



ENGINEERING PERFECTION, PLLC

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South Charleston, WV 25303
www.engineeringperfection.net
(304) 545 3033

Jerry Gilbert -
304-545-3033

August 13, 2013

Mr. Dan Wellings, P.S.
Floodplain Administrator
Doddridge County Commission
118 East Court Street
West Union, WV 26456

2013 AUG 14 PM 2:01

Re: Notice of Plan for Development; Request for Determination that No Flood Development Permit is Required – Vicinity of Routes 15 and 38, Doddridge County West Virginia

Dear Mr. Wellings,

On behalf of Antero Resources LLC, Engineering Perfection requests your review of the enclosed information regarding proposed development in Doddridge County. The enclosed report indicates that all of the proposed development is at an elevation above the base flood elevation calculated for this location. I also request that you issue a determination or other document indicating your concurrence with this finding, and that no Floodplain Development Permit is necessary.

Doddridge County Ordinance and Application

It is my understanding that the Doddridge County Floodplain Ordinance has pending proposed amendments. Part of the purpose of the amendments is to simplify ordinance administrative tasks. If the revisions to the ordinance do indeed become effective in August 2013 and simplify administrative tasks, I ask that our requests be considered following the newly revised ordinance. If however the revisions are delayed in implementation, I ask that our requests be considered following the ordinance now in effect dated May 21, 2013.

In my opinion, this proposed project does not fit well in the Floodplain Development Permit Application for Doddridge County. Entry of information is required on the application that is not necessary for the administration of the ordinance for this specific project. Information that is necessary is not requested. Rather than complete the application form, I have provided the information understood to be necessary in this

transmittal letter and the accompanying documents. If you prefer that the application form be completed and submitted, please let me know and a completed form will be promptly submitted.

Applicant

The applicant is
Antero Resources LLC
175 Elk Creek Road
Clarksburg, WV 26301

The natural person appointed by the applicant to receive notice and contact information is Shawn Flanigan, 175 Elk Creek Road, Clarksburg, WV 26301 304 622 3831. The engineer for this project is Dennis Fisher, P.E., P.O. Box 281, Philippi, WV 26416; phone 304 677 4129. For expediency, please send copies of correspondence to Mr. Fisher as well as the undersigned.

Project Location

The project location is at the intersection of routes 15 and 38. The coordinates are longitude -80.658 and latitude 39.269 degrees. The location is noted on Sheet 1 of the attached drawings.

Most of the proposed development is within the right-of-way of the West Virginia Department of Highways. The surface owner for the portion of proposed development outside this right-of-way is Speery Hardwoods, Inc., 100 Flindertation Rd, Salem, WV 26426. The parcel appears in Deed Book 264 Page 138 and on Tax Map 20 Page 48. There is one abandoned structure and no residents on this parcel. The principle use of the property is timbering.

The project is located on Buckeye Creek and is depicted on Flood Insurance Rate Map panel 0145C, revised October 4, 2011. Nearly all of the development area is in the X zone; a small fraction of the area is depicted as an A zone.

Description of Work

The work is described on the enclosed engineering drawings. The activities include fill, grading, and road construction. The scope does not include alteration or relocation of a stream.

Adjacent and/or Affected Landowners

All proposed development will occur at an elevation above the determined Base Flood Elevation; there are no affected adjacent landowners.

Floodplain Analysis

The results of the floodplain analysis are illustrated on the figure below.

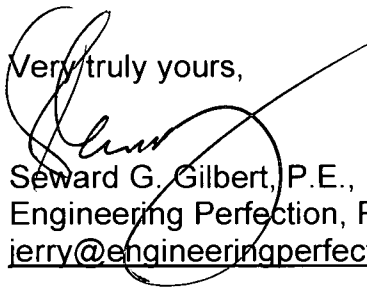


Notes regarding figure above: The western bridge longer exists. FIRM SFHA boundaries were extracted from map 54017C0145C revised October 4, 2011. The Limit of Disturbance was determined by Fisher Engineering and depicted by Jackson Surveying. The Revised SFHA Limit was determined from base flood elevations reported by Engineering Perfection and ground surface elevations measured by Jackson Surveying. Aerial photography from the WV Sheriff's Association dated 2010-11.

A small portion of the proposed development is located in Special Flood Hazard Zone A. A detailed hydrologic and hydraulic analysis was performed for the project site to determine the base flood elevation for this reach of Buckeye Creek; the report is attached. At the location of the proposed development, the base flood elevation was determined to be 846.5 feet. The elevation of the lowest most disturbance of this proposed project is 847 feet. Thus all of the proposed development is above the determined base flood elevation. This finding exceeds the requirement that the development be reasonably safe from flooding, and demonstrates that no fill will be placed in a floodplain area. The floodplain analysis was performed prepared by the undersigned registered professional engineer who certifies that the methods used correctly reflect currently accepted technical concepts.

We will provide the digital HEC-RAS files to you upon request.

Very truly yours,



Seward G. Gilbert, P.E., DEE, CFM
Engineering Perfection, PLLC
jerry@engineeringperfection.net

enclosures:

Project Drawings (8 sheets)
Hydraulic Analysis Report

Cc: Mr. David Jackson, P.S.
Mr. Dennis Fisher, P.E.
Mr. Shawn Flanigan

DAN WELLINGS, PS
DODDRIDGE CO. FLOODPLAIN MANAGER
DODDRIDGE CO. SURVEYOR
1590 WV RT. 18 SOUTH
WEST UNION, WV 26456
PHONE: (304) 873 - 2329
CELL: (304) 629 - 7249
E-MAIL: wellingsd8@gmail.com

DATE: 09/14/2013
RE: Request for determination that No Flood Development Permit is required – Road change in vicinity of intersection of County Routes 15 and 38.

Dear Mr. Gilbert,

I have reviewed your Engineering Perfection report and summary dated August 13, 2013 on behalf/ or for Antero Resources LLC's proposed road change at the intersection of Doddridge County Routes 15 and 38.

After a thorough review of the data supplied, I have determined that the proposed said road project is **NOT** located within the designated floodplain. Therefore a DODDRIDGE COUNTY FLOODPLAIN PERMIT IS **NOT** required.

Sincerely,



DAN WELLINGS, PS
DODDRIDGE COUNTY FLOODPLAIN MNGR.
DODDRIDGE COUNTY SURVEYOR

**HYDRAULIC INVESTIGATION
Analysis of Potential Flood Impacts –
Public Road Modifications
Vicinity of Routes 15 and 38,
Doddridge County West Virginia**

Prepared for:

Mr. David Jackson PS
Jackson Surveying, Inc.
Clarksburg, WV
davidjackson@frontier.com

Prepared by:

 **ENGINEERING PERFECTION, PLLC**

P.O. Box 8596
339 Sixth Avenue
South Charleston, WV 25303
jerry@engineeringperfection.net

August 13, 2013



HYDRAULIC INVESTIGATION
Analysis of Potential Flood Impacts –
Vicinity of Routes 15 and 38,
Doddridge County West Virginia

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APPENDICES

Appendix A: Data Provided by Jackson Surveying
Appendix B: HEC-RAS Data

1 PURPOSE

Engineering Perfection was requested by Jackson Surveying, Inc. to determine the hydraulic effects of modifying a highway bridge approach in Doddridge County, West Virginia. This modification is proposed in the vicinity of Routes 15 and 38 along Buckeye Creek, Doddridge County, West Virginia. The modification is necessary for a nearby proposed natural gas development project.

This investigation was conducted using the U.S. Army Corps of Engineers Hydraulic Engineers Center's River Modeling System (HEC-RAS) to model the stream and bridge. The HEC-RAS model was compiled using survey data provided by Jackson Surveying Inc.

2 SITE DATA

The site is located in Doddridge County, along Buckeye Creek at longitude -80.658 and latitude 39.269 degrees. The FEMA Community number is 540024 with the site shown on panel 0145C, revised October 4, 2011. On the Flood Insurance Rate Map, the site is shown to be an A Zone. The site is immediately upstream of a reach studied in detail for the Flood Insurance Study (FIS) for Doddridge County.

Site data used in this project included the following:

1. Topographic cross sections, elevations, and photographs provided by Jackson Surveying.
2. Aerial photography acquired in 2011 and available from the West Virginia GIS Technical Center.
3. US Geological Survey 1:24,000 scale topographic mapping of Doddridge County.

3 HYDRAULIC ANALYSIS

The hydraulic analysis was comprised of four elements. They were:

- determination of flows for Buckeye Creek,
- preparation of cross section data for the HEC-RAS model,
- execution of the HEC-RAS model, and
- analyses of the results.

Determination of Flow for Buckeye Creek

Since the study site was immediately upstream of a reach studied in detail for the FIS, a regional discharge study was not needed to determine the 100-year flow at the project site. The highway crosses Buckeye Creek a few hundred feet upstream of the confluence with Long Run. Based on work done for similar

studies, the Buckeye Creek flow upstream of Long Run was determined by assuming it was proportional to the square root of the drainage area to flow downstream, a standard hydrology practice. Table 1 below lists the drainage areas and discharges used for the study.

Table 1 Buckeye Creek Discharges and Drainage Areas

Location	Drainage Area (sq. mi.)	Flow (cfs)
At the confluence with Long Run (Published)	22.62	5,150
Upstream of confluence with Long Run	18.18	4,620

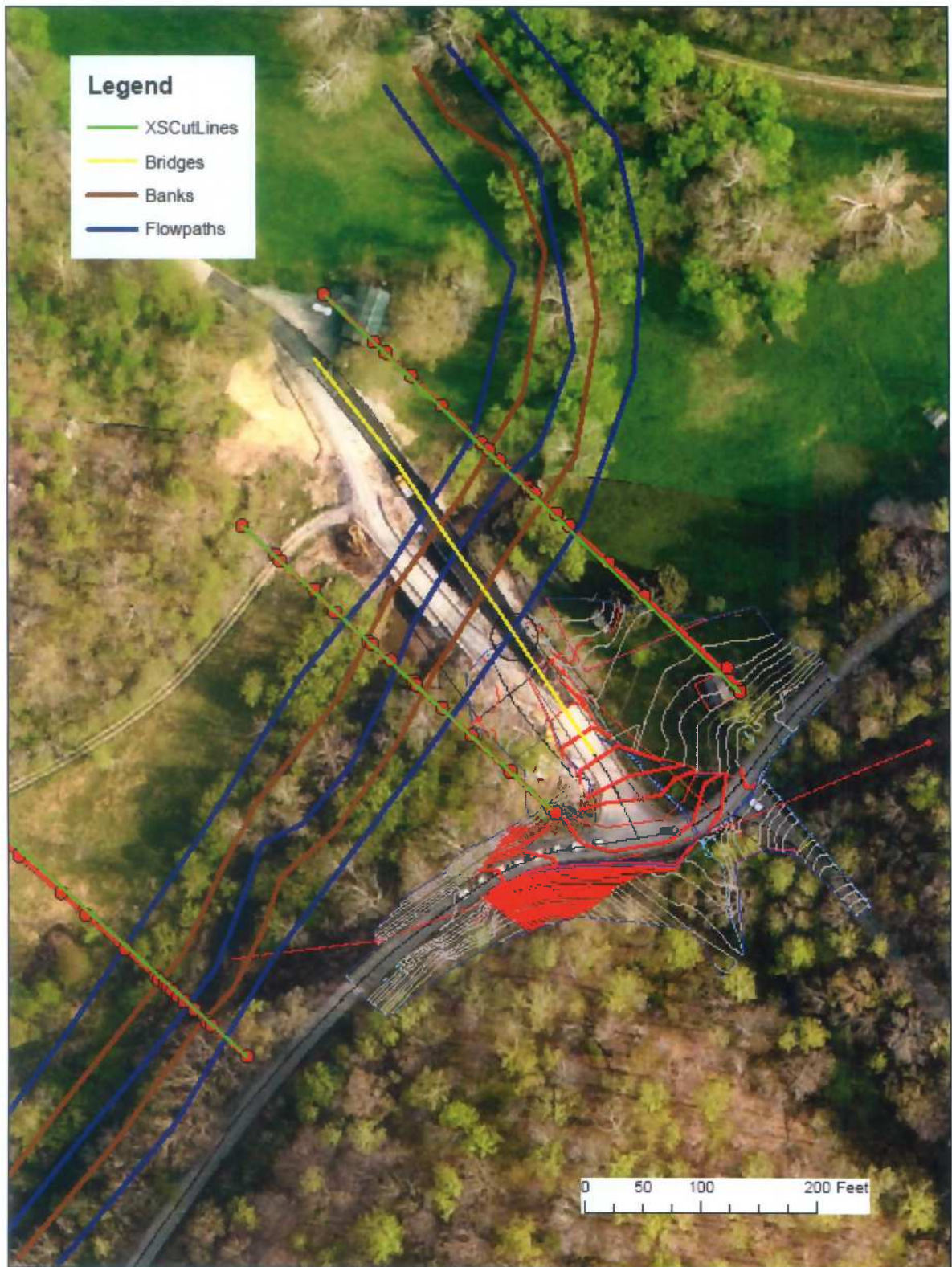
The Buckeye Creek Flow for the Area of Interest in the HECRAS model is 4,620 cfs.

Preparation of Cross Sections for HEC-RAS Model

The U.S. Army Corps of Engineers Hydrologic Engineering Center developed the River Analysis System, or HEC-RAS. Version 4.1.0, issued January 2010, was employed in this study. The study used the steady state version of the model.

A preliminary set of three surveyed stream cross sections and one surveyed bridge crossing were prepared for use in the HEC-RAS model. They are illustrated in Figure 1 below. Cross sections and the road crossing were prepared using the field data provided by Jackson Surveying. The elevation data for the cross sections were obtained by field surveying collected by Jackson Surveying in July 2013. The datum used in the Jackson Surveying data was in NAVD 88. The datum used in the Flood Insurance Study and this report is also NAVD 88.

Figure 1 Location of Cross Sections and Proposed Construction



Note: This photo also shows a temporary bridge that has since been removed.

Several cross sections were copied and/or moved to nearby stream locations, a standard practice in HEC-RAS modeling.

The cross section information includes estimates of the Manning's roughness coefficient. Survey data as well as location photographs were used to confirm these values and to determine placement of these values along the modeled cross section geometry. For Buckeye Creek the stream channel roughness in the model was 0.055 and for the overbank areas, 0.070 was used. These Manning values are consistent with the values used in the FIS for this stream.

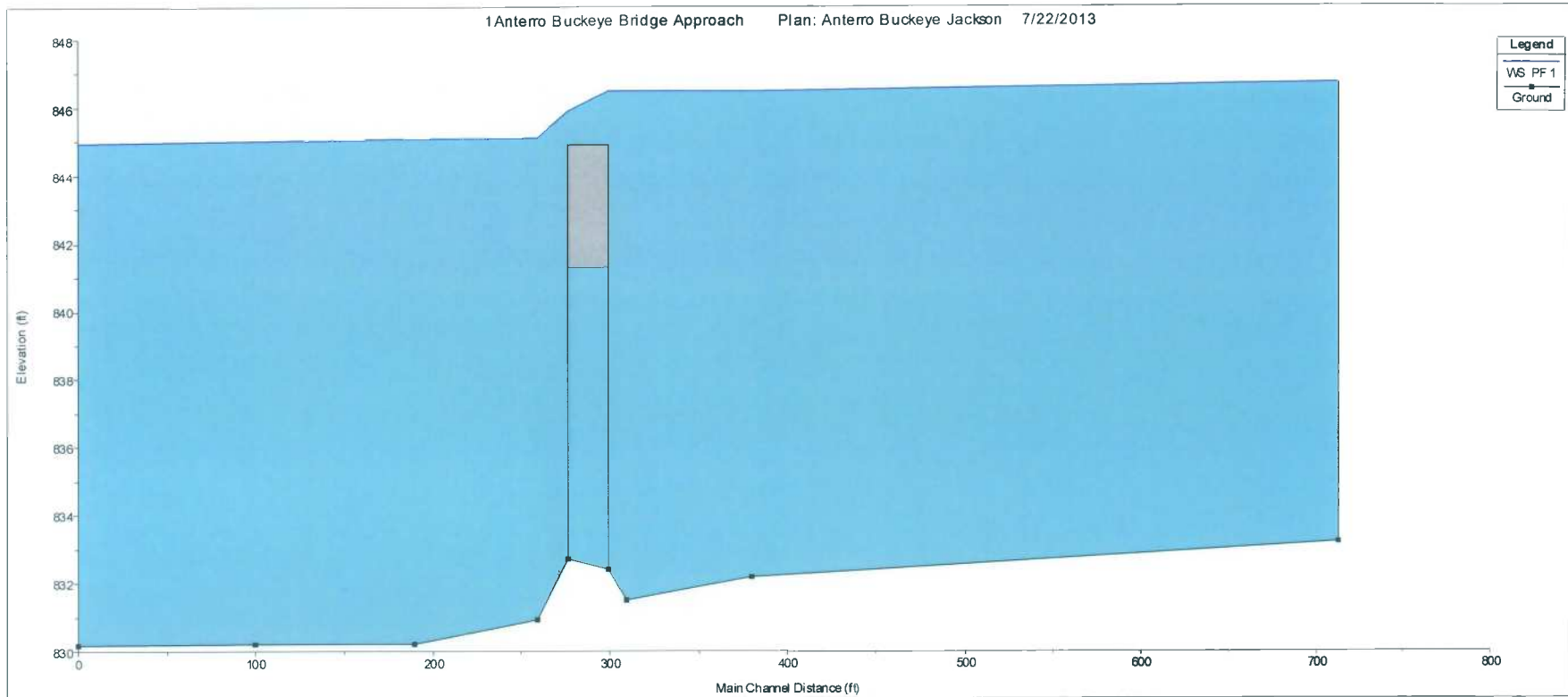
Execution of the HEC-RAS model

Only the existing condition was modeled for this investigation. The starting water surface elevation at the downstream end matched the value provided in the Flood Insurance Study for Buckeye Creek at stream distance 32,500 feet. This stream is in the subcritical flow regime. This means that all of the effects of any changes to a stream are upstream of the change. A stream profile is provided on Figure 2. Results of the modeling are provided in Table 2 below. The digital model is available upon request from Engineering Perfection.

Table 2 Buckeye Creek Existing Condition HEC-RAS Output

River Sta	Q Total	Water Surface Elevation
	(cfs)	(ft)
812.3	4620	846.69
479.2	4620	846.48
409	4620	846.46
369	Bridge	
359	4620	845.12
289.2	4620	845.07
200	4620	845.02
100	4620	844.95

Figure 2 Stream Profile for A Portion of Buckeye Creek



Scope of Modification of Bridge Approach

The scope of the modification of the bridge approach includes both cut and fill of soil to reduce the radii of horizontal and vertical curves. The road will also be resurfaced. The elevation of the lowest most ground disturbance of this proposed project is 847 feet.

Analysis of the Results

From Table 2 it can be seen that the base flood elevation just above the bridge at river station 409 is 846.5 feet. This is below the elevation of the proposed development. Since the proposed development is all higher than the determined base flood elevation, no post-development condition model was needed for this project.

4 CONCLUSIONS

The proposed development is above the determined base flood elevation.

5 LIMITATIONS

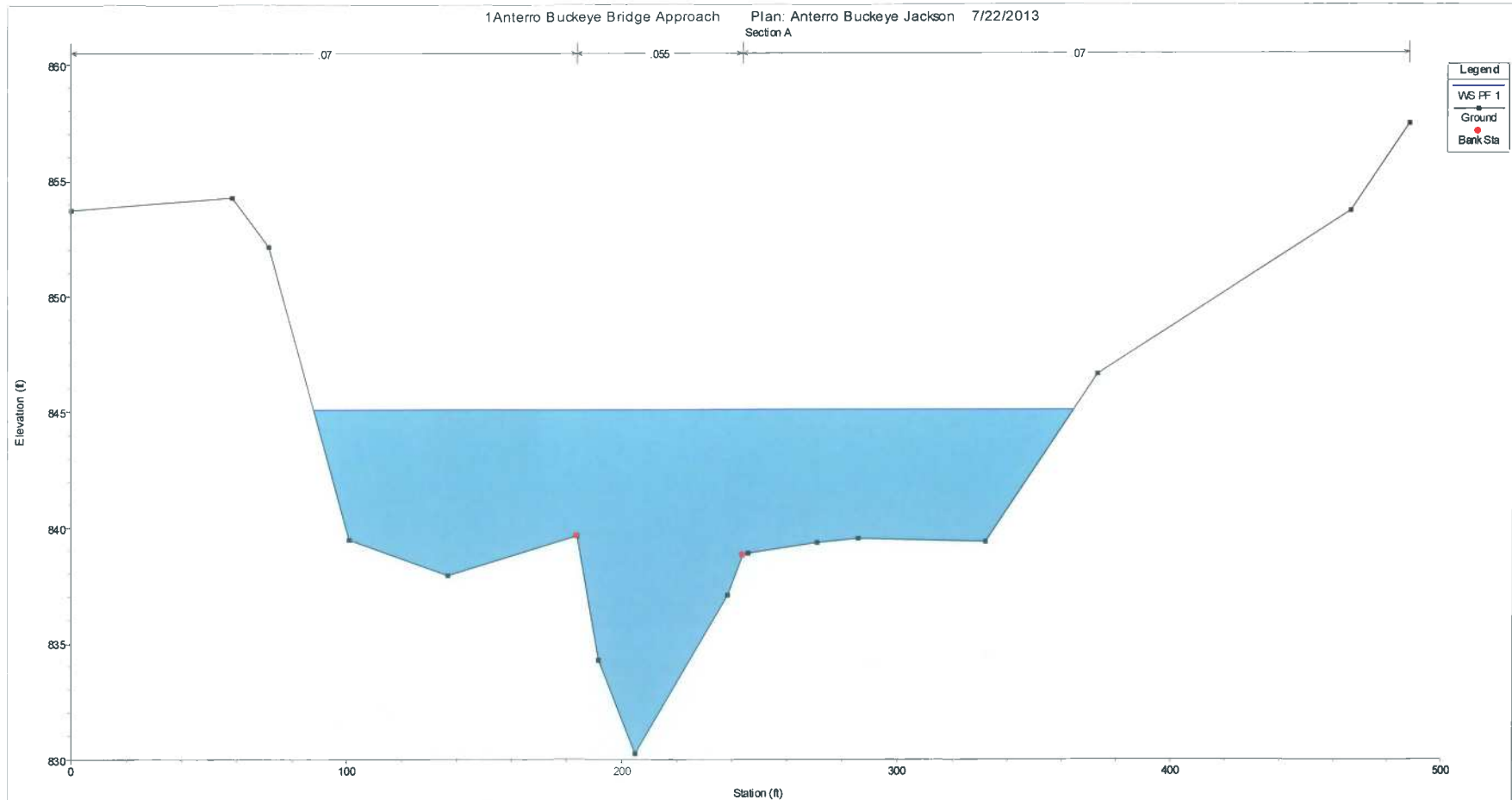
The conclusions submitted in this report apply to the proposed project only. They are not applicable to on-site subsequent construction, or adjacent or nearby projects. In the event that conclusions or recommendations based on this report and relating to any other projects are made by others, such conclusions and recommendations are not the responsibility of Engineering Perfection, PLLC. In performing our professional services, we used that degree of care and skill ordinarily exercised under similar circumstances by members of the engineering profession. No other warranty, expressed or implied is made.

Appendix A:
Data Provided by Jackson Surveying

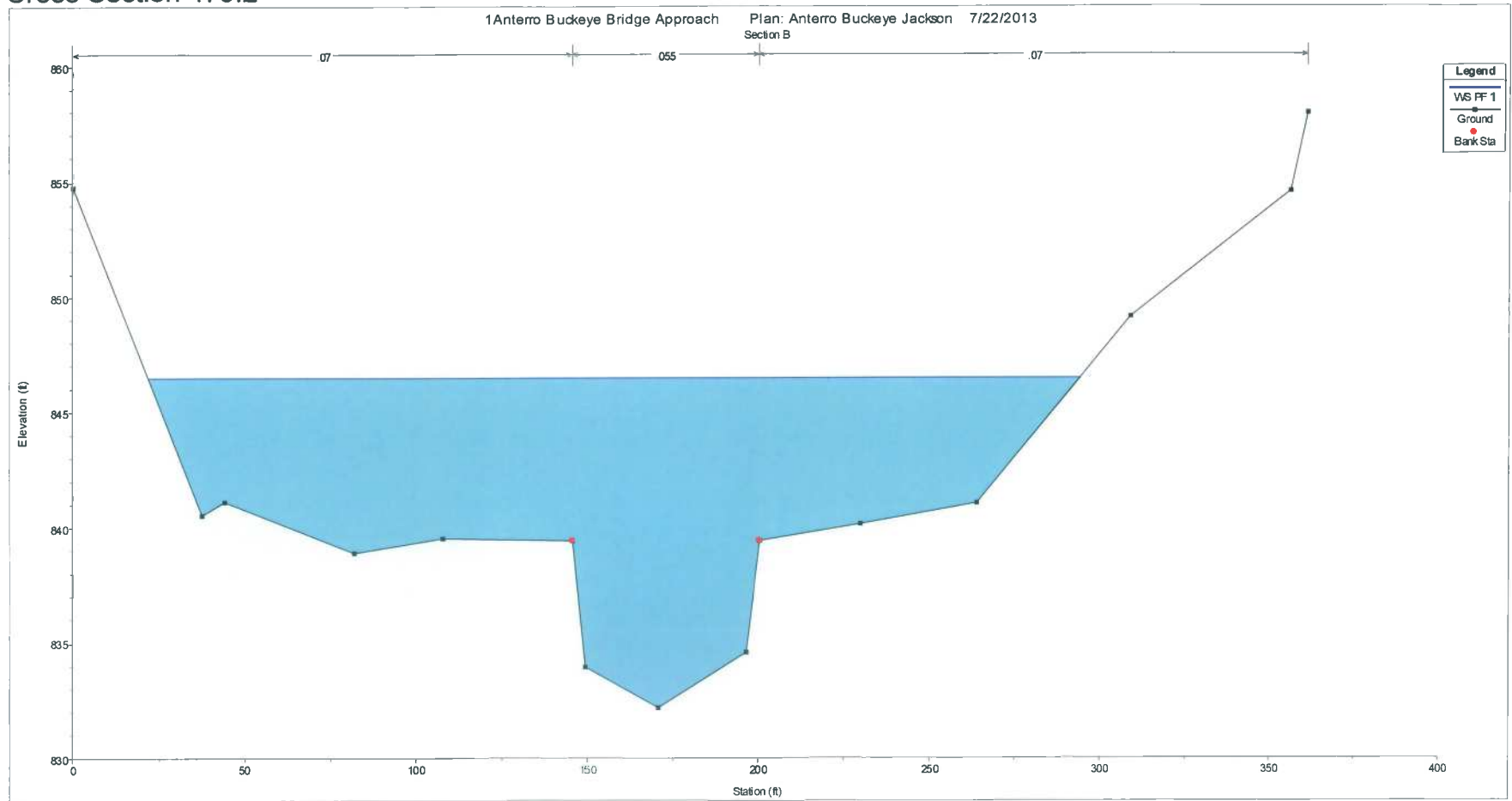
Route 15 Bridge Elevations pdf
Route 15 Sections 7-19-13 pdf
Rt. 15 Bridge Upstream jpeg
RT.15 Bridge Downstream jpeg
RT.15 Section A 7-18-13 spreadsheet
RT.15 Section B 7-19-13 spreadsheet
RT.15 Section C 7-19-13 spreadsheet
Sec. A Downstream jpeg
Sec. B Cross Stream jpeg
Sec. C Downstream jpeg
WV Sec. Rt.15 Bridge 7-19-13 email CADD file

Appendix B: HEC-RAS Data

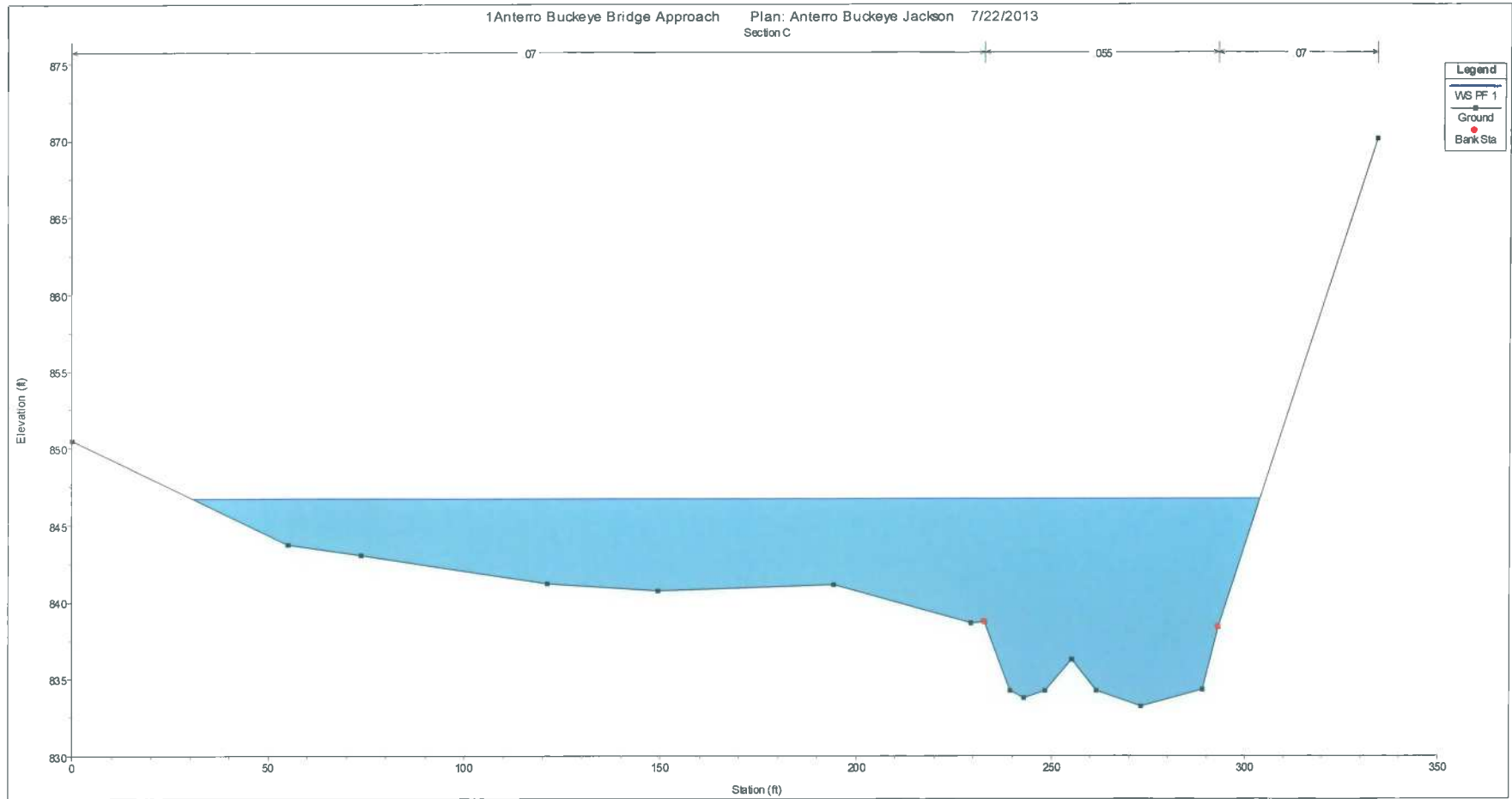
Cross Section 289.2



Cross Section 479.2

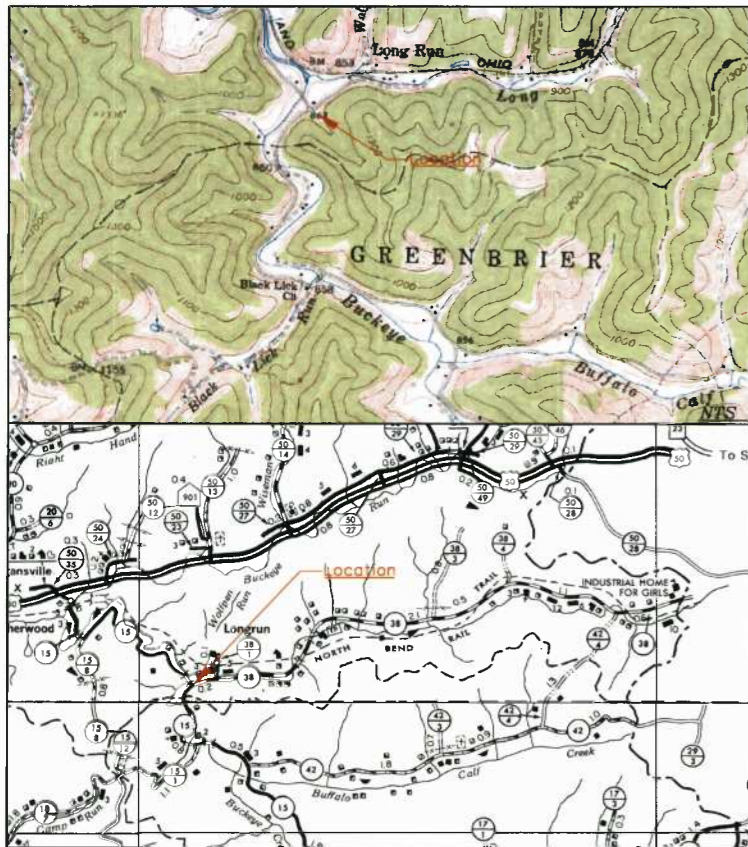


Cross Section 812.3



Call
Jerry Gilbert
when I mail
his Permit.

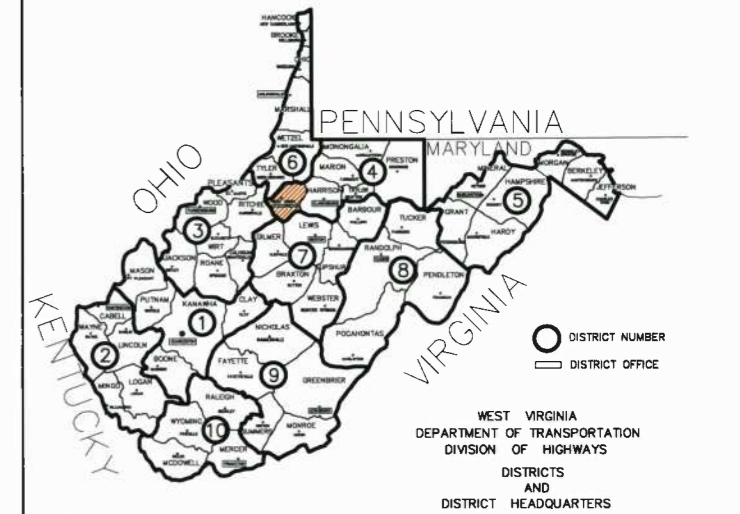
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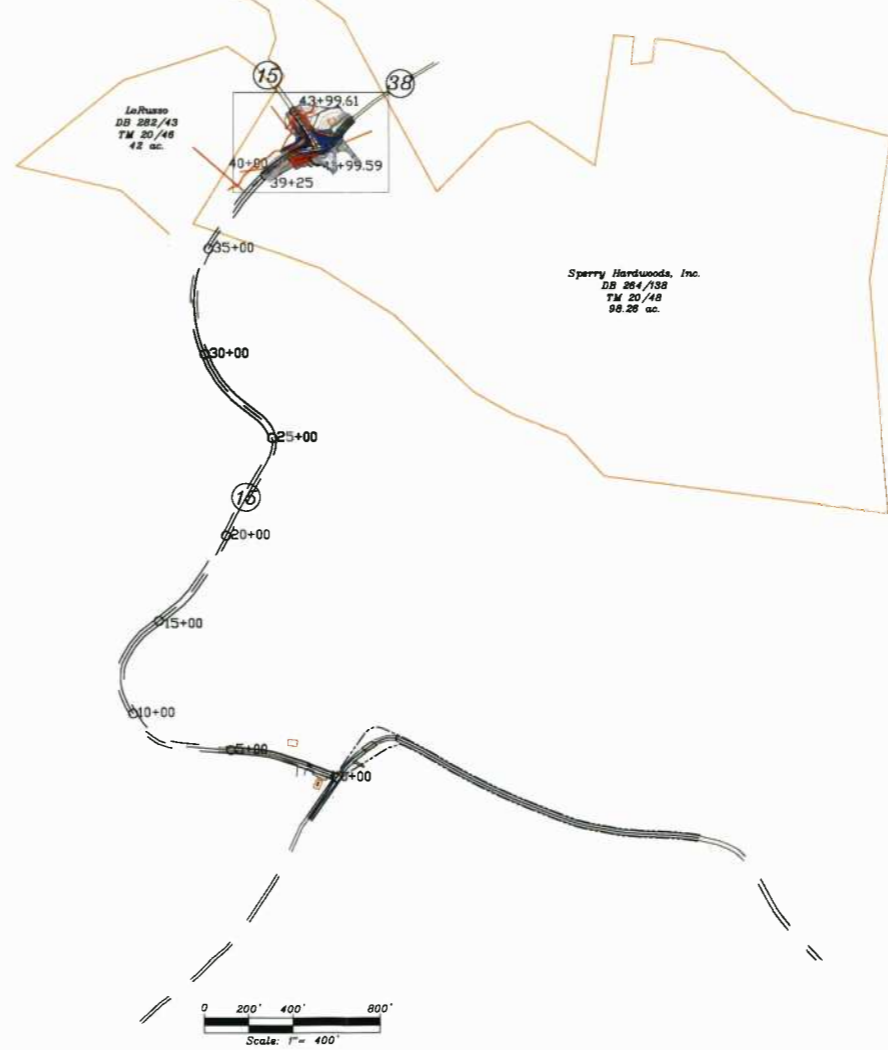
West Virginia
 Department of Transportation
 Division of Highways
 Upgrade For
 WV. Sec Rte. ⑬ & ⑮
 38
 Greenbrier District
 Doddridge County

July 2, 2013

WV Sec Rte 38 Length: STA. 0+00 to STA. 2+18.6 (.04 Miles)
 WV Sec Rte 15 Length: STA. 39+25 to STA. 43+99.6 (.09 Miles)



Sheet	Description
1	Cover
2	Notes
3	Details
4	Details
5	Details
6	Plan
7	Rt. 15 Profile & Cross Section
8	Rt. 38 Profile & Cross Section



All Property Boundaries are based on current deeds and field evidence collected with Sub-Meter GPS

FLOOD PLAIN AREA

AREA of INTEREST

NOTE: Stream & Wetland information from report prepared by AllStar Ecology, LLC dated 2013 and may not match field locations.

FLOOD PLAIN INFORMATION FROM FEMA MAP PANEL #54017C0145C & #54017C0165C

Total Stream Impact = 91 Ft.

Revision:

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Dennis L. Fisher RPE 8684: _____ Date: _____

DLF.
 Dennis L. Fisher, RPE
 PO Box 281
 Philippi, WV 26416
 Cell: 304-677-4129
 E-Mail: Fisher.Engineering@gmx.com

Jackson Surveying Inc.
 Cover
 Road Upgrade
 Sheet 1 of 8
 WV Sec. Route ⑮ & ⑮

677 W. Main St.
 Clarksburg, Wv 26301
 304-623-5851

General Construction Notes:

1. Best Management Practices shall be utilized for erosion and sediment control. The most effective method is concurrent seeding and mulching. Compost Filter Sock (preferable) or filter fence shall be installed in areas down slope of construction where adequate brush filter strips cannot be maintained. Rock check dams or sumps shall be installed at culvert inlets.

2. The contractor shall contact Ms. Utility prior to any disturbance.

3. The attached drawings show existing and proposed grades and dimensions on which the estimated quantities are based. These grades and dimensions may need to be adjusted during construction to meet field conditions. If any adjustment is needed beyond a reasonable conformance with the drawings, the contractor shall contact the engineer.

4. Clearing and grubbing shall be in conformance with Section 201 of the current WVDOH Specifications. All other earthwork shall be in conformance with Section 207 of the current WVDOH Specifications. All brush and non marketable timber shall be chipped.

5. Stockpile topsoil and protect for use in regrading the disturbed areas prior to seeding and mulching.

6. If subgrade is unsuitable, the exposed surface shall be compacted until a relatively unyielding surface is achieved.

7. Surface water and subsurface water shall be prevented from flowing into the disturbed areas during construction

8. Fill shall be placed in uniform twelve (8) inch lifts and compacted with appropriate equipment to a proctor density of 95%.

9. Any imported fill shall be approved by engineer prior to placement.

10. Prevent surfaced water and subsurface water from flowing into excavations and flooding the work. Remove water from excavations to prevent softening of foundation soils and creating soil changes detrimental to the stability of subgrades. Provide and maintain pumps, sumps, sustain and discharge lines and other dewatering system components necessary to convey water away from the site. Convey water removed from excavations to collections or to runoff areas. During periods of inclement weather, temporary slope drains may be utilized as necessary.

11. In areas to receive fill and at the final cut subgrade, proof roll and compact the exposed ground surface following clearing and grubbing and any required excavation with a minimum of four passes of an approved compactor and obtain at least the density required for a suitable impoundment pit foundation and as indicated below. Proof rolling shall be under the observation of the Engineer as described herein. Immediately following the completion of excavation to proposed subgrades in cut areas, proof rolling shall be performed as specified. Any areas which deflect, rut or pump under the loaded dump truck shall be undercut and replaced with compacted fill material or stone base course as directed by the Engineer. Proof rolling methods shall be as follow:

a. After the subgrade has been completed the subgrade shall then be proof rolled. The coverage areas and methods will be identified by the Engineer;

b. The equipment shall be operated at a speed that the Engineer can comfortably and slowly walk along side the equipment.;

c. If it becomes necessary to take corrective action, such as but not limited to underdrain installation, undercut, and backfill of an unsuitable material, and aeration of excessive wet material in areas that have been proof rolled. These areas shall be proof rolled again following the the completion of the necessary corrections.

12. Photographic documentation shall include DAILY photos of before, during and after conditions of all constructions activities.

13. Existing and proposed culverts shall have adequate cover of 1/2 diameter (12" minimum). Adequate cover shall consist of select fill & asphalt overlay.

14. There is no average daily traffic information for this road. The AOT is estimated to be between 80-100 vehicles/day exclusive of proposed gas utility traffic during drilling operations.

15. If an existing culvert is extended, the contractor shall verify size, condition and connection needed prior to ordering the culvert material.

NOTE: ALL WORK (PERFORMED WITHIN THE EXISTING DOH RIGHT OF WAY OR WITHIN THE PROPOSED DOH RIGHT OF WAY) AS SHOWN ON THESE DRAWINGS SHALL CONFORM TO THE WV DOH STANDARD SPECIFICATION FOR ROADS AND BRIDGES AND ANY UPDATED SUPPLEMENTAL SPECIFICATIONS PER TABLE BELOW:

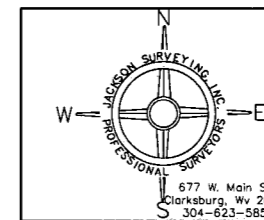
WV DOH Section	Description
201	Clearing & Grubbing
207	Excavation & Embankment
211	Borrow Excavation
212	Structure, Rock, & Wet Excavation
217	Special Rock Fill
218	Slope & Foundation Protection
228	Subgrade Preparation
229	Shoulders & Ditches
240	Cleaning Culverts, Inlets & Manholes
307	Crushed Aggregate Base Course
311	Open Graded Free Draining Base Course
401	Hot-Mix Asphalt Base, Wearing, & Patching & Leveling Courses
402	Hot-Mix Asphalt Skid Resistant Pavement
405	Surface Treatments
408	Tack Coat
412	Winter Grade Asphalt Patching Mixture
415	Removing Existing Pavement Surface
501	Portland Cement Concrete Pavement
502	Approach Slabs
503	Sealing Joints & Cracks In Concrete Pavement
504	Bituminous Underseal For Concrete Pavement
506	Concrete Pavement Repair
507	Crack & Pothole Repair
508	Diamond Grinding
509	Re-Sawing & Sealing Longitudinal Concrete Pavement Joints
510	Re-Sealing Transverse Concrete Pavement Joints
512	Concrete Slab Stabilization
601	Structural Concrete
602	Reinforced Steel
603	Prestressed Concrete Members
604	Pipe Culverts
606	Underdrains
607	Guardrail
623	Pneumatically Applied Mortar
624	Preformed Elastomeric Joint Sealer
626	Retaining Wall Systems
633	Concrete Gutter, Invert Pipe Cutter, or Dumped Rock Cutter
634	Concrete Cribbing
636	Maintaining Traffic
642	Temporary Pollution Control
645	Reinforcing Slopes
651	Furnishing & Placing Topsoil
652	Seeding & Mulching
655	Matting for Erosion Control
663	Pavement Markings
701	Hydraulic Cement
702	Fine Aggregate
703	Course Aggregate
704	Stone & Crushed Aggregate
705	Asphalt Materials
707	Concrete Admixtures, Curing & Coating Materials
708	Joint Materials
709	Metals
710	Wood Materials
712	Guardrail & Fence
713	Metal Pipe
714	Concrete, Clay, Fiber & Plastic Pipe
715	Miscellaneous Materials
716	Embankment & Subgrade Material
717	Compaction Control of Base Course Material

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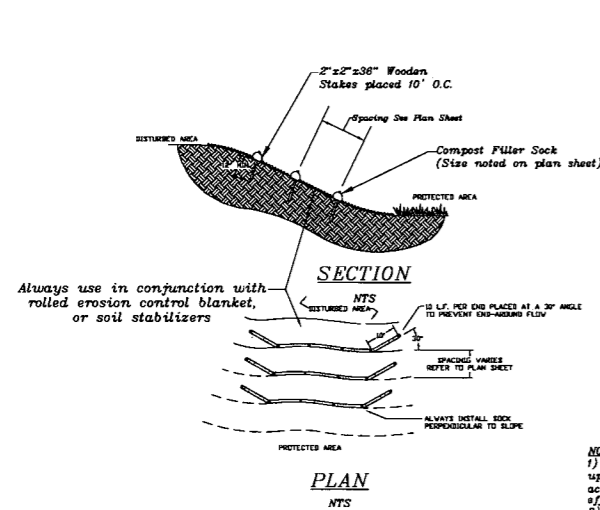
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Dennis L. Fisher, RPE
PO Box 281
Philippi, WV 26416
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E-Mail: Fisher.Engineering@gmx.com

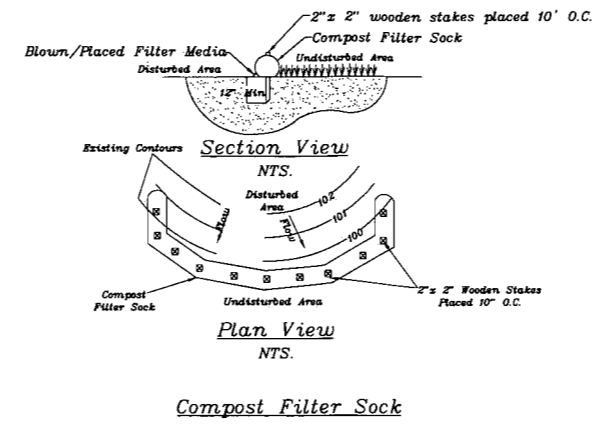


Jackson Surveying Inc.
Details
Road Upgrade
Sheet 2 of 8
WV Sec. Route 15 & 38



Slope Drainage Break Detail
(Not to Scale)

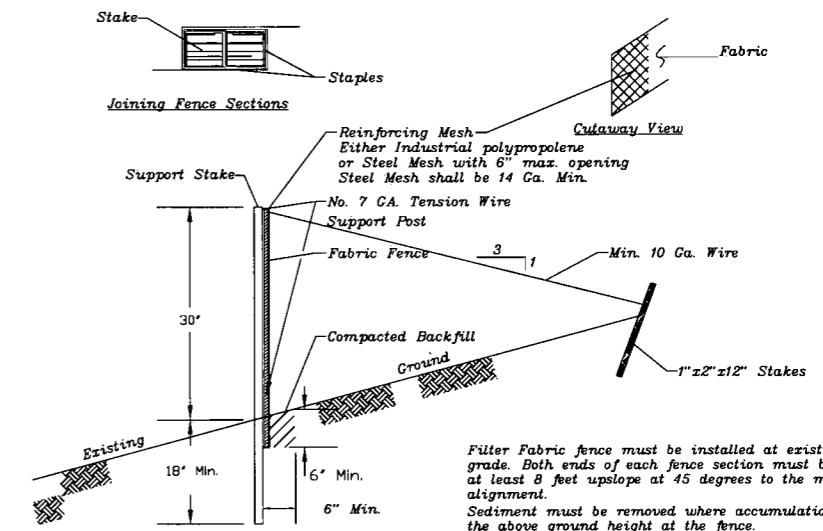
NOTES:
1) Remove sediment from the upslope side of the sock when accumulation has reached 1/2 of effective height.
2) Loose filter media may be backfilled on the upslope side of the Sock to enhance performance.



Compost Filter Sock

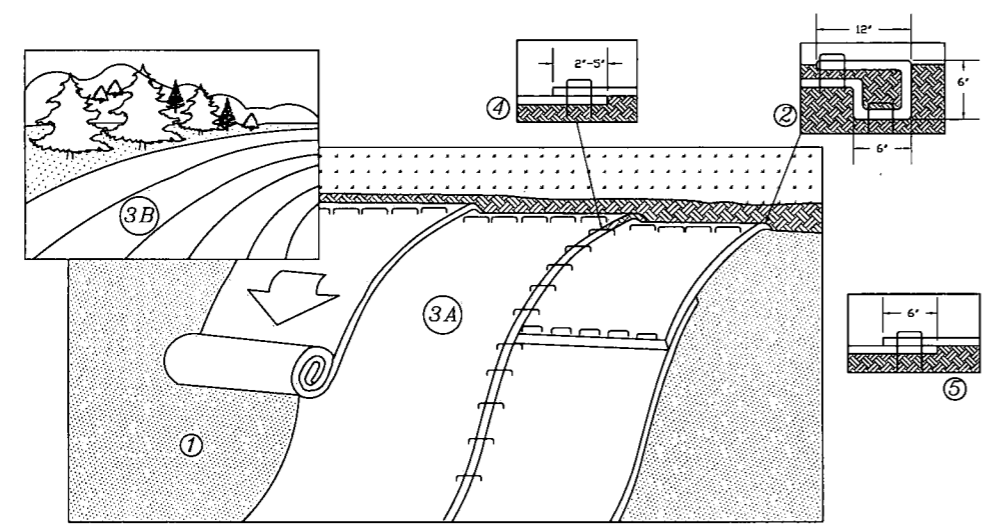
Compost shall meet the following standards:

Organic Matter Content	80%-100% (dry weight basis)
Organic Portion	Fibrous & elongated
pH	5.5-8.0
Moisture Content	35% - 55%
Particle Size	98% pass through 1" screen
Soluble Salt Concentration	5.0 dS Maximum



Reinforced Filter Fabric Fence (30" High)

Filter fabric fence must be installed at existing level grade. Both ends of each fence section must be extended at least 8 feet upslope at 45 degrees to the main fence alignment. Sediment must be removed where accumulations reach 1/2 the above ground height at the fence. Any fence section which has been undermined or topped must be immediately replaced with a rock filter outlet. See Standard Const. Detail VII.



NOTES:
1. Prepare soil before installing rolled erosion control products (RECP's), including any necessary application of lime, fertilizer, and seed.
NOTE: When using Cell-O-Seed, DO NOT seed prepared area. Cell-O-Seed must be installed with paper side down.
2. Begin at the top of the slope by anchoring the RECP's in a 6" Deep X 6" Wide Trench with approximately 12" of RECP's extended beyond the Up-Slope portion of the trench. Anchor the RECP's with a row of staples/stakes approximately 12" apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to compacted soil and fold remaining 12" portion of RECP's back over seed and compacted soil. Secure RECP's over compacted soil with a row of staples/stakes spaced approximately 12" apart across the width of the RECP's.
3. Roll the RECP's (A.) down or (B.) horizontally across the slope. RECP's will unroll with appropriate side against the soil surface. All RECP's must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staples pattern guide. When using the DOT system, staples/stakes should be placed through each of the colored dots corresponding to the appropriate staple pattern.
4. The edge of parallel RECP's must be stapled with approximately 2"-5" overlap depending on RECP's type.
5. Consecutive RECP's spliced down the slope must be placed end over end (shingle style) with an approximate 6" overlap. Staple through overlapped area, approximately 12" apart across entire RECP's width.
NOTE:
* In loose soil conditions, the use of staple or stake lengths greater than 6" may be necessary to properly secure the RECP's.

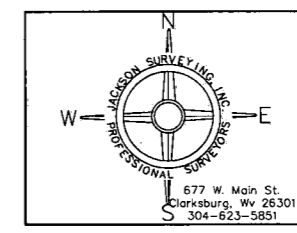
Erosion Control Blanket-Slope Installation
Scale: NTS.

Organic mulch materials & application rates

Mulches	Per acre	Per 1,000 ft ²	Notes
Straw or hay	1.5-2 tons (minimum 2 tons for winter cover)	70-90 lbs	Free from weeds and coarse matter. Must be anchored. Spread with mulch blower or by hand.
Fiber mulch	Minimum 1,500 lbs.	35 lbs.	Do not use as mulch for winter cover or during hot, dry periods. *Apply as slurry.
cornstalks	4-6 tons	185-275 lbs.	Cut or shredded in 4-6" lengths. Air-dried. Do not use in fine turf areas. Apply with mulch blower, chip handler, or by hand.
wood chips	4-6 tons	185-275 lbs.	Free of coarse matter. Air-dried. Treat with 12 lbs. nitrogen per ton. Do not use in fine turf areas. Apply with mulch blower, chip handler, or by hand.
Bark chips or shredded bark	50-70 cu. yds.	1-2 cu. yds.	Free of coarse matter. Air-dried. Do not use in fine turf areas. Apply with mulch blower, chip handler, or by hand.

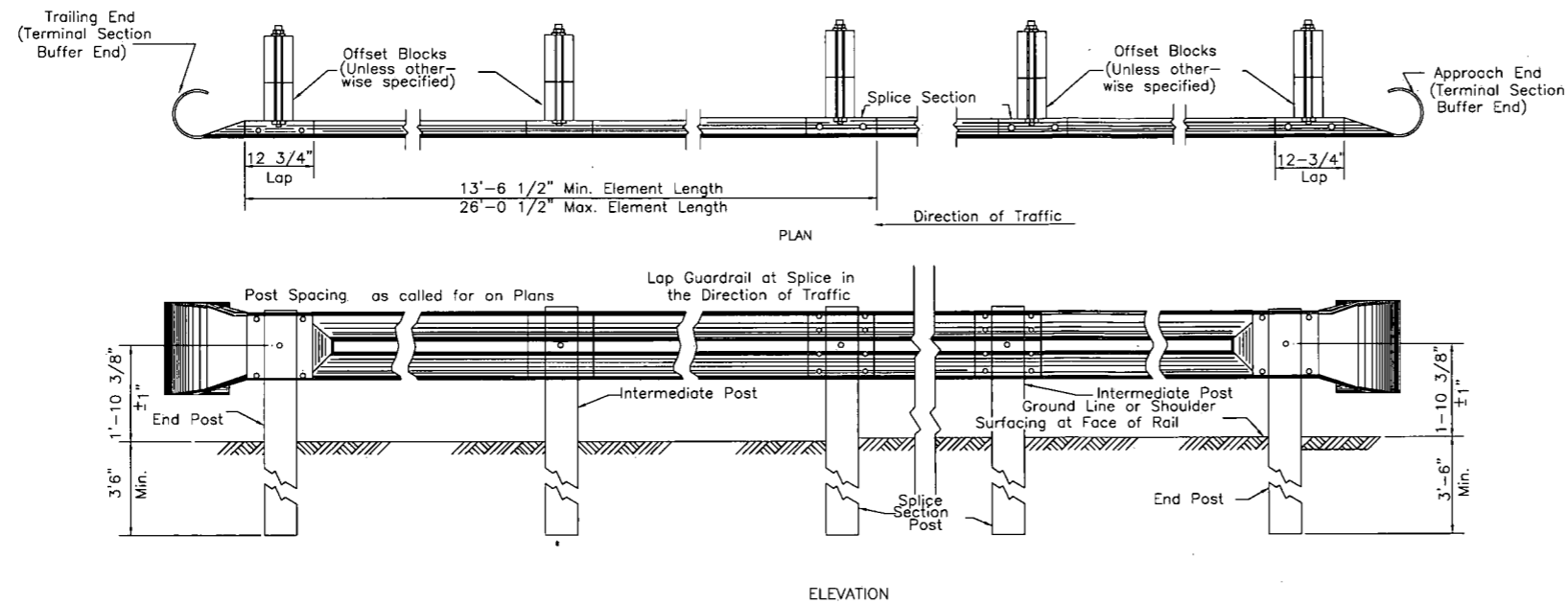
When fiber mulch is the only available mulch during periods when straw should be used, apply at a minimum rate of 2,000 lbs./1,000 sq. ft.

DLF.
Dennis L. Fisher, RPE
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Jackson Surveying Inc.
Details
Road Upgrade
Sheet 3 of 8
WV Sec. Route 15 & 38

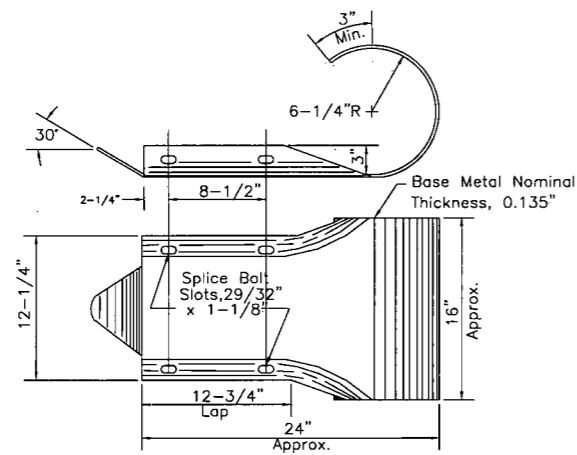
TYPICAL GUARDRAIL INSTALLATION
(UNANCHORED ENDS - WOOD POSTS AND BLOCKS SHOWN)



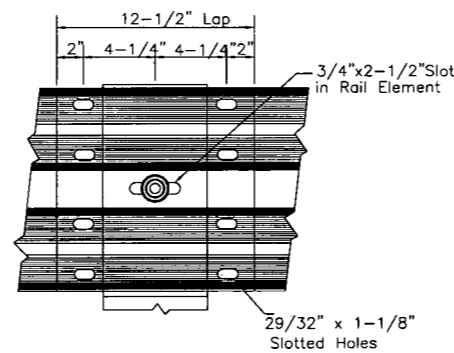
NOTES

Guardrail shall be secured to the blocks, posts and other elements by 5/8" dia. bolts and nuts conforming to the details herein and to the requirements of 712.4 of the Standard Specifications. Nuts shall conform to ASTM A563, Grade A or better.

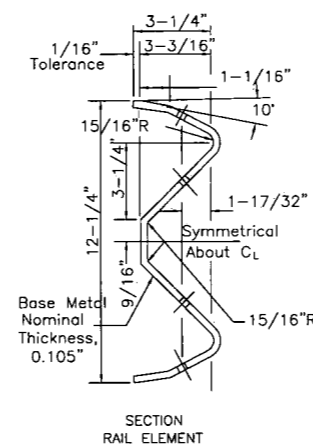
Approach and Trailing End Treatments shall be as shown or specified on the Plans or directed by the Engineer. Approach and trailing ends shall be anchored unless otherwise specified on the Plans; the specific anchor terminal to be utilized shall be as shown or specified.



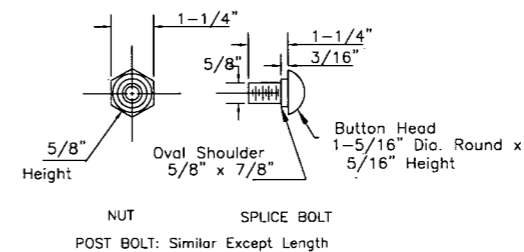
TERMINAL SECTION BUFFER END
(For Use Only on Unanchored Ends And on Special Trailing End Terminal)



RAIL SPLICE
Eight (8) Splice Bolts are to be used at all Rail Splices



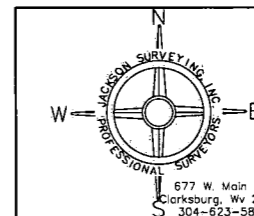
SECTION RAIL ELEMENT



NUT SPLICE BOLT
POST BOLT: Similar Except Length

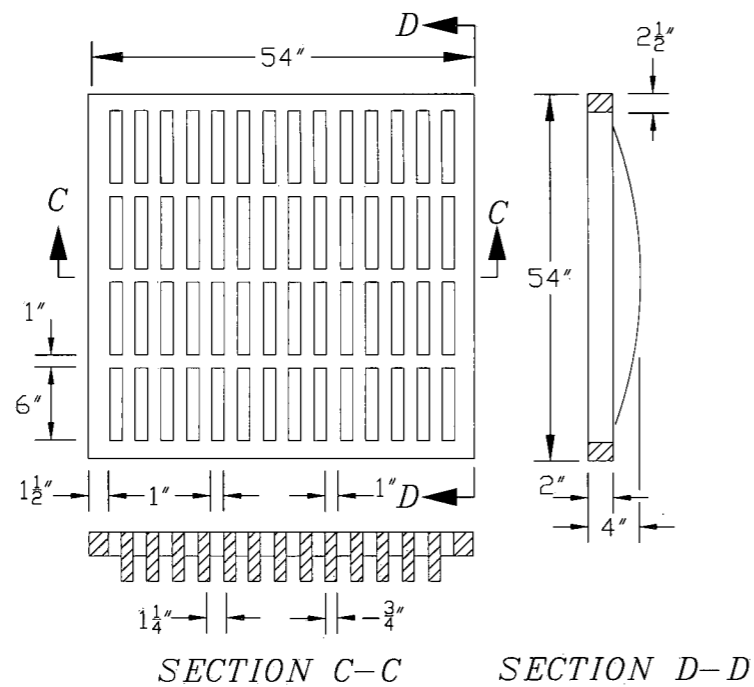
GUARDRAIL ELEMENT

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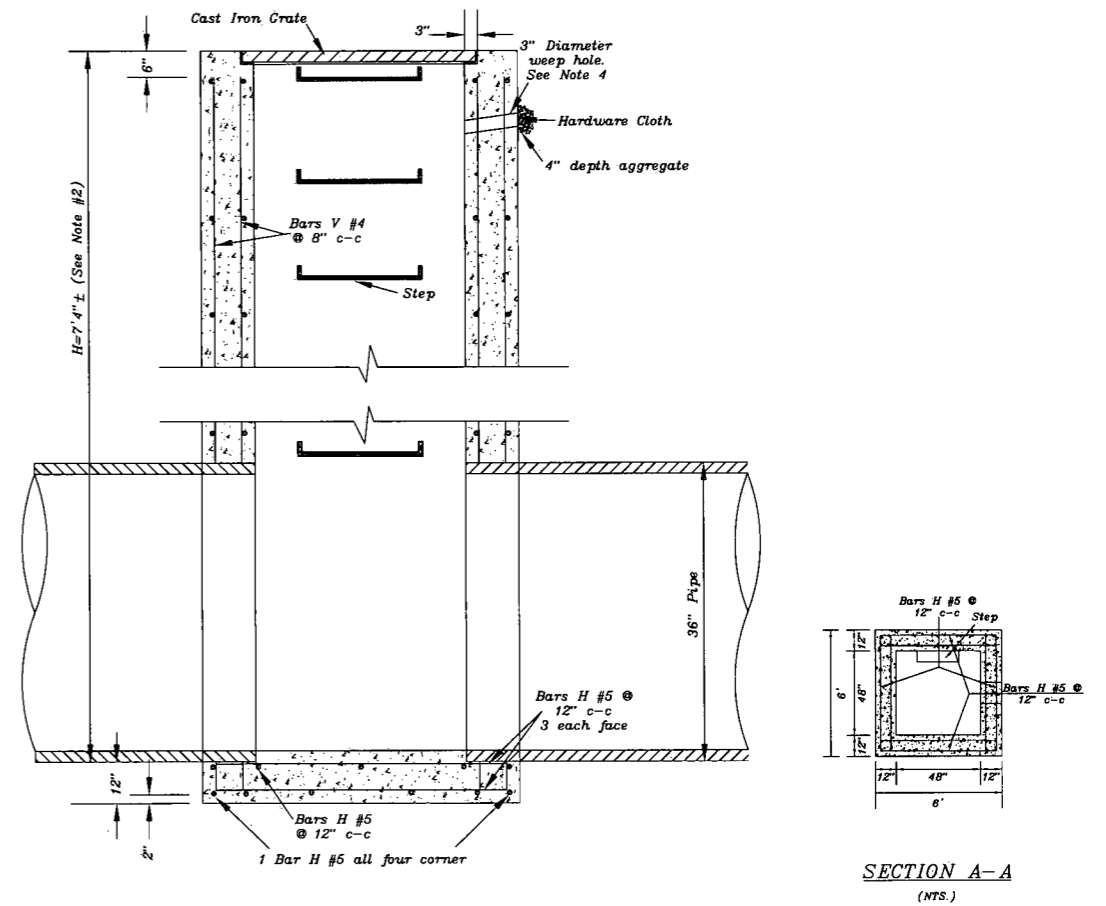


Jackson Surveying Inc.
Details
Road Upgrade
Sheet 4 of 8
WV Sec. Route 15 & 38

677 W. Main St.
Clarksburg, WV 26301
304-623-5851

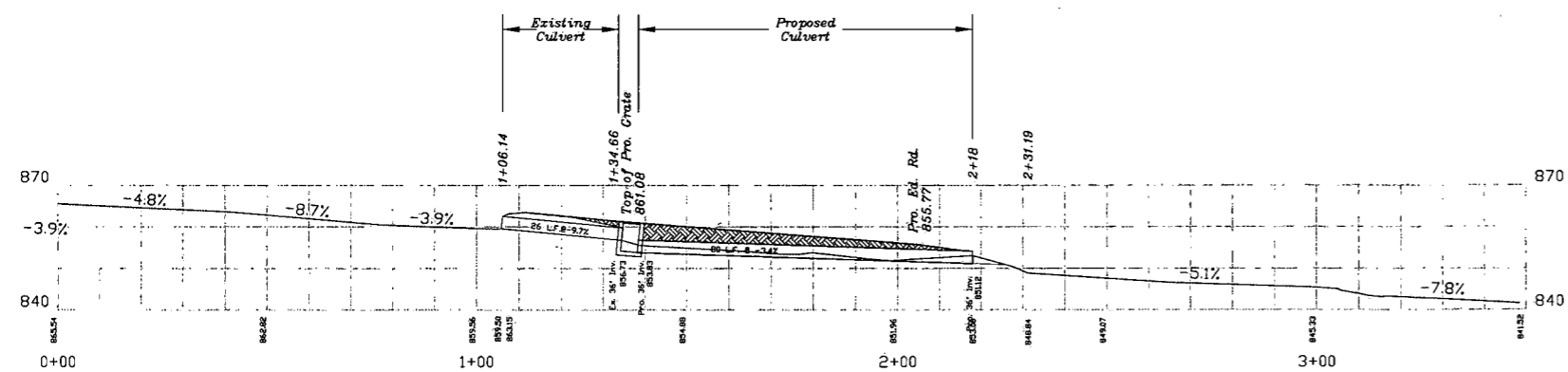


CAST IRON GRATE DETAIL
(NTS.)



INLET DETAIL
(NTS.)

— LEGEND —
Existing Grade
Proposed Grade
Proposed Fill



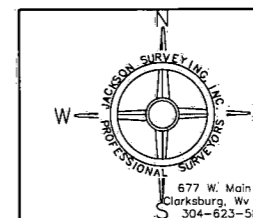
PIPE PROFILE

NOTES:

1. Match top of grate to finish road surface.
2. The "H" dimension shown on the plans will be measured from the invert of the outfall pipe to the top of the structure. Plan "H" dimensions are approximate only for estimating purposes and the actual dimension shall be determined by the contractor from field conditions.
3. This inlet may be precast or cast-in-place.
4. 3" diameter weep hole with 12"x12" plastic hardware cloth 1/2" mesh or galvanized steel wire minimum wire diameter 0.03", number 4 mesh hardware cloth anchored firmly to the outside of the structure.
5. All reinforcing steel shall have a min. cover of 2".
6. All reinforcing steel to be cut clear of all openings by 2".
7. Cast-in-place concrete is to be class A3 (3000 PSI). Precast concrete is to be 4000 PSI.
8. All splices in bars V to be a minimum of 40 diameters (20").

Vert. 1" = 20'
Hori. 1" = 20'

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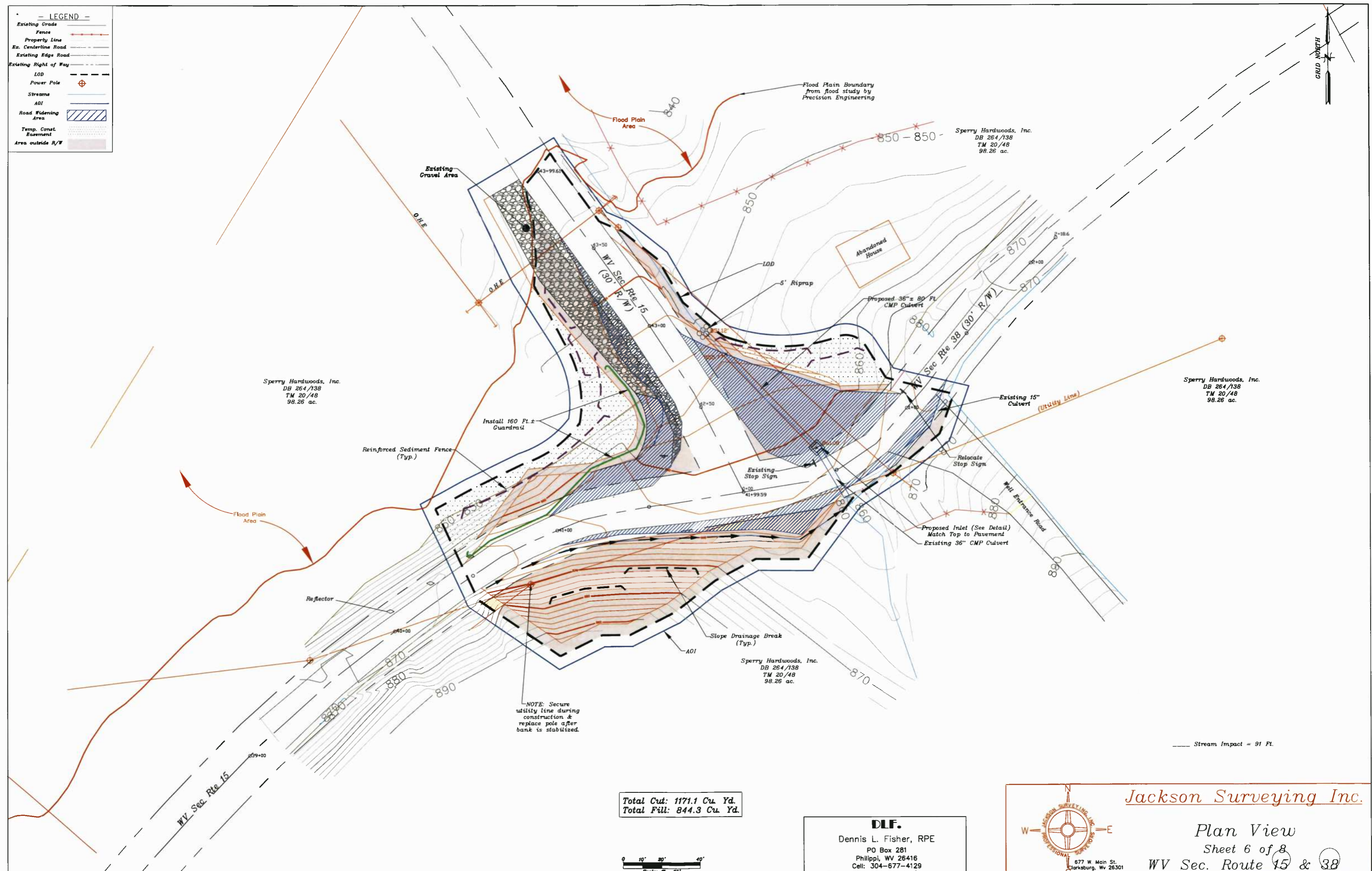
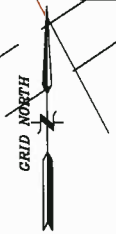


Jackson Surveying Inc.
Details
Road Upgrade
Sheet 5 of 8
WV Sec. Route 15 & 38

677 W. Main St.
Clarksburg, Wv 26301
304-623-5851

— LEGEND —

Existing Grade	—
Fence	—+—+—+—
Property Line	—
Ex. Centerline Road	—+—+—+—
Existing Edge Road	—
Existing Right of Way	—+—+—+—
LOD	—+—+—+—
Power Pole	⊕
Streams	—
AOI	—
Road Widening Area	▨
Temp. Const. Easement	▨
Area outside R/W	▨



Sperry Hardwoods, Inc.
DB 264/138
TM 20/48
98.26 ac.

Sperry Hardwoods, Inc.
DB 264/138
TM 20/48
98.26 ac.

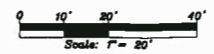
Sperry Hardwoods, Inc.
DB 264/138
TM 20/48
98.26 ac.

Sperry Hardwoods, Inc.
DB 264/138
TM 20/48
98.26 ac.

NOTE: Secure utility line during construction & replace pole after bank is stabilized.

Stream Impact = 91 Ft.

Total Cut: 1171.1 Cu. Yd.
Total Fill: 844.3 Cu. Yd.



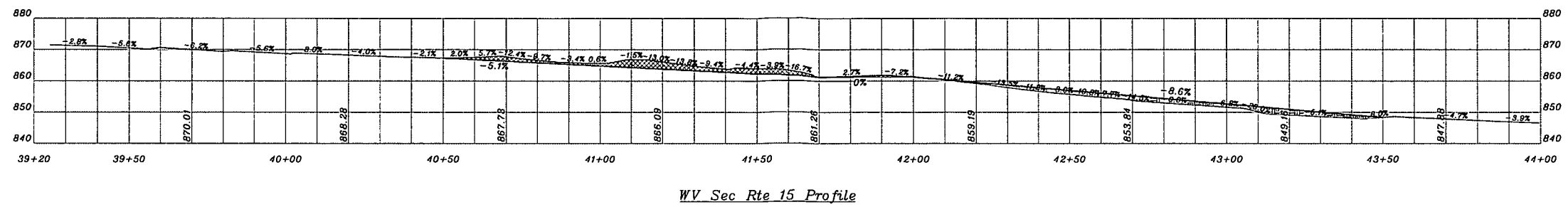
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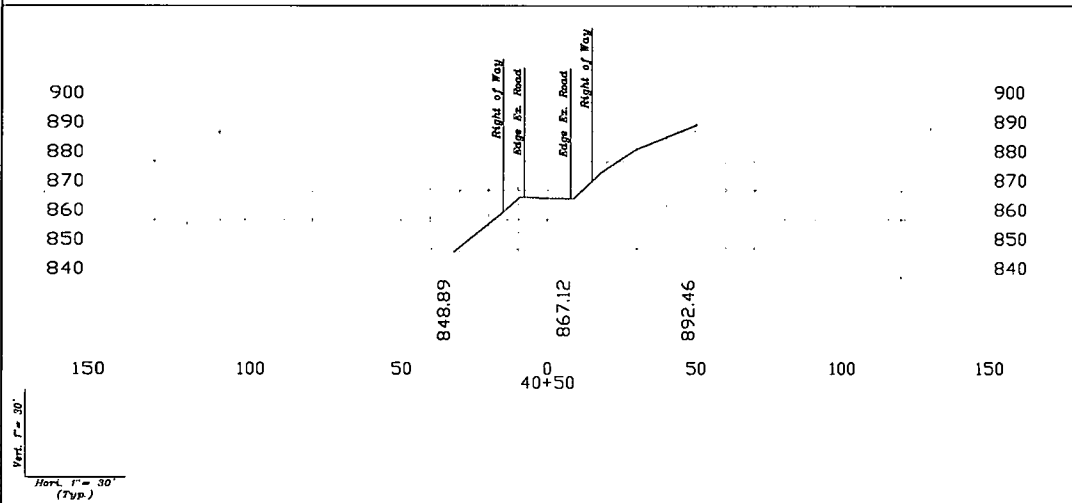
Plan View
Sheet 6 of 8
WV Sec. Route 15 & 38

LEGEND
 Existing Grade
 Proposed Grade
 Proposed Cut

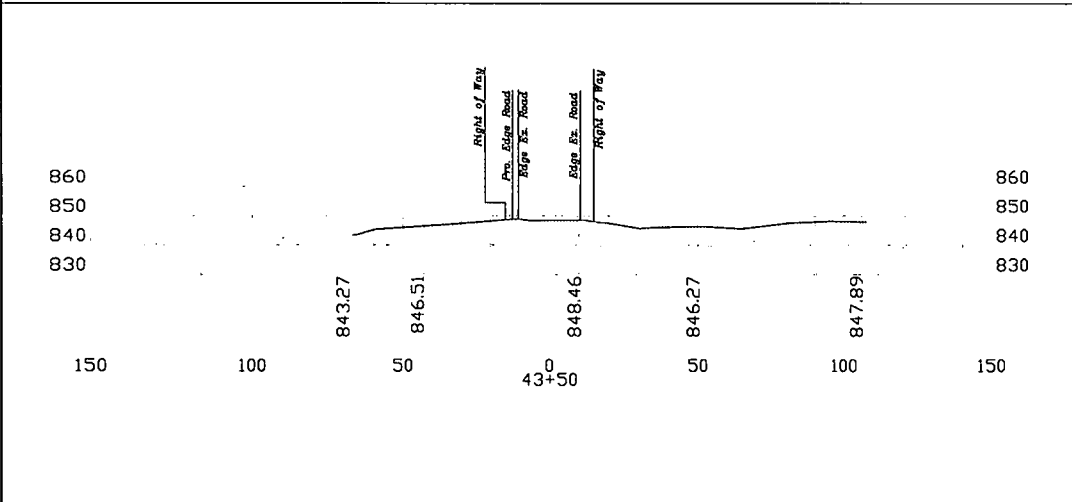
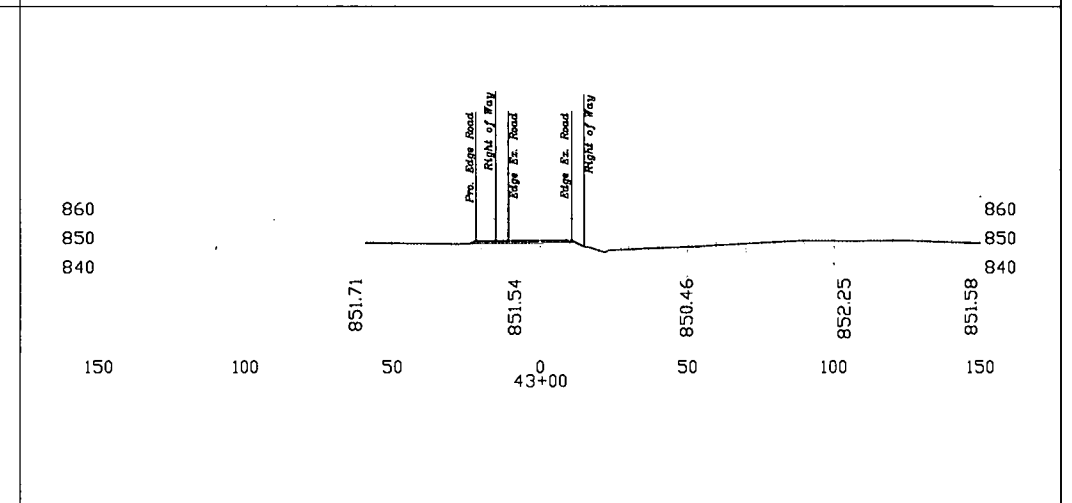
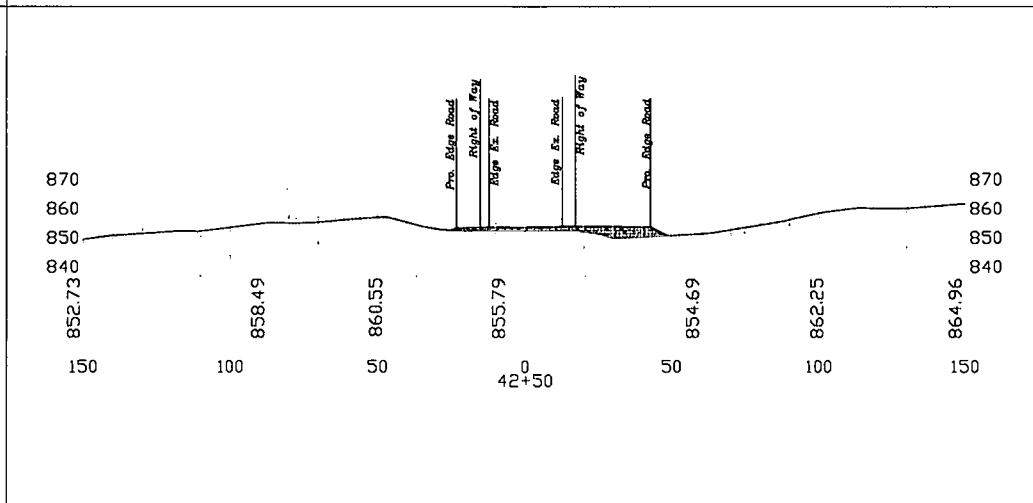
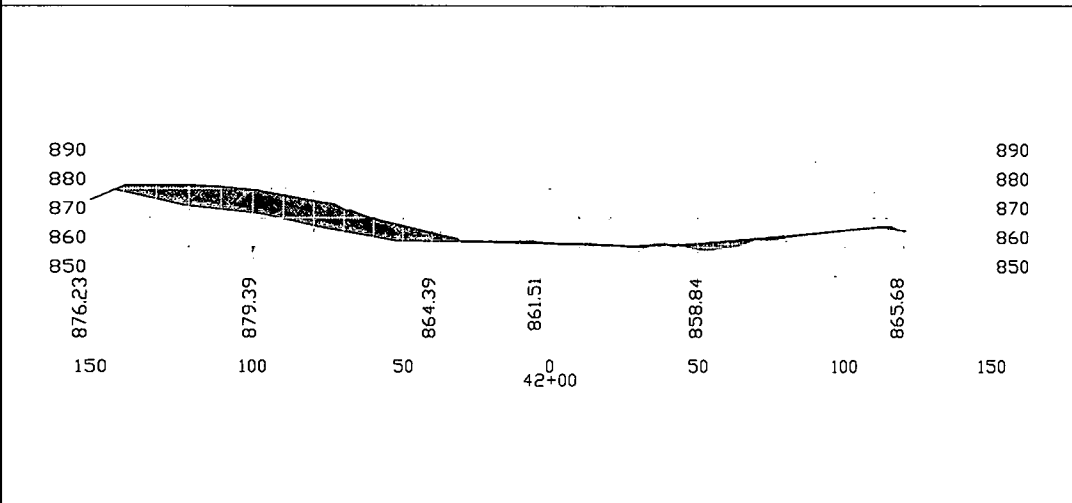
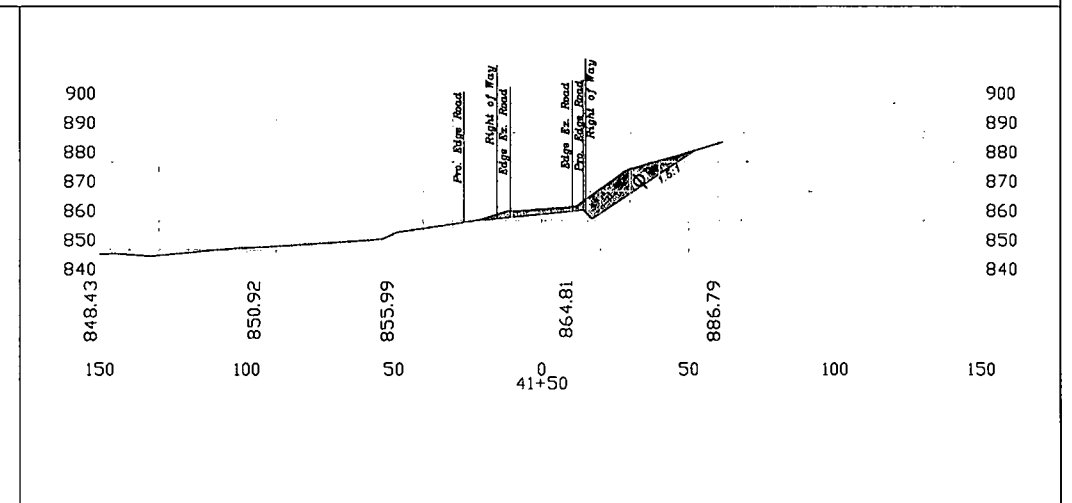
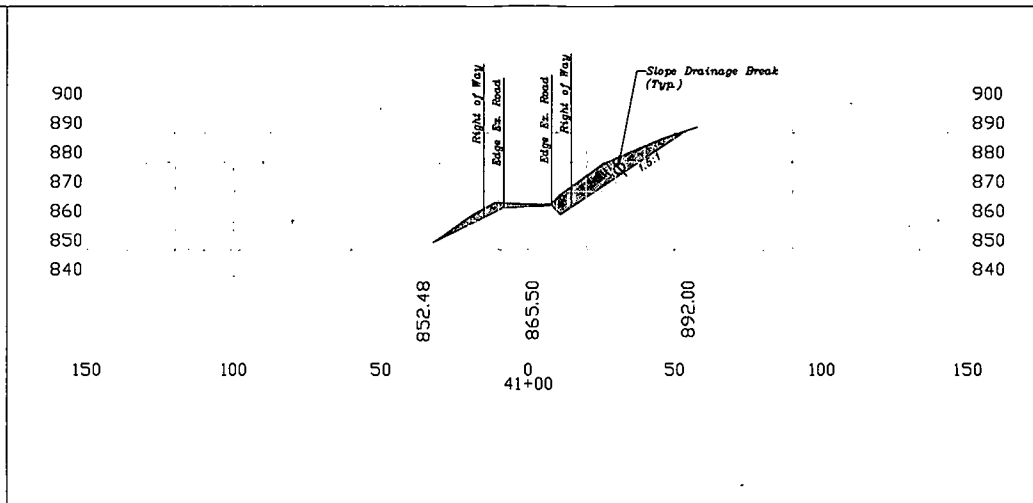


Vert. 1" = 20'
 Hort. 1" = 20'

WV Sec Rte 15 Profile

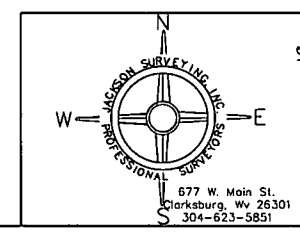


Vert. 1" = 30'
 Hort. 1" = 30'
 (Typ.)



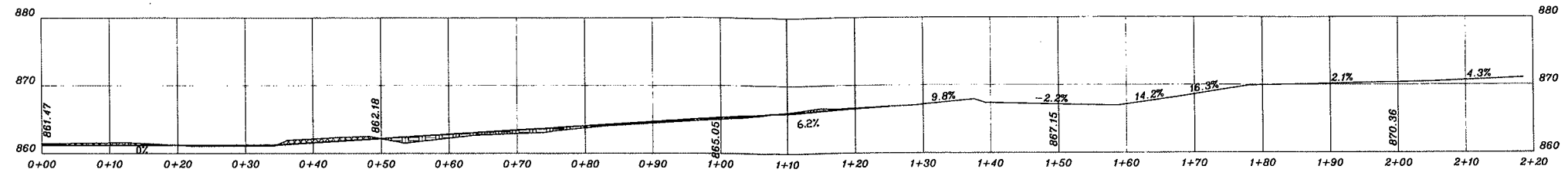
NOTE: All cut slopes will be treated with flex-terra product.
 All fill slopes are 2:1 and shall be covered with erosion matting or flex-terra product.

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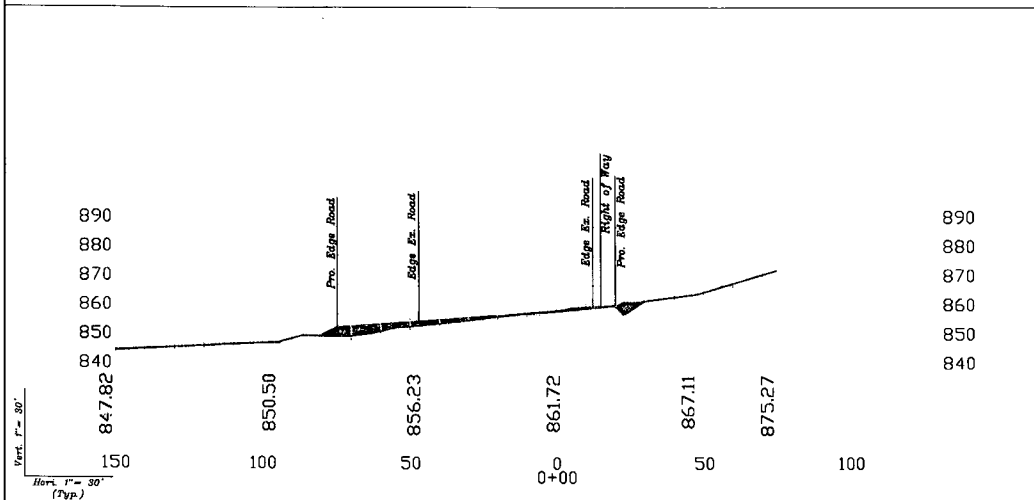
Jackson Surveying Inc.
 WV Sec. Rte. 15
 Profile & Cross-Sections
 Road Upgrade
 Sheet 7 of 8

LEGEND
 Existing Grade
 Proposed Grade
 Proposed Cut

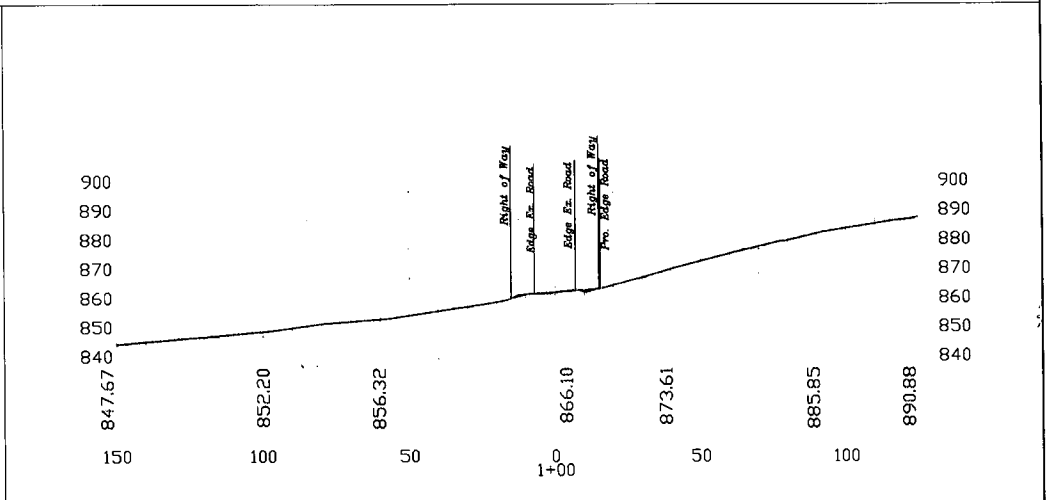
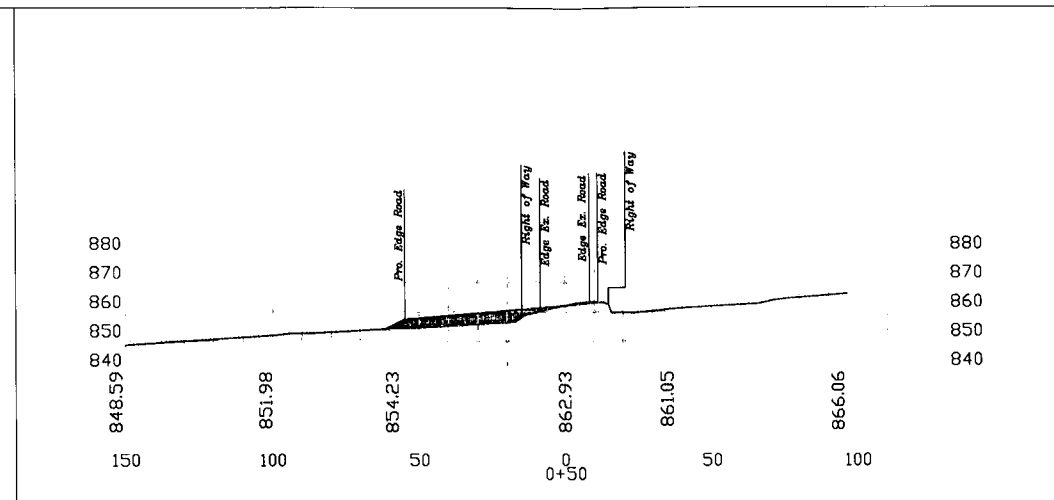


WV Sec Rte 38 Profile

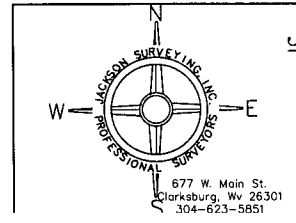
Vert. 1" = 10'
 Hor. 1" = 10'



Vert. 1" = 30'
 Hor. 1" = 30'
 (Typ.)



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Jackson Surveying Inc.
 WV Sec. Rte. 38
 Profile & Cross-Sections
 Road Upgrade
 Sheet 8 of 8