

DCR's Engineering Program-One Year Later

VASWCD Annual Meeting

Richmond, VA

12-7-15

Amanda S. Pennington, PE

District Engineering Services Program Manager

Raleigh Coleman

Agricultural BMP Engineering Specialist

Overview

- Staffing
- Engineering Workgroup
- Practice Standards
- Structures
- Engineering Job Approval Authority
- DCR Engineering Assistance
- Construction Inspections
- Technical Information for District Staff

Staffing

- Amanda S. Pennington, PE
 - Professional Engineer for Agricultural BMPs
- Raleigh Coleman
 - Agricultural BMP Engineering Specialist
- Funding request in agency budget for two additional full time staff
 - One Professional Engineer
 - One Engineering Specialist

Engineering Workgroup

- 25 members
- Started by District employees prior to my hire
- Includes Gary Moore and Kendall Tyree
- Includes District representation from across the State
- Provides input for the development of the Engineering Program
- Meeting Quarterly in Charlottesville

Engineering Workgroup-Cont'd

- Subcommittee reports and meeting summaries circulated to CDC's, Workgroup members, and Technical Contact lists. Happy to send to you, just e-mail me!
 - Technical Contact lists created to include a primary and secondary contact at each district. Identified by CDCs.
- **Subcommittees:**
 - Certification
 - Training
 - Design Tools
 - Standard Operating Procedures
 - Website

Certification

- Engineering Job Approval Authority (EJAA)
- Review of practices
- Consults for TAC Items

Training

- Five sessions tentatively being planned for approximate March/April timeframe:
 - Charlottesville-Basic Stream Crossing
 - Culpeper VDOT training center-Detailed Culvert Design
 - Wytheville Community College-Basic Watering System
 - Prince George Library-Basic Watering System
 - Farmville NRCS Service Center-Stream Crossing

Design Tools

- Design references for website:
 - Standard Drawings
 - Worksheets and Spreadsheets
 - Computer Programs

Standard Operating Procedures

- Checklists for design packages:
 - Watering Systems
 - Stream Crossings
 - District files and contractor/landowner packages
- Process for Structures (pack barns, ag. waste, etc.)

Website

<http://www.dcr.virginia.gov/soil-and-water/district-engineering-services>

- Standard Drawings
- SOPs
- Design Tools
- Engineering Workgroup Meeting summaries
- Forms

Items to note

- Topography Sources:
 - USGS generally inaccurate source
 - Handheld GPS
 - VGIN
 - Working to provide districts with alternative sources
- Worksheets and Calculations
 - Excel file
- Submitting plans
 - Please keep a copy for yourself!
- Survey
- Landowner wants vs. water quality needs

Practice Standards

- NRCS Standards
- This includes:
 - Standard Drawings
 - In the process of replacing NRCS logo with DCR and Mat Lyons's name with mine, some now available on the DCR District Engineering Services webpage
 - Will be placed on DCR website for District use
 - Conservation Practice Standards on eFOTG
 - Plans and specifications
 - Design Data
- Process will be what you are already used to (mostly)

Structures

- This means any ag. waste structure, pack barn, covered winter feeding facility, etc. A building!
- If there is an NRCS standard drawing, and the size of the building falls within this drawing, I will do this for you.
- If it is a custom building (e.g. metal building, special size, etc), must go to a consultant.
 - Will provide guidance for this in the future (hopefully soon!)
 - I need to see the construction plans/drawings **before it goes to construction.** I may request additional documentation.
- When in doubt, call me! I am always available and happy to help.

Engineering Job Approval Authority (EJAA)

- **Definition:**
- EJAA is: “the authority to design, inspect, or certify various BMP practice components. Level of EJAA is granted by the DCR Agricultural BMP Engineer to individuals based on their training, experience and demonstrated competence. Until such time that DCR has a fully functioning EJAA program, any NRCS EJAA granted and current prior to October 1, 2013 will be recognized.”
- **Types:** Inventory and Evaluation (I&E), Design, Construction

EJAA

- DCR is working to develop our own delegated authority program.
- EJAA will be issued for each NRCS practice component
 - EG, SL-6 includes multiple NRCS Standards, 528, 382, 390, etc. EJAA will be issued for each NRCS Standard, not for SL-6 in general.

Stay tuned!

EJAA

- Will separate Agronomic from Engineering
- Using National Handbook of Conservation Practices, Lead Discipline
- Will have various levels, much like NRCS

EJAA

- Currently recognize NRCS EJAA current prior to October 1, 2013
- Will be starting reviews of NRCS issued EJAA this winter
- Cover those that are currently performing design and construction

EJAA

- Must have authorized signature in the “approved by” box in the upper right hand corner of the design sheets

MISS UTILITY (Virginia telephone number 877) must be contacted at least 2 working days before construction begins. The landowner/operator is responsible for ensuring that the contractor contacts MISS UTILITY. The contractor must be able to provide the MISS UTILITY ticket number within 24 hours upon request by the NRCS/SWCD representative. The landowner/operator is responsible for locating any buried utilities (water lines, electric lines, telephone lines, gas lines, sewer lines, etc.) in the work area that are not covered by the MISS UTILITY program.

- NRCS/SWCD makes no representation of the existence or nonexistence of utilities. The presence or absence of utilities on the construction drawings does not assure that there are or are not utilities in the work area.
- The contractor is responsible for knowing and following the appropriate safety standards required by the Virginia Safety and Health Codes Board.
- The landowner/operator shall notify the local NRCS/SWCD representative at least one week prior to beginning construction, and at all other times specified in this construction plan and attached specifications.
- Any deviation from these construction drawings and specifications without written approval from NRCS/SWCD representative may result in failure of this practice to meet NRCS Standards and the withdrawal of technical assistance for this project.
- Prior to beginning construction, the cover sheet must be signed by the landowner/operator, the contractor, and the NRCS/SWCD representative. The landowner/operator is responsible for informing the contractor of these responsibilities by providing the contractor a copy of this cover sheet. The contractor must sign the cover sheet acknowledging that these responsibilities are understood and the landowner/operator must return the signed cover sheet to the NRCS/SWCD Representative.

Sign Cover Sheet	Designed	Drawn	Checked	Approved

EJAA

- Must have authorized signature in the As Built block on the Cover Sheet upon construction completion

<p><u>Acknowledgment Signatures</u> These construction drawings and attached specifications have been reviewed I understand what is required. (Sign and date below)</p> <p>Landowner/Operator _____</p> <p>Contractor _____</p> <p>SWCD Representative _____</p> <p>Engineering Job Class: <input type="text"/></p>		 <p>811 Know what's below. Call before you dig.</p>	 <p>This drawing adapted from NRCS Standard Drawing VA-SO-100 v2.4.0</p>																				
<p><u>"As Built" Documentation</u></p> <p>Certified By and Date _____</p> <p>Practice Completion Date _____</p>																							
<table border="1"> <thead> <tr> <th colspan="4">Revisions</th> </tr> <tr> <th>Version</th> <th>Date</th> <th>Approved by</th> <th>Title</th> </tr> </thead> <tbody> <tr> <td>v 2.3</td> <td>7/2010</td> <td>Marlow Lovitt</td> <td>State Conservation Engineer</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		Revisions				Version	Date	Approved by	Title	v 2.3	7/2010	Marlow Lovitt	State Conservation Engineer									<p>File Name _____</p> <p>Drawing Name _____</p>	<p>Sheet _____ of _____</p>
Revisions																							
Version	Date	Approved by	Title																				
v 2.3	7/2010	Marlow Lovitt	State Conservation Engineer																				

EJAA

- Allows more engineering to be accomplished while ensuring consistency
- Provides Quality Control/Quality Assurance
- Maintain accountability required by state certification of PEs
- Method for determining and documenting employee technical capability

EJAA

- Ensures engineering work is:
 - Safe (minimize threat to life and property)
 - Durable (built to last the “design life”)
 - Efficient (minimize costs of construction)

What if District staff do not have EJAA (or enough EJAA) for a practice?

- Assistance from DCR Engineering staff
- Do as much of the design/drawing for review by DCR Engineering staff. Great training opportunity to help prepare you for future EJAA
- NRCS assistance if available



**AGRICULTURAL BMP
ENGINEERING ASSISTANCE
REQUEST FORM**

To request engineering assistance from the DCR Agricultural BMP Engineer, please complete this form and return to:

Virginia Department of Conservation and Recreation
Division of Soil and Water Conservation
Amanda S. Pennington, PE
600 E. Main St., 24th Floor
Richmond, Virginia 23219

Name: _____ SWCD: _____ County: _____

Lat: _____ Long: _____

Date: _____ Desired Delivery Dates: _____

Project Funding Source and Date of District Board Approval:

Project Description:

Please describe any steps that have been taken towards project completion (e.g. survey, hydrology calculation, etc.):

Has a Cultural Resource Review or Threatened and Endangered Species Review been completed? If so, are there time of year restrictions or special circumstances to be considered?

Additional Information:

*Please use this DCR form instead of NRCS "Technical Assistance Request Form"

Please use decimal form

Complete as many steps as you feel comfortable with and submit with request (Send Excel version of spreadsheets rather than .pdfs)

Please complete CPA-52 prior to submitting request (if possible) to avoid complications that may arise

.....
All materials may be submitted to Amanda electronically. We do NOT recommend mailing original copies of the design materials.

Construction Inspections

- Instructions on District responsibility for inspection and construction documentation will be provided with approved design plans
- Documentation that the practice was installed according to NRCS standard and specifications is required for all projects
- Forms adapted from NRCS material are being developed



Construction Documentation for Watering Systems

Landowner/Operator/Project: _____

Service Center: _____ County: _____

Engineering Job Class: _____ Plan prepared by: _____ Date: _____

Construction Inspector(s): _____

Estimated number of site visits required for this installation: _____

Deliverables - Contractor/Landowner is responsible for delivering the following items for approval prior to use:

1. Well Drillers Completion Report and subsequent documentation for meeting VDH Class III requirements, Std. 642 Water Well, and Spec. VA-730 Water Well .
2. Make and model of trough to be installed.
3. Pump data (Horse Power rating, performance curve, Flow rate GPM, Pressure switch setting, size of pressure tank).
4. Verification from quarry that stone size meets design requirements.
5. Verification that all materials meet the required specifications (concrete, pipeline, geotextile, etc.)
6. Verification that system was pressure checked prior to backfilling.

Inspections – Contractor/Landowner is responsible for requesting inspection or permission to proceed by DCR/SWCD at the following stages of construction:

1. Prior to beginning construction.
2. Prior to completion of backfilling pipeline. Photograph pipeline with ruler showing minimum of 24" depth in trench.
3. Prior to trough and HUA installation. Photograph prior to pouring concrete to show concrete reinforcement and photograph geotextile.
4. Upon completion project for final inspection.

Responsible Party: _____ Date: _____



Construction Documentation for Stream Crossing/Animal Trail & Walkway

Landowner/Operator/Project: _____

Service Center: _____ County: _____

Engineering Job Class: _____ Plan prepared by: _____ Date: _____

Construction Inspector(s): _____

Estimated number of site visits required for this installation: _____

Deliverables - Contractor/Landowner is responsible for delivering the following items for approval prior to use:

1. Verification from the quarry that stone size meets design requirements.
2. Verification that all materials meet the required specifications (concrete (if applicable), geotextile, culvert pipe (if applicable), etc.)

Inspections – Contractor/Landowner is responsible for requesting inspection or permission to proceed by DCR/SWCD at the following stages of construction:

1. Prior to beginning construction.
2. Prior to installation of geotextile, and stone.
3. Prior to installation of culvert for culvert crossings.
4. Upon completion of project for final inspection.

Responsible Party: _____ Date: _____

SWCD/DCR Representative: _____ Date: _____

*Note that these “Construction Documentation” forms are just a subset of actual design deliverables that should be included in the file

See NRCS “Statement of Work” for each practice for the complete list of deliverables (available on eFOTG)

United States Department of Agriculture
Natural Resources Conservation Service
Richmond, VA 23229

Phone: (804) 287-1691
Fax: (804) 287-1737
www.va.nrcs.usda.gov

STATEMENT OF WORK
Stream Crossing (578)
Virginia

These deliverables apply to this individual practice. For other planned practice deliverables, refer to those specific Statements of Work.

DESIGN

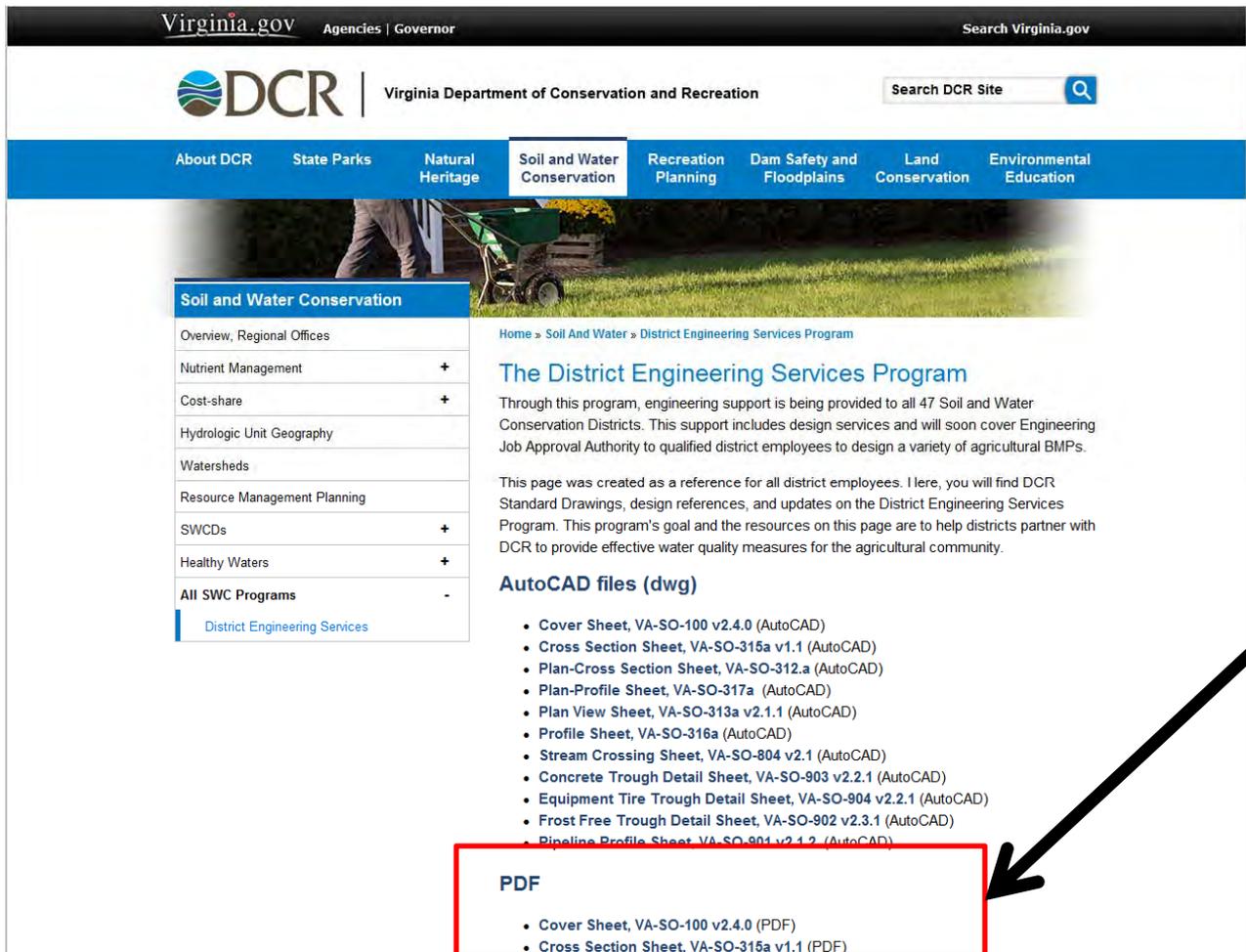
Deliverables:

1. Design documentation that will demonstrate that the criteria in the NRCS practice standard have been met and are compatible with other planned and applied practices:
 - a. Identify, discuss and document client needs, and recommend method of resolution.
 - b. Type of stream crossing and practice purpose(s) as identified in the conservation plan.



Technical Information for District Staff

Use DCR Design Sheets



Virginia.gov Agencies | Governor Search Virginia.gov

DCR | Virginia Department of Conservation and Recreation Search DCR Site

About DCR State Parks Natural Heritage Soil and Water Conservation Recreation Planning Dam Safety and Floodplains Land Conservation Environmental Education

Soil and Water Conservation

- Overview, Regional Offices
- Nutrient Management +
- Cost-share +
- Hydrologic Unit Geography
- Watersheds
- Resource Management Planning
- SWCDs +
- Healthy Waters +
- All SWC Programs -
 - District Engineering Services

Home » Soil And Water » District Engineering Services Program

The District Engineering Services Program

Through this program, engineering support is being provided to all 47 Soil and Water Conservation Districts. This support includes design services and will soon cover Engineering Job Approval Authority to qualified district employees to design a variety of agricultural BMPs.

This page was created as a reference for all district employees. Here, you will find DCR Standard Drawings, design references, and updates on the District Engineering Services Program. This program's goal and the resources on this page are to help districts partner with DCR to provide effective water quality measures for the agricultural community.

AutoCAD files (dwg)

- Cover Sheet, VA-SO-100 v2.4.0 (AutoCAD)
- Cross Section Sheet, VA-SO-315a v1.1 (AutoCAD)
- Plan-Cross Section Sheet, VA-SO-312.a (AutoCAD)
- Plan-Profile Sheet, VA-SO-317a (AutoCAD)
- Plan View Sheet, VA-SO-313a v2.1.1 (AutoCAD)
- Profile Sheet, VA-SO-316a (AutoCAD)
- Stream Crossing Sheet, VA-SO-804 v2.1 (AutoCAD)
- Concrete Trough Detail Sheet, VA-SO-903 v2.2.1 (AutoCAD)
- Equipment Tire Trough Detail Sheet, VA-SO-904 v2.2.1 (AutoCAD)
- Frost Free Trough Detail Sheet, VA-SO-902 v2.3.1 (AutoCAD)
- Pipeline Profile Sheet, VA-SO-901 v2.1.2 (AutoCAD)

PDF

- Cover Sheet, VA-SO-100 v2.4.0 (PDF)
- Cross Section Sheet, VA-SO-315a v1.1 (PDF)

Design Sheets (.pdf) available on DCR “District Engineering Services Program” webpage

- <http://www.dcr.virginia.gov/soil-and-water/district-engineering-services>

Pipeline Detail

- Elevation profile does not necessarily need to be plotted for pressure systems as long as elevations are on Plan View
- Still recommend elevation profile for non-pressure systems to show potential air lock locations
- Pipeline Detail should be included in designs for watering systems even if elevations and pipeline diameters are shown on Plan View (so that the notes below are included in the design)

Scale:
 Horizontal 1" = Vertical 1" =

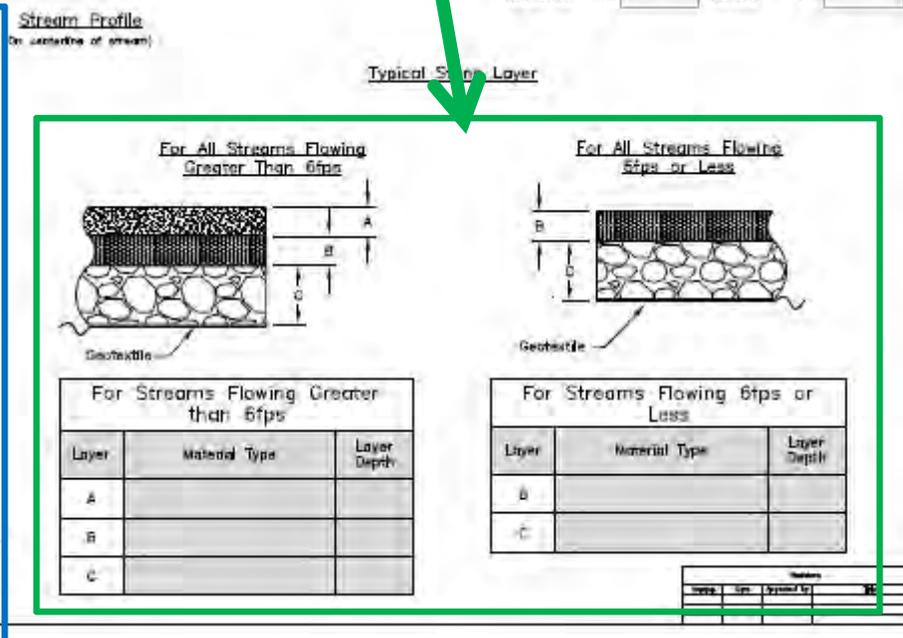
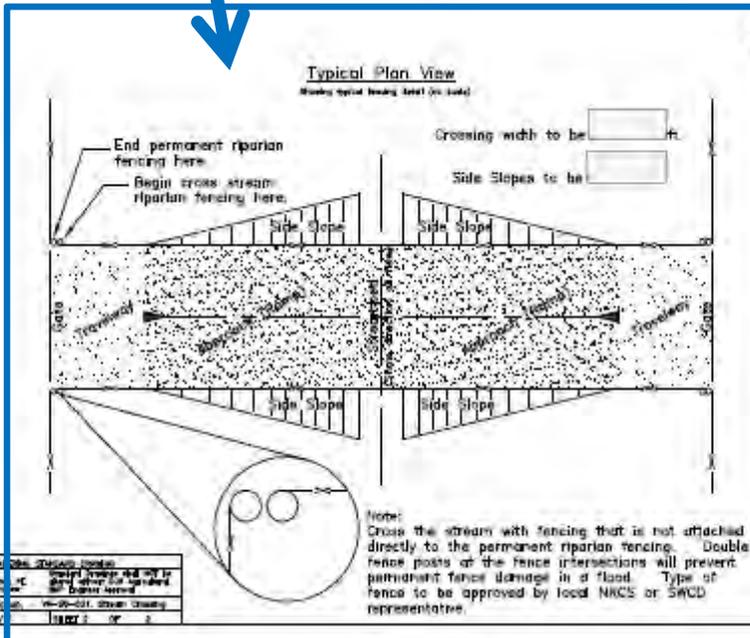
1. Install all pipelines according to Virginia Construction Specification Plastic (PVC, PE) Pipe (VA-745).
 2. All pipelines shall be protected from frost, livestock, and equipment traffic. Where possible, install pipelines a minimum of two feet in the ground.
 3. The pipe trench shall be free of loose rocks before installing the pipeline. In rocky soils, bed the pipe in selected material free of rocks 3 inches or larger or the pipeline may be placed in a sleeve. The pipeline shall be pressure tested at the working head. Repair any leaks and repeat the test. All backfill for underground pipes shall be compacted to the degree required to prevent the ditch from caving after construction.
 4. All pipelines with gravity flows shall be graded to prevent unwanted crests in the pipelines. These areas in the pipeline will cause the pipeline to air lock and not flow.
 5. Install sufficient cutoff valves in the pipeline to allow control of water flow to the watering facilities. Valves shall be installed in a housing that is frost proof, well drained, readily accessible and protected from livestock. A means of draining the water from pipelines not in use, shall be provided.
 6. Install a check valve (or Backflow Preventor if required) to prevent water from flowing back into the water source from a watering facility.
 7. Seed all disturbed areas at the rates given in Virginia Construction Specification Seeding (VA-706).
- * If seeding is done outside recommended seeding dates, a nurse crop is to be used.

Title													
Pipeline Detail													
Project	Sheet												
Drawn	Checked												
Appr'd	Appr'd												
 This drawing adapted from NRCS Standard Drawing VA-50-901 v2.1.2													
Drawing Name													
<table border="1"> <thead> <tr> <th colspan="4">Revisions</th> </tr> <tr> <th>Number</th> <th>Date</th> <th>Appr'd by</th> <th>File</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2/08</td> <td>Robert Lewis</td> <td>See Standard Notes</td> </tr> </tbody> </table>		Revisions				Number	Date	Appr'd by	File	1	2/08	Robert Lewis	See Standard Notes
Revisions													
Number	Date	Appr'd by	File										
1	2/08	Robert Lewis	See Standard Notes										
Sheet													

Stream Crossing Detail

If separate contractors will be doing the stream crossing and the fence, please be sure to also provide a copy of this diagram to the FENCE contractor

When calculating velocity, do NOT be tempted to change Manning's "N" value to reduce velocity. This is a disservice to the landowner, who has to maintain the crossing for 10 years.



Stream Crossing Detail

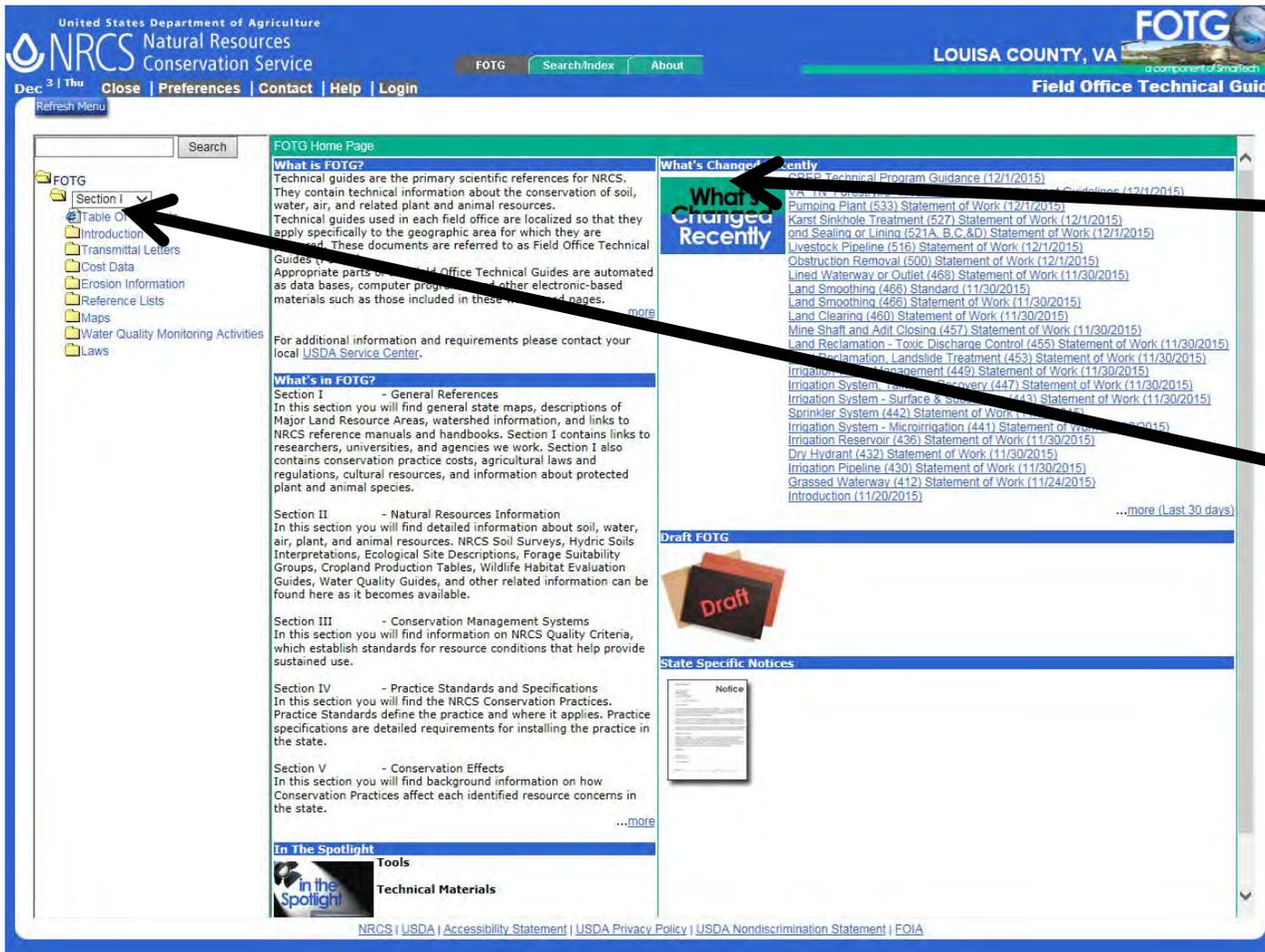
DCR

This drawing adapted from NRCS Standard Drawing VA-50-601 v2.1.1

General Design Procedures

- Always include:
 - cover sheet
 - plan view sheet
 - all additional detail sheets for the specific project
 - water system worksheets if applicable (Contractor/Landowner need this to size pump and pressure switch!)
 - all applicable NRCS stds. and specs.
- Complete separate designs for separate practice types, even if part of same contract
 - e.g. Stream Crossing vs. Watering System
 - Note: Separate parts of one pressure system should be included in one design

Use Current Standards and Specifications



United States Department of Agriculture
NRCS Natural Resources Conservation Service
 Dec 3 | Thu Close | Preferences | Contact | Help | Login

FOTG Search/Index About
 LOUISA COUNTY, VA FOTG a component of SmartTech
 Field Office Technical Guide

Refresh Menu

Search

FOTG Home Page

What is FOTG?
 Technical guides are the primary scientific references for NRCS. They contain technical information about the conservation of soil, water, air, and related plant and animal resources. Technical guides used in each field office are localized so that they apply specifically to the geographic area for which they are intended. These documents are referred to as Field Office Technical Guides (FOTGs). Appropriate parts of the Field Office Technical Guides are automated as data bases, computer programs, and other electronic-based materials such as those included in these FOTG pages. [more](#)

For additional information and requirements please contact your local [USDA Service Center](#).

What's in FOTG?
Section I - General References
 In this section you will find general state maps, descriptions of Major Land Resource Areas, watershed information, and links to NRCS reference manuals and handbooks. Section I contains links to researchers, universities, and agencies we work. Section I also contains conservation practice costs, agricultural laws and regulations, cultural resources, and information about protected plant and animal species.

Section II - Natural Resources Information
 In this section you will find detailed information about soil, water, air, plant, and animal resources. NRCS Soil Surveys, Hydric Soils Interpretations, Ecological Site Descriptions, Forage Suitability Groups, Cropland Production Tables, Wildlife Habitat Evaluation Guides, Water Quality Guides, and other related information can be found here as it becomes available.

Section III - Conservation Management Systems
 In this section you will find information on NRCS Quality Criteria, which establish standards for resource conditions that help provide sustained use.

Section IV - Practice Standards and Specifications
 In this section you will find the NRCS Conservation Practices. Practice Standards define the practice and where it applies. Practice specifications are detailed requirements for installing the practice in the state.

Section V - Conservation Effects
 In this section you will find background information on how Conservation Practices affect each identified resource concerns in the state. [...more](#)

In The Spotlight
 Tools
 Technical Materials

What's Changed Recently
 VA - NRCS - Technical Program Guidance (12/1/2015)
 Pumping Plant (533) Statement of Work (12/1/2015)
 Karst Sinkhole Treatment (527) Statement of Work (12/1/2015)
 Pond Sealing or Lining (521A, B,C,&D) Statement of Work (12/1/2015)
 Livestock Pipeline (516) Statement of Work (12/1/2015)
 Obstruction Removal (500) Statement of Work (12/1/2015)
 Lined Waterway or Outlet (468) Statement of Work (11/30/2015)
 Land Smoothing (466) Standard (11/30/2015)
 Land Smoothing (466) Statement of Work (11/30/2015)
 Land Clearing (460) Statement of Work (11/30/2015)
 Mine Shaft and Adit Closing (457) Statement of Work (11/30/2015)
 Land Reclamation - Toxic Discharge Control (455) Statement of Work (11/30/2015)
 Land Reclamation - Landslide Treatment (453) Statement of Work (11/30/2015)
 Irrigation System - Toxic Discharge Control (449) Statement of Work (11/30/2015)
 Irrigation System - Toxic Discharge Control (447) Statement of Work (11/30/2015)
 Irrigation System - Surface & Subsurface (443) Statement of Work (11/30/2015)
 Sprinkler System (442) Statement of Work (11/30/2015)
 Irrigation System - Microirrigation (441) Statement of Work (11/30/2015)
 Irrigation Reservoir (436) Statement of Work (11/30/2015)
 Dry Hydrant (432) Statement of Work (11/30/2015)
 Irrigation Pipeline (430) Statement of Work (11/30/2015)
 Grassed Waterway (412) Statement of Work (11/24/2015)
 Introduction (11/20/2015)
 ...more (Last 30 days)

Draft FOTG
 Draft

State Specific Notices
 Notice

NRCS | USDA | Accessibility Statement | USDA Privacy Policy | USDA Nondiscrimination Statement | FOIA

“What’s Changed Recently”

Section IV

Virginia Livestock Watering Systems - Pressure System Worksheet

1) Assistance Information

Customer: _____
 County: _____
 Date: _____
 Assisted By: _____

Project Notes:

2) Water Budget

a) Total Daily Water Demand

Type of livestock: _____
 Number of Animals: _____
 Water demand/animal/day: _____ gpd
Total Daily Demand: _____ gpd

See Design Note for watering recommendations for various types of livestock.

b) Daily Peak Water Demand

Number of times herd drinks/day: _____ events/minutes/visit
 Time desired to water herd: _____ minutes
 Average peak demand: _____ gpm
 Alternate peak demand: _____ gpm

See Design Note for considerations for estimating peak demand.

c) Evaluate Source

Source flow rate: _____ gpm
 Source daily yield: _____ gpd
 If source flow rate is close to or less than Peak Demand, consider storage alternatives (see 2nd Tab).
 If source daily yield is less than Daily Demand, consider an alternate or supplemental water source.

3) Design Parameters

a) Trough Information

Trough type(s): _____ Four-Hole Frost-Free
Design flow rate: _____ gpm
 Source flow rate: _____ gpm

Select flow rate to troughs as guided by Step 2 and Design Note. Typical design flow rates are: 8 gpm for frost-free troughs; 5 gpm for storage troughs.

Maximum float valve pressure: _____ psi
 Typical values range from 50-140 psi. Check manufacturer's recommendations.

Minimum float valve pressure: _____ psi
 Varies depending on type of float. Use manufacturer's recommended minimum. Typical value is 10 psi.

b) Pipe Information

Pipe material: _____ Radio: SCH 40 PVC
 Pipe nominal diameter: _____ 1.5" 1.38"
 Pipe avg. inner diameter: _____ 1.38"
 Pipe cross-sectional area: _____ 0.0101 sq. ft.
 Friction loss/100 ft: _____ 0.0 ft./100 ft.
 Velocity check (<5 fps): _____ 0.0 fps
 If velocity is greater than 5 fps, consider a larger diameter pipe.

Pipe length to farthest watering point: _____ 200 feet
 Add 10% for slope and fittings: _____ 220 feet
 Total friction loss: _____ 0 ft. OR
 Total friction loss: _____ 0.0 psi If friction loss is greater than 10 psi, consider using a larger diameter pipe.

Pipe pressure rating: _____ 150 psi
 72% of rating (See VA CPS 516): _____ 115 psi Compare with result in Step 5b.

c) Vertical Pumping Distance

High point to pump "to": _____ feet
 Ground elev. of high point: _____ feet
 Low point to pump "from": _____ feet
 Ground elev. of low point: _____ feet
 Elevation difference: _____ feet
 OR _____ psi

4) Pump and Pressure Tank Design

a) Summary of energy requirements for the watering system:

Elevation head:	_____ psi	OR	_____ feet
Friction loss:	_____ 0.0 psi	OR	_____ 0 feet
Minimum float valve pressure:	_____ 10 psi	OR	_____ 23 feet
Other:	_____ psi	OR	_____ feet
TOTAL REQUIREMENTS:	_____ psi	OR	_____ feet

c) Dynamic Head added to pump by the watering system:

Dynamic head = higher switch setting of _____ psi x 2.31 = _____ feet
 Total Dynamic Head will equal this number plus the Lift Head required to get the water from the source up to the distribution system. The flow rate and the Total Dynamic Head will be used to size the pump for the project.

b) Pressure Switch Settings Based on System Load:

Low pressure switch setting: _____ psi (Minimum is 20 psi.)
 High pressure switch setting: _____ psi (Max. is usually 80 psi.)
 If a high pressure switch setting of 80 psi or more is required, consider alternate design on high pressure-rated tank.

d) Minimum Effective Drawdown for Pressure Tank:

Design pumping rate of _____ 0.0 gpm x
 Minimum pumping time of _____ 1 minute =
 Minimum pressure tank volume of _____ 0.0 gallons
 This is the minimum drawdown volume required to allow the pump to run for at least one minute before shutting off. A larger volume can be used.

5) Static Pressure Checks

a) Static pressure at pressure switch:

Elevation of highest point: _____ ft
 Elevation of pressure switch: _____ ft
 Low pressure switch setting = _____ psi
 Static pressure on switch = _____ psi

If static pressure on the switch exceeds low pressure switch setting (red cell), the pump will not turn back on after trough is initially filled and then emptied.

b) Check static pressure at lowest trough:

Elevation of pressure switch: _____ feet
 Elevation of lowest trough: _____ feet
 Difference: _____ feet OR _____ psi
 Add high pressure switch setting: _____ psi
 Total pressure at lowest trough: _____ psi

Orange cell: pressure exceeds max float valve pressure; red cell: pipe pressure limit exceeded. Check troughs at higher elevations if pressure is excessive at lowest trough.

Non-woven vs. Woven Geotextile



<https://ipafes.com/image/cache/data/non%20woven%20geotextile%202-500x500.jpg>



<http://www.kt-exports.com/slider1.jpg>

- “Holds” stone better on slopes
- Water infiltrates through more easily

Engineering Resources for SWCDs

- DCR Design Sheets available:

<http://www.dcr.virginia.gov/soil-and-water/district-engineering-services>

- NRCS Stds. and Specs. Available on NRCS eFOTG
- GIS Information available on “NRCS Geospatial Data Gateway”
- Virginia NRCS Design Spreadsheets (Watering Systems, Stream Crossings): contact DCR engineering or local NRCS office
- Stream Crossing Guidance: Virginia Engineering Design Note 578
- Watering System Guidance: Virginia Engineering Design Note 614
- NRCS Engineering software programs:
<http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/ndcsmc/?cid=stelprdb1042198>
 - “EFH2”: (Stream Crossing, Grassed Waterway Design)
 - “Hydraulic Formulas”: (Culvert Stream Crossing, Mensuration Formulas, etc.)

Portions of this presentation utilized information from EJAA Presentation by Mat Lyons, P.E., NRCS SCE



Contact Us:

Amanda Pennington, P.E.

Richmond State Office

Amanda.pennington@dcr.virginia.gov

804-786-0113

Raleigh Coleman

Warrenton Regional Office

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Questions?