TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Division of Water Resources

William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, 11th Floor, Nashville, Tennessee 37243

1-888-891-8332 (TDEC)

Notice of Intent (NOI) for General NPDES Permit for Stormwater Discharges from Construction Activities (TNR100000)

Site or Project Name: Clearview Acres, Section 2		***NPDES Tracking Number: TNR***	
Street Address or Location: Along Walnut Grove Road (HWY 269), west of Shelbyville Pike (HWY 231)		Construction Start Date:	June 2019
		Estimated End Date:	June 2020
Site Description: Residential development of 55 lots, grading, and utility placement		Latitude (dd.dddd):	35.7240
		Longitude (-dd.dddd):	-86.4313
County(ies): Rutherford	MS4 Jurisdiction (if applicable): Rutherford	Acres Disturbed:	14.82
		Total Acres:	142.46

Check the appropriate box(s) if there are streams and/or wetlands on or adjacent to the construction site: Streams ☑ Wetlands ☐

If wetlands are located on-site and may be impacted, attach wetlands delineation report.

If an Aquatic Resource Alteration Permit (ARAP) has been obtained for this site, what is the permit number?

Receiving waters: West Fork Stones River

Attach the SWPPP with the NOI: SWPPP Attached ☑ | Attach a site location map: Map Attached ☑

Site Owner/Developer (Primary Permittee): (Provide person, company, or entity that has operational or design control over construction plans and specifications): 3BC, LLC.

For corporate entities only, provide correct Tennessee Secretary of State (SOS) Control Number: 000872272 (an incorrect SOS control number may delay NOI processing)

Site Owner or Developer Contact Name: (individual responsible for site) Bud George		Title or Position: (the party who signs the certification below)	
Mailing Address: 702 Prince Edward Ct		City: Murfreesboro	State: TN / Zip: 37130
Phone: (615) 513-1173	Fax: ( )	E-mail:	

Optional Contact:		Title or Position:	
Mailing Address:		City:	State: / Zip:
Phone: ( )	Fax: ( )	E-mail:	

Owner/Developer Certification: (must be signed by president, vice-president or equivalent, or ranking elected official) (Primary Permittee)

I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

Owner/Developer Name: (print/type) Bud George	Signature:	Date: 5/2/19

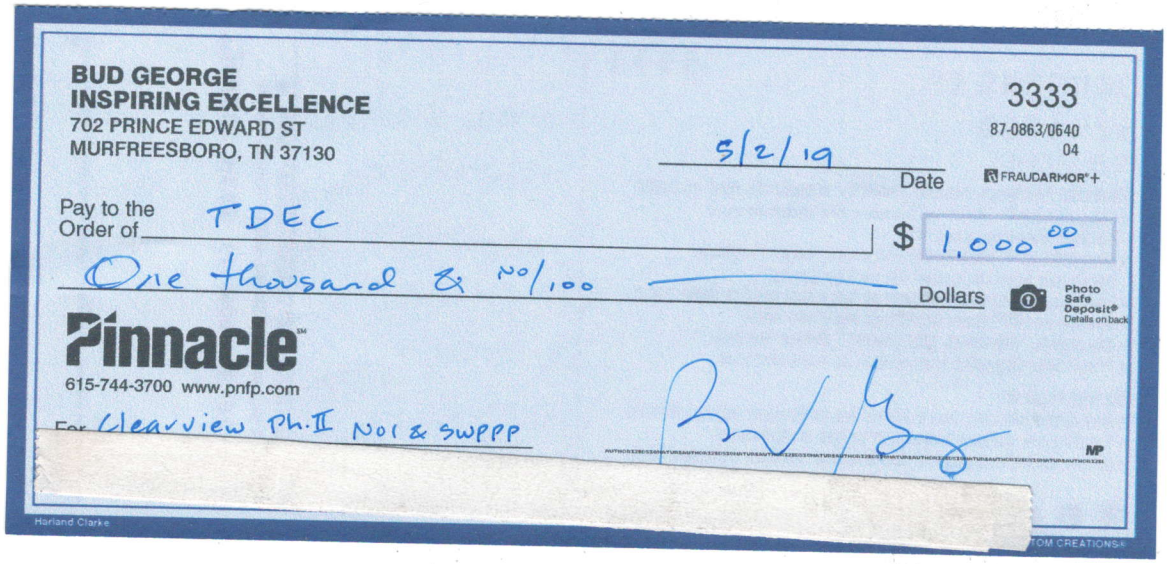
Contractor(s) Certification: (must be signed by president, vice-president or equivalent, or ranking elected official) (Secondary Permittee)

I certify under penalty of law that I have reviewed this document, any attachments, and the SWPPP referenced above. Based on my inquiry of the construction site owner/developer identified above and/or my inquiry of the person directly responsible for assembling this NOI and SWPPP, I believe the information submitted is accurate. I am aware that this NOI, if approved, makes the above-described construction activity subject to NPDES permit number TNR100000, and that certain of my activities on-site are thereby regulated. I am aware that there are significant penalties, including the possibility of fine and imprisonment for knowing violations, and for failure to comply with these permit requirements. As specified in Tennessee Code Annotated Section 39-16- 702(a)(4), this declaration is made under penalty of perjury.

Contractor name, address, and SOS control number (if applicable):	Signature:	Date:
Contractor name, address, and SOS control number (if applicable):	Signature:	Date:

OFFICIAL STATE USE ONLY

Received Date: 5-3-19	Reviewer:	Field Office: 04	Permit Tracking Number: TNR 243434	Exceptional TN Water:
Fee(s): 1000	T & E Aquatic Flora/Fauna:	SOS Corporate Status:	Waters with Unavailable Parameters:	Notice of Coverage Date:



BUD GEORGE
INSPIRING EXCELLENCE
702 PRINCE EDWARD ST
MURFREESBORO, TN 37130

3333
87-0863/0640
04

5/2/19
Date

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615-744-3700 www.pnfp.com

For Clearview Ph. II NOI & SWPPP

Harland Clarke

TOM CREATIONS®

SEC, Inc.

SITE ENGINEERING CONSULTANTS
Engineering • Surveying • Land Planning
850 Middle Tennessee Blvd, Murfreesboro, TN 37129
www.sec-civil.com • 615-890-7901 • fax 615-895-2567

May 2, 2019

Attention: Mrs. Lonna Justus
TDEC - Water Pollution Control
711 R.S. Gass Blvd.
Nashville, TN 37243

RE: Clearview Acres, Section 2
Rutherford County, TN
SEC Project No. 14300

Transmitted herewith is a Notice of Intent (NOI) Form for the General NPDES Permit to discharge Storm Water Associated with Construction Activity related to Clearview Acres, Section 2 project.

Clearview Acres, Section 2 is a residential development of 55 lots that will include road work, grading, and utility placement, disturbing approximately 14.82 acres. The property is located along Walnut Grove Road (Highway 269), west of Shelbyville Pike (Highway 231) in Rutherford County, TN.

Attached is Notice of Intent form (NOI), SWPPP, a set of the Stormwater Management Plans and a check for $1000 for a site disturbance of between five acres and twenty acres.

If you have any questions, comments, or if any additional information is required, please contact me. Please send a copy of the Notice of Coverage (NOC) to me via mail or email at aahmed@sec-civil.com.

Sincerely,

Aws Ahmed, E.I.T.
SEC, Inc.

Enclosures: SWPPP (Electronically)
Review Fee Check (via mail)
Notice of Intent (Electronically)
Topographic Map of Site (Electronically)
Scale Set of Construction Plans (Electronically)

Clearview Acres
Section 2

Rutherford County, TN

STORM WATER POLLUTION PREVENTION PLAN
(SWPPP)
OPERATION & MAINTENANCE

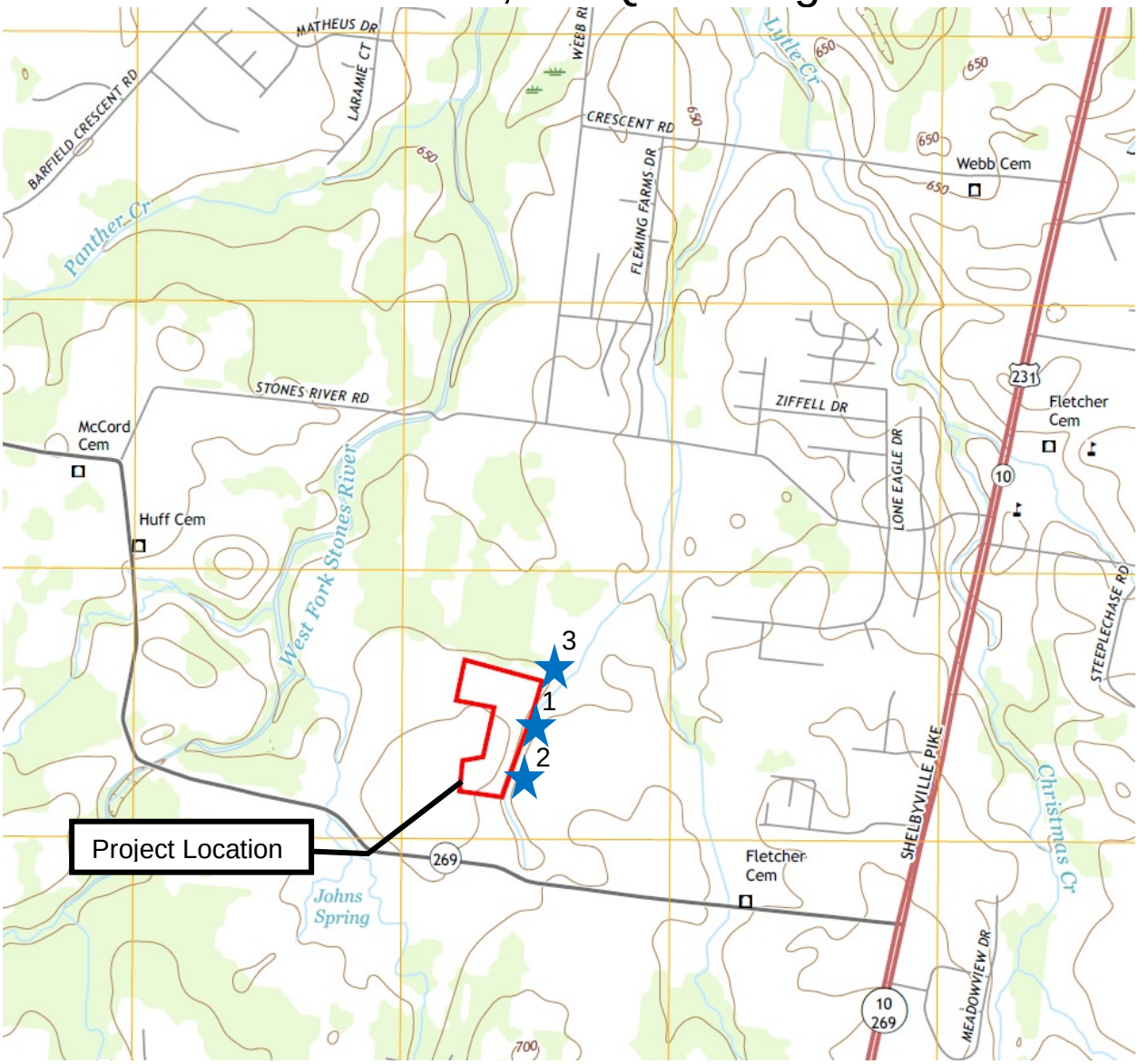
ON BEHALF OF

3BC, LLC.
702 Prince Edward Ct.
Murfreesboro, TN 37130
Contact: Bud George
Phone: (615) 513 - 1173

Prepared By:

Site Engineering Consultants, Inc.
850 Middle Tennessee Boulevard
Murfreesboro, Tennessee 37129
Phone: (615) 890-7901
Fax: (615) 895-2567
SEC Project No. 14300

Fosterville, TN Quadrangle



Map Scale: 1=24000

Drawing Scale: N.T.S

N

General Information

This Storm Water Pollution Prevention Plan (SWPPP) is developed in accordance with the Tennessee General NPDES Permit (TNR 100000) for Storm Water Discharges Associated with Construction Activity (TNCGP), and is prepared using sound engineering practices. SEC, Inc. personnel involved with the development of this plan have completed the *Design of Vegetative and Structural Measures for Erosion Prevention and Sediment Control* course available from the State of Tennessee.

As instructed by the TNCGP, this plan and all attachments are hereby submitted to the local Environmental Field Office (EFO), along with the complete, correctly signed Notice of Intent (NOI). Construction will not be initiated prior to 30 days from the date of submittal of this document, or prior to receipt of a Notice of Coverage (NOC) from the Tennessee Department of Environment and Conservation (TDEC).

Owner/Developer: 3BC, LLC.
702 Prince Edward Ct.
Murfreesboro, TN 37130
Contact: Bud George
Phone: (615) 513 - 1173

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.		
Representative of owner/developer; print or type	Signature	Date
Bud George		5/2/19

Primary Contractor:
Contact Person:
Contact Phone Number:

I certify under penalty of law that I have reviewed this document and any attachments. Based on my inquiry of the construction site owner/developer identified above, and/or my inquiry of the person directly responsible for assembling this Storm Water Pollution Prevention Plan, I believe the information submitted is accurate. I am aware that this Plan, if approved, makes the above described construction activity subject to the NPDES permit number TNR_____, and that certain of my activities on-site are thereby regulated. I am aware that there are significant penalties, including the possibility of fine and imprisonment for knowing violations, and for failure to comply with these permit requirements.		
Company name of primary contractor; print or type	Signature	Date

The individual responsible for installation, maintenance, and inspections of erosion and sediment control measures will be _____. _____ has completed the *Fundamentals of Erosion Prevention and Sediment Control* course offered by the State of Tennessee. _____ mobile telephone number is _____.

It is the intention and goal of the TNCGP and this SWPPP that any discharge from the property described in this document have no objectionable color contrast to the water body that receives it. The construction activity will be carried out in such a manner as will prevent any discharge that would cause a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of the waters on the property or downstream of the property for fish and aquatic life, livestock watering and wildlife, recreation, irrigation, navigation, or industrial or domestic water supply.

Record Keeping Requirements

Current versions of this SWPPP, the NOI, and the NOC will be kept on the site from the date construction commences to the date of termination of permit coverage. These items will be available for the use of all operators and site personnel involved with the erosion and sediment controls, and will be available to TDEC personnel visiting the site.

A notice will be posted near the construction entrance (accessible to the public) during construction, containing:

1.) A copy of the NOC with the tracking number assigned by the EFO,
2.) The name, company name, email address, the telephone number and address of a contact person of the project site owner/operator,
3.) A brief description of the project, and
4.) The location of the SWPPP

The notice must be maintained in a legible condition.

The contractor shall also provide the following items/information in an appropriate location on-site:

1.) A rain gauge
2.) A copy of the twice weekly inspection reports
3.) A copy of the site inspector's Fundamentals of Erosion Prevention and Sediment Control Level 1 certification

The following records shall be maintained on-site:

1.) Dates when major grading activities occur
2.) Dates when construction activities temporarily or permanently cease on all or a portion of the site
3.) Dates when stabilization measures are initiated
4.) Daily Rainfall records

The permittee shall retain copies of the SWPPP and all of the inspection reports, and all related reports and documentation for a period of at least three years from the date the notice of termination is submitted.

Prior to initiating earthwork on any areas that are not within the scope of the project, additional information will be provided to TDEC in support of this document.

Any new contractor on the project that will have any responsibility to install, inspect, or maintain erosion and sediment control measures will sign the contractor's certification on a copy of the NOI (Appendix A) and will submit it to the local EFO. Any correspondence with TDEC or any EFO will reference the tracking number assigned by TDEC to the project. A Notice of Termination (NOT; Appendix B) will be submitted after construction is completed, and the complete installation and successful establishment of the final stabilization activities at the site.

Existing Site Conditions

Clearview Acres, Section 2 shall consist of the development of 55 lots, grading, and utility placement. The property is located along Walnut Grove Road, west of Shelbyville Pike in Rutherford County, TN. The property is located on Tax Map 159, as Parcel 6.00 and 6.01 which encompasses 142.46 ± acres in the jurisdiction of Rutherford County, TN and is currently zoned as a PUD.

The site has been designed to drain into proposed stormwater ponds that will eventually drain into West Fork Stones River which is a fully supporting stream. From the USDA-NRCS – Web Soil Survey the existing soils on site consist of the following:

Percentage	Soil Unit Symbol	Soil Type	Hydrologic Soil Group
16.1%	HcA	Harpeth Silt Loam	B
80.0%	BrB, BsC3, Eg	Bradyville Silt Loam, Bradyville Silty Clay Loam, Egam Silt Loam	C
4.0%	Tu	Tupelo Silt Loam	D

The existing property is pasture and woods with a weighted SCS Curve Number of 76. The topography can best be described as gradual/gentle slopes (1-5%). The receiving waters for the project is West Fork Stones River, which is a fully supporting stream. Therefore, all EPSC measures have been designed for the 2-yr, 24-hr storm event.

Project Description

Clearview Acres, Section 2 is a residential development of 55 lots that will include road work, grading, and utility placement. The limits of disturbance will be 14.82± acres. When construction is completed, the post-development ground cover will consist of 1/8-Acre residential lots, impervious pavement, and open space / landscaping areas as shown on the Grading & Drainage Plan, will have a weighted SCS Curve Number of 88.

There are three outfalls for this project: The temporary construction exit/entrance of the site and the two water quality ponds.

A. Description of the intended sequence of major activities, which disturb soils for major portions of the site.

1. Establish erosion control devices for area to be disturbed (such as silt fence, construction entrance, and sediment traps).
2. Remove topsoil in proposed lot, detention, and roadway locations.
3. Drill and blast for underground utilities (water, sewer, and storm), if required
4. Grade site to proposed subgrade elevations.
5. Install drainage culverts, and drainage structures following required construction methods.
6. Install inlet and outlet protection for the drainage structures such as filter fabric over curb inlets, turf reinforcement at outfalls, and energy dissipation devices, if required.
7. Finish fine grading of site.
8. Install erosion control to help stabilize disturbed areas such as seeding and mulching.
9. Re-grade and compact roadway areas to proposed subgrade elevations.
10. Install curb, base stone, and asphaltic binder for proposed roadway.
11. Backfill behind curbs and grade to final elevations.
12. Clean any silt from storm drainage structures or culverts.
13. Remove all silt fences once a healthy stand of grass is obtained in all disturbed areas.

B. Estimates of total area of the site and the total area of the site that is expected to be disturbed by excavation, grading, or other activities.

Total Area of Site: 142.46± acres
Disturbed Area: 14.82± acres.

C. Data describing the soil

See Existing Site Conditions above.

D. Estimate of the runoff coefficient of the site before and after construction activities are completed.

The existing ground conditions in the project area are best described as pasture and woods in fair condition with a weighted SCS Curve Number of 76.

The developed ground conditions in the project area would be best described as 1/8-Acre residential lots, roads, and open space/landscaping areas with a weighted SCS curve number of 88.

E. Maps (See Attached and Construction Plans)

F. Outfall points for storm water discharges from site

There are three (3) on-site outfall points that are to be monitored during construction as mentioned above and labeled on the Initial and Intermediate Erosion Control Plan. The site drains to West Fork Stones River after draining to proposed stormwater ponds.

G. Description of any discharge associated with industrial activity other than construction storm water that originates on site.

No industrial discharge is associated with this development.

H. Name of receiving waters.

The site drains into West Fork Stones River, which is a fully supporting stream. West Fork Stones River starts to the west of the site and Lytle Creek is adjacent to the site. There are no wetlands on or adjacent to the site.

Initial EPSC Phase

The contractor is responsible for the implementation of all EPSC phases, as well as the removal of trapped sediment at or before 50% design capacity. The Initial Phase begins before any earth moving begins. There will be a temporary construction exit located on the Northeast corner of the site onto Compass Way. A concrete washout area has been shown to be located near this construction entrance as well. Silt fence will be placed around the downstream perimeter of the project to prevent any sediment from leaving the project site during the first phases of construction. Excess material from the project will be stored onsite until its use is required. If any storage areas exist during the life of the construction, they should have the proper EPSC measures installed such as surface roughening, silt fence, and temporary seeding if stored for longer than 6 months. All silt fences will be removed upon the completion of its use to prevent it from acting as a source of pollution.

Check dams will be placed in existing ditches. Stabilization (temporary or permanent) of disturbed areas must be initiated immediately when construction activities temporarily or permanently cease on a portion of the site and will not resume for at least 14 days. Pre-construction vegetative ground cover shall not be destroyed, removed, or disturbed more than 15 days prior to grading activities are projected to begin for that area unless the area is temporarily stabilized. Clearing and grubbing of the site shall be kept to a minimum and only in areas absolutely required for the construction activities.

Intermediate EPSC Phase

The Intermediate Phase will include stabilization measures required for utility installation, storm lines, and mass grading. The mass grading consists of roadway subgrade, pond grading, ditch grading, and lot grading. Temporary seeding and matting on all slopes should be accomplished as soon as practical.

After installation of the stormwater collection system, inlet protection should be installed to reduce sediment buildup in pipes. The measures shown are to remain in place throughout the life of the project until the final stabilization measures and permanent features are achieved.

During this phase, maintenance of all structural BMP’s shall be maintained. The maintenance shall include removing silt as structures approach half capacity, replacing damaged BMP’s, and temporary vegetative measures.

Final EPSC Phase

The Final Phase will consist largely of stabilization measures as part of the grading process during the final stages of construction. These will include permanent seed, mulch, and landscaping on all grading or disturbed areas not previously stabilized. The temporary sediment control measures shown are to remain in place throughout the life of the project until the final stabilization measures and permanent site features are completed.

Site Assessment

West Fork Stones River is a fully supporting stream and this project does not have drainage outfalls areas with more than 10 acres, therefore a site assessment is required, and sediment basins are not required at both pond locations.

Inspection Requirements

Inspections shall be performed at least 2 times per calendar week with at least 72 hours between each inspection. Inspections will cover, at minimum, all disturbed areas that have not undergone final stabilization, sediment control structures, outfall points, and vehicle entrance and exit points. The inspections will be conducted with the purpose of determining whether erosion prevention and sediment control measures are effective in preventing impacts to receiving waters. If during these inspections it is discovered that repair or maintenance is required of any temporary or permanent control measure, the action should be taken before the next rainfall if possible but no longer than 7 days and will be documented. If any structure is found to be at half capacity, then it should be cleaned out and the removed sediment used elsewhere onsite.

If the controls are installed and maintained correctly but are found to provide an inadequate level of protection, revisions will be made to this plan within 7 days following the inspection. Then the revisions will be implemented by the contractor within 14 days of the inspection. The inspector will certify every 72 hours (on the form found in Appendix C) that the inspection described above has been performed and whether or not all of the erosion and sediment control measures are installed in working order. The record of certifications on the form will be kept on site and made available upon request. The forms must be submitted to the division within 10 days of the request. If the records are requested by the division, the forms must contain the printed name and signature of the trained certified inspector and the permittee.

The inspector shall have completed the *Fundamentals of Erosion Prevention and Sediment Control Level I* course. A copy of the certification or training record for the inspector certification should be kept on site.

Spills and Non-Storm Water Contingencies

All fueling of equipment and vehicles on site should be conducted near the construction entrance/staging areas. Any spillage should be removed immediately. Contaminated soils will be placed on heavy plastic and covered or placed into approved containers to prevent contact with storm water. All fuel tanks will be in the containment area. Oils, other vehicle fluids, paints, and solvents will be stored in the construction trailer. Any spill in excess of two gallons will be reported to a representative of the owner.

If a release containing a hazardous substance in an amount equal to or in excess of a reporting quantity established under either 40 CFR 117 or 40 CFR 302 occurs during a 24-hour period, the contractor will immediately notify the permittee who shall then do the following: notify the National Response Center (NRC) (800-424-8802) and Tennessee Emergency Management Agency (TEMA) (emergencies: 800-262-3300; non-emergencies: 800-262-3400); as well as the local Environmental Field Office. Also, a revision of this document will be prepared to identify measures to prevent the reoccurrence of such releases.

Concrete trucks will wash out at the designated area near the construction entrance. Each contractor is responsible to provide litter control for trash generated by his crew and must have a regularly scheduled cleanup time to prevent pollution. A dumpster for garbage will be located near the construction trailer and is limited to garbage and paper trash only. Paint cans, oil cans, used oil, and filters will be contained and disposed of by the contractor by taking them to the Rutherford County Hazardous Waste Disposal Center. Sanitary waste will be handled via portable toilets which will be kept on-site and regular maintenance performed.

The following discharges are prohibited and must be planned for accordingly:

1.) Wastewater from concrete washout, unless managed by an appropriate control,
2.) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials,
3.) Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and
4.) Soaps or solvents used in vehicle and equipment washing.

Storm Water Runoff Controls

This site has a total disturbed area greater than 5 acres; therefore, 3 separate EPSC phases have been developed. These sheets are shown in the civil plan set as Initial EPSC, Intermediate EPSC, and Final EPSC Plan. Supporting details are included in the rest of the civil plan set. Vegetative methods will be will range from sod, to plantings, to mulch. A copy of these civil plan sets has been included with this SWPPP. The measures shown on the Initial EPSC measures plan are to remain in place throughout the life of the project until the final stabilization measures and permanent site features are to be enacted. The Final EPSC measures plan is to be enacted as the grading activities provide for the ability to stabilize areas.

The ultimate goal of the storm water pollution prevention plan is to limit the release of sediment from the construction site. This information is provided as a guide for the developer and contractors, for installation, inspection, follow-up, and periodic maintenance of the items used to prevent and control erosion on this project. The design shown on the construction plans includes multiple measures taken from TDEC's Erosion and Sediment Control Handbook. The details for construction of these items are shown on the Detail Sheets of the construction plans.

Listed below are several general rules of thumb for grading work, along with stormwater rules from the Construction General Permit. These are in addition to the physical controls shown on the plans.

- Minimize clearing to reduce area of exposed soil. This can also be accomplished during construction by phasing work to minimize the exposed soil areas.
- The Contractor shall keep records of activities on-site including dates of installation, grading work, maintenance, and completion.

- Any off-site storage areas are also considered part of the project and must be protected from erosion.
- Seeding should be done as soon as work in an area is complete to minimize the area of exposed soil.
- A Notice of Termination (NOT) shall be completed when work on the project is complete. This will inform TDEC that the developer, contractor, and sub-contractors are no longer responsible for erosion control on the site.

The owner/developer should appoint responsible personnel to cover all aspects of the site operation. It is ideal that there be a pollution prevention team to accomplish the goals of the Storm Water Pollution Prevention Plan (SWPPP). The team members should perform routine inspections and inform the team coordinator of any changes in operations that may affect the SWPPP. More specific inspection recommendations are listed with each item below.

For a construction site, the pollution prevention team should include the site foreman, vehicle maintenance and fueling personnel, heavy equipment operators (grading and buffer issues), etc. SWPPP review and discussion should be a part of new employee training/certification programs.

Maintenance issues identified by inspections should be resolved as soon as possible, but definitely within 7 days or less. Best Management Practices (BMPs) that are found to be insufficient should be augmented or replaced with other BMPs that can more effectively manage the pollutant concern. Onsite personnel should contact the design engineer at 615-890-7901 if they observe that the current erosion control plan is not adequate to control sediment transport. This of course does not include regular maintenance of the controls after rain events.

This plan uses both Temporary Construction Site Management Practices (TCPs) and Permanent Erosion Prevention and Sediment Control (PESC) measures. TDEC's BMPs to be used are included below. An additional reference for erosion control is the Nashville Stormwater Management Manual (SWMM) Volume 4, "Best Management Practices.

TENNESSEE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

EROSION PREVENTION AND SEDIMENT CONTROL

BEST MANAGEMENT PRACTICES

- Identifying Sensitive Areas
- Construction Sequencing
- Topsoiling
- Surface Roughening
- Disturbed Area Stabilization (with Mulch)
- Disturbed Area Stabilization (with Temporary Vegetation)
- Disturbed Area Stabilization (with Permanent Vegetation)
- Erosion Control Blanket/Matting
- Concrete Washout
- Check Dam
- Construction Exit
- Silt Fence
- Inlet Protection

7.1 IDENTIFYING SENSITIVE AREAS OR CRITICAL AREAS

Definition

Marking, flagging, or fencing areas in the field that should be protected from construction activities such as clearing, grading, mowing, staging activities, materials storage, and/or other related activities.

Purpose

To protect sensitive areas from being disturbed or encroached upon by construction or construction-related activities.

Conditions Where Practice Applies

Any site containing features considered to be sensitive to the impacts from construction, regardless of the project size. Areas that should be protected include tree preservation areas, Aquatic Resources Alteration Permit (ARAP) boundaries, streams, wetlands, endangered or protected species habitat, water quality buffers, mitigation or stream relocation boundaries, sinkholes, stormwater treatment areas, caves, and historic preservation areas. There may also be special cases in which the land owner or design professionals deem an area critical for preservation that should be clearly marked to prevent disturbance.

Planning Considerations

Any sensitive or critical areas within the project boundaries should be identified in the SWPPP and on the EPSC plans. The design professional should clearly label all areas on construction plans and specify the type of marking materials to be used.

Design Criteria

When a construction project contains wetlands or streams, additional permits are typically required (see Section 2 for more information on other permits that may be needed). Before any construction activity begins on a project in the vicinity of streams and wetlands, all permit boundaries should be identified on the project and marked in the field.

Temporary and permanent water quality buffers should also be identified. Maintenance and disturbance restrictions can vary, depending on the regulatory

agency's requirements. For example, some portions of buffers can be disturbed and revegetated, while other buffers must remain completely undisturbed. Before staking the outer limits of the buffer, understand the local and state requirements relative to temporary and permanent water quality buffer zone disturbance and long term vegetation management. The SWPPP must clearly document these for the site.

In addition to streams and wetlands, other sensitive areas should be protected during construction. Any portions of the development that are designed as undisturbed natural areas should be clearly marked in the field to prevent disturbance. If these areas are disturbed, additional site design components may be needed to meet local or state requirements.

Areas that should be identified and clearly marked as sensitive areas in the field include the following:

- **Streams and wetland buffers**. Note that the buffer requirements in the Construction General Permit (See Appendix A) may not be the same as the locally required stream and wetland buffers. The more restrictive of the two must be followed.
- **ARAP boundaries**. If the ARAP allows a specific footage or acreage of stream or wetland encroachment, going beyond these boundaries can result in a violation. Clearly marking these boundaries in the field aids in maintaining compliance with the ARAP conditions.
- **Stream mitigation or relocation boundaries**. It is likely that a two step field marking process is necessary for stream relocations and/or mitigation. The first boundaries should identify the permitted impacts to the natural resource and should occur prior to work in the area. Once the relocation or mitigation has been installed and stabilized, these areas should be marked to show the outer limits and prevent disturbance or damage to plants.
- **Sinkholes**. Depending on the drainage patterns of the site, the only discharge point from a site may be a sinkhole. Sinkholes are a vital component of the drainage network and are subject to clogging by sediment and debris. Sinkhole basins should be protected from sediment from construction sites by using appropriate erosion prevention and sediment controls upgradient from the basin. Leaving sinkhole basins undisturbed provides an additional measure of protection. It should be noted that discharges to sinkholes may require a underground injection well permit from the TDEC Division of Water Supply.
- **Undisturbed areas**. Often, undisturbed open space requirements are established and enforced by the local jurisdiction. The amount of undisturbed open space per development is typically a percentage of the development. Disturbing these areas can lead to additional development restrictions or mitigation requirements. In addition, undisturbed areas of a site affect sediment control design. The less disturbed area on a site, the smaller the sediment storage required. If an area is shown on the SWPPP as undisturbed and is disturbed during construction, the sediment control measures can easily be overwhelmed, causing a failure and potential violation.
- **Threatened and/or Endangered species habitat**. Critical habitat for threatened or endangered species should be protected from land disturbing activities and

to avoid a potential "taking." These areas should be clearly identified on the plans and in the field to prevent inadvertent disturbance or encroachment.

- **Stormwater management areas**. Land disturbing activities destroy the infiltration capacity of soils by changing the soil structure, compacting the soils, and subjecting soil organic matter to a more rapid decay process. Many stormwater management practices, such as biorentention areas and water quality swales rely on the soil infiltration capacity. When the infiltration capacity of the in situ soils is substantially altered, the area may no longer be suitable for permanent stormwater management controls.

Construction Specifications

Many types of boundary markers are available. Flags, stakes, posts or fencing can be used as field boundary markers. Whatever type is used, it should be highly visible and installed along the outer perimeter of the feature's boundaries. Bright colors and highly distinguishable marking materials should be specified, such as orange fencing, neon or brightly colored flags, or highly visible signage. Some markers will be temporary (such as ARAP permit boundaries) while others may be more permanent (such as permanent water quality buffer boundaries). The decision about the type of marker to be used at the site may in part be dictated by the lifespan of the feature being marked.

Maintenance and Inspection Points

- Boundary markers should be maintained throughout the lifespan for the feature.
- Boundary markers should be inspected during each inspection, with inspections being performed as required by the CGP.
- Any markers that have been damaged, removed or degraded to the point that they are no longer visible should be replaced.
- Boundary markers should be removed at the end of construction, unless required by an agency or local government to be left in place.

References

TDOT Manual for Management of Stormwater Discharges Associated with Construction Activities

North Carolina Erosion and Sediment Control Planning and Design Manual

7.2 CONSTRUCTION SEQUENCING

Definition A work schedule specific to each project that coordinates the timing of land disturbing activities, installation of erosion prevention and sediment control measures, permanent stormwater management controls and stabilization.

Purpose To minimize the erosion and sedimentation by performing land disturbing activities, installing EPSC measures, installing permanent stormwater controls and stabilization in accordance with a planned schedule. Note that phasing is a site management technique within an overall construction schedule, but should not be mistaken for the construction schedule itself.

Conditions Where Practice Applies All construction sites disturbing one or more acres are required to have a construction schedule in their SWPPP. However, sites that affect less than one acre can benefit from a planned construction schedule as well.

Design Criteria The construction sequence should be designed and written so that it is easily understood and followed by contractors and subcontractors. The sequence should clearly state the order in which erosion prevention and sediment control devices are to be installed, including stating what measures should be in place before other activities are begun. See Table 5.2-1 in Chapter 5 for an example construction sequence.

An example of construction sequencing could be as follows:

- Install Construction entrance, mark sensitive areas, and designate equipment and chemical storage areas.
- Install sediment basins and traps, silt fencing, and other sediment barriers for Phase 1.
- Install runoff controls such as diversion structures, silt fence, wattles, and outlet protection for Phase 1.
- Perform land clearing and grading, installing EPSC components at the earliest possible time during grading activities for Phase 1. Maintain EPSC measures throughout the grading process.
- Stabilize surfaces immediately in areas where work is delayed or completed.
- Mark sensitive areas and install perimeter measures for Phase 2.
- Clear and grub Phase 2.
- Install sediment traps and other internal controls. Maintain controls.
- Install permanent stabilization measures in Phases 1 and 2, such as seeding and mulching, sodding, and riprap at earliest possible time following completion of grading and construction activities.
- Remove temporary controls and stabilize all disturbed areas.

As in the CGP, project sites exceeding 50 acres of disturbance require phasing. In some cases individual construction sequences may be provided for each individual planned phase, while in other cases the designer may find it necessary to provide an overall construction sequence which interconnects the phases and encompasses the project as a whole.

Construction Specifications

The construction sequence is a part of the SWPPP and therefore shall be maintained onsite and be available to all contractors and subcontactors at all times. Efforts to adhere to construction sequence should be a coordinated effort between all parties onsite.

Maintenance and Inspection Points

Follow the construction sequence throughout the entire project development. When changes in construction activities are needed, amend the sequence schedule in advance to maintain management control.

References

North Carolina Erosion and Sediment Control Planning and Design Manual

TDOT Design Division Drainage Manual

7.3 TOPSOILING

Definition

The act of scraping topsoil from a construction site and reserving it for use to aid final stabilization.

Purpose

To provide a suitable soil medium to support vegetation growth.

Conditions Where Practice Applies

Topsoiling should be utilized on all construction sites where topsoil is available at the surface of the soil. Preserving topsoil for use at final stabilization ensures a healthy stand of vegetation. Topsoil storage areas should have EPSC measures applied, such as stockpile perimeter controls and temporary cover. Topsoil should only be placed on slopes less than 2:1 unless additional engineered slope stabilization is applied to prevent slippage.

Planning Considerations

Topsoil is the major zone of root development and biological activity. It is generally darker than the subsoils due to enrichment with organic matter, but not all darker soils are topsoils. Questionable soils available for topsoiling should be analyzed by a soils specialist or soil scientist to insure that the soils can in fact support vegetation growth.

Although topsoil may improve growth capabilities for vegetation, there are some disadvantages to topsoiling. Stripping, stockpiling, hauling, and spreading topsoil, or importing topsoil, may not be cost-effective for some projects. In addition, some topsoil contains weed seeds which compete with desirable vegetation species.

In planning for the final grading and vegetation of a site, the designer should compare the options of topsoiling with preparing a seedbed in the available subsoils.

Subgrade elevations and finished grade elevations should be considered when planning for topsoil thickness.

Topsoil stockpiling should be conducted early in the project as large disturbed areas are scheduled. Placement of topsoil should be completed at the end of construction just before permanent vegetation is to be installed.

Design Criteria

Topsoil should be stripped and stockpiled onsite before grading activities are commenced in any new area of the site. Stockpiled topsoil should be stabilized utilizing temporary vegetation practices *(refer to Sections 7.8 and 7.10 for more information).* Include a topsoil stockpile area on the EPSC Plan and in the construction sequence. Stockpile areas should be located where topsoil is less likely to discharge into streams and other sensitive areas if measures failed; where it does not block natural or artificial drainage ways; and where it does not interfere with work on the site.

Construction Specifications

The topsoil stockpile must be protected against erosion. Stabilize the stockpile with a temporary or permanent groundcover. In addition, perimeter measures should be provided around the stockpile area to prevent sediment migration.

Once grading on any portion of the site has reached final grade, topsoil should be spread prior to final stabilization. Topsoil placement should not be specified in areas where slopes are steeper than 2:1.

Good quality topsoil has the following characteristics:

General Characteristics – Topsoil should be friable and loamy, free of debris, objectionable weeds and stones, and contain no toxic substances that may be harmful to plant growth. Topsoil should be handled only when it is dry enough to work without damaging the soil structure.

Texture – Loam, sandy loam, and silt loam are best; sandy clay loam, silty clay loam, clay loam, and loamy sand are fair. Heavy clay and organics such as peat or muck should not be used as topsoil.

Organic Matter Content – Organic materials should be greater than 2% by weight.

Fertility and nutrients – pH range should be 5.5 to 7.0; liming may be specified if pH is less than 5.5. Soil test for nutrients as well, based upon the type of vegetation to be established.

Organic and inorganic soil amendments (see Chapter 7) may be applied to topsoil to achieve the desired characteristics.

The depth of topsoil to be applied should be 5 inches (unsettled).

STRIPPING

Strip topsoil only from areas that will be disturbed by excavation, filling, paving, or compaction by equipment. Stripping depth various and should be site-specific.

STOCKPILING

Topsoil stockpiles should be located to avoid slopes, natural and artificial drainage ways, and construction traffic. Multiple stockpiles near areas to be stripped may be specified on large sites so that re-spreading topsoil is more efficient and economical.

Sediment controls should be specified where necessary around stockpiles to prevent eroded topsoils from leaving the stockpile area. Temporary seeding practices should be performed no more than 15 days after the formation of the stockpile. Permanent groundcovers should be considered where topsoil stockpiles are to be inactive for longer periods of time.

TOPSOIL SPREADING

Topsoil should be spread only when grading activities have been completed and permanent vegetation is to be applied. Grades should be maintained according to the approved plan, and final grades should not be altered by adding topsoil. The subgrade surface should be roughened by disking or scarifying to a minimum depth of 4 inches prior to spreading topsoil to ensure bonding of the topsoil and subsoils. Apply lime or fertilizer to subgrade before roughening.

Topsoil should be uniformly distributed to a minimum depth of 5 inches and compacted. Do not spread topsoil while it is excessively wet or frozen. Uniformly moisten excessively dry soil that is not workable or too dusty. Correct any irregularities in the surface to prevent the formation of depressions or water pockets. After topsoil application, follow procedures for permanent vegetation.

Maintenance and Inspection Points

Topsoiled areas should be inspected for erosion, depressions or ridges, rocks, and other foreign materials prior to beginning permanent vegetation applications. These areas are subject to ongoing inspections and maintenance until final permanent stabilization has been achieved and a Notice of Termination has been submitted.

References

TDOT Design Division Drainage Manual

North Carolina Erosion and Sediment Control Planning and Design Manual

AIA Masterspec 95 Format, section 02920

STABILIZATION PRACTICES

7.6 STABILIZATION WITH STRAW MULCH

MU STABILIZATION WITH STRAW MULCH

Definition Application of a temporary protective blanket of straw to the soil surface.

Purpose To protect the soil surface from the forces of raindrop impact and overland flow. Mulch reduces runoff and erosion, conserves soil moisture, promotes seed germination, insulates soil, suppresses weed growth, and prevents surface crusting.

Conditions Where Practice Applies Mulch seeded areas immediately. Areas that cannot be seeded because of the season should be mulched to provide temporary protection of the soil surface.

Planning Considerations A surface mulch is considered the most effective, practical means of controlling runoff and erosion on disturbed land prior to vegetative establishment. Mulch reduces soil moisture loss by evaporation, prevents crusting and sealing of the soil surface, moderates soil temperatures, provides a suitable microclimate for seed germination, and may increase the infiltration rate of soil.

Straw mulch is the most common type of mulch used in conjunction with seeding or providing a temporary groundcover. The straw should come from wheat or oats ("small grains"), and may be spread by hand or with a mulch blower. Note that straw may be lost to wind and must be tacked down. The recommended application rate for straw mulch is 2 tons per acre, dry unchopped, unweathered.

Note that the goal is 70% uniform coverage over 100% of the site. Straw mulch is often used in conjunction with some channel liners.

Design Criteria No formal design is required.

Construction Specifications

Before applying mulch, complete the required grading, install sediment control practices, and, if applying seed, prepare the seed bed. When applying seed in combination with mulch, apply the seed before mulch except in the following cases:

- Seed is applied as a part of a hydroseeder slurry containing mulch.
- A hydroseeder slurry is applied over straw.

Application:

Spread mulch uniformly by hand or with a mulch blower. When spreading mulch by hand, divide the area to be mulched into sections of approximately 1000 ft^2 and place 70-90 lbs of straw (1.5 to 2 bales) in each section to facilitate uniform distribution. After spreading mulch, no more than 25% of the soil surface should be visible. In hydroseeding applications a green dye added to the slurry assures a uniform application.

Anchoring:

Straw mulch must be anchored immediately after spreading. The following methods may be used.

Mulch Anchoring Tool: Straw mulch may be pressed into the soil immediately after the mulch is spread. A special crimper or disk harrow with the discs set straight may be used. Serrated discs are preferred and should be 20 inches or more in diameter and 8 to 12 inches apart. The edges of the discs shall be dull enough to press the mulch into the ground without cutting it. Mulch should not be plowed into the soil. This method is limited on slopes no steeper than 3:1, where equipment can operate safely. Operate machinery on the contour.

Liquid Mulch Binders: Application of liquid mulch binders and tackifiers should be heaviest at the edges, crests of ridges, and banks to resist wind. Binders should be applied uniformly to the remaining area. Binders must be applied after the mulch is spread, or may be sprayed into the mulch as it is being applied. Applying the straw and binder together is the most effective method. Liquid binders include emulsified asphalt and an array of commercially available synthetic binders.

Emulsified asphalt is the most commonly used mulch binder. Any type thin enough to be blown from spray equipment is satisfactory. Asphalt is classified according to the time it takes to cure. Rapid setting (RS or CRS designation) is formulated for curing in less than 24 hours, even during periods of high humidity. It is best used in fall and spring. Medium setting (MS or CMS) is formulated for curing in 24 to 48 hours, and slow setting (SS or CSS) is formulated for use during hot, dry weather, requiring 48 hours or more curing time.

Apply asphalt at 0.10 gallons per square yard (10 gal/1000 ft^2). Heavier applications cause straw to "perch" over rills.

In traffic areas, uncured asphalt can be picked up on shoes and cause damage to rugs, clothing, etc. Use types RS or CRS to minimize such problems. Synthetic binders may be used to anchor mulch. Follow the manufacturer's recommended application method and rate. Most synthetic binders are expensive and are therefore used mostly in small areas or in residential areas where asphalt may be a problem.

Mulch Nettings: Lightweight plastic, cotton, jute, wire, or paper nets may be stapled over the mulch according to manufacturer's recommendations. Note that single net RECPs with integrated mulch may be used instead of separate mulch with netting.

Maintenance and Inspection Points

Inspect all mulches periodically, and after rainstorms to check for rill erosion, dislocation or failure. Where erosion is observed, apply additional mulch. If washout occurs, repair the slope grade, reseed and reinstall mulch. Continue inspecting mulched areas until vegetation has firmly established or until construction activities resume in the area.

References

North Carolina Erosion and Sediment Control Planning and Design Manual

STABILIZATION PRACTICES

7.7 STABILIZATION WITH OTHER MULCH MATERIALS

MO STABILIZATION WITH OTHER MULCHES

Ground trees were used to stabilize the flat portion of the site above.

Definition

Application of a protective blanket of plant residues, wood chips, or other organic material, produced on the site if possible, to the soil surface.

Purpose

To protect the soil surface from the forces of raindrop impact and overland flow. Mulch reduces runoff and erosion, conserves soil moisture, promotes seed germination, insulates soil, suppresses weed growth, and prevents surface crusting.

Conditions Where Practice Applies

This practice is applicable for areas that require temporary stabilization until permanent vegetation can establish. These mulches should be applied on areas that are not to be mowed. In addition, do not use in drainages or areas of concentrated flow. Specific applications include:

- Exposed areas that cannot be seeded due to seasonal conditions.
- On areas that are not to be mowed, such as trees, shrubs, or ground covers to stabilize the soil between plants.

Planning Considerations

Woody plant residue, wood chips and mulches that cannot be anchored down are susceptible to floating and movement by water. These materials should not be used in areas of concentrated flow or high sheet flow.

Design Criteria

The choice of materials for mulching should be based on soil conditions, season, type of vegetation, and size of the area.

Wood Chips:
Wood chips are suitable for areas that will not be closely mowed, and around ornamental plantings. Chips do not require tacking. Because they decompose slowly they must be treated with 12 lbs of nitrogen per ton to prevent nutrient deficiency in plants. This can be an inexpensive mulch if chips are obtained from trees cleared on the site.

Bark Chips and Shredded Bark:
Bark chips and shredded bark are byproducts of timber processing that are often used in landscape plantings. Bark is also suitable mulch for areas planted to grasses and not closely mowed. It may be applied by hand or with a mulch blower; do not use a tackifier. Unlike the use of wood chips, bark does not require additional nitrogen fertilizer.

Wood Fiber:
Wood fiber refers to short cellulose fibers applied as a slurry in hydroseeding operations. Wood fiber does not require tacking, although tacking agents or soil binders could be easily added to the slurry. Wood fiber hydroseeder slurries may be used to tack straw mulch on steep slopes, critical areas, and where harsh climatic conditions exist. Wood fiber does not provide sufficient erosion protection to be used alone.

Construction Specifications

Before applying mulch, complete the required grading and install sediment control practices. Woody plant residue mulch should not be used where seed is being or has been applied.

Materials: Organic mulch such as wood chips or bark shall be applied at a rate that provides 70% or greater soil coverage. Organic material from the clearing stage of development should remain on site, be chipped, and applied as mulch. This method of mulching greatly reduces erosion control costs. This method however, should not be used in conjunction with seeding due to soil acidification and nitrogen reduction problems that the decomposition of the "green" material will produce.

Maintenance and Inspection Points

Inspect all mulches periodically, and after rainstorms to check for rill erosion, dislocation or failure. Where erosion is observed, apply additional mulch. If washout occurs, repair the slope grade, reseed and reinstall mulch. Continue inspections until vegetation has firmly established.

References

North Carolina Erosion and Sediment Control Planning and Design Manual

CALTRANS Roadside Management Toolbox

STABILIZATION PRACTICES

7.8 TEMPORARY VEGETATION

TS STABILIZATION WITH TEMPORARY VEGETATION

Definition

The establishment of temporary vegetative cover with fast growing species for seasonal protection on disturbed or denuded areas.

Purpose

To temporarily stabilize denuded areas that will not be brought to final grade for a period of more than 14 days.

Temporary seeding controls runoff and erosion until permanent vegetation or other erosion control measures can be established. Seeding with a temporary groundcover provides temporary stabilization until permanent stabilization can be achieved. In addition, it provides residue for soil protection and seedbed preparation, and reduces problems of mud and dust production from bare soil surfaces during construction.

Conditions Where Practice Applies

On any cleared, unvegetated, or sparsely vegetated soil surface where vegetative cover is needed for less than 1 year.

For permanent seeding specifications, see Section 7.9.

Planning Considerations

Annual plants that sprout and grow rapidly and survive for only one season are suitable for establishing initial or temporary vegetative cover. Temporary seeding preserves the integrity of earthen sediment control structures such as dikes, diversions, and the banks of dams and sediment basins. It can also reduce the amount of maintenance associated with these devices. For example, the frequency of sediment basin cleanouts will be reduced if the watershed areas outside the active construction zone are stabilized.

Proper seedbed preparation, selection of appropriate species, and the use of quality seed are important. Failure to follow established guidelines and recommendations carefully may result in an inadequate or short-lived stand of vegetation that will not control erosion. Temporary seeding provides protection for no more than 1 year, during which time permanent stabilization should be initiated.

Design Criteria

Complete grading before preparing seedbeds, and install all necessary erosion control practices such as dikes, waterways, and basins. Minimize steep slopes because they make seedbed preparation difficult and increase the erosion hazard. If soils become compacted during grading, loosen them to a depth of 6-8 inches using a ripper, harrow, or chisel plow.

Construction Specifications

Grading and Shaping: Excessive water runoff shall be reduced by properly designed and installed erosion control practices such as ditches, dikes, diversions, and sediment basins. No shaping or grading is required if slopes can be stabilized by hand-seeded vegetation or if hydraulic seeding equipment is to be used.

Seedbed Preparation: Good seedbed preparation is essential to successful plant establishment. A good seedbed is well pulverized, loose and uniform. Where hydroseeding methods are used, the surface may be left with a more irregular surface of large clods and stones.

Liming: Apply lime according to soil test recommendations. If the pH (acidity) of the soil is not known, an application of ground agricultural limestone at the rate to 1 to 1½ tons/acre on coarse textured soils and 2-3 tons/acre on fine textured soils is usually sufficient. Apply limestone uniformly and incorporate into the top 4-6 inches of soil. Soils with a pH of 6 or higher do not need to be limed.

Fertilizer: Base application rates on soil tests. When soil tests are not possible, apply a 10-10-10 grade fertilizer at 700-1000lb/acre. Both fertilizer and lime should be incorporated into the top 4-6 inches of soil. If a hydraulic seeder is used, do not mix seed and fertilizer more than 30 minutes before the application.

Surface Roughening: If recent tillage operations have resulted in a loose surface, additional roughening may not be necessary, except to break up large clods. If rainfall caused the surface to become sealed or crusted, loosen it just prior to seeding by disking, raking, harrowing, or other suitable methods. Groove or furrow slopes steeper than 3:1 on the contour before seeding.

Seeding: Select a non-invasive grass or grass-legume mixture suitable to the area and season of the year. See Figures 7.8-1 to 7.8-3 for suggestions of temporary seeding species. Although native plants are preferred, there are currently no available native species that are not cost prohibitive. Non-invasive annual plants are preferred. Seed shall be applied uniformly by hand, cyclone seeder, drill, cultipacker seeder, or hydraulic seeder. Drill or cultipacker seeders should normally place seed ¼ to ½ inches deep. Appropriate depth of planting is 10 times the seed diameter. Soil should be raked lightly to cover seed with soil if seeded by hand.

Mulching: The use of mulch will help ensure establishment under normal conditions, and is essential to seeding success under harsh site conditions. Harsh site conditions include:

- Seeding in fall for winter cover
- Slopes steeper than 3:1
- Excessively hot or dry weather
- Adverse soils (shallow, rocky, or high in clay or sand), and
- Areas receiving concentrated flow.

Irrigation: During times of drought, water shall be applied at a rate not causing runoff and erosion. The soil shall be thoroughly wetted to a depth that will ensure germination of the seed. Subsequent applications should be made as needed. Newly seeded areas require more water than more mature plants.

Species	**Rate (lb/acre)**
Rye	120

Seeding dates

East .....Above 2500 feet: Feb. 15 - May 15
Below 2500 feet: Feb. 1- May 1
Middle ..... Jan. 1 - May 1
West ..... Dec. 1 - Apr. 15

Soil amendments

Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 750 lb/acre 10-10-10 fertilizer.

Mulch

Apply 4,000 lb/acre straw. Anchor straw by tacking with asphalt, netting, or a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring tool.

Maintenance

Refertilize if growth is not fully adequate. Reseed, refertilize and mulch immediately following erosion or other damage.

Figure 7.8-1 Temporary Seeding Recommendation for Late Winter and Early Spring

Species	**Rate (lb/acre)**
Oats	60
Brown top millet	30

Seeding dates

East ..... May 15 - Aug. 15
Middle ..... May 1 - Aug. 15
West ..... Apr. 15 - Aug. 15

Soil amendments

Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 750 lb/acre 10-10-10 fertilizer.

Mulch

Apply 4,000 lb/acre straw. Anchor straw by tacking with asphalt, netting, or a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring tool.

Maintenance

Refertilize if growth is not fully adequate. Reseed, refertilize and mulch immediately following erosion or other damage.

Figure 7.8-2 Temporary Seeding Recommendation for Summer

Species	**Rate (lb/acre)**
Oats	30
Winter wheat	30

Seeding dates

East ..... Aug 15 – Dec 15
Middle ..... Aug. 15 – Dec 30
West ..... Aug. 15 – Dec 30

Soil amendments

Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 750 lb/acre 10-10-10 fertilizer.

Mulch

Apply 4,000 lb/acre straw. Anchor straw by tacking with asphalt, netting, or a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring tool.

Maintenance

Refertilize if growth is not fully adequate. Reseed, refertilize and mulch immediately following erosion or other damage. If necessary to extend temporary cover beyond June 15, overseed with 50 lb/ac crimson clover in late February or early March.

Figure 7.8-3 Temporary Seeding Recommendations for Fall

Maintenance and Inspection Points

Reseed and mulch areas where seedling emergence is poor or where erosion occurs, as soon as possible. Do not mow.

References

North Carolina Erosion and Sediment Control Planning and Design Manual

STABILIZATION PRACTICES

7.9 PERMANENT VEGETATION

PS STABILIZATION WITH PERMANENT VEGETATION

Definition The planting of native perennial vegetation such as ground covers, shrubs, vines, trees, and/or flowering plants (forbs) on exposed areas for erosion control and final stabilization. Permanent perennial vegetation is required to achieve final stabilization. Native perennial plants are preferred for erosion control because of the following reasons:

- In appropriate habitats, native plants are better adapted to environmental and site conditions, resulting in lower maintenance costs
- Natives are not typically aggressive and do not allow the site to become a source of exotic invasive plants that can spread to other locations and become costly to remove
- Unlike most non-natives, native plants support native insect, bird, and other wildlife for pollinations, food sources, and nesting
- Using native plants provides opportunities to educate and demonstrate various sustainable approaches for the public
- The Tennessee Exotic Pest Plant (TNEPPC) council has ranked non-native plants in Tennessee based on their invasiveness and threats to the natural environment. The following plants that have been used for erosion control ty TDEC and TDOT are listed in TNEPPC's publication **"Invasive Exotic Pest Plants in Tennessee – 2009"**:
  - Korean (and Kobe) lespedeza – "Severe Threat" Category (Kobe is not ranked but has same invasive characteristics as Korean)
  - Tall fescue – "Significant Threat" Category

- Foxtail millet – "Significant Threat" Category
- Crown vetch – "Alert" Category

We are providing native and non-invasive alternative species as the preferred choice for erosion control and soil stabilization for TDEC projects. (Table 7.9-1)

Purpose

To reduce stormwater runoff velocity, maintain sheet flow, protect the soil surface from erosion, promote infiltration of runoff into the soil, and improve aesthetics and provide diversity. Many native grasses have very deep and fibrous roots, a minimum of one foot and up to fifteen feet, and provide long-term erosion control.

Conditions Where Practice Applies

Apply to fine-graded areas on which permanent, long-lived vegetative cover is the most practical or most effective method of stabilizing the soil. Permanent seeding may also be used on rough-graded areas that will not be brought to final grade for a year or more. Areas to be seeded with permanent vegetation must be seeded or planted within 14 days after the construction activity in that portion of the site has permanently ceased.

Planning Considerations

The most common and economical means of stabilizing disturbed soils is by seeding a mixture of grasses and forbs. The advantages of seeding over other means of establishing plants include the smaller initial cost, lower labor input, and greater flexibility of method. The disadvantages of seeding include the potential for erosion during the establishment stage, the need to reseed areas that fail to establish, seasonal limitations on suitable seeding dates, and a need for water and appropriate temperatures during germination and early growth. The probability of successful plant establishment can be maximized through good planning, knowledge of the soil characteristics, selection of suitable plant materials for the site, good seedbed preparation, adequate liming and fertilization, and timely planting and maintenance.

Native grasses can be planted by drilling or seeding. The ground should be prepared by discing or rotovating prior to seeding in the spring or summer. Annual grains such as rye or oats can be planted prior to sowing the grass seed for erosion control. Grass seed can be planted in the dormant season as well.

Permanent perennial vegetation is used to provide a protective cover for exposed areas including cuts, fill, and other denuded areas that will not be regraded. Permanent stabilization should be applied where topsoil was never stripped, or has been returned and incorporated into the soil surface.

- When stripping a site, topsoil should be stockpiled for later use.
- Stockpiled topsoil should be stabilized using temporary vegetation.
- Where a suitable planting medium is not present, topsoil shall be imported and incorporated into the site.
- Block sod provides immediate cover; it is especially effective in controlling erosion adjacent to concrete flumes and other structures. .
- When mixed plantings are done during marginal planting periods, companion crops shall be used.
- No-till planting can be effective when planting is done following a summer or winter annual cover crop.
- Irrigation should be used when the soil is dry or when summer plantings are done.

- Native species are low maintenance plants and are preferred to ensure long-lasting erosion control.
- Wildlife plantings of native species should be included when applicable.

Wildlife Plantings: Commercially available plants beneficial to wildlife species include the following:

- Mast Bearing Trees: Beech, Black Cherry, Blackgum, Chestnut, Oak, Hackberry, Hickory, Honey Locust, Black Locust, and Persimmon.
- Shrubs and Small Trees: Serviceberry, Crabapple, Pawpaw, Spicebush, Hazelnut, Dogwood, Highbush and Lowbush Blueberries, native Holly, Red Cedar, Red Mulberry, Sumac, Wild Plum, Blackhaw and Blackberry. Plant shrubs in patches without tall trees to develop stable shrub communities. All produce fruit used by many kinds of wildlife.

Design Criteria

The state is divided into three planting regions designated I, II and III as shown in the figure below. Native seed mixes are preferred and the recommendations are shown in Table 7-9.1. Note that the rates are based upon Pure Live Seed (PLS).

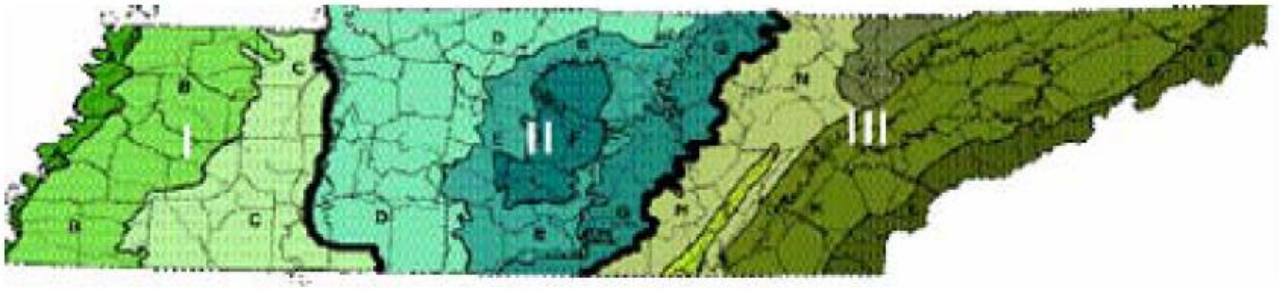


Figure 7.9-1: TN Planting Regions

Table 7.9-1 Preferred seed mixes using natives or naturalized plants and planting dates.
**non-native but do not spread.*

Zone		Best	Marginal	Preferred Rate/Mix (lb/ac PLS)
Region I	Poorly drained soils	Feb 1 – Mar 20 Sept 1 – Sept 30	Mar 20 – Apr 30 Sept 30 – Oct 31	15 Browntop millet* (nurse crop) 2 switch grass 4 little bluestem 4 Virginia wild rye 4 purpletop 2 partridge pea 2 black-eyed susan
	Well drained soils	Apr 1 – July 15		15 Browntop millet* (nurse crop) 4 little blue stem 4 purpletop 2 sideoats gramma 2 partridge pea 2 black-eyed susan
	High maintenance	Apr 1 – July 15		15 Browntop millet* (nurse crop) 2 partridge pea 45 Red fescue* 45 hard fescue* 25 chewing fescue*
Region II	Low maintenance; Slopes and Poor, shallow soils	Aug 25 – Sept 15 **Feb 15 – May 30**	Sept 15 – Oct 25 Mar 21 – May 30	15 Browntop millet* (nurse crop) 5 little bluestem 2 switch grass 2 tall dropseed 5 sideoats gramma 2 black-eyed susan 2 partridge pea 1 greyheaded coneflower
	Low maintenance; Moderate slopes; soils >6 in. depth	Aug 25 – Sept 15 **Feb 15 – May 30**	Sept 15 – Oct 25 Mar 21 – Apr 15	15 Browntop millet* (nurse crop) 5 purpletop 5 little bluestem 5 Virginia wild rye 2 black-eyed susan 2 partridge pea 1 greyheaded coneflower
	High maintenance	Aug 30 – Oct 15	Feb 15 – Apr 15	15 Browntop millet* (nurse crop) 2 partridge pea 45 Red fescue* 45 hard fescue* 25 chewing fescue*
Region III	>2500 ft elevation; steep slopes	Mar 20 – Apr 30	Aug 15 – Aug 30 Mar 1 – Mar 20 Apr 20 – June 15	15 Browntop millet* (nurse crop) 5 purpletop 10 little bluestem 10 Indian grass 2 black-eyed susan 0.5 monarda (bergamot) 4 Maryland senna
	<2500 ft elevation; steep slopes	Aug 15 – Sept 1 **Mar 1 – Apr 1**	Sept 1 – Sept 15 Apr 1 – June 10	

Region III *cont'd*	>2500 ft elev.; Shallow soils	Mar 20 – Apr 20	Aug 15 – Aug 30 Mar 5 – Mar 20 April 20 – June 15	15 Browntop millet* (nurse crop) 4 purpletop 10 little bluestem 10 broomsedge 2 partridge pea 2 black-eyed susan 0.5 monarda (bergamot)
	<2500 ft elev.; Shallow soils	Aug 15 – Sept 1 **Mar 1 – Apr 1**	Sept 1 – Sept 15 Apr 1 – June 10	
	>2500 ft. elev.; Moderate slopes	Mar 20 – Apr 20	Aug 15 – Aug 30 Mar 5 – Mar 20 Apr 20 – June 15	15 Browntop millet* (nurse crop) 4 purpletop 10 little bluestem 10 Indian grass 2 black-eyed susan 0.5 monarda (bergamot) 4 Maryland senna
	<2500 ft. elev.; Moderate slopes	Aug 15 – Sept 1 **Mar 1 – Apr 1**	Sept 1 – Sept 15 Apr 1 – June 10	
	>2500 ft elev.; High maintenance	**Mar 20 – Apr 20**	Aug 15 – Aug 30 Mar 5 – Mar 20 Apr 20 – June 15	15 Browntop millet* (nurse crop) 45 Red fescue* 45 hard fescue* 25 chewing fescue*
	<2500 ft elev.; High maintenance	Aug 15 – Sept 1 **Mar 1 – Apr 1**	Sept 1 – Sept 15 Apr 1 – June 10	

In Table 7.9-1, the bold dates are the preferred dates for seeding. Also, high maintenance areas include lawns and other grassed areas that will be maintained for aesthetics.

Table 7.9-2 Allowable seed mixes and planting dates.

Zone		Best	Marginal	Rate/Mix (lb/ac PLS)
Region I	Poorly drained soils	Feb 1 – Mar 20 Sept 1 – Sept 30	Mar 20 – Apr 30 Sept 30 – Oct 31	80 Pensacola bahiagrass 30 Bermudagrass (hulled) 20 Korean lespedeza** 10 Kobe lespedeza**
	Well drained soils	Apr 1 – July 15		50 Pensacola bahiagrass 15 Bermudagrass (hulled) 30 Korean lespedeza** 15 Foxtail millet**
	High maintenance	Apr 1 – July 15		40 Bermudagrass (hulled)
Region II	Low maintenance; Slopes and Poor, shallow soils	Aug 25 – Sept 15 **Feb 15 – Mar 21**	Sept 15 – Oct 25 Mar 21 – Apr 15	100 Pensacola bahiagrass 40 Bermudagrass (hulled) 20 Korean lespedeza** 10 Kobe lespedeza**
	Low maintenance; Moderate slopes; soils >6 in. depth	Aug 25 – Sept 15 **Feb 15 – Mar 21**	Sept 15 – Oct 25 Mar 21 – Apr 15	80 Pensacola bahiagrass 30 Bermudagrass (hulled) 20 Korean lespedeza** 10 Kobe lespedeza**
	High maintenance	Aug 15 – Oct 15	Feb 15 – Apr 15	200 KY 31 fescue**

Region III	>2500 ft elevation; steep slopes	July 25 - Aug 15 **Mar 20 – Apr 20**	July 15 – July 25 Aug 15 – Aug 30 Mar 1- Mar 20 Apr 20 – May 15	100 KY 31 fescue** 20 Kobe lespedeza** 10 Korean lespedeza** 5 Redtop
	<2500 ft elevation; steep slopes	Aug 15 – Sept 1 **Mar 1 – Apr 1**	July 25 – Aug 15 Sept 1 – Sept 15 Apr 1 – May 10	
	>2500 ft elev.; Shallow soils	July 25 - Aug 15 **Mar 20 – Apr 20**	July 15 – July 25 Aug 15 – Aug 30 Mar 5 – Mar 20 Apr 20 – May 15	40 KY 31 Fescue** 10 Korean lespedeza** 10 Redtop 10 Crown vetch**
	<2500 ft elev.; Shallow soils	Aug 15 – Sept 1 **Mar 1 – Apr 1**	July 25 – Aug 15 Sept 1 – Sept 15 Apr 1 – May 10	
	>2500 ft. elev.; Moderate slopes	July 25- Aug 15 **Mar 20 – Apr 20**	July 15 – July 25 Aug 15 – Aug 30 Mar 5 – Mar 20 Apr 20 – May 15	60 KY 31 fescue** 15 Korean lespedeza** 15 Kobe lespedeza**
	<2500 ft. elev.; Moderate slopes	Aug 15 – Sept 1 **Mar 1 – Apr 1**	July 25 – Aug 15 Sept 1 – Sept 15 Apr 1 – May 10	
	>2500 ft elev.; High maintenance	July 25 - Aug 15 **Mar 20 – Apr 20**	July 15 – July 25 Aug 15 – Aug 30 Mar 5 – Mar 20 Apr 20 – May 15	200 KY 31 fescue**
	<2500 ft elev.; High maintenance	Aug 15 – Sept 1 **Mar 1 – Apr 1**	July 25 – Aug 15 Sept 1 – Sept 15 Apr 1 – May 10	

Figure 7.9-2 Typical Seed

Roundstone Native Seed, LLC
9764 Raider Hollow Road, Upton, KY 42784

Kind: Switchgrass		*Lot No: 11074*	
Variety:	*Cave-in-Rock*	*Inert Matter:*	*1.78*
Origin:	*KY*	*Weed Seeds:*	*0.00*
Test Date:	*02/12*	*Crop Seeds:*	*0.00*
Pure Seed:	*98.22*	*Hard Seed:*	*0.00*
Total Germ:	*95.32*	*Germ:*	*95.32*
Pure Live Seed:	*93.62*	*Noxious:*	*0.00*

Seeding rates: *Seed rates in Table 7.9-1 are based upon Pure Live Seed (PLS), which is the product of the purity shown on the seed tag multiplied by the germination. The PLS for the seed tag shown in Figure 7.9-2 would be 0.9362 X 0.95 = 0.89 Thus only 89% of the seed are considered live. If the plan calls for a seed rate of 2 lb/acre of switchgrass find the actual seed rate for the conditions shown on the tag. Actual seed rate required is 2 lb/ac / 0.95 PLS = 2.15 lb/acre. In other words, to get an actual rate of 2 lb. per acre it will require 2.15 lb. of seed.*

Temporary seed may be required when seeding outside of the preferred seeding dates. See Section 7.8 for more information on temporary seeding.

Construction Specifications

Grading and Shaping: Grading and shaping may not be required where hydraulic seeding and fertilizing equipment is to be used. Vertical banks shall be sloped to enable plant establishment.

When conventional seeding and fertilizing are to be done, grade and shape the slope, where feasible and practical, so that equipment can be used safely and efficiently during seedbed preparation, seeding, mulching, and maintenance of vegetation.

Concentrations of water that could cause excessive soil erosion should be diverted to a safe outlet. Diversions and other treatment practices must conform to the appropriate standards and specifications.

Plant Selection: Only certified seed shall be used. Refer to Table 7.9-1 for suggested species. Grass type should be selected on the basis of species characteristics; site and soil conditions; planned use and maintenance of the area; time of year of planting, method of planting; and the needs and desires of the land user.

Plant selection may also include annual companion crops. Annual companion crops should be used only when the perennial species are not planted during their optimum planting period. Care should be taken in selecting companion crop species and seeding rates because annual crops will compete with perennial species for water, nutrients, and growing space. A high seeding rate of the companion crop may prevent the establishment of perennial species.

Ryegrass shall not be used in any seeding mixtures containing permanent, perennial species due to its ability to out-compete desired species chosen for permanent perennial cover. However, crimson, clover, oats and winter wheat can be planted any time of the year and are recommended as a cover crop with native perennial species.

Topsoil: Topsoil should be replaced on all areas to be seeded. See Practice 7.3 for more information on the removal, storage and reapplication of topsoil.

Seedbed Preparation: When conventional seeding is to be used, topsoil should be applied to any area where the disturbance results in subsoil at the final grade surface. Figure 7.9-3 provides guidance on the volume of topsoil required to provide specific topsoil depths. Soil pH should be above 5 – preferably between 6.0 and 6.5. Soil on the site should be tested to determine lime and fertilizer rates. Soil should be submitted to a soils specialist or County Agricultural Extension agent for testing and soil amendment recommendations. In the absence of soil test results, the following application rates can be used:

- **Ground agricultural limestone:**
  Light-textured, sandy soils: 1- 1 1/2 tons/acre
  Heavy-textured, clayey soils: 2-3 tons/acre
- **Fertilizer:**
  Grasses: 800-1200 lb/acre of 10-10-10 (or the equivalent)
  Grass-legume mixtures: 800-1200 lb/acre of 5-10-10 (or the equivalent)

Broadcast Seeding:

- Seedbed preparation may not be required where hydraulic seeding equipment is to be used.
- Tillage, at a minimum, shall adequately loosen the soil to a depth of 4 to 6 inches; alleviate compaction; incorporate topsoil, lime, and fertilizer; smooth and firm the soil; allow for the proper placement of seed, sprigs, or plants; and allow for the anchoring of straw or hay mulch if a crimper is to be used.
- Tillage may be done with any suitable equipment.
- Tillage should be done parallel to the contour where feasible.
- On slopes too steep for the safe operation of tillage equipment, the soil surface shall be pitted or trenched across the slope with appropriate hand tools to provide consecutive beds, 6 to 8 inches apart, in which seed may lodge and germinate. Hydraulic seeding may also be used.

Depth (Inches)	Per 1,000 Square Feet	Per Acre
1	3.1	134
2	6.2	268
3	9.3	403
4	12.4	537
5	15.5	672
6	18.6	806

7.9-3 Cubic yards of topsoil required to attain various soil depths

Inoculants: Native legume seeds do not need to be inoculated. All non-native legume seed shall be inoculated with appropriate nitrogen fixing bacteria. The inoculants shall be pure culture prepared specifically for the seed species and used within the dates on the container. A mixing medium recommended by the manufacturer shall be used to bond the inoculants to the seed. For conventional seeding, use twice the amount of inoculants recommended by the manufacturer.

No-Till Seeding: No-till seeding is permissible into annual cover crops when planting is done following maturity of the cover crop or if the temporary cover stand is sparse enough to allow adequate growth of the permanent (perennial) species. No-till seeding shall be done with appropriate no-till seeding equipment. The seed must be uniformly distributed and planted at the proper depth. Native grasses respond very well to drill seeding at a depth of one-fourth inch.

Mulch: Straw mulch is required for all permanent vegetation applications and must be applied immediately after the application of seed. The application rate for mulch is 2 tons per acre with overall uniform soil coverage of 70%. All mulch must be anchored. See Practice 7.6 for more information on straw mulch.

Maintenance and Inspection Points

Any areas that have washed out due to high stormwater flows, areas that have been disturbed by blowing wind, and areas that do not show good germination should be retreated.

Inspect seeded areas for failure and make necessary repairs and reseedings within the same season, if possible.

Reseeding: If a stand has inadequate cover, re-evaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand after seedbed preparation or over-seed the stand. Consider seeding temporary, annual species if the time of year is not appropriate for permanent seeding.

References

North Carolina Erosion and Sediment Control Planning and Design Manual

STABILIZATION PRACTICES

7.10 SOD

SO STABILIZATION WITH SOD

Definition Permanently stabilizing areas by laying a continuous cover of grass sod.

Purpose To prevent erosion and damage from sediment and runoff by stabilizing the soil surface with permanent vegetation where specific goals might be:

- to establish immediate ground cover,
- protect the soil surface from erosion,
- reduce stormwater runoff,
- to stabilize disturbed areas with a suitable plant material that cannot be established by seed, or
- to stabilize drainageways, channels, and other areas of concentrated flow where flow velocities will not exceed that specified for a grass lining.

Conditions Where Practice Applies This practice is applicable for areas that require immediate and permanent vegetative cover, or where sodding is preferred over other means of grass establishment. Specific applications include:

- Grass swales or waterways carrying intermittent flow.
- Areas around drop inlets.
- Steep critical areas where vegetative cover may be hard to establish.

Planning Considerations Quality turf can be established with either seed or sod; site preparation for the two methods is similar. The practice of sodding for soil stabilization eliminates both the seeding and mulching operations, and is a much more reliable method of producing adequate cover and sediment control. However, compared to seed, sod is more expensive, difficult to obtain, transport, and store.

Advantages of properly installed sod include:

- immediate erosion and dust control,

- nearly year-round establishment capability,
- less chance of failure than with seedings,
- less weeds, and
- rapid stabilization of surfaces for traffic areas, channel linings, or critical areas.

Sod can be laid during times of the year when seeded grasses may fail, provided there is adequate water available for irrigation in the early weeks. Irrigation is essential, at all times of the year, to install sod. It is initially more costly to install sod than to plant seed. However, the higher cost may be justified for specific applications where sod performs better than seed.
In waterways and channels that carry concentrated flow, properly pinned sod is preferable to seed because it provides immediate protection. For channel design, refer to Section 7.27. Drop inlets placed in areas to be grassed can be protected from sediment by placing permanent sod strips around the inlet. Sod also maintains the necessary grade around the inlet.

Because sod is composed of living plants that must receive adequate care, final grading and soil preparation should be completed before sod is delivered. If left rolled or stacked, heat can build up inside the sod, causing severe damage and loss of costly plant material.

Design Criteria

Choosing appropriate types of sod: The type of sod selected should be composed of plants adapted to both the site and the intended purpose. A complete and current listing of sod recommendations can be obtained from suppliers or the State Agricultural Extension office. Sod composed of a mixture of varieties may be preferred because of its broader range of adaptability. Sod that consists of native species is preferred if available.

In general, warm season grasses such as bermudagrass sod should be used in West TN and cool season grasses such as fescue sod should be used in East TN. Both can be used in Middle TN, with warmer season grasses in southern Middle TN and cooler season grasses in northern Middle TN.

Construction Specifications

Quality of sod: Use only high-quality sod of known genetic origin, free of noxious weeds, disease, and insect problems. It should appear healthy and vigorous, and conform to the following specifications:

- Sod should be machine cut and contain ¾" of soil, not including shoots or thatch.
- Sod should not have been cut in excessively wet or dry weather.
- Sod should be cut to the desired size. Torn or uneven pads should be rejected.
- Harvest, delivery, and installation of sod should take place within a period 36 hours.
- Sections of sod should be strong enough to support their own weight and retain their size and shape when lifted by one end.
- Avoid planting when subject to frost heave or hot weather if irrigation is not available.

Soil Preparation: Bring the soil surface to final grade. Clear surface of trash, woody debris, stones and clods larger than 1". Fill or level low spots in order to avoid standing water. Mix fertilizer and/or lime into soil surface where necessary. See Section 7.9 for more information on soil amendments.

Installation:

- Moistening the sod after it is unrolled helps maintain its viability. Store it in the shade during installation.
- Rake the soil surface to break the crust just before laying sod. During the summer, lightly irrigate the soil, immediately to cool the soil, reduce root burning, and dieback.
- Ensure that the sod is in good contact with the prepared soil surface.
- Do not stretch the sod strips. Instead, maintain the shape of the sod and cut pieces to fit rather than stretching sections.
- Do not install sod on gravel, frozen soils, or soils that have been treated recently with sterilants or herbicides.
- Lay the first row of sod in a straight line with subsequent rows placed parallel to and butting tightly against each other. Stagger strips in a brick-like pattern (see Figure 7-7.10-1). Be sure that the sod is not stretched or overlapped and that all joints are butted tightly to prevent voids.
- Install strips of sod with their longest dimension perpendicular to the slope. On slopes 3:1 or steeper, or wherever erosion may be a problem, secure with pegs or staples.
- As sodding of clearly defined areas is complete, roll sod to provide firm contact between roots and soil.
- After rolling irrigate until the soil is wet 4" below the sod.
- Keep sodded area moist to a depth of 4" until the grass takes root. This can be determined by gently tugging on the sod.
- Mowing should not be attempted until the sod is firmly rooted, usually 2-3 weeks.

Sodded Waterways: The sod must be able to withstand the flow velocity specified in the channel design. Lay sod strips perpendicular to the direction of flows, with the lateral joints staggered in a brick-like pattern. Edges should be butted tightly together.

1. Sodded slopes may require pinning to prevent sod from sliding while it is getting established.

Figure 7-7.10-1. Correct sod placement

Maintenance and Inspection Points

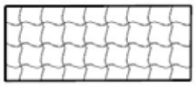
After the first week, water as necessary to maintain adequate moisture in the root zone and prevent the sod from going dormant. Grass height should not be cut to less than 2" to 3". Re-sod areas where an adequate stand of sod is not obtained.

References

North Carolina Erosion and Sediment Control Planning and Design Manual

STABILIZATION PRACTICES

7.11 ROLLED EROSION CONTROL PRODUCTS



ROLLED EROSION CONTROL PRODUCT

Definition

Rolled erosion control products (RECPs) are manufactured sheets of mulch materials (e.g., straw, coir, wood fibers, curled wood, etc.) that are bound into netting composed of either photodegradable synthetic or natural materials. They are usually delivered to a construction site in rolls which are then installed as a protective covering designed to protect soil and hold seed and mulch in place on slopes and in channels so that vegetation can become well established. **This section only addresses RECPs applied to slopes. RECPs as channel linings are covered in Section 7.27 Channels.**

Purpose

To reduce soil erosion and assist in the growth, establishment and protection of temporary or permanent vegetation on steep slopes.

Conditions Where Practice Applies

RECPs can be applied to steep slopes where erosion hazards are high and conventional seeding is likely to be too slow in providing adequate protective cover. RECPs shall be applied to cut or fill slopes of 2.5:1 or steeper with a height of 10 feet or greater in need of protection during establishment of temporary or permanent ground cover.

Planning Considerations

There are many types of erosion control nets and blankets on the market that may be appropriate in certain circumstances. In general, most nets require mulch in order to prevent erosion because they have a fairly open structure. Blankets typically do not require mulch because they usually provide complete protection of the surface.

Good ground contact is critical to the effectiveness of these products. If good ground contact is not achieved, runoff can concentrate under the product, resulting in significant erosion. It is preferred that loose woven netting made with natural fibers be used.

Most netting used with blankets is photodegradable, meaning they break down under sunlight (not UV stabilized). However, this process can take months or years even under bright sun. Once vegetation has established, sunlight does

not reach the mesh. It is not uncommon to find non-degraded netting still in place several years after the installation. This can be a problem if maintenance requires the use of mowers or ditch cleaning equipment. In addition, birds and small animals can become trapped in the netting.

Biodegradable blankets are available for use in sensitive areas. These organic blankets are usually held together with a fiber mesh and stitching which may last up to one year.

Design Criteria

Formal design of RECPs applied to slopes is not required. However, for each location erosion control blankets are used, the type of blanket should be indicated in the EPSC Plans.

The use of erosion control blankets on cut or fill slopes may be considered for the following conditions:

- In flat or rolling terrain, on 2H:1V or 3H:1V fill slopes and/or 2H:1V or 3H:1V cut slopes (in soils) that are 20 feet or greater in height;
- In mountainous or hilly terrain, 2H:1V or 3H:1V fill slopes and/or 2H:1V or 3H:1V cut slopes (in soils) that are 30 feet or greater in height;
- On slopes built of highly erodible soils such as sandy/loess soils in West Tennessee;
- On slopes running adjacent to a stream or adjacent to a large ditch or channel that empties directly into high-quality or sediment-impaired waters near the roadway construction;
- At point of stormwater runoff concentration where off-site runoff threatens stability of cut slopes.

On sites with flat slopes or short slope lengths, it may be possible to substitute mulch control netting or open weave textiles for erosion control blanket, based on economic considerations.

In addition to the above criteria, the designer should consider the design life of the erosion control blanket. The designer should ensure that it is possible for the permanent vegetation to become well established before the degradable portions of the blanket have degraded to the point that their resistance to erosion is significantly reduced.

Construction Specifications

Even if properly designed, if not properly installed, erosion control blankets will likely not function as desired. Proper installation is imperative. Even if properly installed, if not properly timed and nourished, vegetation will likely not grow as desired. Proper seed/vegetation selection is also imperative.

Grade the surface of installation areas so that the ground is smooth and soil loose. When seeding prior to installation, follow the steps for seed bed preparation, soil amendments, and seeding. All gullies, rills, and any other disturbed areas must be fine graded prior to installation. Spread seed before blanket installation. (**Important**: Remove all large rocks, dirt clods, stumps, roots, grass clumps, trash, and other obstructions from the soil surface to allow for direct contact between the soil

surface and the blanket.) Terminal anchor trenches are required at blanket end. Terminal anchor trenches should be a minimum of 12 inches in depth and 6 inches in width.

Installation for Slopes: Place the blanket 2-3 feet over the top of the slope and into an excavated end trench measuring approximately 12 inches deep by 6 inches wide. Pin the blanket at 1 foot intervals along the bottom of the trench, backfill, and compact. Unroll the blanket down (or along) the slope maintaining direct contact between the soil and the blanket. Overlap adjacent rolls a minimum of 3 inches. Pin the blanket to the ground using staples or pins in a 3 foot center-to-center pattern or as recommended by manufacturer.

Anchoring Devices: 11 gauge, at least 6 inches length by 1 inch width, staples or 12 inch minimum length wooden stakes are recommended for anchoring the blanket to the ground.

Drive staples or pins so that the top of the staple or pin is flush with the ground surface. Anchor each blanket every 3 feet along its center. Longitudinal overlaps must be sufficient to accommodate a row of anchors and uniform along the entire length of overlap and anchored every 3 feet along the overlap length. Roll ends may be spliced by overlapping 1 foot (in the direction of water flow), with the upstream/upslope mat placed on top of the downstream/downslope blanket. This overlap should be anchored at 1 foot spacing across the blanket. When installing multiple width mats heat seamed in the factory, all factory seams and field overlaps should be similarly anchored.

Maintenance and Inspection Points

Good contact with the ground must be maintained, and erosion must not occur beneath the blanket.

Any areas of the blanket that are damaged or not in close contact with the ground shall be repaired and stapled.

If erosion occurs due to poorly controlled drainage, the problem shall be fixed and the eroded area repaired.

Monitor and repair the blanket as necessary until ground cover is established. Inspections should include walking across the slope to check for erosion gullies that can be felt rather than seen.

References

TDOT Design Division Drainage Manual

TDOT Erosion Control Standard Drawing EC-STR-34

North Carolina Erosion and Sediment Control Planning and Design Manual

POLLUTION PREVENTION

7.16 CONCRETE WASHOUT

CONCRETE WASHOUT

Definition

A designated area where concrete wash can harden, can be broken up, and can then be placed in the dumpster or backfilled.

Purpose

To prevent or reduce the discharge of pollutants to stormwater from concrete waste by conducting washout offsite or performing onsite washout in a designated area.

Conditions Where Practice Applies

Concrete washout areas are applicable where:

- Concrete trucks and other concrete-coated equipment are washed onsite.
- Slurries containing portland cement concrete or asphalt concrete are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.
- Washing of exposed aggregate concrete.
- Building or house construction mortar mixer waste

Planning Considerations

There are two main types of concrete washouts to be considered, prefabricated washout containers and site-built washouts.

PREFABRICATED WASHOUT CONTAINERS

Many private companies offer heavy-duty, prefabricated concrete washout containers that are delivered to the site. Some services provide only the containers while others also provide the maintenance and disposal of the materials. Utilizing full-service concrete washout companies removes much of the burden from the jobsite superintendent and tends to result in a more maintained washout facility. When selecting a company to handle concrete waste, ensure that they are properly disposing of all materials. If the project utilizes a concrete pump truck, the prefabricated container should have an adequate ramp to accommodate the concrete pump truck.

SITE-BUILT WASHOUTS

There are many design options for the site-built washout, but preference should be given to those built below-grade to prevent breaches and reduce the likelihood of runoff. Above-grade structure can also be used if they are sized properly to avoid spillage, constructed properly to prevent leaks, and diligently maintained.

An important factor that dictates the success of concrete washout facilities is whether or not concrete truck drivers and subcontractors are educated on the use of the washout facilities. The site superintendent should educate all appropriate parties on proper use of concrete washout facilities. Signs should be posted indicating the location and designated use of the facilities.

Design Criteria

When using prefabricated washout containers, ensure containers can withstand heavy impacts and are watertight.

Site-built washouts should be constructed by providing a temporary pit or bermed area sized large enough to handle solids, wash slurry, and rainfall to prevent overflow and include a minimum of 4" freeboard. Above-grade washouts should allow adequate at least 4" of freeboard for structural stability of berms or containment walls. The temporary pit containing dry waste concrete may be incorporated into fill areas as needed. The waste concrete may be broken into smaller pieces to allow proper soil compaction. The storage area should be lined with geotextile fabric to allow water to infiltrate, further aiding the dewatering and drying process.

Consideration should be given to locating washout facilities. The designer should included suggested concrete washout areas on all applicable SWPPPs. Each facility should be located conveniently for concrete trucks, preferably near the area where concrete is being poured, and away from heavy volume construction traffic or access areas to prevent disturbance or tracking. Facilities should also be located a minimum of 50 feet away from storm drains, open ditches, and waterbodies. Appropriate gravel or rock should cover paths to concrete washout facilities if the facilities are located in undeveloped areas.

On large sites with extensive concrete work, concrete washouts should be located in multiple areas for ease of use.

Construction Specifications

- The storage pit area should be lined with a permeable geotextile fabric.
- Do not allow runoff from the storage area. Construct a temporary pit or bermed area large enough to contain anticipated slurry amount, solid waste, and direct rainwater.
- Wash out wastes into the temporary pit where the concrete can set, be broken up, and then disposed properly.
- Avoid creating runoff by draining water to a bermed or level area when washing concrete to remove fine particles and expose the aggregate.

Maintenance and Inspection Points

Ensure contractors avoid mixing excess amounts of fresh concrete and perform washout of concrete trucks offsite or in designated areas only. Do not allow concrete trucks to wash into storm drains, open ditches, streets, or streams. Do not allow excess concrete to be dumped onsite, except in designated areas. Do not wash sweepings from exposed aggregate concrete into the street or storm drains.

Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 inches for above grade facilities and 12 inches for below grade facilities. Inspect plastic linings and sidewalls of site-built washouts to ensure they have not been damaged during construction activities. Inspect all surfaces of prefabricated washouts to ensure the container is not leaking.

Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

Inspectors should note whether washout facilities are being used and maintained regularly. If inspector finds that concrete trucks are being washed out in locations other than designated washout areas, the inspector should notify the site superintendent immediately and the site superintendent should correct the issue.

References

California Stormwater BMP Handbook

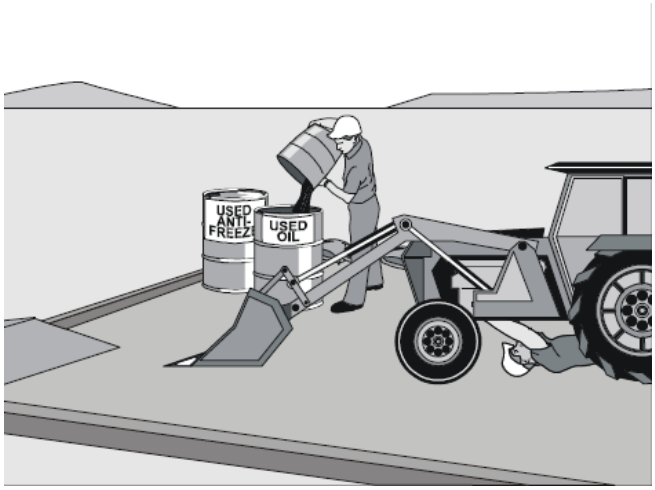
City of Knoxville Best Management Practices Manual

Hamilton County, TN BMP Manual

EPA National Pollutant Discharge Elimination System Concrete Washout

POLLUTION PREVENTION

7.17 VEHICLE MAINTENANCE



VEHICLE MAINTENANCE

Definition Procedures and practices to reduce the discharge of pollutants to storm drain systems, or to watercourses as a result of vehicle and equipment maintenance.

Purpose To prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance.

Conditions Where Practice Applies These procedures are suitable on all construction projects where heavy equipment and vehicles are maintained onsite.

Planning Considerations Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, equipment fueling, and outdoor equipment storage and parking (engine fluid leaks).

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair.

Design Criteria There is no formal design for this measure. However, the following requirements may affect your site design and SWPPP:

Locate maintenance areas where they are protected from stormwater run-on and runoff and at least 50 feet from downstream drainage facilities and watercourses. Dedicated maintenance areas should be covered and paved wherever practical. Washing and maintenance areas should be properly contained, and liquids should be treated before discharging. Utilizing a municipal sanitary sewer system may be practical, but proper coordination and permitting should be obtained before doing so.

Develop a spill prevention and cleanup plan and provide to maintenance personnel. The site superintendent should educate workers on the spill prevention and cleanup procedures.

Construction Specifications

Inspect construction equipment for leaks daily, and repair immediately. Soil staining under or near equipment could be evidence of equipment leaks. Recycle or properly dispose of used oils, antifreeze, solvents, and automotive-related chemicals. Maintain drip pans, absorbent materials and covered trash receptacles in maintenance areas to dispose of spills and leakage. Place a stockpile of spill cleanup materials where it will be readily accessible.

Use vacuums or blowers instead of water to remove dry material from equipment and vehicles whenever possible. Utilize high-pressure water alone for washing instead of detergents whenever possible.

Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.

If maintenance must occur onsite, use designated areas located away from drainage courses and stream buffer zones.

Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids. All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices. Use adsorbent materials on small spills. Remove the absorbent materials after using and dispose of properly.

Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.

Do not place used oil in a dumpster or pour on ground or into a storm drain or watercourse.

Properly dispose of or recycle used batteries.

Maintenance and Inspection Points

Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.

Keep ample supplies of spill cleanup materials onsite.

References

Hamilton County BMP Manual

7.18 CHEMICAL STORAGE

CHEMICAL STORAGE

CHEMICAL STORAGE

Definition

A designated storage area equipped to minimize the risk stormwater pollution of storing chemicals on a construction site.

Purpose

To prevent, reduce, or eliminate the discharge of pollutants from material storage to the stormwater system or watercourses by minimizing the storage of materials onsite, storing materials kept on site in a designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

Conditions Where Practice Applies

This practice is applicable for storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment.

Planning Considerations

Space limitation may preclude indoor storage.

Storage sheds often must meet building and fire code requirements.

Storage areas should not be located near wetlands, streams and other sensitive features.

Design Criteria

There is no formal design for this measure. However, the following requirements may affect your site design and SWPPP:

All chemicals must be stored in covered areas or with containment systems constructed in or around the storage areas. These areas should also be designed for easy access for materials delivery and storage. Show storage areas on the SWPPP and site development plans. Locate temporary storage areas away from high volume vehicular traffic and waterways. Ensure that the site has an accessible 55-gal drum (or similar) container to receive and contain small spill amounts and resulting cleanup materials.

Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area.

Construction Specifications

Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and in secondary containment. Whenever possible, store materials in a covered area and within secondary containment such as an earthen dike or prefabricated storage unit. If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.

Chemicals should be kept in their original labeled containers.

If significant residual materials remain on the ground after construction is complete, properly remove materials and any contaminated soil. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Maintenance and Inspection Points

Keep an up-to-date inventory of materials stored onsite.

Contain and clean up any spill immediately. Dispose of chemicals and materials used for cleaning up after use. Include emergency contact information for spills, such as the local emergency management agency contact information. This spill response information should be prominently displayed. Contact TDEC Water Pollution Control's EFO in the event that a chemical spill reaches a stream or wetland or exceeds 50 gallons.

Keep storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.

Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

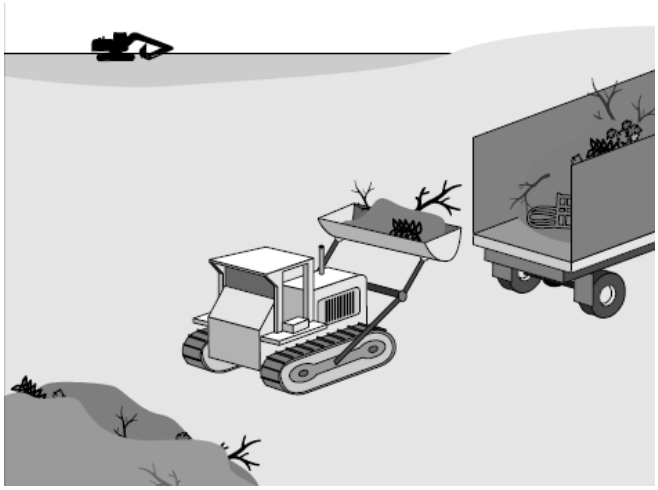
California Stormwater BMP Handbook

Hamilton County BMP Manual

Knox County BMP Manual

POLLUTION PREVENTION

7.19 TRASH AND DEBRIS MANAGEMENT



DEBRIS MANAGEMENT

TRASH AND DEBRIS MANAGEMENT

Definition

The management of waste materials and debris on the construction site.

Purpose

To prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, and arranging for regular disposal.

Conditions Where Practice Applies

This practice is applicable when the following items may be found on the construction site:

- Waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction.
- Packaging materials including wood, paper, and plastic.
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces and masonry products.
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes.
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, Styrofoam and other materials used to transport and package construction materials.
- Construction crew sanitary waste management facilities.

Planning Considerations

All construction trash and debris must be properly collected and managed for proper offsite disposal. A debris storage area should be included on the SWPPP when the materials noted above will be encountered on the project.

Consider using onsite ground trees and brush as mulch. Identify other recyclable materials, and keep them sorted for easy removal.

Design Criteria

Select designated waste collection areas onsite. These areas should be located well away from sensitive site features such as streams, wetlands, and sinkholes.

Locate containers in an easily accessible area and post signage designating waste disposal areas if needed. Provide enclosed containers or locate containers in covered areas to prevent direct rainwater contact or loss of waste due to wind. If using large containers, ensure they have lids to prevent rain from mixing with the debris and trash.

Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris. Post signage and provide worker education related to items that should not be disposed of in municipal waste and construction debris containers.

Construction Specifications

Do not hose out dumpsters on the construction site. Dumpster cleaning should be taken care of by the solid waste management company providing the containers. Do not allow solid waste management workers to clean their containers on the construction site.

Arrange for regular waste collection before containers overflow.

Stormwater runoff should be prevented from contacting stored waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.

Waste storage areas should be located at least 50 feet from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding or in the stream buffer zone.

Clean up immediately if a container does spill.

Ensure that construction debris and trash are not being used as fill onsite unless approved by the local municipality and TDEC.

Maintenance and Inspection Points

Inspect the site for evidence of trash and construction debris being placed outside of the designated trash and debris collection area. Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas. Contractors should ensure all waste and debris is removed from construction site after construction is completed before leaving.

To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.

Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters before a rain event, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.

Inspect trash and debris collection areas after wind and/or rain events to ensure that they are keeping the trash and debris contained.

References

California Stormwater BMP Handbook

RUNOFF CONTROL AND MANAGEMENT

This section contains measures that are permanent or temporary. They are designed to convey storm water runoff non-erosively. Rip rap is a material incorporated into many of the management practices. The following rip rap classes and stone sizes apply to measures throughout this manual:

Table 7.20-1 TDOT Rip Rap Classification and Sizes

TDOT Classification	D_{50} Stone Size (inches)	Overall Stone Sizes (inches)	Placement Depth
Class A-1	9	2 – 15	18 inches
Class A-3	4	2 – 6	As noted on plans
Class B	15	3 – 27	2.5 feet
Class C	20	5 – 36	3.5 feet

7.20 CHECK DAM

Definition

A small temporary barrier, grade control structure or dam constructed across a swale, drainage ditch, or area of concentrated flow.

Purpose

To minimize the erosion rate by reducing the velocity of stormwater in areas of concentrated flow. While check dams are primarily erosion control devices, they provide limited sediment control by slowing velocities and ponding runoff. Note that wattles and tubes installed as check dams are addressed in Section 7.25.

Conditions Where Practice Applies

This practice is applicable for use in ditches and small open channels and **is not to be used in a stream**. Specific applications include:

- Temporary or permanent swales or ditches in need of protection during establishment of grass linings.
- Temporary or permanent swales or ditches that, due to their short length of service or for other reasons, cannot receive a permanent non-erodible lining for an extended period of time.
- Other locations where small localized erosion and sedimentation problems exist in areas of concentrated flow.

Planning Considerations

Check dams are an expedient way to reduce gullying in the bottom of channels that will be filled or stabilized at a later date. The dams should only be used while permanent stabilization measures are being put into place.

Check dams installed in grass-lined channels may kill the vegetative lining if submergence after it rains is too long and/or silting is excessive. All stone and riprap must be removed if mowing is planned as part of vegetative maintenance.

The main function of a check dam is to decrease velocity, not to collect sediment, although sediment capture is an added benefit.

Design Criteria

The channel and check dam must be designed to adequately convey the design storm for the associated drainage area.

Spacing: Maximum spacing between dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam. Two or more check dams in series should be used when the drainage area exceeds the limitation for one dam.

Height: The height of the check dam from the bottom of the channel to the bottom of the weir should be a minimum of 1 foot above the ditch bottom.

Weir: The depth of flow on the center of the structure (weir) shall be computed for the peak flow rate generated by the 2-year, 24-hour storm in order to ensure that the top of the structure will not be overtopped. For sites draining to high quality streams or streams listed as impaired by sediment, the depth must be determined for the 5-year, 24-hour peak flow rate. The weir must be at least 9 inches deep.

Side Slopes: The side slopes should be 2:1 or flatter.

Materials: A geotextile should be used as a separator between the graded stone and the soil base and abutments. The geotextile will prevent the migration of soil particles from the subgrade into the graded stone. Geotextiles should be "set" into the subgrade soils. The geotextile should be placed immediately adjacent to the subgrade without any voids and extend three feet beyond the downstream toe of the dam to prevent scour.

Construction Specifications

- Rock check dams should be constructed out of machined riprap, Class A-1 (see Table 7.20-1 for stone size and d_{50}).
- Place stone to the lines and dimensions shown in the plan on a filter fabric foundation.
- Keep the center stone section at least 9 inches below natural ground level where the dam abuts the channel banks.
- Set spacing between dams to assure that the elevation at the top of weir section of the lower dam is the same as the toe elevation of the upper dam.
- Extend geotextile fabric 3 feet down gradient from the toe of the check dam to prevent scour at the toe.
- Protect the channel after the lowest check dam from heavy flow that could cause erosion.
- Ensure that the channel reach above the most upstream dam is stable.
- Ensure that other areas of the channel, such as culvert entrances below the check dams, are not subject to damage or blockage from displaced stones.

Maintenance and Inspection Points

Sediment should be removed before it reaches a depth of one-half the original dam height.

Add rock as needed to maintain design height and cross section.

If the area is to be mowed, check dams must be removed once final stabilization has occurred. After removal, the disturbed area should be seeded and mulched immediately.

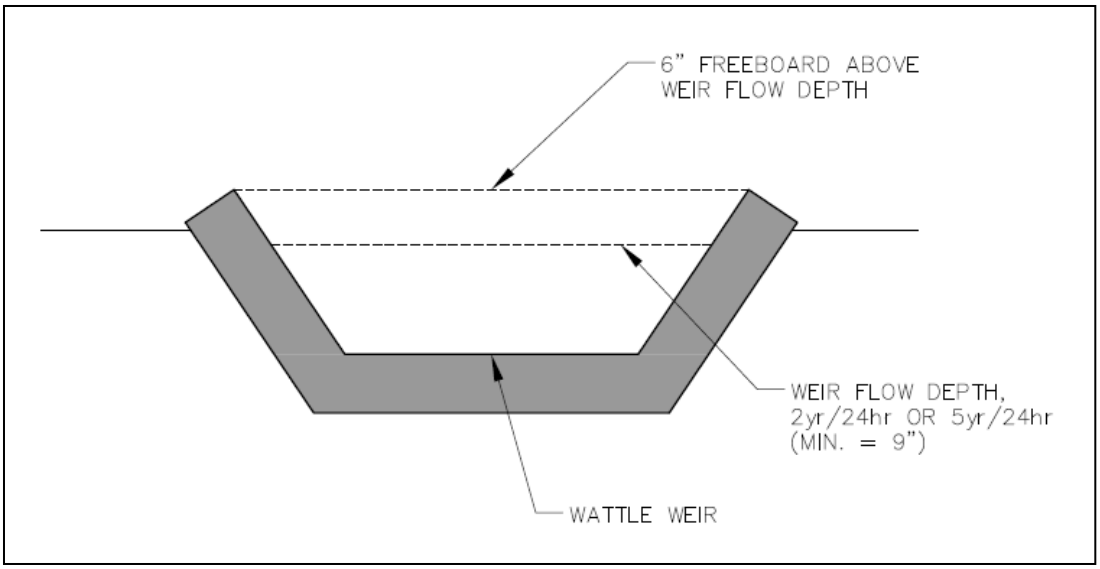


Figure 7.20-1. Wattle Check Dam

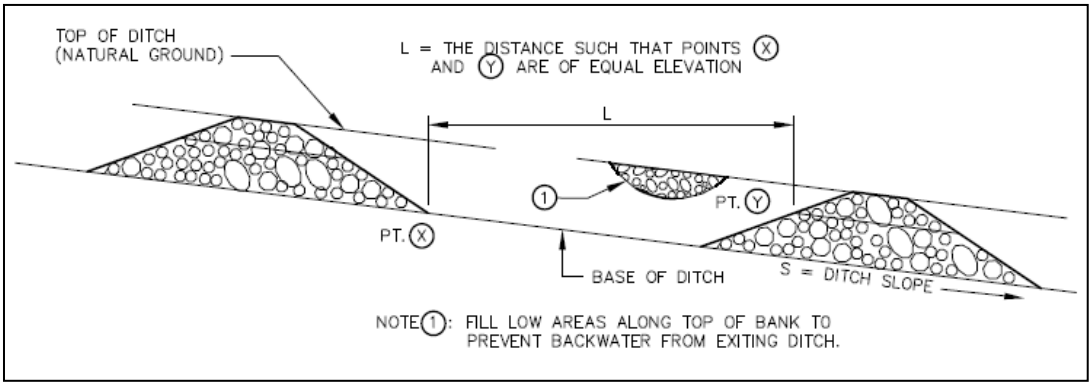


Figure 7.20-2 Spacing between check dams (Source: TDOT)

References

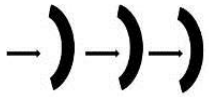
TDOT Design Division Drainage Manual

TDOT Erosion Control Standard Drawing EC-STR-6

North Carolina Erosion and Sediment Control Planning and Design Manual

RUNOFF CONTROL AND MANAGEMENT

7.25 TUBES AND WATTLES



TUBES AND WATTLES

Definition A small temporary barrier, grade control structure or dam constructed across a swale, drainage ditch, or area of concentrated flow.

Purpose To minimize the erosion rate by reducing the velocity of storm water in areas of concentrated flow, and to capture larger soil particles.

Conditions Where Practice Applies This practice is applicable in a ditch to help reduce the effects of soil erosion and aid in sediment retention. Sediment tubes and wattles should not be used in streams.

Planning Considerations The stability of tubes and wattles is very dependent upon proper staking. Thus, they may not be utilized on pavement, rocky soil or at any location where the stakes cannot be driven to the required depth.

Design Criteria The maximum drainage area to any given tube or wattle should be no more than 5 acres. When applied in a ditch, the same design requirements as rock check dams apply. The depth of flow on the center of the wattle or tube (weir) shall be computed for the peak flow rate generated by the 2-year, 24-hour storm in order to ensure that the top of the structure and ditch will not be overtopped. For sites draining to high quality streams or streams listed as impaired by sediment, the depth must be determined for the 5-year, 24-hour peak flow rate. The weir section must be at least 9 inches deep. See Table 7.25-1 for the minimum spacing for ditch applications.

Joints within a ditch section should be avoided. However, where joints are necessary, a second row of tubes or wattles is required with the joints staggered by a distance equal to half of the individual segment length.

Tube/wattle netting should be a knitted material with 1/8 to 3/8 inch openings and made of photodegradable (polypropylene, HDPE) or biodegradable (cotton, jute, coir) material. The minimum diameter for any tube or wattle applied in a ditch should be 12 inches. This will ensure that the tube will function effectively as a velocity control device.

Slope (%)	Maximum Tube/ Wattle Spacing (ft.)
< 2	125
2	100
3	75
4	50
5	40
6	30
> 6	25

Table 7.25-1 Maximum Spacing for Wattles/Tubes in Ditch Application *(Source: TDOT)*

Construction Specifications

Proper site preparation is essential to ensure tubes and wattles are in complete contact with the underlying soil surface. Remove all rocks, clods, vegetation or other obstructions so installed tubes and wattles have direct contact with the underlying soil surface.

Install tubes and wattles by laying them flat on the ground. Install stakes at spacings per the manufacturer's recommendation. Stakes should be installed on the downstream side of the wattles/tubes.

Install tubes so no gaps exist between the soil and the bottom of the tube.

Keep tubes in place until the contributing drainage area has been stabilized.

The ends of the wattle or tube must extend up the ditch side slopes at least 6" vertical above the weir flow depth (see Figure 7.25-1 below).

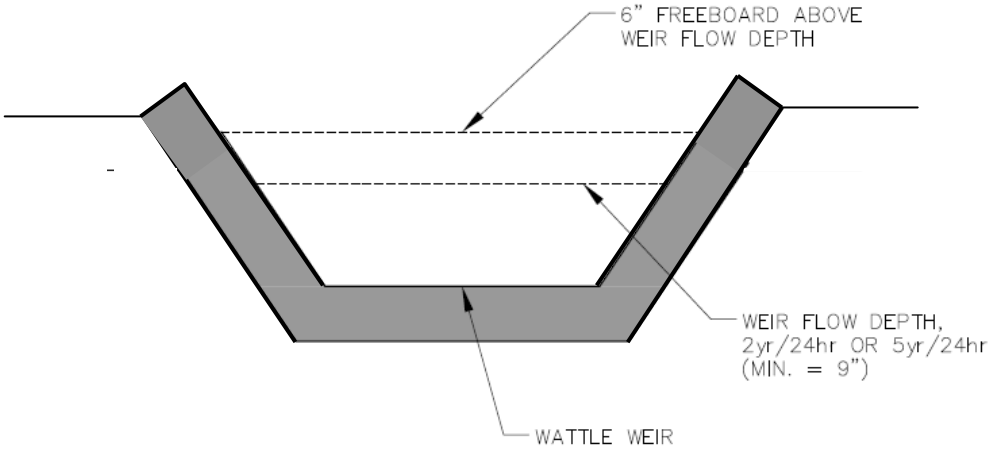


Figure 7.25-1 Cross sectional view of wattle installed in ditch

Maintenance and Inspection Points

- Inspect wattles and tubes after installation for gaps under the tubes and for gaps between the joints of adjacent ends of tubes. Ensure stakes are on the downstream side.
- Repair all rills, gullies, and undercutting near tubes.
- Remove all sediment deposits when the sediment reaches 1/3 the height of the exposed tube.
- Remove and/or replace installed sediment tubes as required to adapt to changing construction site conditions.
- Most tubes and wattles are filled with biodegradable materials. When the fill materials degrade and settle, the wattle should be replaced.
- At the end of the project, biodegradable wattles and tubes can be split open, the netting material and stakes removed, and the biodegradable material left in place to aid stabilization.

References

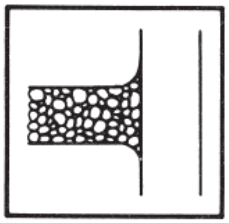
TDOT Design Division Drainage Manual

TDOT Erosion Control Standard Drawing EC-STR-31

South Carolina Department of Health & Environmental Control Stormwater Management BMP Handbook

SEDIMENT CONTROL PRACTICES

7.28 CONSTRUCTION EXIT



GRAVEL CONSTRUCTION EXIT

Definition A stone pad on geotextile fabric or a rumble strip located at any point where traffic will be moving from a construction site onto a public roadway or other paved area.

Purpose To reduce or eliminate the transport of material from the construction area onto a public roadway by providing an area where mud and soil can be removed from the tires of construction vehicles.

Conditions Where Practice Applies This practice is applicable wherever construction traffic leaves a construction site and enters a public right of way.

Planning Considerations Construction exits should be planned and installed at any point that construction traffic exits the project. These stone pads should not be placed in areas with hydric or saturated soils.

Stormwater management must be considered around the construction exit as well.

Avoid steep grades and exits in or near curves in public roads.

Design Criteria Calculations are not required; however, a typical construction exit should conform to the specifications listed below.

- A layer of geotextile fabric is required to stabilize and support the aggregate. The geotextile fabric should extend the full length and width of the construction exit. The fabric should meet the requirements of the standard specifications for geotextiles, AASHTO designated M-288, erosion control.
- The stone pad should be constructed from clean, washed stone with a 2 inch to 4 inch gradation at a minimum thickness of 8 inches. At a minimum, the stone pad should be 50 feet long and 20 feet wide. In addition a turning radius of 20 feet should be provided on each side of the pad where it intersects with the public roadway. See Figures 7.28-1 and -2.
- The area where the pad is to be installed must be undercut at least 3 inches, and then the geotextile fabric should be installed before placing the stone.

- Stormwater management around the construction exit must be taken into consideration. If stormwater runoff flows across the stone pad and onto the public right of way, mud on the pad can be washed into the ROW as well. Diversions or waterbars should be installed at the upgradient end of the pad, directing runoff into sediment traps for treatment prior to discharging runoff into the ROW.

Construction Specifications

- Excavate areas where construction exits are to be constructed to a depth of at least 3 inches and clear the area of all vegetation, roots, and other objectionable material.
- Construction exit areas should be at minimum 50 feet in length by 20 feet in width.
- Install a geotextile underliner across the full width and depth of the construction exit to separate the rock from underlying soil.
- Provide clean, washed stone to a depth of 8 inches. Stone should vary in size from 2 to 4 inches. Rock must be clean rock with no fines. Crusher run and road base are not acceptable materials for a construction exit, as the fines can be tracked out onto the road.

Waterbar Diversion:

On sites where the grade toward the public roadway is greater than 2%, a waterbar diversion 6 to 8 inches in depth with 3:1 side slopes should be constructed at the upper end of the construction exit to prevent stormwater from washing sediment off the construction exit and into the public roadway or storm drain system. See Figure 7.28-1. Other devices, such as berms also may be used to divert stormwater from flowing down the construction exit and onto the pubic ROW.

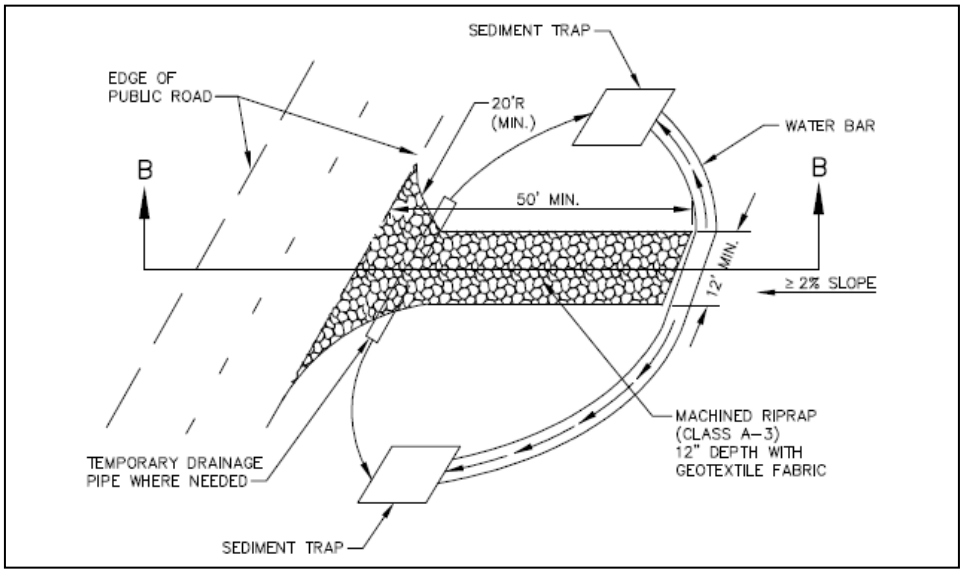


Figure 7.28-1 Construction Exit with Water Bars

Maintenance and Inspection Points

The exit must be maintained in a condition that will prevent tracking or flow of material onto public rights-of-way or into the storm drain system. This may require periodic top dressing with fresh stone or full replacement of stone as conditions demand, and repair and/or cleanout of any related diversions and sediment traps. All materials spilled, dropped, washed, or tracked from vehicles or site onto roadways or into storm drains must be removed by the end of the day.

References

TDOT Design Division Drainage Manual

North Carolina Erosion and Sediment Control Planning and Design Manual

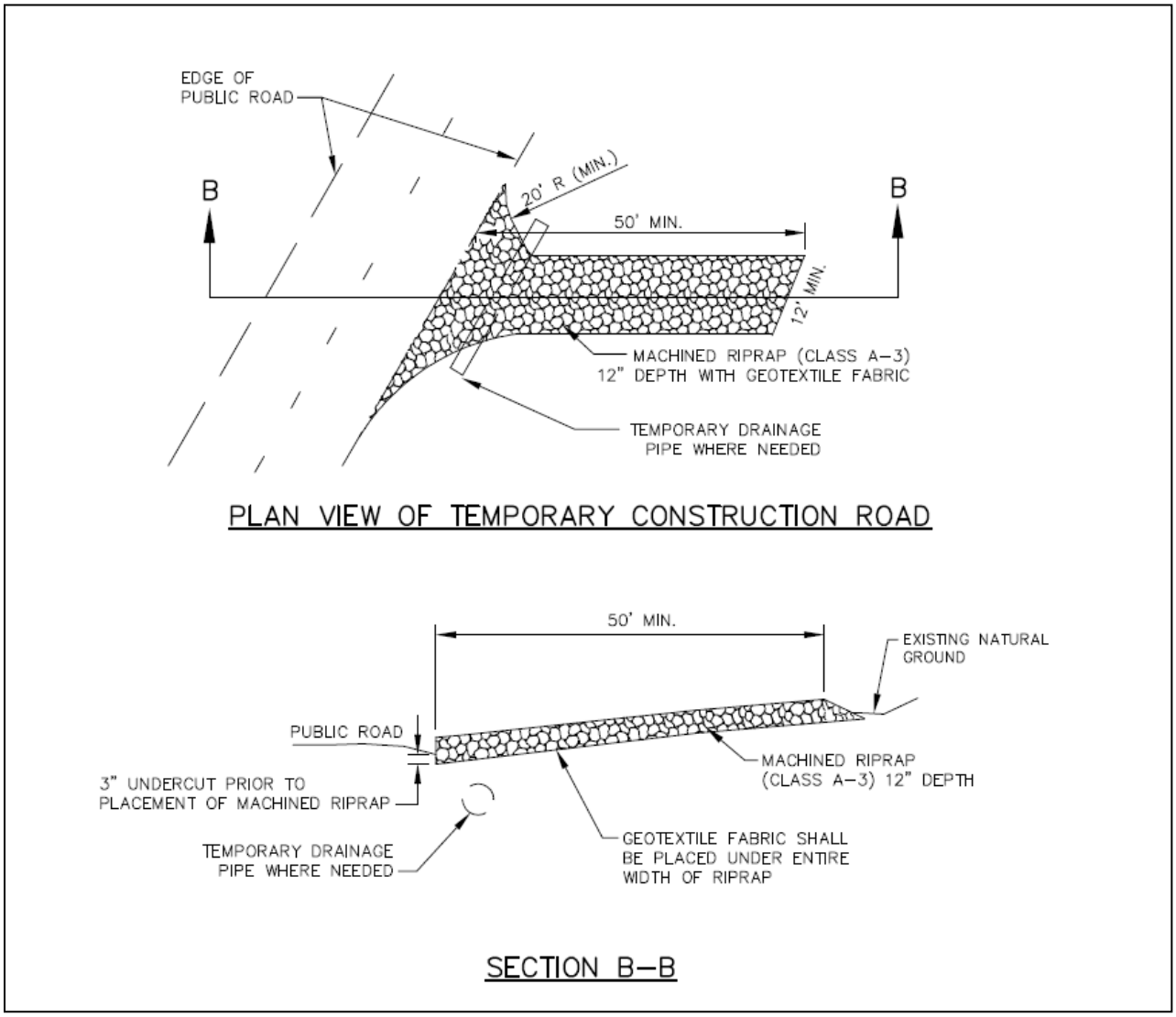
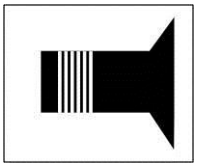


Figure 7.28-2 Construction Exit Detail

SEDIMENT CONTROL PRACTICES

7.29 TIRE WASHING FACILITY



TIRE WASHING FACILITY

Definition

A station for washing tires prior to construction traffic exiting the construction site. Used in conjunction with a gravel construction exit to remove sediment from tires and undercarriages.

Purpose

To prevent or reduce the discharge of pollutants as a result of vehicular egress from the construction site by providing facilities that remove mud and dirt from vehicle tires and undercarriages with sprayed water prior to entering public roads.

Conditions Where Practice Applies

Tire washing facilities are used in addition to gravel construction exits where typical gravel construction exits do not provide sufficient dirt and mud removal from construction equipment. Tire washes are not necessary in all cases but should be considered for sites located in sensitive areas or where track out cannot be controlled with typical gravel construction exits.

Planning Considerations

Tire washing requires a supply of water either by overhead tank, pressurized tank or by water pipeline. All wash water should drain into a sediment-trapping device such as a sediment basin or sediment trap before discharging off the construction project.

If chlorinated water (such as ordinary tap water or hydrant water) is used, allow the water to sit for 24 hours, to allow chlorine to dissipate into the air, prior to discharging effluent to a stream. Effluent may be checked by a standard pool test kit to verify that it is chlorine-free.

A turnout or an extra-wide exit may be necessary to avoid entering vehicles from driving through the tire wash rack area (which is only intended for exiting vehicles).

Design Criteria

- Wash racks should be designed and constructed/manufactured for anticipated traffic loads.
- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff. Refer to sediment trap and channel design sheets, 7.32 Sediment Traps and 7.27 Channels.

Construction Specifications

- Incorporate with a stabilized construction entrance/exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Post signage at tire washing facilities or designate personnel to oversee traffic exiting the construction site at tire washing facility locations.

Maintenance and Inspection Points

Remove accumulated sediment in tire wash rack and sediment traps as necessary to maintain system performance. Inspect routinely for damage and repair as needed.

References

California Stormwater Best Management Practices Handbook

City of Knoxville Best Management Practices Manual

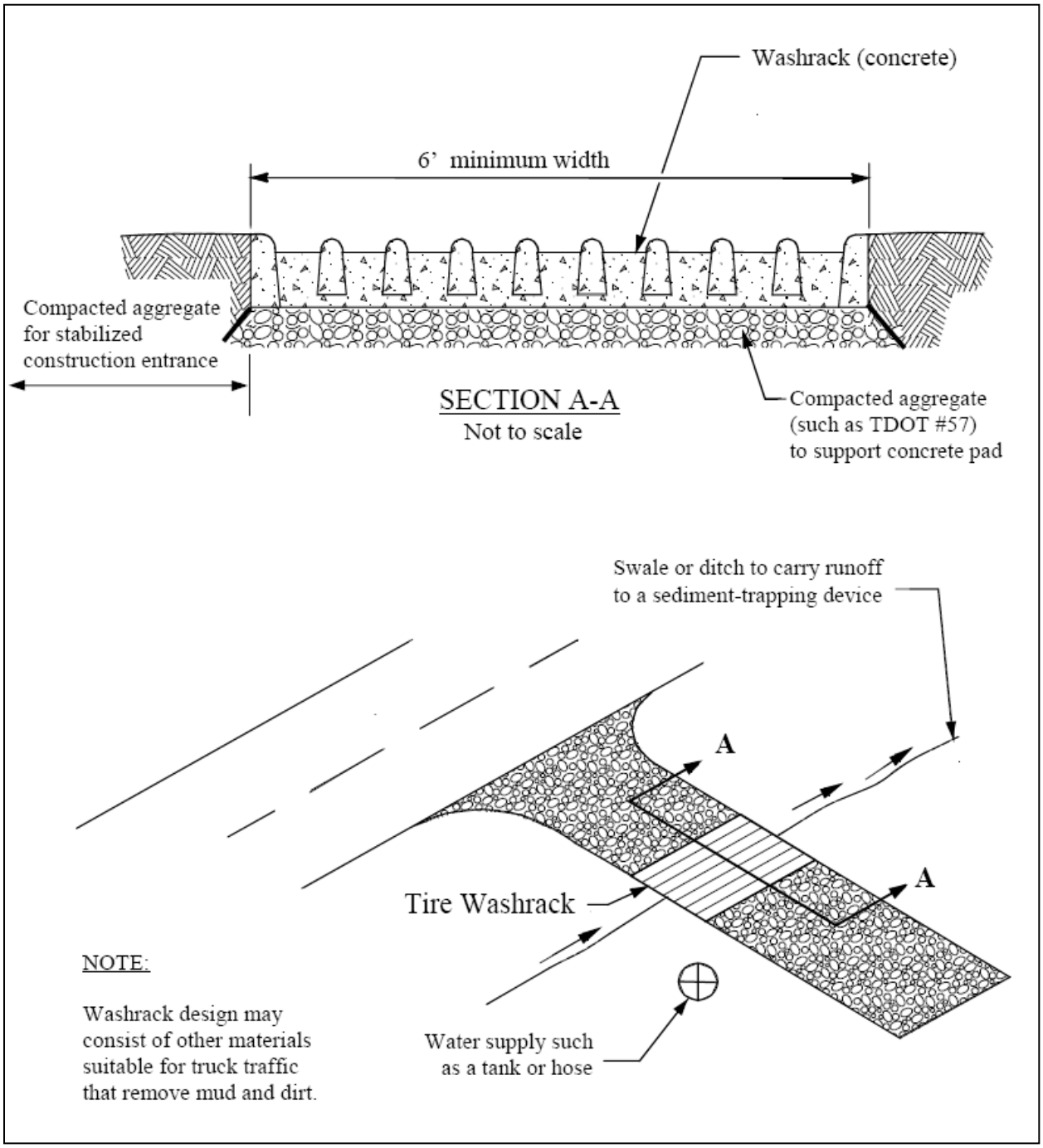


Figure 7.29-1 Tire Wash Rack (Source: City of Knoxville)

SEDIMENT CONTROL PRACTICES

7.31 SEDIMENT BASIN

SEDIMENT BASIN

Definition A temporary basin created by an embankment constructed across a drainage way, or by an excavation that creates a basin, or by a combination of both, suitably located to capture sediment. A sediment basin consists of an embankment (dam), a sediment storage area, a sediment forebay, a dewatering mechanism, a principal (or primary) spillway and emergency spillway system, a permanent pool, and scour protection at the outlet of the principal spillway pipe.

Purpose To capture and retain sediment on the construction site, and to prevent sedimentation in off-site streams, lakes, and drainageways. Given the likelihood that the storm water peak flow from the active construction site will exceed the pre-construction peak flow, a sediment basin can also function as a peak flow attenuation measure during construction to protect the downstream channel from damage due to erosion and sedimentation. Temporary sediment basins may be used to limit post-construction discharges to pre-construction conditions for one or more storm frequency events, as required by local regulations.

Conditions Where Practice Applies Sediment basins, or equivalent measures, are required where:

- The total drainage area at an outfall from a construction site is ten (10) acres or greater for sites draining into unimpaired streams and waters
- The total drainage area at an outfall from a construction site that discharges into Impaired or Exceptional TN Waters, as defined by TDEC, where the total drainage area is five (5) acres or more.
- Sediment basins should also be installed at outfall points that do not meet the criteria above, but where treatment of sediment-laden runoff is necessary.

Sediment basins are **not** to be located in streams.

Planning Considerations

Sediment basins should be carefully located to capture sediment from all areas not treated adequately by other sediment controls. Basins are one part of an overall sediment control treatment train. The choice of construction materials for the sediment basin shall be based upon the basin's design life, which is typically 18 to 30 months.

Access for cleanout and disposal must be considered when choosing the location of a basin. Locations where a small pond can be formed by construction of a low dam across a natural swale are generally preferred to areas that require excavation.

Sediment basins may be located in areas where permanent detention or retention ponds are located; however they must be properly cleaned before converting the basin into a permanent pond. If a sediment basin is located in the same location as a permanent detention pond, then the permanent outlet structure should not be installed until all sediment is cleaned from the sediment basin, the proper grades are established in the detention area, and the basin is fully stabilized.

The size and performance of any sediment basin depends on several factors: (1) shape of the basin, (2) soil properties, (3) runoff volume and peak flow, (4) water chemistry, (5) permanent vs. dry basin design, (6) dewatering the "dry" or temporary storage following a storm, (7) effective erosion prevention practices, (8) effective inspection and maintenance, including pond cleaning, (9) quality of construction practices, and (10) whether the basin side slopes are stabilized. Basins should not be regarded as a single solution to erosion prevention and sediment control on a construction site. Instead, basins should always be used in conjunction with primary controls and stabilizing practices (as found throughout this manual) such as temporary vegetation, mulching, diversion dikes, etc. designed to prevent or reduce the possibility of soil from being eroded in the first place.

Sediment basins should be installed before any land-disturbance takes place within the drainage area. Where practical, sediment-free runoff should be diverted away from the basin.

Sediment basins must be designed by either a professional engineer or a landscape architect, trained in the design of impoundment structures, and in accordance with good engineering practices. Sediment basins must be designed and constructed in accordance with all applicable state and local laws, ordinances, permit requirements, rules, and regulations. Tennessee dam safety regulations apply if the dam height and/or pond volume meet or exceed specified limits provided below.

Embankments must comply with the Tennessee Safe Dams Act of 1973, as amended, if **either** of the following two conditions exist:

a. the embankment is twenty feet or more in height, or
b. the impoundment will have a capacity, at maximum water storage elevation, of thirty (30) acre-feet (48,400 CY) or more.

Any such dam which is equal to or less than six feet in height, regardless of storage capacity, or which has a maximum storage capacity not in excess of fifteen (15) acre-feet (24,200 cy/yds), regardless of height, would not be regulated under the Safe Dams Act. If basins and dams meet or exceed the criteria mentioned

above, permit certificates of construction and operation are required by the Tennessee Dam Safety Office in the Division of Water Supply of the Tennessee Department of Environment and Conservation. Further information on safe dam design standards, regulations, and permit applications are available at the website:

http://www.state.tn.us/environment/permits/safedam.htm.

Three sediment basin modifications can be included in the sediment basin design to increase the settling efficiency for basins:

Surface skimmers. Surface skimmers should be utilized as the dewatering device whenever practical. A skimmer dewaters from the water surface rather than from below the surface.

Baffles. Both porous and non-porous baffles are often used to prevent decrease turbulent flow in a basin settling zone such as the forebay, thereby increasing the settling rate for sediment.

Chemical flocculents. Flocculents such as polyacrylamides (PAM) can be used to enhance the settling efficiency of fine particles such as colloidal clays. This type of treatment should be introduced as part of the sediment treatment train, *upstream* from sediment basins, if conventional settling basin treatment is not, or is unlikely not, effective. In any case, contingency plans for using flocculents, such as PAM, should be built into SWPPPs in case conventional treatment fails and TDEC deems its use necessary.

Design Criteria

Note that the following design procedure is founded on the premise that the engineer or landscape architect has a fundamental understanding of hydrology and hydraulics, as well as an understanding of the necessity of all standard components of the sediment basin. Therefore, all sediment basins shall have a permanent pool. The purpose of having a permanent pool of water is to allow sediment particles to settle out and remain in the pond while skimming off or dewatering the upper layer of relatively clear water near the pond surface. Under no circumstances should an opening be placed at the bottom of a sediment pond. A bottom opening in a principal spillway riser pipe would eliminate a permanent pool by forcing the pond to empty after each storm, along with most of the fine sediment particles concentrated near the bottom of the pond. A riser with a bottom opening, surrounded by porous rock, silt fence fabric, or straw bales, is not effective practice for removing fine sediment particles.

STEP 1: DETERMINE THE BEST LOCATION

Runoff from off-site undisturbed areas should be diverted away from or around the disturbed areas and the basin. To improve the effectiveness of the basin, it should be located so as to intercept the largest possible amount of runoff from the disturbed area, while undisturbed areas are routed around the treatment area. The best locations are generally low areas and natural swales or drainageways below disturbed areas. It is recommended that the basin be located at least 50 feet outside the designated floodway or 60 feet from the top of bank of small streams, or as otherwise required by local ordinance, whichever is greater. Basin efficiency can be improved by the use of baffles and by introducing chemical flocculants.

The basin should not be located where its failure would result in the loss of life or interruption of the use or service to public utilities or roads.

Maximum Drainage Area: The maximum allowable total drainage area (disturbed and undisturbed) feeding into a temporary sediment basin is 50 acres. The 50 acre maximum drainage area limitation is derived from the CGP; additional engineering controls and/or treatment may be necessary for management of stormwater runoff originating from drainage areas exceeding 50 acres, covered under individual NPDES permit(s). However, basins cannot be installed in streams. It is recommended that when the drainage area to any one temporary basin exceeds 25 acres, an alternative design procedure that more accurately defines the specific hydrology, sediment loading, hydraulics of the site, and the control measures in use be utilized to perform design calculations. The design criteria in this manual do not generate hydrographs, estimate sediment erosion and delivery rates, provide hydraulic routing, or predict sediment capture efficiency. More rigorous and accurate design considerations, which are more site-specific than those in this manual, are acceptable and encouraged with any size basin.

Access to maintain the basin must be provided during basin construction and operation. Maintenance access road(s) shall be provided to the sediment basin facility for inspection and for access by maintenance and emergency vehicles. An access road around the basin is recommended for convenient removal of sediment from the basin or basin cells with appropriate equipment. An access ramp into the basin itself is discouraged because of the potential for creating equipment-generated rutting and stabilization problems.

STEP 2. SET THE BASIN GEOMETRY

Basin Shape: It is important that the designer of a sediment basin incorporate features to maximize detention time within the basin in order to improve its trapping efficiency. The primary means for accomplishing this will be specifying a length to width ratio of at least 4L: 1W. Other suggested methods of accomplishing this objective are:

- A wedge shape with the inlet located at the narrow end - ideally, the shape would be symmetrical about the pond's central axis formed by the inlet – riser – center of the dam.
- Installation of baffles or diversions in situations where a 4L: 1W ratio is otherwise not practical (See Figure 7.31-1 for more information).

4L:1W Ratio

The purpose of having a length to width ratio of at least 4L:1W is to minimize the "short-circuiting" effect of the sediment-laden inflow to the riser and increasing the flow length through the treatment zone. Having a symmetrical basin about the central axis from the inlet to the riser tends to reduce dead or ineffective space.

The length of the flow path (L) is the distance from the point of inflow to the riser outflow point. The point of inflow is the point that the stormwater runoff enters the active (sometimes called "normal") pool, created by the elevation of the riser crest. The pool area (A) is the area of the active pool. The effective width (We) is

equal to the area (A) divided by the length (L). The length to width ratio (L:W) is determined from the equation:

$$L:W = L/W_e = L/(A/L) = L^2/A$$

The designer is encouraged to locate all inflows at or near the point of the wedge. However, where there is more than one inflow point and where circumstances preclude this ideal arrangement, any inflow point which conveys more than 30 percent of the total peak inflow rate shall meet the above length-width ratio criteria. If the 4:1 ratio pond cannot be attained on the site, an equivalent 4:1 flow path must be provided through the use of non-porous baffles. Specifications for the stabilization of the basin side slopes and possibly reinforcement through the use of erosion control matting must be included in the design. Otherwise, the inflow point could potentially become the point of greatest concentrated erosion within the basin's watershed.

Non-porous Baffles

The required basin shape should be obtained by proper site selection and by excavation to reduce dead storage and to maximize sediment removal efficiency. Where less than ideal conditions exist, a non-porous baffle may be constructed in the basin. The purpose of the non-porous baffle is to increase the effective flow length from the inflow point(s) to the riser. Non-porous baffles shall be placed mid-way between the inflow point and the riser. The non-porous baffle length shall be as required to achieve the minimum 4L:1W length-width ratio at less than ideal site conditions. The effective length (L_e) shall be the shortest distance the water must flow from the inflow point around the end of the non-porous baffle to the outflow point.

Then:

$$L:W = L_e/W_e = L_e^2/A$$

Three baffle situations where non-porous baffles should be used are shown in Figure 7.31-1. Note that for cases A and B:

$$L_e = L_1 + L_2$$

Where L_1 and L_2 are the shortest travel path segments around the non-porous baffles. For case C, $L_e = 2(L_1 + L_2)$

Non-porous baffle material shall be outdoor grade and weather resistant. Non-porous baffles should be placed in such a manner as to minimize interference with basin cleaning. Construction should be modular for easy maintenance and convenient replacement in the event of damage from cleaning or from deterioration. Non-porous baffles should be inspected frequently for tears or breaks from weathering, high flows, and from cleaning damage. Damaged materials shall be replaced or repaired immediately.

The dimensions necessary to obtain the required basin volume and surface area shall be clearly shown on the plans to facilitate plan review and inspection.

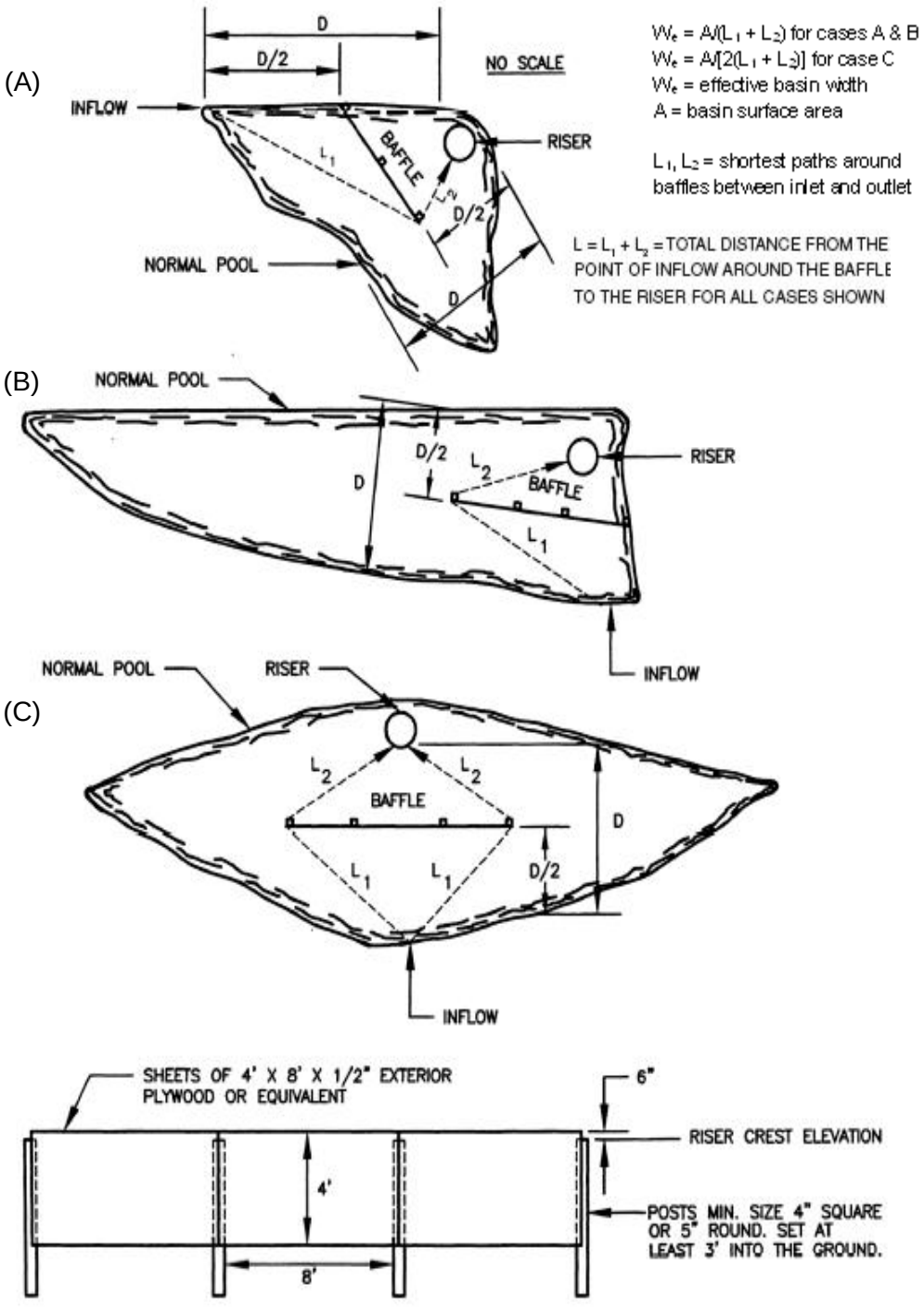


Figure 7.31-1 Non-porous Baffle Locations in Sediment Basins – To Increase Flow Length (*Source: NRCS*)

Volume: The sediment basin treatment area is designed based upon two major components, wet and dry storage:

> Total volume = 134 yd^3/acre (3618 ft^3/acre) of drainage. This total volume is allocated into two major storage components. Half of this volume (67 yd^3/acre or 1809 ft^3/acre) must be provided as *wet* storage, which establishes the permanent pool and the sediment capture zone. The volume below permanent pool shall be measured from the lowest point of the basin up to the bottom elevation of the dewatering device. The other half, or *dry* storage, also should have a minimum volume of 67 yd^3/acre (1809 ft^3/acre), including both the sediment removal zone and the forebay volume (described below). The top of the dry storage defines the principal spillway riser crest and establishes a minimum volume for treatment in the sediment basin. The dry storage volume is to be dewatered down to the permanent pool in 72 hours.

The above total volume requirements, representing one inch of erosion and sediment yield over one acre, are regarded as **minimum** criteria. Where construction sites have steep slopes and/or soils capable of producing greater sediment yields, design professionals should consider using an alternative physically-based approach, such as RUSLE , to size the total storage volume and to protect critical aquatic resources and safety/health of the public. It is noted that disturbed and unprotected areas can contribute large amounts of runoff containing a significant amount of fine-grained sediment particles that are difficult to remove and can reduce the overall performance of a sediment basin. The following conditions and circumstances need to be considered in determining whether or not the basin volume would need to be increased:

- Highly erodible soils
- Steep upslope topography
- Space-limiting basin geometry (depth and/or shape)
- Degree to which off- and/or on-site runoff is diverted from contributing undisturbed areas
- Sediment cleanout schedule
- Degree to which chemical flocculent agents are added to inflowing runoff
- Extent to which other erosion and sediment control practices are used
- Critical downstream conditions

Surface area: Pond surface area is very important to overall sediment basin efficiency. Research shows that sediment trapping efficiency depends primarily on the sediment particle size and the ratio of basin surface area to inflow rate. Basins with a large surface area to volume ratio are most effective in trapping sediment. Generally, the smaller the sediment particle size, the slower the settling velocity, and the larger the required basin surface area. Additionally, the larger the storm water flow into the basin, the larger the required basin surface area. The minimum required surface area, measured at the top of the dry storage pool zone, establishes the crest of the principal spillway, and is calculated by the following empirical formula (Barfield and Clar, 1986):

$$A_s = 0.01Q_p$$

Where

A_s = Surface area (acres)

Q_p = Peak inflow (cfs) for the design storm (2- or 5-year, 24-hour as appropriate)

The method above provides about 75% trapping efficiency for silt loams and higher efficiencies for coarser particles. Additional treatment may be necessary to trap small silt and clay particles.

The permanent pool protects against re-suspension of sediment, promotes better settling conditions between runoff events, and provides a zone for sediment storage. Therefore an opening at the bottom of the riser is not acceptable because it allows the pond to completely drain between storms and prevents the establishment of a permanent pool and sediment capture zone. A minimum depth of 3 feet shall be designed for the permanent pool.

The dry storage is to be dewatered over a period of 72 hours as discussed in the section on Dewatering. The forebay compartment of the dry storage area must have at least 2 porous baffles to promote more effective settling (see Section 7.33 Baffles).

Elevations: The lower elevation limit of the dewatering device should be installed to dewater the dry storage in 72 hours. The volume of the active or drawdown zone shall be measured from the crest elevation of the principal (service) spillway riser pipe down to the permanent pool level.

Forebay: A forebay is required at the primary inlet of the sediment basin to intercept the initial flow and provide an opportunity for larger sand and silt particles to settle out before entering the primary basin. The forebay volume shall be at least 25% of the dry sediment storage volume; this 25% forebay volume can be credited toward the primary basin's required dry storage volume. The bottom elevation of the forebay should equal the top of the permanent pool elevation of the primary basin, and the forebay should be separated from the primary basin with a porous barrier such as a rock berm to promote larger particle settling and spread the incoming flow out to help prevent short-circuiting of the primary basin. The berm overflow crest shall be set no higher than the top of the principal spillway riser crest. To minimize resuspension of trapped sediment and scour in the forebay during high flows, the energy of the influent flow must be controlled as it enters and flows through the forebay. This can be in the form of a plunge pool, rip-rap, or other energy-dissipating control measures. The rock berm shall be designed to pass the 2 or 5-year, 24-hour storm peak flow, as appropriate, without eroding the berm abutments.

The forebay must be readily accessible for maintenance as it will fill up with sediment more quickly than the primary basin. Porous baffles are recommended within the forebay as well to enhance the sediment capture efficiency. Refer to Figures 7.31-2A, -2B and 7.31-3 below for more information. More details can be found in the standard drawing.

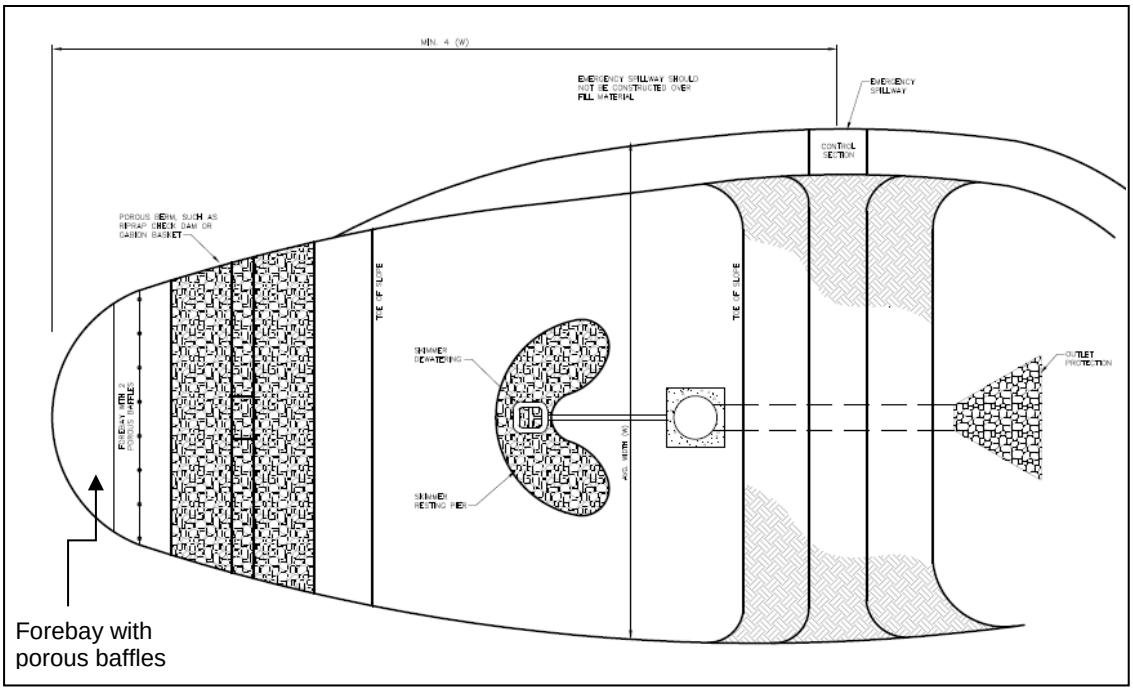
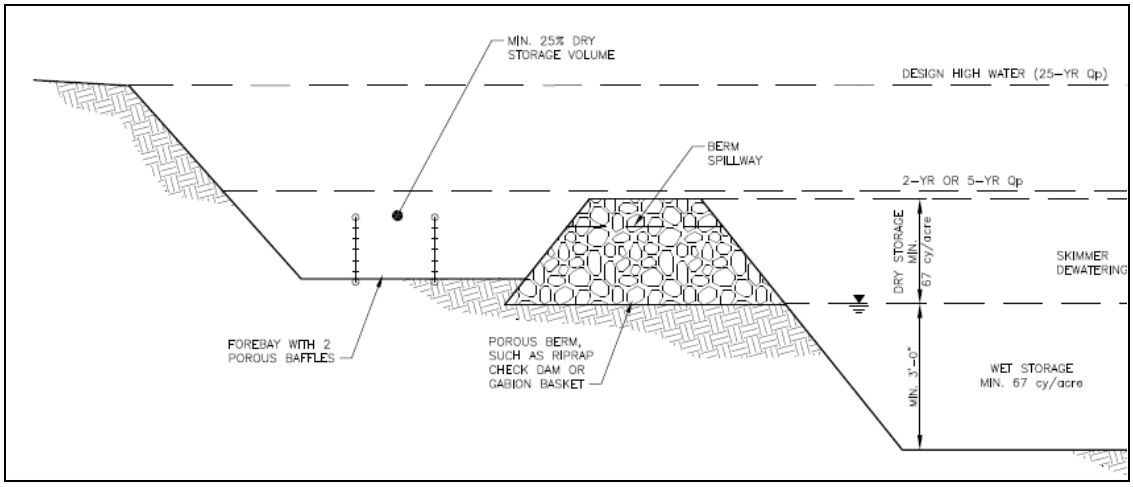


Figure 7.31-2A Sediment Basin with Forebay, Plan View



re 7.31-2B Cross Sectional View of Forebay, Showing Elevations

Figure 7.31-2C Forebay with Porous Berm (Gabion Rock)

STEP 3: DESIGN THE PRINCIPAL SPILLWAY AND DEWATERING DEVICE.

Design the principal spillway for the 2-yr, 24-hr (or 5-yr, 24hr) storm. Incoming flow and storage calculations must begin at the elevation of the permanent pool. Flow through the dewatering device cannot be credited when calculating the 25yr. 24 hr storm outflow from the basin.

The outlets for the basin should consist of a combination of principal and emergency spillways. These outlets must pass the peak runoff expected from the contributing drainage area for a 25-year, 24- hour storm. If, due to site conditions and basin geometry, a separate emergency spillway is not feasible, the principal spillway must pass the entire peak runoff expected from the 25-year 24-hour storm. However, an attempt to provide a separate emergency spillway should always be made (refer to "Emergency Spillway" later on in this section) because the principal spillway riser is vulnerable to clogging by debris during high runoff events. Runoff computations shall be based upon the soil cover conditions that are expected to prevail during the life of the basin. In determining total outflow capacity, the flow through the dewatering device cannot be credited when calculating the 25- year 24-hour storm elevation because of its potential to become clogged. However, the capacity of the principal spillway (i.e. the flow expected through the top of the riser) can be credited to the emergency spillway when determining the peak flow and maximum pond elevation resulting from the 25-year, 24-hour storm. In other words, routing calculations can assume both the principal spillway and emergency spillway are actively flowing for determining the maximum depth of the 25-year, 24-hour storm. Incoming flood flow and storage calculations must begin at the elevation of the permanent pool.

Note that temporary sediment basin storage and outflow controls are not normally designed to reduce incoming peak flows. Consequently, the spillways designed by the procedures contained in the standard and specification will not necessarily

result in any major reduction in the peak rate of runoff. If a reduction in peak runoff is desired or required by local regulations during the construction period, the appropriate hydrographs/storm routings should be generated to adjust the basin and outlet sizes.

Principal Spillway: The principal spillway typically consists of a vertical riser pipe or box of corrugated metal or reinforced concrete. The riser should have a minimum diameter of 18 inches, and be joined by a watertight connection to a horizontal drain pipe (barrel) extending through the embankment and discharging beyond the downstream toe of the fill. The riser and all pipe connections shall be mechanically sound and completely water tight except for the inlet opening at the top or dewatering openings, and shall not have any other holes, leaks, rips, or perforations. If the principal spillway is used in conjunction with a separate emergency spillway, the principal spillway must be designed to pass at least the peak flow expected from of 2-year (5-year), 24-hour storm. If no emergency spillway is used, a combined principal/emergency spillway must be designed to pass the entire peak flow expected from a 25-year 24-hour storm. See Figure 7.31-3 for details.

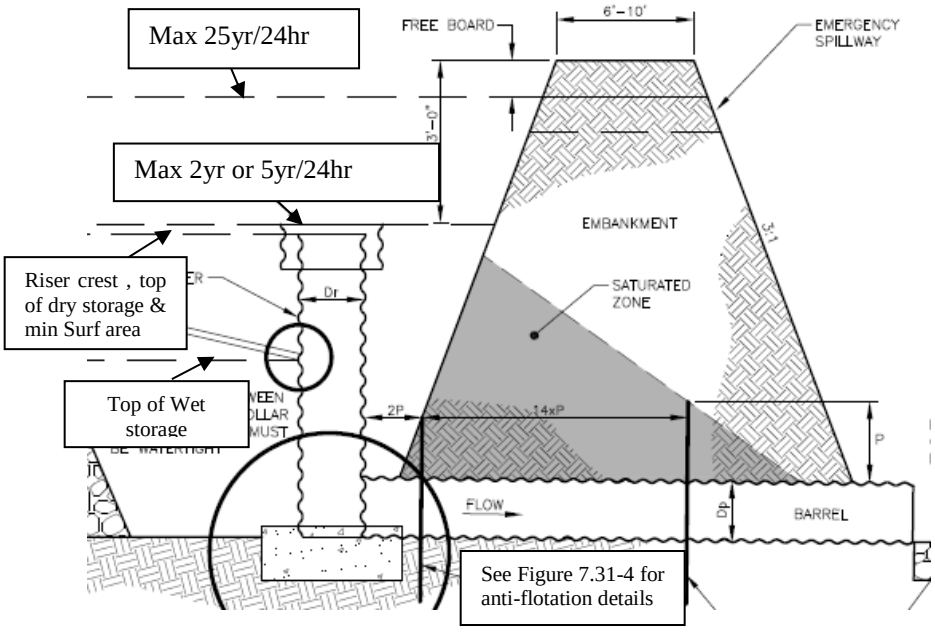


Figure 7.31-3 Elevations within the Basin

Spillway Foundation:
The foundation base of the principal spillway must be firmly anchored to prevent floating due to buoyancy. Computations must be made to determine the anchoring requirements to prevent flotation. A minimum factor of safety of 1.25 shall be used (downward forces = 1.25 x upward forces). For risers 10 feet or less in height, the anchoring may be done in one of the two following ways:

1. A concrete base 18 inches thick and twice the width of riser diameter shall be used and the riser embedded at least 6 inches into the concrete.

See Figure 7.31-4 for details.

2. A square steel plate, a minimum of 1/4-inch thick and having a width equal to twice the diameter of the riser shall be welded to the riser pipe. It shall be covered with 2.5 feet of stone, gravel, or compacted soil to prevent flotation. See Figure 7.31-4 for details. If compacted soil is selected, compaction of 95% of maximum proctor density is required over the plate. Also, added precautions should be taken to ensure that material over the plate is not removed accidentally during removal of sediment from basin. One method would be to use simple marker posts at the four corners.

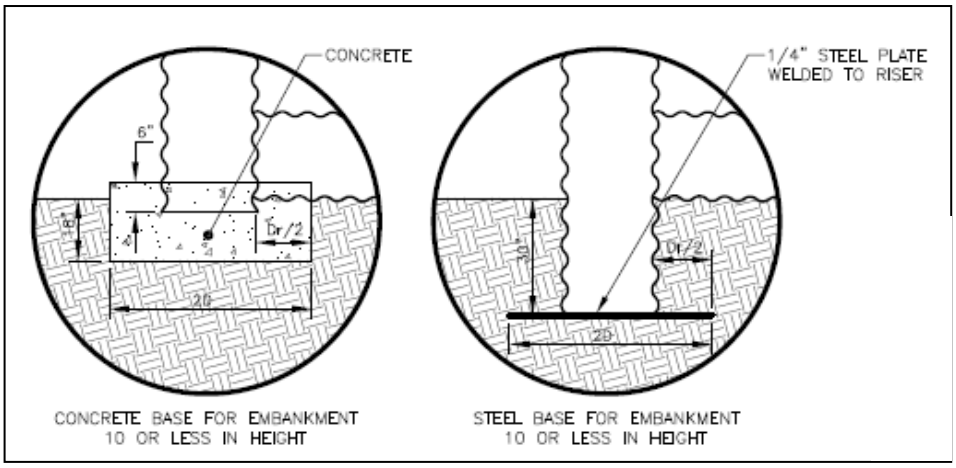


Figure 7.31-4 Anti-Flotation Device

Design Elevations:

The crest of the principal spillway riser shall be set either at the required surface area elevation or at the elevation corresponding to the total wet and dry storage volume required, whichever is greater (See the Basin Geometry for details).

If the principal spillway is used in conjunction with an emergency spillway, the riser elevation shall be a minimum of 1.0 foot below the crest of the emergency spillway. In addition, a minimum freeboard of 1.0 foot shall be provided between the maximum 25-year pool level and the top of the embankment. If no separate emergency spillway is used, the crest of the combined principal/emergency spillway shall be a minimum of 3 feet below the top of the embankment with a minimum freeboard of 2.0 feet between the 25-year pool level and the top of the embankment. Refer to Figures 7.31-3 and 7.31-12 for freeboard details.

Anti-Vortex Device and Trash Rack:

An anti-vortex device and trash rack shall be attached to the top of the principal spillway to improve the flow characteristics of water into the spillway and to reduce the possibility of floating debris from blocking the principal spillway. The anti-vortex device shall be of the concentric type similar to that shown in Figure 7.31-5 and 7.31-6, and designed using the information provided in Table 7.31-1.

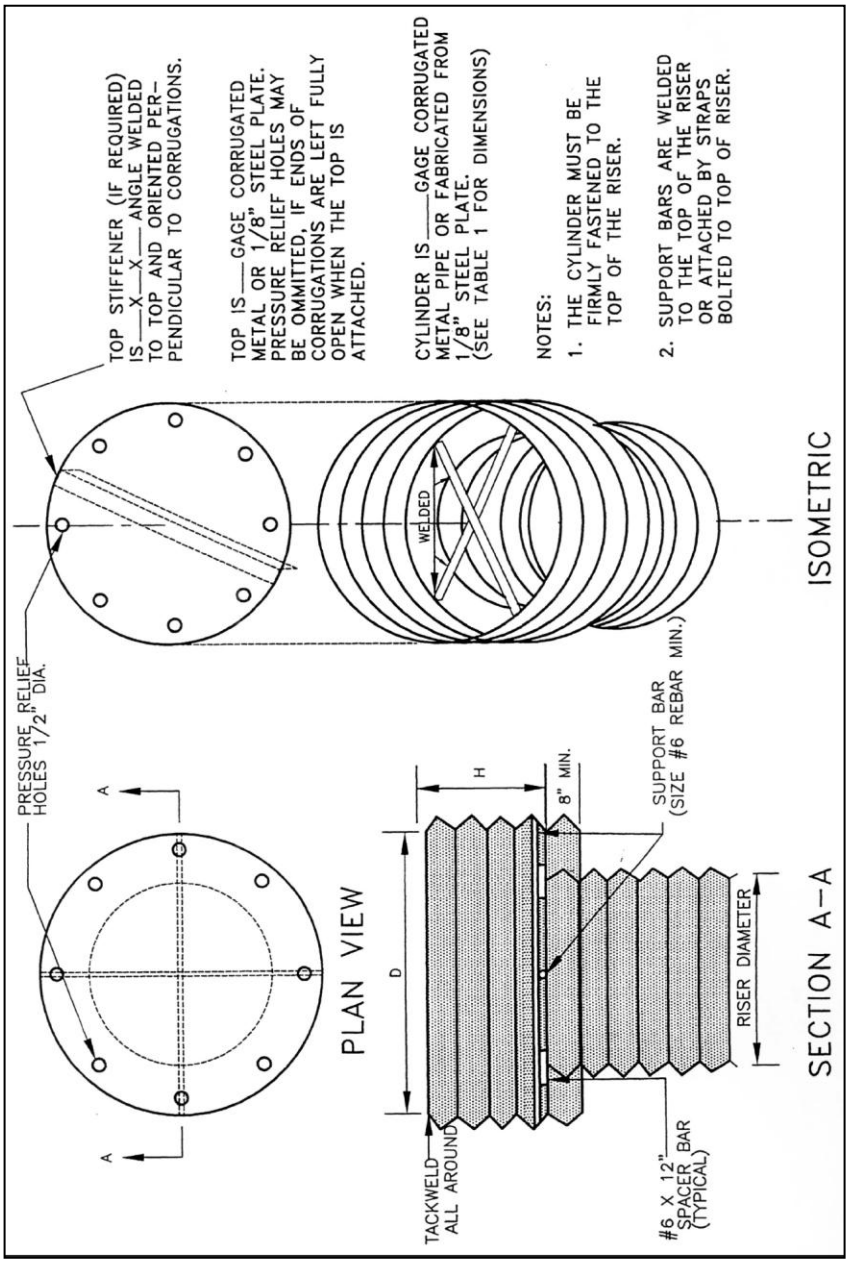


Figure 7.31-5 Anti-Vortex Device Design (*Source: US-NRCS*)

Riser Diam., inches	Cylinder			Minimum Size Support Bar	Minimum Top	
	Diameter, inches	Thickness, gage	Height, inches		Thickness	Stiffener
12	18	16	6	#6 Rebar or 1 1/2" x 1 1/2" x 3/16" angle	16 ga. (F&C)	-
15	21	16	7	" "	" "	-
18	27	16	8	" "	" "	-
21	30	16	11	" "	16 ga.(C), 14 ga.(F)	-
24	36	16	13	" "	" "	-
27	42	16	15	" "	" "	-
36	54	14	17	#8 Rebar	14 ga.(C), 12 ga.(F)	-
42	60	14	19	" "	" "	-
48	72	14	21	1 1/4" pipe or 1 1/4" x 1 1/4" x 1/4" angle	14 ga.(C), 10 ga.(F)	-
54	78	14	25	" "	" "	-
60	90	14	29	1 1/2" pipe or 1 1/2" x 1 1/2" x 1/4" angle	12 ga.(C), 8 ga.(F)	-
66	96	14	33	2" pipe or 2" x 2" x 3/16" angle	12 ga.(C), 8 ga.(F) w/stiffener	2" x 2 1/4" angle
72	102	14	36	" "	" "	2 1/2" x 2 1/2" x 1/4" angle
78	114	14	39	2 1/2" pipe or 2" x 2" x 1/4" angle	" "	" "
84	120	12	42	2 1/2" pipe or 2 1/2" x 2 1/2" x 1/4" angle	" "	2 1/2" x 2 1/2" x 5/16" angle

Note: The table above is useful only for corrugated metal pipe. Concrete trash rack and anti-vortex devices are also available. Manufacturer's recommendations should be followed for concrete applications.

Note: Corrugation for 12"-36" pipe measures 2 2/3" x ½"; for 42"-84" the corrugation measures 5" x 1" or 8" x 1".

Note: C = corrugated; F = flat.

Figure 7.31-6 Dewatering device on Riser with Trash Rack

Outlet Barrel: The drainpipe barrel of the principal spillway, which extends through the embankment, shall be designed to carry the flow provided by the riser of the principal spillway with the water level at the crest of the emergency spillway. The minimum size of the pipe shall be 12 inches in diameter to minimize clogging. The riser and all pipe connections shall be mechanically sound and completely watertight and not have any other holes, leaks, gashes, or perforations other than designed openings. Do not use dimple (mechanical) connectors for CM pipe under any circumstances. The connection between the riser and the barrel must be watertight to prevent local scouring. The use of plastic pipe through the dam should be done with caution because of potential deflection, creep and separation from surrounding embankment soil. The outlet of the barrel must be protected to prevent erosion or scour of downstream areas. Measures may include excavated plunge pools, riprap, impact basins, revetments, or other effective methods. Refer to Section 7.23 Outlet Protection. Where discharge occurs at or near the property line, drainage easements should be obtained in accordance with local ordinances. Caution should be given in directing all outlet water from the impoundment to a receiving watercourse so that natural flow paths are preserved above off-site property owners.

Anti-Seep Collars: Anti-seep collars are used to reduce uncontrolled seepage and prevent internal erosion or "piping" inside the dam along the drainpipe barrel. Anti-seep collars shall be used on the drainpipe barrel of the principal spillway within the normal saturation zone of the embankment to increase the seepage length by at least 10%, if either of the following two conditions is met:

1. The settled height of the embankment exceeds 10 feet.

2. The embankment has a low silt-clay content (Unified Soil Classes SM or GM) and the barrel is greater than 10 inches in diameter.

The anti-seep collars shall be installed within the saturated zone. The assumed normal saturation zone shall be determined by projecting a line at a slope of 4 horizontal: 1 vertical from the point where the normal water elevation (can be assumed to be the top of the principal spillway) meets the upstream slope to a point where this line intersects the invert of the barrel pipe or bottom of the cradle, whichever is lower. The collars shall extend a minimum of 2 feet around the barrel. The maximum spacing between collars shall be 14 times the projection of the collars above the barrel. Collars shall not be closer than 2 feet to a pipe joint. Collars should be placed sufficiently far apart to allow space for hauling and compacting equipment. Precautions should be taken to ensure that 95% compaction is achieved around the collars. Connections between the collars and the barrel shall be watertight. Plans should specify method of compaction around the pipe barrel to ensure adequacy and to prevent damage to the antiseep collars and joints. See Construction Details (Principal Spillway) and refer to Figure 7.31-7 for details. Drainage filter diaphragms may be substituted for anti-seep collars, per NRCS (2003) design practice guidelines.

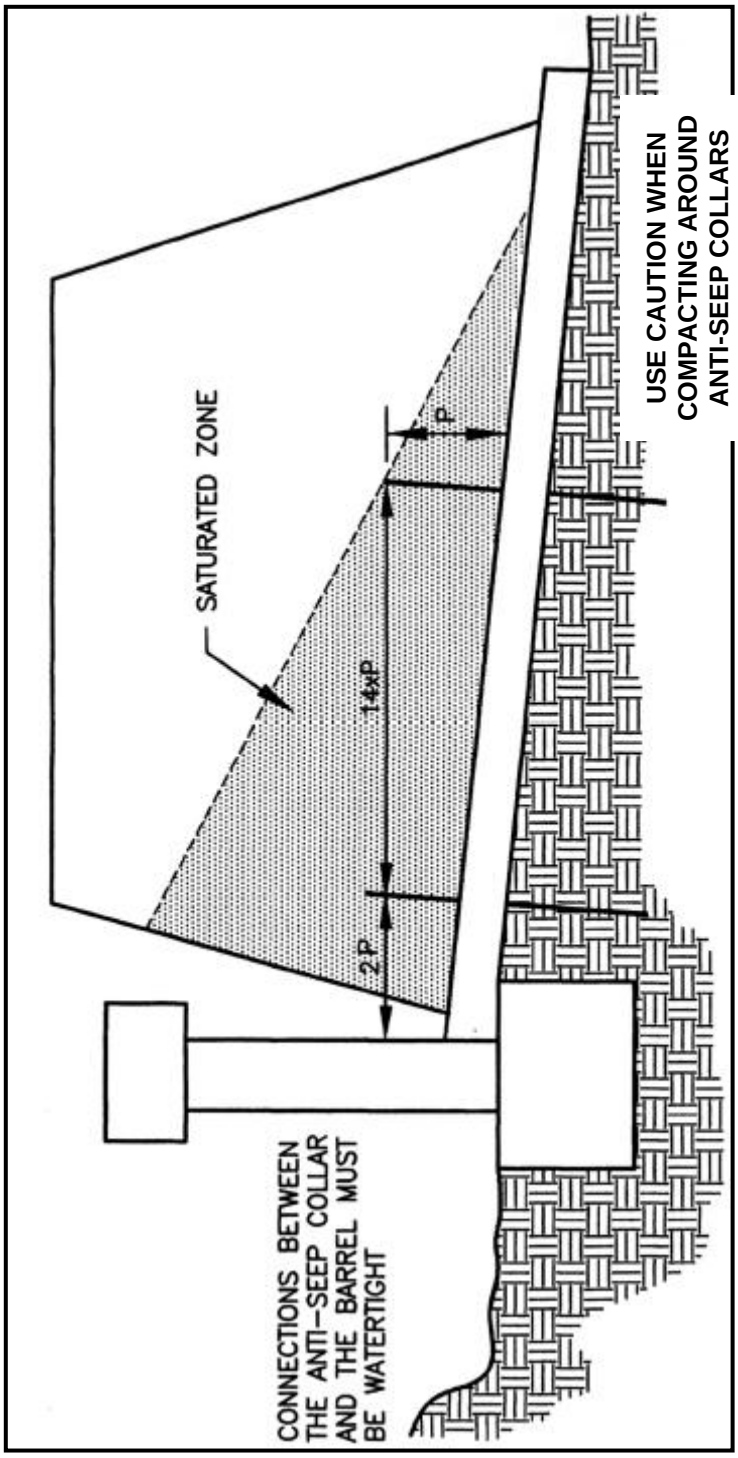


Figure 7.31-7 Anti-Seep Collar ***(Source: VA DSWC)***

Dewatering: Provisions shall be made to dewater the basin down to the permanent (wet) pool elevation. Particle characteristics, flow-through velocity, surface loading rate, turbulence levels, sediment concentration and other lesser factors can have a significant effect on the sediment trapping efficiency in a basin. The dry storage zone above the permanent pool should draw down in 72 hours to promote settling. Drawdown or dewatering must occur from the ponded water surface. Two

types of devices are acceptable for dewatering the dry storage zone of a sediment basin. The floating surface skimmer is the preferred dewatering method, as it dewaters from the top of the water column.

1. Perforated vertical pipe or tubing

An economical and efficient device for performing the drawdown is a section of perforated vertical pipe or tubing, which is connected to and braced to the principal spillway at two locations. The perforations in the pipe allow the upper 2 to 3 foot zone of pond water containing the lowest sediment concentration to be drawn off. The number, diameter and location of drawdown holes should be designed, specified and constructed to drain the dry storage volume in the 72-hour period. A slide gate type of valve is required at the bottom of this tubing for achieving the desired drawdown time and seasonal control. Figure 7.31-8 provides a schematic orientation of such a device. A dewatering operation procedure might be to keep the slide gate valve closed during dry periods, or close it before anticipated precipitation events. Then, during and after the precipitation event, the slide gate valve is manually adjusted to allow the draw down to begin. The amount of adjustment should be determined so that the draw down to the wet pool elevation occurs over a period of 72 hours, as stated above.

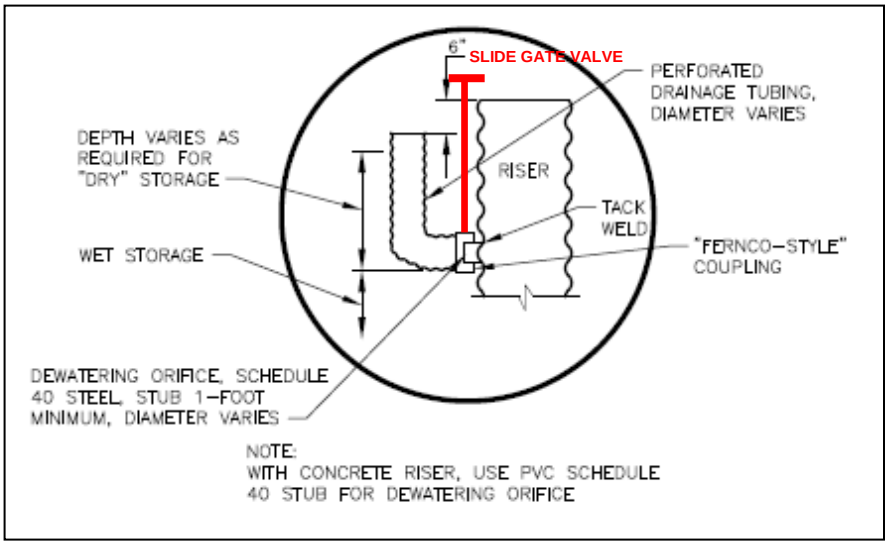


Figure 7.31-8 Slotted Drain Pipe Dewatering Device

2. Floating surface skimmer

Selection of floating skimmer and orifice sizes should be based on the volume of "dry" water storage to be drained over the dewatering time of 72 hours and designed according to skimmer manufacturer design specifications, charts and tables, calculators and procedures. The surface skimmer design and selection involves two steps:

1. Selecting appropriate overall skimmer size having a capacity for dewatering a specified volume (V) of "dry" storage water over a time period (t) of 72 hours (3 days).

2. Determining the skimmer's inlet orifice diameter sized for a flow based on Q = V/t and using either the manufacturer's orifice sizing tables or the

orifice equation with the recommended head (H) and coefficient (C) for a particular skimmer: $Q = CA_o \sqrt{2gH}$

Unlike stationary perforated pipe dewatering devices where the flow rate decreases as the dry pool zone dewaters, the flow rate will be constant for a surface skimmer since the head over the floating skimmer inlet orifice remains constant over the dewatering period.

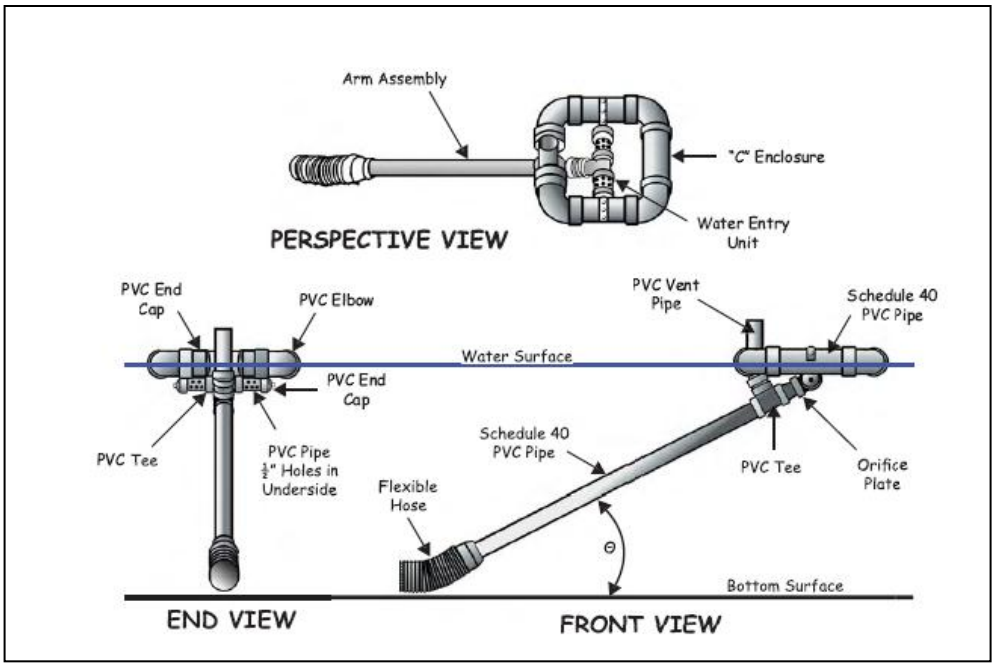


Figure 7.31-9 Schematic of a floating skimmer dewatering device

Include a pier constructed of concrete block or stone for the skimmer to rest upon to limit the dewatering depth and to prevent the skimmer from getting stuck in the muddy bottom. The top of the pier should be set at the elevation of the permanent wet pool. Figure 7.31-9 and Figures 7.31A and 7.31-10B below illustrate the construction and installation of a skimmer dewatering device and resting pier.

Because of the low flow capacity of the dewatering device or orifice and its potential for becoming clogged, no credit should be given for drawdown by the device in the calculation of the principal or emergency spillway locations.

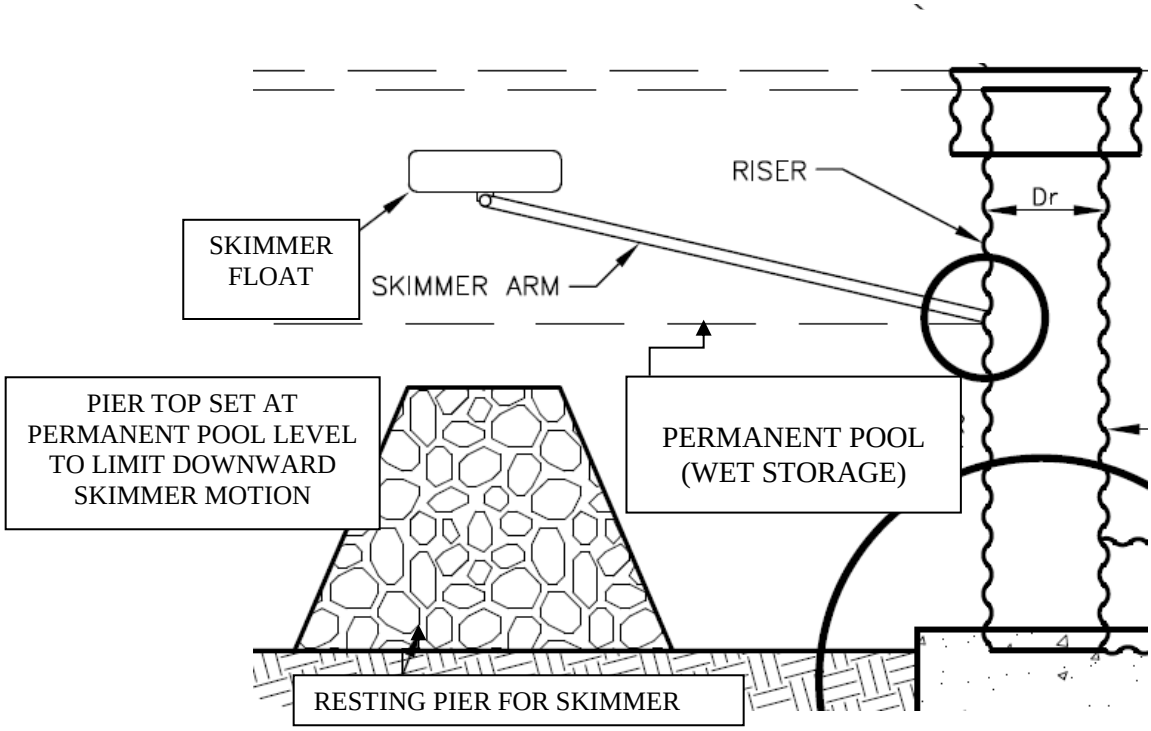


Figure 7.31-10A Skimmer Pier and Permanent Pool

Figure 7.31-10B Floating Skimmer Installation

STEP 4: SET THE EMERGENCY SPILLWAY AND TOP OF EMBANKMENT ELEVATIONS.

Emergency Spillway: The emergency spillway acts as a safety release for a sediment basin, or any impoundment structure, by conveying the larger, less frequent storms (minimum 25-year, 24-hour storm) through the basin without overtopping or damaging the embankment. The emergency spillway also acts as its name implies - an emergency outlet - in case emergency circumstances arise from excessive sedimentation or damage to the riser, which prevents flow through the

principal spillway. The emergency spillway shall consist of an open channel constructed adjacent to the embankment. The emergency spillway should be installed over undisturbed ground or consolidated soil, rather than over an unconsolidated embankment fill of the dam, whenever possible, to prevent damage to the dam. An emergency spillway constructed over a section of the embankment fill is susceptible to settlement, reduced freeboard, and dangerous scouring during the spillway design storm. The emergency spillway shall be lined with a non-erodible material based upon the designed shear stress in the channel (see Channel Design Section 7.27). Design of an emergency spillway requires the special expertise of a qualified, engineering design professional. The control section is a level portion of the spillway channel at the highest elevation in the channel. See Figure 7.31-9 for location of emergency spillway and Figure 7.31-11 for an example of an excavated earthen spillway.

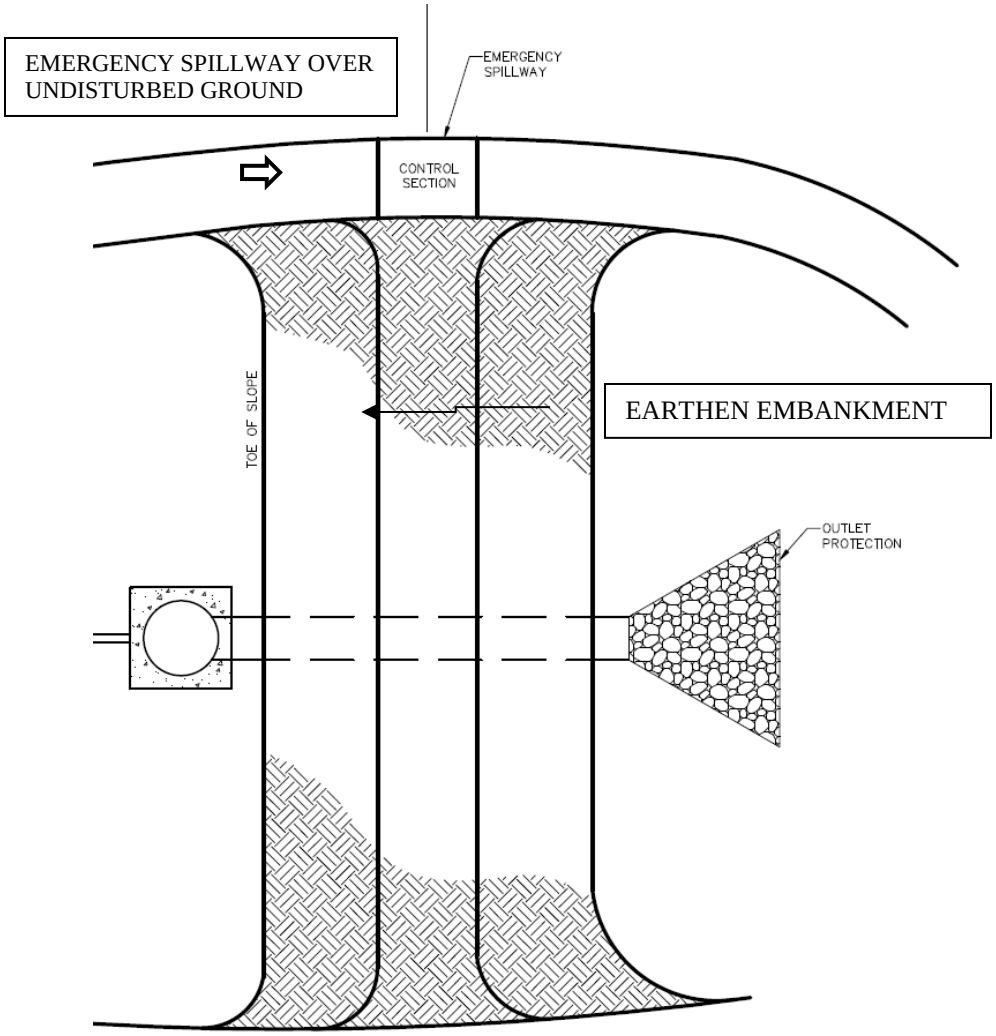


Figure 7.31-11 Earthen Embankment

An evaluation of site and downstream conditions must be made to determine the feasibility and justification for the incorporation of an emergency spillway. In

some cases, the site topography does not allow a spillway to be constructed in undisturbed material, and the temporary nature of the facility may not warrant the cost of disturbing more acreage to construct and armor a spillway. The principal spillway must then be sized as a combined spillway to convey all the design storms, through the 25-year storm at a minimum.

The outlet channel to which the emergency spillway discharges where the flow transitions from the spillway to a channel must be designed to prevent erosion based upon shear stress.

*Capacity***:** The emergency spillway shall be designed such that the 25-year 24-hour storm event is routed through the pond and discharge channel and allows for a minimum freeboard of 1.0 foot above the 25-year, 24-hour peak flow depth.

Design Elevations: The maximum 25-year storm pool elevation shall have a freeboard of at least 1.0 foot below the top of the embankment as shown in Figure 7.31-12.

Embankment Elevation: The height of the embankment dam is measured from its crest down to the lowest point of natural grade (at the downstream toe of the embankment). Embankment geometries are provided in the table below.

Table 7.31-2 Embankment geometries

Embankment Height, ft.	Top width	Upstream Side Slopes	Downstream Side slopes
<10	6 ft min.	2:1 or flatter	3:1 or flatter
10-14	8 ft. min.	2.5:1 or flatter	3:1 or flatter
15-19 ft	10 ft. min.	2.5:1 or flatter	3:1 or flatter

The site foundation for the embankment should be prepared by removing all vegetation, debris, topsoil, and large rocks down to competent material. Embankments should be keyed into the foundation soil. The embankment height should include a 10 percent settlement allowance across the longitudinal axis of the dam to ensure required freeboard. The minimum 1-foot freeboard required between the maximum 25-year design flow level and top of the dam is shown in Figure 7.31-12.

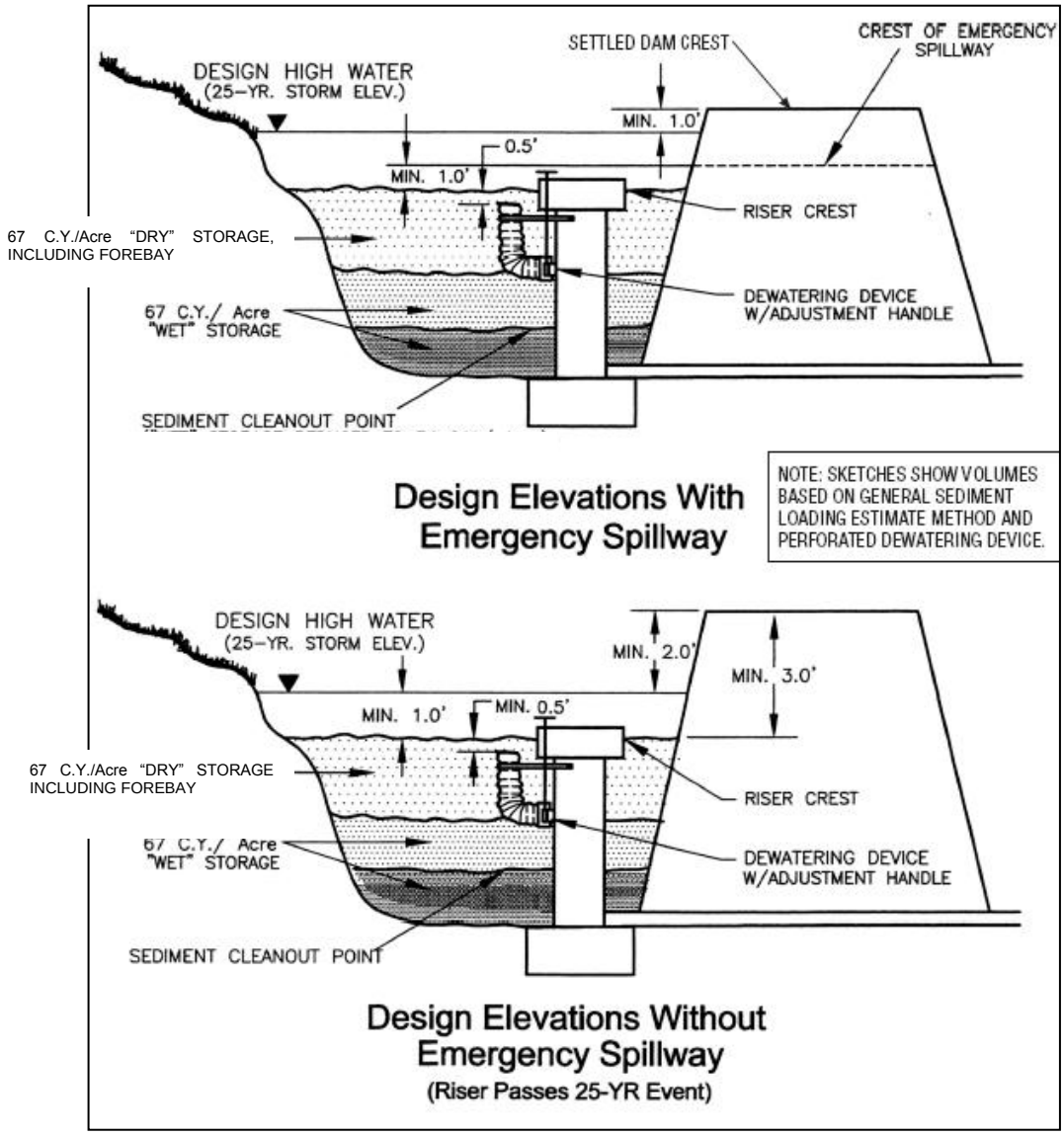


Figure 7.31-12 Schematic Drawing of Typical Sediment Basin (*Source: VA DSWC*)

Multiple Uses:

Sediment basins may remain in place after final site stabilization is completed to serve as permanent stormwater management structures. They also may be used *during* construction for stormwater management. Because the most practical location for a sediment basin is often the most practical location for a stormwater management basin, it is often desirable to utilize these structures for permanent stormwater management purposes. It should be noted, however, that in most cases, a typical structure's outlet control system would vary from construction to post construction periods. Care must be taken to avoid constructing an outlet control system, which will achieve the desired permanent stormwater management treatment but will not provide the necessary facility for the containment and settling of sediment-laden construction runoff. For example, a permanent stormwater detention structure may have a bottom control orifice in the riser, while a temporary sediment pond does not. Notably, the design for such

permanent flow control ponds is beyond the scope of these standards and specifications.

Equivalent Measures: For locations which serve 10 or more acres of disturbed and undisturbed drainage area (5 or more acres discharging into impaired or high quality waters), but where temporary sediment basins are not practical or feasible because of topographical or other physical constraints, equivalent control measures must be used until final stabilization of the site. Examples of equivalent control measures include combinations of multiple, smaller sediment ponds and sediment traps or other proven treatment processes. Where equivalent control measures are substituted for a sediment basin, the basis of and equivalency for trapping sediment using other BMPs must be justified in the SWPPP calculations and narrative to TDEC in terms of equivalent volume, surface area, and hydraulic capacity. The total trapping capacity of these must have an equivalent storage of 3,618 cubic feet (134 cubic yards) of runoff per acre. The total surface area must meet the minimum surface area requirement of 0.01 x Qp. The measure must be able to convey the design storm (2- or 5-year, 24-hour storm, as required).

Construction Specifications

Construction of the sediment basin shall be in accordance with the SWPPP, engineering drawings and specifications. Accurate implementation of specified design elevations, grades, dimensions and sizes, volumes, channel slopes, and erosion control materials are critical to successful and safe operation of the sediment basin. Elevations and dimensions should be constructed within ± 0.1 feet tolerance.. After construction the design engineer or landscape architect shall inspect the sediment basin, according to Site Assessment requirements, to confirm that the plans have been accurately implemented.

Plans and Specifications: The construction plans shall contain sufficient detail in the form of layout, typical details, elevations, dimensions, placement, and specification notes so that the designer's intent can be understood and be properly constructed.

Site Preparation: Areas under the proposed embankment (or any structural works related to the sediment basin) shall first be cleared, grubbed, and stripped of topsoil. All trees, vegetation, roots, and/or other objectionable or inappropriate materials should be removed and disposed of by appropriate methods. In order to facilitate clean out and restoration, the pool area should be cleared of all brush and trees.

Cut-Off Trench: For earth-fill embankments, a cutoff trench shall be excavated along the centerline of the earth fill embankment (dam) to prevent excessive seepage and possible internal erosion. The trench must extend at least 1 foot into a stable, impervious layer of soil and have a minimum depth of 2 feet. The cutoff trench shall extend up both abutments to the riser crest elevation. The minimum width shall be 4 feet, but also must be wide enough to permit operation of compaction equipment. The side slopes shall be no steeper than 1:1. Compaction requirements shall be the same as those for the embankment. The trench shall be drained during the backfilling/compacting operations.

Embankment: The fill material shall be taken from approved borrow areas (shown on the plans). It shall be clean mineral soil, free of roots, woody vegetation, stumps, sod, oversized stones, rocks, or other perishable or objectionable material. The fill material selected must have enough strength for the dam to remain stable and be

tight enough, when properly compacted, to prevent excessive percolation of water through the dam. Fill containing particles ranging from small gravel or coarse sand to fine sand and clay in desired proportion is appropriate. Any embankment material should contain approximately 20% clay particles by weight. Using the Unified Soil Classification System, SC (Clayey sand), GC (clayey gravel) and CL ("low liquid limit" clay) are among the preferred types of embankment soils. Areas on which fill is to be placed shall be scarified prior to placement of fill. The fill material should contain the proper amount of moisture to ensure that at least 95% compaction will be achieved. **Fill material will be placed in 6-inch continuous layers over the entire length of the fill.** Loosely placed embankment soil is subject to excessive settlement, severe erosion and slope failure. Compaction shall be obtained by routing the hauling equipment over the fill so that the entire surface of the fill is traversed by at least one wheel or tread track of the equipment, or by using a compactor. Note that the spillway barrel must be installed in the embankment as it is being constructed in lifts and proper compaction is occurring around the barrel, especially under the haunches. Special care shall be taken in compacting around the anti-seep collars (compact by hand, if necessary) to avoid damage and achieve desired compaction. The embankment shall be constructed to an elevation 10% higher than the design height to allow for settlement if compaction is obtained with hauling equipment. If compaction equipment is used, the overbuild may be reduced to not less than 5%. All components of the embankment must be stabilized with vegetation after construction is complete.

Principal Spillway: The riser of a metal pipe principal spillway shall be securely attached to the barrel pipe by welding the full circumference, making a watertight connection. The barrel and riser shall be placed on a firmly compacted soil foundation. The base of the riser shall be firmly anchored according to design criteria to prevent it from floating. Pervious materials such as sand, gravel, or crushed stone shall not be used as backfill around the barrel or anti-seep collars. Fill material shall be placed around the pipe in 4- inch layers and compacted until 95% compaction is achieved (compact by hand, if necessary). A minimum of two feet of fill shall be hand-compacted around and over the barrel before crossing it with construction equipment. An antiflotation device shall be constructed to prevent movement of the barrel and riser. A trash rack shall be properly fitted and attached to the principal spillway inlet. Soil should be hand-tamped around the pipe barrel, especially below the haunches, to achieve good compaction around the pipe and to prevent damage to the joints and antiseep collars.

Dewatering device: If a skimmer dewatering device is installed, attach a rope or other mechanism to the skimmer arm to retrieve it from the pond for cleaning. Install a rock or concrete pier for the skimmer to rest on. The pier should be at the elevation of the wet storage pool.

Emergency Spillway: The emergency spillway shall be installed in undisturbed ground. The implementation of planned elevations, grades, design width, entrance and exit channel slopes are critical to the successful operation of the emergency spillway and must be constructed within a tolerance of +/-0.1 feet. The emergency spillway should be protected against scouring and erosive shear stress. The spillway should be over-excavated to compensate for the thickness of linings such as rock rip rap in order to preserve its intended design flow capacity.

Inlets: Discharge water into the basin in a manner to prevent erosion and turbulence. Use diversions with outlet protection to divert sediment-laden water to the upper end of the pool area to prevent pond shortcutting and to improve basin trapping efficiency.

Baffles: At least two baffles shall be installed in the forebay. These should be installed as shown in Figures 7-31-2A and -2B and per Section 7.33.

Vegetative Stabilization: The embankment and emergency spillway of the sediment basin shall be stabilized immediately after construction of the basin. Trees and/or shrubs should not be allowed to grow upon the embankment due to the ability for the roots of such vegetation to destabilize the embankment and/or encourage piping.

Erosion prevention and sediment control: The construction of the sediment basin shall be carried out in a manner such that it does not result in sediment problems downstream.

Health and Safety: All state and local requirements shall be met concerning fencing and signs warning the public of the hazards of soft, saturated sediment and flood water. Avoid steep side slopes, and fence - mark basins with warning signs, especially in urban areas where trespassing is likely. The designer and developer should be aware of the potential hazards that a temporary wet pond represents to the health and safety of a neighborhood. Sediment basins can be attractive to children and can be dangerous to those who may accidentally slip into the water and soft mud or who may become entrapped at flowing inlets. Incidents have been reported involving children drowning at construction site sediment ponds. The basin area should, therefore, be fenced or otherwise made inaccessible to persons or animals, unless this is deemed unnecessary due to the remoteness of the site or other circumstances. Strategically placed signs around the impoundment reading "DANGER KEEP OUT" or "DANGER-QUICKSAND" should also be installed. In addition to signs and fences, consideration should be given to frequent inspection, regular maintenance and provision for security at such facilities. Special consideration may need to be given in pond design, operation and maintenance in areas of the state where health hazards stemming from mosquito breeding and West Nile Virus have occurred. In any case, local ordinances and regulations regarding health and safety must be adhered to.

Final Disposal: When temporary structures have served their intended purpose and the contributing drainage area has been properly stabilized, and unless the sediment pond is scheduled for conversion into a permanent stormwater detention facility, the embankment and resulting sediment deposits are to be leveled or otherwise disposed of in accordance with the SWPPP. The proposed use of a sediment basin site will often dictate final disposition of the basin and any sediment contained therein. If the site is scheduled for future construction, then the embankment and trapped sediment must be removed, safely disposed of, and backfilled with a structural fill. When the basin area is to remain open space, the pond may be pumped dry, graded and backfilled.

Maintenance and Inspection Points

Sediment shall be removed from the forebay (and upstream energy dissipation structure, if provided) when 50% of the storage has been filled with sediment. Removing sediment from the dry forebay is much easier than removing sediment from the wet portion of the sediment basin. Also, sediment should be removed from the wet portion of the basin before the sediment level reaches higher than 1 foot below the bottom of the dewatering orifice, or before one-half of the permanent pool volume has been filled in, whichever occurs first. Plans for the sediment basin should indicate the methods for properly disposing of sediment removed from the basin. Possible alternatives are to use the material in fill areas on-site or removal to an approved off-site location.

Accumulated sediment shall be removed from the basin as specified in the SWPPP and/or plan sheets. Sediment shall not enter adjacent streams or drainage ways during sediment removal or disposal. The sediment shall not be deposited downstream from the embankment, adjacent to a stream or floodplain.

Other inspection check points include:

- Inspect storage areas for stabilization of accumulated sediments.
- Check for erosion at the entrances into the basin. These areas should be stabilized to reduce basin maintenance needs.
- Check for blocked spillway systems, including dewatering devices. Remove debris from the basin that may get lodged in the spillways.
- Clean dewatering device(s)
- Check for evidence of piping and internal erosion along the principal spillway barrel by inspecting for embankment crest cracks and subsidence over the barrel and for lost embankment soil appearing at the outlet from along the outside surface of the discharge pipe. Most embankment failures occur at this point.
- If possible, look up the inside of the outlet pipe with a flashlight to check for joint failures
- Inspect the entire embankment for
    - Evidence of erosion or significant settling
    - Downstream slope bulges
    - Structural instability (initial formation of slides)
    - Longitudinal and lateral cracking
- Inspect downstream from the outlet structures for evidence of erosion.
- Inspect the baffles to ensure they are properly anchored and haven't deteriorated.

References

Barfield, B. J. and M.L. Clar, Erosion and Sediment Control Practices, Report to the Sediment and Stormwater Division, Maryland Water Resources Administration, 1986.

TDOT Design Division Drainage Manual

North Carolina Erosion and Sediment Control Planning and Design Manual

SEDIMENT CONTROL PRACTICES

7.33 POROUS BAFFLES

Definition Porous baffles are made of highly porous materials such as coir or jute netting. Porous baffles installed inside temporary sediment traps and sediment basins reduce the velocity and turbulence of the water flowing through the measure, distribute the flow, and facilitate the settling of sediment from the water before discharge.

Purpose Improve the rate of sediment settling by distributing the flow and reducing turbulence. Sediment traps and basins are designed to temporarily pool runoff water to allow sediment to settle before the water is discharged. Unfortunately, these measures are not typically very efficient due to high turbulence and short circuiting flows which take runoff quickly to the outlet with little residence time for settling to occur.

Conditions Where Practice Applies Baffles can be installed in any temporary sediment trap or sediment basin. A secondary benefit of installing porous baffles in sediment traps and basins is that the majority of the sediment load tends to settle on the upstream side of the first porous baffle, making maintenance and cleanout of the sediment storage area much easier.

Planning Considerations Porous baffles effectively spread the flow across the entire width of a sediment basin or trap. Water flows through the baffle material but is slowed sufficiently to back up the flow, causing it to spread across the entire width of the baffle. Spreading the flow in this manner utilizes the full cross section of the sediment storage area, which in turn reduces the flow rates. In addition, turbulent flow is reduced. This combination increases sediment deposition and retention and also decreases the particle size of sediment settling in the storage area.

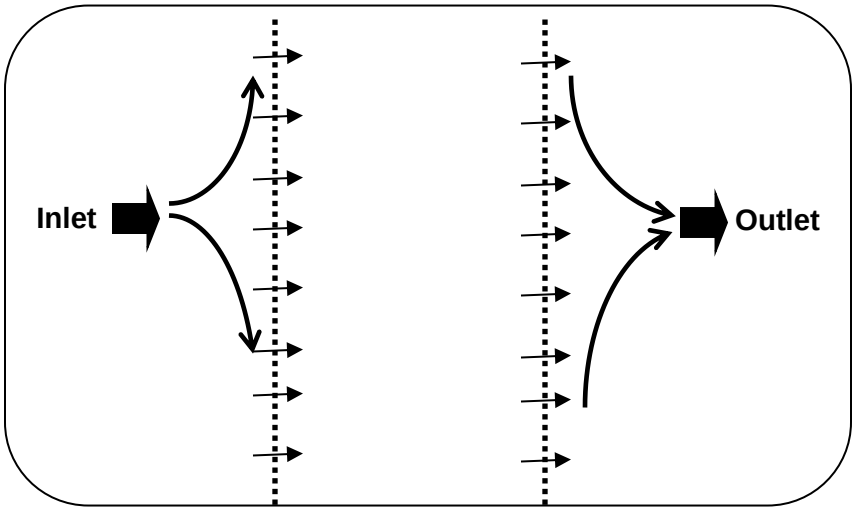


Figure 7.33-1 Porous baffle spreading flow in a sediment trap

Installation of porous baffles is similar to silt fence. The baffles must be installed perpendicular to flow in the sediment storage area. At least two baffles must be installed to be most effective.

Design Criteria

Refer to the design for sediment basins and sediment traps (Section 7.31-7.32).

The porous baffles should be shown on the design plans (and installed in the field) to divide the basin into three sections.

Materials such as 0.14 lb/ft^2 (20 oz/yd^2) coir erosion blanket, coir mesh, or jute fabric can be used to construct the baffle. See Table 7.33-1 for material specifications for coir baffles. Silt fence material is not porous enough to allow enough flow through the material fast enough and can therefore have flow over the material and cause turbulent flow on the downstream side, so it is not recommended. Wire backing can be installed to provide structural support for the baffles between posts. A support wire or rope across the top will help prevent excessive sagging if the material is attached to it with strong zip ties or similar fastenings. These structures work well and can be prefabricated off site and quickly installed.

Table 7.33-1 Coir Baffle Material Specifications (*Source: NCDOT)*

100% coconut fiber (coir) twine woven into high strength matrix	
Thickness	0.30 in. minimum
Tensile strength	1248 x 626 lb/ft minimum
Elongation	34% x 38% maximum
Flexibility (mg-cm)	65030 x 29590
Flow velocity	Observed 11 ft/sec
Weight	20 oz/yd^2
Size	6.6 x 164 ft (120 yd^2)
Open area	50%

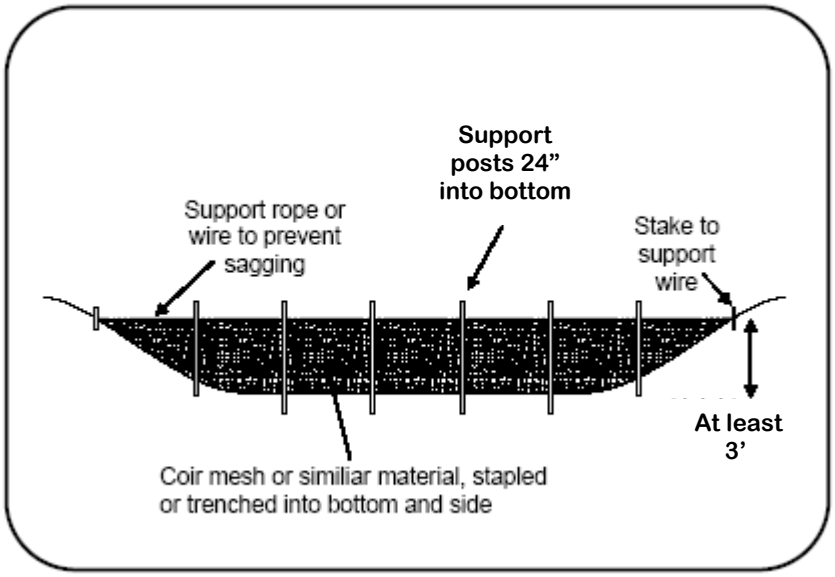


Figure 7.33-2 Cross section of a porous baffle in a sediment trap (*Source: NCDENR)*

Note that in Figure 7.33-2 there is no weir in the baffles because water flows through the porous baffle, not over it.

Construction Specifications

Staples

- Provide staples made of 0.125 in. diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Posts

- Steel posts shall be T-type at least 5 ft. in length, approximately 1 3/8" wide measured parallel to the fence, and have a minimum weight of 1.25 lb/ft of length. The post shall be equipped with an anchor plate having a minimum area of 14.0 square inches, and shall be of the self-fastener angle steel type to have a means of retaining wire and coir fiber mat in the desired position without displacement.

Wire

- Provide 9-gauge high tension wire strand of variable lengths.

Construction

Place the coir fiber baffles immediately upon excavation of basins or traps. Install baffles as required in Sections 7.31 Sediment basins and 7.32 Sediment traps. Steel posts shall be placed at a depth of 2 ft. below the bottom of the basin, with a maximum spacing of 4 ft. The top height of the coir fiber baffles shall not be below the elevation of the emergency spillway base of dams and basins. Attach a 9-gauge high-tension wire strand to the steel posts at a height of 3 ft. with plastic ties or wire fasteners. To anchor the coir fiber mat, install a steel post into the side of the basin at a variable depth at a height of 3 ft. from the bottom of the basin. Secure anchor post to the upright steel post in basin with wire fasteners.

The porous baffle material shall be draped over the wire strand to a minimum of 3 ft. of material on each side of the strand. Secure the baffle material to the wire strand with plastic ties or wire fasteners. Place staples across the matting at ends and junctions approximately 1 ft. apart at the bottom and side slopes of the basin or trap. Overlap matting at least 6" where 2 or more widths of matting are installed side by side.

Maintenance and Inspection Points

- Inspect the sediment deposition cells created by the baffles. Heavier sediments will accumulate in the upper most cell.
- Clean sediment from the cells when half of the storage capacity depth has been filled.
- Ensure that baffle material stays securely installed along the sediment trap sides and in the bottom. Material should stay taunt across the trap.
- Watch for scour along the sides of the baffle.
- Replace baffle material if torn or if evidence of deterioration is noted.

References

North Carolina State University Cooperative Extension, Soil Facts

North Carolina Department of Environment and Natural Resources, Erosion and Sediment Control Planning and Design Manual

North Carolina Department of Transportation, Roadside Environmental Details

SEDIMENT CONTROL PRACTICES

7.34 SILT FENCE

SILT FENCE

Definition

A temporary sediment control measure, composed of woven geotextile fabric supported by steel or wood posts, used to intercept sediment transported from areas where runoff occurs as sheet flow.

Purpose

To prevent sediment carried by sheet flow from leaving the site and entering natural drainage ways or storm drainage systems by slowing storm water runoff, causing ponding and the deposition of sediment at the structure. Silt fence does not filter sediment.

Conditions Where Practice Applies

Silt fence may be used in a variety of locations including:

- at the toe of, or on, an exposed slope
- around the perimeter of an exposed construction site
- along the banks of ditches or swales
- around the perimeter of a soil stockpile
- around buffer areas

Silt fence shall not be installed across streams, ditches, waterways, or other concentrated flow areas.

Planning Considerations

Silt fence is a system to retain sediment on the construction site. The fence retains sediment primarily by retarding flow and promoting deposition. In operation, the geotextile silt fence material ponds runoff behind it, as the flow rate through the geotextile is often much lower than the flow rate of the runoff coming to the silt fence. Ponding behind the silt fence is necessary to encourage sediment settling. The designer should anticipate ponding and provide sufficient storage areas and overflow outlets to prevent flows from overtopping the fence. Since silt fence is not designed to withstand high water levels, locate them so that only shallow pools can form. Tie the ends of silt fence into higher ground to prevent flow around the end of the fence before the pool reaches design level. Silt fence should be curled uphill

on each end of the fence in a "J" pattern to prevent end flow and scour. Provide stabilized outlets to protect the fence system and release storm flows that exceed the design storm.

Deposition occurs as the storage pool forms behind the fence. The designer can direct flows to specified deposition areas through appropriate positioning of the fence or by providing an excavated area behind the fence. Plan deposition areas at accessible points to promote routine cleanout and maintenance.

Silt fence serves no function along ridges or near drainage divides where there is little movement of water. Confining or diverting runoff unnecessarily with a sediment fence may create erosion and sedimentation problems that would not otherwise occur.

Anchoring of silt fence is critical. The toe of the fabric must be anchored in a trench backfilled with compacted earth. Mechanical compaction must be provided in order for the fence to effectively pond runoff.

Design Criteria

Silt fence should be installed along the contour, never up or down a slope. This is essential to ensure that the fence will not accidentally concentrate stormwater flows, thus creating worse erosion problems.

Silt fence can be installed without backing or with wire backing.

- The maximum drainage area for a continuous fence without backing shall be 1/4 acre per 100 linear feet of fence length, up to a maximum area of 2 acres. The maximum slope length behind the fence on the upslope side should be 110 feet (as measured along the ground surface).
- The maximum drainage area for a continuous silt fence with backing shall be 1 acre per 150 linear feet of fence length. The slope length above the silt fence with backing should be no more than 300 feet.

Silt fence should be installed so as to be as close as possible to the ground contour. The bottom of the fence at the ground line should be on a 0% grade, plus or minus 0.5%.

When used at the bottom of a slope, silt fence should be installed 5 feet to 7 feet away from the toe to allow extra space for the ponding of water and collection of sediments.

The expected life span of the silt fence is 6 to 12 months. Therefore, projects of long duration may require a complete replacement of the silt fence. The quantity for silt fence to be in place for a long period of time should be based on the assumption that the material will be replaced every 9 months, on the average.

Table 7.34-1 contains the fabric specifications for silt fence with and without backing. For silt fence without backing, posts shall be hardwood posts that are 2.25" (nominal) x 2.25" (nominal) x 58". T-type steel posts also may be used. Silt fence with backing shall be installed on a minimum of 1.25 lb/ft steel posts with 14 gauge wire backing that has a maximum mesh size of 6 inches. Ensure that steel posts have projections for fastening the fabric.

Table 7.34-1 Silt Fence Fabric Specifications

	Test Material	Without backing	With backing
Geotextile fabric type		Woven slit film	Woven monofilament
Apparent opening size	ASTM D4751	#30 to #70 standard sieve	#70 to #100 standard sieve
Water flux	ASTM D4491	≥ 4 gpm/ft^2	≥ 18 gpm/ft^2
Tensile strength	ASTM D4632	≥ 120 lb. (warp direction) 100 lb. (fill direction)	≥ 310 lb. (warp direction) 200 lb. (fill direction)
UV Stability (after 500 hrs)	ASTM D4355	≥ 70%	≥ 90%
Elongation	ASTM D4632	≤ 20% max.	---
Burst strength	ASTM D3786	≥ 250 PSI	≥ 400 psi
Puncture strength	ASTM D4833	≥ 60 lb.	≥ 105 lb.
Trapezoidal tear	ASTM D4533	≥ 50 lb (warp direction) 40 lb (fill direction)	≥ 100 lb (warp direction) 60 lb (fill direction)

Construction Specifications

- Ensure that the height of the sediment fence does not exceed 24 inches above the ground surface. Ponding water depth should not exceed 1.5 feet. (Higher fences may impound volumes of water sufficient to cause failure of the structure.)
- Construct the filter fabric from a continuous roll cut to the length of the barrier to avoid joints. When joints are necessary, securely fasten the filter cloth only at a support post with 4 feet minimum overlap to the next post or roll the fabric together and fasten to one post to create a stronger joint. Where joints are necessary, plan the roll layout so as not to have joints at low points.
- Do not attach filter fabric to trees.
- When silt fence is installed adjacent to streams, wetlands and other natural resources, silt fence with backing should be used.
- Install posts no more than 6 feet apart.
- Install posts 2 feet deep on the downstream side of the silt fence, and as close as possible to the fabric, enabling posts to support the fabric from upstream water pressure.
- Securely attach the silt fence fabric to the posts on the **upstream** side of the posts. For steel posts, attach fabric to the posts using wire or plastic zip ties with a minimum 50 pound tensile strength, at least 5 to a post. Three ties should be installed in the upper 8 inches for top strength. Ties should be installed on the diagonal, as opposed to on the horizontal, to grab more strands. For hardwood posts, attach fabric with 17 gauge wire staples (3/4" wide x 1/2" long), at least 5 to a post. 3 staples should be installed in the upper 8 inches for top strength.
- Install J-hooks for confining the water behind the fence and maximizing the trapping efficiency. See Figure 7.34-1 below.

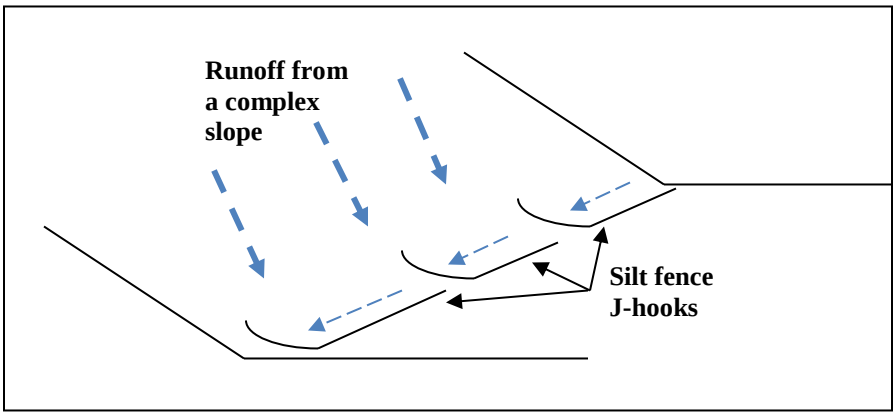


Figure 7.34-1 J-Hook Installation Example

Traditional silt fence trenching method for installation:

- Excavate a trench approximately 4 inches wide and 6 inches deep along the proposed line of posts and upslope from the barrier
- Place 10 inches of the fabric along the bottom and side of the trench. Backfill the trench with soil placed over the filter fabric and compact. Thorough compaction of the backfill is critical to silt fence performance. Poor compaction can cause failure of the silt fence along the toe.
- The base of both end posts should be at least one foot higher than the middle of the fence. Check with a level as necessary.

Slicing method for installation:

- A slicing machine can be used to install silt fence. This method of installation provides excellent compaction and joint integrity along the toe.
- Posts should be set a maximum of 6 feet apart.
- The geotextile fabric should be inserted in a slit in the soil 8-12 inches deep. The slit should be created such that a horizontal chisel point, at the base of a soil-slicing blade, slightly disrupts the soil upward as the blade slices through the soil. This upward disruption minimizes horizontal compaction and creates an optimal soil condition for mechanical compaction against the geotextile. The geotextile should be mechanically inserted directly behind the soil-slicing blade in a simultaneous operation, achieving consistent placement and depth. No turning over (plowing) of soil is allowed for the slicing method.

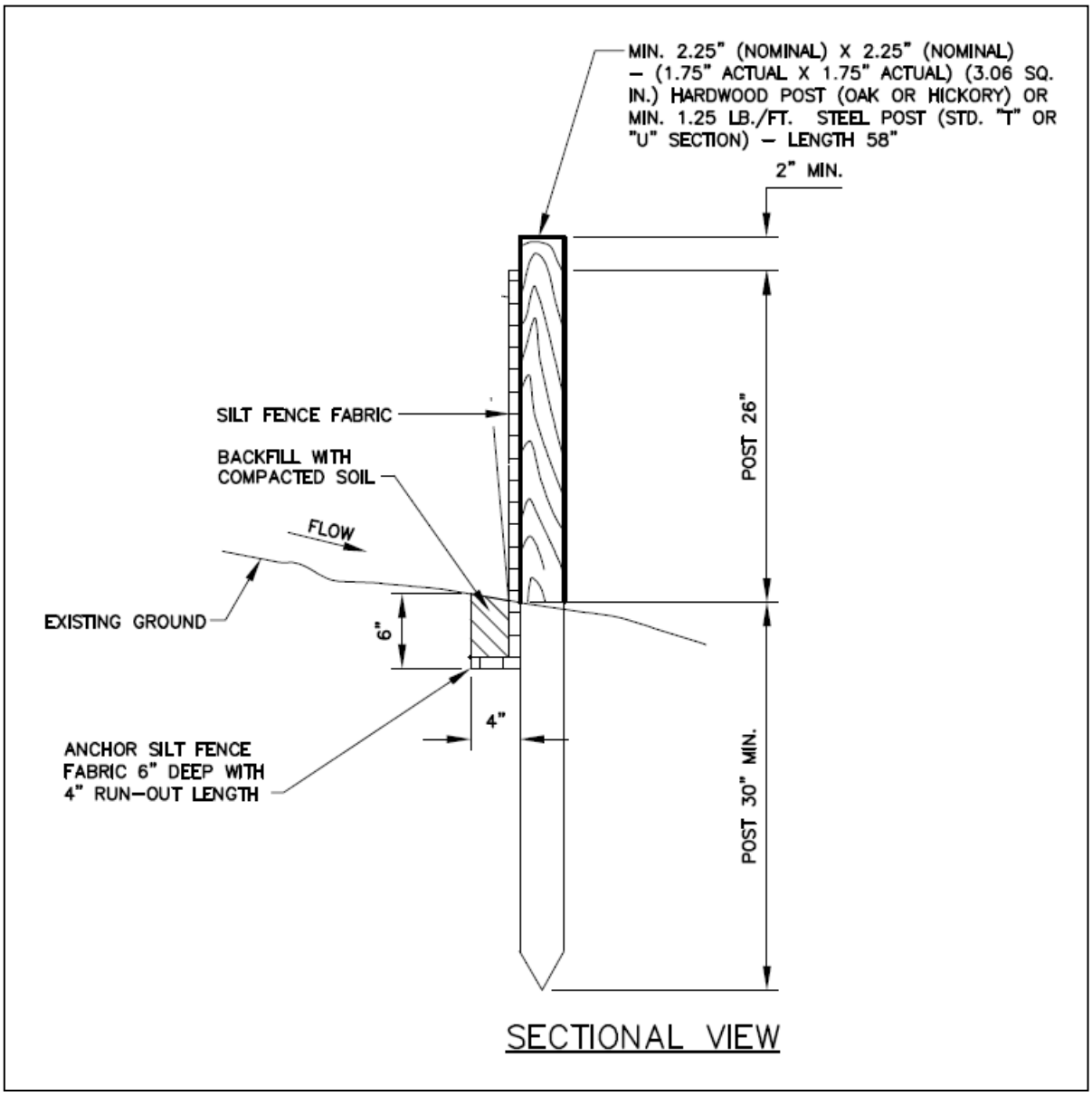


Figure 7.34-2 Silt fence details

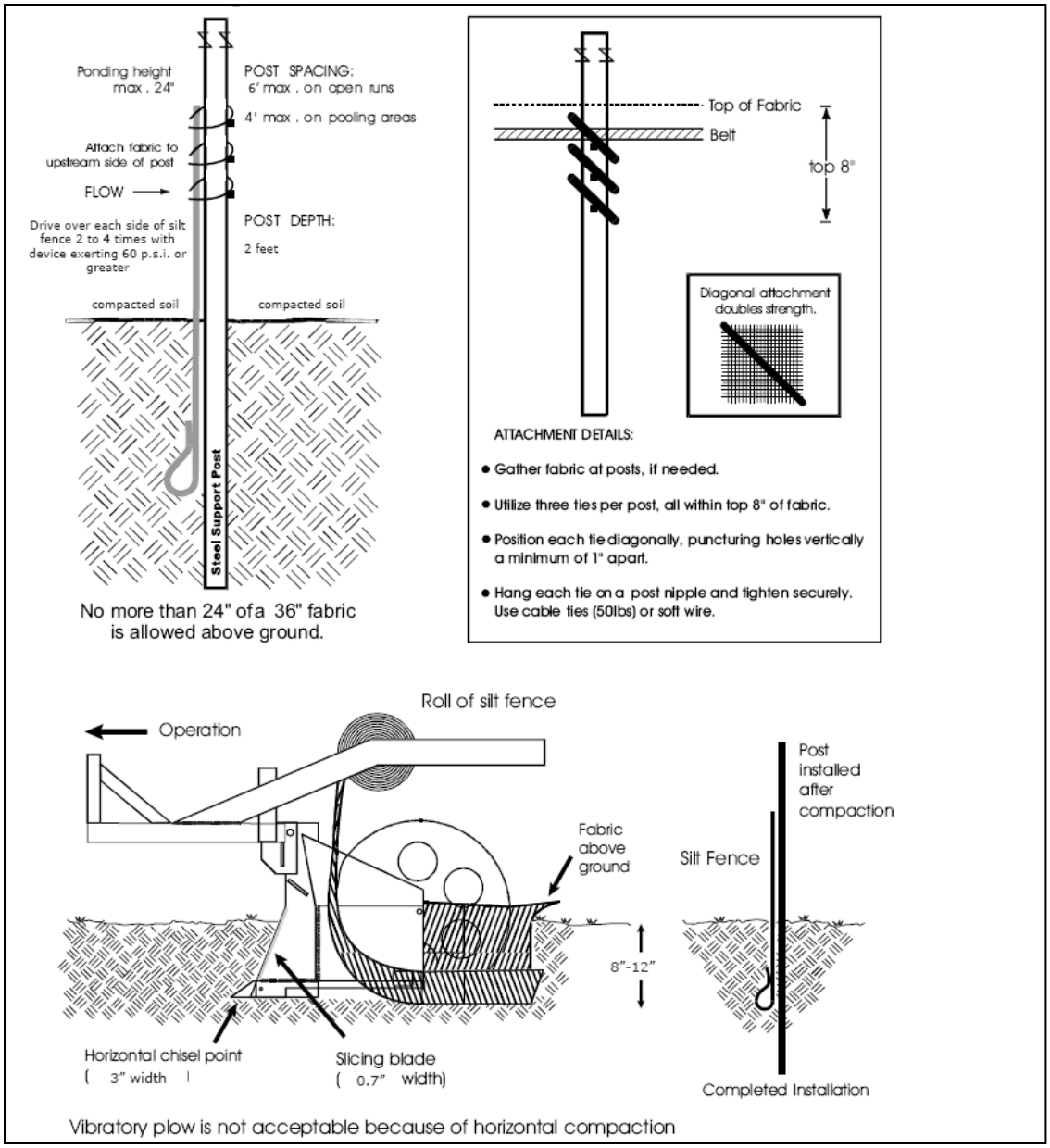


Figure 7.34-3 Silt Fence Slicer Installation Details (*Adapted from Silt Fence That Works)*

Maintenance and Inspection Points

Remove sediment once it has accumulated to ½ the original height of the barrier.

Replace filter fabric whenever it is worn or has deteriorated to such an extent so that the effectiveness of the fabric is reduced.

All sediment accumulated at the fence should be removed and properly disposed of before the fence is removed.

Repair sagging silt fence to prevent failure or overtopping.

Monitor the toe for evidence of piping or erosion along the toe. Install J-hooks wherever runoff flows along the toe of the fencing to prevent undermining.

Silt fence should remain in place until disturbed areas have been permanently stabilized.

References

TDOT Design Division Drainage Manual

TDOT Erosion Control Standard Drawing EC-STR-3B

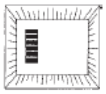
North Carolina Erosion and Sediment Control Planning and Design Manual

Devon Distributing Corporation. http://www.tommy-sfm.com/index.html

Metropolitan Council (Minnesota) Minnesota Urban Small Sites BMP Manual

SEDIMENT CONTROL PRACTICES

7.35 INLET PROTECTION



EXCAVATED INLET PROTECTION

HARDWARE CLOTH AND GRAVEL INLET PROTECTION

ROCK RING INLET PROTECTION

BLOCK AND GRAVEL INLET PROTECTION

Definition A temporary protective device formed around a storm drain drop inlet to trap sediment.

Purpose To prevent sediment from entering the storm drainage system, prior to temporary or permanent stabilization of the disturbed area.

Conditions Where Practice Applies Many different types of inlet protection devices are available. The types highlighted in this section are non-manufactured. Manufactured inlet protection devices are allowable alternatives, provided the following:

- At least 3600 ft^3/acre of drainage is available to store sediment.
- No more than 1 acre of drainage to each measure - 0.5 acre drainage area per each measure is preferable.
- An overflow is provided to safely pass storm events larger than the 5-yr storm.

Non-manufactured inlet protection devices:

Excavated Drop Inlet Protection is applicable where relatively heavy flows are expected and overflow capability is needed.

Hardware Cloth and Gravel Inlet Protection is applicable where the flow is light to moderate. This method is effective where the inlet is expected to drain shallow sheet flow. The immediate land area around the inlet should be relatively flat (less than 1 percent) and located so that accumulated sediment can be easily removed.

Block and Gravel Inlet Protection is applicable to both drop inlets and curb inlets where heavy flows are expected, and an overflow capacity is necessary to prevent excessive ponding around the structure. Shallow temporary flooding after rainfall however, should be expected.

Sod Drop Inlet Protection is applicable where the drainage area of the drop inlet

has been permanently seeded and mulched, and the immediate surrounding area is to remain in dense vegetation. This practice is well suited for lawns adjacent to large buildings.

Rock Ring Inlet Protection is applicable at drop inlets with large drainage areas or at drop inlets that receive high velocity water flows, possibly from many directions.

Rock Pipe Inlet Protection is applicable at pipes with a maximum diameter of 36 inches. This inlet protection may be used to supplement additional sediment traps or basins at the pipe outlet, or used in combination with an excavated sediment storage area to serve as a temporary sediment trap.

Silt fence inlet protection is not allowed, as the failure rate for this type of inlet protection is very high.

Planning Considerations

Inlet protection should be installed at or around all storm drain drop inlets that receive runoff from disturbed areas. Inlet protection should not be used in streams or other natural water resources. It should also not be placed in ditches, swales or other depressions with a depth greater than 1 foot. Due to the high maintenance requirements, inlet protection should be considered secondary sediment controls and not primary sediment controls. These measures should be used in conjunction with other erosion prevention and sediment control measures to be effective. Exercise installation caution so that stormwater runoff cannot back up out adjacent traffic lanes.

Design Criteria

Excavated Drop Inlet Protection (Figure 7.35-1):

- Limit the drainage area to 1 acre. Keep the minimum depth at 1 foot and the maximum depth of 2 feet as measured from the crest of the inlet structure.
- Maintain side slopes around the excavation no steeper than 2:1
- Keep the minimum volume of excavated area around the drop inlet at approximately 3600 ft^3/acre of drainage.
- Shape the sediment storage area to fit site conditions, with the longest dimension oriented toward the longest inflow area to provide maximum trap efficiency.
- Install provisions for draining the temporary pool to improve trapping efficiency for small storms and to avoid problems from standing water after heavy rains.

Hardware Cloth and Gravel Inlet Protection (Figure 7.35-2):

- Ensure that drainage area does not exceed 1 acre per inlet.
- Secure the wire mesh hardware cloth barriers using steel T posts. The posts need to be 1.25 lb/linear ft steel with a minimum length of 5 feet. Make sure the posts have projections to facilitate fastening the hardware cloth. Securely drive each stake into the ground to a minimum depth of 2 feet. The maximum spacing for the posts is 4 feet.
- The wire mesh should be at least a 19-gauge hardware cloth with a ¼ inch mesh opening. The total height should be a minimum of 2 feet. Providing a

flap of hardware cloth on the ground projecting away from the inlet can aid in removal of the stone at the project's completion. Place #57 washed stone to a height of 16 inches on the upstream face of the cloth with an outside slope of 2:1.

- The top elevation of the structure must be at least 12 inches lower than the ground elevation downslope from the inlet. It is important that all storm flows pass over the structure into the storm drain and not bypass the structure. Temporary dikes below the structure may be necessary to prevent bypass flow.

Block and Gravel Inlet Protection (Figure 7.35-3):

- Keep the drainage area no greater than 1 acre unless site conditions allow for frequent removal and adequate disposal of accumulated sediment.
- Keep the height of the barrier at least 12 inches and no greater than 24 inches. Do not use mortar. Limit the height to prevent excess ponding and bypass flow.
- Recess the first course of blocks at least 2 inches below the crest opening of the storm drain for lateral support. Support subsequent courses laterally if needed by placing a 2 x 4-inch wood stud through the block openings that are perpendicular to the block course needing support. Lay some blocks on their side in the bottom row for dewatering the pool.
- Place gravel just below the top of the blocks on slopes of 2:1 or flatter. Place hardware cloth or comparable wire mesh with 1/2-inch openings over all block openings to hold gravel in place.

Sod Drop Inlet Protection (Figure 7.35-4):

- Keep velocity of design flow over the sod area at all points less than 5 ft/sec.
- Place sod to form a turf mat completely covering the soil surface for a minimum distance of 4 feet from each side of the drop inlet where runoff will enter.
- Maintain the slope of the sodded area no greater than 4:1.
- Keep the drainage area no greater than 2 acres; maintain this area undisturbed or stabilize it.

Rock Ring Inlet Protection:

- Place measure at least 30 feet away from vehicular traffic. This inlet protection can be modified to protect one side of the inlet if only one side receives flow.
- Stone – A minimum 1-foot wide level area set 4 inches below the drop inlet crest will add protection against the entrance of material. Structural stone should be Class A-1 riprap with 2:1 side slope, and a minimum crest width of 18 inches. The height of the stone should be from 2 to 3.5 feet. The outside face of the riprap should be covered in a 12-inch thick layer of #5 or #57 washed stone. Wire mesh with 2-inch openings may be placed over the drain grating but must be inspected frequently to avoid blockage by trash.

- The top elevation of the stone structure must be at least 12 inches lower than the ground elevation downslope from the inlet. It is important that all stormwater flow over the structure into the storm drain, and not past the structure. Temporary diking below the structure may be necessary to prevent bypass flow. Material may be excavated from inside the sediment pool for this purpose.

Rock Pipe Inlet Protection (Figure 7.35-5):

- When used in combination with an excavated sediment storage area to serve as a temporary sediment trap, the design criteria for temporary sediment traps must be satisfied. The maximum drainage area should be 5 acres, and 3600 cubic feet of sediment storage per acre of drainage area should be provided.
- The minimum stone height should be 2 feet, with side slopes no steeper than 2:1. The stone "horseshoe" around the pipe inlet should be constructed of Class A-1 or Class B riprap, with a minimum crest width of 3 feet. The outside face of the riprap should be coved with a 12-inch thick layer of #57 washed stone.
- In preparing plans for rock pipe inlet protection, it is important to protect the embankment over the pipe from overtopping. The top of the stone should be a minimum of 1 foot below the top of the fill over the pipe. The stone should tie into the fill on both sides of the pipe. The inside toe of the stone should be no closer than 2 feet from the culvert opening to allow passage of high flows.
- The sediment storage area should be excavated upstream of the rock pipe inlet protection, with a minimum depth of 18 inches below grade.

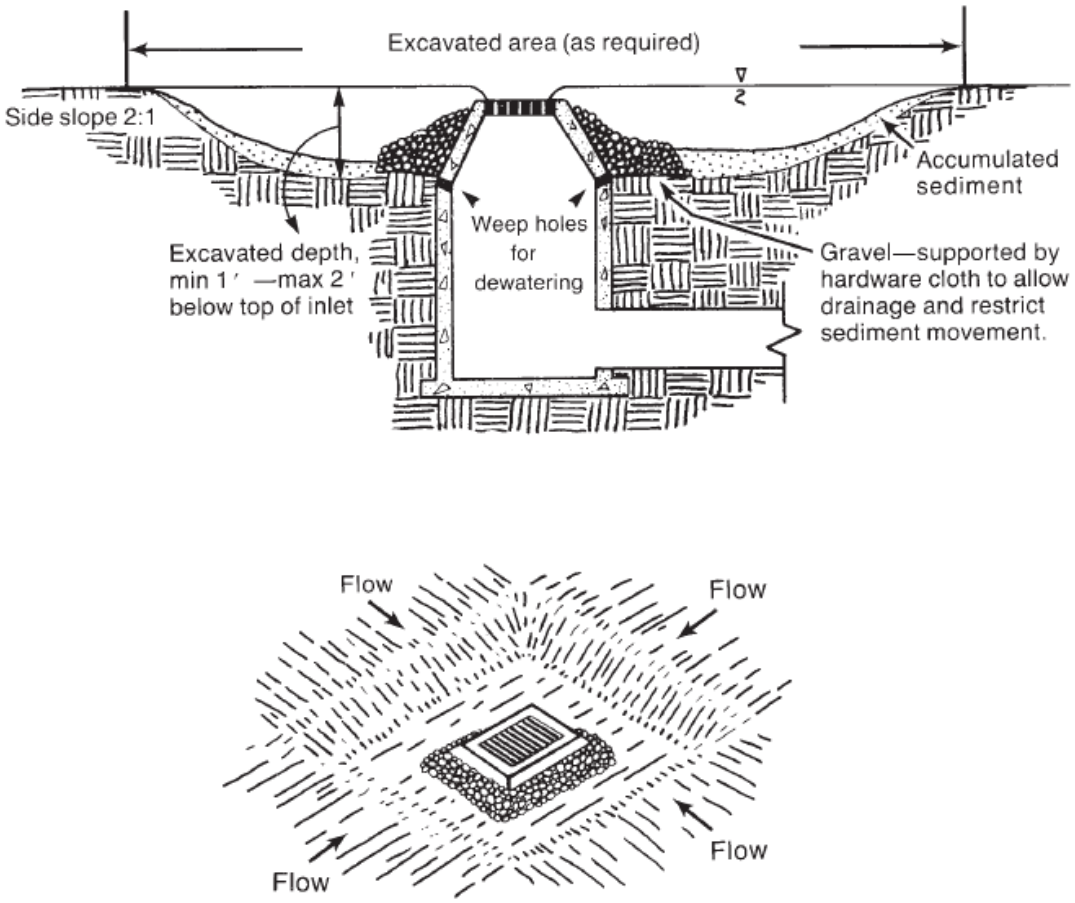


Figure 7.35-1 Excavated Inlet Protection (*Source: NCDENR)*

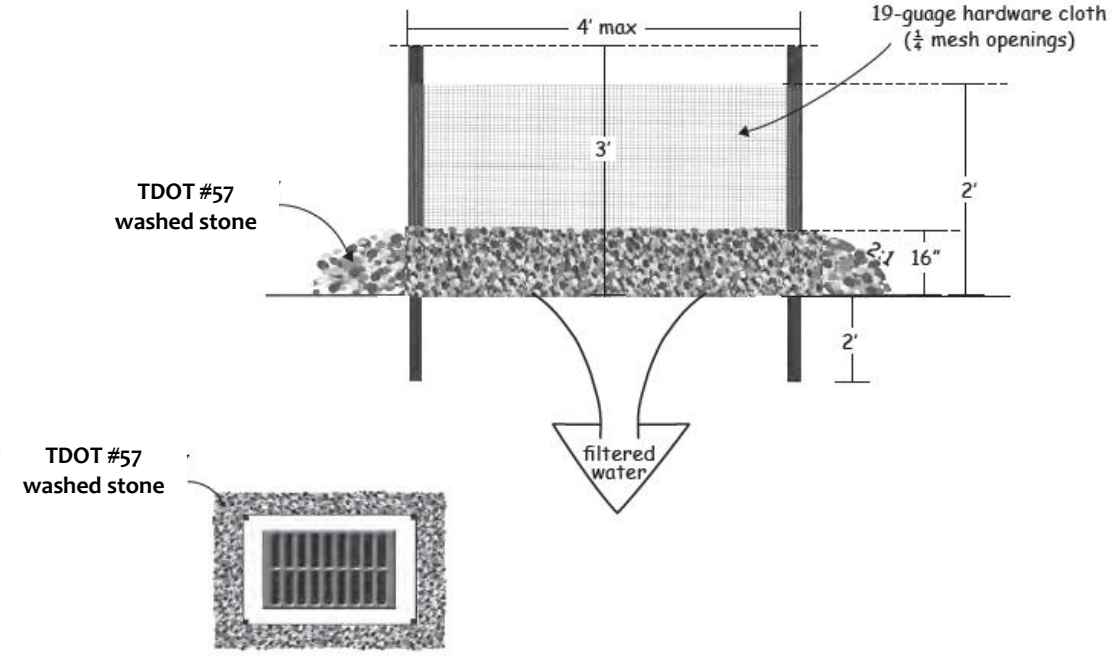


Figure 7.35-2 Hardware Cloth and Gravel Inlet Protection (*Source: NCDENR)*

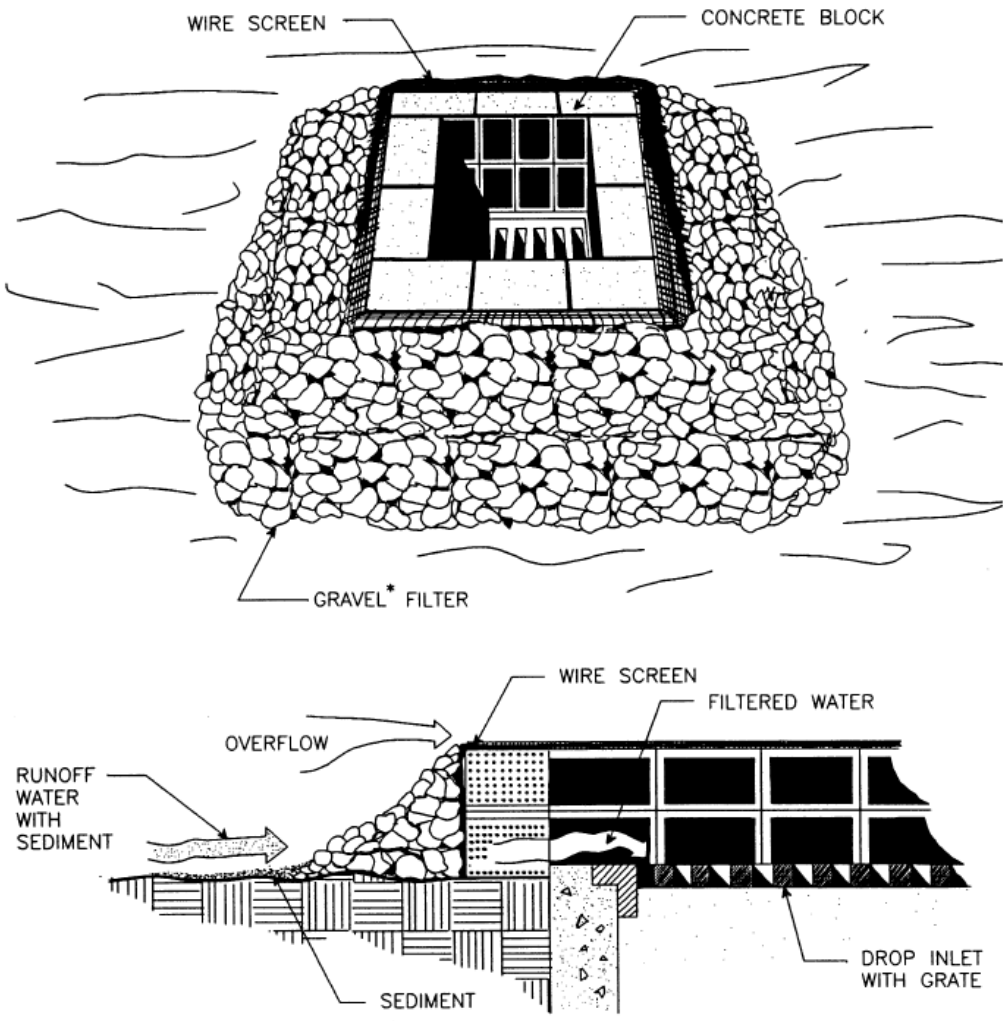


Figure 7.35-3 Block and Gravel Inlet Protection (*Source: VA DSWC)*

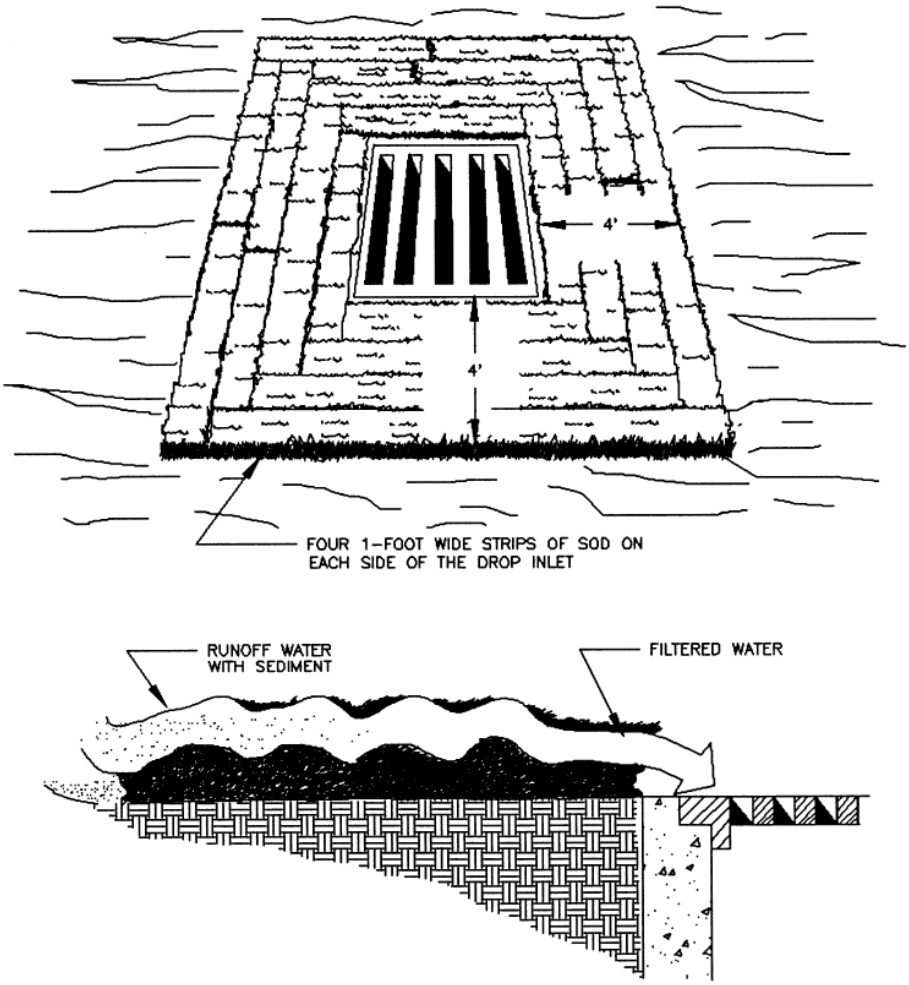


Figure 7.35-4 Sod Inlet Protection Device

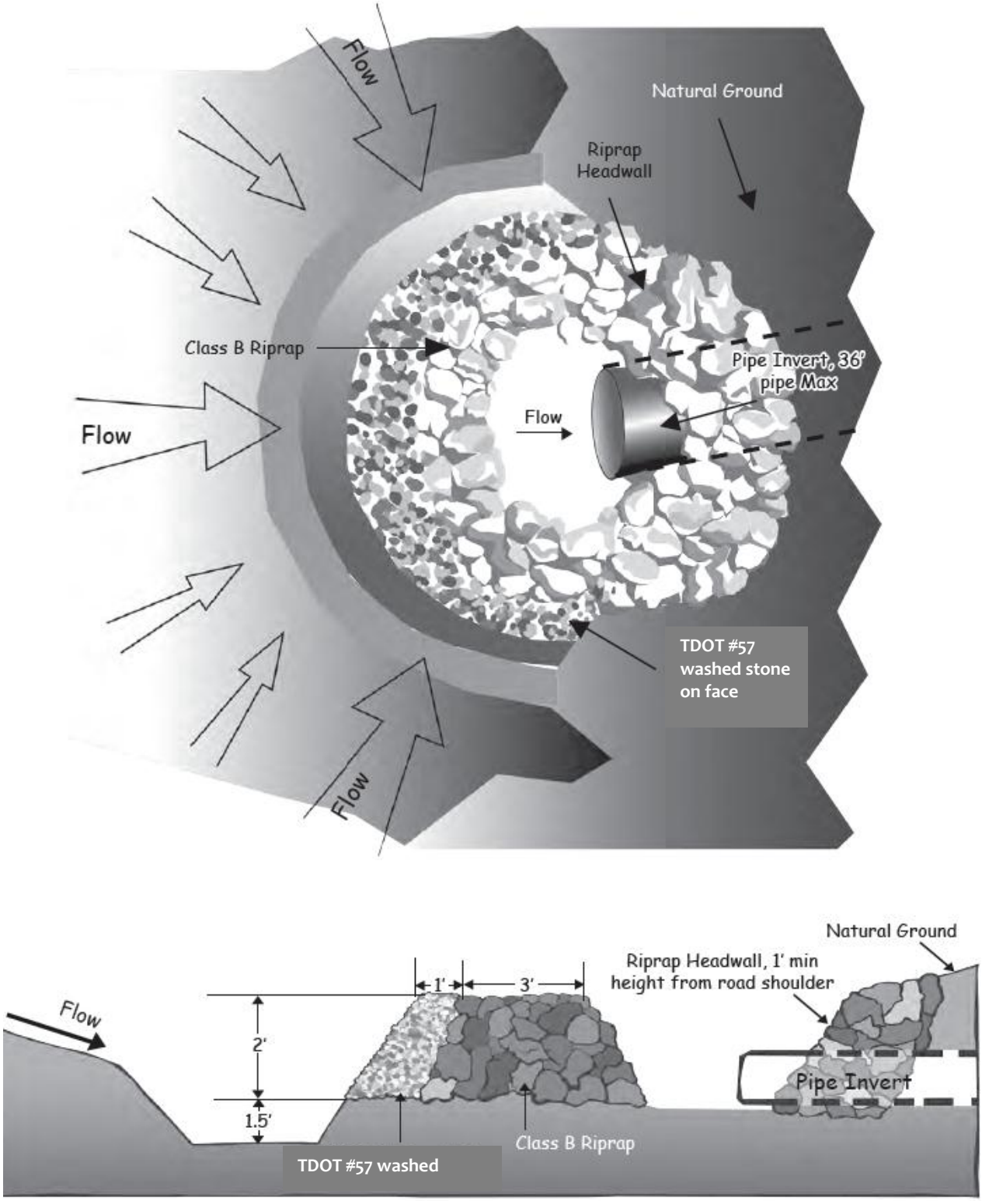


Figure 7.35-5 Rock Pipe Inlet Protection (*Source: NCDENR)*

Construction Specifications

Excavated Drop Inlet Protection:

- Clear the area of all debris that might hinder excavation and disposal of spoil.
- Grade the approach to the inlet uniformly.
- Protect weep holes by gravel.
- When the contributing drainage area has been permanently stabilized, seal weep holes, fill the basin with stable soil to final grading elevations, compact it properly, and stabilize.

Hardware Cloth and Gravel Inlet Protection:

- Uniformly grade a shallow depression approaching the inlet.
- Drive 5-foot steel posts 2 feet into the ground surrounding the inlet. Space posts evenly around the perimeter of the inlet, a maximum of 4 feet apart.
- Surround the posts with wire mesh hardware cloth. Secure the wire mesh to the steel posts at the top, middle, and bottom. Placing a 2-foot flap of the wire mesh under the gravel for anchoring is recommended.
- Place clean gravel (#57 stone) on a 2:1 slope with a height of 16 inches around the wire, and smooth to an even grade.
- Once the contributing drainage area has been stabilized, remove accumulated sediment, and establish final grading elevations.
- Compact the area properly and stabilize it with groundcover.

Block and Gravel Drop Inlet Protection:

- Lay one block on each side of the structure on its side in the bottom row to allow pool drainage. The foundation should be excavated at least 2 inches below the crest of the storm drain. Place the bottom row of blocks against the edge of the storm drain for lateral support and to avoid washouts when overflow occurs. If needed, give lateral support to subsequent rows by placing 2 x 4 wood studs through block openings.
- Carefully fit hardware cloth or comparable wire mesh with ½-inch openings over all block openings to hold gravel in place.
- Use clean gravel, ½- to ¾-inch in diameter, placed 2 inches below the top of the block on a 2:1 slope or flatter and smooth it to an even grade. #57 washed stone is recommended.
- If only stone and gravel are used, keep the slope toward the inlet no steeper than 3:1. Leave a minimum 1-foot wide level stone area between the structure and around the inlet to prevent gravel from entering inlet. On the slope toward the inlet, use stone 3 inches in diameter or larger. On the slope away from the inlet use ½ to ¾-inch gravel (#57 washed stone) at a minimum thickness of 1 foot.

Sod Drop Inlet Protection:

- Bring the area to be sodded to final grade elevation with top soil. Add fertilizer and lime, if necessary.
- Lay all sod strips perpendicular to the direction of flows.
- Keep the width of the sod at least 4 feet in the direction of flows.
- Stagger sod strips so that adjacent strip ends are not aligned.

Rock Doughnut Inlet Protection:

- Clear the area of all debris that might hinder excavation and disposal of spoil.
- Grade shallow depression uniformly towards the inlet with side slopes no greater than 2:1. Grade a 1 foot wide level area set 4 inches below the area adjacent to the inlet.
- Install the Class A-1 or Class B riprap in a circle around the inlet. The minimum crest width of the riprap should be 18 inches, with a minimum bottom width of 7.5 feet. The minimum height of the stone is 2 feet.
- The outside face of the riprap is then lined with 12 inches of #57 washed stone.

Rock Pipe Inlet Protection:

- Clear the area of all debris that might hinder excavation and disposal of spoil.
- Install the Class A-1 or Class B riprap in a semi-circle around the pipe inlet. The stone should be built up higher on each end where it ties into the embankment. The minimum crest width of the riprap should be 3 feet, with a minimum bottom width of 11 feet. The minimum height should be 2 feet, but also 1 foot lower than the shoulder of the embankment or diversions.
- A 1 foot thick layer of #5 or #57 stone should be placed on the outside slope of the riprap.
- The sediment storage area should be excavated around the outside of the stone horseshoe 18 inches below natural grade.
- When the contributing drainage area has been stabilized, fill depression and establish final grading elevations, compact area properly, and stabilize with ground cover.

Maintenance and Inspection Points

Sediment should not be allowed to wash into the inlet. It should be removed from the inlet protection and disposed of and stabilized so that it will not enter the inlet again. Remove sediment from the deposition areas when half the height of the storage area has been filled.

Check measure for damage or evidence of erosion and bypassing around the inlet protection. If inlets are in series, runoff that bypasses an upgradient inlet can overwhelm a downgradient inlet protection device. Sand bags, diversions, or other methods should be used to direct runoff into storm drain inlets.

When the contributing drainage area has been permanently stabilized, all materials and any sediment should be removed, and either salvaged or disposed of properly. The disturbed area should be brought to proper grade, then smoothed and compacted. Appropriately stabilize all disturbed areas around the inlet.

References

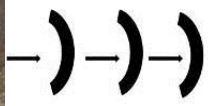
TDOT Design Division Drainage Manual

TDOT Erosion Control Standard Drawing EC-STR-11

North Carolina Erosion and Sediment Control Planning and Design Manual

SEDIMENT CONTROL PRACTICES

7.37 TUBES AND WATTLES



TUBES, WATTLES, SOCKS

Definition A small temporary sediment barrier constructed to intercept sheet flow. In this application, wattles and tubes are primarily sediment control measures. Section 7.25 discusses wattles as erosion control measures used in concentrated flow applications.

Purpose To interrupt flow, decrease velocities, pond water and allow runoff-produced sediment to settle out behind barrier.

Conditions Where Practice Applies This practice is applicable along or on the ground contour or at the toe of slopes and aids in sediment retention. While they are generally used at regular intervals on a slope, they may also be placed at the top or toe of the slope, or at breaks in grade. In addition, they may be placed on or around the perimeter of soil stockpiles or around catch basin inlets.

Planning Considerations The stability of tubes, wattles, and socks are very dependent upon proper staking. Thus, they may not be utilized on pavement, rocky soil or at any location where the stakes cannot be driven to the required depth.

Design Criteria When applied on slopes, temporary sediment tubes should be placed along the contour, and the ends of the tubes should be turned upslope in order to prevent erosion which could occur as flow bypasses around the ends of the row. This will force the discharge to overtop the row away from the end points. The spacing between rows of tubes should be based on Table 7.37-1. The maximum drainage area to a wattle is ¼ acre per 100 linear feet of wattle.

Table 7.37-1 Wattle and Tube Spacing Table for Slope Application

Slope	Wattle and Tube Diameter				
	8”	**12”**	**18”**	**20”**	**24”**
2%	70’	100’	N/A	N/A	N/A
5%	30’	60’	100’	100’	100’
10%	20’	30’	70’	85’	100’
6:1	N/A	20’	40’	50’	55’
4:1	N/A	20’	30’	30’	30’
3:1	N/A	N/A	20’	20’	25’
2:1	N/A	N/A	20’	20’	20’

The size of a sediment tube for a slope application should be selected based on the gradient and length of the slope. In general, larger tube diameters should be selected for steeper or longer slopes.

Where long rows are required on a slope, the ends of the individual tube segments should be overlapped as shown on the standard drawing. This will ensure that gaps will not occur between individual tube segments, allowing sediment-laden water to escape the measure. Tube/wattle netting should be a knitted material with 1/8 to 3/8 inch openings and made of photodegradable (polypropylene, HDPE) or biodegradable (cotton, jute, coir) material.

Construction Specifications

Proper site preparation is essential to ensure sediment wattles and tubes are in complete contact with the underlying soil or underlying surface. Remove all rocks, clods, vegetation or other obstructions so installed sediment tubes have direct contact with the underlying soil or surface.

Install tubes by laying them flat on the ground. Excavate a small trench 2-3 inches in depth on the contour and perpendicular to water flow. Soil from the excavation should be stored close by for use after the wattle has been installed.

Install tubes so no gaps exist between the soil and the bottom of the sediment tube. Lap the ends of adjacent sediment tubes a minimum of 6-inches to prevent flow and sediment from passing through the field joint.

Wooden stakes should be used to fasten the wattles to the soil. When conditions warrant, a straight metal bar can be used to drive a "pilot hole” through the wattle and into the soil.

Drive wooden stakes through the wattle and angled slightly against the direction of flow (see figure 7.37-1). Install wooden stakes at 4 feet intervals, unless the wattle manufacturer specifies otherwise, leaving less than 1-2 inches of stake exposed above the wattle. Alternately, stakes may be placed on each side of the wattle tying across with a natural fiber twine or staking in a crossing manner ensuring direct soil contact at all times.

Terminal ends of wattles may be dog legged up slope to ensure containment and prevent channeling of sedimentation.

Backfill the upslope length of the wattle with the excavated soil and compact.

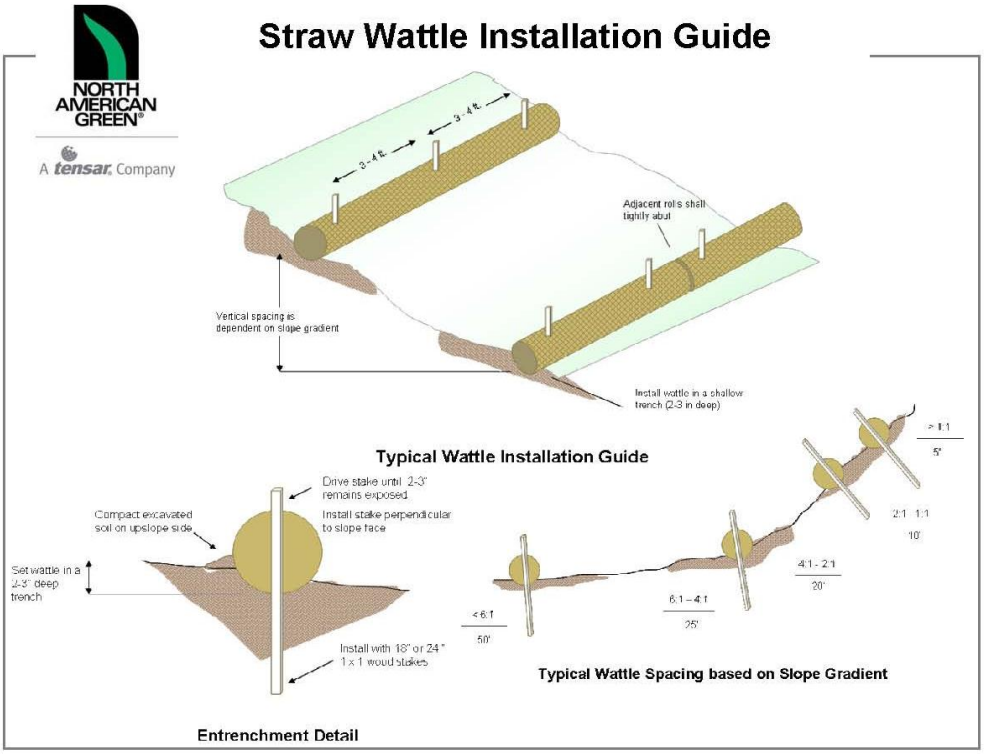


Figure 7.37-1 Wattle Stake Installation

Care shall be taken during installation so as to avoid damage occurring to the wattle as a result of the installation process. Should the wattle be damaged during installation, a wooden stake shall be placed either side of the damaged area terminating the log segment.

Maintenance and Inspection Points

Inspect wattles and tubes after installation for gaps under and between the joints of adjacent ends of wattles and tubes.

Repair all rills, gullies, and undercutting near wattles and tubes.

Remove all sediment deposits that impair the filtration capability of the tubes when the sediment reaches 1/3 the height of the exposed tube.

Remove and/or replace installed sediment tubes as required to adapt to changing construction site conditions.

Prior to final stabilization, backfill all trenches, depressions and other ground disturbances caused by the removal of the devices.

References

TDOT Design Division Drainage Manual

TDOT Erosion Control Standard Drawing EC-STR-31

South Carolina DHEC Stormwater Management BMP Handbook

US Department of Transportation Federal Highway Administration, Western Federal Lands Highway Division, Sediment Wattle Detail WM157-20

Earth Savers, http://www.earth-savers.com/

APPENDIX “A”

NOTICE OF INTENT

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Division of Water Resources
William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, 11th Floor, Nashville, Tennessee 37243
1-888-891-8332 (TDEC)

Notice of Intent (NOI) for General NPDES Permit for Stormwater Discharges from Construction Activities (TNR100000)

Site or Project Name: Clearview Acres, Section 2			***NPDES Tracking Number: TNR***
Street Address or Location: Along Walnut Grove Road (HWY 269), west of Shelbyville Pike (HWY 231)			Construction Start Date: June 2019
			Estimated End Date: June 2020
Site Description: Residential development of 55 lots, grading, and utility placement			Latitude (dd.dddd): 35.7240
			Longitude (-dd.dddd): -86.4313
County(ies): Rutherford	MS4 Jurisdiction (if applicable): Rutherford		Acres Disturbed: 14.82
			Total Acres: 142.46

Check the appropriate box(s) if there are streams and/or wetlands on or adjacent to the construction site: Streams ☑ Wetlands ☐
If wetlands are located on-site and may be impacted, attach wetlands delineation report.
If an Aquatic Resource Alteration Permit (ARAP) has been obtained for this site, what is the permit number?

Receiving waters: West Fork Stones River

Attach the SWPPP with the NOI: SWPPP Attached ☑ | Attach a site location map: Map Attached ☑

Site Owner/Developer (Primary Permittee): (Provide person, company, or entity that has operational or design control over construction plans and specifications): 3BC, LLC.

For corporate entities only, provide correct Tennessee Secretary of State (SOS) Control Number: 000872272
(an incorrect SOS control number may delay NOI processing)

Site Owner or Developer Contact Name: (individual responsible for site) Bud George		Title or Position: (the party who signs the certification below)	
Mailing Address: 702 Prince Edward Ct		City: Murfreesboro	State: TN / Zip: 37130
Phone: (615) 513-1173	Fax: ( )	E-mail:	

Optional Contact:		Title or Position:	
Mailing Address:		City:	State: / Zip:
Phone: ( )	Fax: ( )	E-mail:	

Owner/Developer Certification: (must be signed by president, vice-president or equivalent, or ranking elected official) (Primary Permittee)

I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

Owner/Developer Name: (print/type) Bud George	Signature:	Date: 5/2/19

Contractor(s) Certification: (must be signed by president, vice-president or equivalent, or ranking elected official) (Secondary Permittee)

I certify under penalty of law that I have reviewed this document, any attachments, and the SWPPP referenced above. Based on my inquiry of the construction site owner/developer identified above and/or my inquiry of the person directly responsible for assembling this NOI and SWPPP, I believe the information submitted is accurate. I am aware that this NOI, if approved, makes the above-described construction activity subject to NPDES permit number TNR100000, and that certain of my activities on-site are thereby regulated. I am aware that there are significant penalties, including the possibility of fine and imprisonment for knowing violations, and for failure to comply with these permit requirements. As specified in Tennessee Code Annotated Section 39-16- 702(a)(4), this declaration is made under penalty of perjury.

Contractor name, address, and SOS control number (if applicable):	Signature:	Date:
Contractor name, address, and SOS control number (if applicable):	Signature:	Date:

OFFICIAL STATE USE ONLY

Received Date:	Reviewer:	Field Office:	Permit Tracking Number: TNR	Exceptional TN Water:
Fee(s):	T & E Aquatic Flora/Fauna:	SOS Corporate Status:	Waters with Unavailable Parameters:	Notice of Coverage Date:

CONSTRUCTION GENERAL PERMIT - NOTICE OF INTENT (NOI) - INSTRUCTIONS

A completed NOI must be submitted to obtain coverage under the CGP. **Requesting coverage under this permit means that an applicant has obtained and examined a copy of this permit, and thereby acknowledges applicant's claim of ability to be in compliance with permit terms and conditions.** CGP coverage is required for stormwater (SW) discharge(s) from construction activities including clearing, grading, filling and excavating (including borrow pits) of one or more acres of land. This form should be submitted at least 30 days prior to the commencement of land disturbing activities, or no later than 48 hours prior to when a new operator assumes operational control over site specifications or commences work at the site.

The application fee must accompany the NOI and is based on total acreage to be disturbed by an entire project, including any associated construction support activities (e.g., equipment staging yards, material storage areas, excavated material disposal areas, borrow or waste sites, etc.). A separate annual maintenance fee is also required for activities that exceed 1 year under CGP coverage. See TN Rules, Chapter 0400-40-11-.02(b)(12).

Acres Disturbed	= or > 150 acres	= or > 50 < 150 acres	= or > 20 < 50 acres	= or > 5 < 20 acres	= or > 1 < 5 acres	Subsequent coverage
Fee	$10,000	$6,000	$3,000	$1,000	$250	$100

Who must submit the NOI form? All site operators must submit an NOI form. "Operator" for the purpose of this permit and in the context of SW associated with construction activity means any person associated with a construction project who meets either or both of the following two criteria: (1) The person has operational or design control over construction plans and specifications, including the ability to make modifications to those plans and specifications. This person is typically the owner or developer of the project or a portion of the project (e.g., subsequent builder), or the person that is the current land owner of the construction site, and is considered the primary permittee; or (2) The person has day-to-day operational control of those activities at a project which are necessary to ensure compliance with a SWPPP for the site or other permit conditions. This person is typically a contractor or a commercial builder who is hired by the primary permittee, and is considered a secondary permittee.

Owners, developers and all contractors that meet the definition of the operator in subsection 2.2 of the permit shall apply for permit coverage on the same NOI, insofar as possible. After permit coverage has been granted to the initial site-wide primary permittee, any subsequent NOI submittals must include the site's previously assigned permit tracking number and the project name. The comprehensive site-specific SWPPP shall be prepared in accordance with the requirements of part 3 of the permit and must be submitted with the NOI unless the NOI being submitted is to add a subsequent permittee to an existing coverage. Artificial entities (e.g., corporations or partnerships) must submit the correct Tennessee Secretary of State, Division of Business Services, control number. **The NOI will be considered incomplete without a correct control number, and the division reserves the right to deny coverage to artificial entities that are not properly registered and in good standing with the Tennessee Secretary of State.**

Complete the form: Type or print clearly. Answer each item or enter "NA," for not applicable. If you need additional space, attach a separate piece of paper to the NOI form. **The NOI will be considered incomplete without a permit fee and comprehensive site-specific SWPPP (if applicable).**

Describe and locate the project: Use the legal or official name of the construction site. If a construction site lacks street name or route number, give the most accurate information available to describe the location (reference to adjacent highways, roads and structures; eg., intersection of state highways 70 and 100). Latitude and longitude (in decimal degrees) can be found at numerous other web sites. Attach a copy of a map, showing location of site, with boundaries at least one mile outside the site boundaries. Provide estimated starting date of clearing activities and completion date of the project, and an estimate of the number of acres of the site on which soil will be disturbed, including borrow areas, fill areas, stockpiles and the total acres. For linear projects, give location at each end of the construction area.

Name of the receiving waters: Trace the route of SW runoff from the site and determine the name of the water course(s) into which the stormwater runoff drains. Note that the receiving water course may or may not be located on the construction site. If the first water body receiving construction site runoff is unnamed ("unnamed tributary"), determine the name of the waterbody that the unnamed tributary enters.

An ARAP may be required: **If your work will disturb or cause alterations of a stream or wetland, you must obtain an appropriate Aquatic Resource Alteration Permit (ARAP).** If you have a question about the ARAP program, contact your local Field Office (EFO).

Submitting the form and obtaining more information: Note that this form must be signed by the company President, Vice-President, or a ranking elected official in the case of a municipality, for details see subpart 2.5. For more information, contact your local EFO at the toll-free number 1-888-891-8332 (TDEC). Submit the completed NOI form (keep a copy for your records) to the appropriate EFO for the county(ies) where the construction activity is located, addressed to **Attention: Stormwater NOI Processing.**

Notice of Coverage: The division will review NOIs for completeness and accuracy and issue an NOC to site-wide primary operators, authorizing SW discharge from the construction site as of the effective date of the NOC. New subsequent operators will not receive an NOC, but are considered covered under the permit when their permit record is published on TDEC's dataviewer as "active" and with an effective date. TDEC Permit Dataviewer can be found at: http://environment-online.tn.gov:8080/pls/enf_reports/f?p=9034:34001:0

EFO	Street Address	Zip Code	EFO	Street Address	Zip Code
Memphis	8383 Wolf Lake Drive, Bartlett	38133-4119	Cookeville	1221 South Willow Ave.	38506
Jackson	1625 Hollywood Drive	38305-4316	Chattanooga	1301 Riverfront Pkwy, Suite 206	37402
Nashville	711 R S Gass Boulevard	37243	Knoxville	3711 Middlebrook Pike	37921
Columbia	1421 Hampshire Pike	38401	Johnson City	2305 Silverdale Road	37601

APPENDIX “B”

NOTICE OF TERMINATION

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION (TDEC)
Division of Water Resources
William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, 11th Floor, Nashville, Tennessee 37243
1-888-891-TDEC (8332)

Notice of Termination (NOT) for General NPDES Permit for Stormwater Discharges from Construction Activities (CGP)

This form is required to be submitted when requesting termination of coverage from the CGP. The purpose of this form is to notify the TDEC that either all stormwater discharges associated with construction activity from the portion of the identified facility where you, as an operator, have ceased or have been eliminated; or you are no longer an operator at the construction site. Submission of this form shall in no way relieve the permittee of permit obligations required prior to submission of this form. Please submit this form to the local DWR Environmental Field Office (EFO) address (see table below). For more information, contact your local EFO at the toll-free number 1-888-891-8332 (TDEC).

Type or print clearly, using ink.

Site or Project Name:	**NPDES Tracking Number: TNR**
Street Address or Location:	County(ies):

Name of Permittee Requesting Termination of Coverage:			
Permittee Contact Name:	Title or Position:		
Mailing Address:	City:	State:	Zip:
Phone:	E-mail:		

Check the reason(s) for termination of permit coverage:

☐	Stormwater discharge associated with construction activity is no longer occurring and the permitted area has a uniform 70% permanent vegetative cover OR has equivalent measures such as rip rap or geotextiles, in areas not covered with impervious surfaces.
☐	You are no longer the operator at the construction site (i.e., termination of site-wide, primary or secondary permittee coverage).

Certification and Signature: (must be signed by president, vice-president or equivalent ranking elected official)

I certify under penalty of law that either: (a) all stormwater discharges associated with construction activity from the portion of the identified facility where I was an operator have ceased or have been eliminated or (b) I am no longer an operator at the construction site. I understand that by submitting this notice of termination, I am no longer authorized to discharge stormwater associated with construction activity under this general permit, and that discharging pollutants in stormwater associated with construction activity to waters of the United States is unlawful under the Clean Water Act where the discharge is not authorized by a NPDES permit. I also understand that the submittal of this notice of termination does not release an operator from liability for any violations of this permit or the Clean Water Act.

For the purposes of this certification, elimination of stormwater discharges associated with construction activity means that all stormwater discharges associated with construction activities from the identified site that are authorized by a NPDES general permit have been eliminated from the portion of the construction site where the operator had control. Specifically, this means that all disturbed soils at the portion of the construction site where the operator had control have been finally stabilized, the temporary erosion and sediment control measures have been removed, and/or subsequent operators have obtained permit coverage for the site or portions of the site where the operator had control.

I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

Permittee name (print or type):	Signature:	Date:

EFO	**Street Address**	**Zip Code**	**EFO**	**Street Address**	**Zip Code**
Memphis	8383 Wolf Lake Drive, Bartlett, TN	38133	Cookeville	1221 South Willow Ave.	38506
Jackson	1625 Hollywood Drive	38305	Chattanooga	1301 Riverfront Parkway, Ste. 206	37402
Nashville	711 R S Gass Boulevard	37243	Knoxville	3711 Middlebrook Pike	37921
Columbia	1421 Hampshire Pike	38401	Johnson City	2305 Silverdale Road	37601

APPENDIX “C”

INSPECTION FORMS

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION (TDEC)

Division of Water Resources
William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, 11th Floor, Nashville, Tennessee 37243
1-888-891-8332 (TDEC)

General NPDES Permit for Stormwater Discharges from Construction Activities (CGP)

Construction Stormwater Inspection Certification (Twice-Weekly Inspections)

Site or Project Name:		**NPDES Tracking Number: TNR**
Primary Permittee Name:		Date of Inspection:
Current approximate disturbed acreage:	Has rainfall been checked/documented daily? ☐ Yes ☐ No	Name of Inspector:
Current weather conditions:		Inspector's Training Certification Number:

Please check the box if the following items are on-site:

☐ Notice of Coverage (NOC) ☐ Stormwater Pollution Prevention Plan (SWPPP) ☐ Twice-weekly inspection documentation

☐ Site contact information ☐ Rain Gage ☐ Off-site Reference Rain Gage Location: _____

Best Management Practices (BMPs):

Are the Erosion Prevention and Sediment Controls (EPSCs) functioning correctly: If "No," describe below in Comment Section			
1.	Are all applicable EPSCs installed and maintained per the SWPPP?	Yes	No
2.	Are EPSCs functioning correctly at all disturbed areas/material storage areas per section 4.1.5?	Yes	No
3.	Are EPSCs functioning correctly at outfall/discharge points such that there is no objectionable color contrast in the receiving stream, and no other water quality impacts per section 5.3.2?	☐ Yes	☐ No
4.	Are EPSCs functioning correctly at ingress/egress points such that there is no evidence of track out?	☐ Yes	☐ No
5.	If applicable, have discharges from dewatering activities been managed by appropriate controls per section 4.1.4? If "No," describe below the measures to be implemented to address deficiencies.	☐ Yes	☐ No
6.	If construction activity at any location has temporarily/permanently ceased, was the area stabilized within 14 days per section 3.5.3.2? If "No," describe below each location and measures taken to stabilize the area(s)	☐ Yes	☐ No
7.	Have pollution prevention measures been installed, implemented, and maintained to minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters per section 4.1.5? If "No," describe below the measures to be implemented to address deficiencies.	☐ Yes	☐ No
8.	If a concrete washout facility is located on site, is it clearly identified on the project and maintained? If "No," describe below the measures to be implemented to address deficiencies. ☐ N/A	☐ Yes	☐ No
9.	Have all previous deficiencies been addressed? If "No," describe remaining deficiencies in Comment section. ☐ Check if deficiencies/corrective measures have been reported on a previous form.	☐ Yes	☐ No

Comment Section. If the answer is "No" for any of the above, please describe the problem and corrective actions to be taken. Otherwise, describe any pertinent observations:

Certification and Signature (must be signed by the certified inspector and the permittee per Sections 3.5.8.2 (g) and 7.7.2 of the CGP)

I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

Inspector Name and Title:	Signature:	Date:
Primary Permittee Name and Title:	Signature:	Date:

Construction Stormwater Inspection Certification Form (Twice-Weekly Inspections)

Purpose of this form/ Instructions

An inspection, as described in section 3.5.8.2. of the General Permit for Stormwater Discharges from Construction Activities ("Permit"), shall be performed at least twice every calendar week and documented on this form. Inspections shall be performed at least 72 hours apart. Where sites or portion(s) of construction sites have been temporarily stabilized, or runoff is unlikely due to winter conditions (e.g., site covered with snow or ice), such inspection only has to be conducted once per month until thawing results in runoff or construction activity resumes.

As described in section 3.5.8.1 of the Permit, inspectors performing the required twice weekly inspections must have an active certification by completing the "Fundamentals of Erosion Prevention and Sediment Control Level I" course (http://www.tnepsc.org/). Twice weekly inspections can also be performed by: a licensed professional engineer or landscape architect; a Certified Professional in Erosion and Sediment Control (CPESC) or a person who has successfully completed the "Level II Design Principles for Erosion Prevention and Sediment Control for Construction Sites" course. A copy of the certification or training record for inspector certification should be kept on site.

Qualified personnel, (provided by the permittee or cooperatively by multiple permittees) shall inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, structural control measures, locations where vehicles enter or exit the site, and each outfall.

Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the site's drainage system. Erosion prevention and sediment control measures shall be observed to ensure that they are operating correctly.

Outfall points (where discharges leave the site and/or enter waters of the state) shall be inspected to determine whether erosion prevention and sediment control measures are effective in preventing significant impacts to receiving waters. Where discharge locations are inaccessible, nearby downstream locations shall be inspected. Locations where vehicles enter or exit the site shall be inspected for evidence of offsite sediment tracking.

Based on the results of the inspection, any inadequate control measures or control measures in disrepair shall be replaced or modified, or repaired as necessary, before the next rain event if possible, but in no case more than 7 days after the need is identified.

Based on the results of the inspection, the site description identified in the SWPPP in accordance with section 3.5.1 of the Permit and pollution prevention measures identified in the SWPPP in accordance with section 3.5.2 of the Permit, shall be revised as appropriate, but in no case later than 7 days following the inspection. Such modifications shall provide for timely implementation of any changes to the SWPPP, but in no case later than 14 days following the inspection.

All inspections shall be documented on this Construction Stormwater Inspection Certification form. Alternative inspection forms may be used as long as the form contents and the inspection certification language are, at a minimum, equivalent to the division's form and the permittee has obtained a written approval from the division to use the alternative form. Inspection documentation will be maintained on site and made available to the division upon request. Inspection reports must be submitted to the division within 10 days of the request.

Trained certified inspectors shall complete inspection documentation to the best of their ability. Falsifying inspection records or other documentation or failure to complete inspection documentation shall result in a violation of this permit and any other applicable acts or rules.

APPENDIX “D”

HYDOLOGICAL DETERMINATION

Anthony A. Grow, PG
TNQHP 1128-TN15
1406 Wilson Avenue
Tullahoma, TN 37388
macduff1@charter.net
(931) 273-4681 cell

February 10, 2017

Division of Water Resources
Tennessee Department of Environment and Conservation
711 R.S. Gass Boulevard
Nashville, TN 37216

RE: Hydrological Determination (HD) Report – Clearview Estates, 1004 Walnut Grove Road, Christiana, Rutherford County

The attached hydrologic determination (HD) report (Attachment 1) is submitted **to qualify for treatment provided for in §69-3-108(r).** A determination was conducted of four channels draining to West Fork Stones River northwest of the site to identify water resource impacts of developing the site. There is a small non-jurisdictional pond in the center of the site. The attached HD report identified the following water resource features:

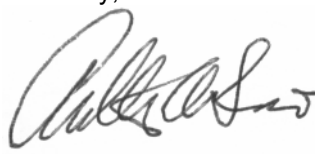
1 (Wet Weather Conveyance) – Start: 35.718396, -86.431155; End: 35.721339, -86.431713
2 (Wet Weather Conveyance) – Start: 35.722058, -86.431454; End: 35.724575, -86.429554
3 (Stream) – Start: 35.722358, -86.438791; End: 35.725190, -86.440468
4 (Stream) – Start: 35.724265, -86.441138; End: 35.725040, -86.440750
Pond (0.40 acre) - 35.721654, -86.431556

The residential development proposes (see attached Site Plan) re-routing one wet weather conveyance and filling the pond.

The property owner is Clearview Acres, LP, property owner. A signed property access permission letter is attached to this report.

Please contact me via my cell phone or by email if you have any questions. All submitted information is true, accurate and complete.

Sincerely,



Anthony A. Grow, PG
TNQHP 1128-TN15

Attachments
1. Hydrologic Determination Report – Clearview Estates Property
2. Clearview Estates Site Plan
3. Property Access Permission Letter

Attachment 1 - Hydrologic Determination Report – Clearview Estates Property

Hydrologic Determination Report

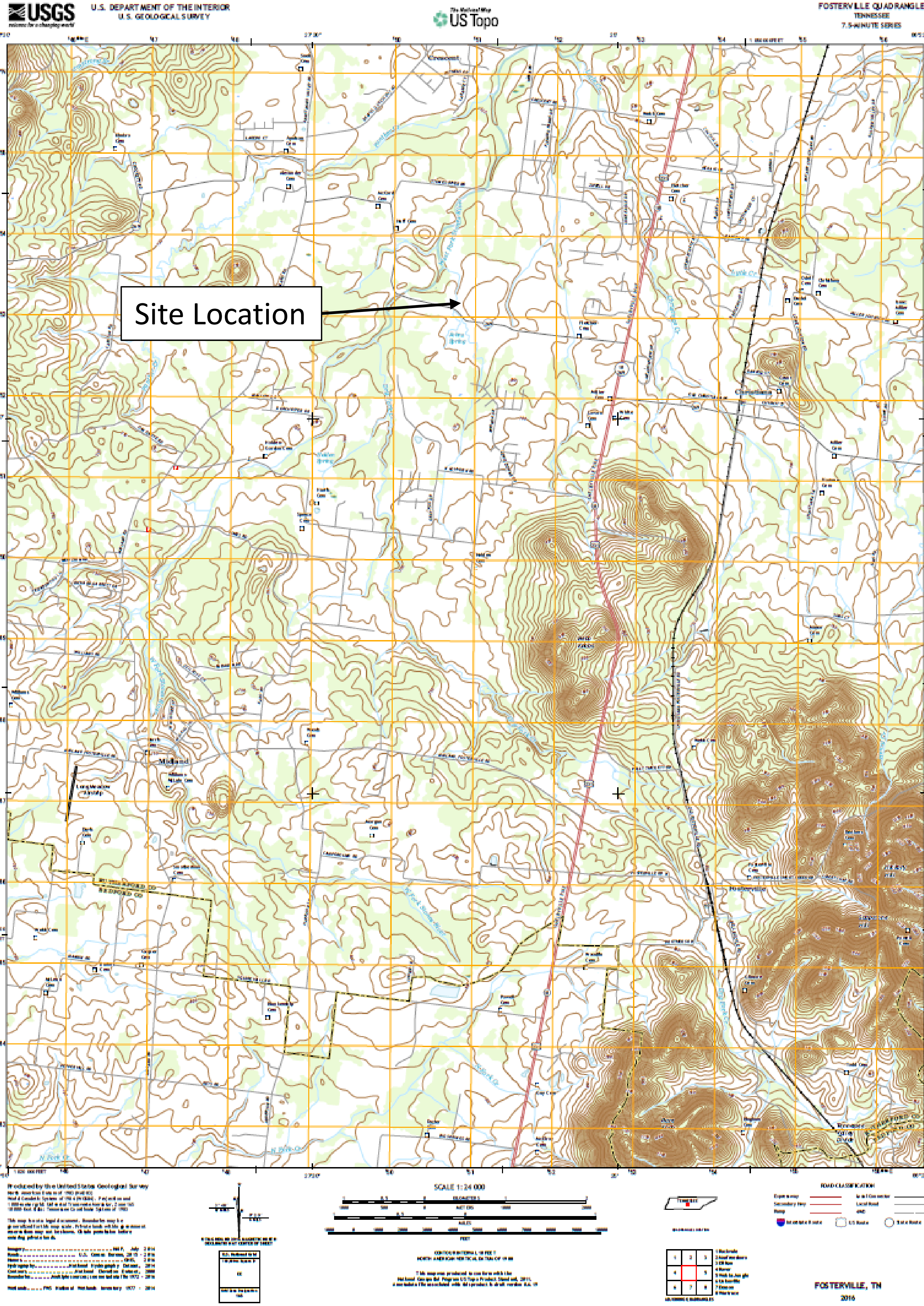
Clearview Estates Property – 1004 Walnut Grove
Christiana, Tennessee

Prepared by
Anthony A. Grow, PG
TNQHP 1128-TN15

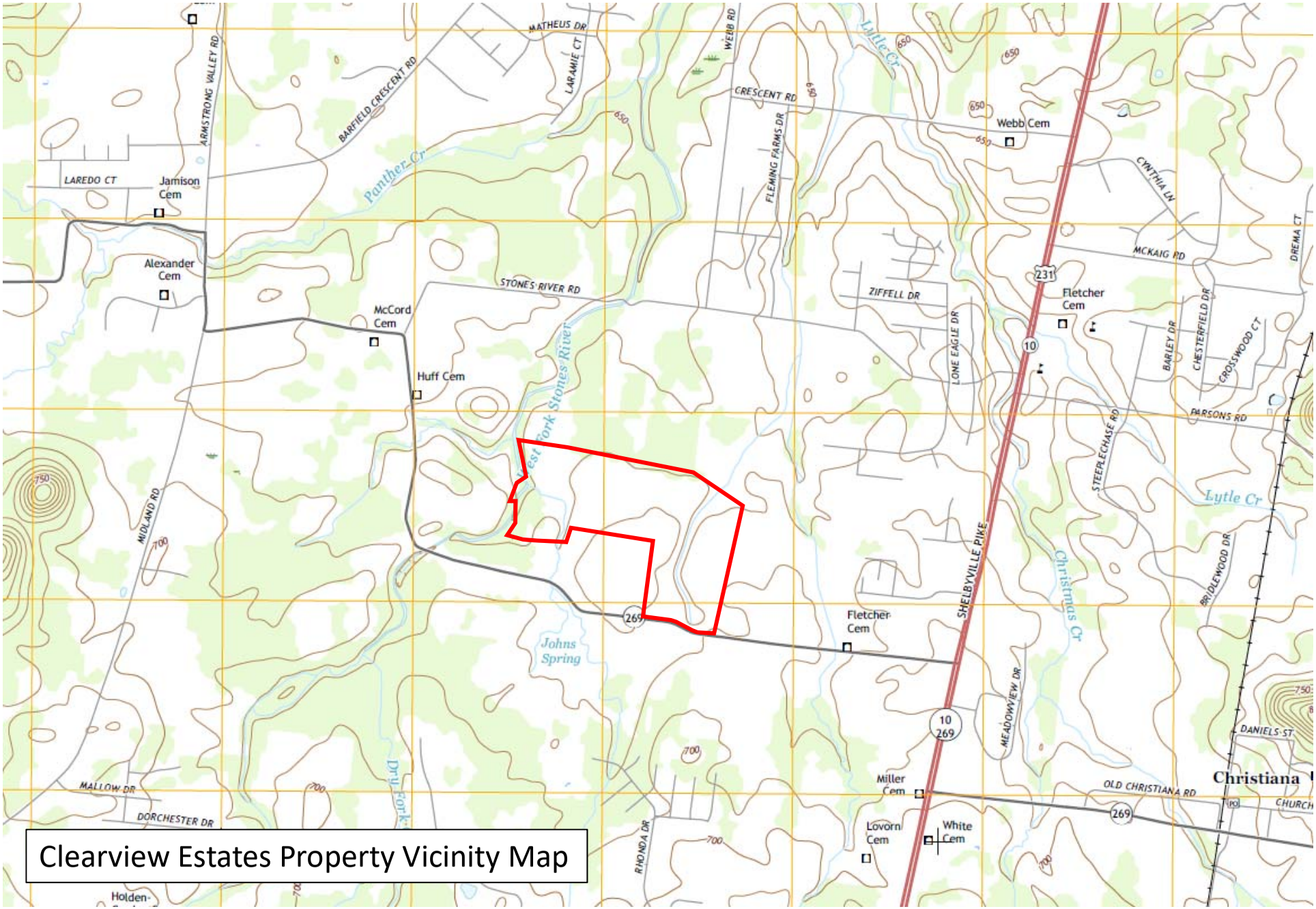
February 10, 2017

Contents

TOPOGRAPHIC MAP SHOWING
SITE LOCATION

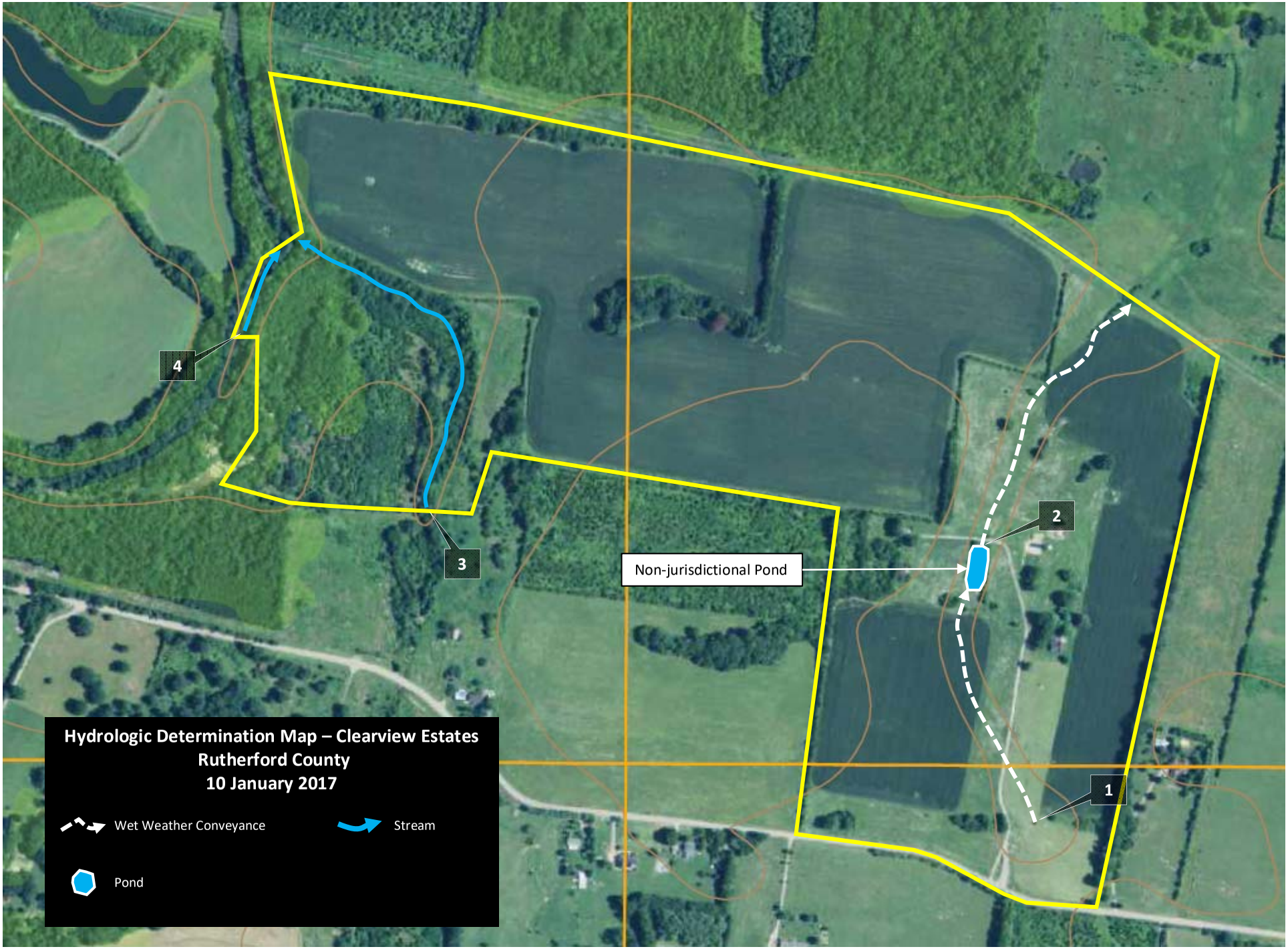

USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
US Topo
FOSTERVILLE QUADRANGLE
TENNESSEE
7.5-MINUTE SERIES
Site Location
SCALE 1:24 000
FOSTERVILLE, TN
2016

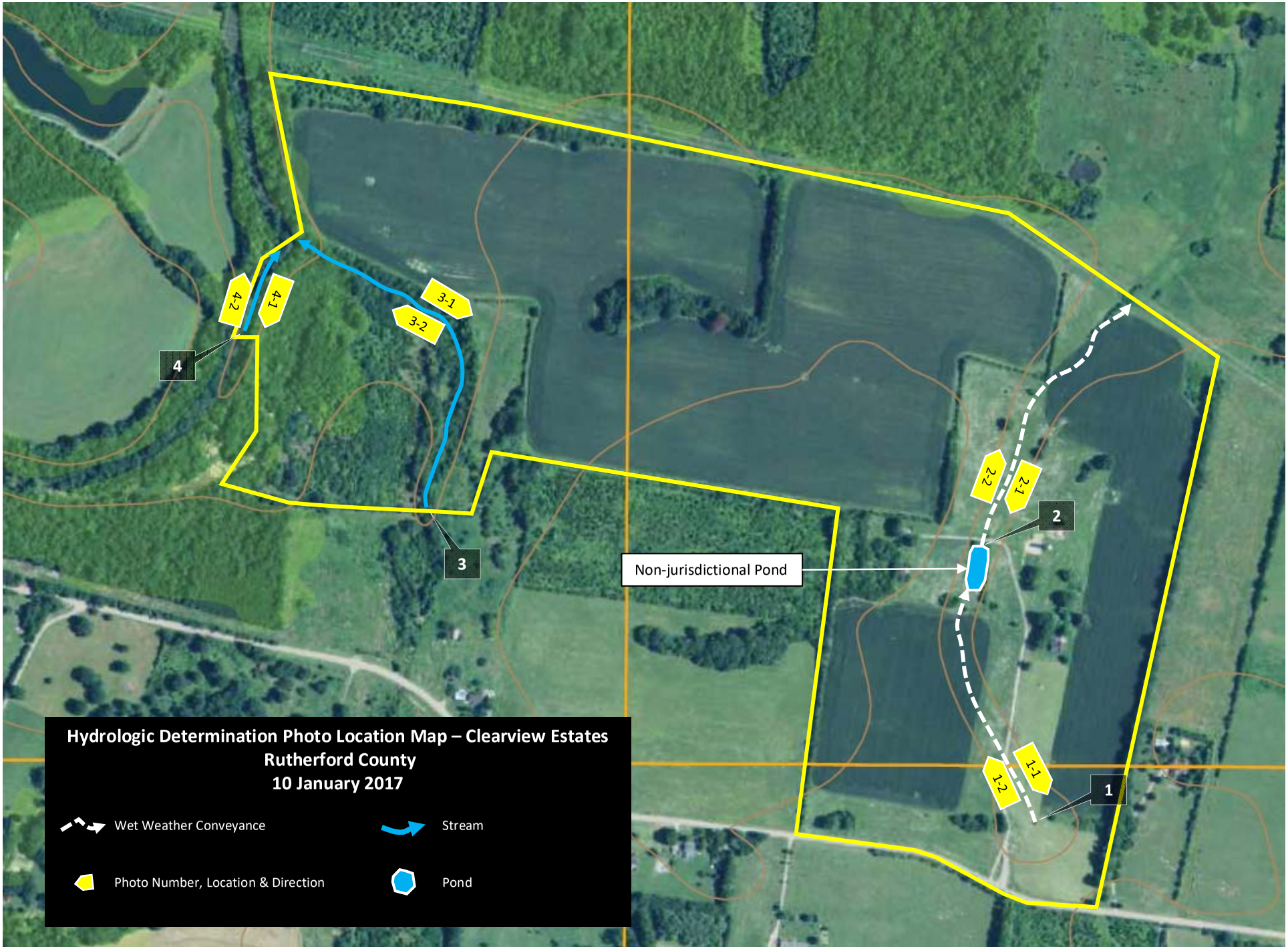
VICINITY MAP



Clearview Estates Property Vicinity Map

HYDROLOGIC DETERMINATION FEATURES MAP


4
3
2
1
Non-jurisdictional Pond
Hydrologic Determination Map – Clearview Estates
Rutherford County
10 January 2017
Wet Weather Conveyance
Stream
Pond


4-2
4-1
3-1
3-2
4
3
Non-jurisdictional Pond
2-2
2-1
2
1-1
1-2
1
Hydrologic Determination Photo Location Map – Clearview Estates
Rutherford County
10 January 2017
Wet Weather Conveyance
Stream
Photo Number, Location & Direction
Pond

HYDROLOGIC DETERMINATION
FIELD DATA SHEETS & PHOTOGRAPHS

Hydrologic Determination Field Data Sheet

1-WWC

Tennessee Division of Water Pollution Control, Version 1.4

County: Rutherford	Named Waterbody: Unnamed Tributary	Date/Time: 1/10/17
Assessors/Affiliation: Anthony A. Grow, TNQHP # 1128-TN15		Project ID :
Site Name/Description: Clearview Estates Property		
Site Location: 1004 Walnut Grove Road, Christiana, TN		
USGS quad: Fosterville	HUC (12 digit):	Lat/Long: Start: 35.718396, -86.431155 End: 35.721339, -86.431713
Previous Rainfall (7-days) : 0.64 inch		
Precipitation this Season vs. Normal : very wet wet <average> dry drought unknown Source of recent & seasonal precip data : CoCoRah Station TN-RD-8		
Watershed Size : 11 acres	Photos:<Y>or N (circle) Number : 1-1, 1-2	
Soil Type(s) / Geology : Egam silt loam		Source: USDA
Surrounding Land Use : Agricultural		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate <Slight> Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	X	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass		<WWC>
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions		WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall		WWC
5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase		Stream
6. Presence of fish (except *Gambusia*)		Stream
7. Presence of naturally occurring ground water table connection		Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed		Stream
9. Evidence watercourse has been used as a supply of drinking water		Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Wet Weather Conveyance (1-WWC)

Secondary Indicator Score (if applicable) =

Justification / Notes : Numerous sinkholes along channel.

Photo 1-1 Wet Weather Conveyance (1)
Date: 1-10-17
Lat: 35.719276
Lon: -86.430973
View looking upstream

Photo 1-2 Wet Weather Conveyance (1)
Date: 1-10-17
Lat: 35.719276
Lon: -86.430973
View looking downstream

Hydrologic Determination Field Data Sheet

2-WWC

Tennessee Division of Water Pollution Control, Version 1.4

County: Rutherford	Named Waterbody: Unnamed Tributary	Date/Time: 1/10/17
Assessors/Affiliation: Anthony A. Grow, TNQHP # 1128-TN15		Project ID :
Site Name/Description: Clearview Estates Property		
Site Location: 1004 Walnut Grove Road, Christiana, TN		
USGS quad: Fosterville	HUC (12 digit):	Lat/Long: Start: 35.722058, -86.431454 End: 35.724575, -86.429554
Previous Rainfall (7-days) : 0.64 inch		
Precipitation this Season vs. Normal : very wet wet <average> dry drought unknown Source of recent & seasonal precip data : CoCoRah Station TN-RD-8		
Watershed Size : 5 acres	Photos:<Y>or N (circle) Number : 2-1, 2-2	
Soil Type(s) / Geology : Egam silt loam		Source: USDA
Surrounding Land Use : Agricultural		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate <Slight> Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	X	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass		<WWC>
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions		WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall		WWC
5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase		Stream
6. Presence of fish (except *Gambusia*)		Stream
7. Presence of naturally occurring ground water table connection		Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed		Stream
9. Evidence watercourse has been used as a supply of drinking water		Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Wet Weather Conveyance (2-WWC)

Secondary Indicator Score (if applicable) =

Justification / Notes : Two sinkholes along length of channel.

Photo 2-1 Wet Weather Conveyance (2)
Date: 1-10-17
Lat: 35.722547
Lon: -86.431101
View looking upstream

Photo 2-2 Wet Weather Conveyance (2)
Date: 1-10-17
Lat: 35.722547
Lon: -86.431101
View looking downstream

Hydrologic Determination Field Data Sheet

3-Stream

Tennessee Division of Water Pollution Control, Version 1.4

County: Rutherford	Named Waterbody: Unnamed Tributary	Date/Time: 1/10/17
Assessors/Affiliation: Anthony A. Grow, TNQHP # 1128-TN15		Project ID :
Site Name/Description: Clearview Estates Property		
Site Location: 1004 Walnut Grove Road, Christiana, TN		
USGS quad: Fosterville	HUC (12 digit):	Lat/Long: Start: 35.722358, -86.438791 End: 35.725190, -86.440468
Previous Rainfall (7-days) : 0.64 inch		
Precipitation this Season vs. Normal : very wet wet <average> dry drought unknown Source of recent & seasonal precip data : CoCoRah Station TN-RD-8		
Watershed Size : 17 acres	Photos:<Y>or N (circle) Number : 3-1, 3-2	
Soil Type(s) / Geology : Egam silt loam		Source: USDA
Surrounding Land Use : Agricultural		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate <Slight> Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	X	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	X	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	N/A	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase	X	Stream
6. Presence of fish (except *Gambusia*)	X	Stream
7. Presence of naturally occurring ground water table connection		<Stream>
8. Flowing water in channel and 7 days since last precipitation in local watershed		Stream
9. Evidence watercourse has been used as a supply of drinking water		Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Stream (3-Stream)

Secondary Indicator Score (if applicable) =

Justification / Notes :

Photo 3-1 Stream (3)
Date: 1-10-17
Lat: 35.724185
Lon: -86.438265
View looking upstream

Photo 3-2 Stream (3)
Date: 1-10-17
Lat: 35.724185
Lon: -86.438265
View looking downstream

Hydrologic Determination Field Data Sheet

4-Stream

Tennessee Division of Water Pollution Control, Version 1.4

County: Rutherford	Named Waterbody: Unnamed Tributary	Date/Time: 1/10/17
Assessors/Affiliation: Anthony A. Grow, TNQHP # 1128-TN15		Project ID :
Site Name/Description: Clearview Estates Property		
Site Location: 1004 Walnut Grove Road, Christiana, TN		
USGS quad: Fosterville	HUC (12 digit):	Lat/Long: Start: 35.724265, -86.441138 End: 35.725040, -86.440750
Previous Rainfall (7-days) : 0.64 inch		
Precipitation this Season vs. Normal : very wet wet <average> dry drought unknown Source of recent & seasonal precip data : CoCoRah Station TN-RD-8		
Watershed Size : 24 acres	Photos:<Y>or N (circle) Number : 4-1, 4-2	
Soil Type(s) / Geology : Arrington silt loam		Source: USDA
Surrounding Land Use : Agricultural		
Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) : Severe Moderate <Slight> Absent		

Primary Field Indicators Observed

Primary Indicators	NO	YES
1. Hydrologic feature exists solely due to a process discharge	X	WWC
2. Defined bed and bank absent, dominated by upland vegetation / grass	X	WWC
3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	N/A	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	N/A	WWC
5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase	X	Stream
6. Presence of fish (except *Gambusia*)	X	Stream
7. Presence of naturally occurring ground water table connection		<Stream>
8. Flowing water in channel and 7 days since last precipitation in local watershed		Stream
9. Evidence watercourse has been used as a supply of drinking water		Stream

NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

Overall Hydrologic Determination = Stream (4-Stream)

Secondary Indicator Score (if applicable) =

Justification / Notes :

Photo 4-1 Stream (4)
Date: 1-10-17
Lat: 35.725042
Lon: -86.440665
View looking upstream

Photo 4-2 Stream (4)
Date: 1-10-17
Lat: 35.725042
Lon: -86.440665
View looking downstream

USDA SOILS MAP DATA

Soil Map—Rutherford County, Tennessee
(Clearview Estates)

Map Scale: 1:8,180 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rutherford County, Tennessee
Survey Area Data: Version 13, Sep 12, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2011—May 5, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Rutherford County, Tennessee (TN149)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Ar	Arrington silt loam, 0 to 2 percent slopes, occasionally flooded	3.9	2.7%
BrA	Bradyville silt loam, 0 to 2 percent slopes	22.0	15.3%
BrB	Bradyville silt loam, 2 to 5 percent slopes	33.7	23.5%
BsC3	Bradyville silty clay loam, 5 to 12 percent slopes, severely eroded	9.0	6.3%
BtC	Bradyville-Rock outcrop complex, 2 to 12 percent slopes	5.9	4.1%
CpA	Capshaw silt loam, 0 to 2 percent slopes	0.0	0.0%
Eg	Egam silt loam	16.7	11.6%
GRC	Gladeville-Rock outcrop complex, 2 to 15 percent slopes, extremely stony	8.5	5.9%
HcA	Harpeth silt loam, 0 to 2 percent slopes	22.7	15.8%
Ru	Roellen silty clay	0.7	0.5%
TaB2	Talbott silt loam, 2 to 5 percent slopes, eroded	6.9	4.8%
TbB3	Talbott silty clay loam, 2 to 5 percent slopes, severely eroded	4.3	3.0%
TbC3	Talbott silty clay loam, 5 to 12 percent slopes, severely eroded	2.9	2.0%
Tu	Tupelo silt loam	3.2	2.2%
Wo	Woodmont silt loam	3.3	2.3%
Totals for Area of Interest		**143.8**	**100.0%**

CALCULATION OF WEATHER CONDITIONS

Table 1. Calculation of Weather Conditions - Clearview Estates

		Long-term rainfall records							
	Month	Minus One Std. Dev. (DRY)	Normal (Mean inches)	Plus One Std. Dev. (WET)	Actual Rainfall	Condition (dry, wet, normal)	Condition value	Month weight value	Product of previous two columns
1st prior month*	Dec 2016	4.95	5.23	5.50	7.19	WET	3	x 3	9
2nd prior month*	Nov 2016	4.58	4.80	5.01	1.97	DRY	1	x 2	2
3rd prior month*	Oct 2016	3.28	3.45	3.62	0.47	DRY	1	x 1	1
								Sum =	12

Note:

If sum is:	
6-9	then prior period has been drier than normal
10-14	then prior period has been normal
15-18	Then prior period has been wetter than normal

Condition value:	
Dry =	1
Normal =	2
Wet =	3

Conclusions: Normal weather conditions.

View Data : Station Report Summary US Units

View Data

- Daily Precip Reports
- Daily Comments Reports
- Significant Weather Reports
- Multiple Day Reports
- Condition Monitoring Reports

- Days with Hail
- Search Hail Reports
- Station Hail Reports
- Station Precip Summary

- Water Year Summary
- Station Precip Summary
- Station Snow Summary
- Rainy Days Report
- Total Precip Summary
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- Master Gardener Guide
- State Climate Series
- March Madness
- WxTalk Webinars

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- CoCoRaHS Store

Station Report Summary

Station 1 : TN-RD-8 Example: CO-LR-273
Station 2 :
Station 3 :
Start Date: 1/3/2017 **End Date:** 1/9/2017

Get Summary

Stations:

TN-RD-8
Murfreesboro 3.2 WSW
Lat: 35.831422
Lon: -86.44507

* indicates Multi-Day Accumulation Report

Station **TN-RD-8**

Date	Precip in.
01/03/2017	0.51
01/04/2017	0.00
01/05/2017	0.00
01/06/2017	T
01/07/2017	0.13
01/08/2017	0.00
01/09/2017	0.00
Totals :	**0.64 in.**

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Station Report Summary

Station 1 : TN-RD-8 Example: CO-LR-273
Station 2 :
Station 3 :
Start Date: 12/1/2016 **End Date:** 12/31/2016
Get Summary

Stations:

TN-RD-8
Murfreesboro 3.2 WSW
Lat: 35.831422
Lon: -86.44507

* indicates Multi-Day Accumulation Report

Station **TN-RD-8**

Date	Precip in.
12/01/2016	0.01
12/02/2016	0.00
12/03/2016	0.00
12/04/2016	0.46
12/05/2016	0.20
12/06/2016	0.93
12/07/2016	T
12/08/2016	T
12/09/2016	0.00
12/10/2016	0.00
12/11/2016	0.00
12/12/2016	1.16
12/13/2016	0.04
12/14/2016	0.00
12/15/2016	0.00
12/16/2016	0.00
12/17/2016	0.07
12/18/2016	1.92
12/19/2016	T
12/20/2016	0.00
12/21/2016	0.00
12/22/2016	0.00
12/23/2016	0.00
12/24/2016	0.87
12/25/2016	0.25
12/26/2016	0.00
12/27/2016	0.92
12/28/2016	T
12/29/2016	0.34
12/30/2016	0.00
12/31/2016	0.02
Totals :	**7.19 in.**

View Data : Station Report Summary US Units

View Data

- Daily Precip Reports
- Daily Comments Reports
- Significant Weather Reports
- Multiple Day Reports
- Condition Monitoring Reports

- Days with Hail
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Station Report Summary

Station 1 : TN-RD-8 Example: CO-LR-273
Station 2 :
Station 3 :
Start Date: 11/1/2016 **End Date:** 11/30/2016
Get Summary

Stations:

TN-RD-8
Murfreesboro 3.2 WSW
Lat: 35.831422
Lon: -86.44507

* indicates Multi-Day Accumulation Report

Station **TN-RD-8**

Date	Precip in.
11/01/2016	0.00
11/02/2016	0.00
11/03/2016	0.00
11/04/2016	0.00
11/05/2016	0.00
11/06/2016	0.00
11/07/2016	0.00
11/08/2016	0.00
11/09/2016	0.00
11/10/2016	0.00
11/11/2016	0.00
11/12/2016	0.00
11/13/2016	0.00
11/14/2016	0.00
11/15/2016	0.00
11/16/2016	0.00
11/17/2016	0.00
11/18/2016	0.00
11/19/2016	0.14
11/20/2016	0.00
11/21/2016	0.00
11/22/2016	0.00
11/23/2016	0.00
11/24/2016	T
11/25/2016	0.00
11/26/2016	0.00
11/27/2016	0.00
11/28/2016	0.00
11/29/2016	0.93
11/30/2016	0.90
Totals :	**1.97 in.**

View Data : Station Report Summary US Units

View Data

- Daily Precip Reports
- Daily Comments Reports
- Significant Weather Reports
- Multiple Day Reports
- Condition Monitoring Reports

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Station Report Summary

Station 1 : TN-RD-8 Example: CO-LR-273
Station 2 :
Station 3 :
Start Date: 10/1/2016 **End Date:** 10/31/2016
Get Summary

Stations:

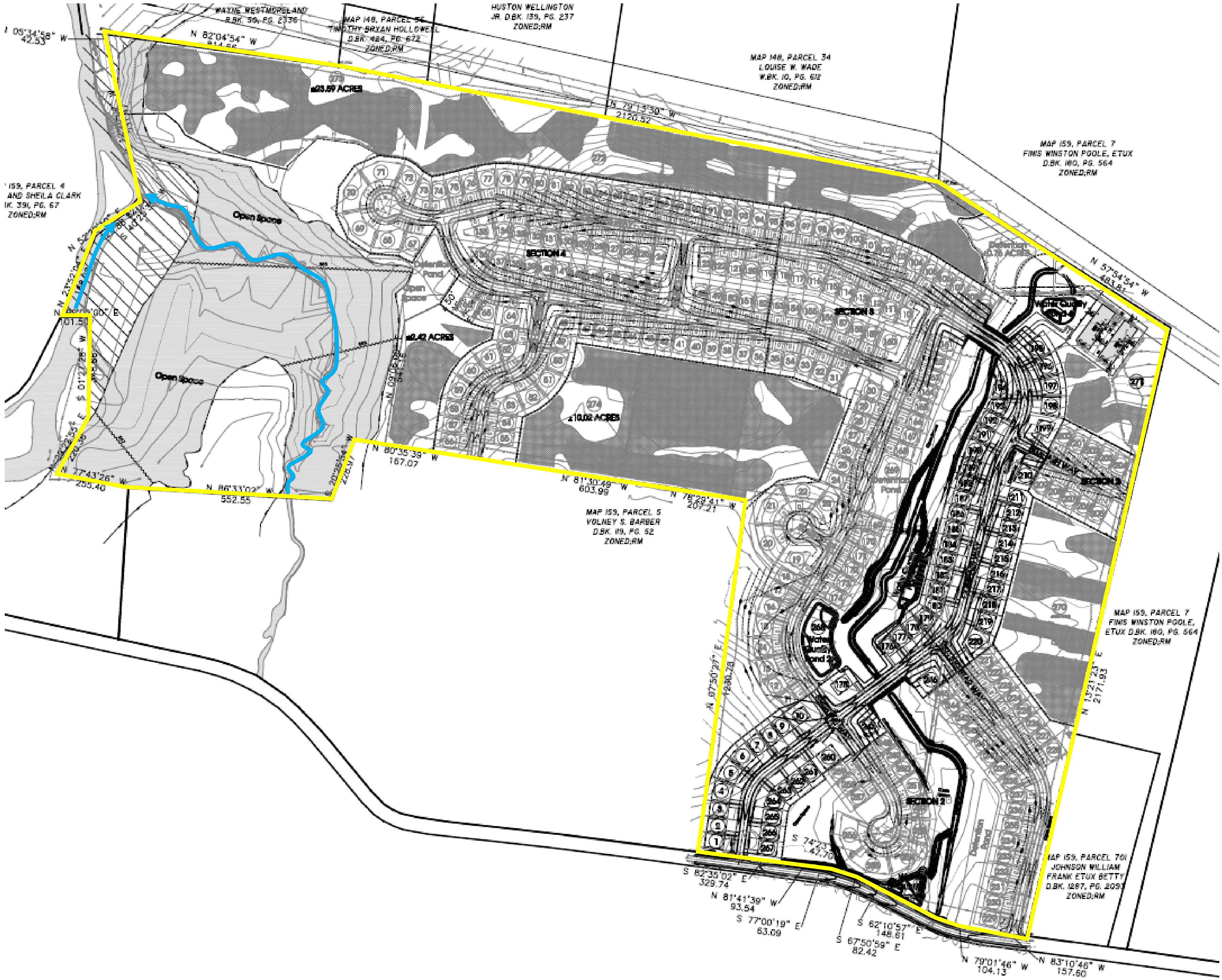
TN-RD-8
Murfreesboro 3.2 WSW
Lat: 35.831422
Lon: -86.44507

* indicates Multi-Day Accumulation Report

Station **TN-RD-8**

Date	Precip in.
10/01/2016	0.00
10/02/2016	0.00
10/03/2016	0.00
10/04/2016	0.00
10/05/2016	0.00
10/06/2016	0.00
10/07/2016	0.00
10/08/2016	0.00
10/09/2016	0.00
10/10/2016	0.00
10/11/2016	0.00
10/12/2016	0.00
10/13/2016	0.00
10/14/2016	0.00
10/15/2016	T
10/16/2016	0.00
10/17/2016	0.00
10/18/2016	0.00
10/19/2016	0.00
10/20/2016	0.00
10/21/2016	0.47
10/22/2016	0.00
10/23/2016	0.00
10/24/2016	0.00
10/25/2016	0.00
10/26/2016	0.00
10/27/2016	0.00
10/28/2016	T
10/29/2016	0.00
10/30/2016	0.00
10/31/2016	0.00
Totals :	**0.47 in.**

Attachment 2. Clearview Estates Site Development Plan



WAYNE WESTMORELAND
D.BK. 50, PG. 2336
MAP 148, PARCEL 56
TIMOTHY BRYAN HOLLOWELL
D.BK. 424, PG. 672
ZONED:RM
HUSTON WELLINGTON
JR. D.BK. 139, PG. 237
ZONED:RM
MAP 148, PARCEL 34
LOUISE W. WADE
W.BK. 10, PG. 612
ZONED:RM
MAP 159, PARCEL 7
FINIS WINSTON POOLE, ETUX
D.BK. 160, PG. 564
ZONED:RM
MAP 159, PARCEL 7
FINIS WINSTON POOLE,
ETUX D.BK. 160, PG. 564
ZONED:RM
MAP 159, PARCEL 70
JOHNSON WILLIAM
FRANK ETUX BETTY
D.BK. 1287, PG. 2093
ZONED:RM
MAP 159, PARCEL 5
VOLNEY S. BARBER
D.BK. 119, PG. 52
ZONED:RM
159, PARCEL 4
AND SHEILA CLARK
BK. 391, PG. 67
ZONED:RM
05°34'58" W
42.53
N 82°04'54" W
N 79°13'30" W
2120.52
N 57°54'54" W
483.81
N 13°21'23" E
2171.93
N 83°10'46" W
157.60
N 79°01'46" W
104.13
S 67°50'59" E
82.42
S 62°10'57" E
148.61
S 77°00'19" E
63.09
N 81°41'39" W
93.54
S 82°35'02" E
329.74
N 07°50'27" E
1230.28
N 78°29'41" W
207.21
N 81°30'49" W
603.99
N 80°35'39" W
167.07
N 86°33'02" W
552.55
N 77°43'26" W
255.40
S 01°27'28" W
101.51
±93.59 ACRES
±10.02 ACRES
±2.42 ACRES
SECTION 2
SECTION 3
SECTION 4
Open Space
Open Space
Detention Pond
Water Quality Pond 2

Attachment 3. Property Access Permission Letter

Date: 2/9/17

Division of Water Resources
Tennessee Department of Environment and Conservation (TDEC)
711 R.S. Gass Boulevard
Nashville, TN 37216

RE: Permission to Access Property for Hydrological Determination for Clearview Acres, 1004 Walnut Grove, Christiana, (Rutherford County)

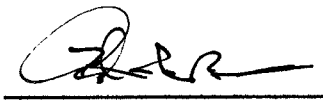
TDEC has my permission to access the property located at 1004 Walnut Grovet as referenced in the Hydrological Determination Report conducted by Mr. Anthony Grow.

Please contact me via my cell phone or email if you have any questions.

Sincerely,

Company Name (if applicable): Clearview Acres, LP

Name: Gilbert Barbar

Signature: 

Address: 1002 Walnut Grove Road, Christiana, TN

Phone: (615) 893-3552

Email: 

Cc:
Anthony A. Grow, PG, TNQHP

APPENDIX “E”

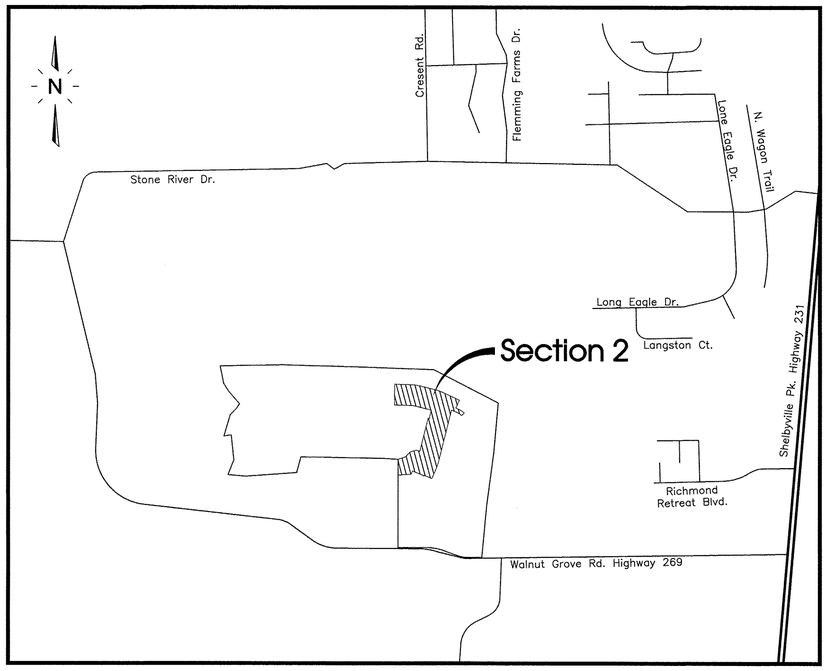
½ SIZE CONSTRUCTION PLANS

Clearview Acres
Section 2

Rutherford County, Tennessee
S.O.P. No. 16018
Construction Drawings

Drawing Index

Sheet No.	Title
C0.0	Cover Sheet
C0.1	Master Plan
C1.0-C1.1	Preliminary Plan
C2.0	Existing Conditions and Initial EPSC Plan
C3.0	Intermediate EPSC Plan
C4.0-C4.1	Grading, Drainage and Final EPSC Plan
C5.0-C5.1	Road Profiles
C6.0	General Notes
C6.1-C6.2	Notes and Details



Site Location Map
Not To Scale

Owner/Developer:

3BC, LLC
2127 Tabasco Way
Murfreesboro, TN 37128-8255
(615) 531-1173
Contact: Bud George

Floodplain Note:

A Portion Of This Site Lies Within The 100 Year Flood Plain Per F.E.M.A. Community Panel No. 47149C0377H, 47149C0381H and 47149C0383H, Dated Jan. 5 2007.

Total Site Land Data:

Zoning: PUD
Total 278 Lots on 142.46± Acres
Total 268 Buildable Lots
Section 2 Total Area 13.05± Acres
Section 2 Total No.Lots: 55
Section 2 Total Buildable Lots: 54

Yard Requirements:

Front: 35'
Side: 7.5' (15' Separation Between Buildings)
Rear: 20'

Deed Reference:

The property shown hereon is Tax Map 159, Parcels 6.00 and 6.01, in the 8th Civil District of Rutherford County, as recorded in Record Bk. 606, Pg 664.

STEP Design:

STEP Area = 37.52 Acres
Design Flow = 270 Lots x 300 gpd = 81,000 gpd
Design Loading Soil Rate = 0.15 gal/sf
Required Land Application Area = 12.40 Acres
Proposed Land Application Area = 12.40 Acres
Required 50% Reserve Application Area = 6.20 Acres
Provided 56% Reserve Application Area = 9.29 Acres

Notes:

1. As-built surveys and certifications will be required for detention ponds, public storm infrastructure, and cut/fill on lots, prior to the release of lots for home construction.
2. Sidewalks to be maintained by HOA.

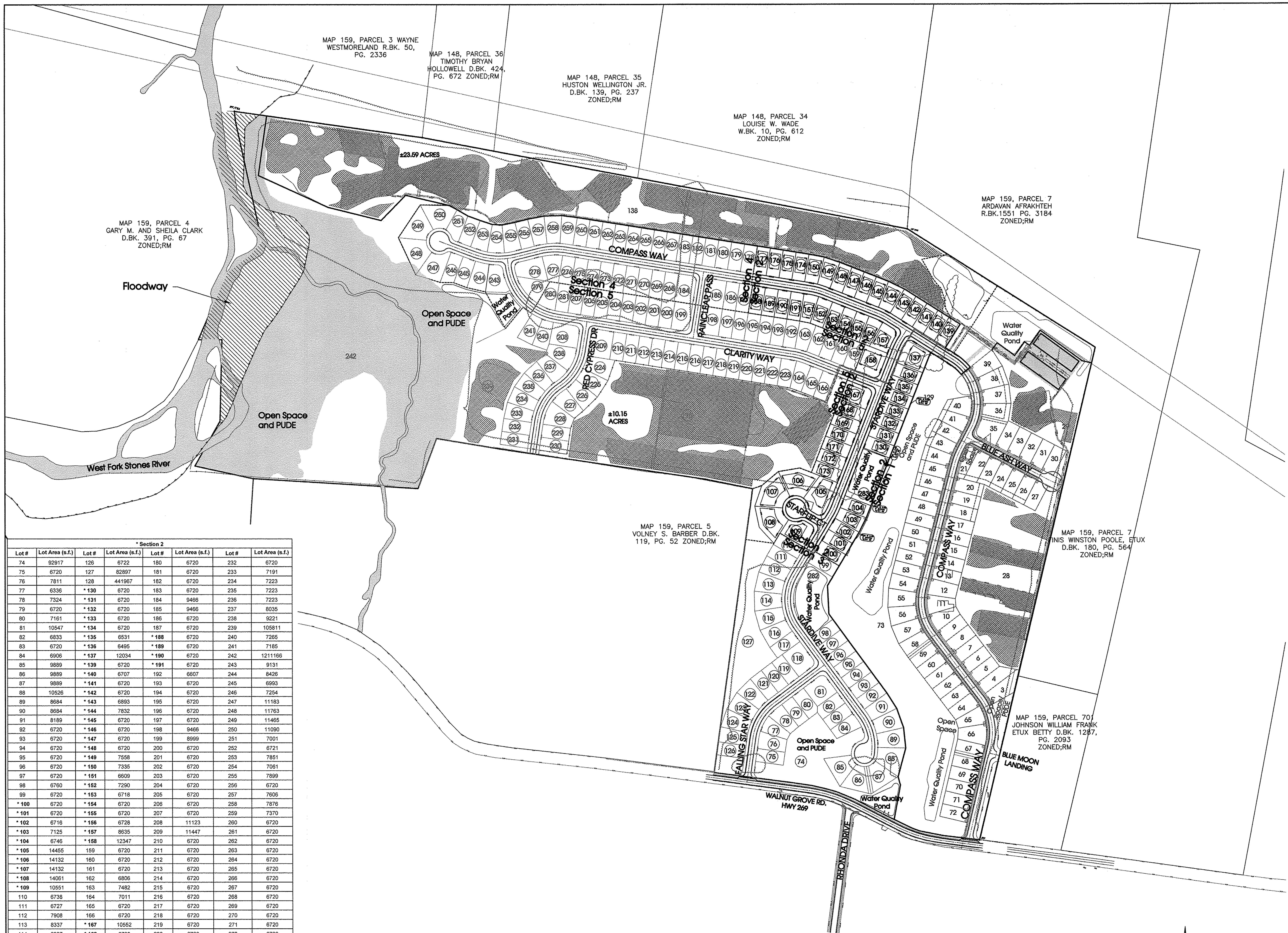
SEC, Inc. SITE ENGINEERING CONSULTANTS
ENGINEERING • SURVEYING • LAND PLANNING
LANDSCAPE ARCHITECTURE
850 MIDDLE TENNESSEE BOULEVARD MURFREESBORO, TENNESSEE 37129
PHONE: (615) 890-7901 E-MAIL: RHOUZE@SEC-CIVIL.COM FAX: (615) 895-2567

By: Richard Houze Date: 3/7/19
Richard Houze, P.E. TN. Reg. #108494

R. CHARD HOUZE REGISTERED ENGINEER AGRICULTURAL & BIOSYSTEMS ENGINEER No. 108494 STATE OF TENNESSEE

Drainage Basin: West Fork Stones River Upper

Sheet C0.0
Clearview Acres, Section 2
Construction Drawings
S.E.C. Project #14300
Date: 2-28-19
Revised:



* Section 2									
Lot #	Lot Area (s.f.)	Lot #	Lot Area (s.f.)	Lot #	Lot Area (s.f.)	Lot #	Lot Area (s.f.)
74	92917	126	6722	180	6720	232	6720
75	6720	127	82897	181	6720	233	7191
76	7811	128	441967	182	6720	234	7223
77	6336	*** 130**	6720	183	6720	235	7223
78	7324	*** 131**	6720	184	9466	236	7223
79	6720	*** 132**	6720	185	9466	237	8035
80	7161	*** 133**	6720	186	6720	238	9221
81	10547	*** 134**	6720	187	6720	239	105811
82	6833	*** 135**	6531	*** 188**	6720	240	7265
83	6720	*** 136**	6495	*** 189**	6720	241	7185
84	6906	*** 137**	12034	*** 190**	6720	242	1211166
85	9889	*** 139**	6720	*** 191**	6720	243	9131
86	9889	*** 140**	6707	192	6607	244	8426
87	9889	*** 141**	6720	193	6720	245	6993
88	10526	*** 142**	6720	194	6720	246	7254
89	8684	*** 143**	6893	195	6720	247	11183
90	8684	*** 144**	7832	196	6720	248	11763
91	8189	*** 145**	6720	197	6720	249	11465
92	6720	*** 146**	6720	198	9466	250	11090
93	6720	*** 147**	6720	199	8999	251	7001
94	6720	*** 148**	6720	200	6720	252	6721
95	6720	*** 149**	7558	201	6720	253	7851
96	6720	*** 150**	7335	202	6720	254	7061
97	6720	*** 151**	6609	203	6720	255	7899
98	6760	*** 152**	7290	204	6720	256	6720
99	6720	*** 153**	6718	205	6720	257	7606
*** 100**	6720	*** 154**	6720	206	6720	258	7876
*** 101**	6720	*** 155**	6720	207	6720	259	7370
*** 102**	6716	*** 156**	6728	208	11123	260	6720
*** 103**	7125	*** 157**	8635	209	11447	261	6720
*** 104**	6746	*** 158**	12347	210	6720	262	6720
*** 105**	14455	159	6720	211	6720	263	6720
*** 106**	14132	160	6720	212	6720	264	6720
*** 107**	14132	161	6720	213	6720	265	6720
*** 108**	14061	162	6806	214	6720	266	6720
*** 109**	10551	163	7482	215	6720	267	6720
110	6738	164	7011	216	6720	268	6720
111	6727	165	6720	217	6720	269	6720
112	7908	166	6720	218	6720	270	6720
113	8337	*** 167**	10552	219	6720	271	6720
114	8337	*** 168**	6720	220	6720	272	6720
115	8277	*** 169**	6720	221	6720	273	6720
116	6720	*** 170**	6720	222	6720	274	6720
117	6720	*** 171**	6720	223	7335	275	6720
118	11140	*** 172**	6720	224	8800	276	6719
119	6731	*** 173**	6708	225	8331	277	7664
120	6720	* 174	6720	226	8333	278	10501
121	6941	* 175	6720	227	8066	279	8419
122	8153	* 176	6720	228	9211	280	6984
123	8153	* 177	6720	229	6720	281	6718
124	8153	178	6750	230	6720	282	35576
125	7229	179	6720	231	6720	*** 283**	**26359**

Legend:

EXIST. CONCRETE MONUMENT	BENCHMARK
IRON PIN SET (I.P.S.)	HANDICAP RAMP SYMBOL
IRON PIN FOUND (I.P.F.)	VAN ACCESSIBLE HANDICAP DESIGNATION
EXIST. SIGN POST	HC SIGN
EXIST. SEWER CLEANOUT	PROPOSED SIGN POST
EXIST. MANHOLE (SEWER and PHONE)	CONCRETE BOLLARD
EXIST. CATCH BASIN (STORM SEWER)	WHEEL STOP
EXIST. WATER/GAS VALVE	CONCRETE SIDEWALK
EXIST. TELEPHONE RISER	EXTRUDED CURB
EXIST. GAS RISER	CURB and GUTTER
ELECTRICAL ENCLOSURE	TRAFFIC ARROW
EXIST. WATER METER	TURN LANE ARROWS
EXIST. UTILITY POLE	REVISION NUMBER
EXIST. FIRE HYDRANT	DRAINAGE STRUCTURE DESIGNATION
POST INDICATOR VALVE	DRAINAGE PIPE DESIGNATION
BLOW OFF VALVE	RIP RAP
REDUCER	RUNOFF FLOW ARROW
REMOTE FIRE DEPT. CONNECTION	INLET FILTER PROTECTION
CONCRETE THRUST BLOCK	PROPOSED SPOT ELEVATION
DOUBLE DETECTOR CHECK VALVE	EXIST. SPOT ELEVATION
FIRE DEPT. CONNECTION	SEWER/STORM FLOW DIRECTION
FIRE HYDRANT	CATCH BASIN
GATE VALVE and BOX	CURB INLET
WATER METER	AREA DRAIN
GAS METER	HEADWALL
GREASE TRAP	WINGED HEADWALL
EXTERIOR CLEANOUT ECO	CONCRETE SWALE
MANHOLE	TYPE- X- HEADWALL

EXISTING PHONE	PH
EXISTING ELECTRIC	OH
PROPERTY LINE	
EASEMENTS	
RIGHT OF WAY	ROW
EROSION CONTROL SILT FENCE	SF
EROSION EEL	E
EXISTING TREELINE	
EXISTING FENCELINE	X
MINIMUM BUILDING SETBACK LINE	MBSL
PHASE BOUNDARY	
EXISTING GAS LINE	GAS
PROPOSED GAS LINE	GAS
EXISTING STORM	STM
PROPOSED STORM	STM
EXISTING CONTOUR LINES	601
PROPOSED CONTOUR LINES	601
EXISTING SANITARY SEWER	SS
PROPOSED SANITARY SEWER	SS
EXISTING WATER	W
PROPOSED WATER	W

SITE ENGINEERING CONSULTANTS
ENGINEERING • SURVEYING • LAND PLANNING

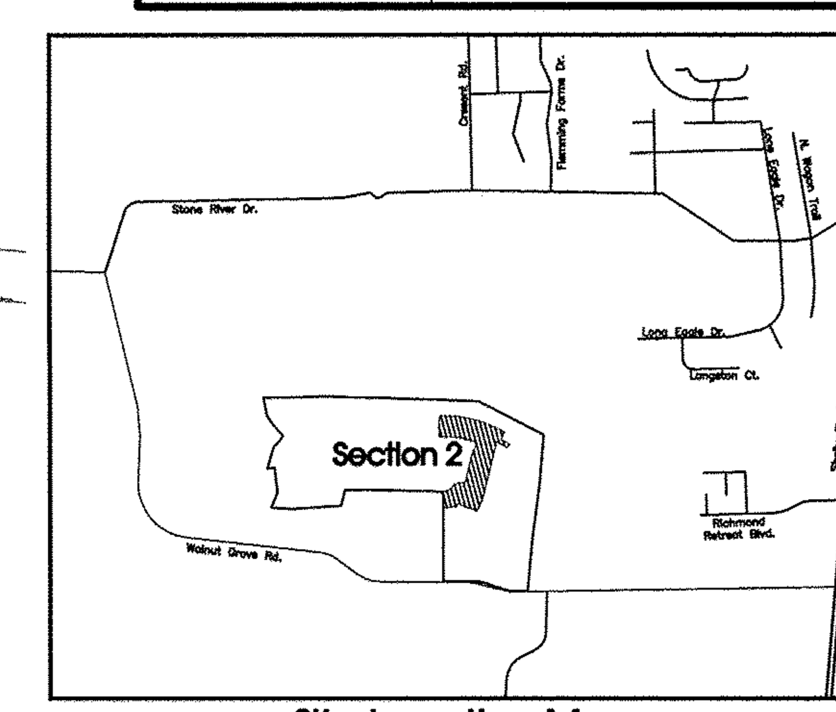
SEC, Inc.

850 MIDDLE TENNESSEE BOULEVARD MURFREESBORO, TENNESSEE 37129
PHONE: (615) 890-7901 FAX: (615) 895-2567

RICHARD HOUZE — STATE OF TENNESSEE

Clearview Acres Section 2

Rutherford County, TN

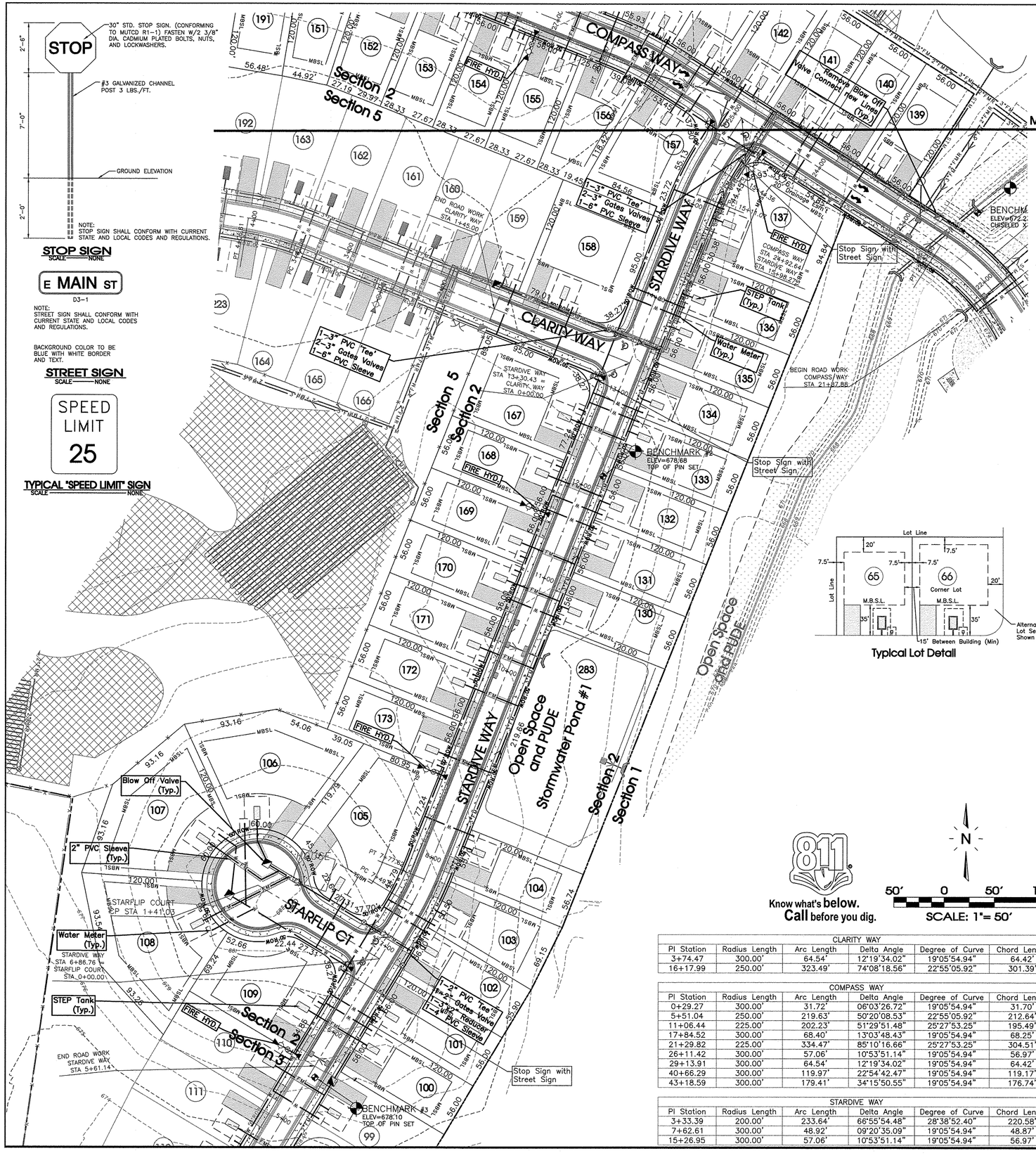


Site Location Map
Not To Scale

REVISED:

DRAWN: JLM
DATE: 1-31-19
CHECKED: RH
FILE NAME: 14300ProjectP2
SCALE: 1"=200'
JOB NO. 14300
SHEET: C0.1

Master Plan



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Field Survey performed from: 09-6 to 09-27, 2016. Horizontal and vertical survey control is tied to the Tennessee State Plane coordinate system (NAD83/NAVD88), referenced from Rutherford County Control monument number RCC-020.

BENCHMARK #1:	BENCHMARK #2:	BENCHMARK #3:
CHISELED 'X' ON HW	TPS	TPS
ELEV: 672.23	ELEV: 678.68	ELEV: 678.10
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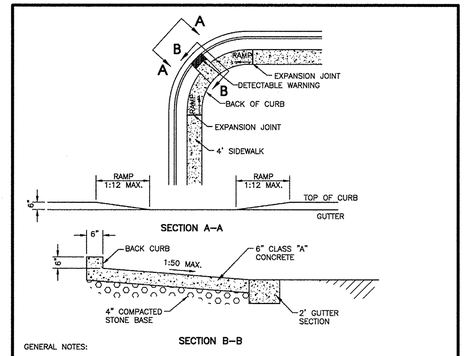

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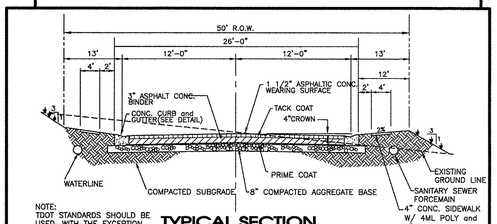
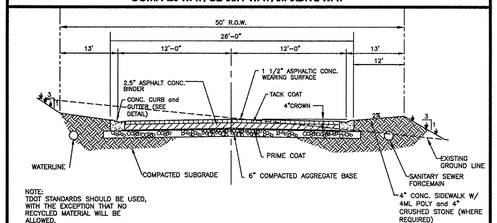
HANDICAP RAMP
SCALE NONE



NOTE: TDOT STANDARDS SHOULD BE USED, WITH THE EXCEPTION THAT NO RECYCLED MATERIAL WILL BE ALLOWED.

TYPICAL SECTION
SCALE NONE
COMPASS WAY, CLARITY WAY, STARDIVE WAY



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STARFLIP COURT

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Legend:

EXIST. CONCRETE MONUMENT		BENCHMARK	
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IRON PIN FOUND (I.P.F.)	V.A.	VAN ACCESSIBLE HANDICAP DESIGNATION	
EXIST. SIGN POST		HC SIGN	
EXIST. SEWER CLEANOUT		PROPOSED SIGN POST	
EXIST. MANHOLE (SEWER and PHONE)		CONCRETE BOLLARD	
EXIST. CATCH BASIN (STORM SEWER)		WHEEL STOP	
EXIST. WATER/GAS VALVE		CONCRETE SIDEWALK	
EXIST. TELEPHONE RISER		EXTRUDED CURB	
EXIST. GAS RISER		CURB and GUTTER	
ELECTRICAL ENCLOSURE		TRAFFIC ARROW	
EXIST. WATER METER		TURN LANE ARROWS	
EXIST. UTILITY POLE	1	REVISION NUMBER	
EXIST. FIRE HYDRANT	#1	DRAINAGE STRUCTURE DESIGNATION	
POST INDICATOR VALVE	A	DRAINAGE PIPE DESIGNATION	
BLOW OFF VALVE		RIP RAP	
REDUCER		RUNOFF FLOW ARROW	
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FIRE DEPT. CONNECTION		SEWER/STORM FLOW DIRECTION	
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GATE VALVE and BOX		CURB INLET	
WATER METER		AREA DRAIN	
GAS METER		HEADWALL	
GREASE TRAP		WINGED HEADWALL	
EXTERIOR CLEANOUT ECO		CONCRETE SWALE	
MANHOLE		TYPE- X- HEADWALL	
EXISTING PHONE	PH		
EXISTING ELECTRIC	OH		
PROPERTY LINE			
EASEMENTS			
RIGHT OF WAY	ROW		
EROSION CONTROL SILT FENCE	SF SF		
EROSION EEL	E E E E		
EXISTING TREELINE			
EXISTING FENCELINE	X X		
MINIMUM BUILDING SETBACK LINE	MBSL		
PHASE BOUNDARY			
EXISTING GAS LINE	GAS GAS		
PROPOSED GAS LINE	GAS GAS		
EXISTING STORM	STM STM		
PROPOSED STORM	STM STM		
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Owner/Developer:

3BC, LLC
2127 Tabasco Way
Murfreesboro, TN 37128-8255
(615) 531-1173
Contact: Bud George

Floodplain Note:

A Portion Of This Site Lies Within The 100 Year Flood Plain Per F.E.M.A. Community Panel No. 47149C0377H, 47149C0381H and 47149C0383H, Dated Jan. 5 2007.

Total Site Land Data:

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Total 278 Lots on 142.46± Acres
Total 268 Buildable Lots
Section 2 Total Area 13.05± Acres
Section 2 Total No.Lots: 55
Section 2 Total Buildable Lots: 54

Yard Requirements:

Front: 35'
Side: 7.5' (15' Separation Between Buildings)
Rear: 20'

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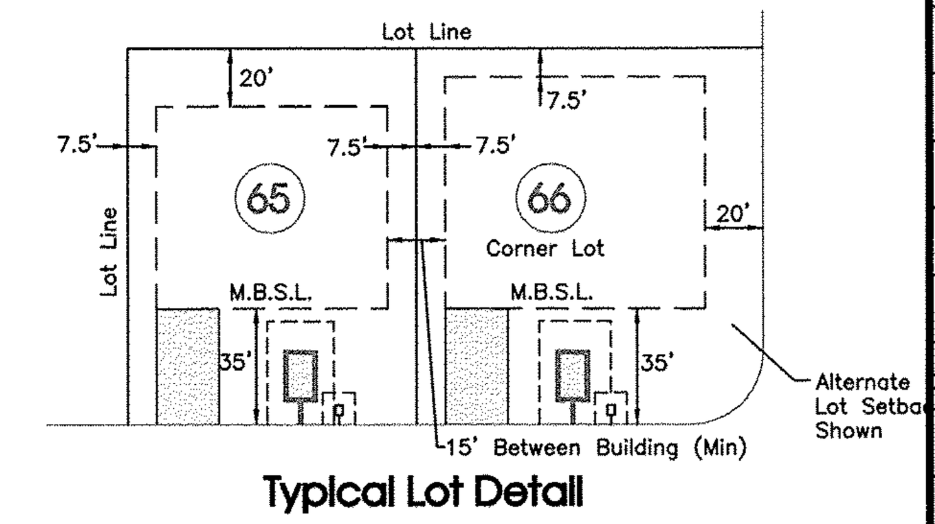
RICHARD HOUZE LICENSED PROFESSIONAL ENGINEER STATE OF TENNESSEE

Clearview Acres Section 2

Rutherford County, TN

Preliminary Plan

REVISED:
DRAWN: JLM
DATE: 2-28-19
CHECKED: RH
FILE NAME: 14300ProjectP2
SCALE: 1"=50'
JOB NO. 14300
SHEET: C1.0



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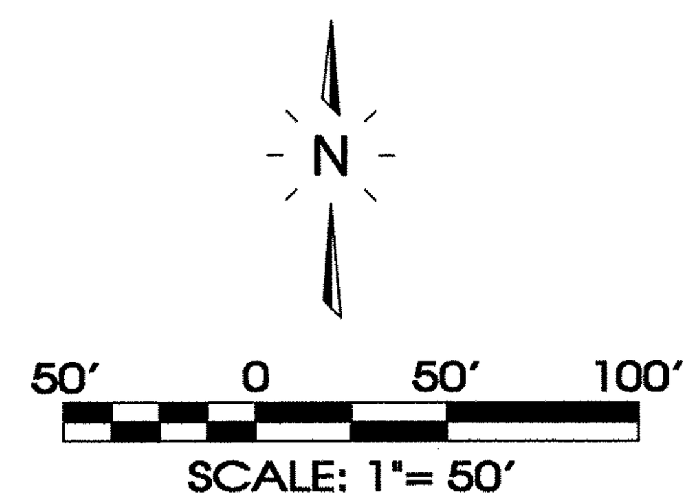
Know what's **below.**
Call before you dig.



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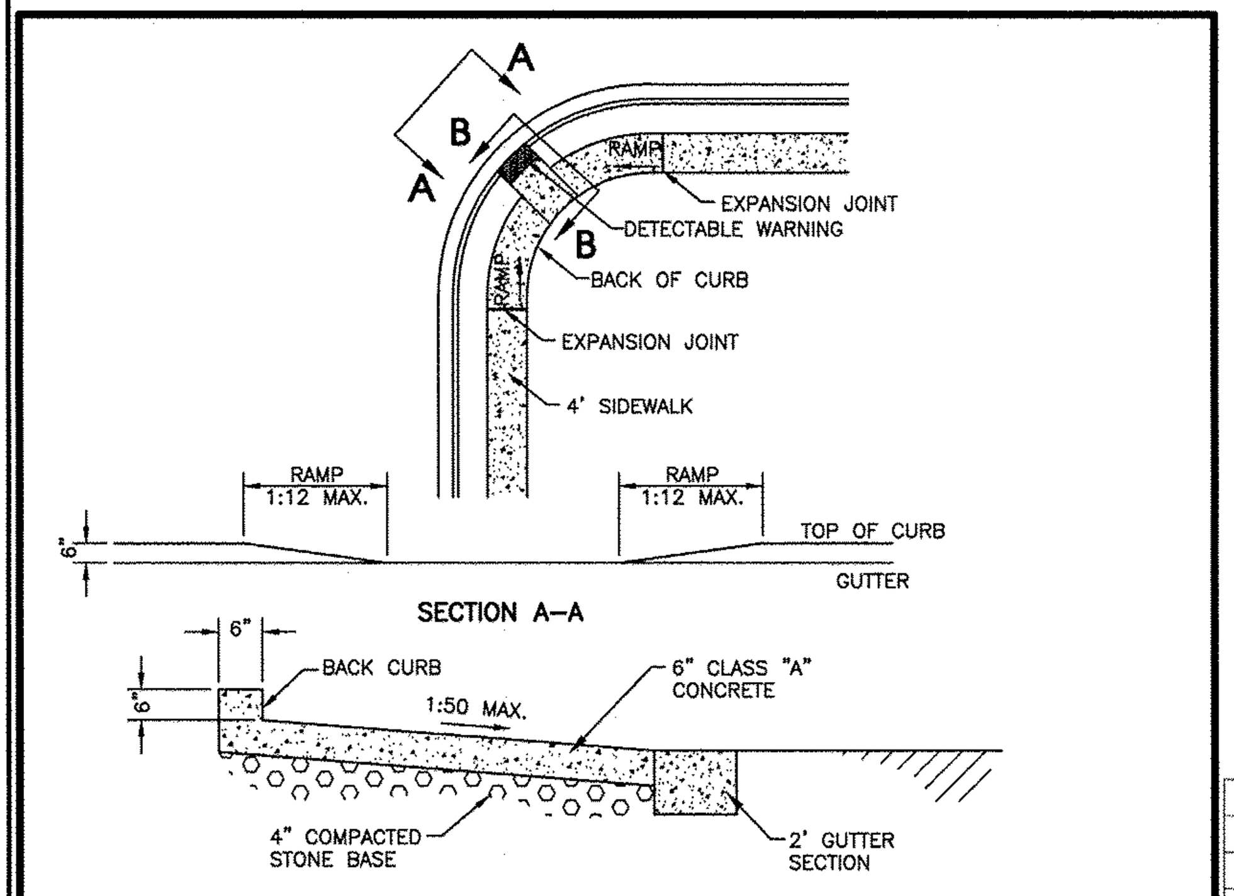
The site as shown on these construction drawings is intended to achieve specific engineering design criteria and objectives. It is the sole responsibility of the owner/developer to ensure that the construction of the site shown on these construction drawings is in total accordance with the design as noted, described, and illustrated. The engineer assumes no administrative liability or responsibility in the assurance that the site is constructed in accordance with the construction plans.

RICHARD HOUZE — REGISTERED ENGINEER — AGRICULTURE COMMERCE — No. 108494 — STATE OF TENNESSEE

Clearview Acres Section 2

Rutherford County, TN



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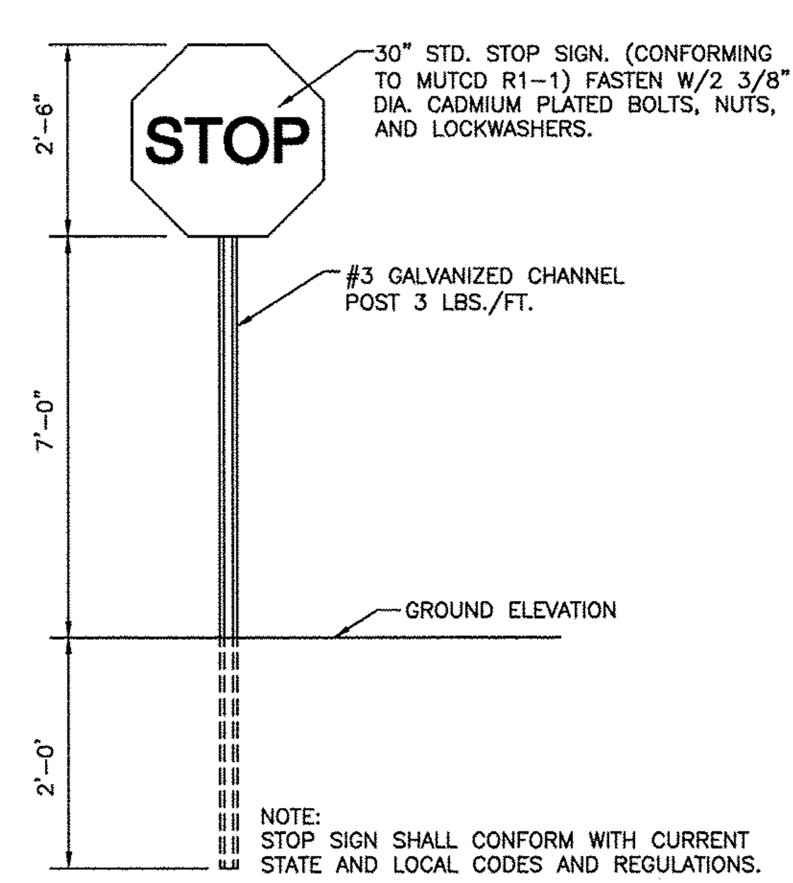


NOTE:
STOP SIGN SHALL CONFORM WITH CURRENT STATE AND LOCAL CODES AND REGULATIONS.

STOP SIGN
SCALE——NONE

E MAIN ST
D3-1

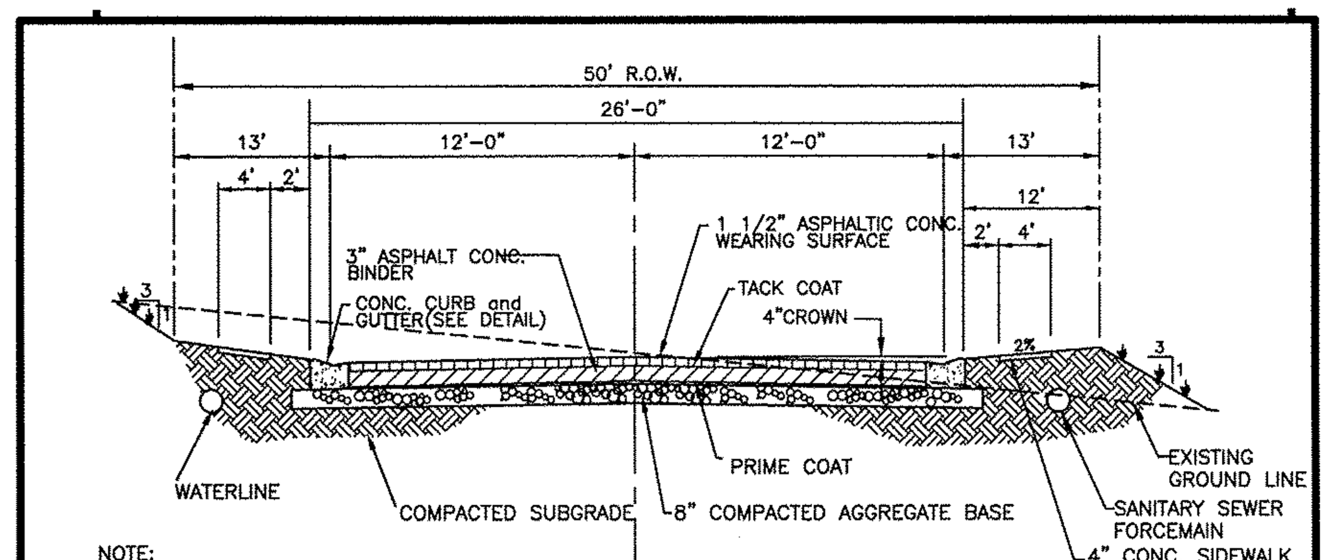
NOTE:
STREET SIGN SHALL CONFORM WITH CURRENT STATE AND LOCAL CODES AND REGULATIONS.

BACKGROUND COLOR TO BE BLUE WITH WHITE BORDER AND TEXT.

STREET SIGN
SCALE——NONE

SPEED LIMIT 25

TYPICAL 'SPEED LIMIT' SIGN
SCALE——NONE



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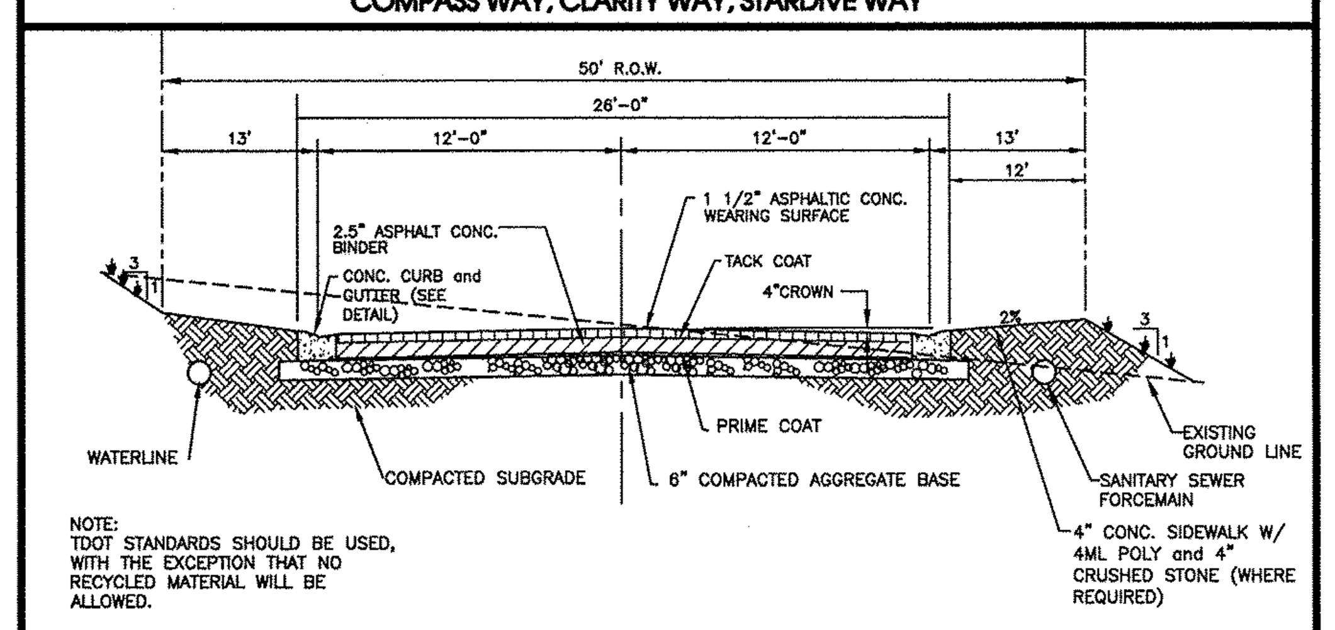

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Preliminary Plan

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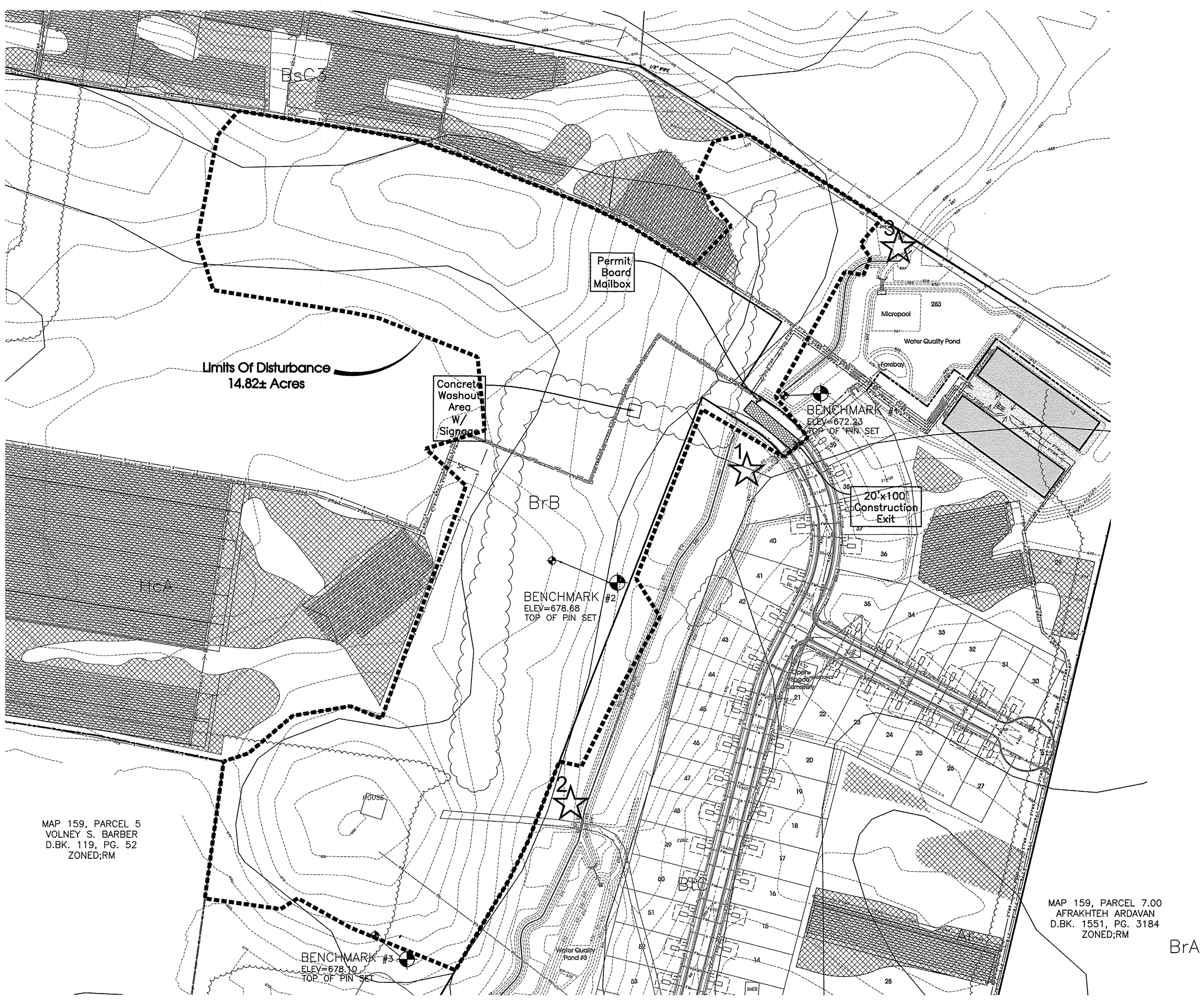

PROPOSED BMP'S

BMP	TYPE
SILT FENCE	TEMPORARY, SEDIMENT CONTROL
CONSTRUCTION ENTRANCE	TEMPORARY, SEDIMENT CONTROL
VEGETATION	PERMANENT, EROSION PREVENTION
INLET PROTECTION	TEMPORARY, SEDIMENT CONTROL
DETENTION POND	PERMANENT, WATER QUALITY
TREE PROTECTION	TEMPORARY, PROTECTION
EROSION EEL	TEMPORARY, SEDIMENT CONTROL

EXISTING ON-SITE CONDITIONS

COVER	SCS CLASSIFICATION	AREA (Ac)
PASTURE	PASTURE FAIR CONDITION B SOILS, CN=69	1.94
PASTURE	PASTURE FAIR CONDITION C SOILS, CN=79	9.63
PASTURE	PASTURE FAIR CONDITION D SOILS, CN=84	0.53
WOODS	WOODS FAIR CONDITION B SOILS, CN=60	0.55
WOODS	WOODS FAIR CONDITION C SOILS, CN=73	2.77
WOODS	WOODS FAIR CONDITION D SOILS, CN=79	0.09
		COMPOSITE CN=76

PROPOSED ON-SITE CONDITIONS

COVER	SCS CLASSIFICATION	AREA (Ac)
PAVED ROADS	ROADS, CN=98	2.91
RESIDENTIAL $\frac{1}{8}$ ACRE LOTS	RESIDENTIAL 30% IMPERVIOUS B SOILS, CN=85	2.07
RESIDENTIAL $\frac{1}{8}$ ACRE LOTS	RESIDENTIAL 30% IMPERVIOUS C SOILS, CN=90	7.72
RESIDENTIAL $\frac{1}{8}$ ACRE LOTS	RESIDENTIAL 30% IMPERVIOUS D SOILS, CN=92	0.02
OPEN SPACE	OPEN SPACE B SOILS, CN=61	0.32
OPEN SPACE	OPEN SPACE C SOILS, CN=74	2.08
OPEN SPACE	OPEN SPACE D SOILS, CN=80	0.41
		COMPOSITE CN=88

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OUTFALLS

NUMBER	DESCRIPTION	DRAINAGE AREA			RECEIVING FEATURE
		DISTURBED	PASS THRU	TOTAL	
1	TEMP. CONSTRUCTION EXIT	0.10 Ac.	0.00 Ac.	0.10 Ac.	WEST FORK STONES RIVER UPPER
2	WATER QUALITY POND	4.60 Ac.	5.08 Ac.	9.68 Ac.	WEST FORK STONES RIVER UPPER
3	WATER QUALITY POND	4.84 Ac.	1.88 Ac.	6.72 Ac.	WEST FORK STONES RIVER UPPER

EPSC Phasing

Initial: Silt Fence Along Downgradient
Perimeter Construction Entrance
Check Dams In Existing Ditches
Filter Fabric Inlet Protection

Intermediate: Temporary Seeding
Filter Fabric Inlet Protection
Check Dams In Proposed Ditches
Silt Fence To Protect Ditches
Erosion Control Blanket Installation At Prescribed Locations

Final: Seeding And Stabilization Of All Disturbed Areas

1 ☆ Outfall

LIMITS OF DISTURBANCE

Know what's below. Call before you dig.

N

100' 0 100' 200'
SCALE: 1"= 100'

Legend:

	EXIST. CONCRETE MONUMENT		BENCHMARK
	IRON PIN SET (I.P.S.)		HANDICAP RAMP SYMBOL
	IRON PIN FOUND (I.P.F.)	V.A.	VAN ACCESSIBLE HANDICAP DESIGNATION
	EXIST. SIGN POST		HC SIGN
	EXIST. SEWER CLEANOUT		PROPOSED SIGN POST
	EXIST. MANHOLE (SEWER and PHONE)		CONCRETE BOLLARD
	EXIST. CATCH BASIN (STORM SEWER)		WHEEL STOP
	EXIST. WATER/GAS VALVE		CONCRETE SIDEWALK
T	EXIST. TELEPHONE RISER		EXTRUDED CURB
G	EXIST. GAS RISER		CURB and GUTTER
E	ELECTRICAL ENCLOSURE		TRAFFIC ARROW
	EXIST. WATER METER		TURN LANE ARROWS
	EXIST. UTILITY POLE	1	REVISION NUMBER
	EXIST. FIRE HYDRANT	#1	DRAINAGE STRUCTURE DESIGNATION
	POST INDICATOR VALVE	A	DRAINAGE PIPE DESIGNATION
	BLOW OFF VALVE		RIP RAP
	REDUCER		RUNOFF FLOW ARROW
	REMOTE FIRE DEPT. CONNECTION		INLET FILTER PROTECTION
	CONCRETE THRUST BLOCK	63.25 ×	PROPOSED SPOT ELEVATION
	DOUBLE DETECTOR CHECK VALVE	(63.25) ×	EXIST. SPOT ELEVATION
	FIRE DEPT. CONNECTION		SEWER/STORM FLOW DIRECTION
	FIRE HYDRANT		CATCH BASIN
	GATE VALVE and BOX		CURB INLET
W	WATER METER		AREA DRAIN
G	GAS METER		HEADWALL
	GREASE TRAP		WINGED HEADWALL
	EXTERIOR CLEANOUT ECO		CONCRETE SWALE
	MANHOLE		TYPE- X- HEADWALL

EXISTING PHONE	PH
EXISTING ELECTRIC	OH
PROPERTY LINE	
EASEMENTS	
RIGHT OF WAY	ROW
EROSION CONTROL SILT FENCE	SF SF
EROSION EEL	E E E E
EXISTING TREELINE	
EXISTING FENCELINE	X X
MINIMUM BUILDING SETBACK LINE	MBSL
PHASE BOUNDARY	
EXISTING GAS LINE	GAS GAS
PROPOSED GAS LINE	GAS GAS
EXISTING STORM	STM STM
PROPOSED STORM	STM STM
EXISTING CONTOUR LINES	601
PROPOSED CONTOUR LINES	601
EXISTING SANITARY SEWER	SS SS
PROPOSED SANITARY SEWER	SS SS
EXISTING WATER	W W
PROPOSED WATER	W W

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E-MAIL: RHOUZE@SEC-CIVIL.COM

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RICHARD HOUZE
STATE OF TENNESSEE

Clearview Acres
Section 2

Rutherford County, TN

Existing Condition and Initial EPSC Plan

REVISED:
DRAWN: JLM
DATE: 2-28-19
CHECKED: RH
FILE NAME: 14300ProjectP2
SCALE: 1"=100'
JOB NO. 14300
SHEET: C2.0

Storm Water Pollution Prevention Notes:

Before starting demolition or construction operations, refer to the Initial EPSC, Intermediate EPSC and SWPPP Plan sheets.

1. The site contractor is responsible for establishing and maintaining suitable erosion and sediment control devices on-site during construction as required to prevent silt from leaving site. Silt will not be allowed beyond construction limits.

2. The contractor is responsible for removing silt from site if not reusable on-site and ensuring plan alignment and grade in all ditches at completion of construction.

3. Erosion control measures shall be provided for all cut and fill operations within the limits of the construction site, throughout the construction period to provide the site with maximum protection from erosion at all times.

4. Erosion control measures are to be installed prior to any grading on-site and are to be maintained in place until stabilization of erodable soils has been accomplished.

5. The Storm Water Pollution Prevention Plan (SWPPP) is an integral part of the Erosion Prevention and Sediment Control (EPSC) Plan and should be followed during all phases of construction (bidding, site work, final stabilization).

6. Any graded or disturbed areas shall have 4 inches of topsoil, seed, mulch, fertilizer and water applied until a healthy stand of grass is obtained unless otherwise noted on plans. The restoration shall closely follow construction.

7. The construction drawings shall be made available on site at all times and presented upon request. If unforeseen stormwater pollution prevention is encountered, additional Storm Water Pollution Prevention (SWPPP) measures may be requested by the owner, city engineer, project engineer, or soil conservation service representative at anytime. Such requests shall be implemented immediately at contractor's expense.

8. All Storm Water Pollution Prevention items shall be installed as shown or noted in these plans.

9. Apply temporary seeding and mulching in all areas that shall be inactive for 15 days or more. All disturbed and eroded earth shall be regraded and seeded within 7 days, as defined above and as shown on the table below to establish stability and provided sediment control.

10. Permanent vegetation shall be installed within 7 days of the completion of any graded area, weather permitting.

11. At such time rough grading or the site is complete and drainage diverts to inlets, inlet sediment filters shall be installed at all inlet structures to keep piping systems free of silt.

12. Silt barriers shall be installed around all existing or new storm inlets, catch basins, yard drains. Install rock check dams for headwall inlets for storm water pollution prevention.

13. Storm water pollution prevention measures shall be installed around all dirt or topsoil stockpiles and other temporarily disturbed areas.

14. Contractor shall inspect all SWPPP measures daily and repair as necessary to prevent erosion. Siltation shall be removed from areas where failures have occurred and corrective action taken within 24 hours to maintain all SWPPP items.

15. Silt barriers, construction entrances, and silt fences shall remain in place until a good stand of grass has been obtained and/or paving operations are complete. Contractor shall keep silt from entering any storm drainage system. Once site has been completely stabilized, silt in pipes and drainage swales shall be removed within 10 days.

16. Temporary sedimentation and stormwater pollution prevention measures must be inspected and logged by the contractor for inspection, inspections and logging shall be weekly and after rain storms.

17. Utility companies must comply with all stormwater pollution prevention measures as defined on the storm water pollution prevention plans, details and notes.

18. The total area of disturbance for the project is 20.91 Acres.

19. All stormwater pollution prevention practices shall be installed before any other earth moving occurs.

20. The contractors shall use temporary sediment filter bags as necessary to control sediment runoff.

21. The following stormwater pollution prevention and sediment control measures will be used on this site:
   A) Sediment control barrier
   B) Filter fabric inlet protection
   C) Construction entrance
   D) Concrete washout facility
   E) Check dams
   F) Temporary seeding
   G) Erosion control blanket
   H) Permanent seeding or sodding

22. Sediment shall be removed from sediment controls as necessary but at least when the design capacity of the control has been reduced by 50%.

Construction Sequence:

1. Stake and/or flag limits of clearing.

2. During preconstruction meeting all erosion and sediment control facilities and procedures shall be discussed.

3. Clear and grub, as necessary, for installation of perimeter controls.

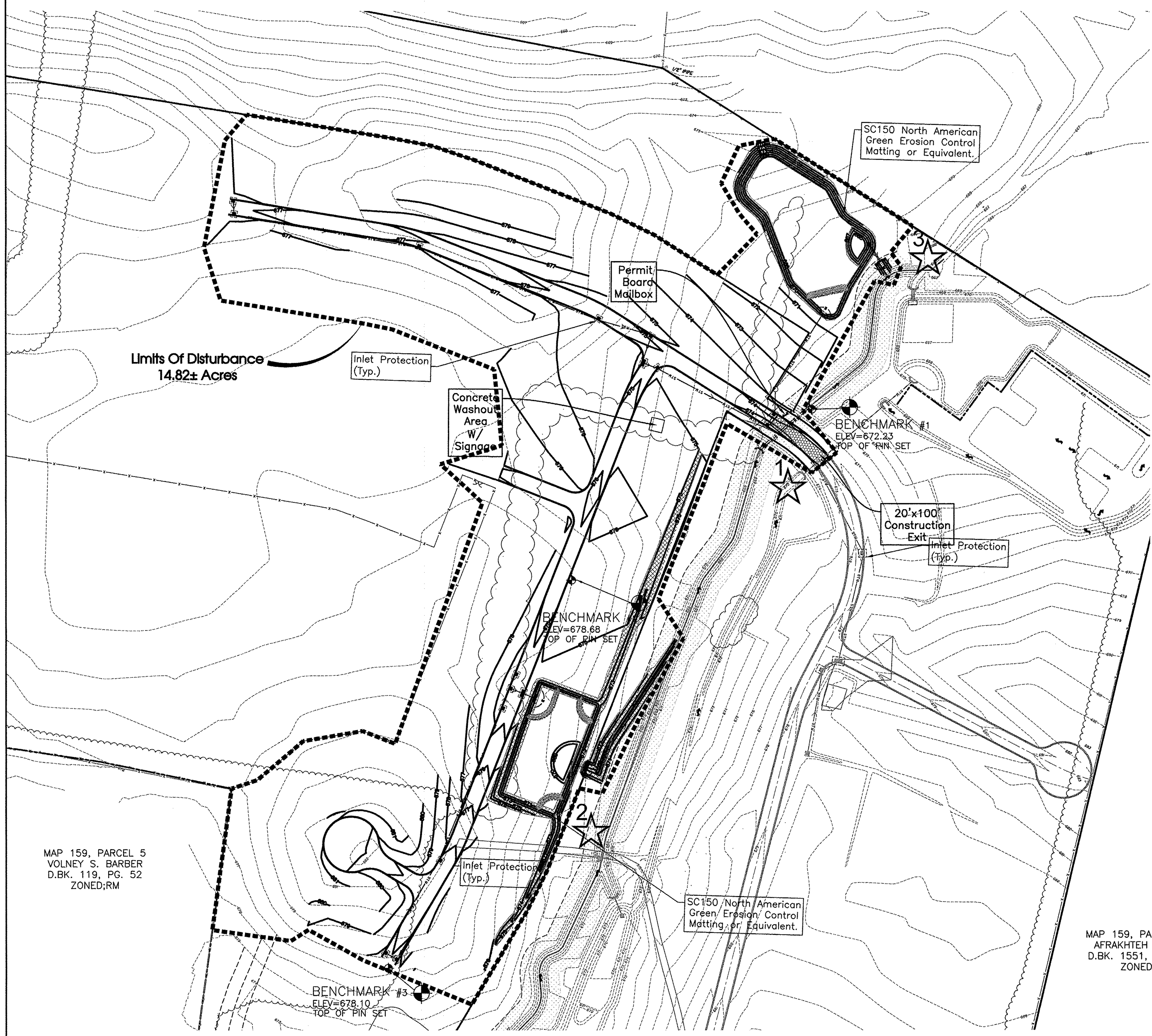
4. Install perimeter sediment controls as shown on plans.

5. Install construction entrance and concrete washout facility, if conditions are such that mud is collecting on vehicle tires, the tires must be cleaned before the vehicles enter the public roadway. The site entrance shall be maintained in a condition that will prevent the tracking or flow of mud onto the public right-of-way. All materials spilled, dropped, washed or tracked from vehicles onto the roadway must be removed promptly.

6. Clear and grub the remaining site as necessary.

7. Refer to construction SWPPP plan sheet.

Seeding Dates	Seed Type	Application Rate Per 1,000 Sq.Ft.
March 1 – August 15	Oats Perennial Rye Grass Or Tall Fescue	3#
August 16 – November 1	Rye, Wheat or Perennial Rye Grass Tall Fescue	1#
After November 1	Straw or Hay Mulch	2–3 Bales
Seed Bed Preparation	Lime 10–10–10 or 12–12–12 Fertilizer	100# 12–15#



Survey Control

Field Survey performed from: 09–6 to 09–27, 2016. Horizontal and vertical survey control is tied to the Tennessee State Plane coordinate system (NAD83/NAVD88), referenced from Rutherford County Control monument number RCC–020.

BENCHMARK #1:	BENCHMARK #2:	BENCHMARK #3:
CHISELED X ON HW	TPS	TPS
ELEV: 672.23	ELEV: 678.68	ELEV: 678.10
NAVD88	NAVD88	NAVD88

EPSC Phasing

Initial: Silt Fence Along Downgradient
Construction Entrance
Concrete Washout Area
Detention Pond/Temp. Sediment Trap

Intermediate: Temporary Seeding
Filter Fabric Inlet Protection
Check Dams In Proposed Ditches
Erosion Control Blanket Or Grass Sod
Installation At Prescribed Locations

Final: Seeding And Stabilization Of All
Disturbed Areas

PROPOSED BMP'S

BMP	TYPE
SILT FENCE	TEMPORARY, SEDIMENT CONTROL
CONSTRUCTION ENTRANCE	TEMPORARY, SEDIMENT CONTROL
VEGETATION	PERMANENT, EROSION PREVENTION
INLET PROTECTION	TEMPORARY, SEDIMENT CONTROL
DETENTION POND	PERMANENT, WATER QUALITY
TREE PROTECTION	TEMPORARY, PROTECTION
EROSION EEL	TEMPORARY, SEDIMENT CONTROL

EXISTING ON-SITE CONDITIONS

COVER	SCS CLASSIFICATION	AREA (Ac)
PASTURE	PASTURE FAIR CONDITION B SOILS, CN=69	1.94
PASTURE	PASTURE FAIR CONDITION C SOILS, CN=79	9.63
PASTURE	PASTURE FAIR CONDITION D SOILS, CN=84	0.53
WOODS	WOODS FAIR CONDITION B SOILS, CN=60	0.55
WOODS	WOODS FAIR CONDITION C SOILS, CN=73	2.77
WOODS	WOODS FAIR CONDITION D SOILS, CN=79	0.09
		COMPOSITE CN=76

PROPOSED ON-SITE CONDITIONS

COVER	SCS CLASSIFICATION	AREA (Ac)
PAVED ROADS	ROADS, CN=98	2.91
RESIDENTIAL $\frac{1}{8}$ ACRE LOTS	RESIDENTIAL 30% IMPERVIOUS B SOILS, CN=85	2.07
RESIDENTIAL $\frac{1}{8}$ ACRE LOTS	RESIDENTIAL 30% IMPERVIOUS C SOILS, CN=90	7.72
RESIDENTIAL $\frac{1}{8}$ ACRE LOTS	RESIDENTIAL 30% IMPERVIOUS D SOILS, CN=92	0.02
OPEN SPACE	OPEN SPACE B SOILS, CN=61	0.32
OPEN SPACE	OPEN SPACE C SOILS, CN=74	2.08
OPEN SPACE	OPEN SPACE D SOILS, CN=80	0.41
		COMPOSITE CN=88

Survey Control

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BENCHMARK #1: CHISELED X ON HW ELEV: 672.23 NAVD88
BENCHMARK #2: TPS ELEV: 678.68 NAVD88
BENCHMARK #3: TPS ELEV: 678.10 NAVD88

OUTFALLS

NUMBER	DESCRIPTION	DRAINAGE AREA			RECEIVING FEATURE
		DISTURBED	PASS THRU	TOTAL	
1	TEMP. CONSTRUCTION EXIT	0.10 Ac.	0.00 Ac.	0.10 Ac.	WEST FORK STONES RIVER UPPER
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3	WATER QUALITY POND	4.84 Ac.	1.88 Ac.	6.72 Ac.	WEST FORK STONES RIVER UPPER

811 Know what's below. Call before you dig.

N

100' 0 100' 200'
SCALE: 1"= 100'

Legend:

EXIST. CONCRETE MONUMENT	BENCHMARK
IRON PIN SET (I.P.S.)	HANDICAP RAMP SYMBOL
IRON PIN FOUND (I.P.F.)	VAN ACCESSIBLE HANDICAP DESIGNATION
EXIST. SIGN POST	HC SIGN
EXIST. SEWER CLEANOUT	PROPOSED SIGN POST
EXIST. MANHOLE (SEWER and PHONE)	CONCRETE BOLLARD
EXIST. CATCH BASIN (STORM SEWER)	WHEEL STOP
EXIST. WATER/GAS VALVE	CONCRETE SIDEWALK
EXIST. TELEPHONE RISER	EXTRUDED CURB
EXIST. GAS RISER	CURB and GUTTER
ELECTRICAL ENCLOSURE	TRAFFIC ARROW
EXIST. WATER METER	TURN LANE ARROWS
EXIST. UTILITY POLE	REVISION NUMBER
EXIST. FIRE HYDRANT	DRAINAGE STRUCTURE DESIGNATION
POST INDICATOR VALVE	DRAINAGE PIPE DESIGNATION
BLOW OFF VALVE	RIP RAP
REDUCER	RUNOFF FLOW ARROW
REMOTE FIRE DEPT. CONNECTION	INLET FILTER PROTECTION
CONCRETE THRUST BLOCK	PROPOSED SPOT ELEVATION
DOUBLE DETECTOR CHECK VALVE	EXIST. SPOT ELEVATION
FIRE DEPT. CONNECTION	SEWER/STORM FLOW DIRECTION
FIRE HYDRANT	CATCH BASIN
GATE VALVE and BOX	CURB INLET
WATER METER	AREA DRAIN
GAS METER	HEADWALL
GREASE TRAP	WINGED HEADWALL
EXTERIOR CLEANOUT ECO	CONCRETE SWALE
MANHOLE	TYPE– X– HEADWALL

EXISTING PHONE	PH
EXISTING ELECTRIC	OH
PROPERTY LINE	
EASEMENTS	
RIGHT OF WAY	ROW
EROSION CONTROL SILT FENCE	SF SF
EROSION EEL	E E E E
EXISTING TREELINE	
EXISTING FENCELINE	X X
MINIMUM BUILDING SETBACK LINE	MBSL
PHASE BOUNDARY	
EXISTING GAS LINE	GAS GAS
PROPOSED GAS LINE	GAS GAS
EXISTING STORM	STM STM
PROPOSED STORM	STM STM
EXISTING CONTOUR LINES	601
PROPOSED CONTOUR LINES	601
EXISTING SANITARY SEWER	SS SS
PROPOSED SANITARY SEWER	SS SS
EXISTING WATER	W W
PROPOSED WATER	W W

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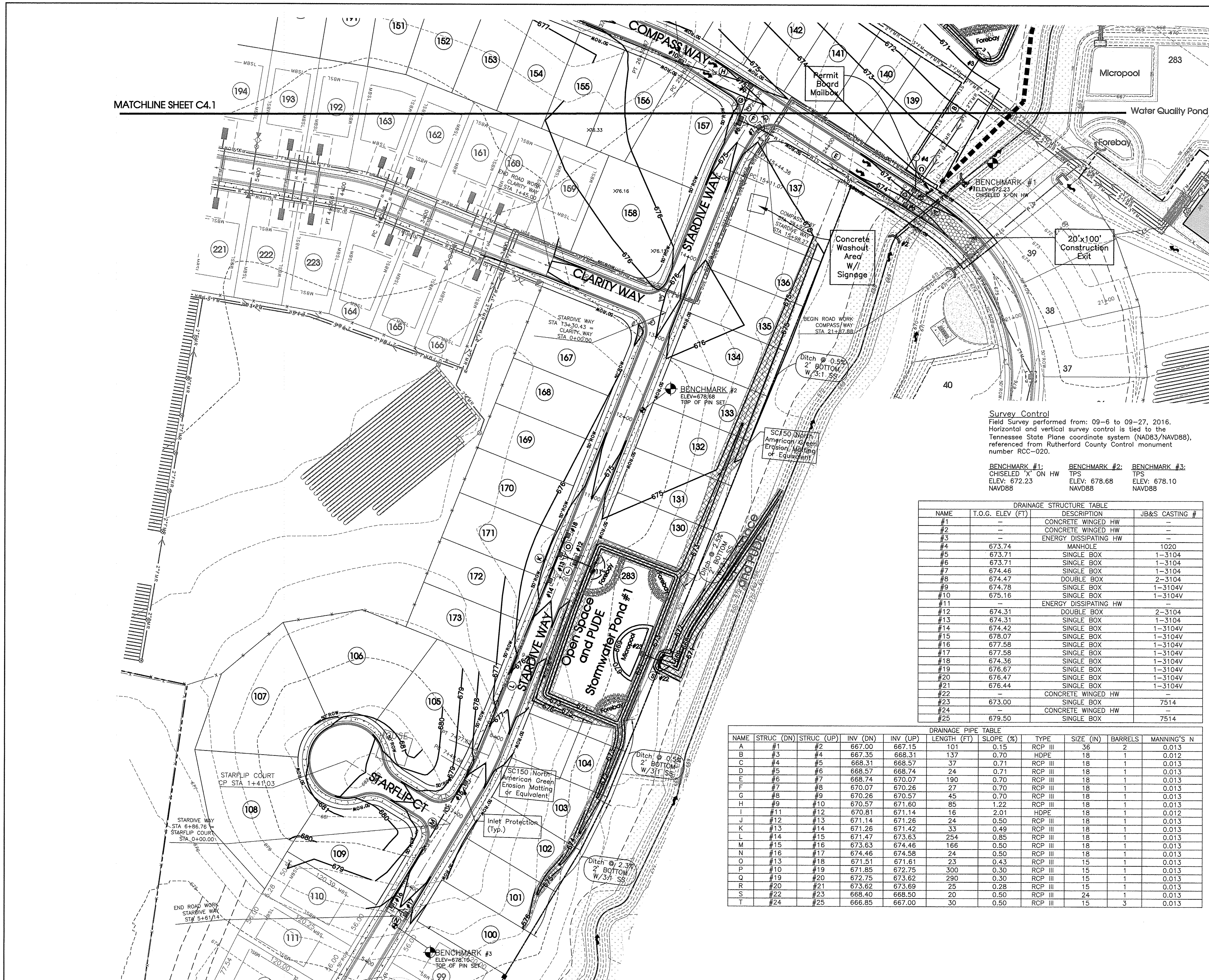
RICHARD HOUZE — STATE OF TENNESSEE

Clearview Acres
Section 2
Rutherford County, TN

REVISED:
DRAWN: JLM
DATE: 2–28–19
CHECKED: RH
FILE NAME: 14300ProjectP2
SCALE: 1"=100'
JOB NO. 14300
SHEET: C3.0

Intermediate EPSC Plan



Survey Control

Field Survey performed from: 09-6 to 09-27, 2016. Horizontal and vertical survey control is tied to the Tennessee State Plane coordinate system (NAD83/NAVD88), referenced from Rutherford County Control monument number RCC-020.

BENCHMARK #1:	BENCHMARK #2:	BENCHMARK #3:
CHISELED 'X' ON HW	TPS	TPS
ELEV: 672.23	ELEV: 678.68	ELEV: 678.10
NAVD88	NAVD88	NAVD88

DRAINAGE STRUCTURE TABLE

NAME	T.O.G. ELEV (FT)	DESCRIPTION	JB&S CASTING #
#1	–	CONCRETE WINGED HW	–
#2	–	CONCRETE WINGED HW	–
#3	–	ENERGY DISSIPATING HW	–
#4	673.74	MANHOLE	1020
#5	673.71	SINGLE BOX	1–3104
#6	673.71	SINGLE BOX	1–3104
#7	674.46	SINGLE BOX	1–3104
#8	674.47	DOUBLE BOX	2–3104
#9	674.78	SINGLE BOX	1–3104V
#10	675.16	SINGLE BOX	1–3104V
#11	–	ENERGY DISSIPATING HW	–
#12	674.31	DOUBLE BOX	2–3104
#13	674.31	SINGLE BOX	1–3104
#14	674.42	SINGLE BOX	1–3104V
#15	678.07	SINGLE BOX	1–3104V
#16	677.58	SINGLE BOX	1–3104V
#17	677.58	SINGLE BOX	1–3104V
#18	674.36	SINGLE BOX	1–3104V
#19	676.67	SINGLE BOX	1–3104V
#20	676.47	SINGLE BOX	1–3104V
#21	676.44	SINGLE BOX	1–3104V
#22	–	CONCRETE WINGED HW	–
#23	673.00	SINGLE BOX	7514
#24	–	CONCRETE WINGED HW	–
#25	679.50	SINGLE BOX	7514

DRAINAGE PIPE TABLE

NAME	STRUC (DN)	STRUC (UP)	INV (DN)	INV (UP)	LENGTH (FT)	SLOPE (%)	TYPE	SIZE (IN)	BARRELS	MANNING'S N
A	#1	#2	667.00	667.15	101	0.15	RCP III	36	2	0.013
B	#3	#4	667.35	668.31	137	0.70	HDPE	18	1	0.012
C	#4	#5	668.31	668.57	37	0.71	RCP III	18	1	0.013
D	#5	#6	668.57	668.74	24	0.71	RCP III	18	1	0.013
E	#6	#7	668.74	670.07	190	0.70	RCP III	18	1	0.013
F	#7	#8	670.07	670.26	27	0.70	RCP III	18	1	0.013
G	#8	#9	670.26	670.57	45	0.70	RCP III	18	1	0.013
H	#9	#10	670.57	671.60	85	1.22	RCP III	18	1	0.013
I	#11	#12	670.81	671.14	16	2.01	HDPE	18	1	0.012
J	#12	#13	671.14	671.26	24	0.50	RCP III	18	1	0.013
K	#13	#14	671.26	671.42	33	0.49	RCP III	18	1	0.013
L	#14	#15	671.47	673.63	254	0.85	RCP III	18	1	0.013
M	#15	#16	673.63	674.46	166	0.50	RCP III	18	1	0.013
N	#16	#17	674.46	674.58	24	0.50	RCP III	18	1	0.013
O	#13	#18	671.51	671.61	23	0.43	RCP III	15	1	0.013
P	#10	#19	671.85	672.75	300	0.30	RCP III	15	1	0.013
Q	#19	#20	672.75	673.62	290	0.30	RCP III	15	1	0.013
R	#20	#21	673.62	673.69	25	0.28	RCP III	15	1	0.013
S	#22	#23	668.40	668.50	20	0.50	RCP III	24	1	0.013
T	#24	#25	666.85	667.00	30	0.50	RCP III	15	3	0.013

Legend:

EXIST. CONCRETE MONUMENT	BENCHMARK
IRON PIN SET (I.P.S.)	HANDICAP RAMP SYMBOL
IRON PIN FOUND (I.P.F.)	V.A. VAN ACCESSIBLE HANDICAP DESIGNATION
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EXIST. WATER METER	TURN LANE ARROWS
EXIST. UTILITY POLE	REVISION NUMBER
EXIST. FIRE HYDRANT	#1 DRAINAGE STRUCTURE DESIGNATION
POST INDICATOR VALVE	(A) DRAINAGE PIPE DESIGNATION
BLOW OFF VALVE	RIP RAP
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REMOTE FIRE DEPT. CONNECTION	INLET FILTER PROTECTION
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EXISTING WATER	W W
PROPOSED WATER	W W

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N

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SCALE: 1"= 50'

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RICHARD HOUZE REGISTERED ENGINEER No. 108494 STATE OF TENNESSEE

Clearview Acres Section 2
Rutherford County, TN

REVISED:
DRAWN: JLM
DATE: 2-28-19
CHECKED: RH
FILE NAME: 14300ProjectP2
SCALE: 1"=50'
JOB NO. 14300

Grading and Drainage and Intermediate EPSC Plan

SHEET: C4.0

Survey Control

Field Survey performed from: 09-6 to 09-27, 2016. Horizontal and vertical survey control is tied to the Tennessee State Plane coordinate system (NAD83/NAVD88), referenced from Rutherford County Control monument number RCC-020.

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NAME	STRUC (DN)	STRUC (UP)	INV (DN)	INV (UP)	LENGTH (FT)	SLOPE (%)	TYPE	SIZE (IN)	BARRELS	MANNING'S N
A	#1	#2	667.00	667.15	101	0.15	RCP III	36	2	0.013
B	#3	#4	667.35	668.31	137	0.70	HDPE	18	1	0.012
C	#4	#5	668.31	668.57	37	0.71	RCP III	18	1	0.013
D	#5	#6	668.57	668.74	24	0.71	RCP III	18	1	0.013
E	#6	#7	668.74	670.07	190	0.70	RCP III	18	1	0.013
F	#7	#8	670.07	670.26	27	0.70	RCP III	18	1	0.013
G	#8	#9	670.26	670.57	45	0.70	RCP III	18	1	0.013
H	#9	#10	670.57	671.60	85	1.22	RCP III	18	1	0.013
I	#11	#12	670.81	671.14	16	2.01	HDPE	18	1	0.012
J	#12	#13	671.14	671.26	24	0.50	RCP III	18	1	0.013
K	#13	#14	671.26	671.42	33	0.49	RCP III	18	1	0.013
L	#14	#15	671.47	673.63	254	0.85	RCP III	18	1	0.013
M	#15	#16	673.63	674.46	166	0.50	RCP III	18	1	0.013
N	#16	#17	674.46	674.58	24	0.50	RCP III	18	1	0.013
O	#13	#18	671.51	671.61	23	0.43	RCP III	15	1	0.013
P	#10	#19	671.85	672.75	300	0.30	RCP III	15	1	0.013
Q	#19	#20	672.75	673.62	290	0.30	RCP III	15	1	0.013
R	#20	#21	673.62	673.69	25	0.28	RCP III	15	1	0.013
S	#22	#23	668.40	668.50	20	0.50	RCP III	24	1	0.013
T	#24	#25	666.85	667.00	30	0.50	RCP III	15	3	0.013

Legend:

Symbol	Description	Symbol	Description
	EXIST. CONCRETE MONUMENT		BENCHMARK
	IRON PIN SET (I.P.S.)		HANDICAP RAMP SYMBOL
	IRON PIN FOUND (I.P.F.)	V.A.	VAN ACCESSIBLE HANDICAP DESIGNATION
	EXIST. SIGN POST		HC SIGN
	EXIST. SEWER CLEANOUT		PROPOSED SIGN POST
	EXIST. MANHOLE (SEWER and PHONE)		CONCRETE BOLLARD
	EXIST. CATCH BASIN (STORM SEWER)		WHEEL STOP
	EXIST. WATER/GAS VALVE		CONCRETE SIDEWALK
T	EXIST. TELEPHONE RISER		EXTRUDED CURB
G	EXIST. GAS RISER		CURB and GUTTER
E	ELECTRICAL ENCLOSURE		TRAFFIC ARROW
W	EXIST. WATER METER		TURN LANE ARROWS
	EXIST. UTILITY POLE	1	REVISION NUMBER
	EXIST. FIRE HYDRANT	#1	DRAINAGE STRUCTURE DESIGNATION
	POST INDICATOR VALVE	A	DRAINAGE PIPE DESIGNATION
	BLOW OFF VALVE		RIP RAP
	REDUCER		RUNOFF FLOW ARROW
	REMOTE FIRE DEPT. CONNECTION		INLET FILTER PROTECTION
	CONCRETE THRUST BLOCK	63.25 ×	PROPOSED SPOT ELEVATION
	DOUBLE DETECTOR CHECK VALVE	(63.25) ×	EXIST. SPOT ELEVATION
	FIRE DEPT. CONNECTION	>	SEWER/STORM FLOW DIRECTION
	FIRE HYDRANT		CATCH BASIN
	GATE VALVE and BOX		CURB INLET
W	WATER METER		AREA DRAIN
G	GAS METER		HEADWALL
	GREASE TRAP		WINGED HEADWALL
	EXTERIOR CLEANOUT ECO		CONCRETE SWALE
	MANHOLE		TYPE- X- HEADWALL

Line type	Symbol
EXISTING PHONE	PH
EXISTING ELECTRIC	OH
PROPERTY LINE	
EASEMENTS	
RIGHT OF WAY	ROW
EROSION CONTROL SILT FENCE	SF SF
EROSION EEL	E E E E
EXISTING TREELINE	
EXISTING FENCELINE	X X
MINIMUM BUILDING SETBACK LINE	MBSL
PHASE BOUNDARY	
EXISTING GAS LINE	GAS GAS
PROPOSED GAS LINE	GAS GAS
EXISTING STORM	STM STM
PROPOSED STORM	STM STM
EXISTING CONTOUR LINES	601
PROPOSED CONTOUR LINES	601
EXISTING SANITARY SEWER	SS SS
PROPOSED SANITARY SEWER	SS SS
EXISTING WATER	W W
PROPOSED WATER	W W

Know what's **below.**
Call before you dig.

N

50' 0 50' 100'
SCALE: 1"= 50'

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RICHARD HOUZE
STATE OF TENNESSEE

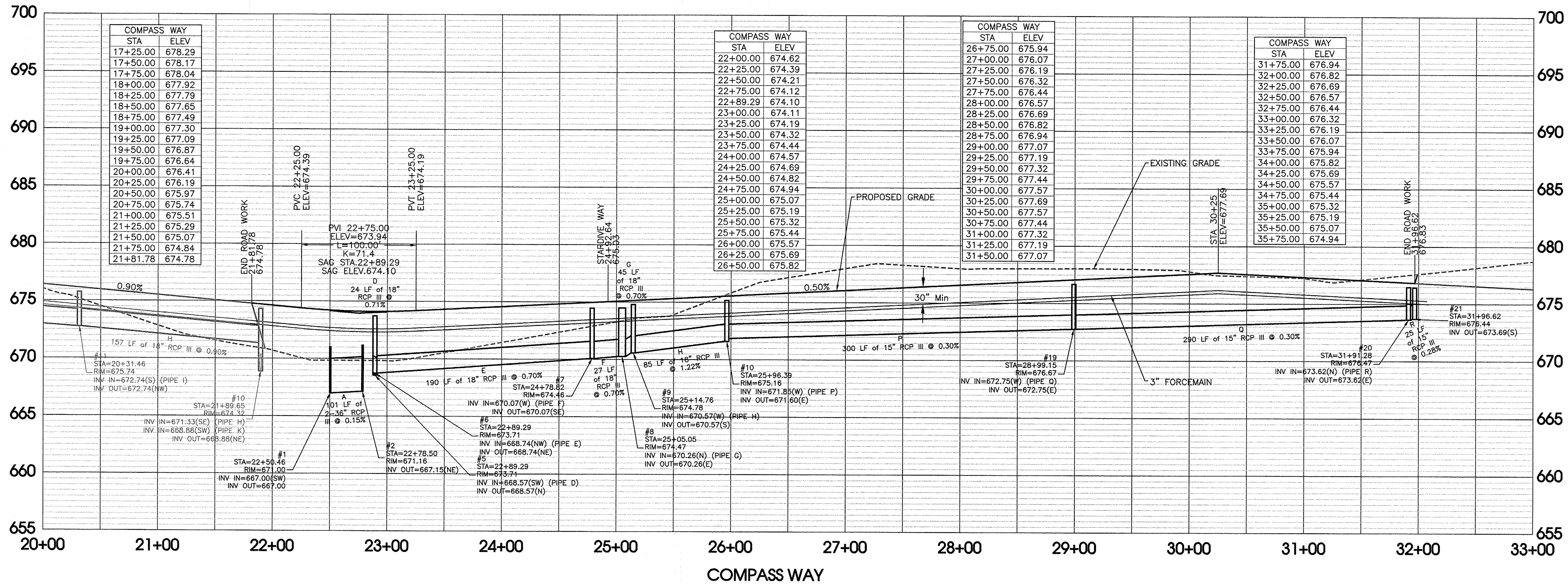
Clearview Acres
Section 2
Rutherford County, TN

REVISED:

DRAWN: JLM
DATE: 2-28-19
CHECKED: RH
FILE NAME: 14300ProjectP2
SCALE: 1"=50'
JOB NO. 14300

Grading and Drainage and Intermediate EPSC Plan

SHEET: C4.1



COMPASS WAY

STA	ELEV
17+25.00	678.29
17+50.00	678.17
17+75.00	678.04
18+00.00	677.92
18+25.00	677.79
18+50.00	677.65
18+75.00	677.49
19+00.00	677.30
19+25.00	677.09
19+50.00	676.87
19+75.00	676.64
20+00.00	676.41
20+25.00	676.19
20+50.00	675.97
20+75.00	675.74
21+00.00	675.51
21+25.00	675.29
21+50.00	675.07
21+75.00	674.84
21+81.78	674.78

COMPASS WAY

STA	ELEV
22+00.00	674.62
22+25.00	674.39
22+50.00	674.21
22+75.00	674.12
22+89.29	674.10
23+00.00	674.11
23+25.00	674.19
23+50.00	674.32
23+75.00	674.44
24+00.00	674.57
24+25.00	674.69
24+50.00	674.82
24+75.00	674.94
25+00.00	675.07
25+25.00	675.19
25+50.00	675.32
25+75.00	675.44
26+00.00	675.57
26+25.00	675.69
26+50.00	675.82

COMPASS WAY

STA	ELEV
26+75.00	675.94
27+00.00	676.07
27+25.00	676.19
27+50.00	676.32
27+75.00	676.44
28+00.00	676.57
28+25.00	676.69
28+50.00	676.82
28+75.00	676.94
29+00.00	677.07
29+25.00	677.19
29+50.00	677.32
29+75.00	677.44
30+00.00	677.57
30+25.00	677.69
30+50.00	677.57
30+75.00	677.44
31+00.00	677.32
31+25.00	677.19
31+50.00	677.07

COMPASS WAY

STA	ELEV
31+75.00	676.94
32+00.00	676.82
32+25.00	676.69
32+50.00	676.57
32+75.00	676.44
33+00.00	676.32
33+25.00	676.19
33+50.00	676.07
33+75.00	675.94
34+00.00	675.82
34+25.00	675.69
34+50.00	675.57
34+75.00	675.44
35+00.00	675.32
35+25.00	675.19
35+50.00	675.07
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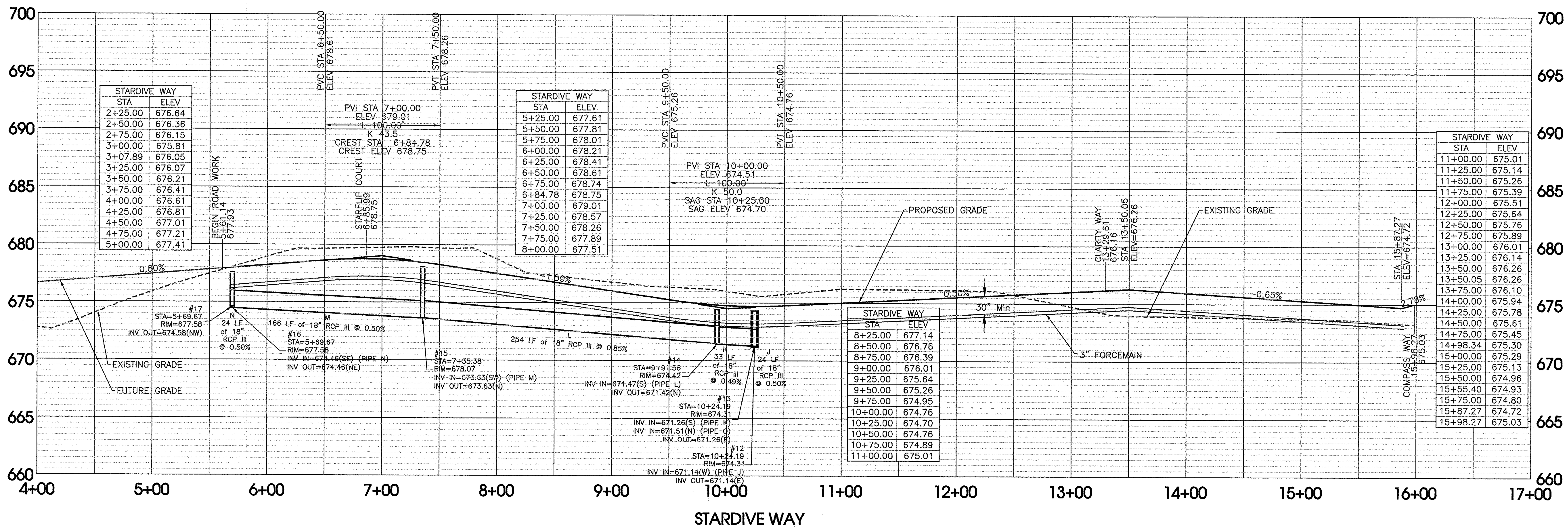

STARDIVE WAY

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3+25.00	676.07
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3+75.00	676.41
4+00.00	676.61
4+25.00	676.81
4+50.00	677.01
4+75.00	677.21
5+00.00	677.41

STARDIVE WAY

STA	ELEV
5+25.00	677.61
5+50.00	677.81
5+75.00	678.01
6+00.00	678.21
6+25.00	678.41
6+50.00	678.61
6+75.00	678.74
6+84.78	678.75
7+00.00	679.01
7+25.00	678.57
7+50.00	678.26
7+75.00	677.89
8+00.00	677.51

STARDIVE WAY

STA	ELEV
8+25.00	677.14
8+50.00	676.76
8+75.00	676.39
9+00.00	676.01
9+25.00	675.64
9+50.00	675.26
9+75.00	674.95
10+00.00	674.76
10+25.00	674.70
10+50.00	674.76
10+75.00	674.89
11+00.00	675.01

STARDIVE WAY

STA	ELEV
11+00.00	675.01
11+25.00	675.14
11+50.00	675.26
11+75.00	675.39
12+00.00	675.51
12+25.00	675.64
12+50.00	675.76
12+75.00	675.89
13+00.00	676.01
13+25.00	676.14
13+50.00	676.26
13+50.05	676.26
13+75.00	676.10
14+00.00	675.94
14+25.00	675.78
14+50.00	675.61
14+75.00	675.45
14+98.34	675.30
15+00.00	675.29
15+25.00	675.13
15+50.00	674.96
15+55.40	674.93
15+75.00	674.80
15+87.27	674.72
15+98.27	675.03

SEC, Inc.
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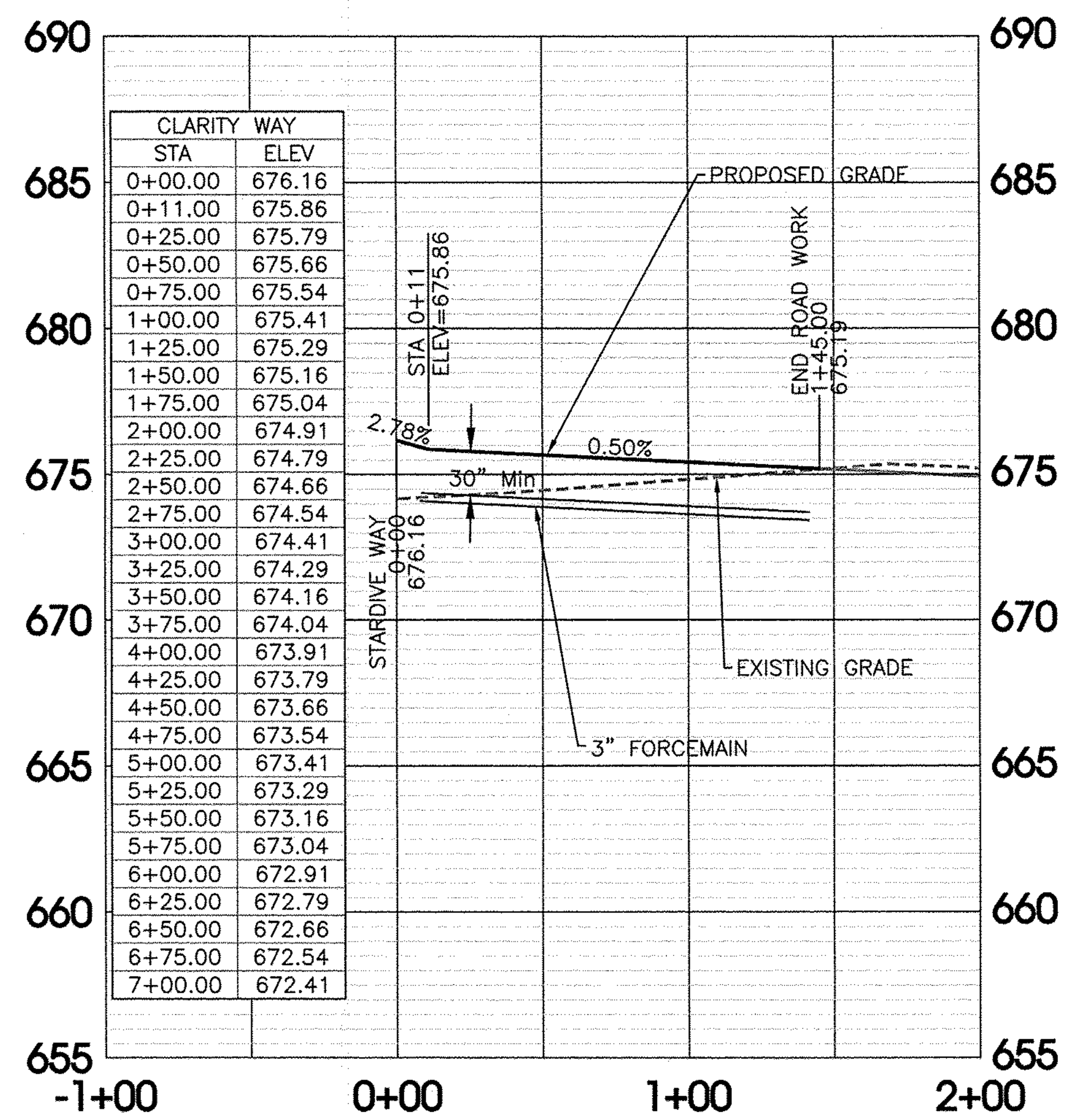
RICHARD HOUZE · REGISTERED ENGINEER · STATE OF TENNESSEE

Clearview Acres Section 2

Rutherford County, TN

Road Profiles

REVISED:
DRAWN: JLM
DATE: 2-28-19
CHECKED: RH
FILE NAME: 14300ProjectP2
SCALE: 1"=5' VERTICAL 1"=50 HORIZ.
JOB NO. 14300
SHEET: C5.0



CLARITY WAY	
STA	ELEV
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0+11.00	675.86
0+25.00	675.79
0+50.00	675.66
0+75.00	675.54
1+00.00	675.41
1+25.00	675.29
1+50.00	675.16
1+75.00	675.04
2+00.00	674.91
2+25.00	674.79
2+50.00	674.66
2+75.00	674.54
3+00.00	674.41
3+25.00	674.29
3+50.00	674.16
3+75.00	674.04
4+00.00	673.91
4+25.00	673.79
4+50.00	673.66
4+75.00	673.54
5+00.00	673.41
5+25.00	673.29
5+50.00	673.16
5+75.00	673.04
6+00.00	672.91
6+25.00	672.79
6+50.00	672.66
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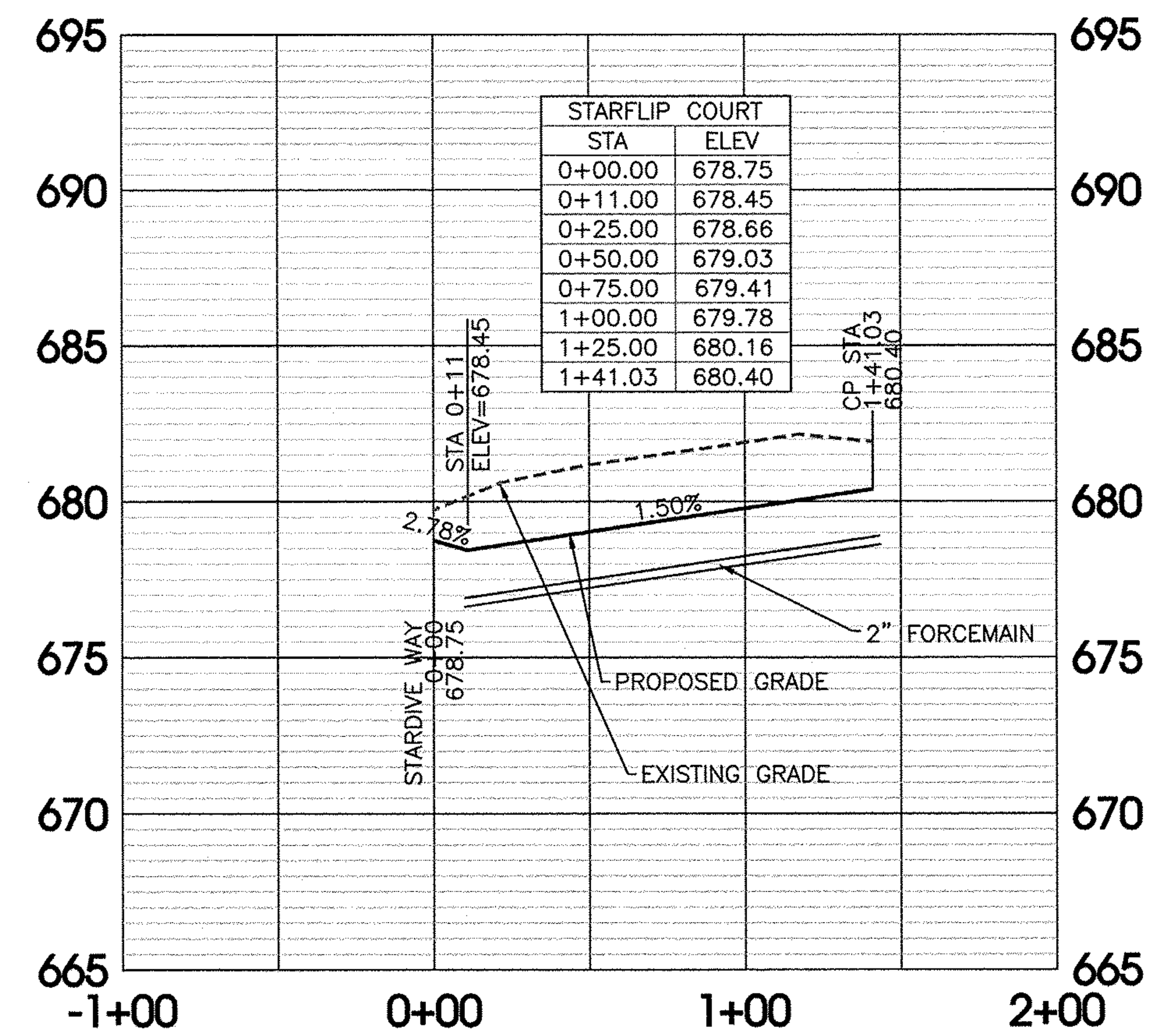
7+00.00	672.41

CLARITY WAY



STARFLIP COURT	
STA	ELEV
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0+11.00	678.45
0+25.00	678.66
0+50.00	679.03
0+75.00	679.41
1+00.00	679.78
1+25.00	680.16
1+41.03	680.40

STARFLIP COURT

SEC, Inc. SITE ENGINEERING CONSULTANTS
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RICHARD HOUZE STATE OF TENNESSEE

Clearview Acres Section 2

Rutherford County, TN

REVISED:

DRAWN: JLM
DATE: 2-28-19
CHECKED: RH
FILE NAME: 14300ProjectP2
SCALE: 1"=5' VERTICAL 1"=50 HORIZ.
JOB NO. 14300

Road Profiles

SHEET: C5.1

Site Clearing and Demolition Notes:
1. Before starting demolition operations, refer to the Existing Conditions and Initial EPSC.

2. Demolition includes the following within the property lines:
   1) Transfer benchmark control to new locations outside the disturbed area prior to commencing demolition operations (when applicable)
   2) Provide temporary barricades and other forms of protection as required to protect owner's personnel property and general public from injury due to demolition work.
   3) Demolition and removal of site improvements.
   4) Disconnecting, capping or sealing, and abandoning/removing site utilities in place (whichever is applicable)

3. Promptly remove waste materials, unsuitable and excess topsoil and other clearing debris from Owner's property and dispose of off site.

4. Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain.

5. Existing foundations and utilities may be encountered across the site. If encountered, these items will require removal. Resulting excavations should be backfilled with properly compacted select fill.

6. Removal includes digging out stumps and roots. Remove all stumps, roots over 4-inches in diameter and matted roots within the limits of grubbing to depths as follows:
   1) Footings: 18 inches
   2) Walks: 12 inches
   3) Roads: 18 inches
   4) Parking Areas: 12 inches
   5) Lawn Areas: 18 inches
   6) Fills: 12 inches

7. Remove reinstall, and relocate: items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage reinstall items in locations indicated.

8. Provide protection necessary to prevent damage to existing improvements indicated to remain in place. Protect benchmarks, existing structures, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic.
   1) Protect improvements on adjoining properties and on the Owner's property.
   2) Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

9. Contractor shall schedule demolition activities with the construction project manager.

10. Comply with applicable requirements of federal, state and local laws, regulations and codes of the authorities having jurisdiction for the disposal of trees, shrubs and other cleared material.

11. Conduct site clearing operations to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities. Do NOT close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

12. Obtain approved borrow soil materials off-site when sufficient satisfactory soil materials are not available on-site.

13. Maintain existing utilities indicated to remain in service and protect them against damage throughout construction operations.
   1) Do not interrupt exist utilities serving occupied or operating facilities, except when authorized in writing by engineer and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to owner and to governing authorities.
   2) Contractor shall coordinate with appropriate utility owner when disconnecting, removing, or relocating existing utility services.

14. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
   1) Erect temporary protection, barricades as per local governing authorities.
   2) Protect existing site improvements and appurtenances to remain.

15. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to remain in place.
   1) Protect tree root systems from damage due to deleterious materials caused by run-off or spillage during mixing, use or discarding of construction materials or drainage from stored materials. Protect root systems from compaction, flooding, erosion or excessive wetting.
   2) Engage a qualified tree surgeon to remove branches from trees, if required, to clear for new construction. Where cutting is required, tree surgeon shall cut branches and roots with sharp pruning instruments; do not break or chop.

16. Explosives: use of explosives will not be permitted.

17. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

18. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to same condition existing before start of demolition.

19. Damages: Promptly repair damages to adjacent facilities caused by demolition operations at the contractors cost.

20. Remove existing above-grade and below-grade improvements necessary to permit construction and other work as indicated.

21. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

22. Do NOT Burn or bury materials on site.

23. Contractor to sawcut existing pavement to remain prior to curb, gutter, pavement, etc. removal.

24. In Tennessee it is a requirement per "The Underground Utility Damage Prevention Act" that anyone who engages in excavation must notify all known utility owners, no less than three nor more than ten working days, prior to their intended excavation. A list of these utility owners may be obtained from the county register of deeds. Those utility owners who participate in the Tennessee One Call System can be notified toll free at 1-800-351-1111.

25. Utilities shown are based on visual observations and utility markings. Contractor shall call TN One Call and confirm locations prior to starting work.

General Plan Notes:
1. Prior to starting construction the contractor shall be responsible for making sure that all required permits and approvals have been obtained. No construction or fabrication shall begin until the contractor has received and thoroughly reviewed all plans and other documents approved by all of the permitting authorities.

2. All work shall be performed in accordance with these plans, specifications, and the requirements and standards of the local governing authority. The soils report and recommendations set forth therein are a part of the required construction documents and take precedence unless specifically noted otherwise on the plans. The contractor shall notify the construction/project manager of any discrepancy between soils report and plans, etc.

3. The locations of underground facilities shown on the plan are based on field surveys and city records. It shall be the contractor's full responsibility to contact the various utility companies to locate their facilities prior to the starting of construction. No additional compensation shall be paid to the contractor for work having to be redone due to information shown incorrectly on these plans if such notification has not been given.

4. All work within the rights of way shall be in accordance with the governing jurisdiction and specifications.

5. Contractor shall coordinate any maintenance of traffic with the owner's representative and the local jurisdiction prior to construction.

6. Contractor shall at all times ensure that SWPPP measures protecting existing drainage facilities be in place prior to the commencement of any phase of the site construction or land alteration.

7. Upon completion of project, contractor shall clean the paved areas prior to removal of temporary sediment controls, as directed by the city and/or construction/project manager. If power washing is used, no sediment laden water shall be washed into the storm system. All sediment laden material on pavement or within the storm system shall be collected and removed from the site at contractor's expense.

8. Rock may be present at shallow depths requiring some rock excavation for utility installation. No extra compensation shall be given for rock excavation.

9. These project construction documents shall not constitute a contractual relationship between the engineer and the contractor.

10. The engineer shall not be responsible for construction safety, means, methods, techniques, sequences, or procedures utilized by the contractor or subcontractors.

Site Plan Notes:
1. Contractor shall immediately notify the engineer of any discrepancies found between these plans, the architectural plans, and/or field conditions prior to construction.

2. Apparent errors, discrepancies, or omissions on the drawing shall be brought to the attention of the owner prior to bid submittal. The contractor may not use apparent errors, discrepancies, or omissions present on the drawings presented for bidding for additional charges after bids have been submitted. The architect shall be permitted to make corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the contract documents.

3. The contractor shall stake all improvements using the geometric data provided in the drawings. It is the sole responsibility of the contractor to completely stake and check all improvements to ensure adequate positioning, both horizontal and vertical, prior to the installation of any improvements. No digital file will be provided.

4. The notes and plans shown call attention to certain required features of the construction but do not claim to cover all details of design and construction. The contractor shall furnish and install the work complete and ready for operation.

5. After completion of construction, the contractor shall perform site cleanup to remove all trash, debris, excess materials, equipment, and other deleterious materials associated with construction. The contractor is expressly responsible for ensuring the site is clean and in operable condition at the time of final acceptance.

6. The contractor is responsible for the protection and replacement of all property pins on this site.

7. These drawings are intended for use on this site only and as an integrated set for this specific project. These drawings may not be used in whole or in part on any other project under the professional engineer's seal. The owner shall hold harmless and indemnify the architect and engineer from and against any and all claims of any nature whatsoever arising from such use.

8. All dimensions and radii are given to face of curb unless otherwise noted.

9. Asphalt paving: do not apply prime and tack coats when temperature is below 50° F, or when base is wet. Apply asphalt paving only when temperature is above 40° F and when base is dry.

10. Materials:
   10A) Subgrade: Cohesive subgrade shall be compacted to 95% compaction. Cohesion less subgrade shall be compacted to 100% compaction.
   10B) Subbase: Unless otherwise noted on these plans, base shall consist of water bonded limestone, crushed rock or DGA.
   10C) Asphalt: Bituminous concrete hot plant mix binder course and asphalt topping plant mix shall be applied over base, minimum temperature time of placement shall be 225° F.

11. Cast in place concrete: All concrete work shall conform to all requirements of American Concrete Institute ACI 301 and applicable sections of ASTM C-94 (latest ed.) for ready mixed concrete.

12. All concrete shall be in-transit mixed concrete, 3% to 5% air-entrained and shall attain a minimum compressive strength of 4,000 p.s.i. in twenty-eight (28) days.

13. Slump: Maximum allowable slump will be five (5) inches.

14. Concrete Materials:
   14A) Portland cement: Gray portland cement, ASTM C-150 (latest ed.) type 1. All concrete shall contain not less than five bags of cement per cubic yard.
   14B) Aggregates: ASTM C-33 (latest ed.).
   14C) Sand: Hard, durable, clean, sharp, natural sand free from clay, loam, dust or organic matter.
   14D) Water: Clean, potable, free from oil, acids, alkali, organic matter and other deleterious substances.
   14E) Admixture: Air type to meet ASTM C-260 (latest ed.)

15. Reinforcing materials shall be uncoated and free from excessive rust, mill scale, oil, grease and other deleterious matter.

16. All above grade exterior concrete surfaces shall be cured with curing compound sprayed on in strict compliance with manufacturer's directions.

17. Weather Requirements:
   17A) Hot Weather Placing: No concrete shall be placed when the air temperature is greater than 90° F unless the following special procedures have been included in the contract and reviewed by the engineer: temperature of the concrete when placed shall not be greater than 90° F. Procedures for cooling, retarding and protecting in-place concrete during hot weather shall be in accordance with ACI 305. Provide special procedures required to control concrete temperature and to protect surfaces from drying out, mixing water may be chilled or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water, use of liquid nitrogen to cool concrete is the contractor's option.
   17B) Cold Weather Placing: Do not mix or place when atmospheric temperature will fall below 40° F, or when conditions indicate temperature will fall below 40° F within 72 hours. Concrete deposited shall have temperature not less than 60° F. Reinforcement, forms and ground which concrete will contact shall be completely free of frost. Keep concrete and form work at a temperature not less than 50° F for not less than 72 hours after pouring. Comply with requirements of ACI 305 (latest ed.) for cold weather protection.

18. Concrete tests shall be authorized by the owner on an as needed basis.

19. All exterior curb shall have expansion joints at 100'-0" O.C., and construction joints at 10'-0" O.C. (unless otherwise specified on the detail sheets).

20. All concrete shall have a medium transverse finish.

21. Subgrade shall be free of extraneous materials. Proof-roll soil subgrade with heavy, pneumatic tired equipment immediately prior to placing stone base. Any soft or unstable zones detected thereby shall be undercut to firm soil and backfilled with engineered earth fill compacted as specified. The subgrade for all pavements shall be uniformly stable before any stone base is installed. No base materials shall be placed if the subgrade indicates pumping.

22. Surface preparation, spreading and laying, compacting and rolling operations shall conform with asphalt institute recommended specifications.

23. Inspect area to be paved and insure that all subgrade conditions are sufficiently carried out to insure a good paving job. A finished surface shall not vary more than 1/8" in 10 feet when tested with a straight edge applied parallel with, or at right angle, to centerline of asphalt surface. Humps or depressions which exceed specified tolerances or which retain water shall be immediately corrected by removing the defective work and replacing it with new material at the contractor's expense.

Grading And Drainage Plan Notes:
1. The site work contractor shall coordinate the installation of all underground utilities with his work. All underground utilities (water, sanitary sewer, storm sewer, electrical conduit, irrigation sleeves, and any other miscellaneous underground utilities, devices, or structures), shall be in-place prior to the placement of base course material.

2. The contractor shall cut existing pavement as necessary to assure a smooth fit and continuous grade.

3. The contractor shall verify the horizontal and vertical location of all existing storm sewer structures, pipes and all utilities prior to construction.

4. Clearing and grubbing limits shall include all areas disturbed by grading operation.

5. The soil materials shown hereon may be disturbed by cutting or filling operations performed during or before development. Therefore, the builder of any proposed structure shall investigate the current conditions and consult with a geotechnical expert or other qualified person as he deems appropriate to assure himself that the design of the proposed foundation is adequate.

6. A Portion Of This Site Lies Within The 100 Year Flood Plain Per F.E.M.A. Community Panel No. 47149C0377H, 47149C0381H and 47149C0383H, Dated Jan. 5 2007.

7. Prior to site construction activity, the contractor shall install all SWPPP measures to protect existing drainage facilities. Contractor shall prevent siltation from leaving the site at all times.

8. Strip building and pavement areas of all organic topsoils. Stockpile suitable topsoils for respreading onto landscape areas. All excess excavated materials shall be removed from the site at the contractor's expense.

9. Site grading shall be performed in accordance with these plans and specifications and the recommendations set forth in this plan set. The contractor shall be responsible for removing all soft, yielding or unsuitable materials and replacing with suitable materials.

10. It is the earthwork contractor's responsibility to maintain the site soils and engineered fills with a workable moisture content range to obtain the required in-place density. Scarifying and drying operation should be included in the contractor's price and should not be considered an extra for the contract. The contractor shall review and be aware of all moisture concerns and soil remediations requirements.

11. Following grading of subsoil to subgrade elevations the contractor shall place topsoil to a 6" depth in all disturbed areas which are not to be paved. Smoothly finish grade to meet surrounding lawn areas and ensure positive drainage. Stockpiled topsoil shall be screened prior to respreading. Topsoils shall be free of subsoil, debris, brush and stones larger than 1" in any dimension. Rock hounding in place will not be permitted. All excess topsoil shall be legally disposed of off site.

12. After fine grading topsoil, contractor shall seed, mulch, fertilize and water until a healthy stand of grass is obtained. The restoration shall closely follow construction.

13. Elevations given are at bottom face of curb and/or finished pavement grade unless otherwise specified on grading plan. All pavement shall be laid on a straight, even, and uniform grade with a minimum of 1% slope toward the collection points unless otherwise specified on the grading plan. DO not allow negative grades or ponding of water.

14. Contractor shall provide butt end joint to meet existing pavement in elevation at drive returns and ensure positive drainage.

General Utility Notes:
1. Contractor shall contact all utility companies immediately after bid is awarded and ensure the utility companies have the essentials required for complete service installation. Contractor shall notify construction manager and engineer of any time frames established by utility companies which will not meet opening date.

2. Existing utility lines shown are approximate locations only. Contractor shall verify the size, location, invert elevation, and condition of existing utilities which are intended to be utilized as a connection point for all proposed utilities (see sheet), prior to any construction. Contractor to ensure existing utilities are in good condition and free flowing (if applicable). If elevations, size, or location differ from what is shown on sheet, contractor shall notify engineer immediately.

3. The contractor will provide all necessary protective measures to safeguard existing utilities from damage during construction of this project. In the event that special equipment is required to work over and around the utilities, the contractor will be required to furnish such equipment. The cost of protecting utilities from damage and furnishing special equipment will be included in the price bid for other items of construction.

4. The contractor shall notify each individual utility owner of his plan of operation in the area of the utilities, prior to commencing work, the contractor shall contact the utility owners and request them to properly locate their respective utility on the ground. This notification shall be given at least three (3) business days prior to commencement of operations around the utility.

5. The contractor shall coordinate installation of utilities in such a manner as to avoid conflicts and assure proper depths are achieved as well as coordinating with the regulatory agency as to location and scheduling of tie-ins/connections to their facilities.

6. All underground utilities (water, sewer, storm sewer, electrical conduit, irrigation sleeves, and any other miscellaneous), shall be in-place prior to the placement of base course material.

7. Utility contractor will be responsible for all tap and tie on fees required, as well as cost of underground service connections.

8. No more than 25 percent of the dollar amount of the contract may be awarded to subcontractors.

9. The contractor shall provide a suitable office near the site for his use and at which copies of the specifications and drawings shall be kept. The contractor shall also designate to the owner a person to be notified in Murfreesboro in case of emergencies other than during working hours and on holidays and weekends.

10. Streets shall be graded to subgrade before water lines and sanitary sewers are installed.

11. All waterline taps are to be made by C.U.D.

12. Contractor shall comply with all requirements of the latest edition of C.U.D.'s specifications.

13. In Tennessee it is a requirement per "the Underground Utility Damage Prevention Act" that anyone who engages in excavation must notify all known utility owners, no less than three nor more than ten working days, prior to their intended excavation. A list of these utility owners may be obtained from the county register of deeds those utility owners who participate in the Tennessee one call system can be notified toll free at (800) 351-1111.

Waterline Notes:
1. All water mains shall be hydrostatically tested and disinfected before acceptance.

2. All trenches, pipe laying, and backfilling shall be in accordance with federal O.S.H.A. regulations.

3. Contractor shall comply with all requirements of the latest edition of the CUD specifications.

4. Utility contractor shall have approval of all governing agencies having jurisdiction over this system prior to installation.

5. The developer must post bond, $2,000 or $250 for each valve box (whichever is greater), whenever the subject project has valve boxes that are located within pavement upon completion of the proposed water system extension.

6. The owner/developer for budget purposes should contact CUD for related fees to project which may be substantial.

7. Water Service materials shall be copper type "K" unless otherwise noted on plans. Diameter shall be as noted on these plans and shall be installed with a minimum cover of 42" or below frost line, whichever is greater.

8. Construction and Materials Provided By The Water Company:
   - Tap Main.
   - Furnish and install curb stop and box and water meter.
   - Coordinate all work with the City of Murfreesboro, Greg Harvey and 615-848-3200.
   - Coordinate fire metering with the Consolidated Utility District (CUD), Brandon Hunter @ 615-225-3340.

9. Construction and Materials Provided By The Contractor:
   - Furnish and install copper service line from meter to building.
   - All trenching and backfilling.
   - Coordinate all work with the City of Murfreesboro, Greg Harvey @ 615-848-3200
   - Coordinate with Bill Dunnill (CUD) @ 615-867-7302 for water meter specifications.
   - Coordinate fire metering with the Consolidated Utility District, Brandon Hunter @ 615-225-3340

Natural Gas Notes:
1. Construction And Materials Provided By The Gas Company:
   - Tap Main.
   - Furnish and install mainline extension, including all trenching and backfilling.
   - Furnish and install meter.
   - Coordinate all work with Atmos Energy, Brad Beningfield @ 615-982-3654

2. Construction and Materials Provided By The Contractor:
   - Furnish and install service lateral, including all trenching and backfilling.
   - Contractor shall include all fees required by the gas company to provide a complete working service.

S.T.E.P. System General Notes:
1. The location of treatment system components as shown are general in nature. Minor field adjustments may be necessary. The contractor may request to modify the location of the components through the owner and the Tennessee Division of Water Pollution Control.

2. This design is for the treatment and disposal of wastewater collected from 260 single family residential lots. Lots shown hereon this plan are preliminary only.

3. All flows for this system shall be controlled and monitored by the MVD (Smart) Panel. This monitoring shall be considered the flow meter for this system.

4. The minimum horizontal separation between the closest two points of the water and sewer line is ten (10) feet. The minimum vertical separation between the closest two points of the water and sewer line shall be 18 inches, with waterlines being above sewer lines.

5. Contractor shall comply with the most current requirements, specifications, and detail drawings for the installation of STEP system collection lines as outlined in the WPC Design Criteria Section 2.4.1.

6. All trenches, pipe laying, and backfilling shall be in accordance with federal O.S.H.A. regulations.

7. Utility contractor shall have approval of all governing agencies having jurisdiction over this system prior to installation.

8. All tanks shall be one-piece, structurally sound, watertight tanks as manufactured by Jarrett Concrete Products, or approved equal.

9. Testing procedure for water tightness is as follows. Fill tank 2" into the riser. After a period of 24 hours, the water level should have lowered no more than ¼".

10. Collection forcemain shall be 2"ø and 3"ø SDR21 purple PVC pipe (color to be coordinated with C.U.D.). Forcemain shall be tested and rated for a 150 PSI working pressure.

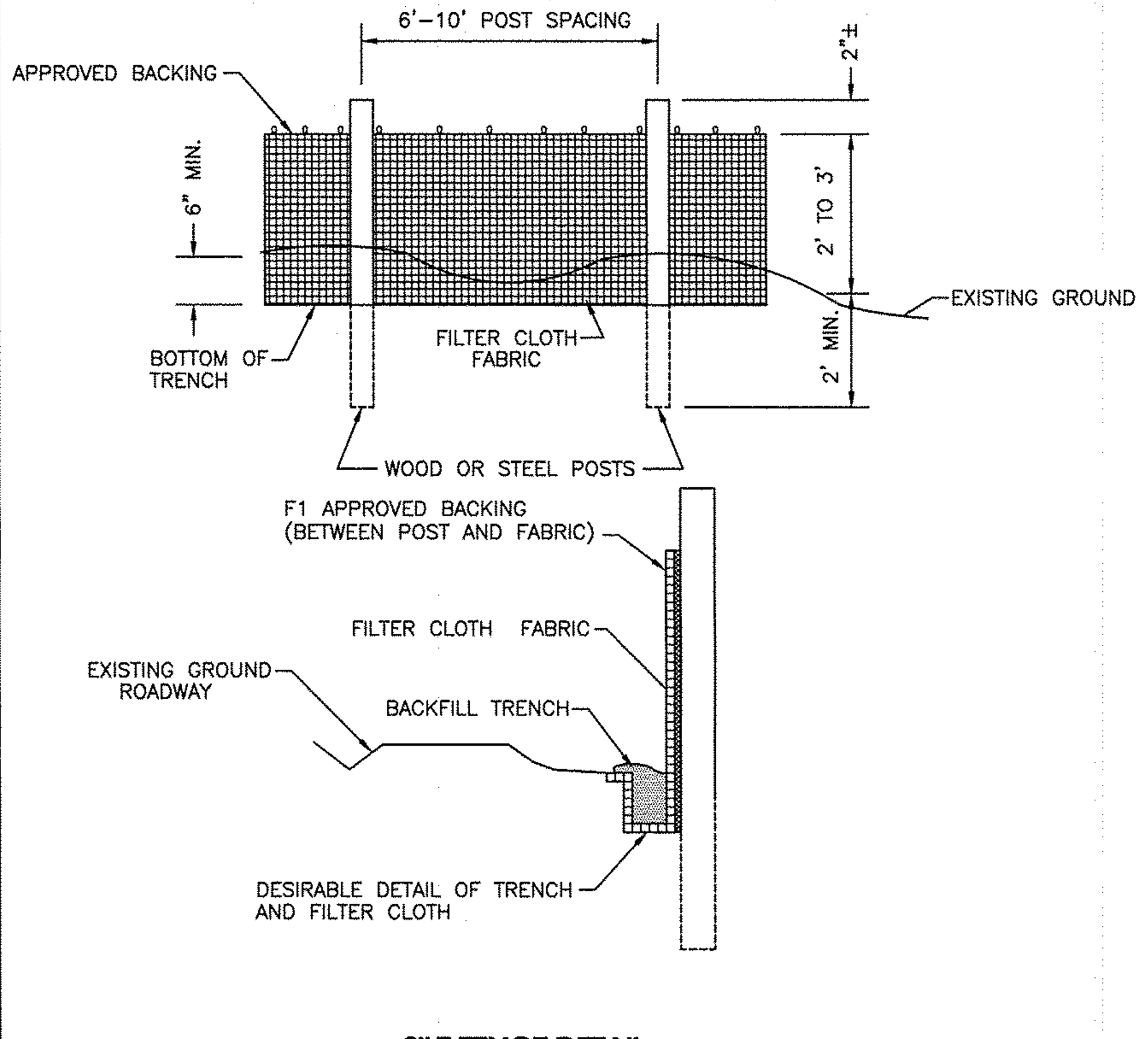
SEC, Inc. SITE ENGINEERING CONSULTANTS
ENGINEERING · SURVEYING · LAND PLANNING
850 MIDDLE TENNESSEE BOULEVARD MURFREESBORO, TENNESSEE 37129
PHONE: (615) 890-7901 E-MAIL: RHOUZE@SEC-CIVIL.COM FAX: (615) 895-2567

The site as shown on these construction drawings is intended to achieve specific engineering design criteria and objectives. It is the sole responsibility of the owner/developer to ensure that the construction of the site shown on these construction drawings is in total accordance with the design as noted, described, and illustrated. The engineer assumes no administrative liability or responsibility in the assurance that the site is constructed in accordance with the construction plans.

Clearview Acres
Section 2
Rutherford County, TN

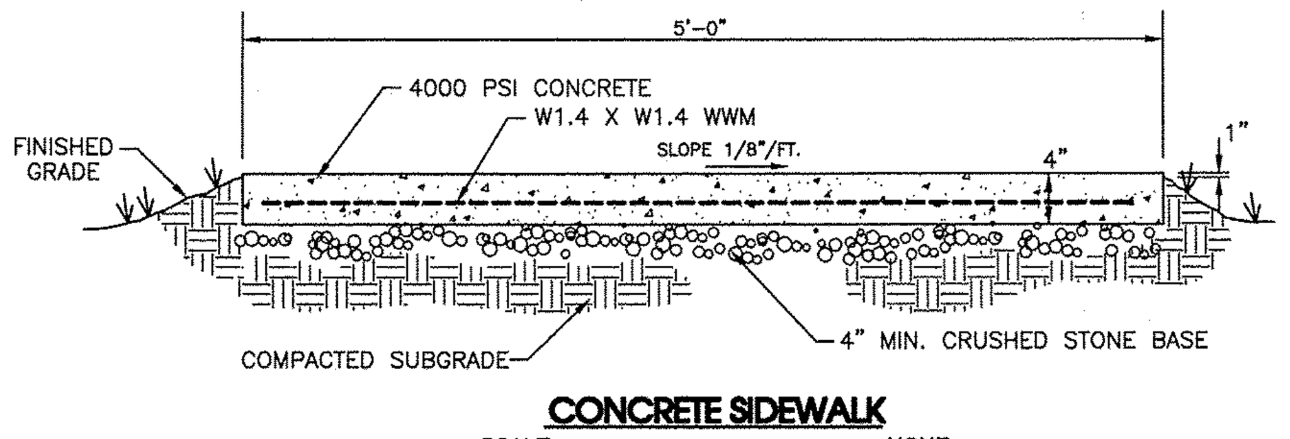
General Notes

REVISED:
DRAWN: JLM
DATE: 2-28-19
CHECKED: RH
FILE NAME: 14300ProjectP2
SCALE: None
JOB NO. 14300
SHEET: C6.0



SILT FENCE DETAIL

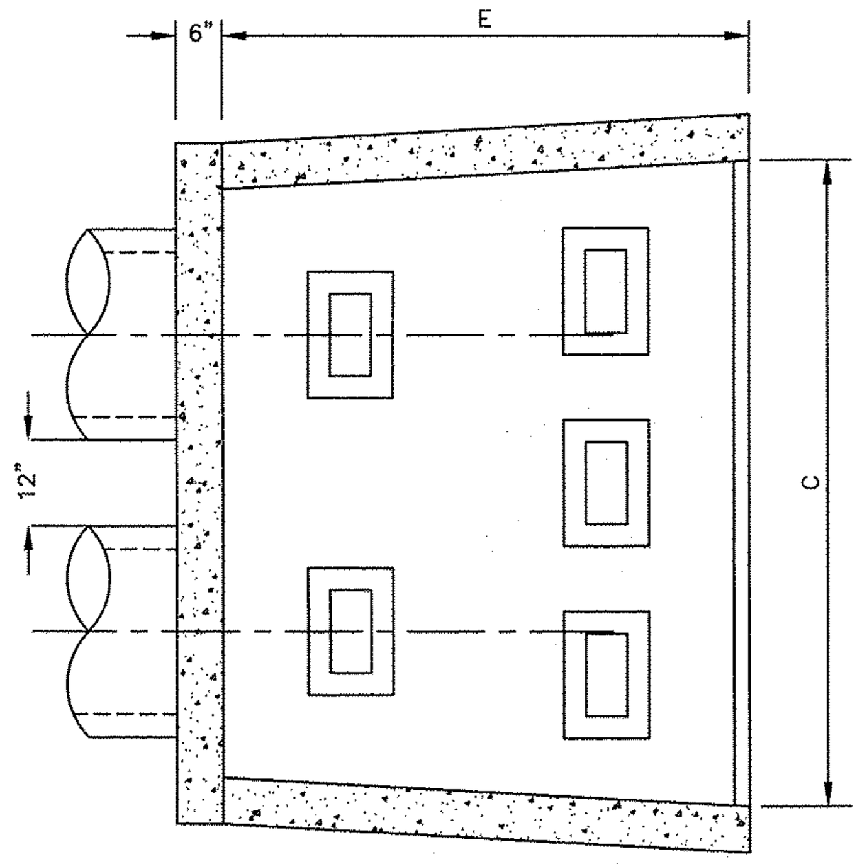
SCALE —— NONE



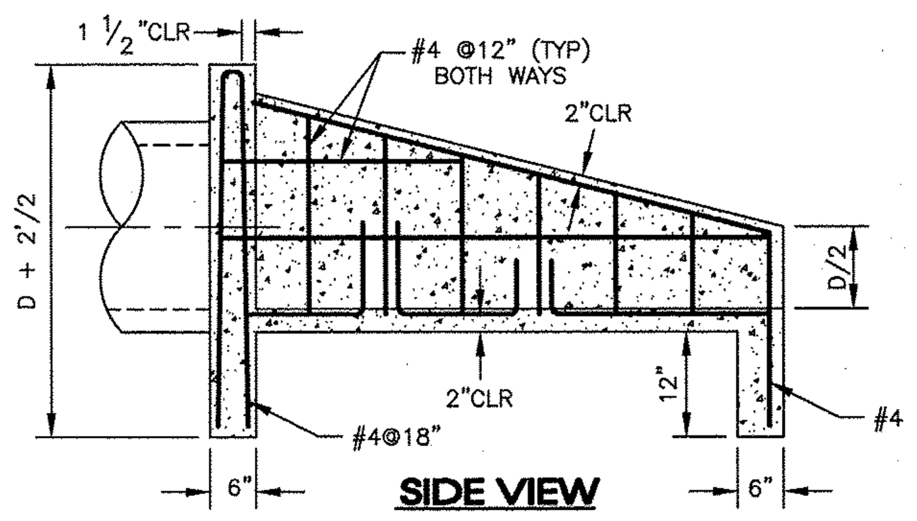
CONCRETE SIDEWALK

SCALE —— NONE

NOTES:
1. PROVIDE 1/2" EXP. JT. BETWEEN ALL FIXED OBJECTS AND WALK.
2. PROVIDE CONTRACTION JOINTS EVERY 6' AND EXTEND AT LEAST 1/3 OF DEPTH OF SLAB.
3. PROVIDE EXP. JOINTS (1/2") AT INTERSECTIONS OF DIFFERENT WALKS AND EVERY 30' O.C. ON STRAIGHT RUNS.
4. HOA IS RESPONSIBLE FOR MAINTENANCE OF SIDEWALKS.



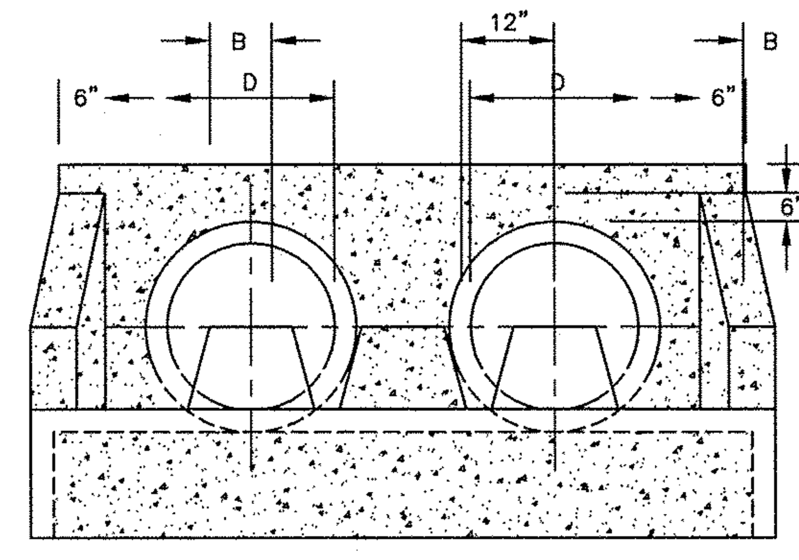
PLAN VIEW



SIDE VIEW

DIMENSIONS IN INCHES

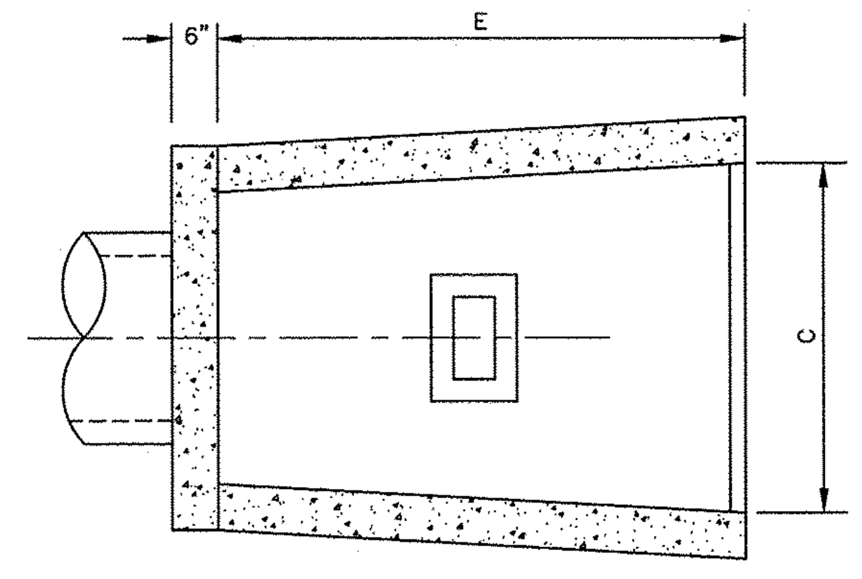
A	9	10	12	14	15	16	18	21	24	27	30
B	6	7	8	9	10	11	12	14	16	18	20
C	32	42	48	54	60	66	72	84	96	108	120
D	18	21	24	27	30	33	36	42	48	54	60
E	54	63	72	81	90	99	108	126	144	162	180



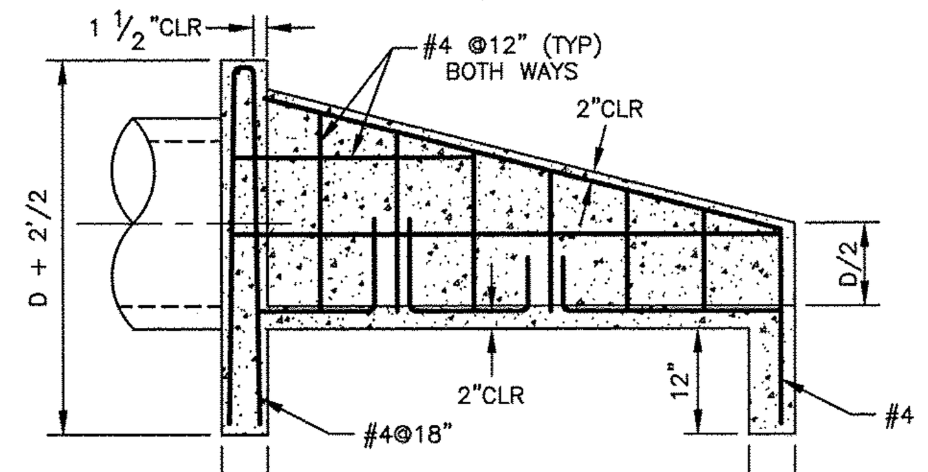
FRONT VIEW

ENERGY DISSIPATING HEADWALL (DOUBLE)

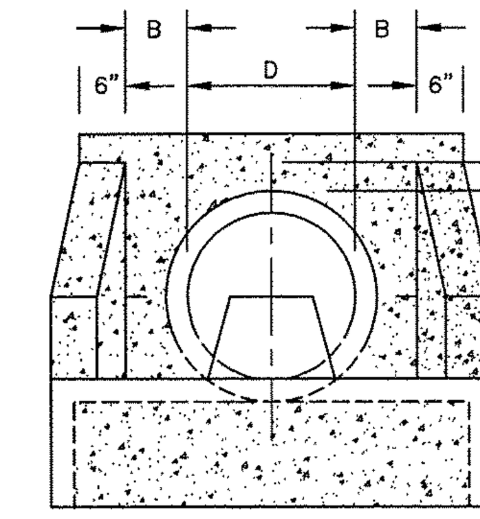
SCALE —— NONE



PLAN VIEW



SIDE VIEW



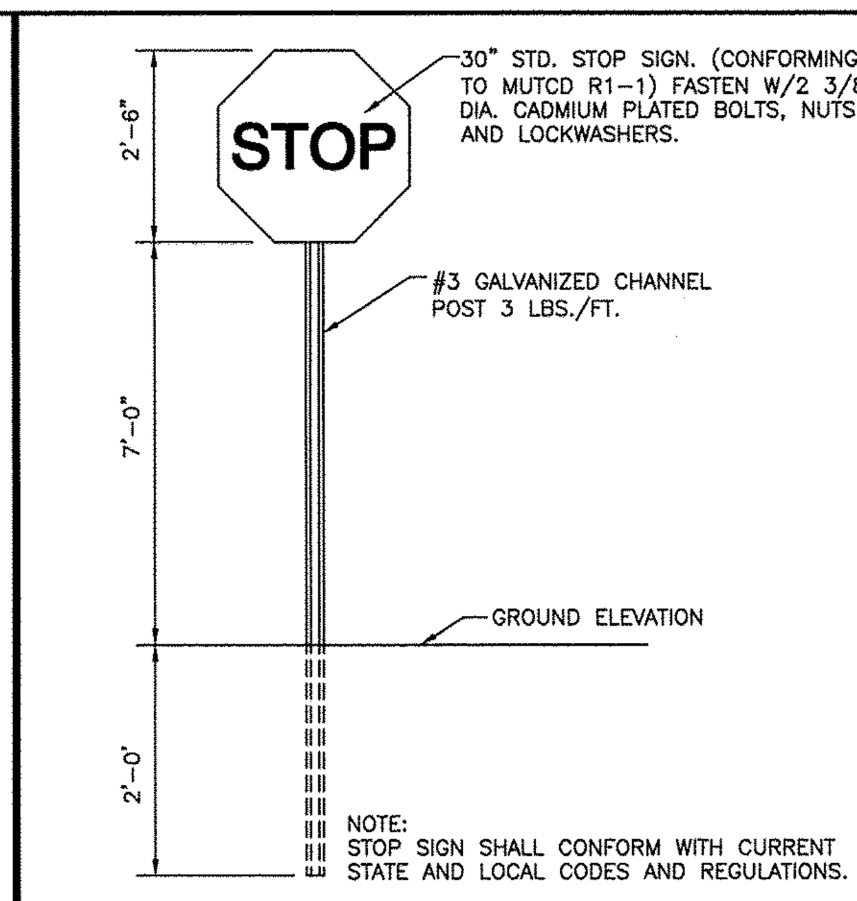
FRONT VIEW

ENERGY DISSIPATING HEADWALL (SINGLE)

SCALE —— NONE

DIMENSIONS IN INCHES

A	9	10	12	14	15	16	18	21	24	27	30
B	6	7	8	9	10	11	12	14	16	18	20
C	32	42	48	54	60	66	72	84	96	108	120
D	18	21	24	27	30	33	36	42	48	54	60
E	54	63	72	81	90	99	108	126	144	162	180



NOTE:
STOP SIGN SHALL CONFORM WITH CURRENT STATE AND LOCAL CODES AND REGULATIONS.

STOP SIGN

SCALE —— NONE

D3-1

NOTE:
STREET SIGN SHALL CONFORM WITH CURRENT STATE AND LOCAL CODES AND REGULATIONS.

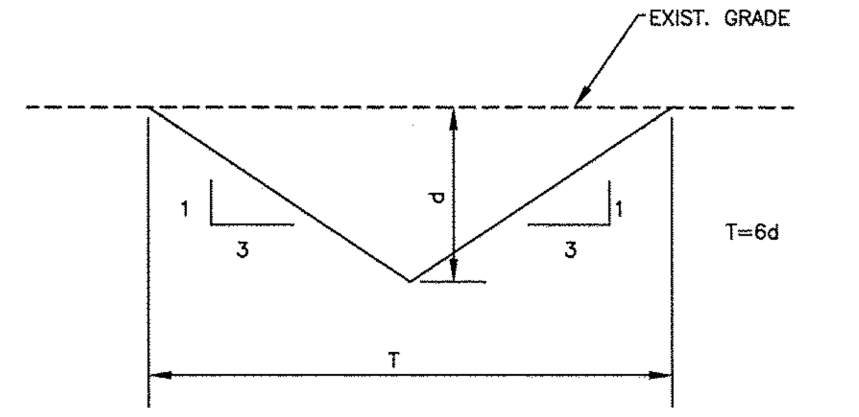
BACKGROUND COLOR TO BE BLUE WITH WHITE BORDER AND TEXT.

STREET SIGN

SCALE —— NONE

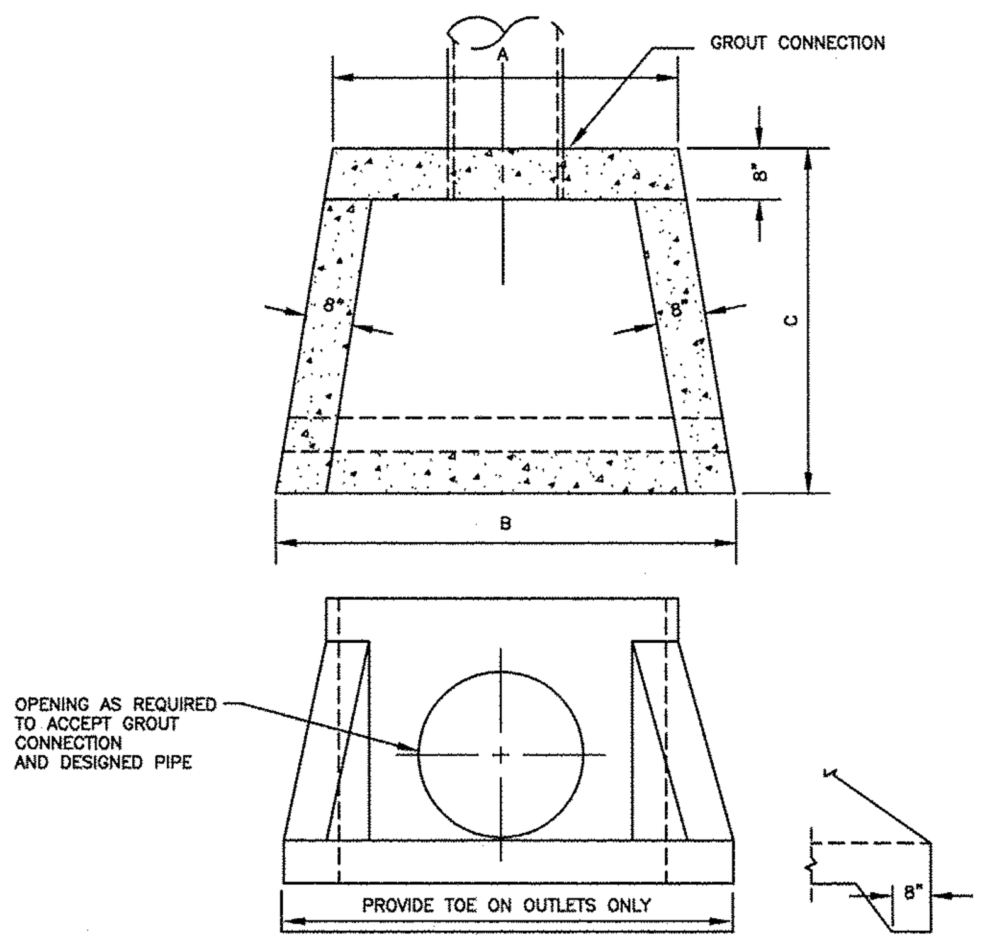
TYPICAL "SPEED LIMIT" SIGN

SCALE —— NONE



"V" BOTTOM DITCH DETAIL

SCALE —— NONE

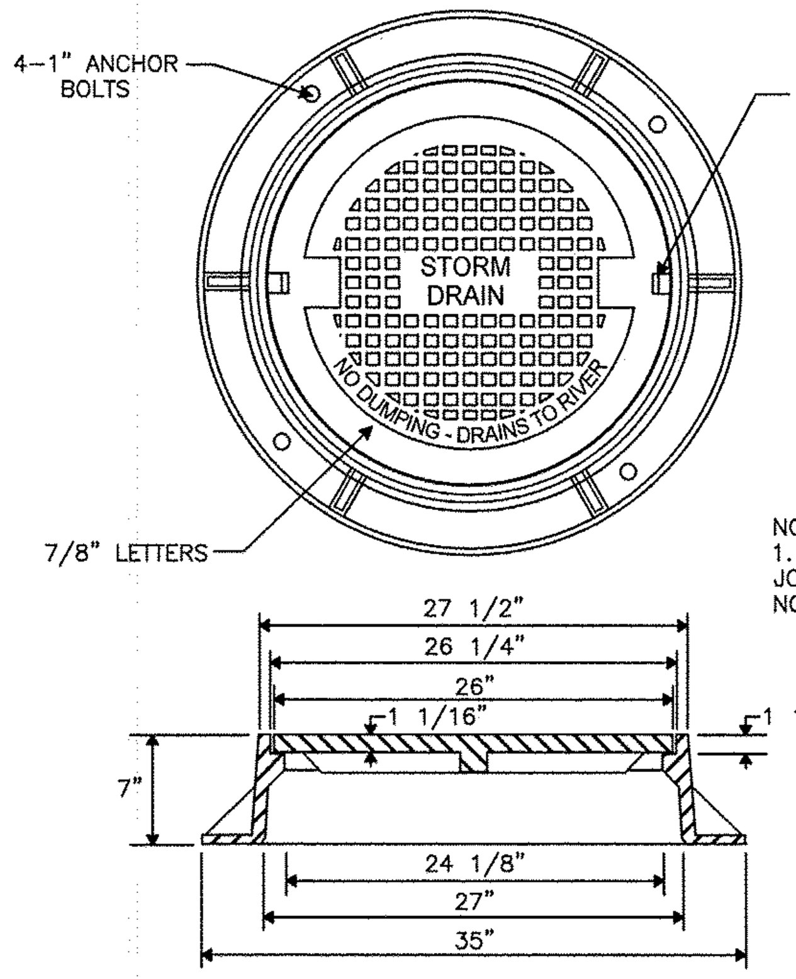


REINFORCED WITH NO.4 REBAR @ 10" C/C, E.W., ALL WALLS AND SLABS
CONCRETE: 4,000 P.S.I. AT 28 DAYS

PIPE SIZE	A	B	C
24" O.D. MAX.	48"	72"	44"
39" O.D. MAX.	72"	96"	50"
53" O.D. MAX.	96"	120"	56"

WINGED HEADWALL

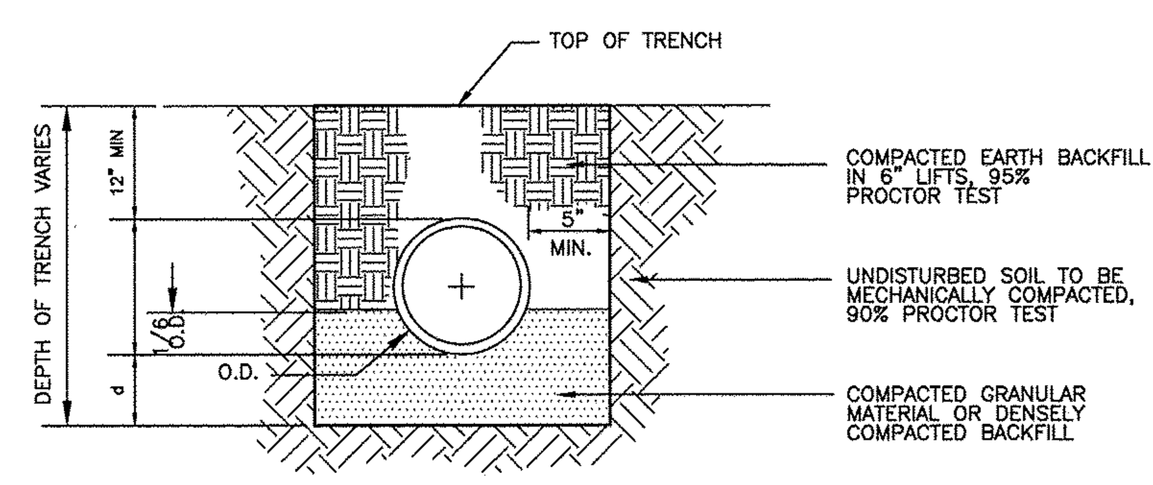
SCALE —— NONE



NOTES:
1. FRAME AND COVER TO BE JOHN BOUCHARD AND SON NO. 1020 OR EQUAL

MANHOLE FRAME AND COVER

SCALE —— NONE

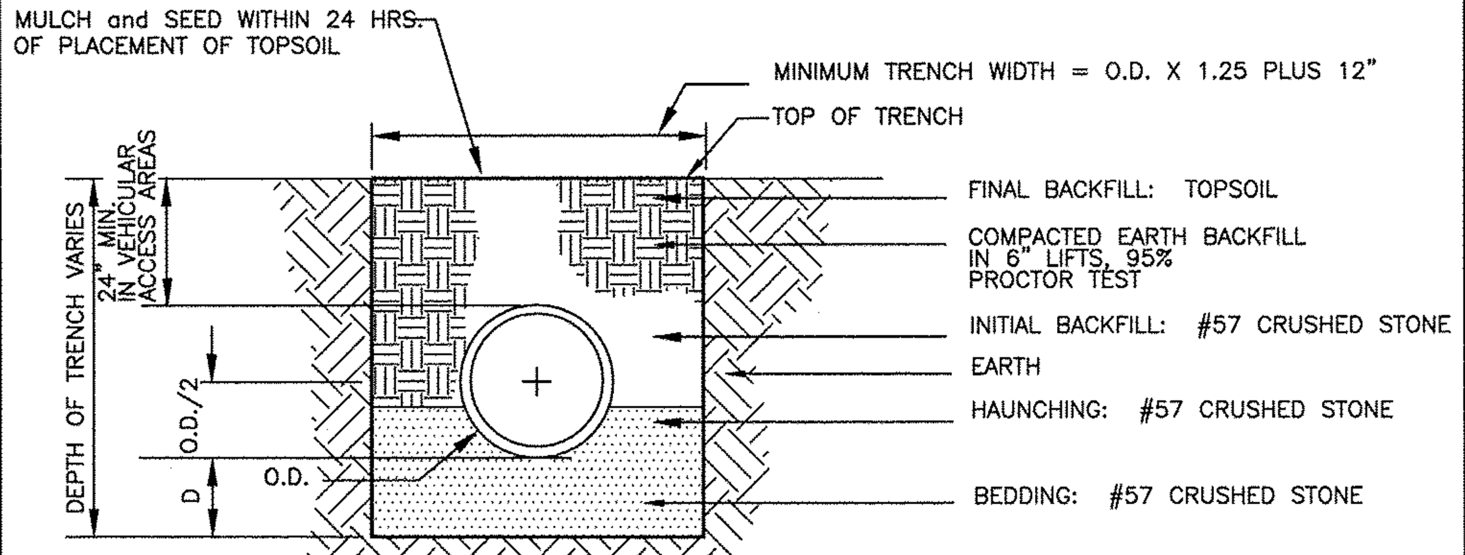


NOTES:
1. WHEN PIPE IS TO BE PLACED IN A FILL SECTION, THE COMPACTED FILL SHALL BE PLACED A MIN. of 15" ABOVE THE PIPE ELEVATION BEFORE THE TRENCH IS EXCAVATED.
2. SUBGRADES SHOULD BE EXCAVATED, IF NECESSARY, SO A UNIFORM FOUNDATION FREE OF PROTRUDING ROCKS MAY BE PROVIDED.

PIPE DIA.	D (MIN.)
27" and SMALLER	6"
30" TO 60"	6"
66" and LARGER	6"

TRENCH BEDDING FOR STORM DRAIN CMP AND RCP ONLY

SCALE —— NONE



NOTES:
1. WHEN PIPE IS TO BE PLACED IN A FILL SECTION, THE COMPACTED FILL SHALL BE PLACED A MIN. of 15" ABOVE THE PIPE ELEVATION BEFORE THE TRENCH IS EXCAVATED.
2. SUBGRADES SHOULD BE EXCAVATED, IF NECESSARY, SO A UNIFORM FOUNDATION FREE OF PROTRUDING ROCKS MAY BE PROVIDED.
3. REQUIREMENTS FOR INSTALLATION OF HIGH DENSITY POLYETHYLENE (HDPE) PIPE SHALL BE AS DESCRIBED IN ASSTM: D2321.

CONDITION	D (MIN.)
MIN.	6"
ROCK CUTS	6"

TRENCH BEDDING DETAIL HDPE PIPE ONLY

SCALE —— NONE

NOTES:

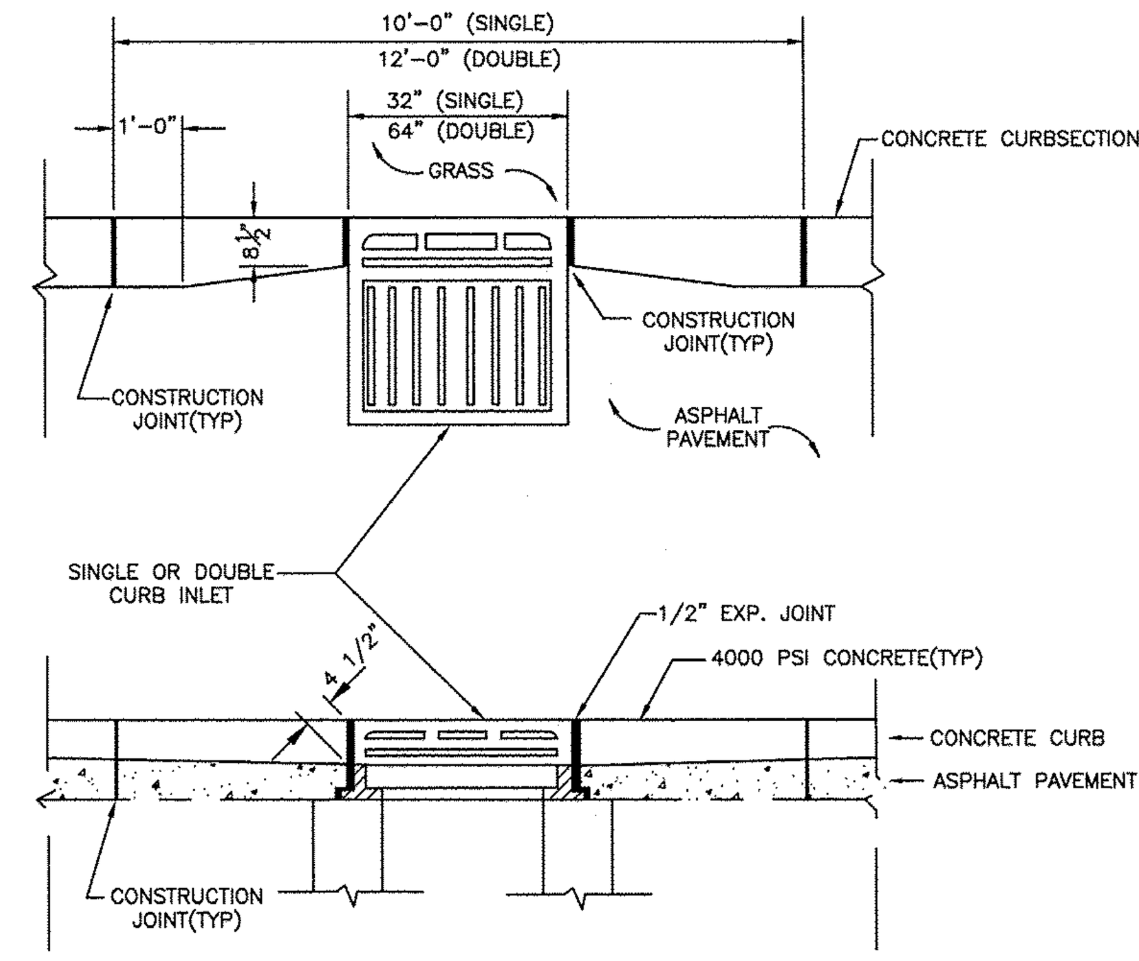
1. THE NOTATION "HDPE" SHOWN ON THIS SHEET AND ELSEWHERE IN THESE PLANS REFERS TO HIGH DENSITY POLYETHYLENE PIPE WITH AN INTEGRALLY FORMED SMOOTH INTERIOR AS MANUFACTURED BY ADVANCED DRAINAGE SYSTEMS, INC. (ADS), COLUMBUS, OHIO, AND DESIGNATED N-12, OR APPROVED EQUAL.

2. THE NOMINAL SIZE FOR THE PIPE AND FITTINGS IS BASED ON THE NOMINAL INSIDE DIAMETER OF THE PIPE.

3. THE PIPE AND FITTINGS SHALL BE FREE OF FOREIGN INCLUSIONS AND VISIBLE DEFECTS. FITTINGS MAY BE EITHER MOLDED OR FABRICATED. FITTINGS SUPPLIED BY THE MANUFACTURERS OTHER THAN THE SUPPLIER OF THE PIPE SHALL NOT BE PERMITTED WITHOUT APPROVAL OF THE PROJECT ENGINEER. THE ENDS OF THE PIPE SHALL BE CUT SQUARELY AND CLEANLY SO AS NOT TO ADVERSELY EFFECT JOINING.

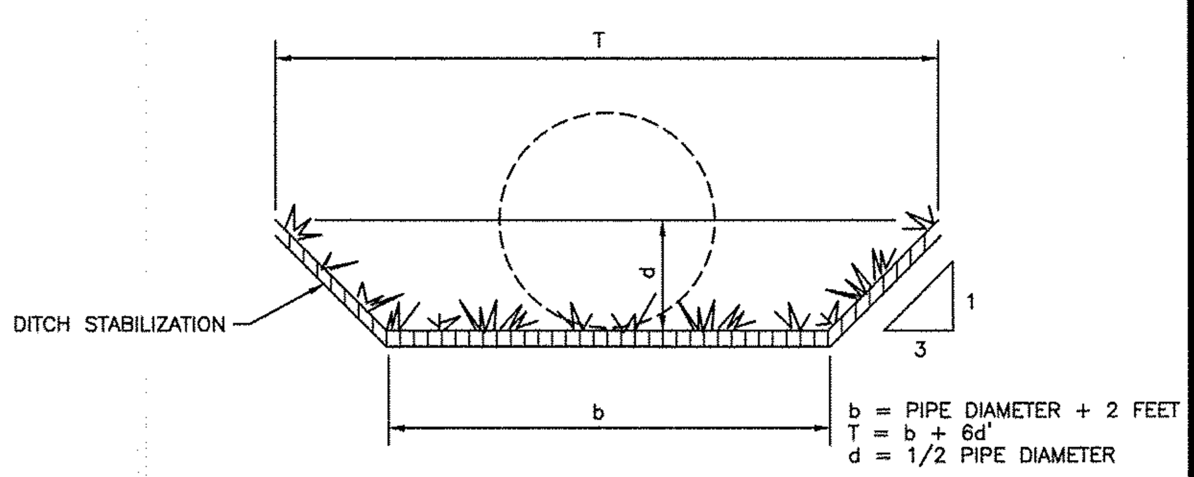
4. JOINTS SHALL BE MADE WITH SPLIT COUPLINGS, CORRUGATED TO ENGAGE THE PIPE CORRUGATIONS, AND SHALL ENGAGE A MIN. OF 4 CORRUGATIONS, 2 ON EACH SIDE OF THE PIPE JOINT.

5. HDPE PIPE N = 0.012.



CURB TRANSITION AT INLET

SCALE —— NONE



b = PIPE DIAMETER + 2 FEET
T = b + 6d'
d = 1/2 PIPE DIAMETER

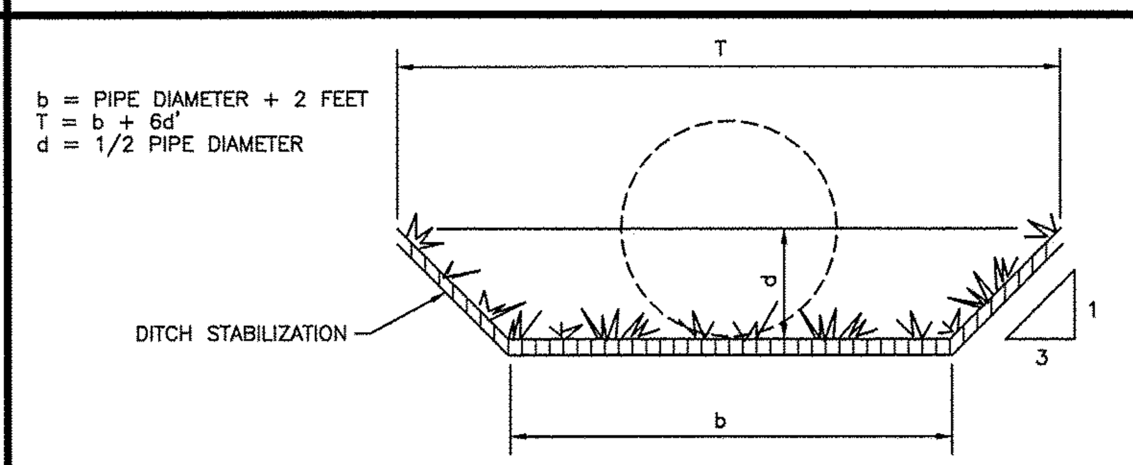
STABILIZATION OF DITCHES: ALL DITCHES SHALL BE STABILIZED IN ACCORDANCE W/ THE FOLLOWING REQUIREMENTS

SIZE OF NEAREST CULVERT UPSTREAM	SEED	SOD	LINE W/ STONE
15"	GRADES LESS THAN 3%	GRADES 3 - 12%	GRADES EXCEEDING 12%
18" 21" 24"	GRADES LESS LESS THAN 1.5%	GRADES 1.5 - 7%	GRADES EXCEEDING 7%
30" and 36"	GRADES LESS THAN 1.0%	GRADES 1.0 - 4.0%	GRADES EXCEEDING 4%
42" and 72"	NA	GRADES 2.5% OR LESS	GRADES EXCEEDING 2.5%

DITCH STABILIZATION SECTION

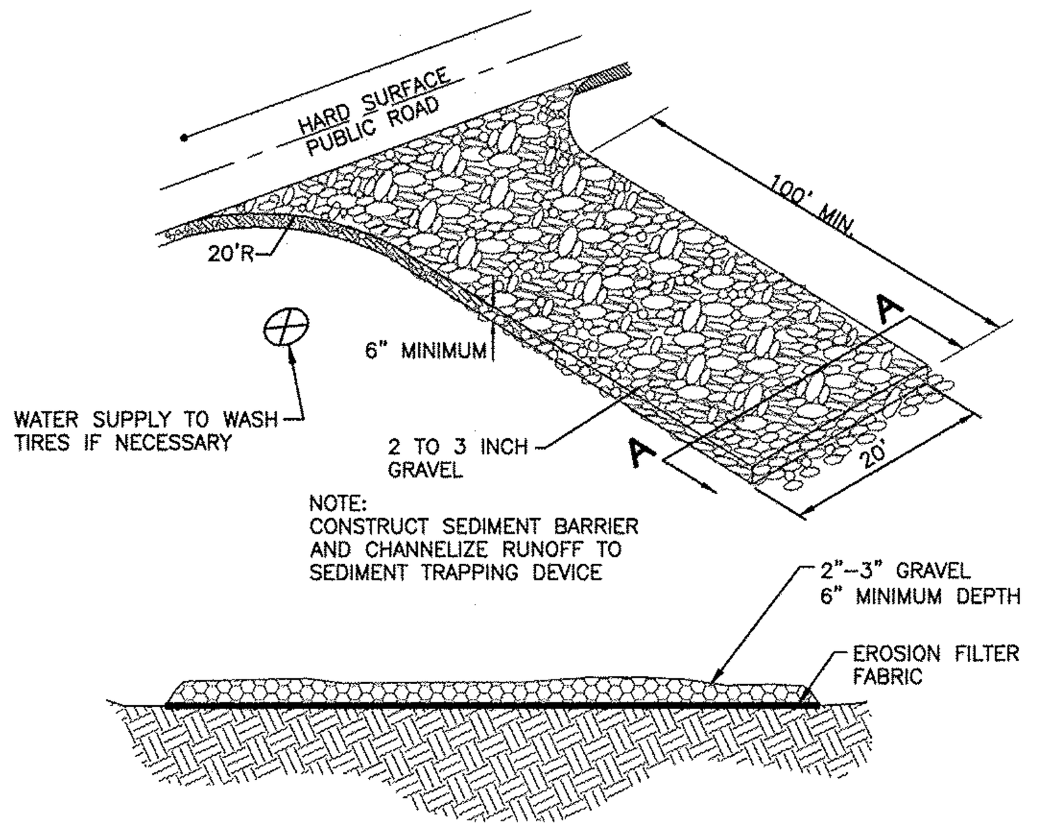
SCALE —— NONE

b = PIPE DIAMETER + 2 FEET
T = b + 6d'
d = 1/2 PIPE DIAMETER



TRAPEZOIDAL DITCH DETAIL

SCALE —— NONE

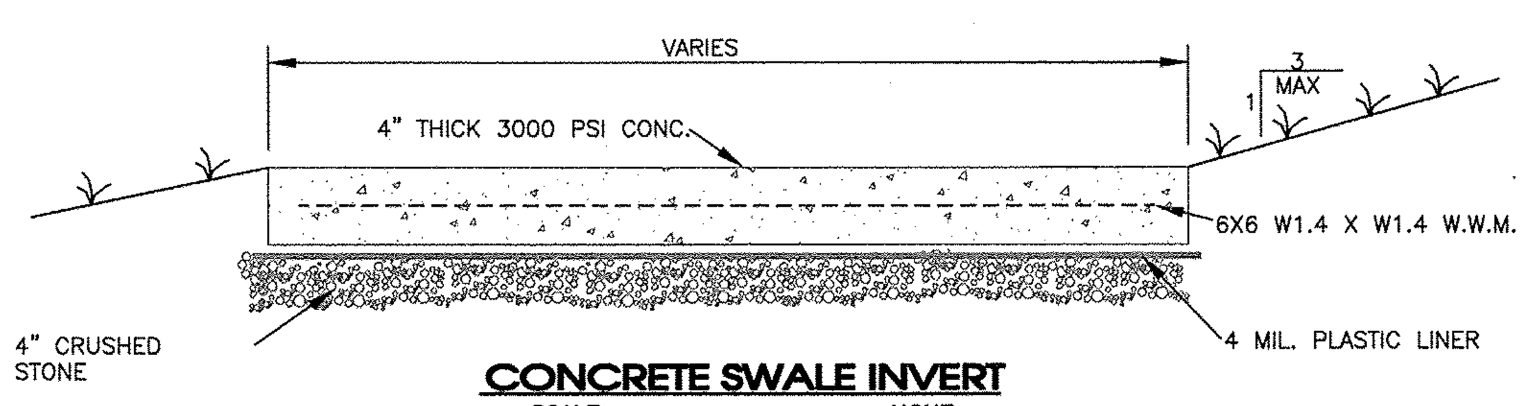


NOTE:
CONSTRUCT SEDIMENT BARRIER AND CHANNELIZE RUNOFF TO SEDIMENT TRAPPING DEVICE

SECTION A-A

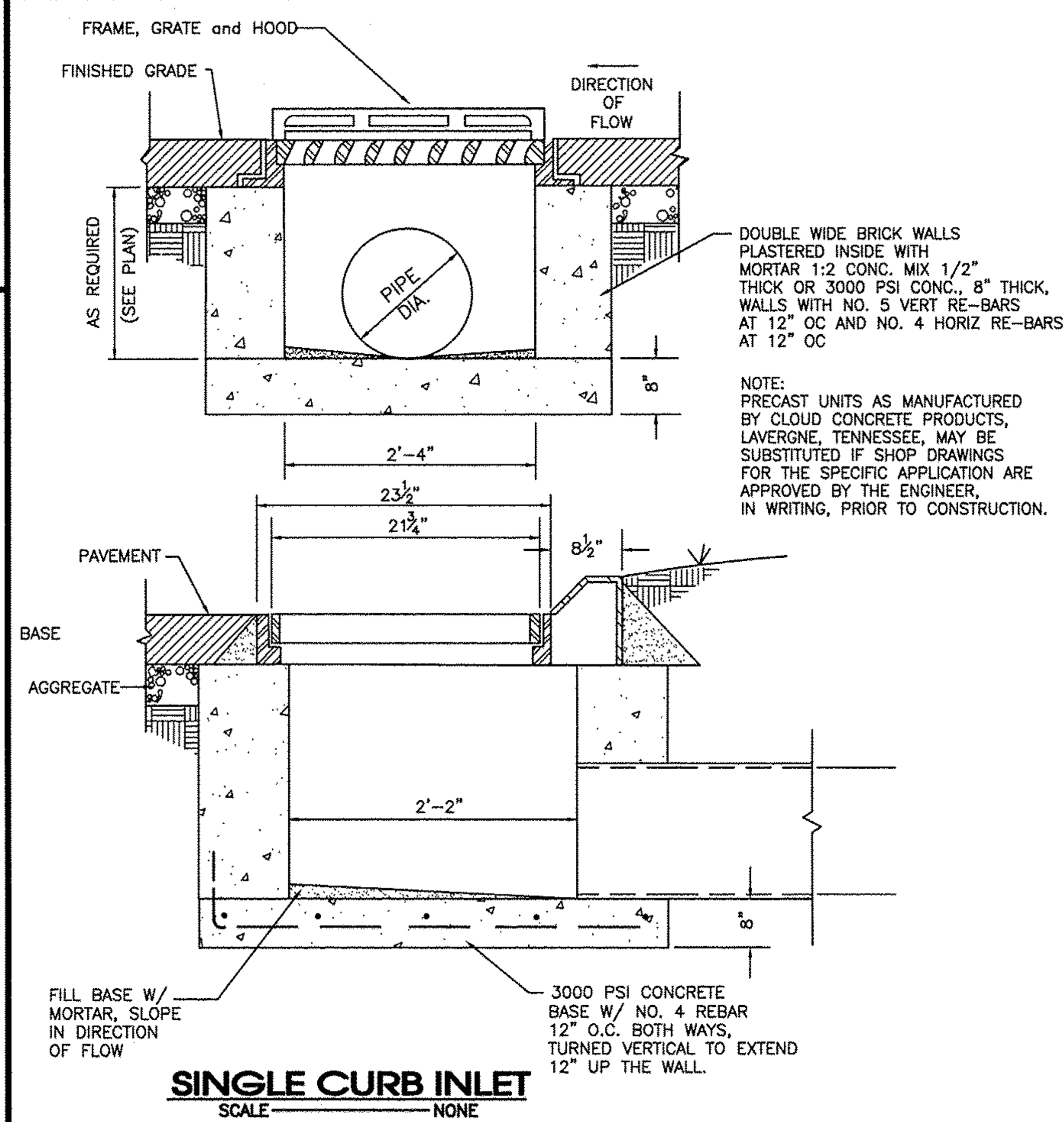
GRAVEL CONSTRUCTION ENTRANCE

SCALE —— NONE



CONCRETE SWALE INVERT

SCALE —— NONE



DOUBLE WIDE BRICK WALLS PLASTERED INSIDE WITH MORTAR 1:2 CONC. MIX 1/2" THICK OR 3000 PSI CONC. 8" THICK, WALLS WITH NO. 5 VERT RE-BARS AT 12" OC AND NO. 4 HORIZ RE-BARS AT 12" OC

NOTE:
PRECAST UNITS AS MANUFACTURED BY CLOUD CONCRETE PRODUCTS, LAVERGNE, TENNESSEE, MAY BE SUBSTITUTED IF SHOP DRAWINGS FOR THE SPECIFIC APPLICATION ARE APPROVED BY THE ENGINEER, IN WRITING, PRIOR TO CONSTRUCTION.

SINGLE CURB INLET

SCALE —— NONE

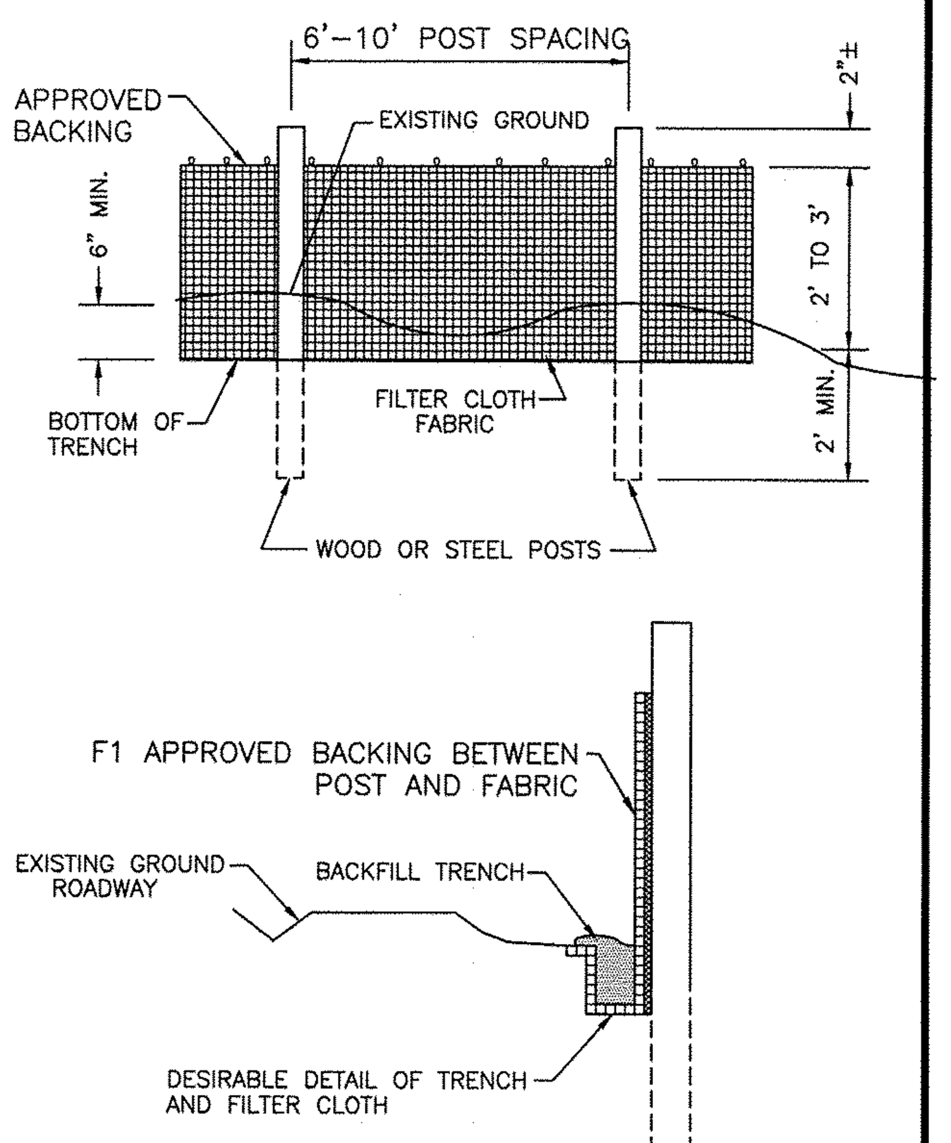
FOR PIPE 24"ø AND SMALLER

SEC, Inc.
SITE ENGINEERING CONSULTANTS
ENGINEERING • SURVEYING • LAND PLANNING
850 MIDDLE TENNESSEE BOULEVARD MURFREESBORO, TENNESSEE 37129
PHONE: (615) 890-7901 E-MAIL: RHOUZE@SEC-CIVIL.COM FAX: (615) 895-2567

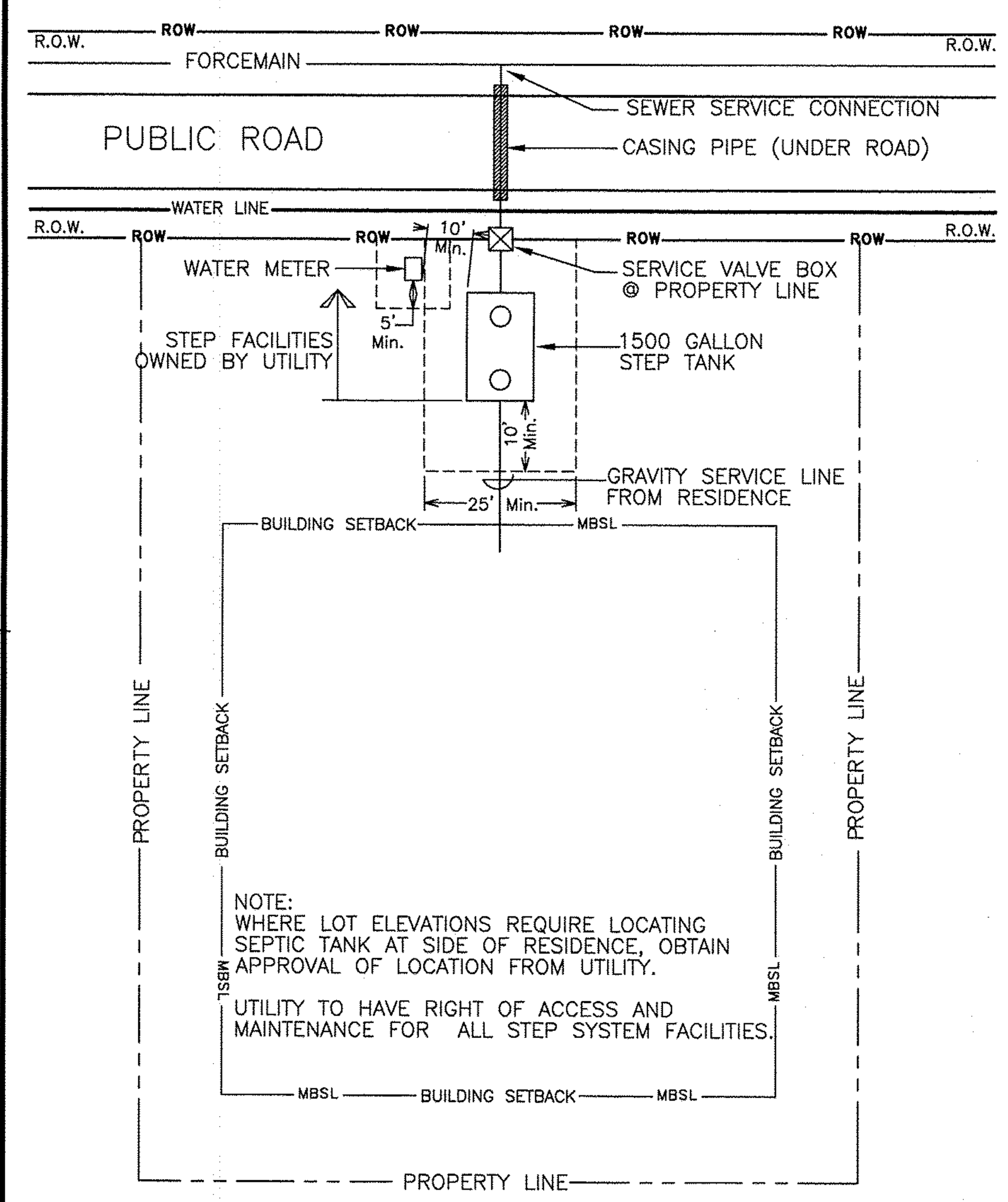
Clearview Acres
Section 2
Rutherford County, TN

REVISED:
DRAWN: JLM
DATE: 2-28-19
CHECKED: RH
FILE NAME: 14300ProjectP2
SCALE: None
JOB NO. 14300
SHEET: C6.1

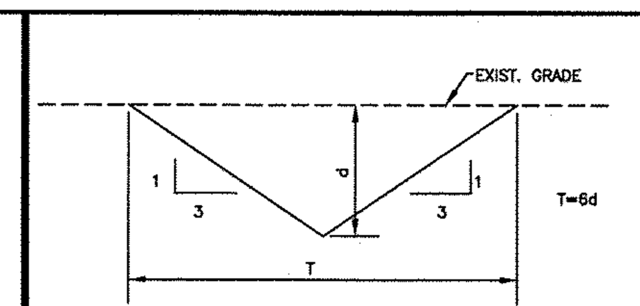
Details



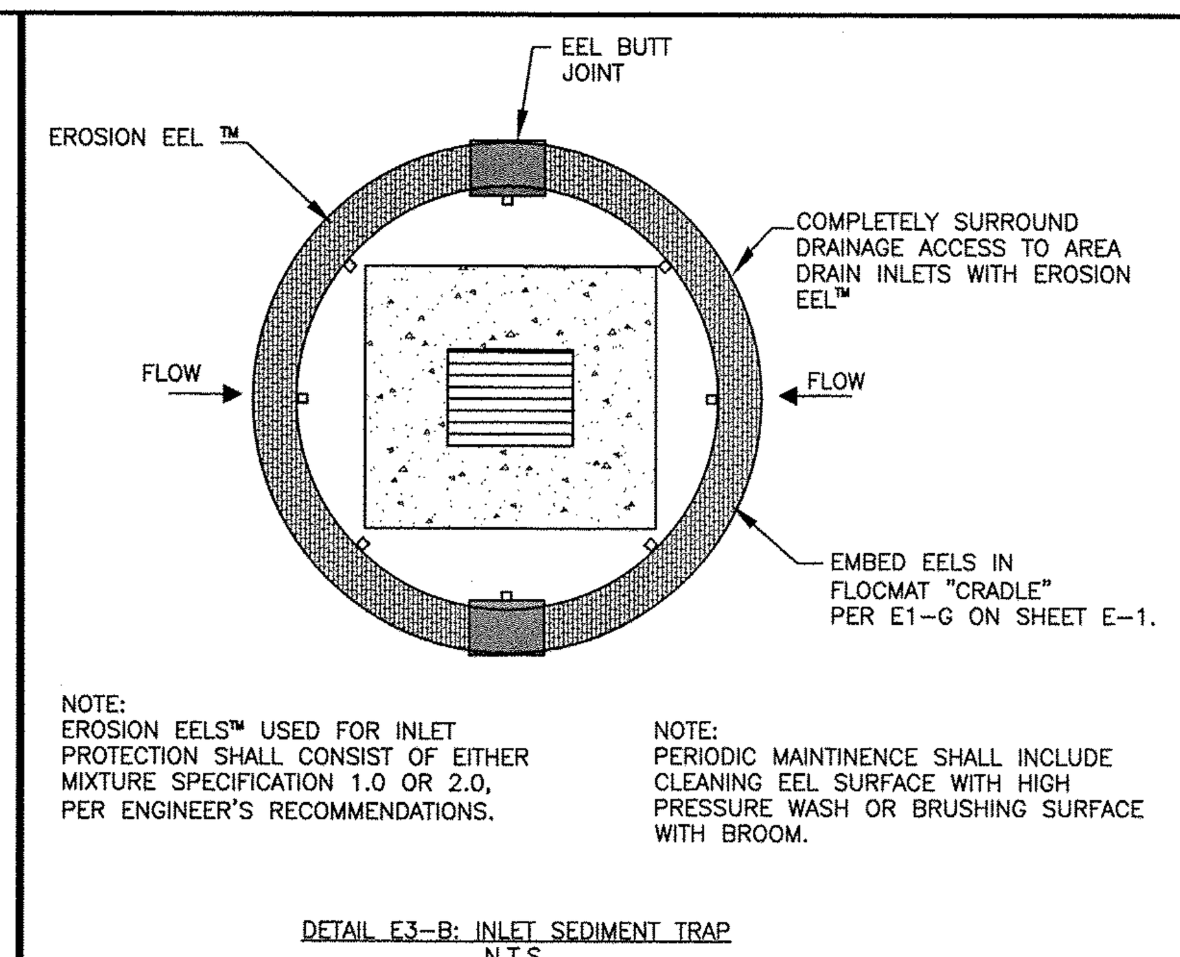
SILT FENCE DETAIL
SCALE — NONE



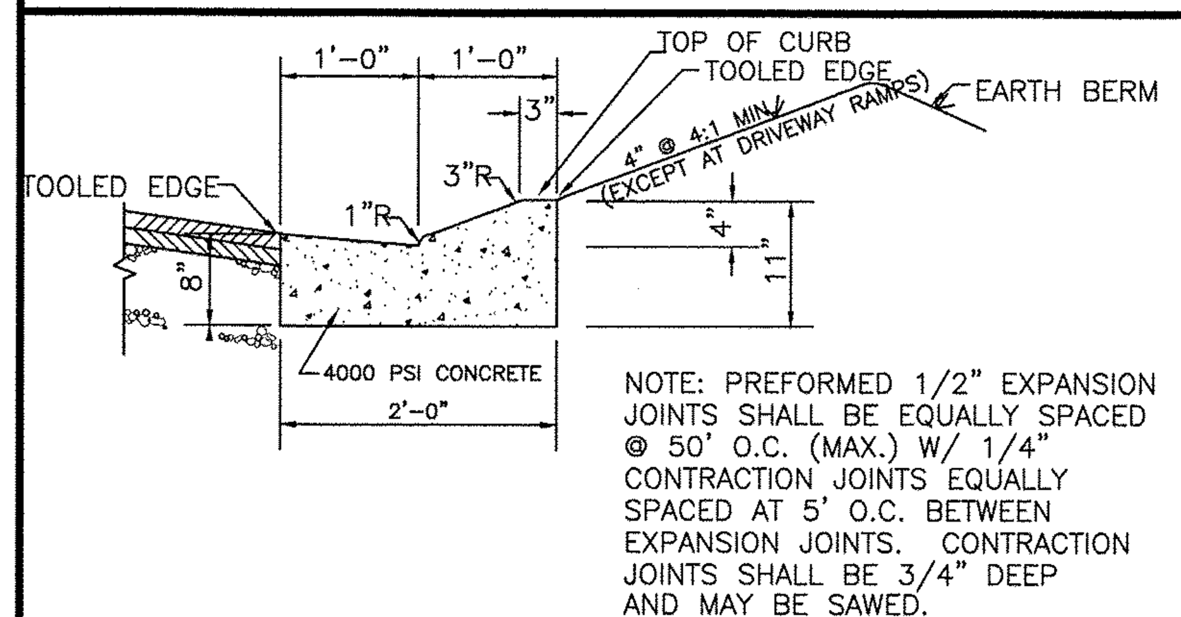
TYPICAL RESIDENTIAL SERVICE CONNECTION PLAN
SCALE — NONE



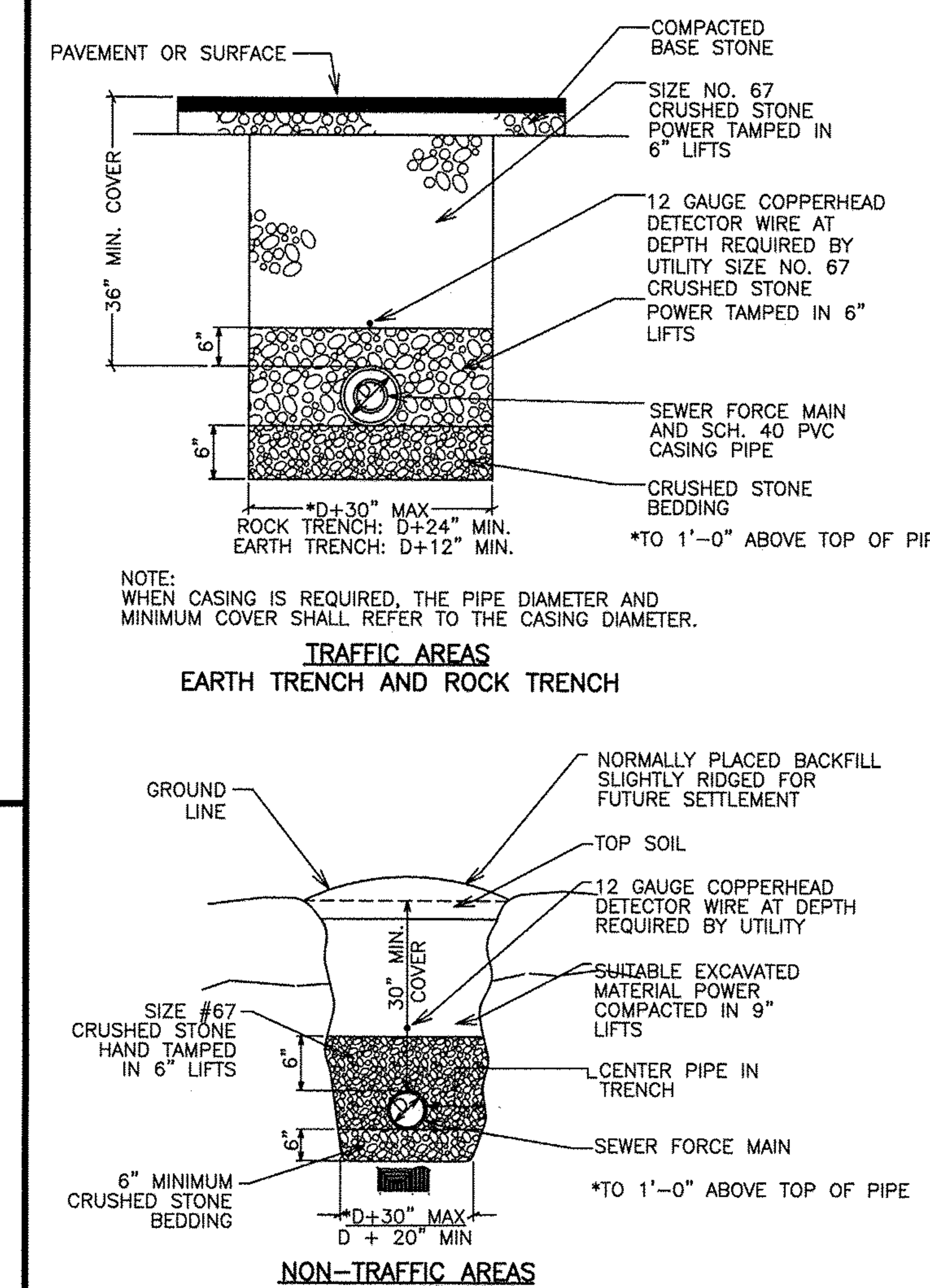
"V" BOTTOM DITCH DETAIL
SCALE — NONE



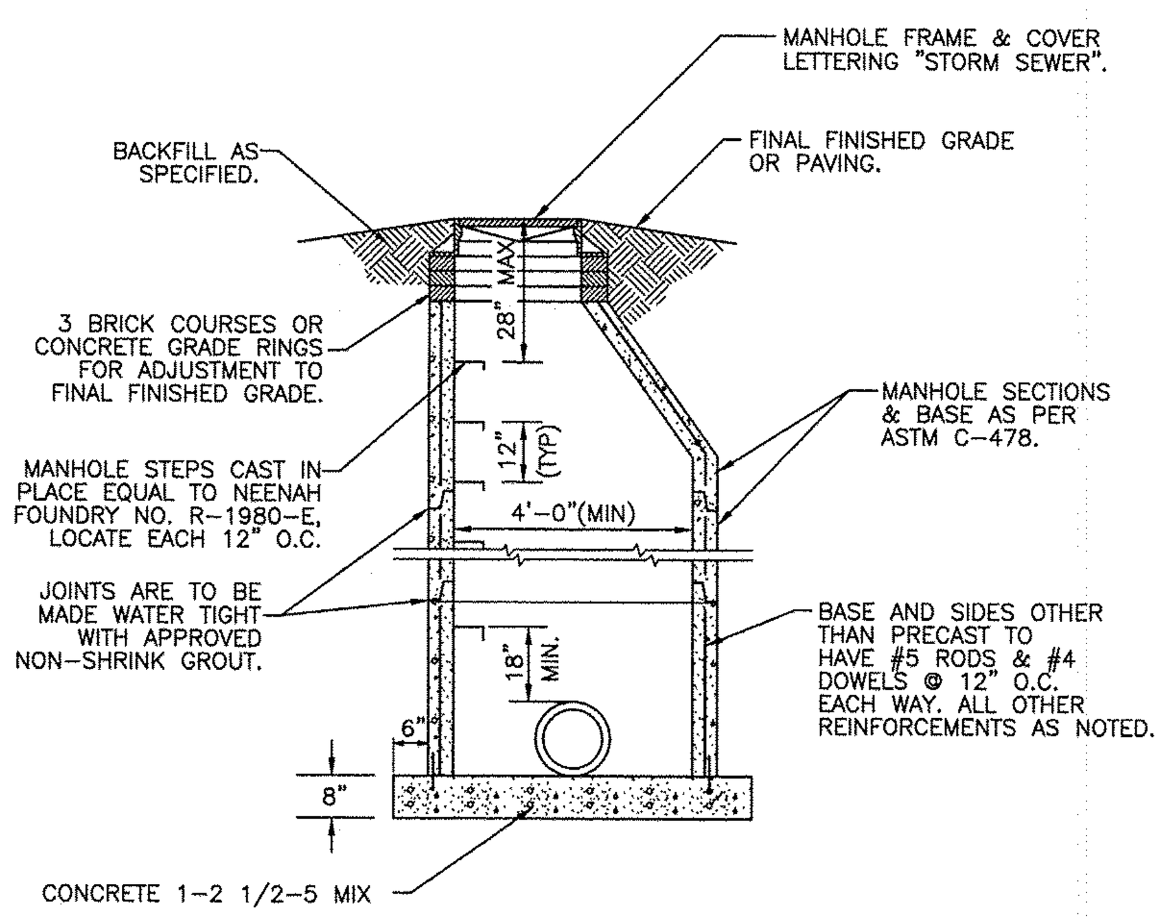
INLET PROTECTION DETAIL
SCALE — NONE



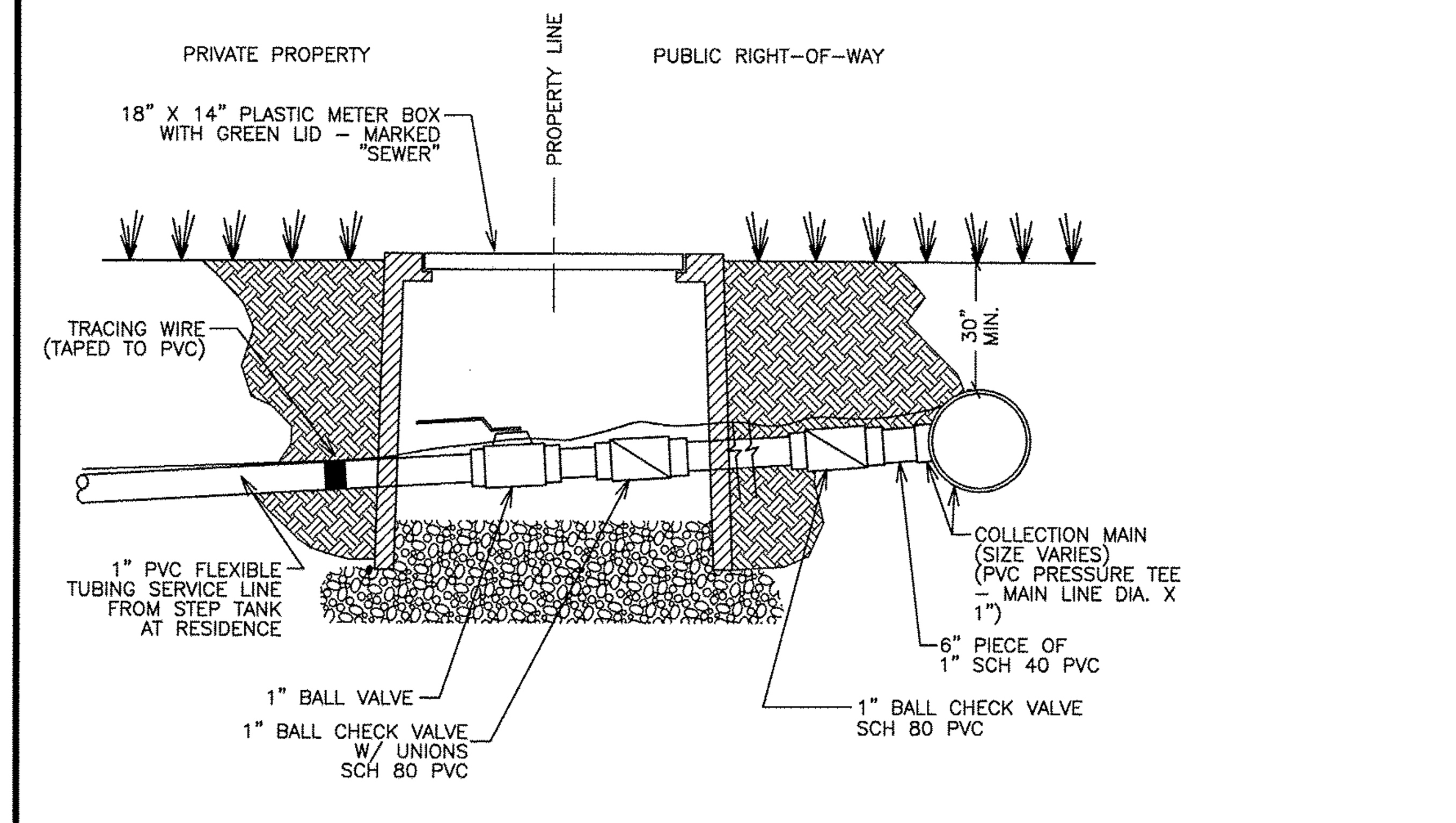
CONCRETE CURB
SCALE — NONE



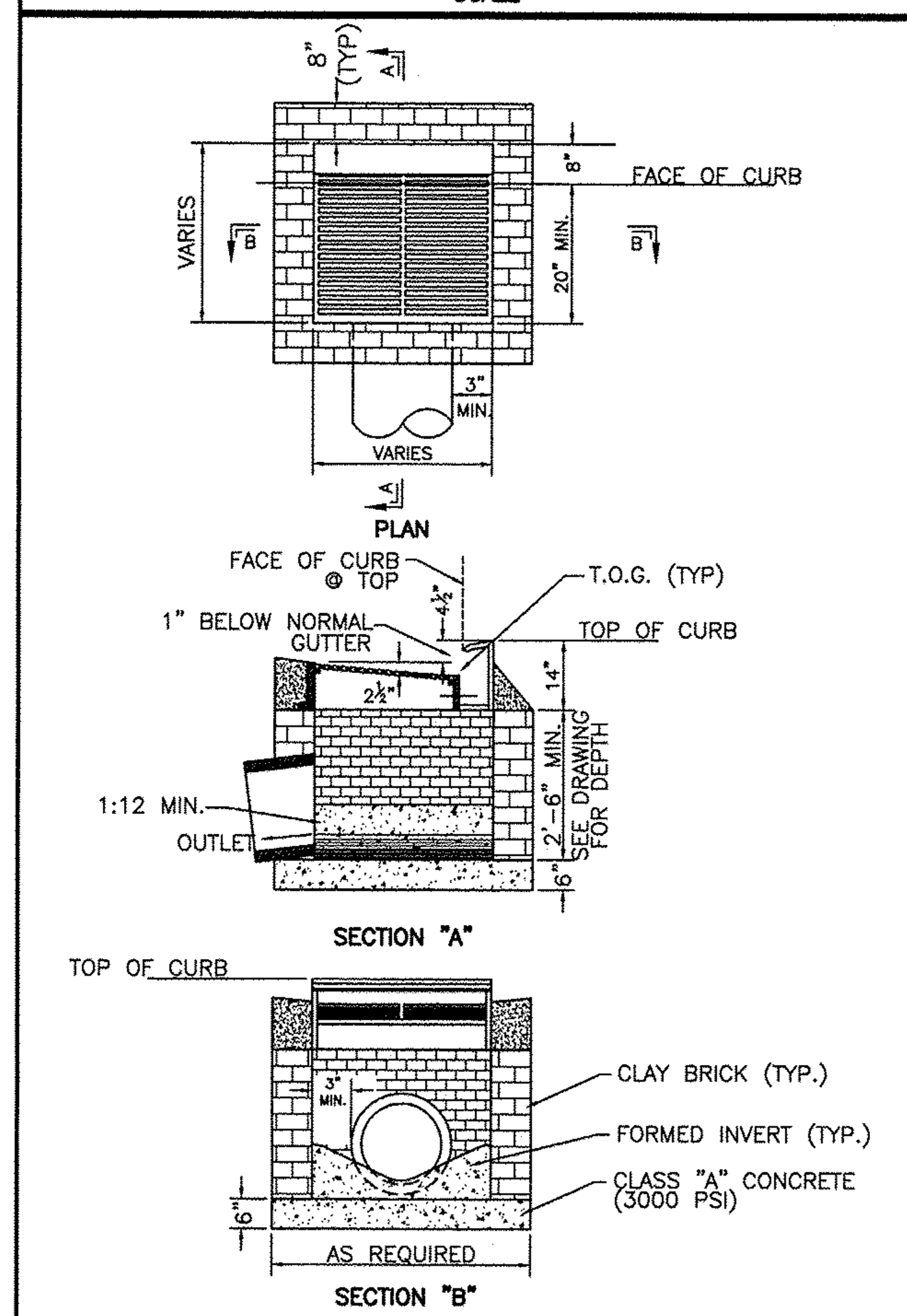
PIPING TRENCH DETAILS
SCALE — NONE
COLLECTION PIPE



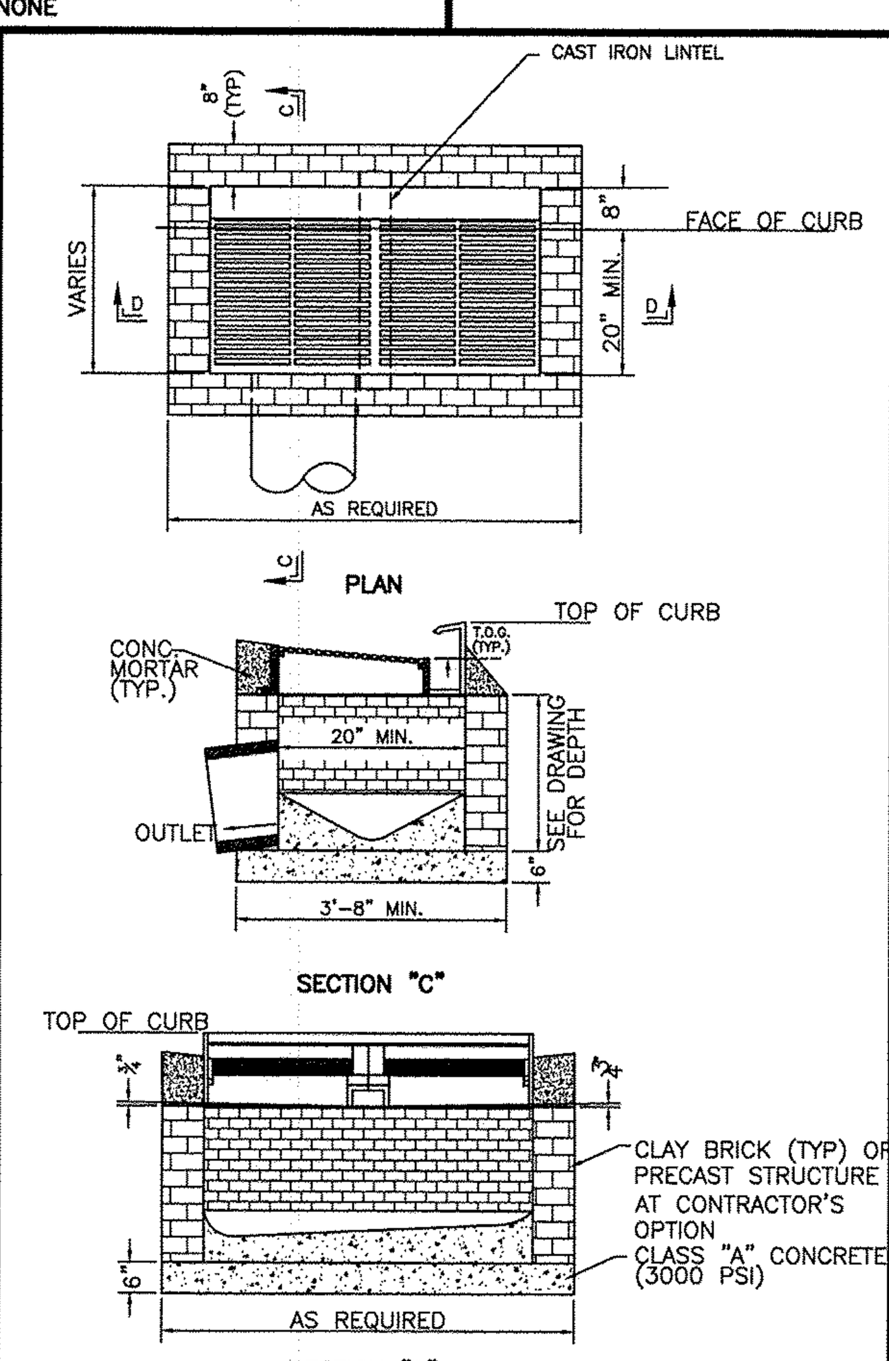
TYPICAL STORM MANHOLE DETAIL
SCALE — NONE



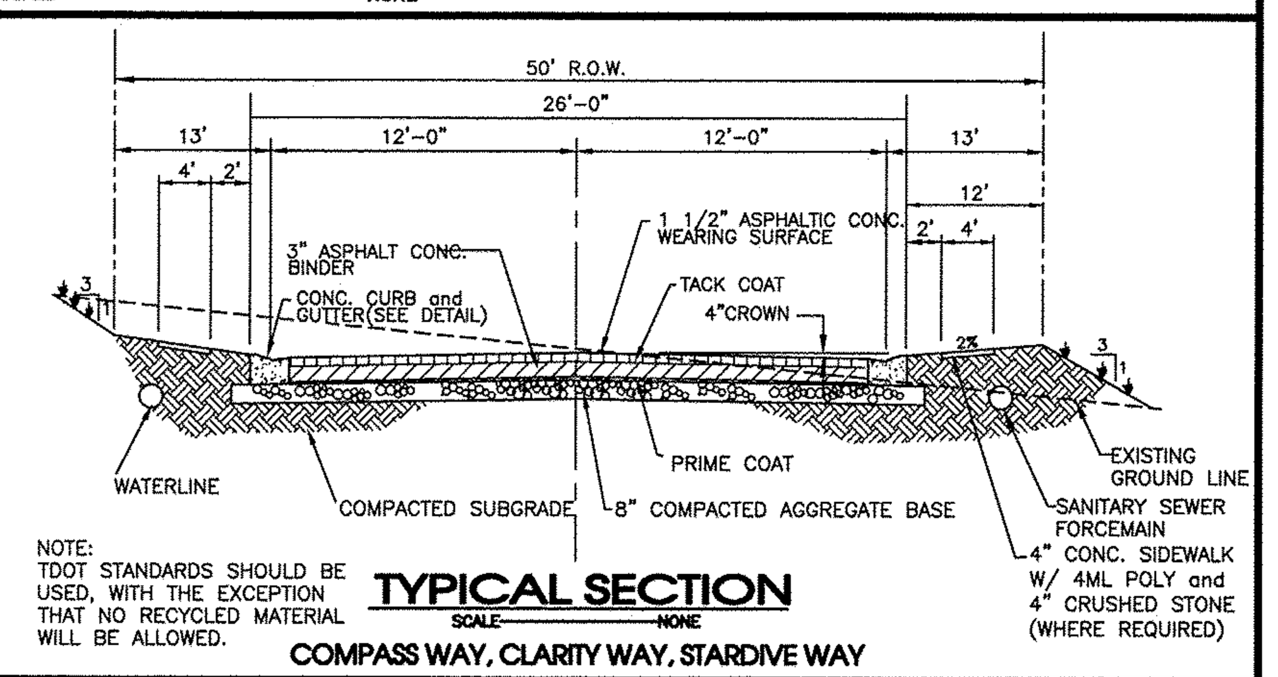
TYPICAL SERVICE CONNECTION (PRESSURE)
SCALE — NONE



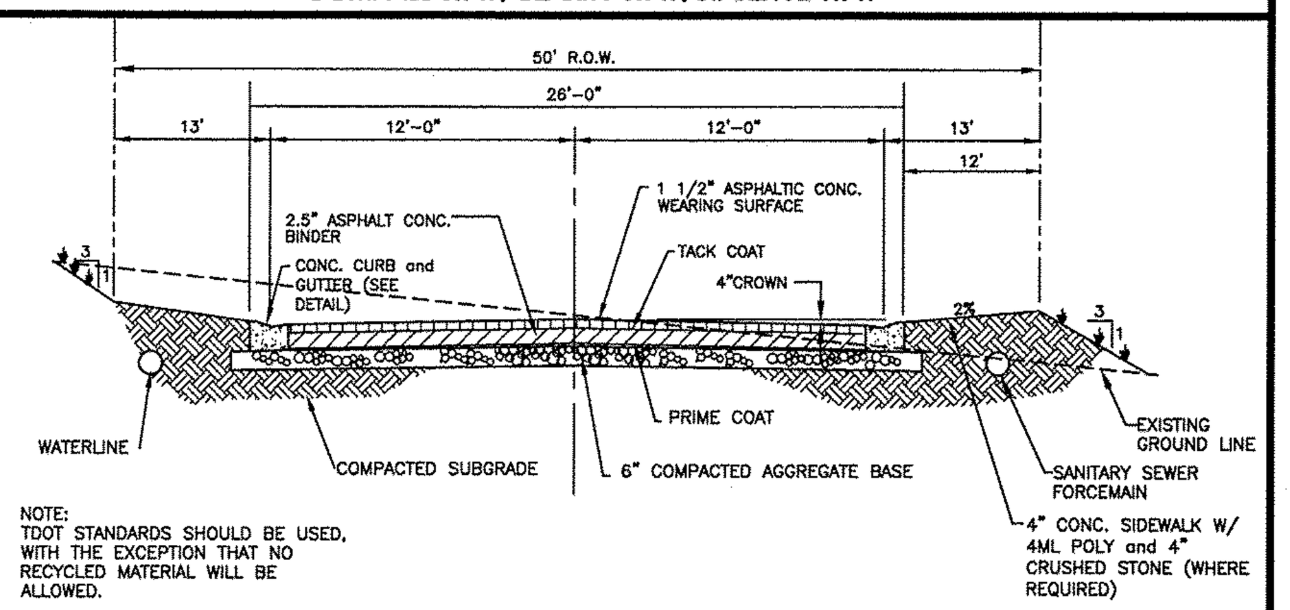
SINGLE CURB INLET
SCALE — NONE



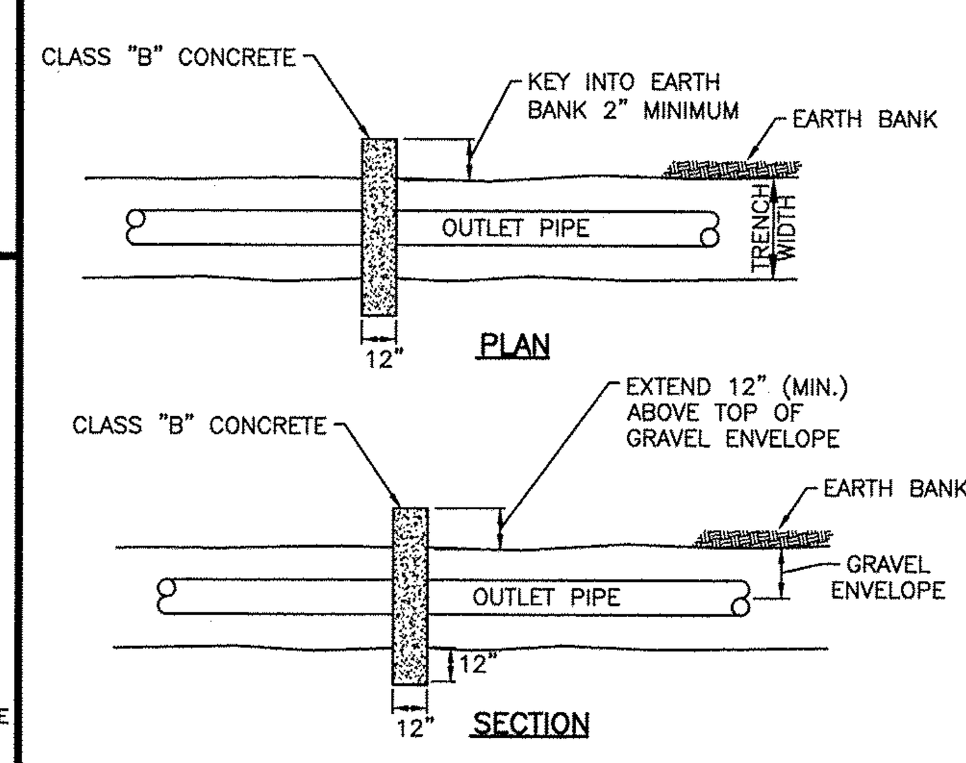
DOUBLE CURB INLET
SCALE — NONE



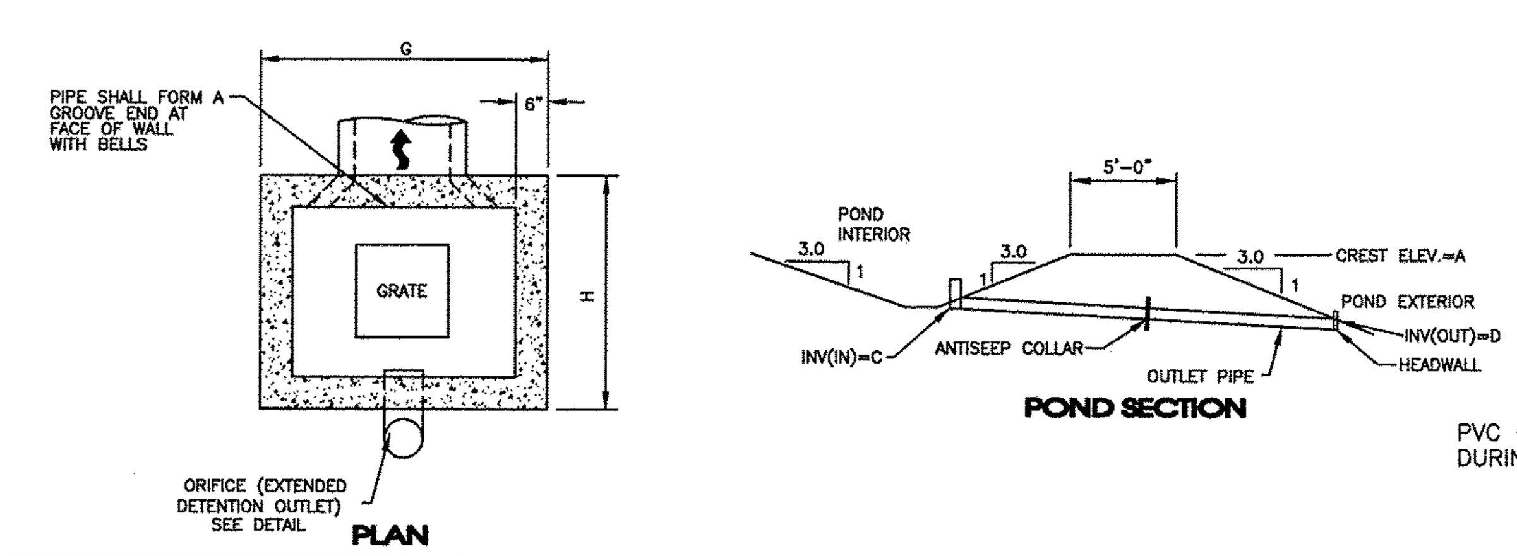
TYPICAL SECTION
SCALE — NONE
COMPASS WAY, CLARITY WAY, STARDIVE WAY

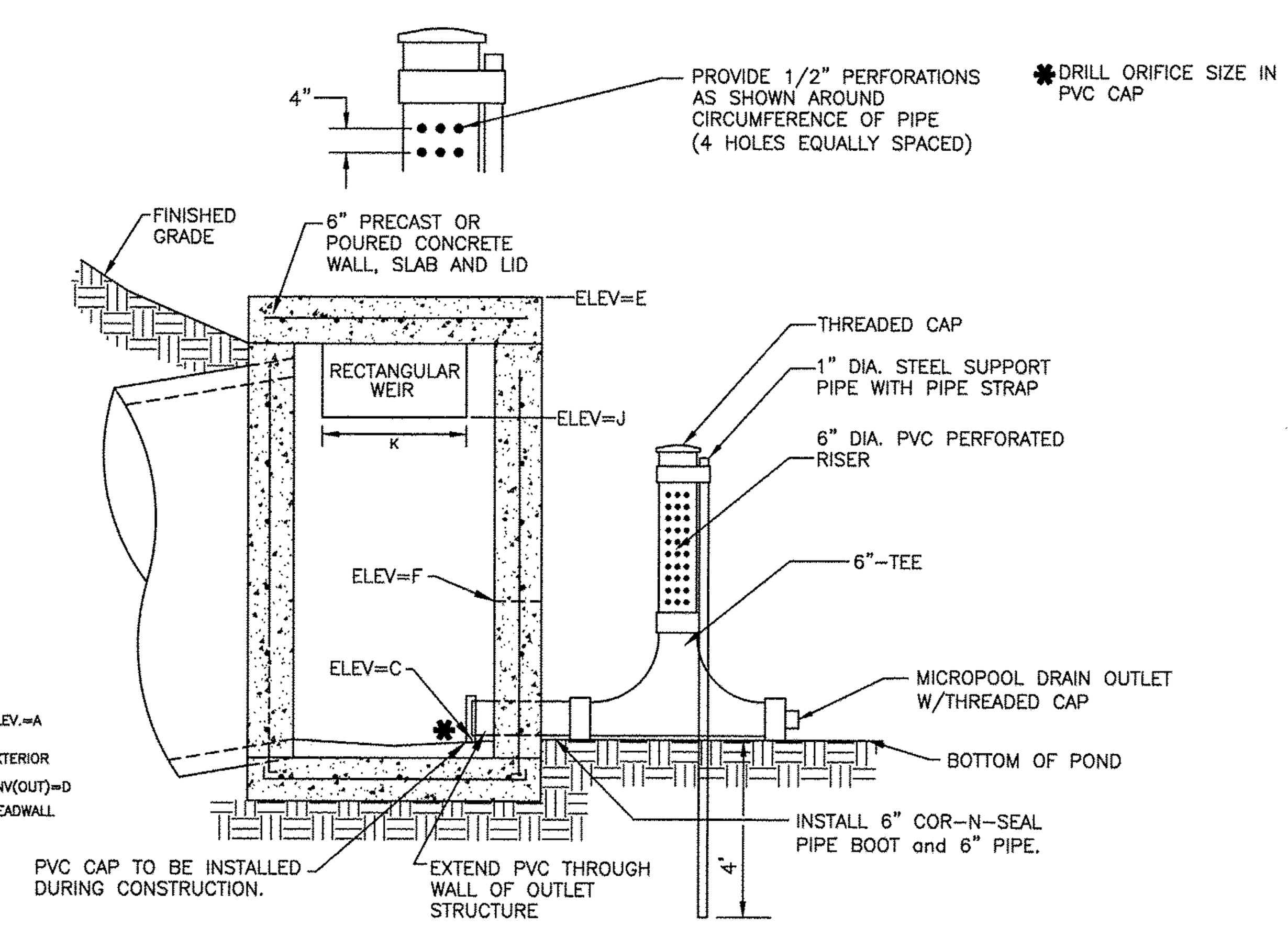


TYPICAL SECTION
SCALE — NONE
STARFLIP COURT



ANTI-SEEP COLLAR
SCALE — NONE





✱ DRILL ORIFICE SIZE IN PVC CAP

	ELEVATIONS										OUTLET PIPE			✱
	A	B	C	D	E	F	G	H	J	K	SIZE	LENGTH	SLOPE	ORIFICE SIZE
POND 1	673.50	-	668.50	668.40	673.00	-	5'	5'	671.00	4'	24"	20'	0.50%	2 1/2"
POND 2	670.00	-	667.00	666.85	669.50	-	6'	6'	667.80	4'	3-15"	30'	0.50%	2"

WATER QUALITY POND OUTLET STRUCTURES
SCALE — NONE

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RICHARD HOUZE — STATE OF TENNESSEE

Clearview Acres Section 2

Rutherford County, TN

REVISED:

DRAWN: JLM
DATE: 2-28-19
CHECKED: RH
FILE NAME: 14300ProjectP2
SCALE: None
JOB NO. 14300
SHEET: C6.2

Details