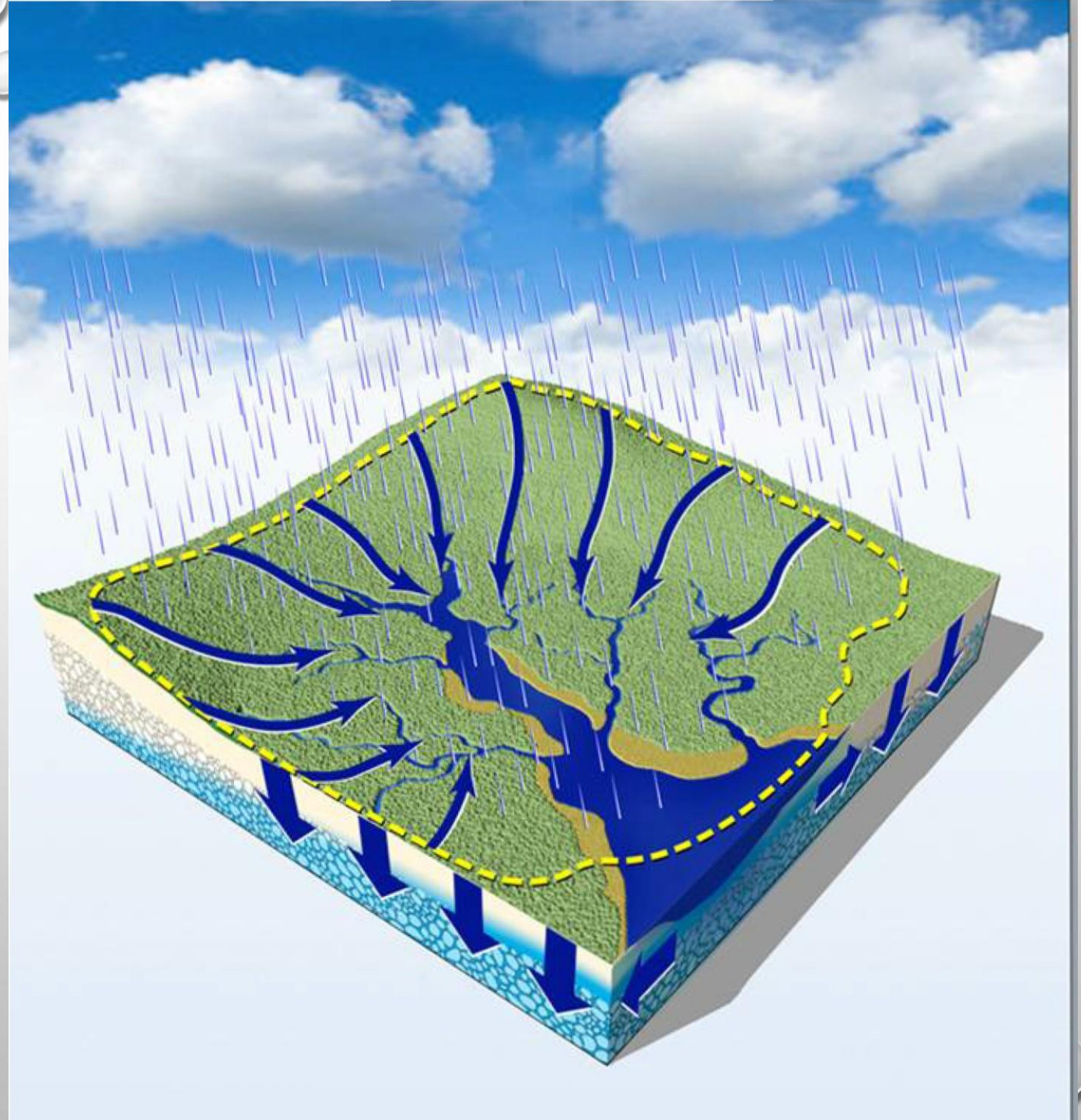
Infiltration



Infiltration

Stormwater runoff harms streams in two ways:

1. Stormwater runoff picks up pollutants like sediment, trash oil, and fertilizer and carries them to streams affecting **<u>water quality</u>**
2. Less infiltration, volume and velocity increase. Increase in **<u>water quantity</u>** can result in channel erosion and flooding as well as pose risks to downstream properties



Nansemond River

James River

Chesapeake Bay

What is stormwater runoff?

- **Storm water runoff results from rainfall.** Typically, the more rainfall we get the less likely that the rain water will be absorbed into the soils resulting in more storm water reaching our storm drains, ditches, streams, lakes and reservoirs.
- Runoff from other critical source areas, such as vehicle service facilities and large parking areas, should at least receive adequate pretreatment to eliminate their groundwater contamination potential before infiltration.
- **Impervious surfaces prevent stormwater from naturally soaking into the ground.**

Why is stormwater runoff a problem?

- **Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water.** Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water. (is a hazard to our health)

Summary of potential problems of untreated stormwater runoff?

High Stormwater volume and velocity.

* More impervious surfaces leads to less ground infiltration, more higher energy runoff
* Increase stream volume and flow rates, flooding, more erosion.

Pollutant in Stormwater Runoff

* Pollutant transport untreated to our waterways. (nutrients, sediments, toxics, litter, debris, etc.)

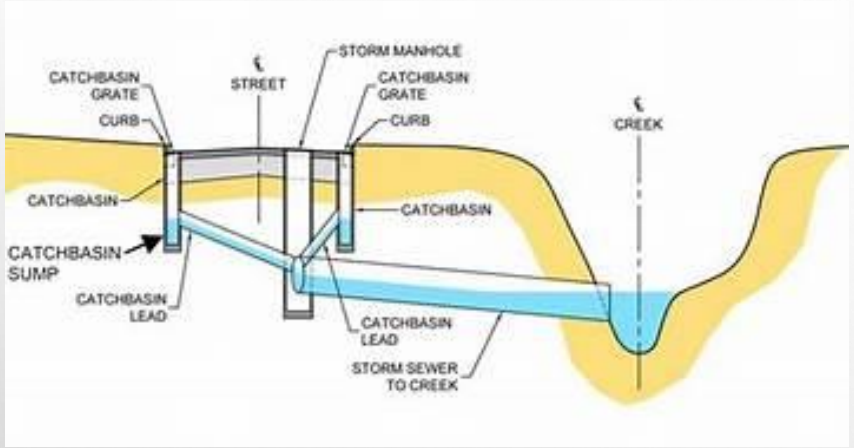
Ecological Impacts

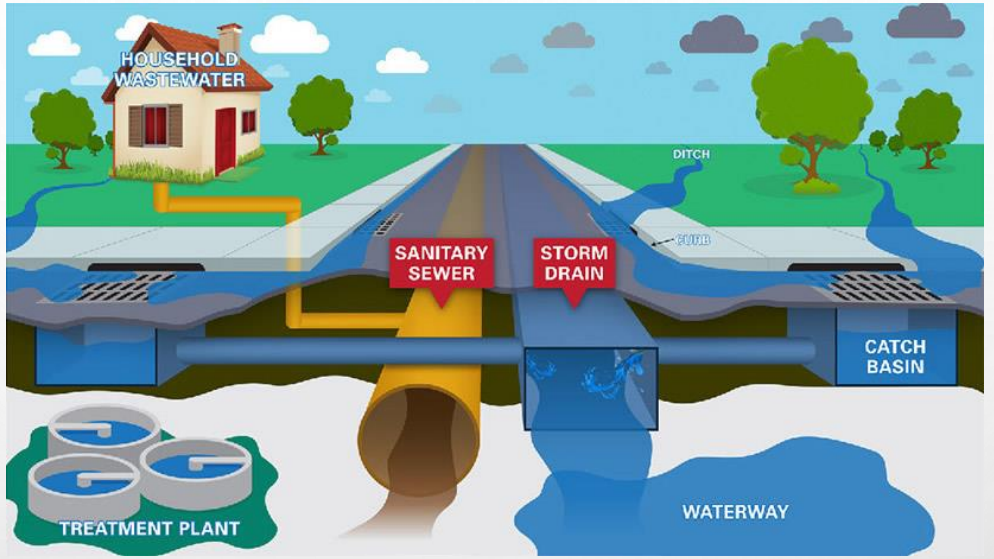
* Altered of lost habitats (aquatic)
* Reduced richness and diversity of species
* Shift in ecological balance

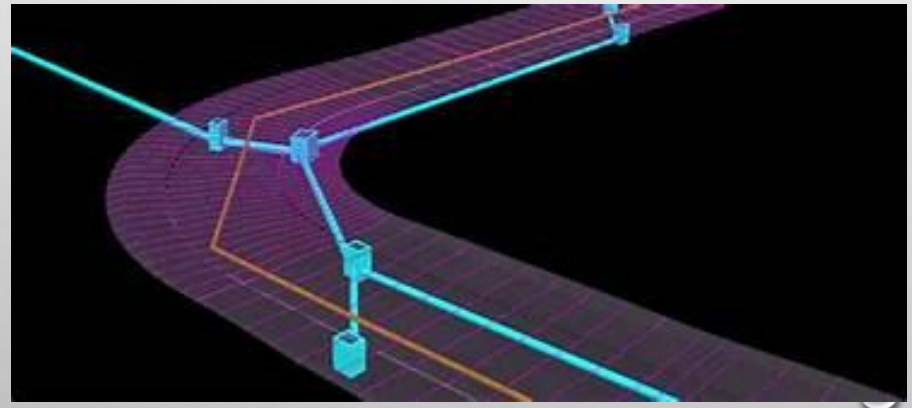
Loss of Beneficial Uses

* Reduction in desirable fish species
* Shellfish contamination
* Contamination of drinking water sources
* Contamination of swimming beaches
* Loss of recreation and aesthetic value of state waters

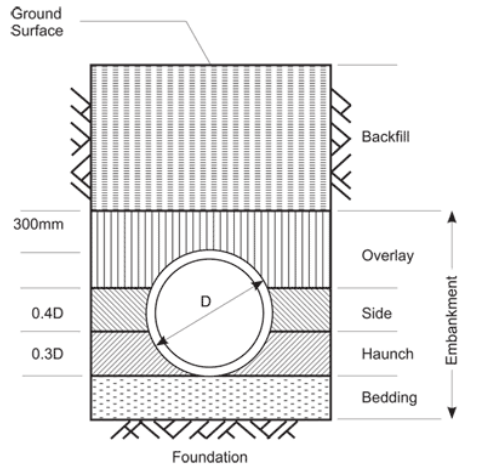
STORMWATER INFRASTRUCTURE

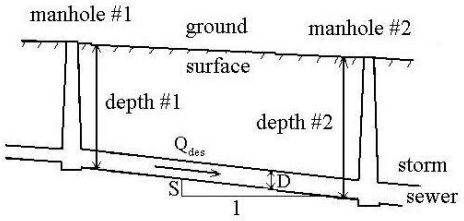






Installation methods:





Longitudinal Section of Storm Sewer

Stormwater Management

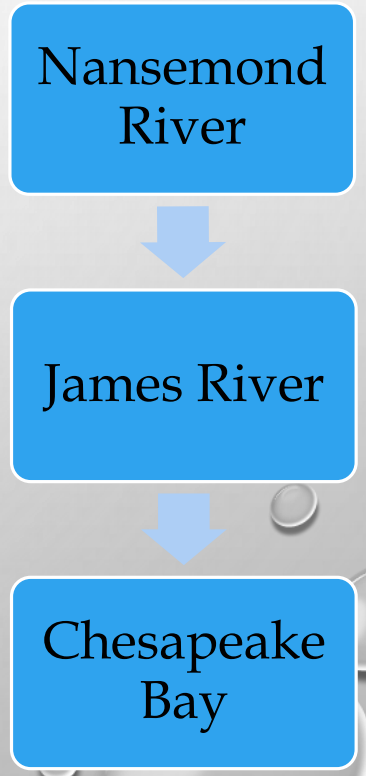
The goal of storm water management is to mitigate the impact on the hydrologic cycle resulting from changes to the land surface. Urban development has been identified as having a direct impact on the hydrologic cycle by reducing or even eliminating the natural storage capacity of the land. This impact is the result of a decrease in tree cover, loose organic surface soils, and natural depressions, all of which provide natural storage capacity. **These natural storage areas are then replaced with impervious and managed pervious surfaces.** Impervious cover prevents the percolation of the runoff into the soil, which means that most, if not all of the rainfall is converted to runoff**. In addition, managed pervious areas, such as courtyards and lawn areas typically do not provide opportunities for infiltration due to compaction of the surface soil profile and improved drainage conveyances.**

What are storm drains?

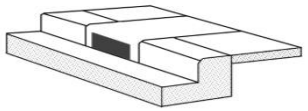
Stormwater collection and conveyance system, including catch basins, piping, channels, ditches and culverts. Water typically flows across the land onto the road and gutters and into storm water inlets that are connected to the storm water drainage pipes. In the more rural areas, storm water is conveyed along roadside ditches.

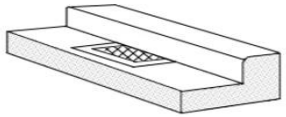
What are outfalls?

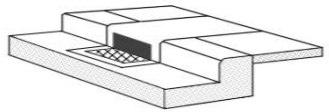
Area at which water is released into a receiving stream or other water body.



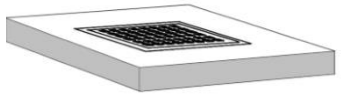
INLET STRUCTURE


Curb


Grate

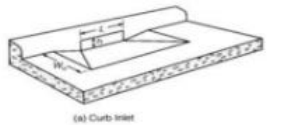

Combination


Drop Curb

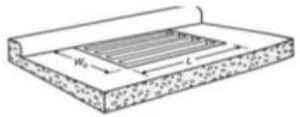

Drop Grate

Storm water inlets

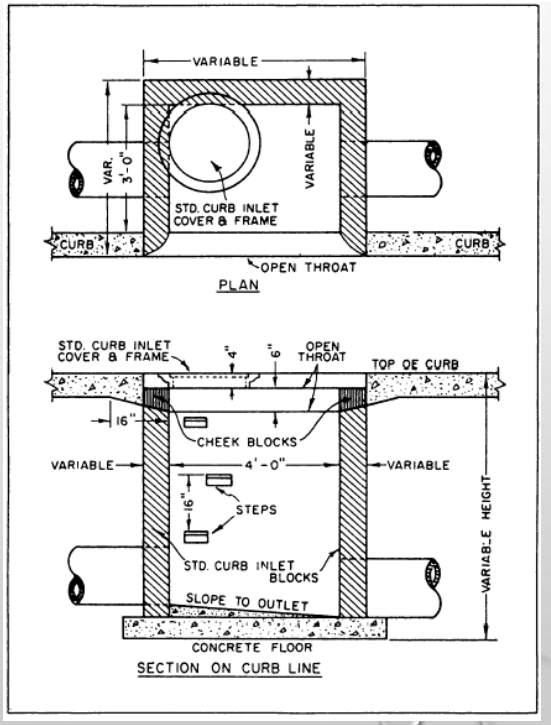
- May be located either on a continuous grade or in a sag location
  - Part of the gutter flow can bypass the inlet in case of the Inlets on continuous grade (carry over, bypass or runby flow)
- Storm water inlet types:
  - Gutter (grade) inlets
  - Curb opening inlets
  - Slotted drain inlet
  - Combination inlets
- A concrete box with grating or opening in the vertical or horizontal direction
  - Vertical or curb inlet
  - Horizontal inlet or gutter
- Grates of the inlets can be reticular, rectangular or parallel bars

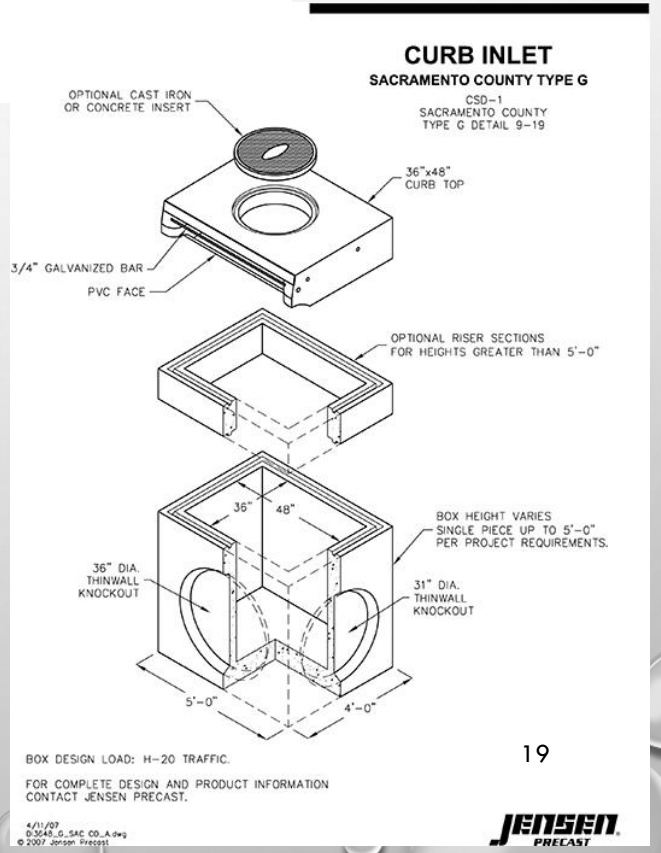

(a) Curb Inlet


(c) Slotted-Drain Inlet

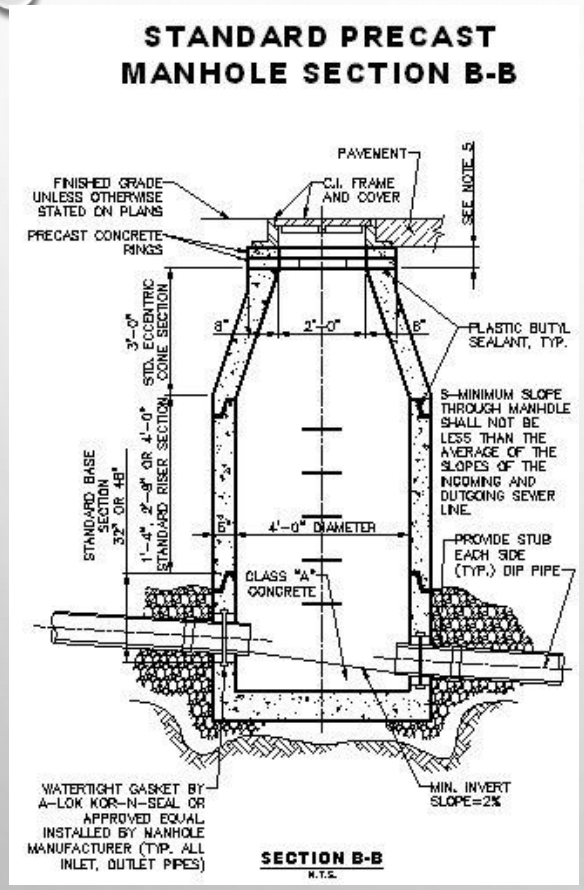

(b) Grate Inlet

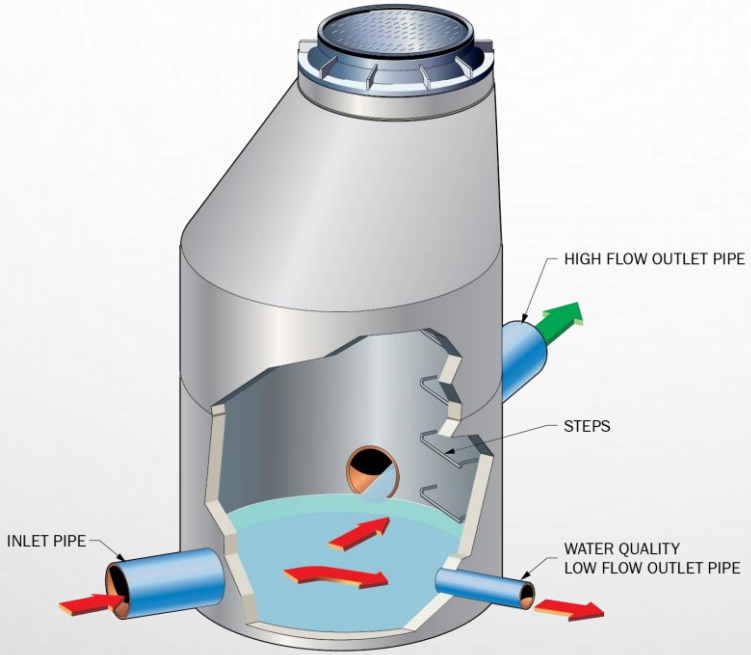

(d) Combination Inlet

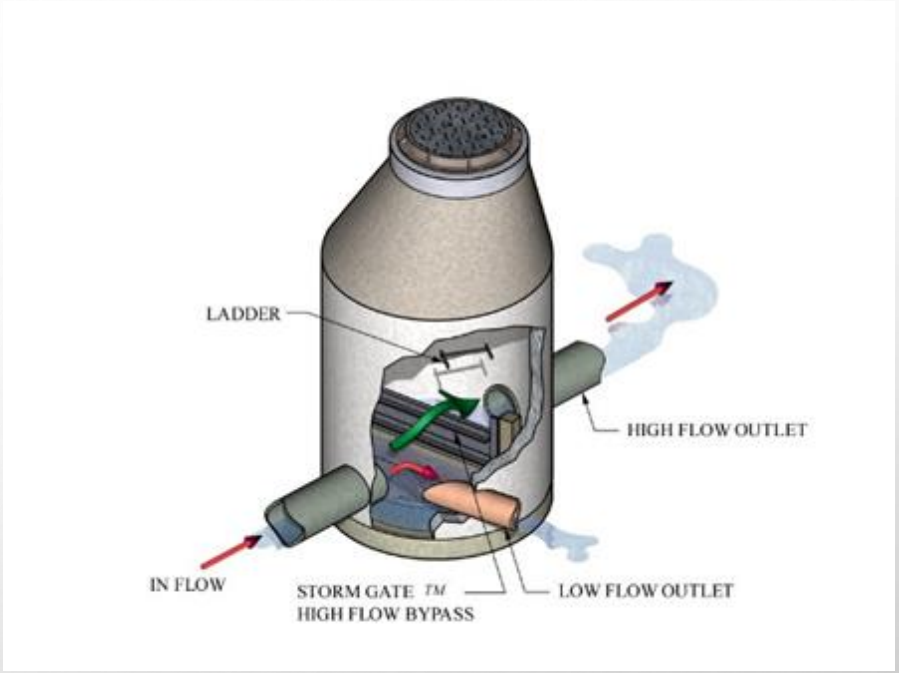


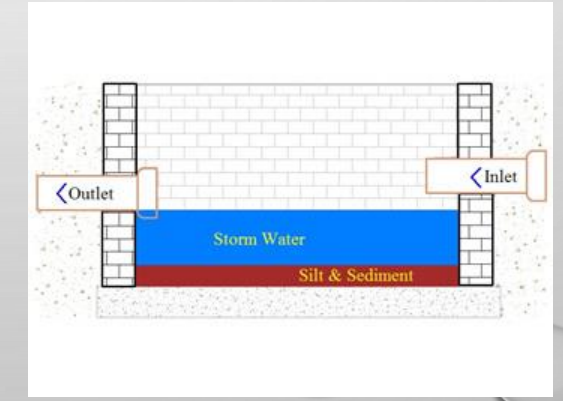


MANHOLE STRUCTURE









STORMWATER MEDALLION PROGRAM

- Drains to Bay
- Drains to River
- Drains to Lake
- Drains to Ocean
- Drains to Stream
- Drains to Creek
- Drains to Waterway
- Drains to Wetlands
- Drains to Pond
- Drains to Gulf
- Only Rain in the Drain (Avail. in Spanish) AND MORE!

Custom Legends and Symbols are available by our in-house Art & Die Departments.

It is important to keep pollutants out of our storm drains because water that flows into the storm drains goes directly into our local streams, bay and oceans. When it rains over parking lots, sidewalks, and streets, the water picks up dirt, trash, oil grease, fertilizers, and other pollutants and carries it into the storm drain.

CITY OF SUFFOLK D.I. MARKER

6 MINIMUM CONTROL MEASURES

1. Public Education and Outreach: Distributing educational materials and performing outreach to inform citizens about the impacts polluted storm water runoff discharges can have on water quality.

2. Public Participation/ Involvement: Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a storm water management panel.

3. Illicit Discharge Detection and Elimination: Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about the hazards associated with illegal discharges and improper disposal of waste).

4. Construction Site Storm Water Runoff Control: Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb 1 or more acres of land. These controls could include silt fences, erosion control blankets, rip rap, and inlet protection.

5. Post-Construction Storm Water Runoff Control: Developing, implementing, and enforcing a program to address discharges of post-construction storm water runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural Best Management Practices (BMPs) such as grassed swales or porous pavement.

6. Pollution Prevention/ Good Housekeeping: Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning).

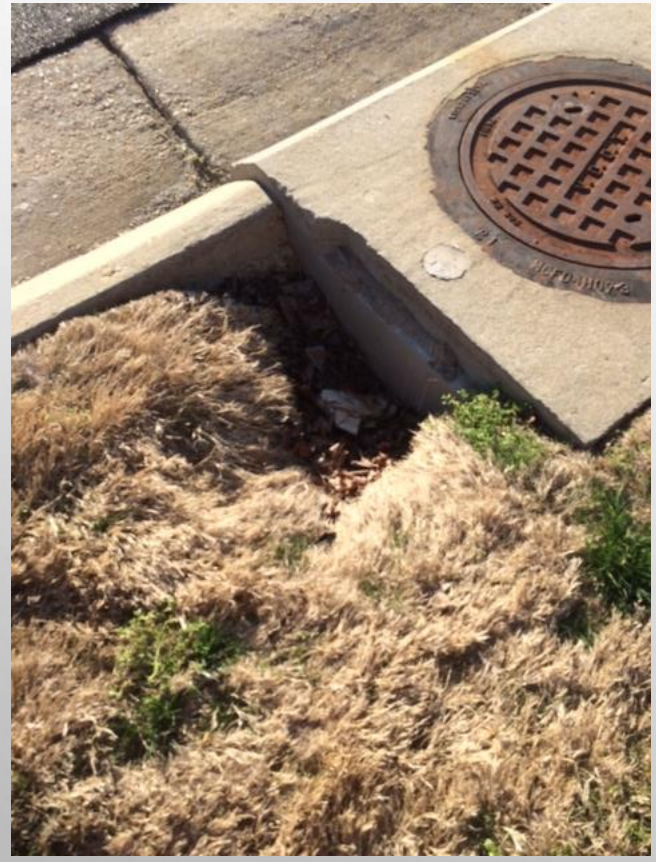
HOUSEKEEPING

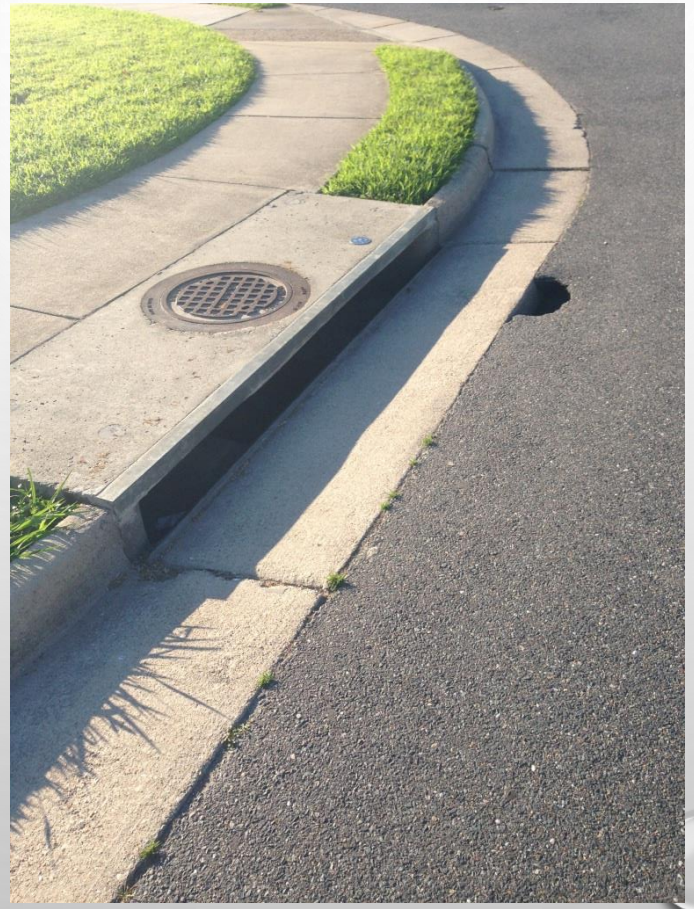
- **Routine Maintenance**
  - Stormwater drainage systems need to be cleaned regularly.
  - High pressured water jetting or hydro jetting is one of the most effective ways
  - Unclogging Inlet and storm gates of large object and debris. (leaves, pine straw, accumulated trash, plastic bags)

Street and Storm Drain Cleaning

Equipment - Vactruck, pipe water-jetting, Street Sweeping, CCTV

SCHEDULE AND PERFORMANCE MAINTENANCE





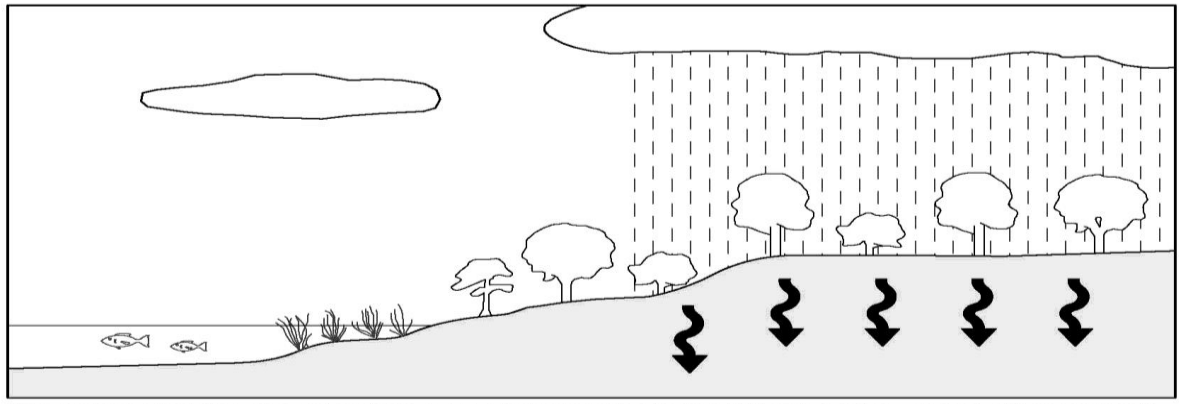


Illustration showing the natural process of stormwater being filtered by the ground after a rainfall.

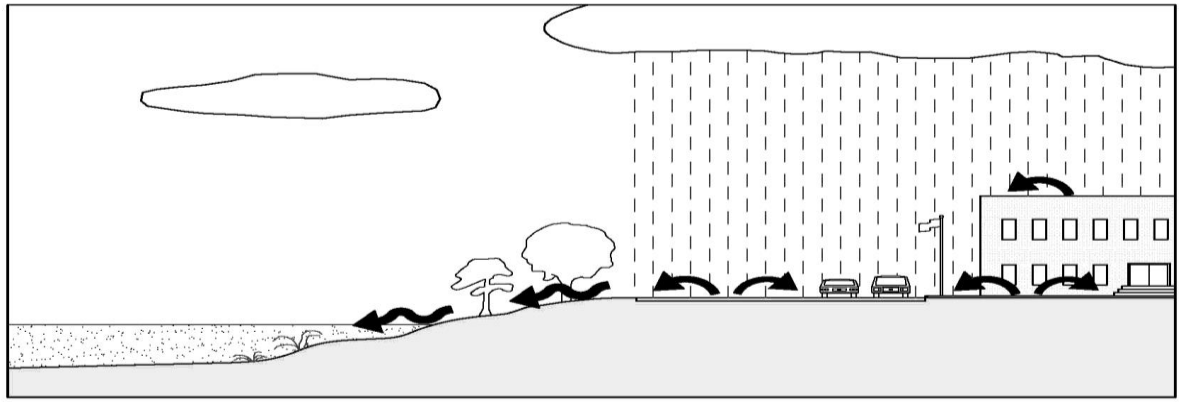


Illustration showing the natural filtration process being blocked by development. The stormwater washes directly into the river carrying pollutants from the surface and contaminating the water.

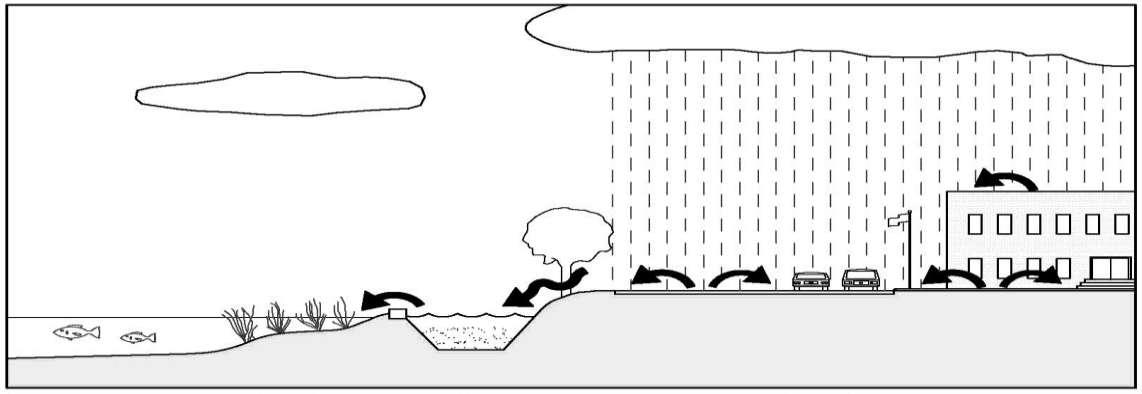
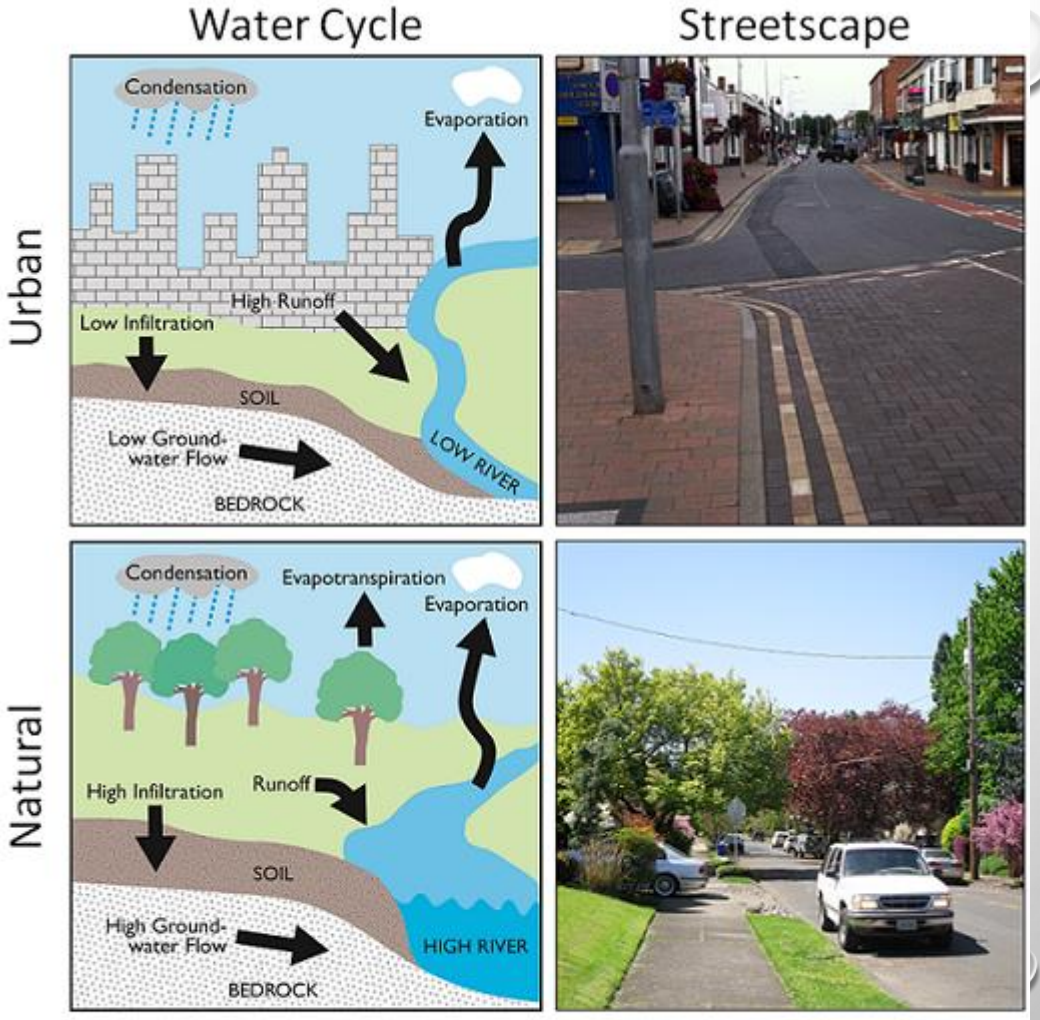
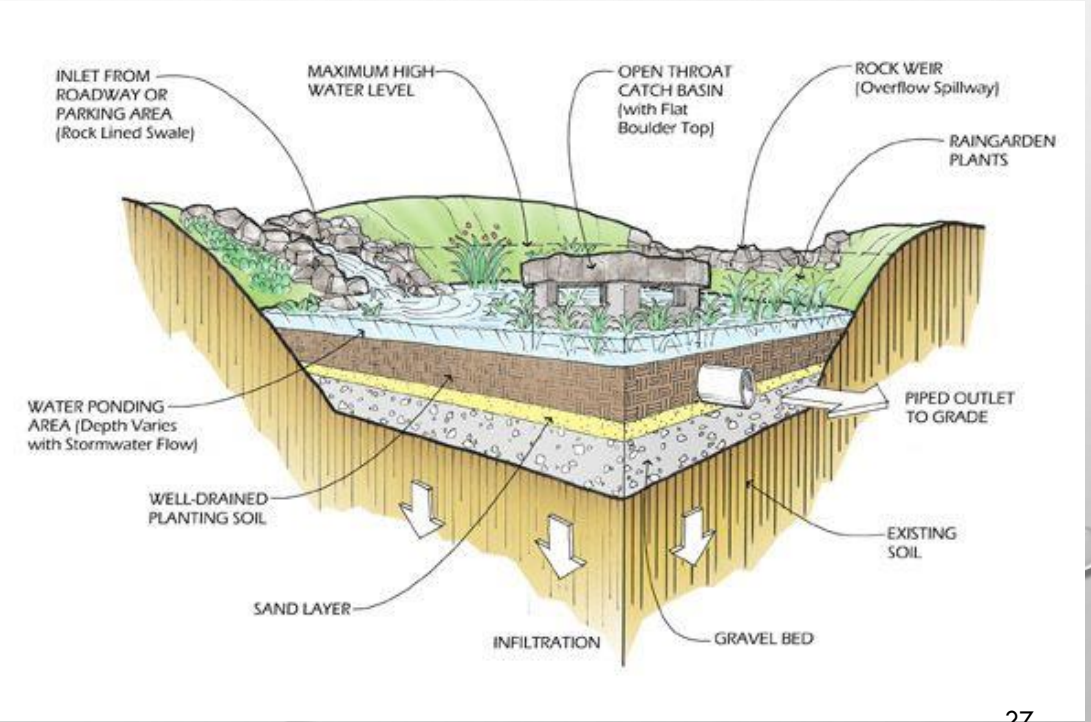


Illustration showing developed area utilizing BMP. Polluted water is gathered in a stormwater facility effectively allowing particles to settle out before being released into the nearby river.



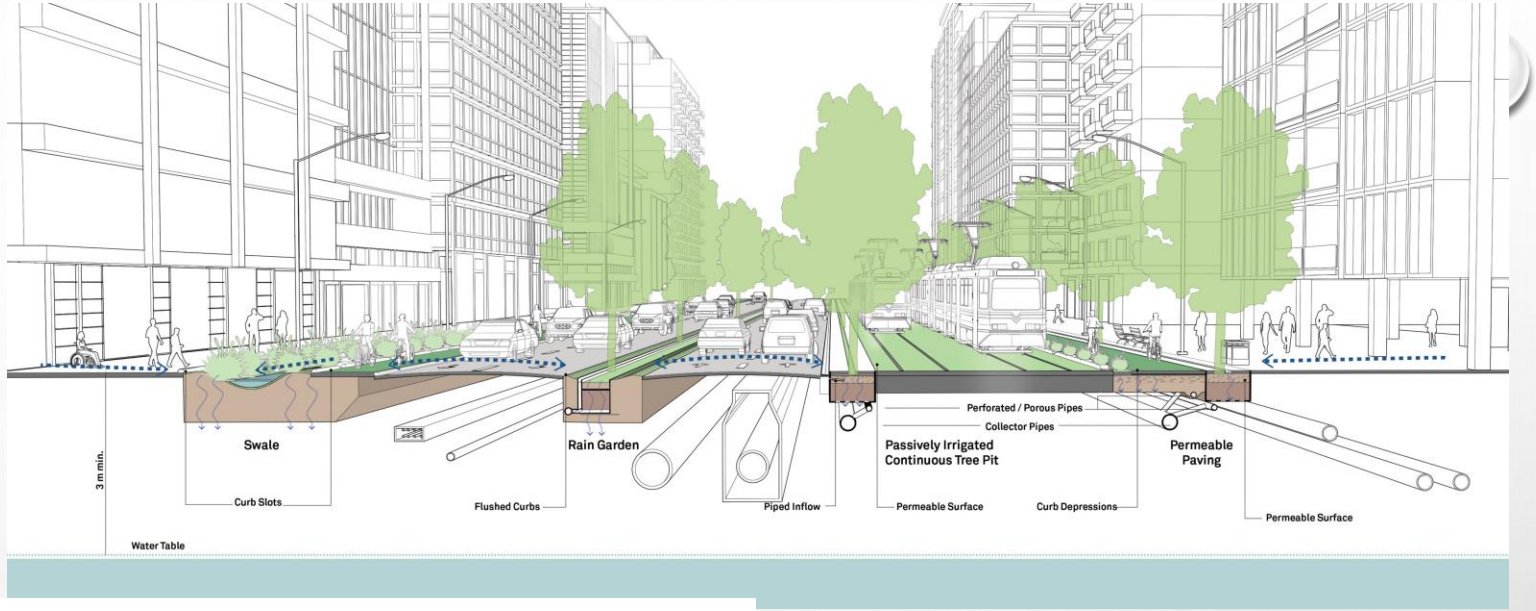
POST CONSTRUCTION

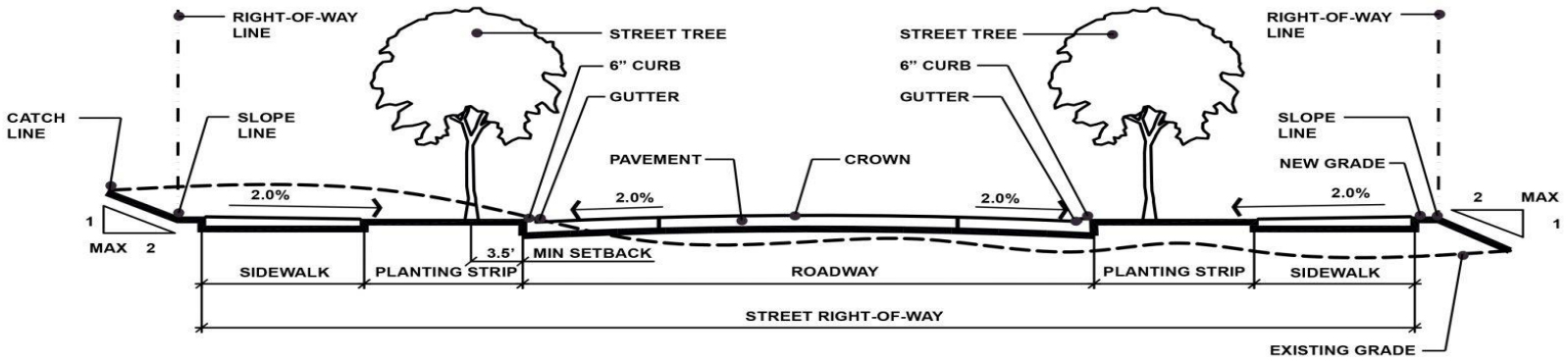
BMP
(BEST MANAGEMENT PRACTICE)



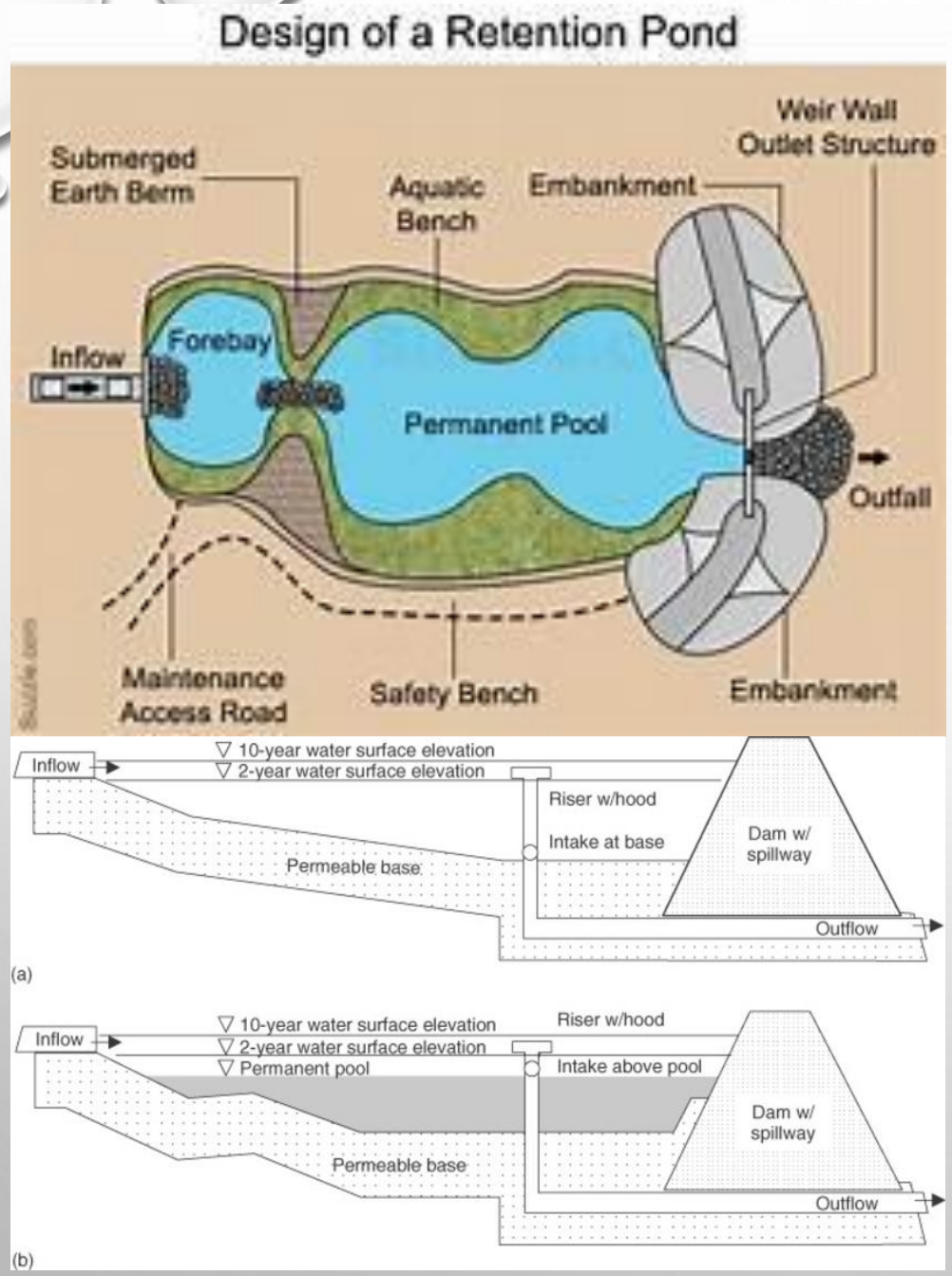
REDEVELOPMENT

Post-Construction Storm Water Runoff Control





STANDARD DESIGN CROSS SECTION
NOT TO SCALE



INFILTRATION TIME

BMPs are used to achieve the water quality criteria by removing pollutants and in some cases, reducing runoff.

Detention pond = Dry pond

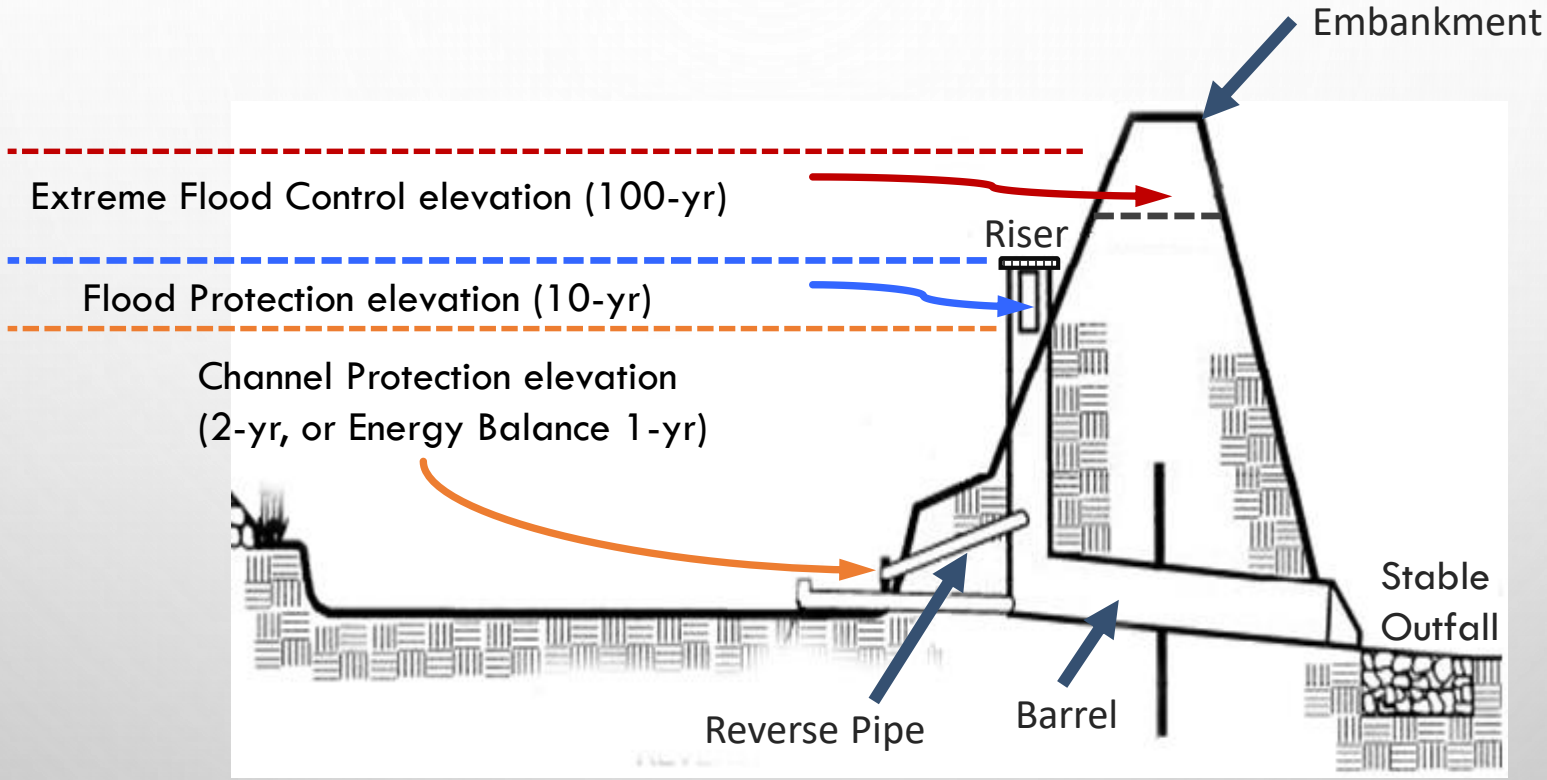
- Pool of water 48-72 hrs

Retention pond = Wet pond

- Pool of water thoughout the year

Stormwater Management Pond Schematic (Profile)

Post-Construction Storm Water Runoff Control



Water quantity compliance on approved plan/installed pond achieved via size of riser pipe, size of riser orifice(s), size of outflow pipes, and barrel size.

Pipe materials/specs should be verified in accordance with approved plan.

QUESTIONS

<u>SPECIAL THANKS</u>

- VIRGINIA MOSQUITO CONTROL ASSOCIATION
- MARY ANN HERRING