Module 5: Virginia Erosion & Sediment Control Minimum Standards

Module 5 Objectives

After completing this module, you will be able to:

- Understand the time line for adoption and implementation of the VESC Regulations
- Correlate the regulation's 19 minimum standards with the appropriate on-site practice

Module 5 Content

Introduction to the VESC Regulations

5a. Purpose of Minimum Standards

5b. Minimum Standards 1-18

5c. Minimum Standard 19

Introduction

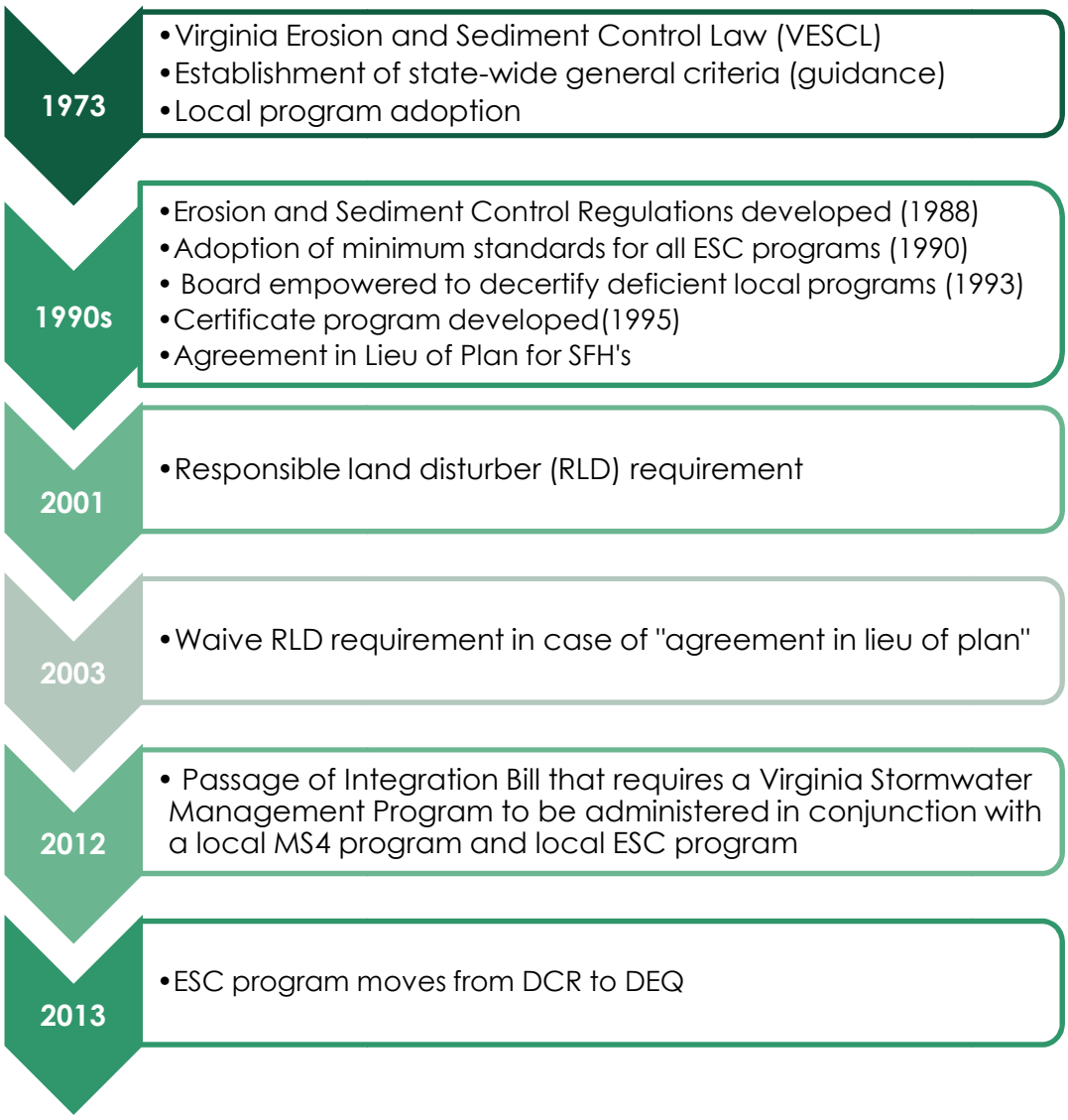
Virginia Erosion and Sediment Control (VESC) Regulations

The VESC regulations were first adopted on September 13, 1990, with amendments in 1995, 2012 and 2013. A primary objective in developing these regulations was to adopt a set of uniform statewide minimum standards that provide a set of clear cut rules for the control of erosion and sedimentation on construction sites. It was expected that these minimum standards would be mutually understood by the plan preparer, plan reviewer, developer (operator), and inspector, and allow for equal enforcement and compliance of these rules throughout the state.

Scope and Applicability

- VESCPs
- Plans Submitted to DEQ
- Linear Projects
- State Agencies with Annual Specifications
- Federal Agencies
- State Institutions of Higher Learning

Historical Sequence of Erosion and Sediment Control Regulations:



5a. Purpose of Minimum Standards

As we learned in Module 4, the VESCL provided the authority to adopt regulations containing Minimum Standards for controlling erosion and sedimentation from non-agricultural land disturbing activities. The stated purpose of the regulations in section 9VAC25-840-20 says *"The purpose of this chapter is to form the basis for the administration, implementation and enforcement of the Act. The intent of this chapter is to establish the*

framework for compliance with the Act while at the same time providing flexibility for innovative solutions to erosion and sediment control concerns."

The regulations set forth the minimum standards for the effective control of soil erosion, sediment deposition, and non agricultural runoff that must be met in every Virginia Erosion and Sediment Control Program (VESCP). It could be said that the Minimum Standards are "performance standards" that should be incorporated in the ESC plan and implemented on the actual land disturbing activity.

The Minimum Standards (MS) can be divided into a number of distinct groups:

- Erosion control (MS-1, 2, 3, 5) Soil stabilization
- Sediment control (MS-4 and 6)
- Slope protection (MS-7, 8 and 9)
- Channels, culverts and outlets (MS-10 and 11)
- Water courses (MS-12, 13, 14 and 15)
- Underground utilities (MS-16)
- Construction entrances (MS-17)
- Project completion (MS-18)
- Post construction stormwater management (MS-19)

5b. Minimum Standards: 1-18

Text in *italics* on the following pages indicates the language of the minimum standard copied from the regulations. For the official language please follow this link to the Virginia Legislative Information System (LIS);
http://lis.virginia.gov/cgi-bin/legp604.exe?000+reg+9VAC25-840-10

MS-1 was changed in 2012 to align with the 2014 Construction General Permit and EPA's effluent limit guidelines (ELGs), which requires stabilization of all areas that remain dormant for more than 14 days.

MS-1: Stabilization

Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site. Temporary soil stabilization shall be applied within seven days to denuded areas that may not be at final grade but will remain dormant for longer than 14 days. Permanent stabilization shall be applied to areas that are to be left dormant for more than one year.

- If final or temporary grade is reached during a period of the year when seeding is not appropriate, a temporary mulch cover should be applied
- Ground cover can reduce the erosion potential by 90% to 99%

Not at Final Grade

- Stabilize in 14 days
- Temporarily seed
- Mulch
- Permanently stabilize if dormant >1 year

At Final Grade

- Stabilize in 7 days
- Permanently or temporarily seed and mulch
- Mulch

MS-2: Stock Piles, Waste and Borrow Areas

During construction of the project, soil stock piles and borrow areas shall be stabilized or protected with sediment trapping measures. The applicant is responsible for the temporary protection and permanent stabilization of all soil stockpiles on site as well as borrows areas and soil intentionally transported from the project site.

- Per MS-1, soil stockpiles and areas that are going to *remain dormant* for more than 14 days should also be stabilized with temporary cover (i.e. mulch or annual vegetation), unless it will remain on site for more than one year, then it should be stabilized using permanent vegetation
- This also applies to off-site borrow and spoil areas

Mulch on stockpile and protected with silt fence
Purpose: Mulch prevents erosion by protecting the surface from raindrop impact and silt fence intercepts and detains from disturbed areas

MS-3: Permanent Vegetation

A permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.

- The inspector from the VESCP may have the final say on whether final site stabilization has been achieved

It is the responsibility of the developer/owner to achieve permanent stabilization on the entire site, including pervious (which are inherently stable) **and** impervious areas. This needs to be discussed at the beginning of the project (i.e. pre-construction meeting) in order for the developers to make better preparations and obtain the proper resources to do the job correctly and cost effectively.

Permanent vegetation
Purpose: Reduce erosion and decrease sediment yield from disturbed area

MS-4: First-Step Measures

Sediment basins and traps, perimeter dikes, sediment barriers and other measures intended to trap sediment shall be constructed as a first step in any land-disturbing activity and shall be made functional before upslope land disturbance takes place.

- This minimum standard is meant to assure that sediment does not leave the LDA once site clearing, grading and construction commences
- This standard is also known as getting the "*perimeter controls*" or as "*first step measures*" in place prior to land disturbance
- A certain amount of initial land disturbance may be required to provide access for equipment to install the perimeter controls, but site clearing and grading should be kept to a minimum until the perimeter controls are in place

Examples of perimeter controls:

- Silt fences
- Sediment traps
- Sediment basins
- Construction entrance
- Temporary diversions
- Diversions

Silt fence with wire support

Silt fence with wooden stakes

Purpose: Intercept and detain small amounts of sediment from disturbed areas during construction operation to prevent sediment from leaving the site and decrease velocity of sheet flows and low-to-moderate level channel flow

MS-5: Earthen Structure Stabilization

Stabilization measures shall be applied to earthen structures such as dams, dikes and diversions immediately after installation.

- In this case, MS-5 overrules MS-1 so that the earthen erosion and sediment control structures that were installed do not become the source of sediment. Earthen structures are generally intended to impound, convey or divert water so immediate stabilization is needed to prevent damage or failure of the structure.

Earthen structures seeded and mulched immediately after construction
Purpose: Reduce erosion and sedimentation and reduce damage from sediment and runoff to downstream or off-site areas

MS-6: Traps and Basins

Sediment traps and sediment basins shall be designed and constructed based upon the total drainage area to be served by the trap or basin.

a) The minimum storage capacity of a sediment trap shall be 134 cubic yards per acre of drainage area and the trap shall only control drainage areas less than three acres.

b) Surface runoff from disturbed areas that is comprised of flow from drainage areas greater than or equal to three acres shall be controlled by a sediment basin. The minimum storage capacity of a sediment basin shall be 134 cubic yards per acre of drainage area (134 cubic yards per acre is equivalent to one inch runoff). *The outfall system shall, at a minimum, maintain the structural integrity of the basin during a 25-year storm of 24-hour duration. Runoff coefficients used in runoff calculations shall correspond to a bare earth condition or those conditions expected to exist while the sediment basin is utilized.*

Sediment trapping devises:

- Place near the lowest drainage points of a project
- Installed as a first step measure (MS-4)
- Stabilize immediately (MS-5)
- Must include outlet protection for basins (MS-11)

MS-7: Cut and Fill Slopes

Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Slopes that are found to be eroding excessively within one year of permanent stabilization shall be provided with additional slope stabilizing measures until the problem is corrected.

It is important that slopes are properly seeded and mulched so that permanent vegetation is established and erosion by concentrated flow does not occur.

- While plants on a slope need water for germination and establishment, cut and fill slopes are inherently unstable and any runoff from up-gradient areas must be conveyed down the slope in a non-erodible way
- Roughening the surface of the slope decreases runoff, lowers the velocity runoff, increases water retention, and leads to better seed germination
    - This practice should generally be implemented unless the slope will require a high degree of maintenance mowing after vegetative establishment

MS-8: Concentrated Runoff

Concentrated runoff shall not flow down cut or fill slopes unless contained within an adequate temporary or permanent channel, flume or slope drain structure.

Temporary slope drains

Purpose: Temporarily conduct concentrated stormwater runoff safely down the face of a cut or fill slope without causing erosion on or below the slope

MS-9: Water Seeps

Whenever water seeps from a slope face, adequate drainage or other protection shall be provided.

- Cut and fill operations may expose shallow aquifers or groundwater tables from which water may seep through the side of a slope
    - The water seeps can cause slopes to erode or slough from the soil's weight above

Slope Failure from a Water Seep

MS-10: Inlet Protection

All storm sewer inlets that are made operable during construction shall be protected so that sediment-laden water cannot enter the conveyance system without first being filtered or otherwise treated to remove sediment.

The cost to clean out a site's stormwater infrastructure is well over $8.00 per cubic yard of sediment for street and culvert and more than $60.00 per cubic yard for hydro-flushing of storm sewers.

- Storm sewers are designed to efficiently transport stormwater away from the site, so when sediment enters the storm sewer system, two negative effects can occur:
    1. When the velocity of flow is high, much of the sediment will be quickly transported to the nearest receiving channel, defeating the purpose of a sediment control program
    2. When the velocity of the flow is low, the sediment may be deposited in the pipes resulting in clogging

Silt fence drop inlet protection

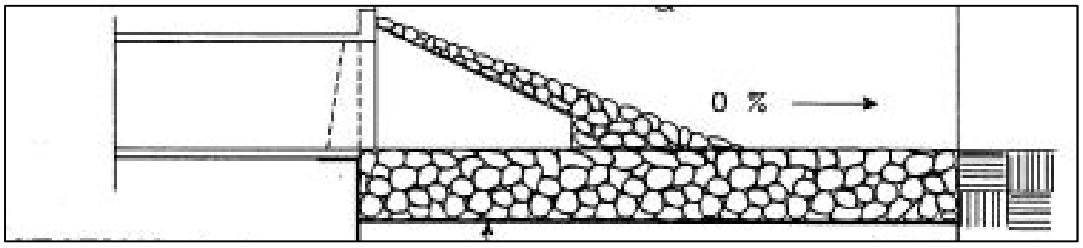
Block and gravel drop inlet sediment filter

Purpose: Prevent sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area

MS-11: Outlet Protection

Before newly constructed stormwater conveyance channels or pipes are made operational, adequate outlet protection and any required temporary or permanent channel lining shall be installed in both the conveyance channel and receiving channel.

- Outlet protection provides energy dissipation from the concentrated discharge from a pipe or channel in order to prevent erosion and provide a stable transition
- Must constructed at 0 grade (see below)



Outlet protection

Purpose: Prevent scour at stormwater outlets, protect outlet structure, and minimize potential for downstream erosion by reducing the velocity and energy of concentrated stormwater flows

MS-12: Watercourse Construction

When work in a live watercourse is performed, precautions shall be taken to minimize encroachment, control sediment transport and stabilize the work area to the greatest extent possible during construction. Non-erodible material shall be used for the construction of causeways and cofferdams. Earthen fill may be used for these structures if armored by non-erodible cover materials.

In stream work
Purpose: Use of non-erodible materials prevents damage to the stream bed and sedimentation

MS-13: Temporary Stream Crossing

When a live watercourse must be crossed by construction vehicles more than twice in any six-month period, a temporary vehicular stream crossing constructed of non-erodible material shall be provided.

Utility stream crossing
Purpose: Help protect sediment from entering the stream from construction within approach areas and minimize amount of disturbance within the stream itself

T**emporary stream crossing**
Purpose: Provide a means for construction traffic to cross flowing streams without damaging the channel or banks and keep sediment generated by construction traffic out of the stream

MS-14: Other Watercourse Regulations

All applicable federal, state and local requirements pertaining to working in or crossing live watercourses shall be met.

Activities in live water courses usually falls under the jurisdiction of other agencies and/or regulations, including:

- U.S. Army Corps of Engineers (404 Permit)
- DEQ's 401 permitting regulations
- DGIF or local wetland board time of year restrictions

All applicable permits need to be obtained and need to be available on site before construction in live water courses may start

Water bodies may be identified through wetlands delineation, followed by a jurisdictional determination by the U.S. Army Corps of Engineers. Wetlands and streams and other water bodies and the impact on these water bodies are usually indicated on plats, sometimes including permit numbers.

Note: Jurisdiction of wetlands and shorelines in coastal areas and areas under the Chesapeake Bay Act may have complicated jurisdictional divisions.

MS -15: Bed and Bank Stabilization

The bed and banks of a watercourse shall be stabilized immediately after work in the watercourse is completed.

- When working in a watercourse, MS-15 requires stabilization to be done immediately after completion of the work
- When working in water, the safety of the workers and equipment is important. The weather also factors in heavily when deciding to continue working in a watercourse or not due to potentially high flows of water

Vegetative streambank stabilization
Purpose: Protect streambanks from erosive forces of flowing water

MS-16: Utility Construction

Underground utility lines shall be installed in accordance with the following standards in addition to other applicable criteria:

a) No more than 500 linear feet of trench may be opened at one time

b) Excavated material shall be placed on the uphill side of trenches

c) Effluent from dewatering operations shall be filtered or passed through approved sediment trapping devices (or both), before being discharged in a manner that does not adversely affect flowing streams or off-site property

d) Material used for backfilling trenches shall be properly compacted in order to minimize erosion and promote stabilization

e) Re-stabilization shall be accomplished in accordance with this chapter (9VAC25-840)

f) Applicable safety requirements shall be complied with

- The basic principle of controlling erosion and sedimentation on utility projects is to get the trench back-filled and stabilized as soon as possible
- Section (f) refers to the safety requirements set forth by OSHA in regards to trench depth and the requirement for shoring or trench boxes when workers are in the trench

Backfilling a utility trench

MS-17: Vehicular Tracking and Construction Entrances

Where construction vehicle access routes intersect paved or public roads, provisions shall be made to minimize the transport of sediment by vehicular tracking onto the paved surface. Where sediment is transported onto a paved or public road surface, the road surface shall be cleaned thoroughly at the end of each day. Sediment shall be removed from the roads by shoveling or sweeping and transported to a sediment control disposal area. Street washing shall be allowed only after sediment is removed in this manner. This provision shall apply to individual development lots as well as to larger land-disturbing activities.

- During wet weather, construction traffic can transport a significant amount of sediment (i.e. mud) onto paved public roads, creating not only a sedimentation problem but also a safety hazard and public nuisance
- The operator is responsible for keeping public roads adjacent to their project clean
- Mud should be swept or shoveled off the road and deposited on areas where it will not cause another sedimentation problem

Sweeping and washing
Washing is only permitted after shoveling and sweeping of sediment

Temporary stone construction entrance
Purpose: Reduce amount of mud transported onto paved public roads by motor vehicles or runoff

MS-18: Control Removal

All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization or after the temporary measures are no longer needed, unless otherwise authorized by the VESCP authority. Trapped sediment and the disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation

- Temporary erosion and sediment control measures can become a problem if left in place beyond their useful life
  - Sediment fences can trap wildlife and small animals
  - Sediment basins can become drowning hazards or sources of sediment in cases of failure, and they become unsightly
- Temporary control measures should be removed and the area should be stabilized as soon as their function has been completed or are no longer needed

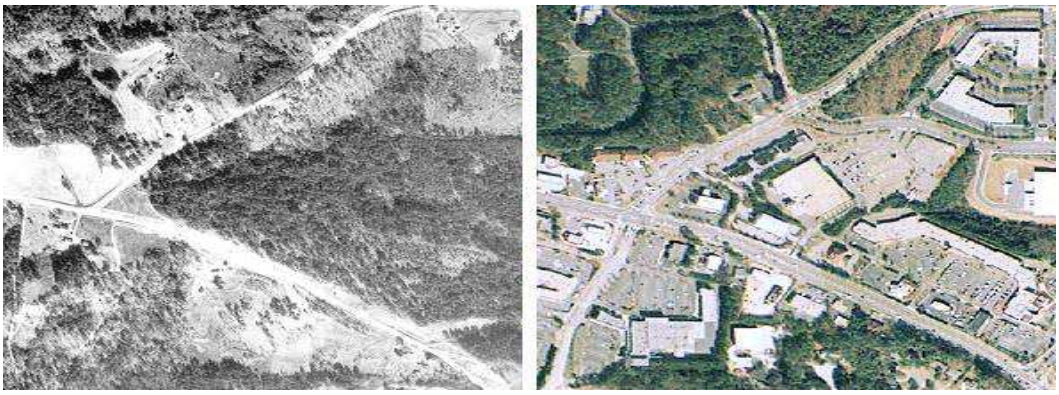
Some sediment basins are designed to be converted to stormwater basins at the end of a project. This can only be done once final stabilization has been achieved

Frayed and weathered silt fence that was not removed at the end of the project

5c. MS-19: Stormwater Management in relation to Erosion and Sediment Control

Before the adoption of the Virginia Erosion and Sediment Control Regulations, only guidance existed to control the stormwater runoff from a developed site. Excess water caused by increased impervious cover was considered a nuisance and quick disposal was the goal. The pictures below illustrate the icrease in impervious are with development and subsequent decrease of infiltration into the ground thus producing higher post development runoff, flooding and downstream erosion.

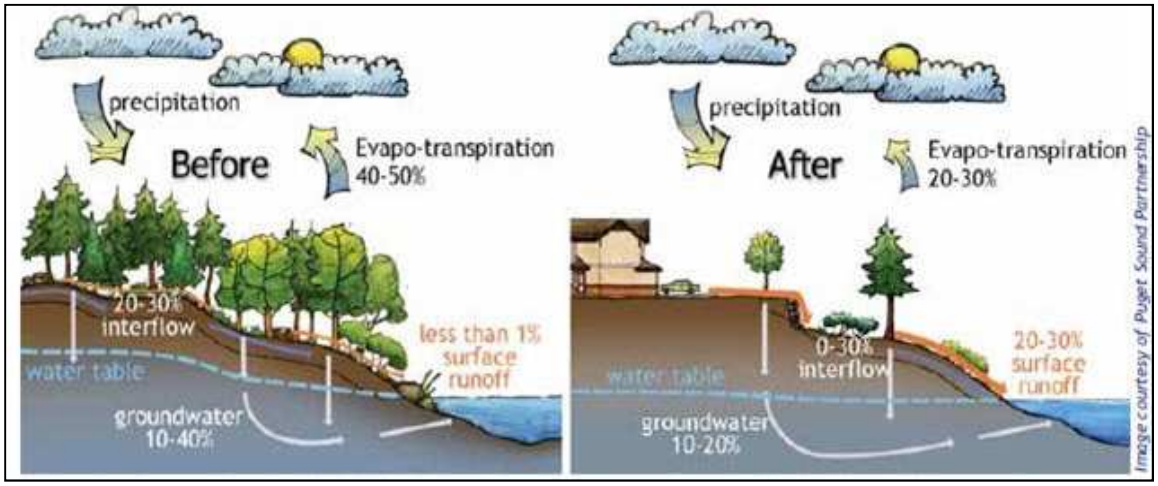
Impervious cover is a ground surface that does not allow water absorption or infiltration but rather results in surface runoff.



(Typical Changes in Land Surface (1958 – 1999) for a Commercial Area)
Source: ARC, 2001

Hydrologic changes are further intensified by the widespread use of man-made drainage systems such as gutters, storm sewers, and smooth-lined channels that are designed to quickly carry runoff to rivers and streams (see images below). These structures further reduce water infiltration into the soil and groundwater recharge.

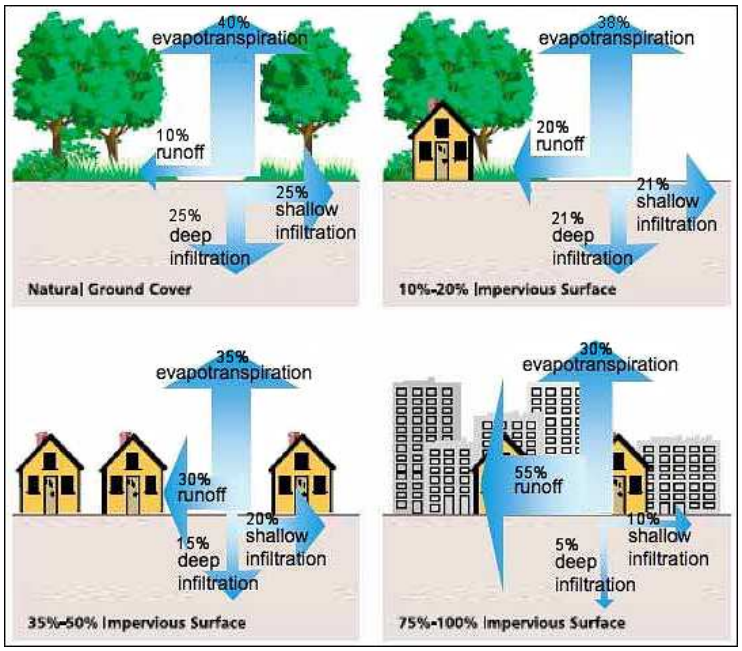
As illustrated below, the increase in impervious area can adversely affect the hydrologic cycle even in a localized situation.



(Changes in hydrology and land cover before (left) and after (right) development)
Source: Puget Sound Partnership, 2013

How increased impervious cover affects runoff

Although the total amount of rainfall varies somewhat in different regions of the state, the basic changes to the hydrologic cycle holds true (see image below).



Relationship between impervious cover and surface runoff
Source: Federal Interagency SWRG, 1998

Altering one component of the water cycle affects all other elements of the cycle

Impervious surfaces (roads, buildings, parking lots):

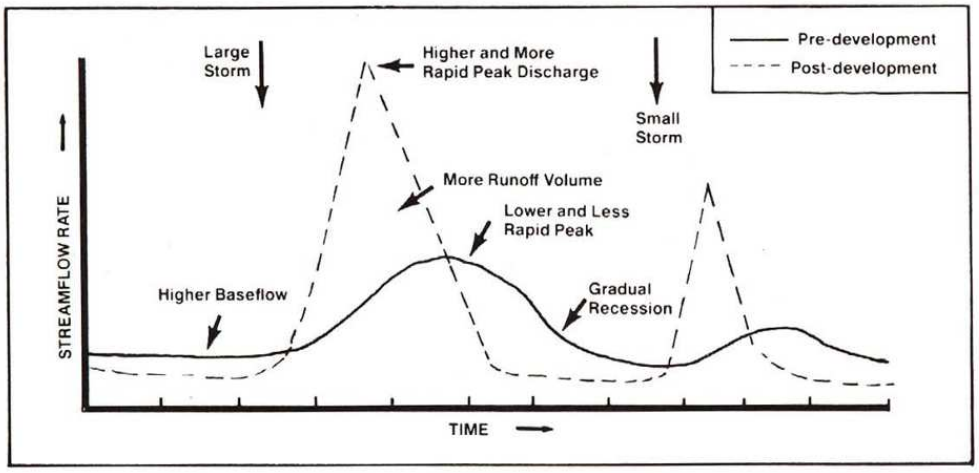
- Prevent rainfall from infiltrating into the soil and significantly increase surface runoff
- Replace natural vegetation that alter natural drainage patterns
    - Evapo-transpiration and infiltration decrease
    - Runoff increases in volume and flow rate

How stormwater runoff influences stream hydrology

Where land development has increased the volume and velocity of stormwater runoff to receiving waters and channels, significant changes to stream flow characteristics can occur:

- Increased peak discharges for a developed watershed can be two to five times higher than those for an undeveloped watershed.
- As runoff velocities increase, it takes less time for water to run off the land and reach a stream or other water body (time of concentration).
- Streams in developed areas can be more volatile because of their response to these altered runoff characteristics.
- This characterization translates into the sharp peak and increased size of the post-development hydrograph as seen in the figure below, which depicts typical pre-development and post-development streamflow hydrographs for a developed watershed.

Time of concentration is the time it takes for water to flow from the most remote point in a watershed to the watershed outlet **or** time required for 100% contribution from all points in a watershed during any uniform storm having



Typical Pre- and post-development stormwater runoff hydrographs

MS-19 *"Properties and waterways downstream from development sites shall be protected from sediment deposition, erosion and damage due to increases in volume, velocity and peak flow rate of stormwater runoff for the stated frequency storm of 24-hour duration in accordance with the following standards and criteria:"*

Developers are responsible for managing stormwater runoff in a manner that will prevent erosion damage and flooding to downstream properties and waterways. While the measures which are taken to satisfy this standard are usually selected and designed in the site planning stage, it is the primary role of the job superintendent and inspector to see that the stormwater management practices are installed properly and on time.

Minimum standard 19 (MS-19) states that stormwater must be discharged directly into a natural or man-made channel, pipe, or pipe system that can contain the design flow without eroding (i.e., is adequate). Channel adequacy is achieved by balancing channel capacity and stability with the volume and energy of the flow.

To fully meet the requirements of MS-19, **three** components of stormwater discharge must be addressed:

1. Channel capacity
   (Volume and duration)
2. Channel stability
   (Permissible velocity – the highest velocity at which water is permitted to pass through a structure or conduit without causing erosion)
3. Peak flow rate (over topping of bed and banks)

Channel analysis is a critical component in determining channel adequacy. For most sites, MS-19 can be adequately addressed through use of on-site BMPs to reduce the runoff, detention to control the runoff, and channel modifications or improvements (or a combination of these) to adequately convey the runoff.

MS-19 Standards and criteria for stormwater discharges

Minimum Standard (MS) 19 of the Virginia Erosion and Sediment Control (ESC) Regulations (**9VAC25-840-40.19**) requires designers to evaluate the adequacy of the downstream manmade and/or natural channels to safely convey the developed condition runoff. The criterion of the ESC regulations requires the designer verify the adequacy of all channels and pipes in the following manner:

1. Demonstrate that the total drainage area to the point of analysis within the channel is one hundred times greater than the contributing drainage area of the project (in which case the channel or pipe system is assumed to be adequate based on the correspondingly small impact of the project's runoff to the larger stream or channel system);

2. (a) Natural channels shall be analyzed by the use of a 2-year storm to verify that stormwater will not overtop channel banks nor cause erosion of channel bed or banks.

   (b) All man-made channels shall be analyzed by the use of a 10-year storm to verify that stormwater will not overtop its banks and by the use of a 2-year storm to demonstrate that stormwater will not cause erosion of channel bed or banks; and(c) Pipes and storm sewer systems shall be analyzed by the use of a ten-year storm to verify that stormwater will be contained within the pipe or system.

If the existing natural or manmade channels or pipes are not adequate, the applicant shall:

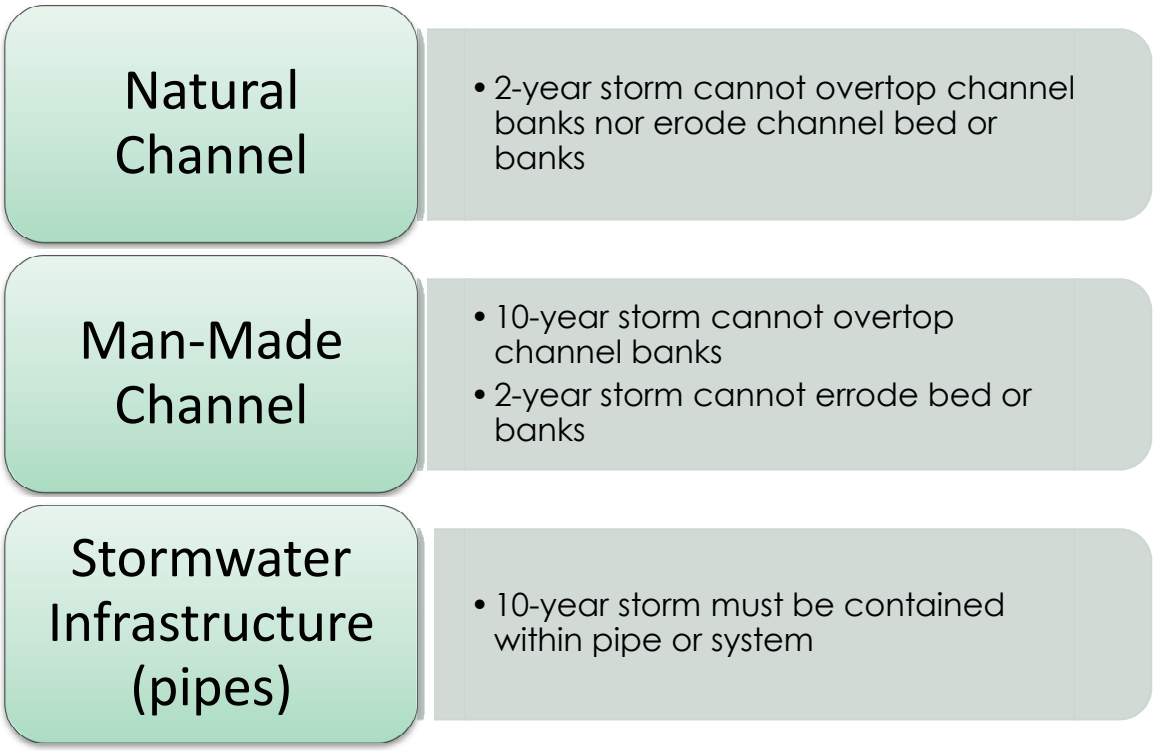
(1) Improve the channel to a condition that meets 2(b) above;

(2) Improve the pipe or pipe system so that the 10-year storm is contained within the system;

(3) Develop a site design that:

- will not cause the pre-development peak runoff rate from a two-year storm to increase when runoff outfalls into a natural channel; or
- will not cause the pre-development peak runoff rate from a ten-year storm to increase when runoff outfalls into a man-made channel; or

(4) Provide a combination of channel improvement, stormwater detention or other measures which is satisfactory to the VESCP authority to prevent downstream erosion.



★**Remember:** For ESC plans approved on and after July 1, 2014, designs must use the flow rate capacity and velocity requirements of the stormwater management regulations to satisfy compliance with the water quantity requirements in the Stormwater Management Act (§ 62.1-44.15:24 et seq.) and attendant regulations, unless such land-disturbing activities are in accordance with the grandfathering provisions of the Virginia Stormwater Management Program (VSMP) Regulation (9VAC25-870-48). In other words, grandfathered projects will need to meet the Part II C requirements or MS-19.

On and after July 1, 2014, projects subject to the Virginia Stormwater Management Act must meet the water **quality** and **quantity** requirements in Part II B of the Virginia Stormwater Management Program (VSMP) Regulation (9VAC25-870-62).

The water quantity requirements of the stormwater management regulations require designers to demonstrate that the energy or the post developed discharge rates of a LDA

provide channel protection by use of the "Energy Balance" method. The Energy Balance method is intended to achieve a balance between the "energy" exerted on the stream by the pre- and post-developed peak discharge. The formula provided does not actually represent stream energy, but rather a simplification of an effort to balance the hydrologic response characteristics of a developing watershed: impervious cover, channelization, and other impacts associated with the developed landscape resulting in an increase in the volume and peak rate of runoff. The Energy Balance method utilizes the inverse relationship between pre- and post-developed condition runoff volume to reduce the allowable peak discharge.

The information below describes the Energy Balance Method:

Discharge to a **natural** stormwater conveyance system

- The maximum peak flow rate from the one-year 24-hour storm following the LDA shall be calculated using the energy balance equation:

$$\mathbf{Q}_{Developed} \leq \mathbf{I.F.} \times (\mathbf{Q}_{Pre\text{-}developed} \times \mathbf{RV}_{Pre\text{-}Developed}) \; / \; \mathbf{RV}_{Developed}$$

$Q_{Developed}$	Allowable peak flow rate of runoff from the developed site
$RV_{Developed}$	Volume of runoff from the site in the developed condition
$Q_{Pre\text{-}Developed}$	Peak flow rate of runoff from the site in the pre-developed condition
$RV_{Pre\text{-}Developed}$	Volume of runoff from the site in pre-developed condition
Q_{Forest}	Peak flow rate of runoff from the site in a forested condition
RV_{Forest}	Volume of runoff from the site in a forested condition
I.F.	Improvement factor

★ Under no condition can the post-development peak flow rates be greater than pre-development peak flow rates

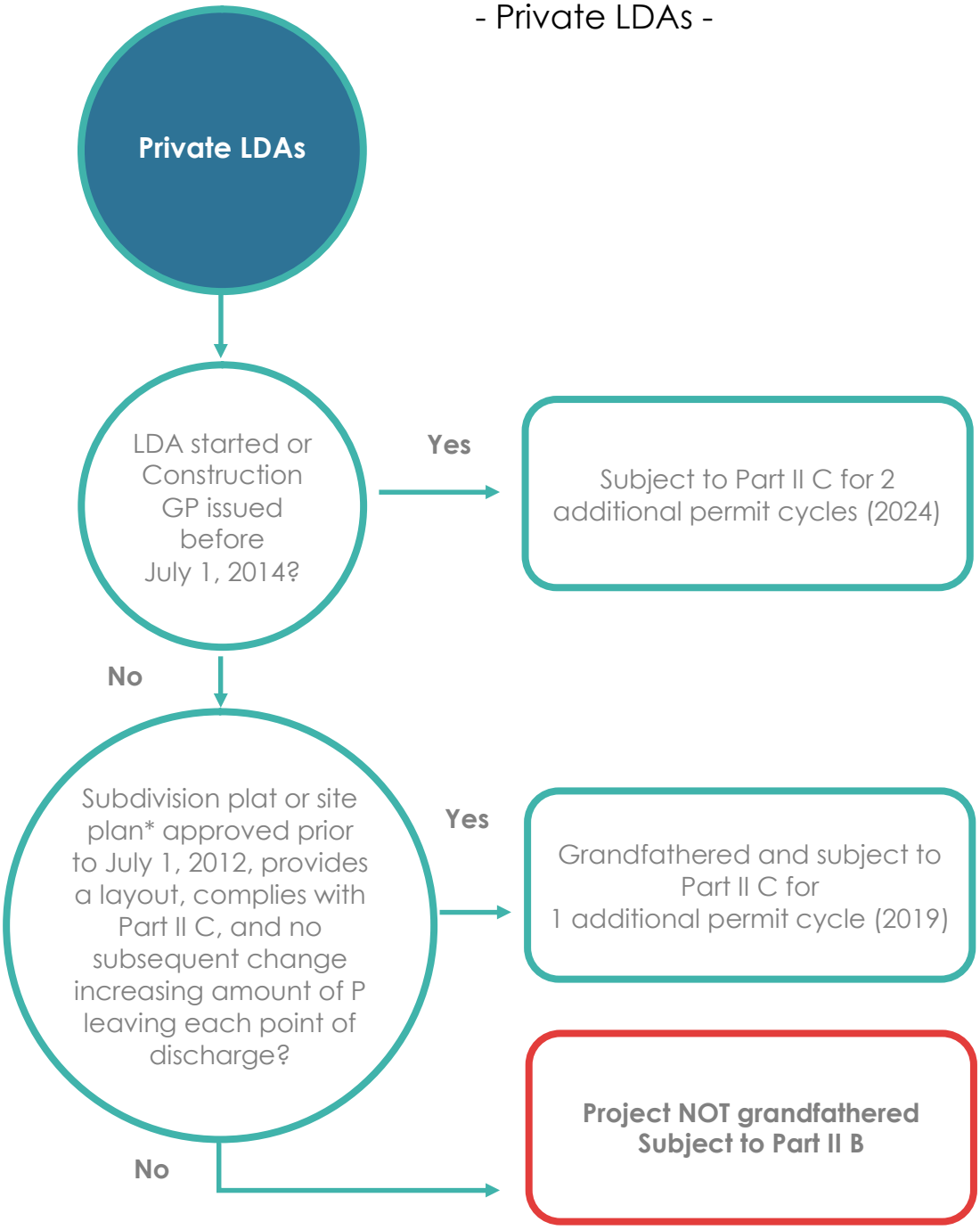
★ Under no condition can the post-development peak flow rates be required to be less than the peak flow rate of the site in a forested condition after adjusting for runoff volume

A VSMP authority may use another methodology that has been demonstrated to achieve equivalent results and has been approved by the Board

Projects that are grandfathered as mentioned above can be determined by using the following flow charts:

Flow Chart of Time Limits on Applicability of Approved Design Criteria and Grandfathering

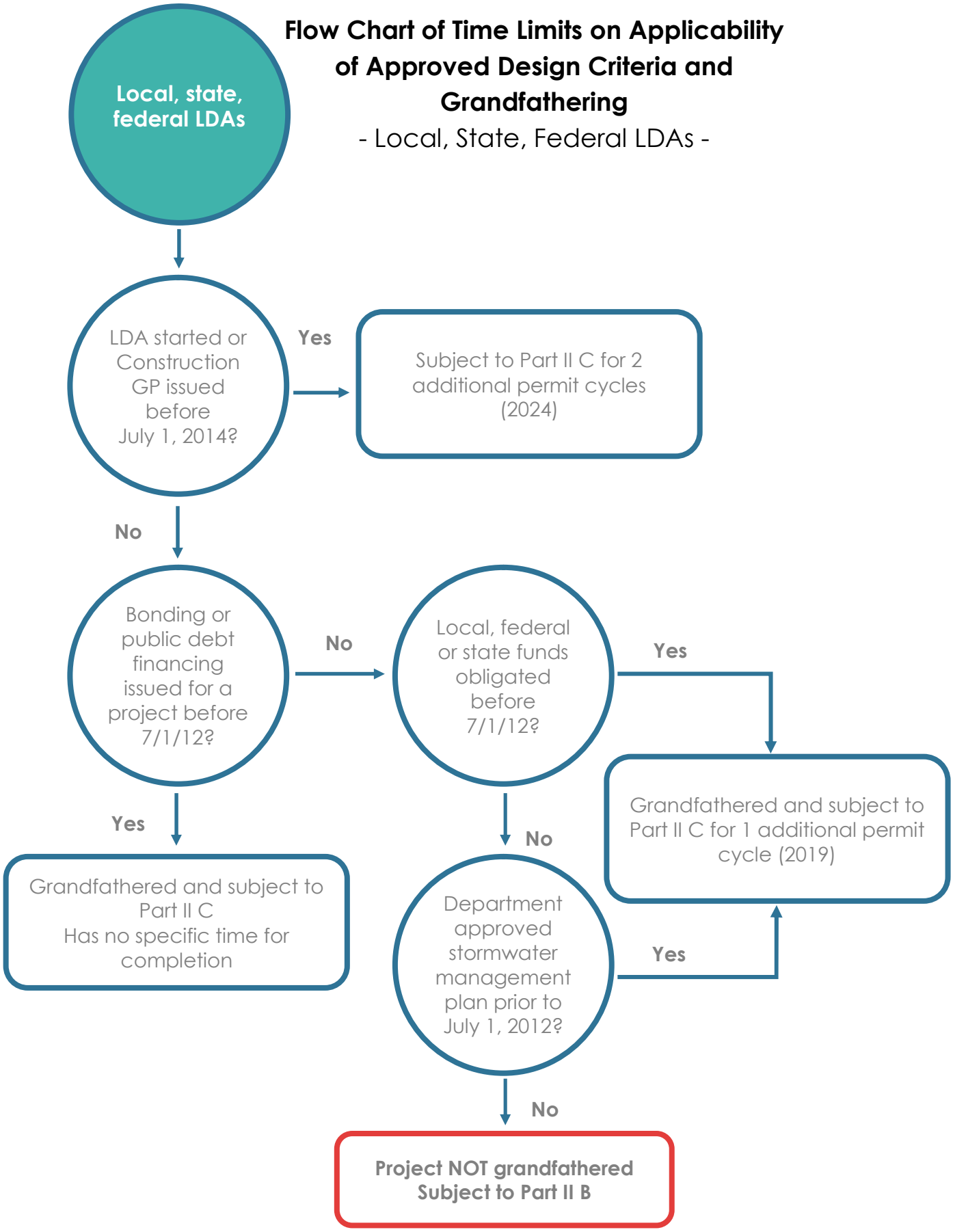
- Private LDAs -



*Or a proffered or conditional zoning plan, zoning with a plan of development, preliminary or final subdivision plat, preliminary or final site plan, or any document determined by the locality to be equivalent thereto.

Flow Chart of Time Limits on Applicability of Approved Design Criteria and Grandfathering

- Local, State, Federal LDAs -



The graphic below illustrates how the VSMP transforms the view of stormwater as a nuisance to stormwater being used as a resource instead.

Past

- MS-19 (State-wide)
- Stormwater (CBPA localities)
- ≥10,000 ft^2 or more stringent
- Quantity based
- Management of discharge

Present

- VSMP Law and regulations
- Areas ≥1 acre (CBPA LDA ≥ 2,500 ft^2)
- Quality and quanity (Energy balance equation)
- Runoff reduction (Infiltration/re-use)
- After July 1, 2014
- Grandfathered projects and projects between 10,000 sqf and 1 acre not in CBPA areas will still be regulated by MS-19 until 2019 or 2024

Stormwater Management
Past vs. Present

Some reasons why we should manage stormwater

High Stormwater Volume and Velocity

- More impervious surfaces lead to less ground infiltration, higher energy of runoff
- Increased stream volumes and flow rates, flooding, more erosion

Pollutants in Stormwater Runoff

- Pollutants are transported untreated to our waterways (nutrients, sediments, toxics, litter, debris, bacteria and pathogens, higher water temps)

Ecological Impacts

- Altered or lost habitats (aquatic, riparian)
- Reduced species richness and diversity
- Shift in ecological balance (aquatic food sources, opportunistic or undesireable species take over)

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

Knowledge Check - update

1. Sediment traps and basins are designed to serve:

    a. the area being cleared
    b. total drainage area going thru the project
    c. two year storms

2. Stabilization must occur when soil stockpiles are dormant more than _____ days and also within _____ days of final grade

    a. 30, 14
    b. 7, 14
    c. 14, 7
    d. 7, 3

Minimum Standard #	Summary Description & Purpose of Minimum Standards
MS 1	Addresses permanent and temporary soil stabilization: within 7 days when site is at final grade and on sites that are not at final grade but remain dormant for more than 14 days.
MS 2	Soil Stockpiles and borrow areas must be stabilized or protected with sediment trapping measures. This includes off site/remote areas. According to MS-1, piles dormant > 14 days should be temporary seeded.
MS 3	Permanent Stabilization: must be applied to areas not otherwise permanently stabilized. Ground cover needs to be uniform, mature enough to survive and inhibit erosion.
MS 4	Perimeter controls (sediment basins, traps, perimeter dikes, sediment barriers or etc) must be installed as first measures in any LDA and shall be made functional before upslope LDA occurs.
MS 5	Stabilization practice shall be applied immediately to earthen structures (such as dams, dikes & diversions) after installation.
MS 6	Sediment traps & basins shall be designed & constructed based on the total drainage area they serve.
MS 7	Cut and fill slopes shall be designed & constructed in a manner that will minimize erosion.
MS 8	Concentrated runoff shall not flow down a cut or fill slope unless contained in an adequate temporary or permanent channel, flume or slope drain structure.
MS 9	Where water seeps from a slope face, adequate drainage or other protection shall be provided.

MS 10	**All storm inlet made operable during construction must be protected so sediment laden water cannot enter without first being filtered.**
MS 11	**Before any newly constructed stormwater conveyance channel can be made operational, adequate protection and any required temporary or permanent channel lining shall be installed in both the conveyance channel & receiving channel.**
MS 12	**Minimize encroachment to live water course. Use non-erodible materials shall be used for constructing of causeways and coffer dams; earthen material may be used if armored by non-erodible material.**
MS 13	**When construction vehicles must cross a live water course more than twice in a 6 month period, a temporary stream crossing of non-erodible material must be provided.**
MS 14	**When working in a live water course, all applicable Federal, State and local regulations pertaining to the activity must be met.**
MS 15	**The bed and banks of a watercourse shall be stabilized immediately after work in the watercourse has been completed.**
MS 16	**Underground utility lines can have no more than 500 feet open trench and need to be stabilized as soon as possible. All dewatering operations shall be filtered before water leaves the site.**
MS 17	**Provisions shall be made to minimize the transport of sediment from the site onto paved surfaces.**
MS 18	**All temporary ESC measures shall be removed within 30 days of achieving a stabilized final grade or when the measure is no longer needed.**
MS 19	**Stormwater standard: Protect properties and waterways downstream of a LDA from erosion and sediment deposition due to increases in peak stormwater runoff.**