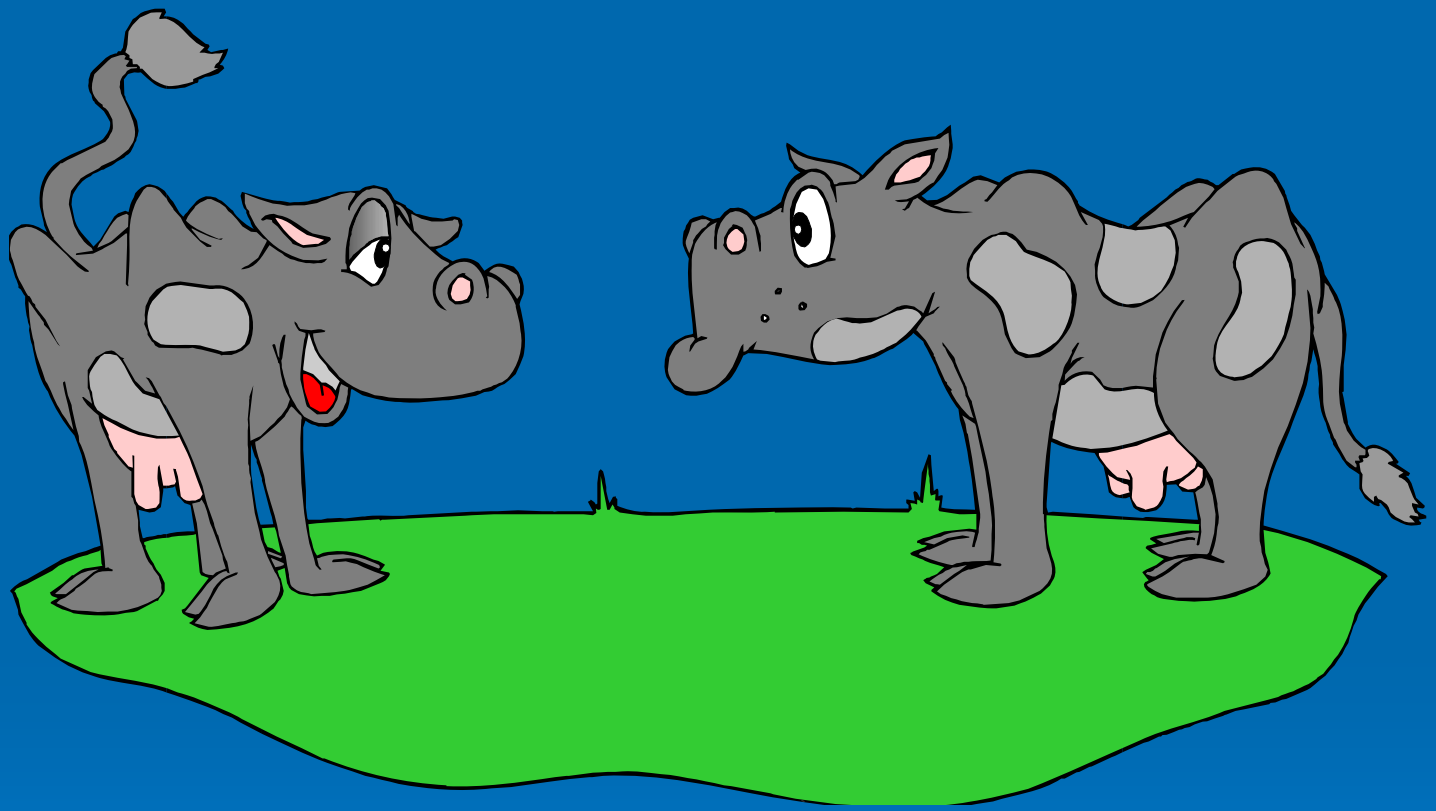
Got Water?



Survey &Design

7 Steps in the Planning Process

1. Identify Problem
2. Determine Objectives
3. Inventory Resources
4. Analyze Resource Data
5. Formulate Alternatives
6. Evaluate Alternatives
7. Make Decisions

During Planning Process…

Water Source Was Determined to be Adequate
Type and Location of Troughs were Determined
Water Demand was Determined (flow for peak demand)
Wetland concerns were noted and mitigations addressed
An EE was filled out along with the wetland supplement
and this sent to the Wetland Team Leader for the area

1. Survey
    - Elevations
    - Distance
2. Water Source
    - Spring Development (574 Standard EFOTG Section 4)
    - Well (642 Standard EFOTG Section 4)
    - Pumping Plant (533 Standard EFOTG Section 4)
3. Watering Facility Design
    - Watering Facility (614 Standard EFOTG Section 4)
4. Pipe Design
    - 516 Standard (EFOTG Section 4)
    - Pipe Layout
    - Sizing
        - Pressure System Calculations Spreadsheet
        - Gravity System Calculations – pipe flow capacity chart
    - Type (materials)
5. Acceptable Design Package

Survey

Tools available (GPS, total station, self level, rod, hand level, etc)

Elevation at Water Source

Elevation and distances at Water Facility

Ground Shots along pipe profile

for gravity pipelines – shots at all lows and highs

Adequate and Proper Field Notes (TR 62 - Engineering Layout, Notes, Staking and Calculations)

ROLL & PLUG

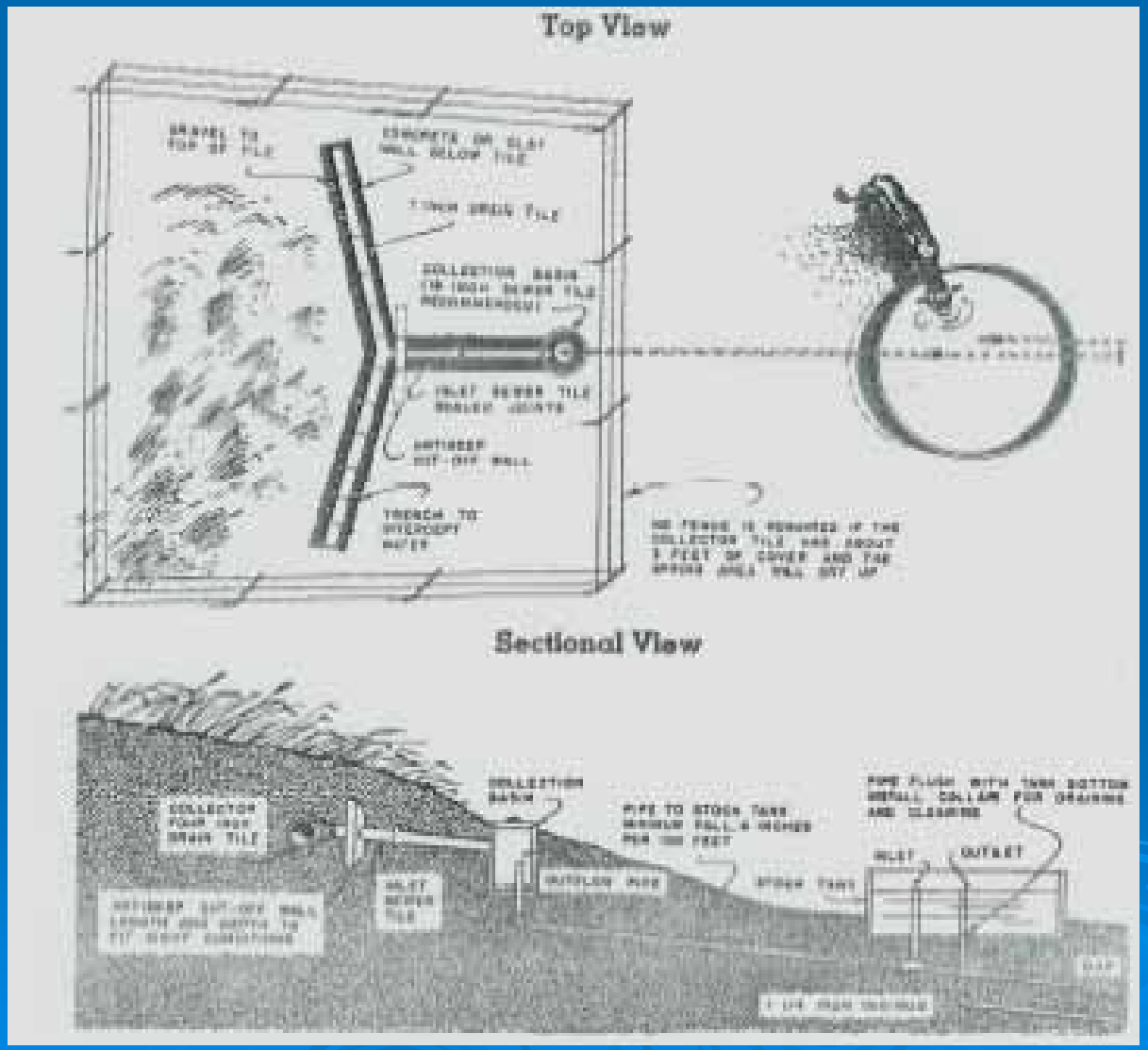
GPS

Camera

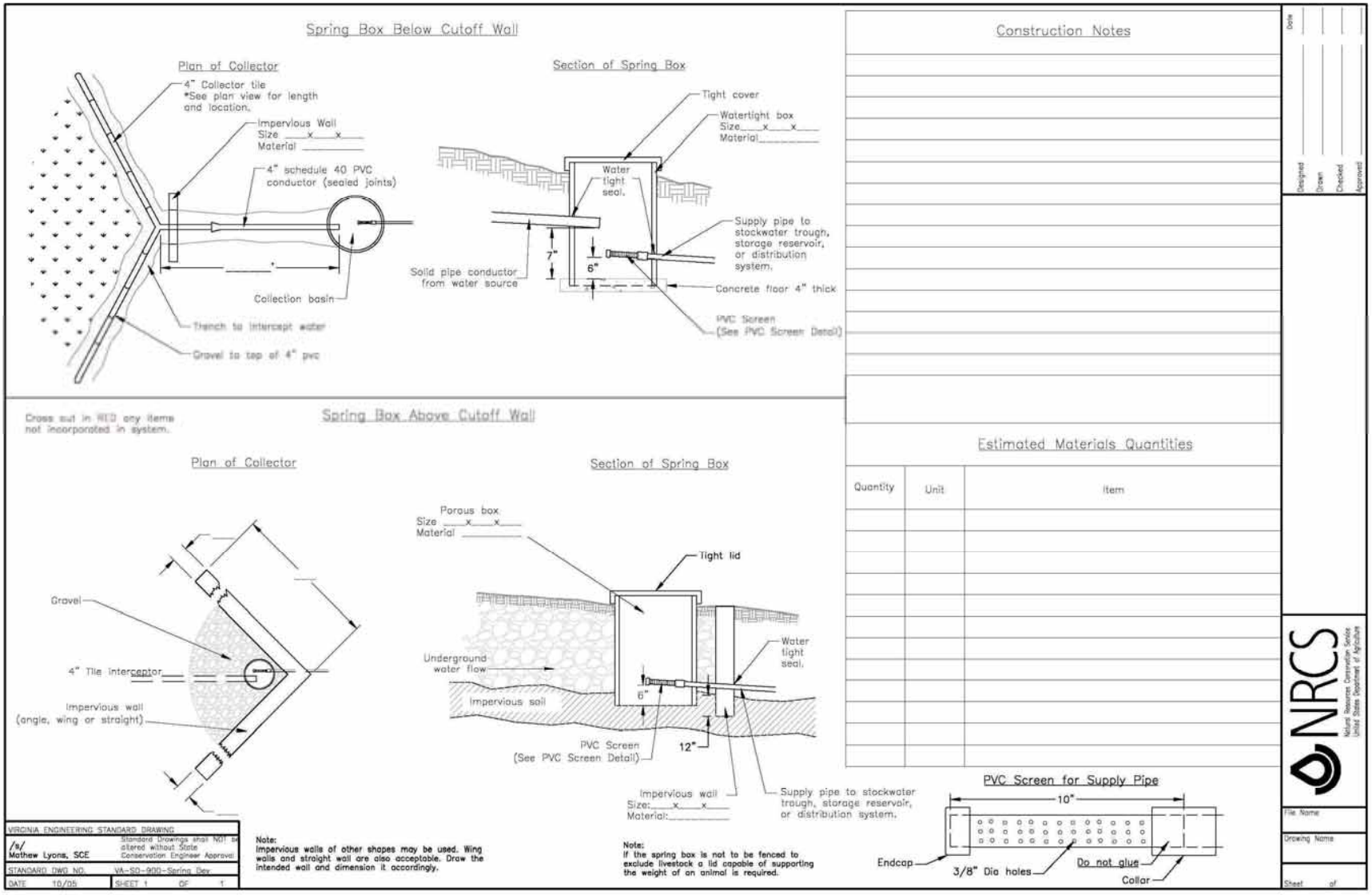
Wheel

Spring Development

Spring Development (574 Standard EFOTG Section 4)



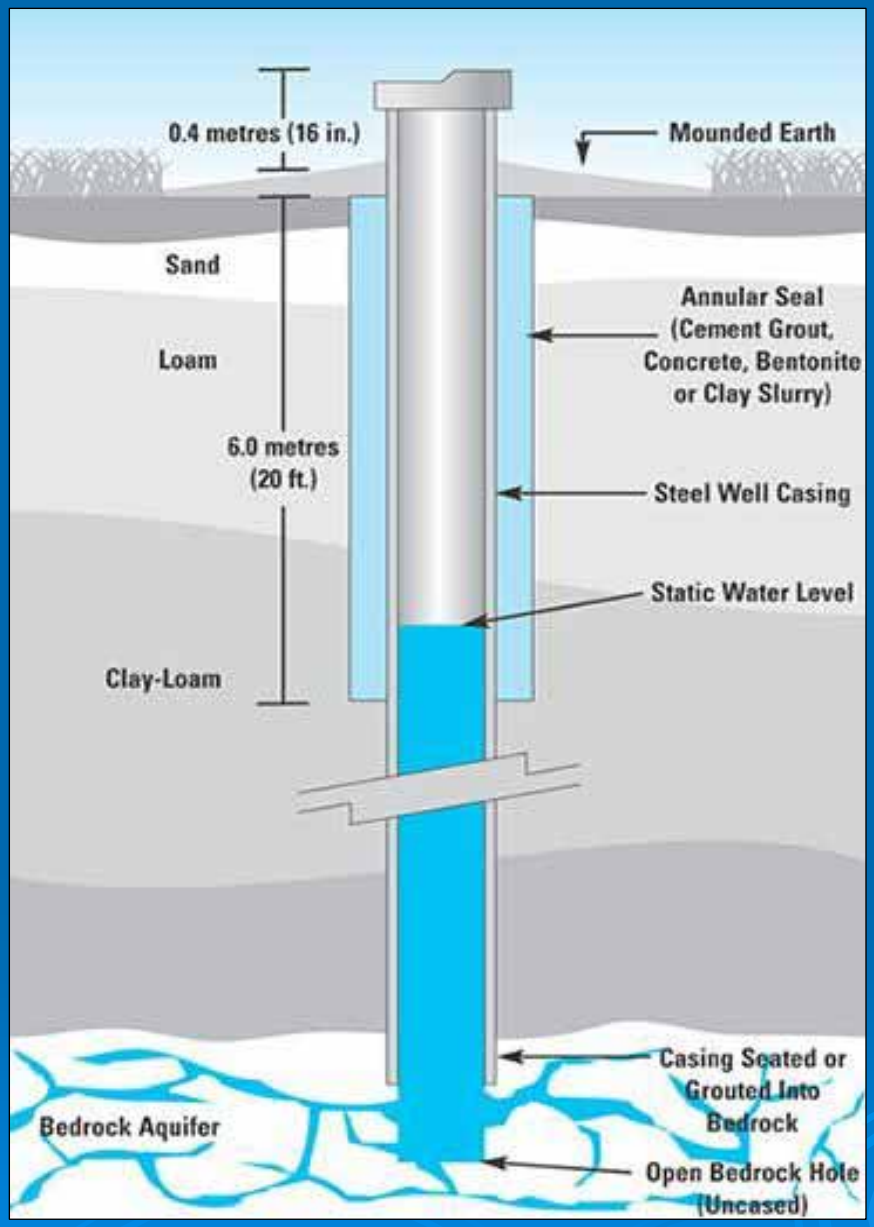
Spring Development



Water Source - WELL

Well (642 Standard EFOTG Section 4)
Pumping Plant (533 Standard EFOTG Section 4)

Pump and Pressure Tank to be Sized According to Manufacturer Recommendation



Typical Water Well

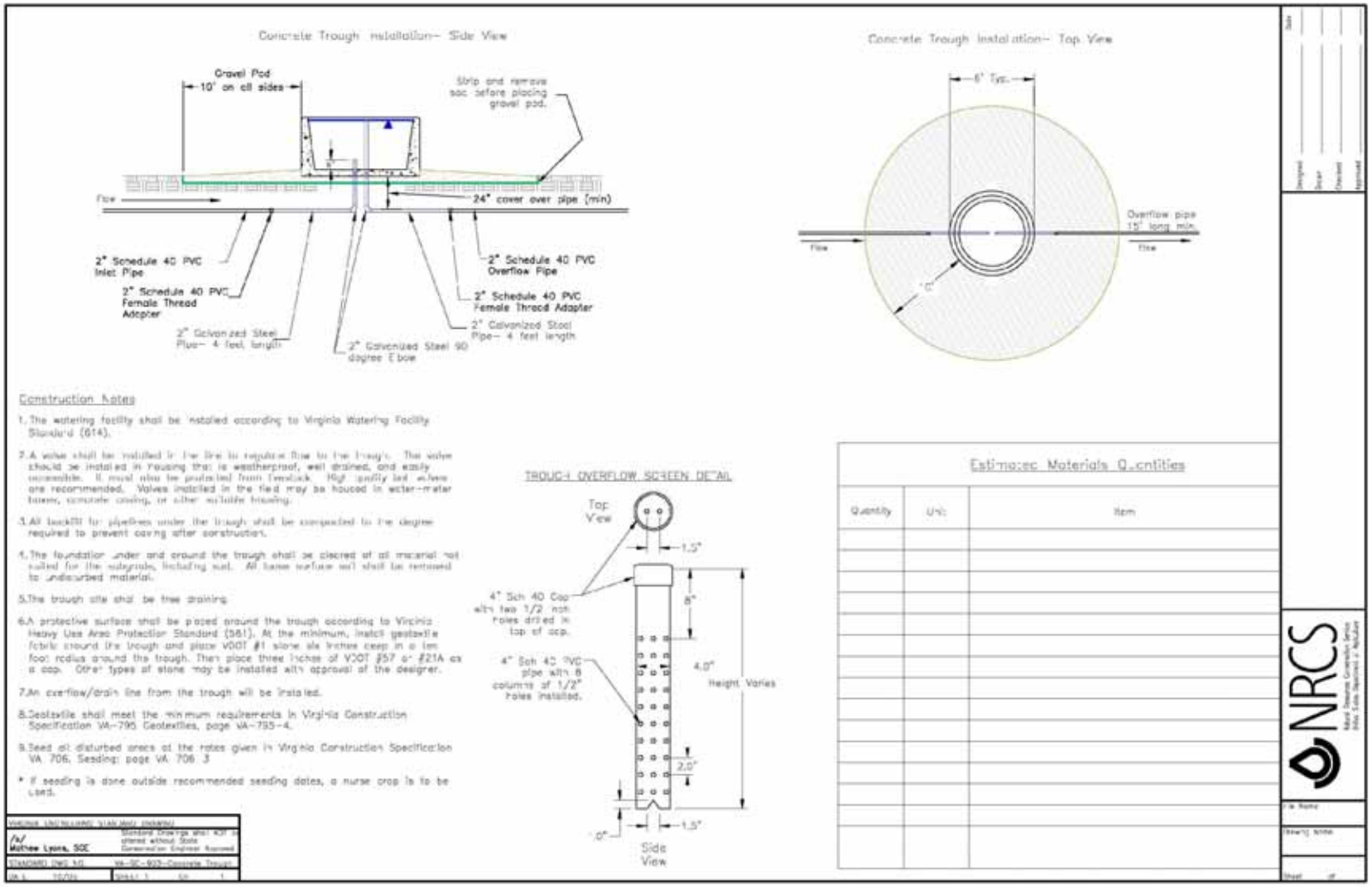
Watering Facility Design

Watering Facility
(614 Standard EFOTG Section 4)

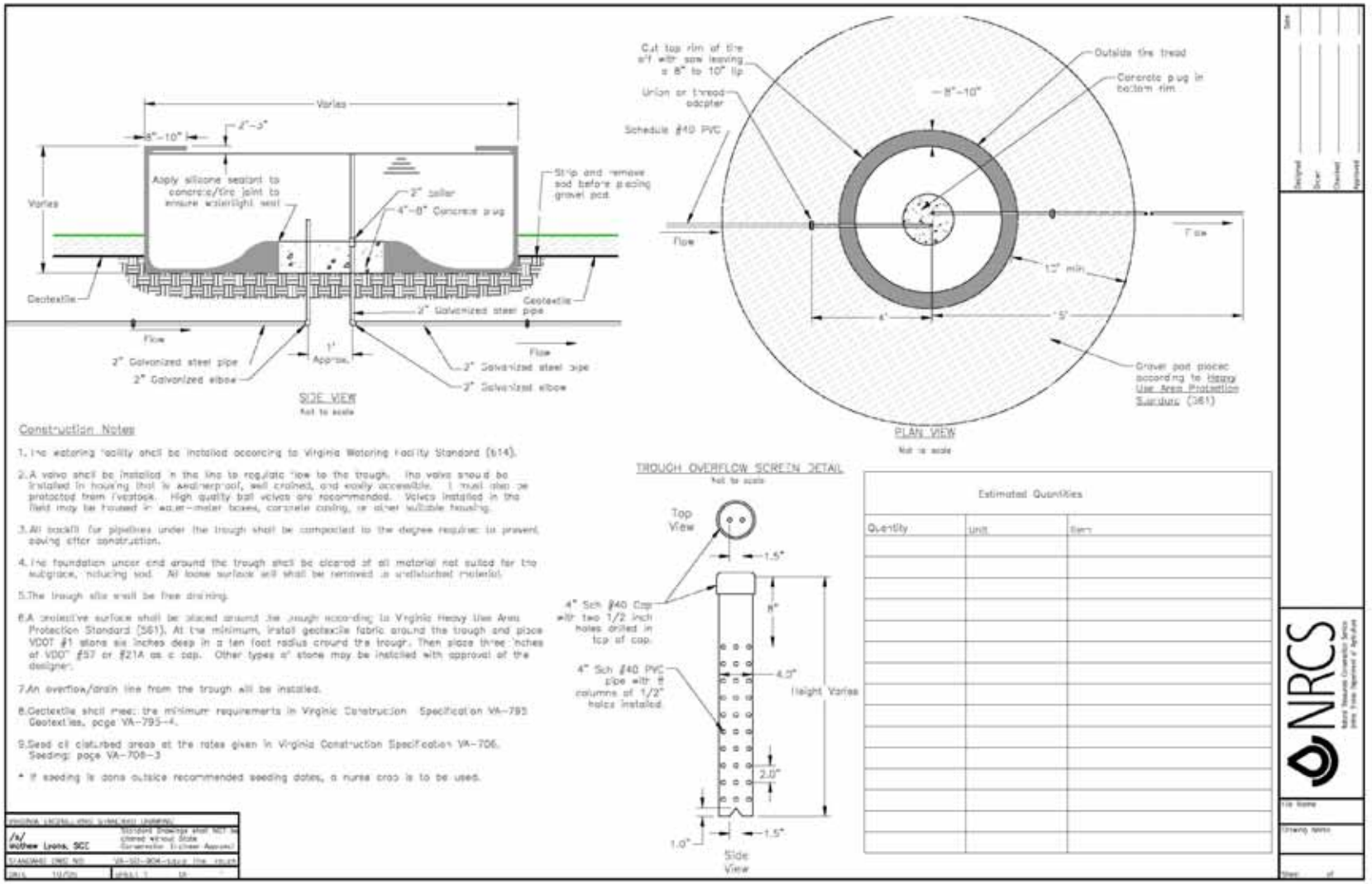
Heavy equipment tire water trough

Permanent concrete water trough

Concrete Trough



Heavy Equipment Tire

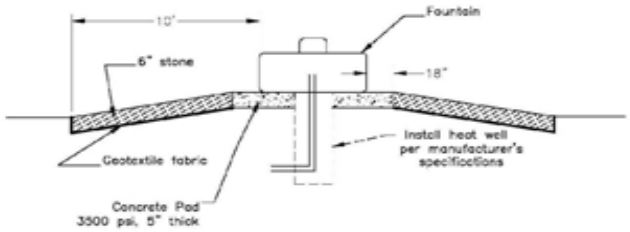


Watering Facility Design

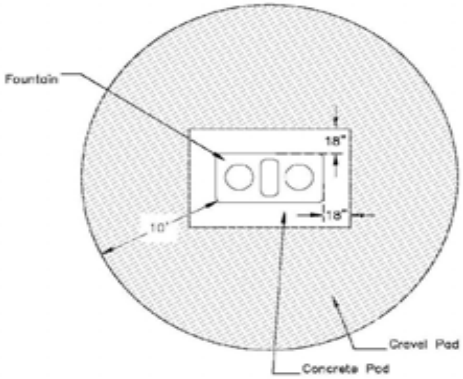
Pressure System Troughs

Frost-Free Troughs

Frost-free Fountain Installation- Side View



Frost-free Fountain Installation- Top View



Construction Notes

1. The watering facility shall be installed according to Virginia Watering Facility Standard (614).
2. The concrete pad for the fountain shall extend a minimum of 18" past the edges of the fountain. The pad dimensions recommended by the manufacturer will be used if the dimensions are larger. Concrete shall be 3500 psi installed a minimum of 5" thick. 6"x6" 6/6 gage welded wire mesh reinforcing will be used in the 5" slab. Position the hole for the heat well and pipes per manufacturer's recommendations.
3. The fountain must be attached to the concrete pad per manufacturer's recommendations.
4. A valve shall be installed in the line to regulate flow to the fountain. The valve should be installed in housing that is weatherproof, well drained, and easily accessible. It must also be protected from livestock. High quality ball valves are recommended. Valves installed in the field may be housed in water-meter boxes, concrete casing, or other suitable housing.
5. All backfill for pipelines under the fountain shall be compacted to the degree required to prevent caving after construction.
6. The foundation under and around the fountain location shall be cleared of all material not suited for the subgrade, including sod. All loose surface soil shall be removed to undisturbed material.
7. The fountain site shall be free draining.
8. A protective surface shall be placed around the fountain according to Virginia Heavy Use Area Protection Standard (561). At the minimum, install geotextile fabric around the pad and place VDOT #357 stone six inches deep in a ten foot radius around the fountain. A two inch cap of VDOT #57 or #21A can be placed on the #357. Other types of stone may be installed with approval of the designer.
9. Geotextile shall meet the minimum requirements in Virginia Construction Specification VA 755 Geotextiles, page VA-755-4.
10. Seed all disturbed areas at the rates given in Virginia Construction Specification VA-706. Seeding: page VA 706 3
* If seeding is done outside recommended seeding dates, a nurse crop is to be used.

VIRGINIA ENGINEERING STANDARD DRAWING	
/s/ Mathew Lyons, SCE	Standard Drawings shall not be altered without State Conservation Engineer Approval
STANDARD DWG. NO.	VA-561-902-Frost -free trough
DATE 10/09	SHEET 1 OF 1

Estimated Materials Quantities

Quantity	Unit	Item

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Pipeline

Rigid vs. Flexible

Cost

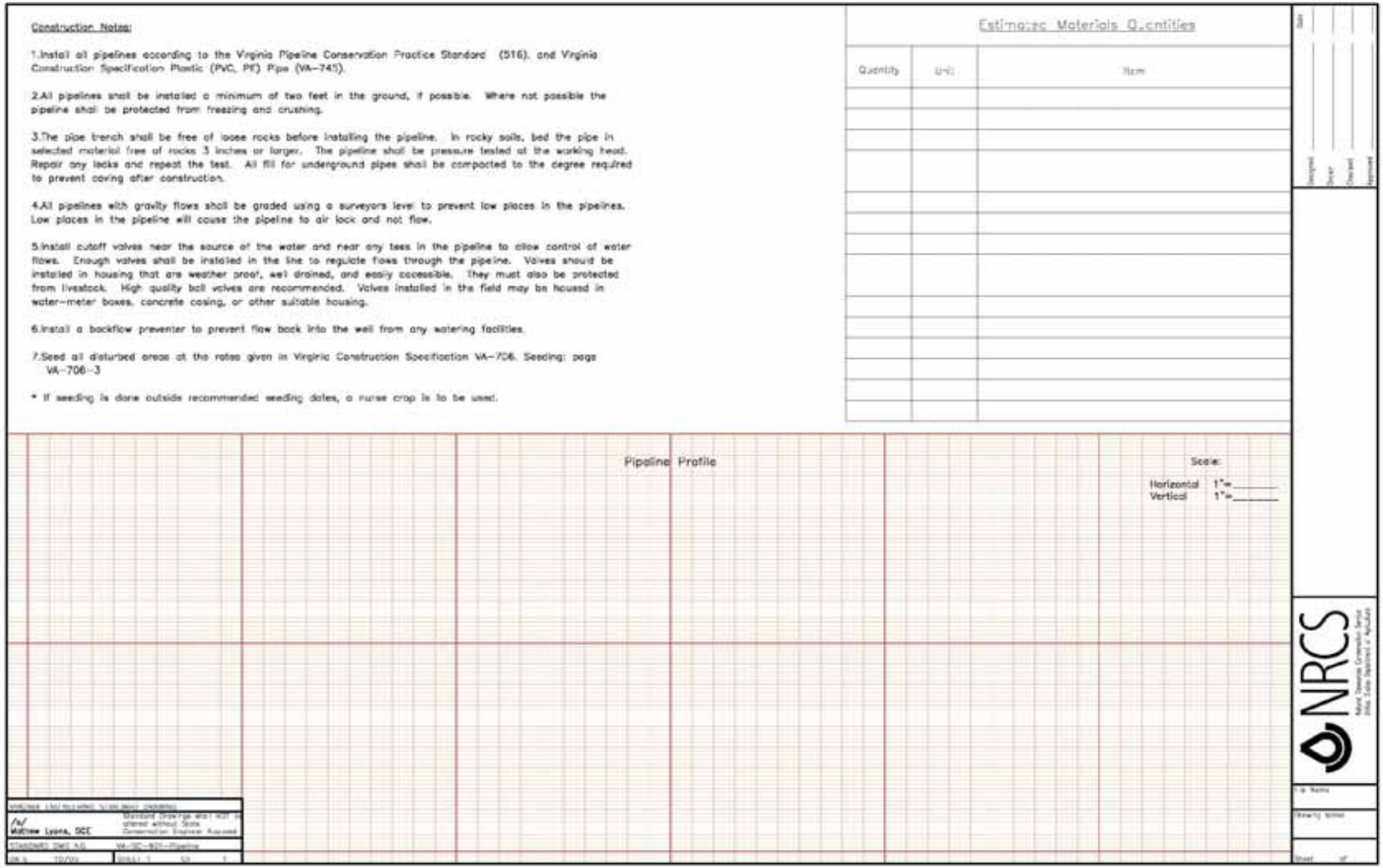
Site conditions

- Frost Depth
- Crush resistance

- VA 745 – PLASTIC (PVC, PE) PIPE
- 516 Standard (EFOTG Section 4)
  - Pipe Layout
  - Pipe Profile Design Sheet
  - Size/Type
    - Pressure System Calculations Spreadsheet
    - Gravity System Calculations – pipe flow capacity chart

Installation of pipes to a permanent water tank

Pipe Profile Design Sheet



Construction Notes:

1.Install all pipelines according to the Virginia Pipeline Conservation Practice Standard (516), and Virginia Construction Specification Plastic (PVC, PE) Pipe (VA-745).

2.All pipelines shall be installed a minimum of two feet in the ground, if possible. Where not possible the pipeline shall be protected from freezing and crushing.

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. The pipeline shall be pressure tested at the working head. Repair any leaks and repeat the test. All fill for underground pipes shall be compacted to the degree required to prevent caving after construction.

4.All pipelines with gravity flows shall be graded using a surveyors level to prevent low places in the pipelines. Low places in the pipeline will cause the pipeline to air lock and not flow.

5.Install cutoff valves near the source of the water and near any tees in the pipeline to allow control of water flows. Enough valves shall be installed in the line to regulate flows through the pipeline. Valves should be installed in housing that are weather proof, well drained, and easily accessible. They must also be protected from livestock. High quality ball valves are recommended. Valves installed in the field may be housed in water-meter boxes, concrete casing, or other suitable housing.

6.Install a backflow preventer to prevent flow back into the well from any watering facilities.

7.Seed all disturbed areas at the rates given in Virginia Construction Specification VA-706. Seeding: page VA-706-3

* If seeding is done outside recommended seeding dates, a nurse crop is to be used.

Estimated Materials Quantities

Quantity	Unit	Item

Pipeline Profile

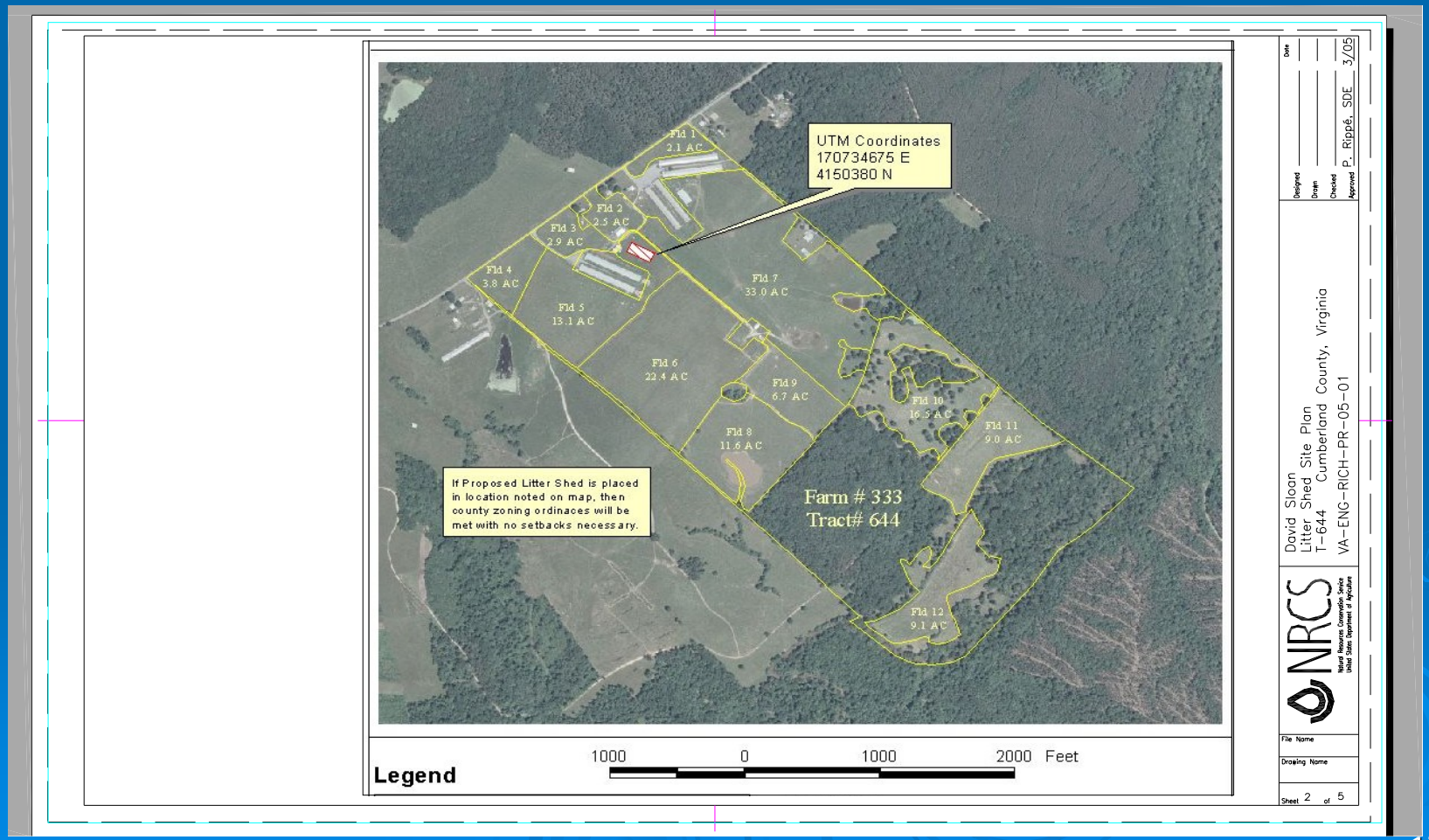
Scale:
Horizontal 1"=_____
Vertical 1"=_____

Matthew Lyons, SCC

NRCS

Pipe Design

- Planview (including Pipe Layout)



VA Specifications----FTOG

VA-703 Structure Removal - Construction Specification
VA-706 Seeding - Construction Specification
VA-707 Site Preparation - Construction Specification
VA-708 Salvaging and Spreading Topsoil - Contruction Specification
VA-721 Excavation - Construction Specification
VA-723 Earthfill - Construction Specification
VA-730 Well - Construction Specification
VA-731- Plain (Unreinforced) Concrete Construction - Construction Specification
VA-732-Reinforced Concrete Construction - Construction Specification
VA-745 Plastic PVC, PE Pipe - Construction Specification
VA-772 Watering Facility Trough or Tank - Construction Specification
VA-795-Geotextile Construction Specification
VA_Underground_Outlet_620_Operations&Maintenance
VA763-Spreading Topsoil Construction Specification

O & M Plans:------FTOG

- Pipeline 516 Operations & Maintenance
- Spring Development 574 Operations & Maintenance
- Waste Storage Facility 313 Operations & Maintenance
- Water Well 642 Operations & Maintenance

Design Data Sheets:

- **Cover sheet**
- **Spring Development**
- **Concrete Trough**
- **Frost Free Trough**
- **Heavy Equipment Tire Trough**
- **Pipe Profile**

\\varichmondc001\shared\PUBLIC_NRCS\NRCS Engineering\CAD\Standard Drawings\Adobe PDF

Pressure Flow Design

Livestock Watering Systems-Pressure System Calculation Worksheet

Cooperator: | Service Center: | Date: 5/16/2006

Conservation District: | Assisted By:

Tract Number: | Field Number(s):

1. Determine the number of animals using the system:

# of animals to use system: | Animal Type: | Consumption per animal per day: gallons

# of animals to use system: | Animal Type: | Consumption per animal per day: gallons

2. Determine the water demand the animals will have per typical day:

# of animals to use system: 0 X gallons/day/animal = 0 gallons/day

# of animals to use system: 0 X gallons/day/animal = 0 gallons/day

Total Demand = 0 gallons/day

3. Determine Target Supply Rate (TSR): This is based on the number of planned drinking events per day, assuming each event is two hours long.

Enter the number of drinking events per day you are planning for (typically 2 or 3):

Total Demand of gallons per day divided by minutes = gallons per minute **(TSR)**

4. Source flow rate in gallons per minute: gpm. Value may be from a spring, well, or known pump flow rate for a planned or existing pump.

Select whether the Target Supply Rate or the supply rate from the source will be used in the following friction loss calculations: *See note at bottom of next page.

Target Supply Rate

5. Measure distance to farthest watering point: feet

6. Determine vertical elevation difference from the pressure tank to the highest watering point: feet

Select type of pipe to be used: | **Select Diameter of pipe to be used:**

7. Friction loss in the pipeline:

a: Measured length of pipeline from Step 5 = feet

b: Add additional pipe lengths due to fittings. Multiply number of fittings by their Equivalent Lengths (E.L.) and total:

# of fittings: | Fitting type: | # : | X E.L. | Length added (ft): 0

# of fittings: | Fitting type: | # : | X E.L. | Length added (ft): 0

Total length added by fittings: 0

c: Add length due to fittings: feet to measured length of 0 feet (from Step 5) to determine total overall length in feet = 0

d: Using selected pipe diameter, selected flow rate (steps 3 & 4), and friction loss equations we determine friction loss per 100 feet is: feet

Total calculated length = | so the calculated friction loss will be = /100 feet X 0.0 = feet

The total friction loss for the scenario detailed above is: feet. | This is equivalent to a loss of: psi

Pressure Flow Design

Livestock Watering Systems-Pressure System Worksheet Continued

8. Expected or needed pressure at most remote watering point (may vary depending on type of float).

Use manufacturer's recommended minimum pressure or 10 psi, whichever is greater. Use Pressure at Outlet = psi

9. Operating pressure at the pressure tank

Pressure losses due to elevation differences equals the elevation difference determined in Step 6: divided by 2.31= 0.0 psi

Friction Loss determined in Step 7: 0.0 psi

Pressure needed at Outlet: 0.0 psi

Total = 0.0 psi

Round to the nearest multiple of 10= psi. This is the lower setting of the pressure switch. A minimum setting of 20 psi will be used.

Add 20 to the lower setting = psi. This is the higher setting.

A maximum of 80 psi will be used only when the pressure tank is rated for such a pressure.

Use a pressure switch setting of: / psi. Make sure a minimum setting of 20/40 psi has been calculated.

10. Convert needed data to dynamic head added to the pump by livestock watering system:

Multiply higher switch setting: X 2.31= feet. This is the dynamic head added to the pump by the watering system.

Dynamic Head added to pump by watering system: feet. This is not Total Dynamic Head but rather the amount of head added to that total by the planned livestock watering system.

11. Compile the system requirements into a list that the pump supplier can use to size the pump.

Pump to provide a minimum of: gallons per minute. (This value is dependent on whether you selected the Target Supply Rate or the source rate as the basis for the design calculations.)

The system is **adding** feet to the pump's dynamic head. Total Dynamic Head will equal this number plus the 'Lift' Head required to get the water from the water source to the pressure tank. The flow rate and the Total Dynamic Head will be used to size the pump for the project.

The pressure switch setting is: / psi.

Pressure tank will have minimum effective drawdown of: (supply rate) X 1 (minimum) = gallons.

The effective drawdown is sized so that the pump will come on and operate for a minimum of one minute before shutting off. One minute operating time reduces wear on the pump caused by excessive starting and stopping. The pressure tank may be sized to have an effective drawdown of two, three, or more times greater than the pumping rate. But a minimum effective drawdown of one times the pumping rate should be provided.

* The user should choose a value based on whether you are designing a system to match the Target Supply Rate or whether you are using a known value for the pumping rate in gallons per minute. If you select TSR from the dropdown menu, then the design will be based on pumping that amount. Otherwise, if you want to pump 8 gallons a minute, for example, then you should enter 8 gpm in step 4 and select 'Rate from Source' from the dropdown menu. The remaining calculations will be based on this value.

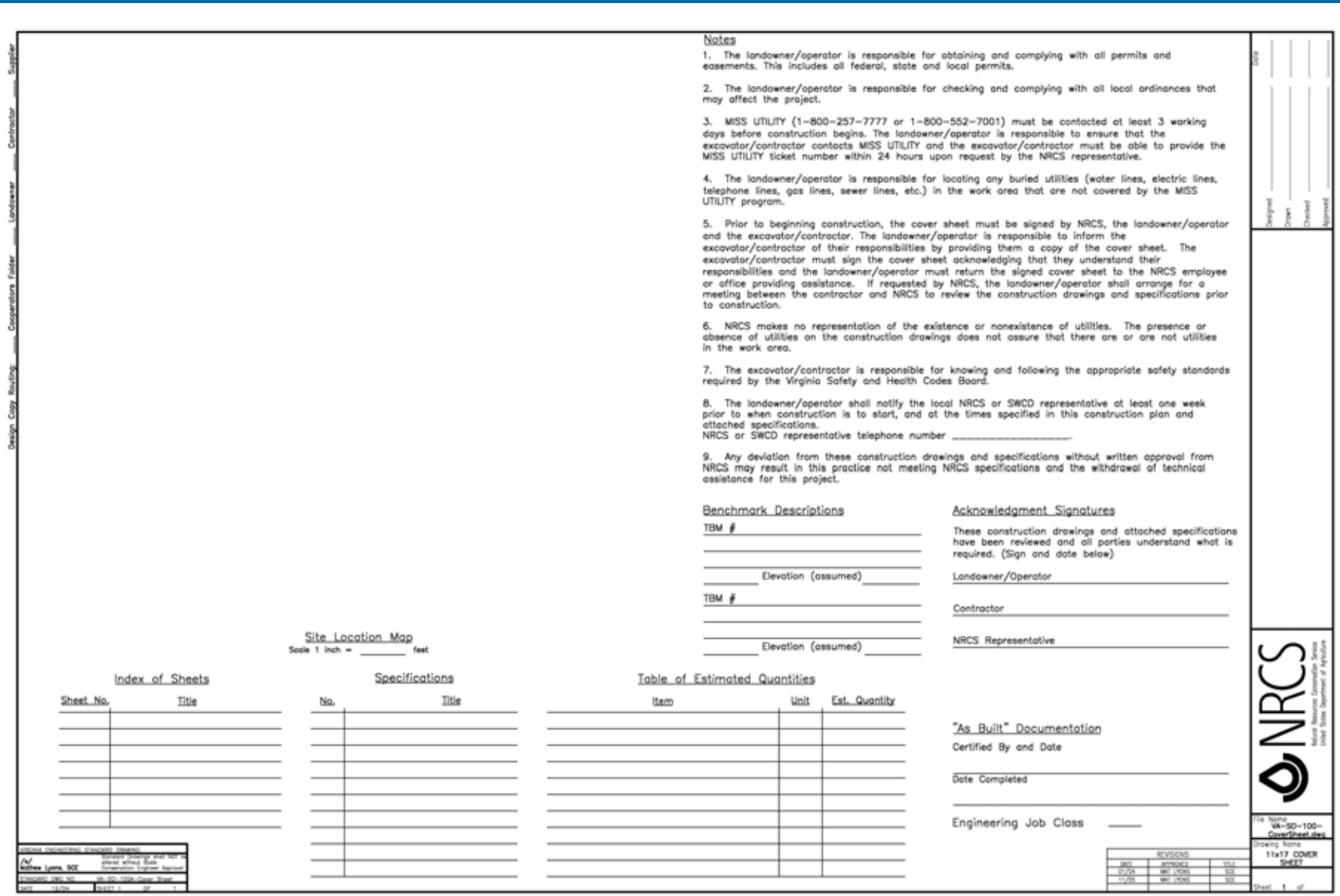
The Target Supply Rate is a design number based on trying to deliver water to the livestock over a selected number of 2-hour drinking events. When designing a watering system with no existing components it can be used as the basis for the sizing of the pump. Where a source already exists (a well with a given yield, a spring to be collected in the reservoir, etc.) you should attempt to match the pump rate to the source yield. Where the pumping rate is planned to be higher than the source yield, the designer will need to ensure there is adequate storage (water column in a well, storage in a reservoir, etc.) so the pump does not draw the water level below the pump intake.

You can also overcome low source yield or pumping rates by providing storage in reservoirs that will supply the troughs by gravity or by providing additional storage at the watering location through the use of larger concrete troughs.

Acceptable Design Package

- Design sheets
  - Cover Sheet (Fill out and sign)
  - Plan View of Watering System Sheet
  - Pipe Profile Sheet (Pipe profile along proposed line from source to point of delivery)
  - Water Facility Design Sheet (Standard Drawing)
- Operation and Maintenance
- VA series Construction Specifications (700s)
- Completed Environmental Evaluation
- Cost estimates
- Pipe Design Computations
- Water Demand Computations
- Copy of Survey Field Notes
- Before pictures of site

Cover Sheet



Notes

1. The landowner/operator is responsible for obtaining and complying with all permits and easements. This includes all federal, state and local permits.

2. The landowner/operator is responsible for checking and complying with all local ordinances that may affect the project.

3. MISS UTILITY (1-800-257-7777 or 1-800-552-7001) must be contacted at least 3 working days before construction begins. The landowner/operator is responsible to ensure that the excavator/contractor contacts MISS UTILITY and the excavator/contractor must be able to provide the MISS UTILITY ticket number within 24 hours upon request by the NRCS representative.

4. 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.

5. Prior to beginning construction, the cover sheet must be signed by NRCS, the landowner/operator and the excavator/contractor. The landowner/operator is responsible to inform the excavator/contractor of their responsibilities by providing them a copy of the cover sheet. The excavator/contractor must sign the cover sheet acknowledging that they understand their responsibilities and the landowner/operator must return the signed cover sheet to the NRCS employee or office providing assistance. If requested by NRCS, the landowner/operator shall arrange for a meeting between the contractor and NRCS to review the construction drawings and specifications prior to construction.

6. NRCS 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.

7. The excavator/contractor is responsible for knowing and following the appropriate safety standards required by the Virginia Safety and Health Codes Board.

8. The landowner/operator shall notify the local NRCS or SWCD representative at least one week prior to when construction is to start, and at the times specified in this construction plan and attached specifications.
NRCS or SWCD representative telephone number _____

9. Any deviation from these construction drawings and specifications without written approval from NRCS may result in this practice not meeting NRCS specifications and the withdrawal of technical assistance for this project.

Benchmark Descriptions

TBM # _____

_____

_____

_____ Elevation (assumed) _____

TBM # _____

_____

_____

_____ Elevation (assumed) _____

Acknowledgment Signatures

These construction drawings and attached specifications have been reviewed and all parties understand what is required. (Sign and date below)

Landowner/Operator _____

Contractor _____

NRCS Representative _____

Site Location Map

Scale 1 inch = _____ feet

Index of Sheets

Sheet No.	Title

Specifications

No.	Title

Table of Estimated Quantities

Item	Unit	Est. Quantity

"As Built" Documentation

Certified By and Date

_____

Date Completed

_____

Engineering Job Class _____

NRCS

Natural Resources Conservation Service
United States Department of Agriculture

File Name: VA-SD-100-CoverSheet.dwg

Drawing Name: 11x17 COVER SHEET

Sheet 1 of

Date

Designed

Drawn

Checked

Approved

REVISIONS

DATE	APPROVED	TITLE
01/24	MAT LYONS	SCE
11/25	MAT LYONS	SCE

VIRGINIA ENGINEERING STANDARDS DRAWING

Standard Drawings shall NOT be altered without State Conservation Engineer Approval

/s/ Mathew Lyons, PE

STANDARD DWG. NO. VA-SD-100A-Cover Sheet

DATE 12/24 SHEET 1 OF 1

Boswells Tavern
Quad-Site Location
Map-
Not Scale

Notes

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Index of Sheets

Specifications and Standards

No.	Item
VA-706	Seeding
VA-707	Site Preparation
VA-721	Excavation
575	Animal Trails and Walkways
	Stream Crossing O&M

Table of Estimated Quantities

Item	Unit	Est. Quantity
VDOT Gabion Stone	Tons	45
VDOT No. 357	Tons	20
Geotextile fabric (16 ft wide)	LFT	80
See VA-706 for seeding quantities		

These construction drawings and attached specifications have been reviewed and all parties understand what is required. (Sign and date below)

Landowner/Operator _____

Contractor _____

NRCS Representative _____

"AS BUILT"

_____
Date Completed

_____
Certified By and Date

ENGINEERING JOB CLASS _____

STANDARD DWG NO.	VA-SO-100
DATE 3/03	SHEET 1 OF 1

Date / Approved By _____ / Title _____ / Title _____

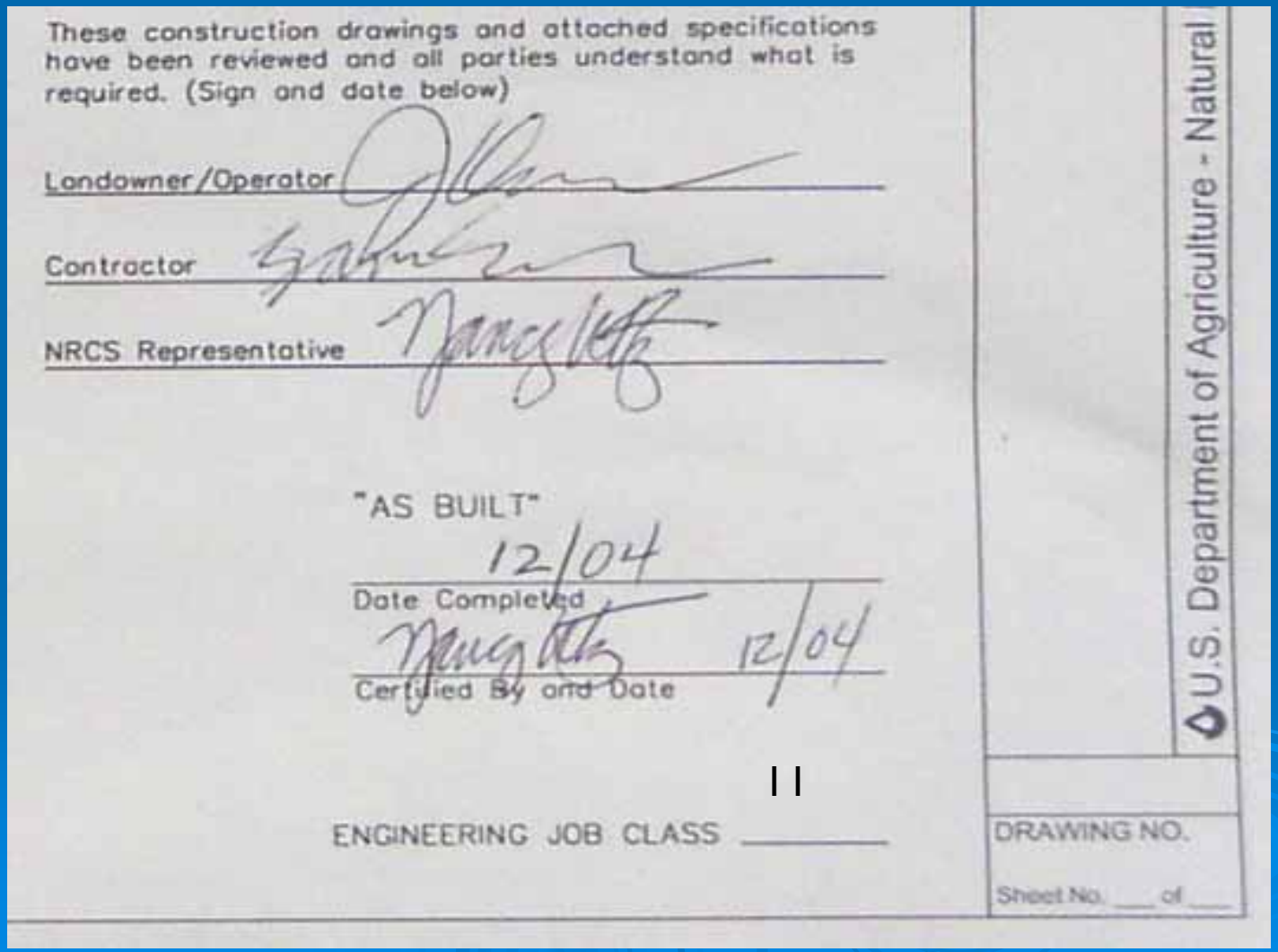
Date / Designed P. Rippe / Drawn P. Rippe / Traced _____ / Checked _____

Pat Hanley - Stream Crossing
Cover Sheet / Index of Sheets
Louisa County, Virginia

U.S. Department of Agriculture - Natural Resources Conservation Service

DRAWING NO. VA-ENG-FARM-04-18
Sheet No. ___ of ___

SIGN!!!! With the appropriate job approval authority



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Landowner/Operator

Contractor

NRCS Representative

"AS BUILT"

12/04
Date Completed

12/04
Certified By and Date

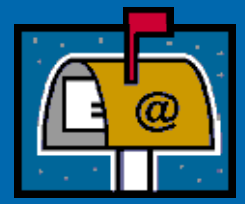
II
ENGINEERING JOB CLASS

U.S. Department of Agriculture - Natural

DRAWING NO.

Sheet No. ___ of ___

Send to the landowner



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  - Operation and Maintenance
  - VA series Construction Specifications (700s)
  - Cost estimates
  - Contractor list

Make no recommendations

Happy Healthy Livestock

THE END