**WEST VIRGINIA**

**DEPARTMENT OF ENVIRONMENTAL PROTECTION**

**OFFICE OF ABANDONED MINE LANDS AND RECLAMATION**

---

**COUNTY**

**OF**

**BARBOUR**

---

**NAME OF PROJECT**

**PEPPER PORTALS AND DRAINAGE**

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**N O T I C E**

**ALL PAPERS BOUND WITH OR ATTACHED TO THE BID FORM ARE A NECESSARY PART THEREOF AND MUST NOT BE DETACHED**

# PROJECT SPECIFICATION BOOK

## INDEX

# ARTICLE I - DEFINITIONS

## ARTICLE I - DEFINITIONS

1.0 "Bidder" refers to the person, firm, or company offering to furnish the work called for by the specifications herein.

2.0 "Chief" shall mean the Chief of the West Virginia Department of Environmental Protection's, Office of Abandoned Mine Lands & Reclamation.

3.0 "Construction Administrator" refers to the head of the Construction Group of the Office of Abandoned Mine Lands & Reclamation of the West Virginia Department of Environmental Protection.

4.0 "Construction Supervisor" refers to the regional supervisor of the West Virginia Department of Environmental Protection, Office of Abandoned Mine Lands & Reclamation Construction Inspectors.

5.0 "Contract" refers to a purchase order placed by the West Virginia Department of Administration on behalf of the Department of Environmental Protection and accepted by the Contractor together with these specifications and all other documents incorporated therein by reference.

6.0 "Contract Documents" consist of all of the articles, sections, and attachments to the contract, including Information for Bidders, General Conditions, General Requirements, Special Conditions, drawings, specifications, all addenda issued prior to execution of the contract, and change orders and other written modifications issued after execution of the contract and executed by both parties to the contract.

7.0 "Contractor" refers to the person, firm or company contracting with the West Virginia Department of Environmental Protection to furnish the work called for in the contract.

8.0 "Director" refers to the Director of the West Virginia Department of Environmental Protection.

9.0 "DEP" means the West Virginia Department of Environmental Protection.

10.0 "Engineer" shall mean the representative of the Office of Abandoned Mine Lands & Reclamation's Engineering Section or the Architect/Engineering consulting firm, whichever designed the project.

11.0 "Inspector" shall refer to DEP's Inspector, who monitors all construction operations at the project site.

12.0 "Project" shall mean the Abandoned Mine Lands Project described and referred to by the specifications herein.

13.0 "Sub-contractor" refers to the person, firm or company contracting directly with the Contractor and not with DEP to furnish the Contractor with any portion of the work called for by the contract.

## ARTICLE I - DEFINITIONS

**14.0** **"Work" shall be understood to mean and include any and all of the labor, supervision, services, materials, machinery, equipment, tools, supplies and facilities called for by and required to complete the contract.**

# ARTICLE II - BIDDING INFORMATION

## ARTICLE II - BIDDING INFORMATION

**Sections Included:**

## ARTICLE II - BIDDING INFORMATION

### 1.0 RECEIPT & OPENING OF BIDS

**1.1 BIDS SHOULD BE SUBMITTED ON FORMS PROVIDED BY THE STATE PURCHASING DIVISION. ANY BID RECEIVED AFTER DATE AND TIME OF THE BID OPENING WILL NOT BE CONSIDERED.**

**1.2 Purchasing may consider informal any bid not prepared and submitted in accordance with the above procedure and may waive any informalities in or reject any and all bids.**

**1.3 Bid proposals containing any omission, alterations of forms, additions or conditions not called for, conditional or alternate bids (unless called for), or incomplete bid proposals may be rejected. DEP reserves the right to waive any technicalities as to changes, alterations, omissions or reservations, to the extent allowed by State Purchasing law, and recommend the award in the best interests of DEP.**

### 2.0 ELIGIBILITY REQUIREMENT OF BIDDERS

**In order for any bids to be considered or to be eligible for consideration, the bidder should first file a Vendor Registration and Disclosure Statement Form, and obtain a Vendor's Registration Number prior to award of a Purchase Order. The subject Form may be obtained from the State Purchasing Division at the above address, or by calling 304/558-2311.**

### 3.0 PREPARATION OF BID

**3.1 Each bid should be submitted on the required form and in accordance with the Purchasing Division's requirements. All blank spaces for bid prices should be completed, in ink or typewritten figures.**

### 4.0 METHOD OF BIDDING

**DEP invites the bid as indicated in the package furnished by the Purchasing Division of the West Virginia Department of Administration.**

## 5.0 QUALIFICATIONS OF BIDDERS

DEP may make such investigations as it deems necessary to determine the bidder's ability to perform the work, and the bidder shall furnish to DEP all such information and data for this purpose as DEP may request. DEP reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy DEP that such bidder is properly qualified to carry out the obligations of the contract and complete the work contemplated therein. Conditional bids will not be accepted.

## 6.0 SUB-CONTRACTS

Any person, firm or other party whom the Contractor proposes to award a sub-contract under this contract must be acceptable to DEP.

## 7.0 FORFEITURE OF BID SECURITY FOR FAILURE TO ENTER INTO CONTRACT

Should the apparent successful bidder fail or refuse to execute and deliver its required bonds for any reason within fourteen (14) days after receiving notice of the acceptance of its bid, the security deposited with its bid shall be forfeited.

## 8.0 TIME OF COMPLETION & LIQUIDATED DAMAGES

The successful bidder agrees to schedule with the DEP a Pre-Construction Conference within twenty-one (21) calendar days of the purchase order date. The successful bidder agrees to commence work on a date specified in a "Notice to Proceed" issued by the DEP and to fully complete the project within 365 calendar days from said date. Said date shall be set within ten (10) calendar days of the Pre-Construction Conference date. The Contractor must contact the DEP within 10 days of receiving the Purchase Order in order to schedule the Pre-Construction Conference. A Notice to Proceed may be delayed due to adverse weather conditions with written approval from the Construction Administrator. If the contractor fails to complete the work within the time specified in the contract, or any extension thereof, Contractor shall pay to DEP as liquidated damages the sum of two hundred and fifty dollars ($250) for each day of delay.

## ARTICLE II - BIDDING INFORMATION

### 9.0 ADDENDA & INTERPRETATIONS

9.1 No interpretation of the meaning of the plans, drawings, specifications or other pre-bid documents will be made to any bidder orally.

9.2 All addenda will be issued by the State Purchasing Division in writing to attendees of the mandatory Pre-Bid Conference. The changes contained therein are the only binding changes to the plans and/or specifications of this project.

### 10.0 CONDITIONS OF WORK

Each bidder must inspect the conditions relating to the project and the employment of labor thereon. Failure to do so will not relieve the successful bidder of any obligation to furnish all material and labor necessary to carry out the provisions of the contract. Insofar as possible, the Contractor in carrying out its work must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

### 11.0 OBLIGATIONS OF BIDDERS

At the time of the opening of bids, each bidder will have inspected the project job site, and will have read and will be thoroughly familiarized with all of the contract documents, including addenda. The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder of any obligation with respect to its bid.

### 12.0 METHOD OF AWARD

The contract shall be awarded to the lowest responsible bidder, in accordance with West Virginia Code Section 5A-3-14.

**OMB #1029-0119**
**Expiration Date: 1/31/16**

# AML CONTRACTOR INFORMATION FORM

**You must complete this form for your AML contracting officer to request an eligibility evaluation from the Office of Surface Mining to determine if you are eligible to receive an AML contract. This requirement applies to contractors and their sub-contractors and is found under OSM's regulations at 30 CFR 874.16. When possible, please type your information onto this form to reduce errors on our end. NOTE: Signature and date this form is signed must be recent (within the last month) to be considered for a current bid**

**Part A: General Information**

Business Name: _____ Tax Payer ID No.: _____
Address: _____
City: _____ State: _____ Zip Code: _____ Phone: _____
Fax No.: _____ E-mail address: _____

**Part B: Legal Structure**

( ) Corporation ( ) Sole Proprietorship ( ) Partnership ( ) LLC
( ) Other (please specify) _____

**Part C: Certifying and updating information in the Applicant/Violator System (AVS).** Select only one of the following options, follow the instructions for that option, and sign below.

*I,* _____, ***have the express authority to certify that:***
**(print name)**

1. _____Information on the **attached** Entity Organizational Family Tree (OFT) from AVS is accurate, complete, and up-to-date. If you select this option, you **must** attach an Entity OFT from AVS to this form. Sign and date below and do not complete Part D.

2. _____Part of the information on the **attached** Entity OFT from AVS is missing or incorrect and must be updated. If you select this option, you **must** attach an Entity OFT from AVS to this form. Use Part D to provide the missing or corrected information. Sign and date below and complete Part D.

3. _____Our business currently is not listed in AVS. If you select this option, you must provide all information required in Part D. Sign and date below and complete Part D.

_____ _____ _____
Date Signature Title

**IMPORTANT! In order to certify in Part C to the accuracy of existing information in AVS, you must obtain a copy of your business' Entity OFT. To obtain an Entity OFT, contact the AVS Office, toll-free, at 800-643-9748 or from the AVS website at https://avss.osmre.gov.**

**Part D.**

Contractor's Business Name: _____

If the current Entity OFT information for your business is incomplete or incorrect in AVS, or if there is no information in AVS for your business, you must provide all of the following information as it applies to your business. Please make as many copies of this page as you require.

- Every officer (President, Vice President, Secretary, Treasurer, etc.);
- All Directors;
- All persons performing a function similar to a Director;
- Every person or business that owns 10% or more of the voting stock in your business;
- Every partner, if your business is a partnership;
- Every member and manager, if your business is a limited liability company; and
- Any other person(s) who has the ability to determine the manner in which the AML reclamation project is being conducted.

Name _____ Position/Title _____
Address _____ Telephone # _____
_____ % of Ownership _____
Begin Date: _____ Ending Date: _____

Name _____ Position/Title _____
Address _____ Telephone # _____
_____ % of Ownership _____
Begin Date: _____ Ending Date: _____

Name _____ Position/Title _____
Address _____ Telephone # _____
_____ % of Ownership _____
Begin Date: _____ Ending Date: _____

Name _____ Position/Title _____
Address _____ Telephone # _____
_____ % of Ownership _____
Begin Date: _____ Ending Date: _____

PAPERWORK REDUCTION STATEMENT

The Paperwork Reduction Act of 1995 (44 U.S.C. 3501) requires us to inform you that: Federal Agencies may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. This information is necessary for all successful bidders prior to the distribution of AML funds, and is required to obtain a benefit.

Public reporting burden for this form is estimated to range from 15 minutes to 1 hour, with an average of 22 minutes per response, including time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. You may direct comments regarding the burden estimate or any other aspect of this form to the Information Collection Clearance Officer, Office of Surface Mining Reclamation and Enforcement, Room 202 SIB, Constitution Ave., NW, Washington, D.C. 20240.

# ARTICLE III - GENERAL CONDITIONS

## ARTICLE III - GENERAL CONDITIONS

**Sections Included:**

## ARTICLE III - GENERAL CONDITIONS

### 1.0 ENUMERATION OF CONTRACT DOCUMENTS

#### 1.1 Drawings

Construction drawings (25 sheets) for the reclamation of the project as prepared by for the West Virginia Department of Environmental Protection, Office of Abandoned Mine Lands and Reclamation, 601 57th Street, SE, Charleston, West Virginia 25304-2345, Telephone (304) 926-0485.

#### 1.2 Specifications

See Index

#### 1.3 Addenda

No. _____ Date _____

No. _____ Date _____

No. _____ Date _____

No. _____ Date _____

### 2.0 CORRELATION OF DOCUMENTS

2.1 The intent of the contract documents is to include all labor, materials, equipment, operations and transportation necessary for the proper execution and completion of the work. The contract documents are complementary and what is required by one is required by all.

2.2 The Contractor shall carefully study and compare the contract documents and shall at once report to DEP any error, inconsistency or omission it may discover. Contractor shall not proceed with the work affected by such error, inconsistency, or omission until resolved to the satisfaction of itself and DEP.

2.3 The drawings and specifications are correlative and shall be accepted and used as a whole and not separately. Should any item be omitted from the drawings and be included in the specifications, and be required to complete the work under the contract, it shall be executed as if shown on both and contained in both; except that it is not intended that items or work not applicable or required be provided unless it is consistent therewith and reasonably inferable therefrom as being necessary to produce the intended results.

2.4 In case of disagreement or conflict between drawings and specifications, or inconsistencies, errors, or if omissions be discovered in the drawings and specifications, or if in any part the meaning of either or both shall be considered obscure or uncertain, the Director or his/her authorized

representative shall be immediately notified thereof. No work so affected by such circumstances shall proceed until the Director or his/her authorized representative renders a decision and/or interpretation thereon. Large scale drawing details shall take precedence over drawings of lesser scale. Words and abbreviations which have well known technical or trade meanings are used in the contract documents in accordance with such recognized meanings.

## 3.0 EXAMINATION OF PREMISES

3.1 Before submitting proposals for the work, each bidder will be held to have examined the premises and satisfied itself as to the existing conditions under which it will be obliged to operate, or that will in any manner affect the work under the contract. Bidders shall have become familiar with the drawings and specifications and have compared them with existent conditions.

3.2 By executing the contract, Contractor represents that it has visited the site, familiarized itself with the local conditions under which the work is to be performed, and correlated its observations with the contract documents. No allowance will subsequently be made by reason of neglect or error on the part of the Contractor for failing to inform itself of the requirements and conditions contained herein.

## 4.0 MATERIALS & WORKMANSHIP

4.1 All installed materials and equipment shall be new, and all materials, equipment, and workmanship shall be of kind and type specified, and in all cases, be of good quality. Contractor shall, if required, furnish satisfactory evidence as to kind and quality of its materials, equipment and workmanship.

4.2 The Contractor shall provide and pay for all labor, materials, equipment operations, tools, construction equipment, and machinery, transportation, water, heat, utilities, and other facilities and services necessary for the proper execution and completion of the work. The Contractor at all times shall supply sufficient skilled and other labor necessary to adequately fulfill the requirements of the drawings and specifications, and provide for expeditious and practicable execution of the work to its completion.

4.3 The installation or application of all devices and materials shall be in accordance with the manufacturer's installation application data, shop drawings and instructions, unless otherwise provided herein.

## 5.0 GUARANTEE & MAINTENANCE

5.1 The materials and workmanship affected by the Contractor are subject to the guarantee established by custom of the respective trades. In the absence

of a trade guarantee custom or a special guarantee provision, the work, both as to the materials and workmanship, shall upon acceptance of final payment by the Contractor be considered guaranteed by the Contractor for one (1) year from the date of the acceptance of the work. Neither the final acceptance nor the final payment shall relieve the Contractor of responsibility for negligence or faulty materials, and for defects appearing within the guarantee period shall be remedied at the expense of the Contractor upon written notice.

5.2 During the one-year guarantee period, the Contractor will maintain the project to the conditions existing at the date of the acceptance of the work. Any failures due to the negligence or workmanship of the Contractor in any of the work which develop during the guarantee period shall be corrected by the Contractor at its expense.

5.3 The one-year guarantee period shall not be construed as being an extension of the performance time allotted for work under the contract.

5.4 Guarantees concerning revegetation may be further defined in the technical specifications contained herein.

## 6.0 SUPERVISION & CONSTRUCTION PROCEDURES

6.1 The Contractor shall supervise and direct the work, using its best skill and attention. It shall be responsible for all construction means, methods, techniques, and procedures, coordinating all portions of the work, and for cooperating with appropriate DEP personnel and with other contractors in every way possible.

6.2 The Contractor shall be responsible to DEP for the acts and omissions of its employees, its subcontractors and their agents or employees, and other persons performing any of the work under a contract with the Contractor.

6.3 The Contractor will be supplied with five (5) copies of the plans and specifications. It shall have available on the work site at all times one (1) copy of said plans and specifications. Additional copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

## 7.0 PERMITS, LAWS, REGULATIONS, & RIGHTS OF ENTRY

7.1 As indicated in Section 13 of the Special Provisions, the WVDEP-AML has obtained a Construction Storm Water General Permit for this project from WVDEP Division of Water and Waste Management (WVDEP DWWM). The registration for this reclamation project will be modified to include the Contractor as Co-Applicant #1, with the WVDEP-AML being Co-Applicant #2. As such, the Contractor shall assume responsibility for compliance with the terms and conditions of the permit and any future correspondence such as registration renewal invoices, inspection reports, and notices of violation shall be forwarded to the Contractor. Upon award of the contract, the Contractor shall complete a Co-Applicant #1 signature page and submit the completed form to WVDEP-AML prior to scheduling aPre-Construction Conference.

Upon receipt of the completed form, WVDEP-AML will request the WVDEP DWWM to modify the existing NPDES registration for this project to make the Contractor the Co-Applicant #1 to the permit.

The WVDEP DWWM will notify the Contractor and WVDEP-AML when the successful transfer of registration under WV/NPDES Storm Water Construction General Permit (No.WV0115924) is completed. A Notice to Proceed will not be issued until the successful transfer of registration has been completed. Once the transfer has been completed, the Contractor shall be responsible for any and all fees, violations and fines assessed against the project that are a result of the Contractor's negligence, carelessness, or failure to install permanent controls as part of the work as scheduled.

The Contractor shall apply for a Notice of Termination (NOT) from WVDEP DWWM via the Construction Storm Water website http://www.dep.wv.gov/Programs/stormwater/csw/Documents/Construction upon completion of construction activities at the site. The NOT shall be issued by WVDEP DWWM upon completion of the project. The Contractor will continue to be bound by the terms and conditions of the permit until the NOT has been approved by WVDEP DWWM. Once the project is complete, the Contractor will still bear responsibility for the NPDES registration until a NOT is received from the WVDEP DWWM.

7.2 The Contractor shall comply with all laws, ordinances, rules, orders and regulations relating to the performance of the work, the protection of adjacent property, the maintaining of passageways, guard fences, or other protective facilities.

7.3 All applicable Federal and State laws and regulations, municipal ordinances, and the rules and regulations of all public authorities having jurisdiction over construction of the project shall apply to the contract throughout, and are incorporated herein by reference.

7.4 DEP shall be responsible for obtaining all construction rights of entry for the project unless otherwise provided for in the Construction Specifications.

7.5 The Contractor agrees to indemnify and hold harmless the DEP from all liability and/or damages resulting from the Contractor's use of property for which the Contractor was to obtain rights of entry for borrow, disposal, access or other purposes. Said indemnification shall include, but is not limited to, liability and damages resulting from the Contractor's failure to obtain any or not all the right of entry; failure to utilize appropriate language in the right of entry agreements; or failure to obtain the permission and signatures of all persons or entities holding a legal interest in the subject property(ies) covered by the rights of entry.

7.6 All right of entry agreements the Contractor obtains for borrow, disposal, access or other purposes for this project shall include a provision requiring the property owner to indemnify and hold harmless the DEP for the Contractor's actions and any injury or damages whatsoever resulting from the Contractor's use of the property.

## Co-Applicant #1 Signature Page

Co-Applicant#1: _____

New and/or Modification of NPDES Storm Water of Construction Project Name: _____

BY COMPLETING AND SUBMITTING THIS APPLICATION, I HAVE REVIEWED AND UNDERSTAND AND AGREE TO THE TERMS AND CONDITIONS OF THE GENERAL PERMIT ISSUED ON DECEMBER 05, 2012. I UNDERSTAND THAT PROVISIONS OF THE PERMIT ARE ENFORCEABLE BY LAW, VIOLATION OF ANY TERM AND CONDITION OF THE GENERAL PERMIT AND /OR OTHER APPLICABLE LAW OR REGULATIONS CAN LEAD TO ENFORCEMENT ACTION.

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED ON THIS FORM AND ALL ATTACHMENTS AND THAT, BASED ON MY INQUIRING OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION. THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT.

_____ _____

(CO- APPLICANT #1 SIGNATURE) DATE

Print Name: _____

Print Title: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone Number: (____) _____ - _____

Email: _____

FEIN: _____

## 8.0 SAFETY REQUIREMENTS

8.1 Particular attention is directed to the "West Virginia Safety Code for Building Construction" as published by the West Virginia Department of Labor. Observance of and compliance with said laws, regulations and codes shall be solely with and without qualification the responsibility of the Contractor.

8.2 The Contractor, subcontractors, other contractors and all employees and workers shall comply with the provisions of the Occupational Safety and Health Act of 1970, Public Law 91-596. The Contractor shall be held liable to DEP for any health and safety infractions, on the Contractor's part, which cause DEP to receive a citation and/or fine from any local, State or Federal agency. Actual costs involved will be paid by the Contractor to the satisfaction of DEP.

## 9.0 PROTECTION OF PERSONS & PROPERTY

9.1 The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work.

9.2 Safety of Persons and Property: The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection, preventing damage, injury, or loss to:

(a) All employees on the work, and all other persons who may be affected thereby;

(b) All the work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor, or any of its subcontractors or their employees or subcontractors; and

(c) Other property on the site or adjacent thereto, including, but not limited to, paving, roadways, structures, utilities and permanent property boundaries, monuments or markers not designated for removal, or relocation, or replacement in the course of construction. Any damage to these items shall be repaired or replaced at the expense of the Contractor and to the satisfaction of DEP.

9.3 The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations, and lawful orders of any public authority, bearing on the safety of persons or property, or their protection from damage, injury, or loss.

9.4 The Contractor shall erect and maintain, as required by existing conditions and progress of the work, all reasonable and adequate safeguards for safety and protection. It shall post danger signs and provide other warnings as required against hazards and dangers to persons and property.

9.5 In case of an emergency which threatens injury, loss of life and/or damage to property, the Contractor will be permitted to act, without prior instruction from the Construction Administrator, in a diligent manner. It shall notify the Construction Supervisor immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted to the Construction Supervisor for verification and approval by the Construction Administrator.

Where the Contractor has not taken action, but has notified the Construction Administrator of an emergency threatening injury to persons or damage to the work or any adjoining property, it shall act as instructed or authorized by the Construction Administrator.

The amount of reimbursement claimed by the Contractor for work arising out of any emergency situation shall be determined by the Director or his/her authorized representative.

9.6 The Contractor shall be responsible for the verification of existing utilities that may be affected by its work in the project area. It shall be held responsible for any damage to and for maintenance and protection of existing utilities and structures during the performance of the work.

## 10.0 INSURANCE & WORKER'S COMPENSATION

### 10.1 Contractor's and Subcontractor's Public Liability, Vehicle Liability and Property Damage Insurance.

The Contractor shall maintain insurance as follows:

(a) Contractor's Public Liability Insurance and Comprehensive Vehicle Liability Insurance shall be in an amount not less than $2,000,000.00 for bodily injury and property damage for each occurrence and not less than $2,000,000.00 aggregate.

The required insurance must be written by a company or companies licensed to do business in West Virginia at the time the policy is issued and the policy must be countersigned by a licensed resident agent.

(b) Contractor shall either (1) require each of the subcontractors to procure and to maintain, during the life of its subcontract, subcontractor's Public Liability and Property Damage Insurance of the type and in the same amounts as specified in paragraph (a) above, or (2) insure the activities of its subcontractors in its own policy.

Contractor agrees to indemnify and hold harmless DEP from all liability for personal injury, including death resulting therefrom, and against all liability for property damage sustained by any person or persons, including persons employed by Contractor or subcontractors, which is caused in whole or in part by an act or omission, negligent or otherwise, of the Contractor, its agents, servants, or employees, and to assume the defense of any action brought by such persons to recover damages, and to pay all costs and expenses, including attorney's fees, incurred by DEP as result thereof.

Each party to the contract shall promptly notify the other of the assertion of any claim against which such party is held harmless pursuant to this Section, shall give such other party the opportunity to defend any such claim, and shall not settle any such claim without approval of the indemnifying party.

10.2 Proof of Carriage of Insurance.

The Contractor shall provide DEP, before work commences, with certificates issued by the insurance company or companies issuing the insurance policies required by this Section. The certificates shall show the type, amount, class of operations covered, effective dates, and dates of expiration of such policies. Such certificates shall provide that written notice shall be given to DEP prior to expiration, cancellation, or modification of any such policy, and shall contain substantially the following representation: "The insurance covered by this certificate will not be canceled, or materially modified or altered, except after ten (10) days written notice has been verified as received by the West Virginia Department of Environmental Protection".

10.3 Worker's Compensation Insurance.

All employees of the Contractor, and of subcontractors engaged in the work of this contract, shall be covered by West Virginia Worker's Compensation Insurance. Certificates shall be provided to DEP by the Contractor and subcontractors showing compliance with the Worker's Compensation Laws of West Virginia.

RTICLE III - GENERAL CONDITIONS

## 11.0 LABOR LAWS, ORDINANCES, WAGES, AND OTHER CONDITIONS

11.1 The Contractor shall obey and abide by all laws of the State of West Virginia, particularly with respect to the carrying out of public improvements.

The Contractor shall not pay less than the established prevailing minimum wage rate for each particular class of employment in the county in which the work is being performed.

11.2 During the performance of this contract, the Contractor agrees as follows:

(a) The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.
Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notice, to be provided by the contracting officer, setting forth the provisions of this nondiscrimination clause.

(b) Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color or national origin.

(c) Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, a notice, to be provided by the agency contracting officer, advising the labor union or worker's representative of the Contractor's commitments under Section 202 of Presidential Executive Order #11246 of September 24, 1965 (hereinafter "Executive Order #11246"), as amended by Presidential Executive Order #11375 and supplemented by U.S. Department of Labor regulations 41 CFR Part 60 and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(d) Contractor will comply with all provisions of Executive Order #11246, and with all of the applicable rules, regulations, and relevant orders of the U.S. Secretary of Labor (hereinafter "Secretary of Labor").

(e) Contractor will furnish all information and reports required by Executive Order #11246, and by the applicable rules, regulations and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders. These provisions shall also apply to DEP or employees of the Federal Government or their designated representatives for the purpose of making audits, examinations, excerpts, or transcriptions.

(f) In the event of the Contractor's noncompliance with these nondiscrimination clauses, this contract may be canceled, terminated, or suspended, in whole or in part, and the Contractor may be declared ineligible for further government contracts in accordance with procedures authorized in Executive Order #11246, and such other sanctions may be imposed and remedies invoked as provided in Executive Order #11246, or by rules, regulations, or orders of the Secretary of Labor, or as otherwise provided by law.

(g) The Contractor will include the provisions of these paragraphs (a) through (g) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order #11246, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontractor or purchase order as the contracting agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event the Contractor becomes involved in, or is threatened with litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor may request DEP to enter into such litigation to protect the interests of DEP.

(h) Copeland "Anti-Kickback" Act. Contractor or Subcontractor shall comply with the Copeland "Anti-Kickback" Act (18 USC 874) as supplemented in U.S. Department of Labor regulations (29 CFR Part 3). Said Act provides that each Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public works, to give up any part of the compensation to which it is otherwise entitled. The Contractor shall report all suspected or reported violations to DEP.

(i) Clean Air & Water Acts. Should the amount of this contract exceed one-hundred thousand dollars ($100,000.00), compliance will be required with all applicable standards, orders, or requirements issued under Section 306 of the Clean Air Act (42 USC 1857[h]), Section 508 of the Clean Water Act (33 USC 1368), Presidential Executive Order #11738, and Federal Environmental Protection Agency regulations (40 CFR Part 15), which prohibit the use under non-exempt Federal contracts, grants or loans of facilities included on the EPA List of Violating Facilities. Contractor shall report violations to DEP and to the U.S. EPA Assistant Administrator for Enforcement (EN-329).

(j) Energy Policy & Conservation Act. The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the State energy conservation plan issued in compliance with the Energy Policy and Conservation Act, Public Law 94-163.

(k) Access to Records. DEP, the U.S. Department of Interior's Office of Surface Mining Reclamation & Enforcement, and the U.S.Comptroller General or their duly authorized representatives shall have access to any books, papers, and records of the Contractor which are directly pertinent to that specific contract, for the purpose of making audits, examinations, excerpts, and transcriptions.

(l) Maintenance of Records. The Contractor shall maintain all required records for three (3) years after DEP processes final payments and all other pending matters are closed.

(m) Termination of Contract by DEP. This contract may be cancelled in whole or in part in writing by the Director of Purchasing, without prejudice to any other right or remedy it may have, provided that the contractor is given not less than thirty (30) calendar days written notice, (delivered by certified mail, return receipt requested) of intent to terminate.

(n) Legal Remedies. Unless otherwise provided by law or elsewhere in this contract, all claims, counter-claims, disputes and other matters in question between DEP and the Contractor arising out of, or relating to, this contract or the breach of it will be decided by arbitration if the parties mutually agree, or in a court of competent jurisdiction within the State of West Virginia.

11.3 Wages.

Attention is called to the prevailing rates of wages to be paid for labor on public improvements in Barbour County, West Virginia, as determined by the West Virginia Department of Labor. A copy of wage rates shall be posted in a conspicuous location on the job site. Copies of the wage rates are included herein, however, it is the responsibility of the Contractor to pay the wage rate in effect when the project was bid. The Contractor is to maintain and have available for inspection by DEP, upon request, certified copies of its payrolls.

The contractor/subcontractors shall pay the higher of the U.S. Department of Labor Davis-Bacon Act or the WV Prevailing wage rate as established for various county, pursuant to West Virginia Code 21-5A, Et, Seq. and 42CSR7 Rules & Regulations for the WV Prevailing Wage Act. For prevailing wage rates, please refer to http://www.sos.wv.gov

## 12.0 SUBCONTRACTORS

12.1 Unless otherwise required by the contract documents, the Contractor, as soon as practicable after award of the contract, shall furnish DEP in writing the names of subcontractors (including those who are to furnish materials or equipment fabricated to special design) proposed for performing portions of the work.

12.2 DEP reserves the right to disapprove any proposed subcontractor whose record of performance does not establish its experience, competence, and financial ability to perform the work for which it is proposed. Nothing contained in the contract documents shall create any contractual relation between any subcontractor and DEP.

## 13.0 TIME

13.1 The date of commencement of work is the date established in a written "Notice to Proceed" issued by DEP to the Contractor. The date of completion shall be the date that DEP finds the work acceptable under the contract documents and the contract fully performed.

13.2 Delays & Extensions of Time.

(a) It is agreed that if the Contractor should be unavoidably delayed in fulfilling its obligations under this contract by acts of Providence or general strikes, or by Court injunctions, or by stopping of the work by DEP because of any Contractor toward final completion of the work hereunder, DEP may require the Contractor to prepare an itemized estimate of the amount of work performed, and material and equipment stored under the contract since the date of the last preceding estimate and Application for Payment. DEP may request that the Contractor submit such estimate along with supporting documentation in the form of certified payrolls, material invoices, weight slips, and Applications for Payment. Contractor is to maintain and have available such records for inspection by DEP upon request.

(b) Upon approval by DEP of the Application and Certificate for Payment, DEP shall, as soon thereafter as practicable, process for the Contractor as a progress payment a sum equal to the contract value of the work performed since the last preceding estimate and Application for Payment in accordance with Paragraphs 14.4 and 14.5 of this Section, less the aggregate of previous payments.

(c) No Certificate for a progress payment, nor any progress payment, shall constitute acceptance or be deemed or construed as acceptance of any part of the work not in accordance with the contract documents.

(d) The Contractor warrants and guarantees that title to all work, materials, and equipment covered by an Application for Payment, whether incorporated in the project or not, will pass to DEP upon the receipt of such payment by the Contractor, free and clear of all liens.

13.3 Progress Schedule.

The Contractor, immediately after being awarded the contract, shall prepare and submit, for DEP's information, an estimated progress schedule for the work. Such progress schedule shall be related to the entire project to the extent required by the contract documents, and shall provide for expeditious and practicable execution dates of the various stages of construction and may be revised as required by conditions of work, subject to DEP's approval.

## 14.0 PAYMENTS & COMPLETION

14.1 Contract Sum.

The contract sum as stated in the Contractor's executed Contract Acceptance Form, including any authorized adjustment(s) thereto, is the total amount payable by DEP to the Contractor for the performance of the work under the contract documents.

14.2 Schedule of Values.

Before submitting its first Application for Payment, the Contractor shall submit to DEP a schedule of values allocated to the various portions of the work, prepared in such form and supported by such data to substantiate its accuracy, as DEP may require. This schedule shall be used only as a basis for the Contractor's Applications for Payment.

14.3 Progress Estimates, Applications for Payment.

(a) On the fifteenth (15th) and thirtieth (30th) day of each month during which progress has been made on the work under the contract by the Contractor toward final completion of the work hereunder, DEP may require the Contractor to prepare an itemized estimate of the amount of work performed since the date of the last preceding estimate and Application for Payment. DEP may request that the Contractor submit such estimate along with supporting documentation in the form of certified payrolls (not to include social security numbers), material invoices, weight slips, and Applications for Payment. Contractor is to maintain and have available such records for inspection by DEP upon request.

(b) Upon approval by DEP of the Application and Certificate for Payment, DEP shall, as soon thereafter as practicable, process for the Contractor as a progress payment a sum equal to the contract value of the work performed since the last preceding estimate and Application for Payment, in accordance with Paragraphs 14.4 and 14.5 of this Section, less the aggregate of previous payments.

(c) No Certificate for a progress payment, nor any progress payment, shall constitute acceptance or be deemed or construed as acceptance of any part of the work not in accordance with the contract documents.

(d) The Contractor warrants and guarantees that title to all work, materials, and equipment covered by an Application for Payment, whether incorporated in the project or not, will pass to DEP upon the receipt of such payment by the Contractor, free and clear of all liens, claims, security interests or encumbrances, and that no work, materials, or equipment covered by an Application for Payment will have been acquired by the Contractor or by any other person performing the work at the site or furnishing materials and equipment for the project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the Contractor or otherwise imposed by the Contractor or such other person.

14.4 Payments Withheld.

The Director may decline to approve an estimate or Application for Payment, to the extent necessary to protect DEP from loss because of:

(i) Unsatisfactory, unrepresentative, and unverified amounts and items included in progress estimates of Paragraph 14.3(a) above.

(ii) Unfulfilled provisions of Paragraphs 14.3(d) above.

(iii) Defective work not remedied.

(iv) Unsatisfactory performance of the work by the Contractor.

(v) Failure of the Contractor to make payments properly to subcontractors, or for labor, materials, or equipment.

(vi) Reasonable doubt that the remaining work can be completed for the unpaid balance of the contract sum.

(vii) Reasonable indication that the work will not be completed within the contract time for completion.

(viii) Third party claims filed, or reasonable evidence indicating probable filing of such claims.

(ix) Damage to another contractor.

When the above grounds under 14.4 (i)-(ix) are removed, payment shall be approved for the amounts that were withheld because of them.

14.5 Final Completion & Final Payment.

(a) Upon notice from the Contractor that the work is ready for final inspection, the Construction Supervisor will promptly make such inspection. If the Construction Supervisor upon his/her inspection finds the work acceptable under the contract documents and the contract fully performed, the Contractor shall submit a Final Estimate Application and Certificate for Payment to DEP for processing. Also, final quantity calculations shall be submitted to DEP at the final inspection conference by the Contractor.

(b) Final payment to the Contractor will be processed by DEP upon fulfillment of the provisions of the contract documents and the conditions thereof.

(c) **The processing of final payment and the processing of payment of retained percentage shall constitute a waiver of all claims by DEP except those arising from:**

(i) **Unsettled liens.**

(ii) **Faulty or defective work appearing after final completion.**

(iii) **Failure of the work to comply with requirements of the contract documents.**

(iv) **Terms of any special warranties required by the contract documents.**

(d) **The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Application for Payment. No payment, however, final or otherwise, shall operate to release the Contractor or its sureties from any obligation under the contract documents, or the Performance Bond, and the Labor and Material Payment Bond. (See 15.1 below.)**

14.6 **Application for Payment Forms.**

**Bound herewith on the following pages are sample Application and Certificate for Payment forms which the Contractor shall use in the submittal of progress estimate Applications for Payment to DEP.**

**DEPARTMENT OF ENVIRONMENTAL PROTECTION / OFFICE OF ABANDONED MINE LANDS & RECLAMATION**

AML-7
Revised 5/09

# APPLICATION AND CERTIFICATE FOR PAYMENT

Page _1_ of _____ pages

Project Name: _____

Contractor: _____

Address: _____

ATTN (AML&R Inspector): _____

Application No: _____

Application Date: _____

Performance Period From: _____ To: _____

**CHANGE ORDER SUMMARY**

| Change Order Number | Approved (date) | Additions $+ | Deductions $- |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Application is made for payment, as shown below, in connection with contract. Continuation Sheet is attached. The present status of the account for this contract is as follows:

ORIGINAL CONTRACT SUM $_____

Net Change by Change Orders $_____

CONTRACT SUM TO DATE $_____

TOTAL COMPLETED & STORED TO DATE $_____
(Column "G" on Continuation Sheet)

LESS PREVIOUS CERTIFICATES FOR PAYMENT $_____

CURRENT PAYMENT DUE $_____

Items listed hereon conform to specification, were received & are approved for payment.

Date: Signed: _____, Inspector

PO#:

P#:

Office/App

FEIN/SS#: _____

Date

FIMS Vendor #

| FUND | FY | ORG | ACT | OBJ CODE | GRANT | PROJECT |
|---|---|---|---|---|---|---|
| 8708 | 20 | | 130 | 830 | | |

% COMPLETE: (Total Completed & Stored to Date / Contract Sum to Date) x 100 = _____

Contractor: _____
Original Signature (Blue Ink)

**DEPARTMENT OF ENVIRONMENTAL PROTECTION / OFFICE ABANDONED MINE LANDS & RECLAMATION**

**AML-7A**
Revised 6/00

# CONTINUATION SHEET OF APPLICATION AND CERTIFICATE FOR PAYMENT

Project Name:_____ Application No:_____

Page ___ of ___ pages

| BID SCHEDULE PER CONTRACT | | | | UNITS THIS APPLICATION | TOTAL COMPLETED AND STORED TO DATE | |
|---|---|---|---|---|---|---|
| ITEM # **A** | DESCRIPTION **B** | UNITS **C** | UNIT BID PRICE **D** | UNITS **E** | UNITS **F** | COST **G=(DxF)** |
| | | | | | | |

**SUBTOTAL OR TOTAL**

## 15.0 SURETY BONDS

15.1 The Contractor shall provide and deliver to DEP's Buyer at the Purchasing Division of the Department of Administration at the time of execution of the contract, and prior to the performance of the work, satisfactory surety bonds in an amount of not less than one hundred percent (100%) of the contract sum which shall include a Performance Bond and Labor and Material Payment

Bond, with sureties acceptable to DEP's Buyer, for the faithful fulfillment of the contract within the time specified. Said bonds shall also save and hold harmless DEP from all liens and claims arising out of the work. The Contractor shall pay for the bonds.

15.2 In the event that the surety on any contract or payment bond given by the Contractor becomes insolvent, or is placed in the hands of a receiver, or has its right to do business in this State revoked as provided by law, the Director may at his/her election, withhold payment or any estimate until the Contractor shall give a good and sufficient bond in lieu of the bond so executed by such surety.

15.3 Power of Attorney.

Attorneys-in-Fact who execute surety bonds issued pursuant to this Section must provide with each such bond a certified and properly executed Power of Attorney.

15.4 Bond Release.

All performance bonds shall be in effect throughout the one-year guarantee period set out in Section 5.0 above. Bonds will be released upon completion of the guarantee period and acceptance of the project by DEP.

## 16.0 CHANGES IN THE WORK

16.1 Change Orders.

(a) DEP, without invalidating the contract, may order or the Contractor may request changes in the work within the general scope of the contract consisting of additions, deletions, or other revisions, the contract sum and the contract time being adjusted accordingly. All such changes in the work shall be authorized by change order, and shall be executed under the applicable conditions of the contract documents.

(b) A change order is a written order to the Contractor, properly executed as to form, issued after the execution of the contract, authorizing a change in the work or an adjustment in the contract sum or contract time. The contract sum or contract time may be changed only by a change order. A change order issued to the Contractor indicates its agreement therewith, including the adjustment in the contract sum or contract time set forth therein.

(c) The cost or credit to DEP resulting from a change in the work shall be determined in one or both of the following ways:

(i) By mutual acceptance of a lump sum properly itemized.

(ii) By unit prices stated in the contract documents or subsequently agreed upon.

(d) If none of the methods set forth in 16.1(c) above is agreed upon, or the work to be performed is agreed by DEP and Contractor to be of such nature that it cannot be estimated in advance with sufficient exactness for mutual agreement, then DEP may direct the Contractor to perform the work by change order in accordance with the following provisions, and the Contractor shall promptly proceed with the work:

(i) The work shall then be performed for an amount equal to the actual and necessary net cost to the Contractor for material and labor cost necessarily used therein, including all taxes and delivery costs for materials, all required extra costs on labor, plus cost for superintendents, power, use of tools, equipment, plant, plus the Contractor's normal charge under the contract for overhead and profit. The Contractor shall keep and present to DEP for inclusion in the change order complete itemized accounting for all materials, complete identified time and payment records for all employees, and workmen actually performing the work covered by the change order, the cost accounting of work performed by subcontractors for work covered by the change order. DEP reserves the right to require verifications of all costs covered under the change order.

(ii) The amount of credit to be allowed by the Contractor to DEP for any deletion or change which results in a net decrease in the contract sum will be the actual net cost. When both additions and credits covering related work or substitutions are involved in one change, the allowance for overhead and profit shall be figured only on the basis of the increase, if any, with respect to that change.

16.2 The Director is the only individual who can execute a change order committing DEP to the expenditure of public funds. No person other than the Director or his/her authorized representative can make any changes to the terms, conditions, contract clauses, or other stipulations of this contract.

The Contractor shall not accept any instructions issued by any person other than the Director or his/her authorized representative regarding changes in the work under the contract which affect the contract sum and/or contract time. No information, other than that which may be contained in an authorized modification to this contract, duly issued by the Director or his/her authorized representative, which may be received from any person employed by DEP or otherwise, shall be considered grounds for deviation from any stipulation of the contract.

16.3 Minor Changes in the Work.

Notwithstanding the requirements of Section 16.2 above, the Director or his/her authorized representative shall have authority to order minor changes in the work not involving an adjustment in the contract sum or an extension of the contract time and not inconsistent with the intent of the contract documents. Such changes may be affected by field order or by other written order. Such changes shall be binding on DEP and the Contractor. The Contractor shall carry out such written orders promptly.

16.4 Omissions.

DEP may omit any item or items in the contract, provided that the notice of intent to omit such item or items is given to the Contractor before any material has been purchased or labor involved has been performed, and such omission shall not constitute grounds of any claim for damages or loss of anticipated profits. DEP may omit any item or items shown the estimate, at any time, by agreeing to compensate the Contractor for the reasonable expense already incurred and to take over at actual cost any unused material purchased in good faith for use for the item or items omitted.

## 17.0 UNCOVERING & CORRECTION OF WORK

17.1 Uncovering of Work.

(a) If any work should be covered contrary to the request of DEP, it must, if required by DEP, be uncovered for its observation and be replaced at the Contractor's expense.

(b) If any other work has been covered which DEP has not specifically requested to observe prior to being covered, DEP may request to see such work and it shall be uncovered by the Contractor. If such work is found to be in accordance with the contract documents, the cost of uncovering and replacement shall, by appropriate change order, be charged to DEP. If such work is found not to be in accordance with the contract documents, the Contractor shall pay such costs unless it is found that such condition was caused by a separate contractor employed by DEP and in that event DEP shall be responsible for the payment of such costs.

17.2 Correction of Work.

The Contractor shall promptly correct all work rejected by DEP as defective or as failing to conform to the contract documents whether observed before or after final completion and whether or not fabricated, installed or completed. The Contractor shall bear all cost of correcting such rejected work. All such defective or

non-conforming work shall be removed from the site if necessary, and the work shall be corrected to comply with the contract documents at no cost to DEP. If the Contractor fails to correct such defective or non-conforming work, DEP may correct it in accordance with Section 17.3 below or Section 11.2(m) of these General Conditions.

17.3 Acceptance of Non-Conforming Work.

If DEP prefers to accept non-conforming work, it may do so instead of requiring its removal and correction, in which case a change order will be issued to reflect an appropriate reduction in the contract sum, or, if the amount is determined after final payment, it shall be paid by the Contractor.

18.0 ASSIGNMENT OF CONTRACT

Contractor shall not assign or transfer this contract or sublet it as a whole without having first obtained the written consent of DEP to do so; and it is likewise agreed that the Contractor shall not assign legally or equitably any of the moneys payable to it under the contract, or its claim thereto, without having first obtained the written consent of DEP to do so.

# ARTICLE IV - GENERAL REQUIREMENTS

# ARTICLE IV - GENERAL REQUIREMENTS

**Sections Included:**

# ARTICLE IV - GENERAL REQUIREMENTS

## 1.0 SUMMARY OF THE WORK

This Article briefly outlines and describes the work to be performed and is not intended to limit the faithful execution of the contract documents.

### 1.1 Work Included.

The scope of the work for this project, without attempting to restrict or limit the contractor's responsibility, consists of furnishing all plant, labor, materials, and equipment to construct abandoned mine drainage control structures described in the drawings and these specifications. The work shall include, but not be limited to, the following:

Elimination of the existing highwall by re-grading of the available on-site spoil; installation of a modified mine seal with associated conveyance pipe; construction of temporary and permanent fence; access road construction; construction of a gabion basket wall for ground stabilization below the access road; installation of an aggregate plug in a subsidence feature; installation of culverts and a low water crossing; construction of riprap, grouted riprap, and vegetated mat lined drainage channels; and other work associated with reclamation of the site such as erosion and sediment control, re-vegetation, and underdrains.

## ARTICLE IV - GENERAL REQUIREMENTS

### 2.0 QUALITY STANDARDS, APPROVALS

2.1 Not withstanding reference in the specifications or on the drawings to any article, item, product, material, equipment, or system by name, brand, make, or manufacturer, such reference shall be intended and interpreted as establishing a standard of quality, and shall not be taken, regarded, or construed as limiting competition.

2.2 Any article, item, product, material, equipment, or system which will perform adequately and satisfactorily the duties imposed by the general design will be considered equally acceptable to that specified or referenced, providing the article, item, product, material, equipment, or system so proposed is equal in quality, substance, design, manufacture, function and performance as that specified or referenced, and adjudged and determined to be so in the opinion of the Construction Supervisor and is approved by him/her. The approval of the Construction Administrator is required before purchase and installation.

2.3 Approvals.

Where the term "of approved manufacture" appears in the specifications, or an "approved" or "approved as equal" article or item is referred to, it shall mean that the article, item, workmanship, or material must meet the approval of the Construction Supervisor.

### 3.0 SUPERINTENDENTS, COORDINATION

3.1 Superintendents.

The Contractor shall employ and keep a competent superintendent and assistants who shall be capable of effective communication as required on the job at all times and who shall give efficient supervision to the work, using his/her best skill and attention, and shall have knowledge and control of all trades. The superintendent shall be acceptable to the Construction Supervisor and shall not be changed without the Construction Supervisor's knowledge and consent. The Contractor also shall see that each respective sub-contractor provides a competent foreman for each trade.

3.2 Coordination.

The Contractor and each sub-contractor shall coordinate the work and operations and shall cooperate with and assist each other on the job for the successful execution of the work within trade jurisdictional rulings. Each shall study all drawings and specifications and shall perform all work which properly comes under jurisdiction of the trade he/she represents.

### 4.0 PROJECT MEETINGS AND CONFERENCES

4.1 The following meetings shall be scheduled and held prior to commencement of the project and during execution of the work. DEP will schedule such

meetings and advise all parties concerned by written notice of the date, time, and location of such meetings.

(a) Pre-Bid Conference. Conference with Engineer, bidders and appropriate DEP personnel as necessary, and others directly concerned for explanation of bidding and contract documents, project site familiarization as required, and for answering questions pertinent to the project. Attendance by bidders is mandatory in order to be eligible to bid on the project.

A date and time will be set for the on-site mandatory Prebid Conference. All interested parties are required to attend this meeting. Failure to attend the mandatory pre-bid shall result in disqualification of the bid. No one person may represent more than one bidder.

An attendance sheet will be made available for all potential bidders to complete. This will serve as the official document verifying attendance at the mandatory pre-bid. Failure to provide your company and representative name on the attendance sheet will result in disqualification of the bid. The State will not accept any other documentation to verify attendance. The bidder is responsible for ensuring they have completed the information required on the attendance sheet. The Purchasing Division and the state agency will not assume any responsibility for a bidder's failure to complete the pre-bid attendance sheet. In addition, we request that all potential bidders include their e-mail address and fax number.

All potential bidders are requested to arrive prior to the starting time for the pre-bid. Bidders who arrive late, but prior to the dismissal of the technical portion of the pre-bid will be permitted to sign in. Bidders who arrive after conclusion of the technical portion of the pre-bid, but during any subsequent part of the pre-bid will not be permitted to sign the attendance sheet.

(b) Pre-Construction Conference. Conference with Engineer, appropriate DEP personnel, Contractor, Sub-Contractors, and others directly concerned, after award of the contract and prior to commencement of construction, for discussion of the project, contract documents, scheduling, and for resolving questions concerning project execution and administration as required.

(c) Project Meetings. Meetings shall be held at periodic intervals throughout the construction contract period for discussion of matters pertinent to the execution and administration of the project. The Construction Administrator, Engineer, Construction Supervisor, Inspector, Contractor and/or its Superintendent, Subcontractors, Project Foremen, as required, and others directly concerned, as necessary, shall attend the meetings.

## 5.0 AUTHORITY & DUTIES OF INSPECTORS

5.1 The Inspector, as the Director's authorized representative, is authorized to make minor field changes to the plans and specifications that do not involve an increase or decrease in the contract sum or an increase or decrease in the contract time. The Inspector shall be authorized to inspect all work done, all material furnished, payroll records of personnel, material invoices and relevant data and records of the work, and the preparation, fabrication, or manufacture of the materials to be used. The Inspector is not authorized to revoke, alter, or waive any requirements of the plans and specifications that result in an increase or decrease in the amount of compensation due the Contractor or an increase or decrease in the contract time. The Inspector is authorized to call to the attention of the Contractor any failure of the work or materials to conform to the plans and specifications. The Inspector shall have the authority to reject materials or suspend the work until any questions at issue can be referred to and decided by the Construction Administrator.

5.2 The Inspector shall in no case act as foreman or perform other duties for the Contractor, nor interfere with the management of the work by the Contractor. Any advice which the Inspector may give the Contractor shall in no way be construed as binding the Construction Administrator in any way, or releasing the Contractor from fulfilling all of the terms of the contract.

5.3 If the Contractor refuses to suspend operations on verbal order, the Inspector shall issue a written order giving the reason for ordering the work to stop. After placing the order in the hands of the person in charge, the Inspector shall immediately leave the job, and the Contractor shall cease all operations.

## 6.0 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

### 6.1 Definitions.

(a) "Shop drawings" are drawings, diagrams, schedules, and other data, prepared for the project by the Contractor, Sub-contractor, manufacturer, or supplier, to illustrate and/or install some portion of the work.

(b) "Product data" are illustrative data, brochures, schedules, catalog cuts, charts, informative material and specifications to illustrate materials, articles, items, or products for use in some portion of the work.

(c) "Samples" are physical examples which show and illustrate materials, finishes, equipment or workmanship of products proposed for use in some portion of the work.

### 6.2 Submittals.

(a) The Contractor shall review, approve, and submit to the Construction Administrator with reasonable promptness, and in such sequence to cause no delay in the work, all shop drawings, product data, and samples required by the contract documents.

(b) No shop drawings, product data, or samples shall be submitted to the Construction Administrator except by the Contractor, who shall, before submission, verify all materials, check all details, measurements, verify all field measurements and field construction conditions, and other job coordination requirements. Upon review, check, and approval by the Contractor, the Contractor shall place its stamp of approval thereon before submitting to the Construction Administrator.

(c) The Contractor shall not be relieved of responsibility for any deviation from the requirements of the contract documents by the Construction Administrator's approval of shop drawings, product data, or samples, nor shall it be relieved of responsibility for errors or omissions therein.

(d) Shop drawings, product data, and samples shall be submitted in sufficient number for all approvals, with a minimum of two (2) copies or samples being retained by the Construction Administrator, and a number of copies and samples being retained by the Contractor as required for the execution of its work.

(e) No portion of the work requiring submission of a shop drawing, product data, or sample shall be commenced until the submittal has been approved by the Construction Administrator. All such portions of the work shall be in accordance with approved submittals.

(f) Shop drawings, product data, and samples shall be submitted for work, systems, articles, items, and equipment as specified. Other additional shop drawings, product data, and samples as may be requested for the work by the Construction Administrator shall be submitted to him/her for approval.

## 7.0 MEASUREMENTS, MANUFACTURER'S DIRECTIONS

### 7.1 Measurements.

Before ordering any material, product, article, or doing any work, the Contractor shall take all necessary measurements at the project and shall be responsible for the correctness of same. No extra charge or compensation will be allowed on account of differences between actual dimensions and the dimensions indicated on the drawings. The Construction Administrator shall be notified of any differences found and work shall not proceed thereon until the Construction Administrator has rendered a decision.

### 7.2 Manufacturers' Directions.

All manufactured articles, items, products, material, and equipment shall be applied, installed, connected, erected, used, cleaned, conditioned and put into operation or use as directed by the manufacturer's printed instructions, unless specified otherwise herein. The Contractor shall be responsible for obtaining all such instructions.

### 7.3 Measurement of Quantities.

The Contractor shall be responsible for providing all necessary volumetric and weight measurement equipment necessary to measure quantities accurately for payment of contract unit items, and said equipment shall be subject to the Construction Administrator's approval. Volume and weight measurements shall be submitted to the Construction Administrator for approval.

## 8.0 LINES, LEVELS, GRADES, LAYOUT

### 8.1 Lines, Levels, Grades.

(a) Control points have been established in the field and are shown on the plans whereby the Contractor can properly control the work contracted for under these specifications. Such stakes and markings which the Engineer may have set for either his/her own guidance shall be scrupulously preserved by the Contractor, or its employees. If any

action by the Contractor should result in the destruction of such stakes or markings, an amount equal to the cost of replacing same may be deducted from subsequent estimates due the Contractor at the discretion of the Construction Supervisor. The Contractor shall satisfy itself as to the accuracy of all measurements before constructing any permanent structure and shall not take advantage of any errors which may have been made in laying out the work. Should any discrepancies become evident between the plans and the Contractor's field survey, the Contractor shall immediately notify the Inspector. If these discrepancies will create a change in any item in the Contractor's accepted final bid, the DEP reserves the right to re-design or negotiate. Should the Contractor fail to make notification of these discrepancies, DEP will not be held liable for any changes in the original quantities.

(b) The Contractor shall make all field measurements necessary for its work and shall be responsible for the accuracy of all dimensions, lines, levels, and grades. If a survey is required, it shall be performed at the expense of the Contractor. All survey work shall be performed by a West Virginia Registered Civil Professional Engineer or Licensed Land Surveyor who shall certify as to the accuracy of the survey to DEP.

## 9.0 DOCUMENTS, SHOP DRAWINGS, ETC., AT THE SITE

9.1 The Contractor shall maintain at the project site for DEP one (1) record copy of all drawings, specifications, addenda, change orders, and other modifications, in good order, marked currently to record all changes made during construction, and all approved shop drawings, product data, and samples, properly filed and referenced. All such documents and samples shall be delivered to the Construction Supervisor upon completion of the work.

9.2 The Contractor shall furnish the Inspector in writing two (2) sets of daily reports showing all personnel (by classification), equipment, and tools engaged in the work, for use in accounting records.

9.3 The Contractor shall be responsible for submitting a daily activity summary which shall be used to report progress of the various construction activities performed at the subject site. The summary report shall be submitted to the Inspector on a weekly basis on the prescribed forms. Processing invoices may be delayed if summary reports are not submitted.

## 10.0 STORAGE OF MATERIALS

10.1 The Contractor, under and with the approval, supervision, and direction of DEP, shall assume full charge of the area or areas of the project premises allocated for the storage of materials and equipment as required, allocating the necessary site space to any sub-contractor(s) for storage sheds and space for the storage of materials and equipment. Such arrangement of storage facilities

shall be orderly, convenient, shall not obstruct movement on the site, the work of others, or construction operations. All storage sheds, enclosures, and facilities shall fully protect the stored materials. The Contractor shall arrange with appropriate landowner(s) for any storage areas located outside of the project limits and such storage areas shall also be subject to DEP's approval.

10.2 All materials subject to damage by moisture, water, or weather shall be fully protected. All flammable, toxic, and explosive materials shall be safely stored in conformity with applicable safety requirements of State and Federal regulations and safety standards of the National Fire Protection Association.

## 11.0 PROTECTION OF WORK; DAMAGES

### 11.1 Protection and Replacement of Work.

(a) The Contractor shall protect its work from damage of any kind until completion of construction. Each contractor or sub-contractor shall adequately protect all preceding work from damage caused by it or its work. Should any part of the construction be subject to freezing or exposure to the elements, the same shall be fully protected to prevent damage.

(b) The Contractor and each sub-contractor shall provide protection against weather, frost, freezing, storms, and heat, to maintain all work, materials, installations, and equipment safe from injury and damage. The Contractor shall provide temporary covering and closures in the construction as required to protect it from damage by weather, until permanent construction provides such protection.

(c) Damaged or defective work must be replaced; all other work injured or damaged in the replacing of such work or in any way incidental thereto must be brought back to its original condition or replaced by the Contractor performing the work, without additional cost to DEP.

### 11.2 Damages to Existing Work.

All masonry damage, glass breakage, and other damage caused to existing buildings and appurtenances by the Contractor or by other contractors in the performance of work shall be properly replaced or repaired at the option of DEP, without additional cost to DEP.

## 12.0 TEMPORARY FACILITIES

### 12.1 Job Utilities.

(a) General. All concerned with providing temporary utilities for use on the project are advised to determine locations of sources of supply and the conditions under which services can be brought to points of use on the site.

(b) Drinking Water. The Contractor shall arrange for drinking water and containers to be provided on the site.

(c) Utility Connections. The Contractor is to furnish power, gas, compressed air and any other utilities required for its own use during construction. The Contractor shall remove all temporary wiring, switches, lights, piping and connections to service facilities used during construction. Such connections shall not be made without approval of the Inspector.

(d) Temporary Supports. The Contractor shall provide such temporary supports as may be required during construction, including those necessary to ensure the stability of the proposed excavation.

(e) Equipment. The Contractor shall furnish all special apparatuses, welding machines, air compressors, hoisting equipment, tools, implements, cartage, scaffolding, ladders, planks, acetylene gas, oxygen gas, expendable materials, temporary light and heat, construction materials, shims and all other materials that may be required for the proper execution of the work.

(f) Temporary Buildings. The Contractor will furnish, place, and equip, at its own expense, and as it deems necessary, any portable construction building(s) such as a trailer, storage sheds or chemical sanitary facilities. These portable facilities must be within the designated project limits; otherwise, the Contractor is solely responsible for making necessary arrangements with the proper landowner when the buildings are set up outside of the project limits. The type and number of buildings are subject to the approval of the Inspector. All written instructions, orders, and other communication delivered to the temporary construction office set up on the site shall be considered as having been delivered to the Contractor itself. The Contractor shall provide and pay for its own fire protection, watchman, temporary utility hookups, etc. The Contractor will promptly remove from the project any office facilities, equipment or materials when so instructed by the Inspector.

(g) Sanitation Facilities. The Contractor shall provide and pay for adequate temporary toilet facilities for personnel during the project construction period. Toilets shall be of types approved by DEP and the State Division of Health, and situated only in approved locations. The Contractor shall be responsible for operation and sanitary maintenance of the temporary toilets and shall have them removed upon completion of construction.

## ARTICLE IV - GENERAL REQUIREMENTS

### 13.0 CONSTRUCTION SIGN

**13.1 Work Required.**

The work to be performed under this Section consists of providing all labor, material and equipment necessary to install a project sign as indicated on the detail included herein and as specified herein.

**13.2 Materials.**

(a) Paint. Paint for the project sign shall be one (1) coat Exterior-Grade Wood Primer-Sealer, and two (2) coats Exterior Grade Low-Sheen Enamel by Glidden or another approved manufacturer.

(b) Wood. Sign face shall be 3/4" Marine Exterior plywood, and posts and cross-brace shall be No. 2 Grade Pine or Fir, kiln dried and treated.

(c) Hardware:

(1) All hardware shall be manufactured from good, commercial-quality material and meet all applicable ASTM standards.

(2) Spikes and nails shall be common wire-type and shall meet AISI steel specifications 1010 or 1020.

(3) All hardware shall be hot-dip galvanized in accordance with ASTM A-153.

**13.3 Execution.**

(a) Project Sign. The sign board shall be cut to the dimensions shown on the detail herein. The sign shall painted with one (1) coat of primer and two (2) coats of white enamel. All exterior cut edges shall be smooth sanded prior to painting. All edges shall be double primed. The letters, border and strips shall be painted as shown on the detail drawing. Posts and cross-brace shall be painted with two (2) finished coats of brown enamel.

The Contractor shall bolt the sign to posts and provide required cross-bracing. The posts and sign shall be erected and posts set in gravel base, as shown on the drawings. One (1) sign is required and is to be located at the discretion of the Inspector.

(b) Payment. Payment for the work which shall include installation of the project sign shall be part of the lump-sum bid for "Mobilization".

# STATE OF WEST VIRGINIA
# DEPARTMENT OF ENVIRONMENTAL PROTECTION

## Office of Abandoned Mine Lands & Reclamation

Earl Ray Tomblin
Governor

dep

Randy C. Huffman
Cabinet Secretary

AML

Robert Rice
Chief

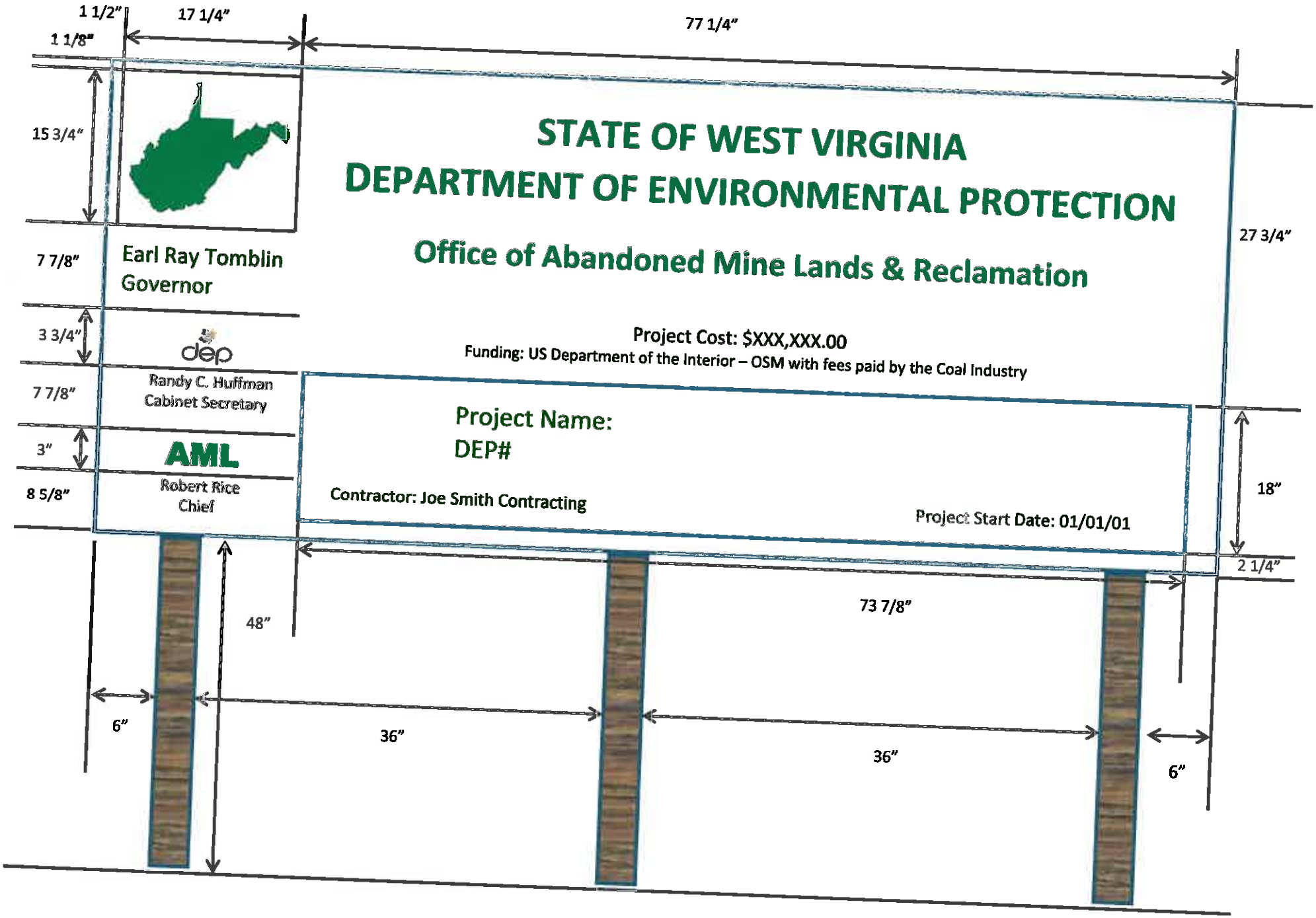
Project Cost: $XXX,XXX.00

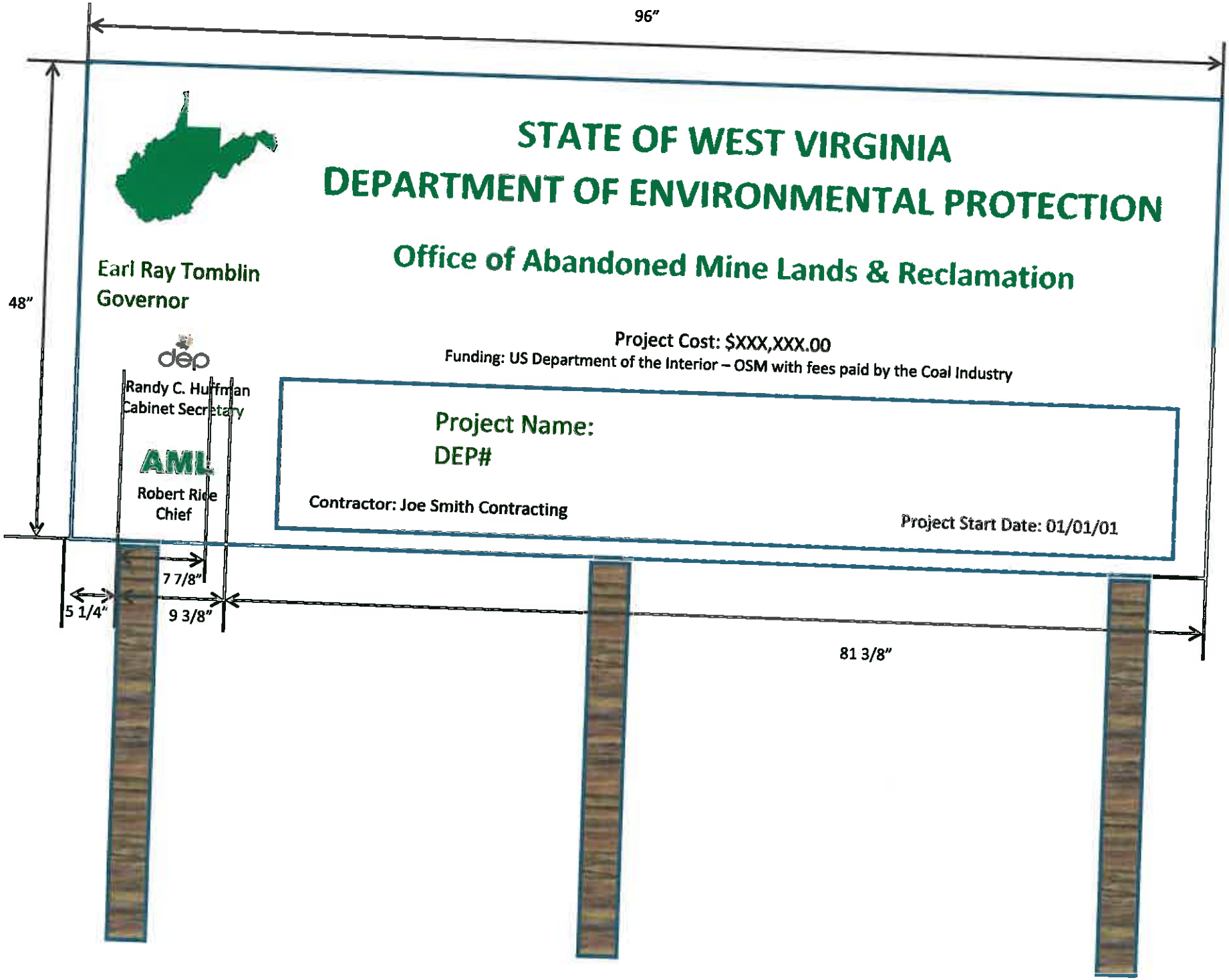
Funding: US Department of the Interior – OSM with fees paid by the Coal Industry

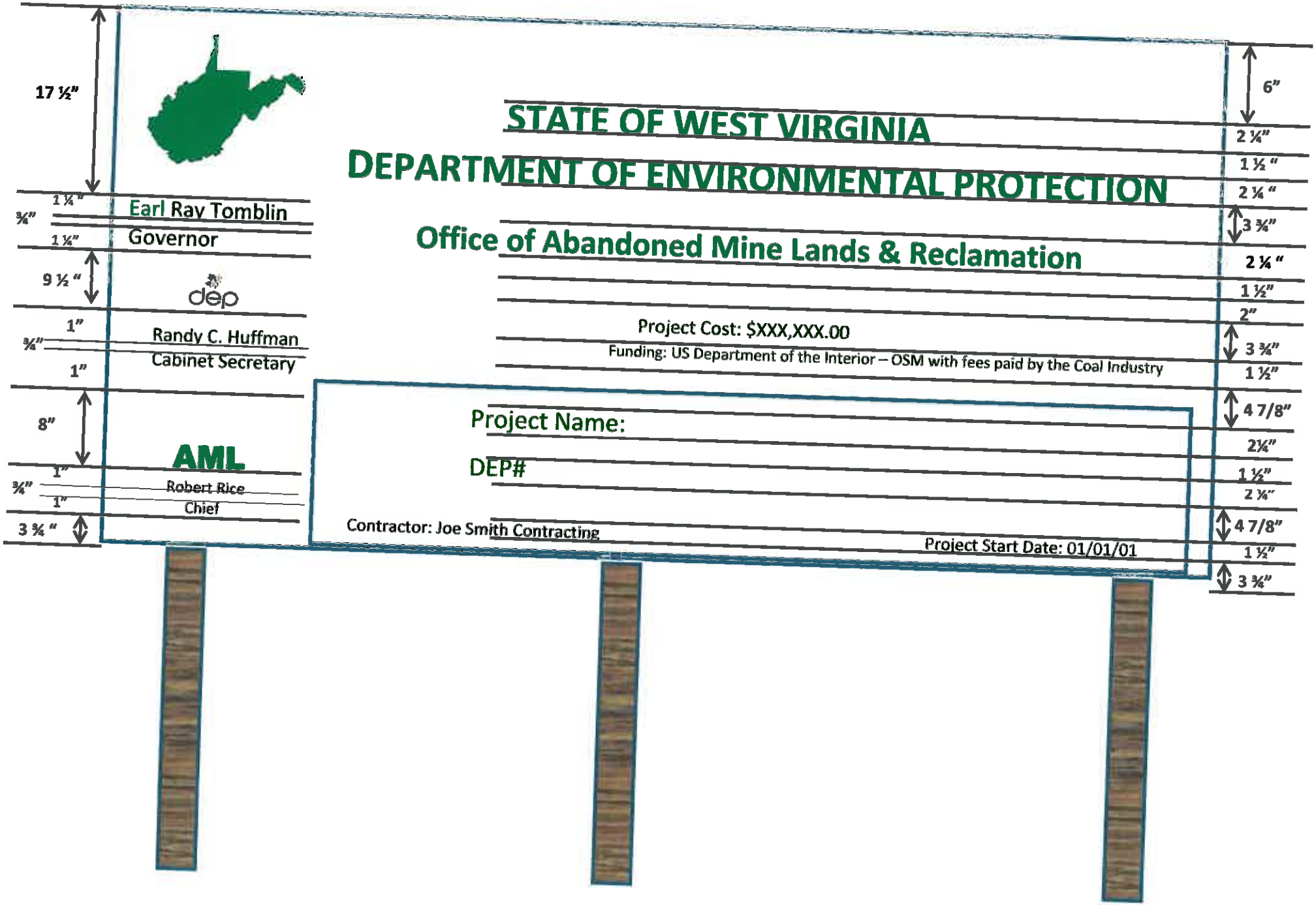
Project Name:
DEP#

Contractor: Joe Smith Contracting

Project Start Date: 01/01/01

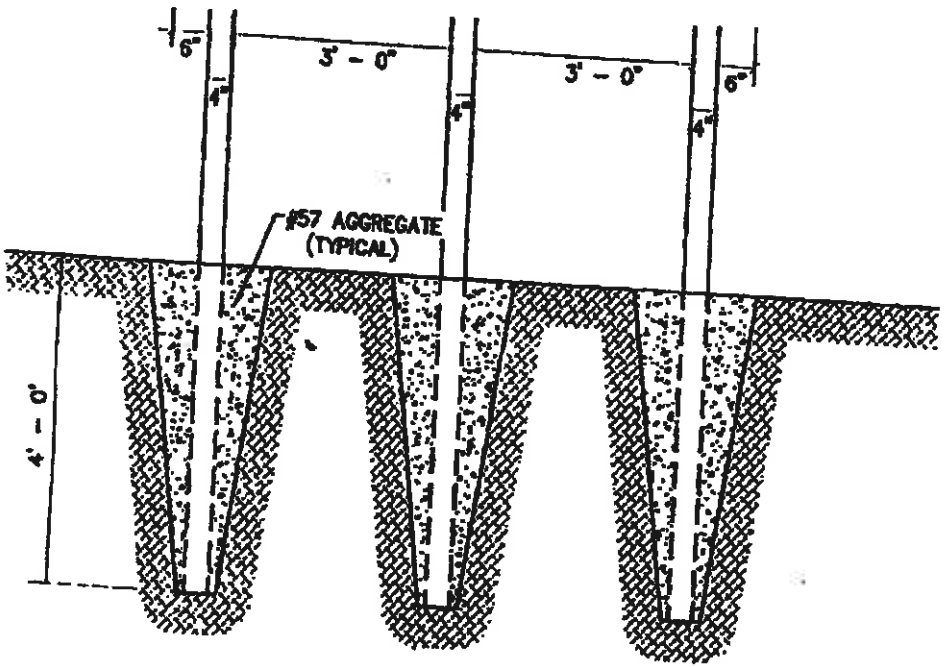

1 1/2"
1 1/8"
17 1/4"
77 1/4"
15 3/4"
27 3/4"
7 7/8"
3 3/4"
7 7/8"
3"
8 5/8"
STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Office of Abandoned Mine Lands & Reclamation
Earl Ray Tomblin
Governor
dep
Randy C. Huffman
Cabinet Secretary
AML
Robert Rice
Chief
Project Cost: $XXX,XXX.00
Funding: US Department of the Interior – OSM with fees paid by the Coal Industry
Project Name:
DEP#
Contractor: Joe Smith Contracting
Project Start Date: 01/01/01
18"
2 1/4"
48"
73 7/8"
6"
36"
36"
6"

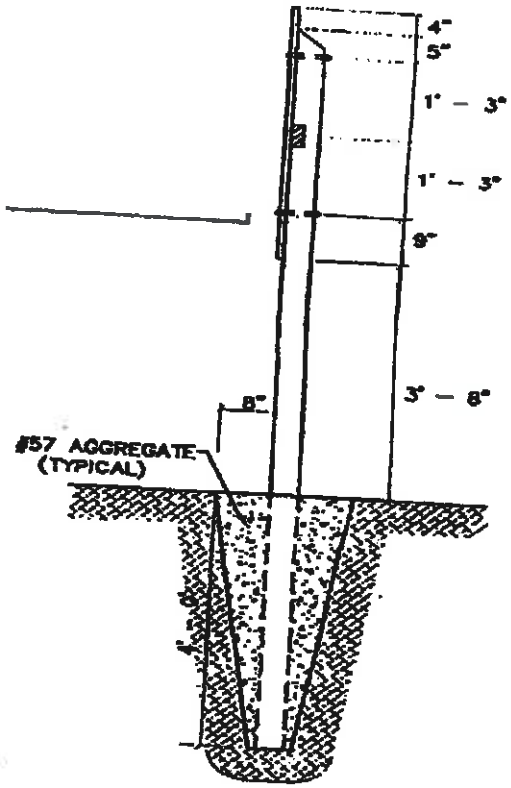

96"
48"
STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Office of Abandoned Mine Lands & Reclamation
Earl Ray Tomblin
Governor
dep
Randy C. Huffman
Cabinet Secretary
AML
Robert Rice
Chief
Project Cost: $XXX,XXX.00
Funding: US Department of the Interior – OSM with fees paid by the Coal Industry
Project Name:
DEP#
Contractor: Joe Smith Contracting
Project Start Date: 01/01/01
7 7/8"
5 1/4"
9 3/8"
81 3/8"


17 ½"
1 ¼"
¾"
1 ¼"
9 ½ "
1"
¾"
1"
8"
1"
¾"
1"
3 ¾ "
Earl Ray Tomblin
Governor
dep
Randy C. Huffman
Cabinet Secretary
AML
Robert Rice
Chief
STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Office of Abandoned Mine Lands & Reclamation
Project Cost: $XXX,XXX.00
Funding: US Department of the Interior – OSM with fees paid by the Coal Industry
Project Name:
DEP#
Contractor: Joe Smith Contracting
Project Start Date: 01/01/01
6"
2 ¼"
1 ½ "
2 ¼ "
3 ¾"
2 ¼ "
1 ½"
2"
3 ¾"
1 ½"
4 7/8"
2¼"
1 ½"
2 ¼"
4 7/8"
1 ½"
3 ¾"

**Notes:**

1. **Sign board to be ¾" by 4'X 8' marine plywood.**
2. **Sign board color is to be white and letter colors are to be dark green and sized as shown on the detail.**
3. **2"X 4" treated cross brace let into posts.**
4. **Mount sign to posts using 3/8"X 5" galvanized carriage bolt.**
5. **Posts are to be treated 4"X 4"X 12' and panted brown.**
6. **Location determined by WVDEP.**



## ARTICLE IV - GENERAL REQUIREMENTS

### 14.0 CLEANING & FINAL CLEAN-UP

#### 14.1 Housekeeping - Periodic Cleaning.

The Contractor shall at all times keep the construction site free of accumulations of waste materials and rubbish caused by its operations. Periodically during the progress of the work, and also when directed to do so by DEP, the Contractor shall remove, or cause to be removed by sub-contractors responsible, accumulated waste materials, rubbish, and debris, and leave the construction area in good order.

#### 14.2 Final Clean-Up.

The Contractor at all times shall dispose of all debris and waste resulting from work at the Contractor's dump site. The Contractor shall not put or spill any materials into any drainage system which would pollute area streams or waterways. The Contractor shall be liable for any stream pollution caused directly or indirectly by its own employees or those of it sub-contractors.

#### 14.3 DEP's Right to Clean-Up.

Should disputes arise between Contractor and separate contractors, or sub-contractors as to responsibilities for cleaning-up, and refusals to do so result therefrom, DEP may perform the clean-up and charge the cost thereof to the Contractor, the contractors, or sub-contractors responsible therefor, as DEP shall determine fair and just.

### 15.0 TESTING.

#### 15.1 When Testing Required.

Testing shall be performed as required by the specifications or ordered by the Construction Administrator in writing. The Construction Administrator will determine the need, location, extent, and time of any testing herein specified, or in addition to that which is herein specified.

#### 15.2 Payment for Testing.

The Contractor shall select an independent testing laboratory or utilize a laboratory run by the Contractor, to perform all testing for compaction, concrete, and soils as specified herein. All laboratory reports must be signed by a registered professional engineer. The Contractor shall be responsible for testing payments as an incidental to the various items of the bid schedule. If the Contractor allows work to proceed beyond a testing point resulting in the disassembly of structures or the uncovering of work for testing, payment for such will be the responsibility of the Contractor at no extra cost to DEP.

## ARTICLE IV - GENERAL REQUIREMENTS

### 16.0 PROJECT COMPLETION - CERTIFICATES

16.1 All certificates of testing, quality, compliance, and performance, as required, requested, and/or specified, shall be delivered to DEP upon delivery or completion of the work covered by the certificates.

16.2 All certificates of approval, compliance, and completion as required by codes, inspection and regulatory agencies, and local, State and Federal governmental authorities, shall be delivered to DEP upon completion of the work and inspections covered by such certificates.

16.3 The contractor shall submit to the WVDEP as built drawings certified by a Registered Professional Engineer identifying all changes occurring on the project. The drawings shall be of professional quality. Unsuitable drawings will be returned for revisions. These drawings shall be approved by WVDEP prior to scheduling a Final Inspection.

## DEPARTMENT OF ENVIRONMENTAL PROTECTION
## OFFICE OF ABANDONED MILE LANDS & RECLAMATION

Report for Week Ending:_____ Project Name:_____
By:_____ Location:_____
Title:_____ Contractor:_____

Daily Activity Summary

| | |
|---|---|
| **Sunday** | |
| **Monday** | |
| **Tuesday** | |
| **Wednesday** | |
| **Thursday** | |
| **Friday** | |
| **Saturday** | |

**DEPARTMENT OF ENVIRONMENTAL PROTECTION**
**OFFICE OF ABANDONED MILE LANDS & RECLAMATION**

Weekly Quantity Summary

Report By: _____ For Week Ending: _____

| Pay Item | Units | Quantity Performed |
|---|---|---|
| | | |
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Attach any sheets applicable to this weeks work and check appropriate box.

Change Orders ☐
Test Results ☐
Other (explain) ☐

Field Changes ☐
Explanation of work stoppages not due to weather ☐

# ARTICLE V - SPECIAL CONDITIONS

## ARTICLE V - SPECIAL CONDITIONS

**Sections Included:**

## ARTICLE V - SPECIAL CONDITIONS

### 1.0 USE OF MINORITY, WOMEN'S, & SMALL BUSINESS ENTERPRISES

**1.1 Should the Contractor intend to sublet a portion of the work on this project, it shall seek out and consider minority, women's, and small business enterprises as potential sub-contractors. The Contractor shall contact minority, women's, and small businesses to solicit their interest, capability, and prices, and shall retain proper documentation to substantiate such contacts.**

**1.2 The Contractor will sign and provide the enclosed Minority, Women's and Small Business Affirmative Action Certification to DEP along with the name(s) of any subcontractor(s) it submits for approval.**

**WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION**
**CONSTRUCTION CONTRACTOR'S**
**MINORITY, WOMEN'S AND SMALL BUSINESS**
**AFFIRMATIVE ACTION CERTIFICATION**

**We, _____, the undersigned, Construction Contractor on the Abandoned Mine Lands & Reclamation construction contract herein, intending to sub-contract a part of our contract work under Requisition No. _____, hereby certify as follows:**

1) **We will include qualified small, minority and women's businesses on solicitation lists;**

2) **We will assure that small, minority and women's businesses are solicited whenever they are potential sources;**

3) **We will, when economically feasible, divide total requirements into smaller tasks or quantities so as to permit maximum small, minority and women's business participation.**

4) **Where our requirements permit, we will establish delivery schedules which will encourage participation by small, minority and women's businesses.**

5) **We will utilize the services and assistance of the Small Business Administration, the Office of Minority Business Enterprise of the Department of Commerce and the Community Services Administration as required.**

**We understand that we may obtain the information required under the foregoing provisions from the Governor's Office of Community & Industrial Development's Small Business Development Center, 1115 Virginia Street, East, Charleston, West Virginia 25301, Phone 304/348-2960.**

6) **We will submit this certification to the Construction Supervisor when we submit proposed subcontractors for approval.**

7) **We agree that all documentation relative to affirmative action taken by us to seek out and consider the use of minority, women's and small business enterprises as sub-contractors shall be made available for inspection by representatives of the West Virginia Department of Environmental Protection and the U.S. Office of Surface Mining Reclamation and Enforcement;**

8) **This certification is an integral part of our proposal for the construction contract.**

**Signed this _____ day of _____, 20___ .**

_____
**Signature of Authorized Representative**

_____
**Title**

## ARTICLE V - SPECIAL CONDITIONS

### 2.0 EROSION & SEDIMENT CONTROL

**The manual entitled "West Virginia Department of Natural Resources Technical Handbook of Standards and Specifications for Erosion and Sediment Control", 1981, is incorporated herein by reference as a guide for erosion and sediment control, except that where any provision of said manual is in conflict with any special erosion and sediment control provision set out and contained in this specification book and/or in the plans for this project, the specification book and/or plans shall prevail and be followed.**

**ASSURANCE REQUIREMENT REGARDING EQUAL EMPLOYMENT OPPORTUNITY FOR VENDORS, SUPPLIERS AND CONTRACTORS ENGAGED IN COMMERCIAL TRANSACTIONS WITH THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION**

**We, _____, the undersigned, desiring to avail ourselves of the benefits of engaging in commercial transactions with the West Virginia Department of Environmental Protection, hereby agree that:**

1) **All employment and personnel practices under this contract, Requisition No. _____, will be conducted without regard to race, sex, religion or national origin;**

2) **We will include in all recruitment advertisements the following wording:**

   **"An Equal Opportunity Employer"; and**

3) **We will provide the Director of the Abandoned Mine Lands and Reclamation Division or his/her authorized representative, upon request, documentation that will enable him/her to judge the extent of our compliance with the requirements of Governor's Executive Order No. 4-65, of December 15, 1965.**

**Signed this ____ day of _____, 20___.**

_____

**Signature of Authorized Representative**

_____

**Title**

## ARTICLE V - SPECIAL CONDITIONS

## 3.0 GOVERNMENT-WIDE DEBARMENT & SUSPENSION REQUIREMENTS

### U. S. Department of the Interior

### Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion

### Lower Tier Covered Transactions

---

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms "covered transaction," "debarred", "suspended", "ineligible", "lower tier covered transaction", "participant", "person", "primary covered transaction", "principal", "proposal", and "voluntarily excluded", as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction originated.

6. The prospective lower tier participant further agrees by submitting this proposal, that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Non procurement List (Tel.#).

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 6 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

## U. S. Department of the Interior

## Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion

## Lower Tier Covered Transactions

---

**This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 43 CFR Part 12, Section 12.510, Participants' responsibilities. The regulations were published as Part VII of the May 26, 1988 Federal Register (pages 19160-19211). For assistance in obtaining a copy of the regulations, contact the U.S. Department of the Interior, Acquisition and Assistance Division, Office of Acquisition and Property Management, 18th and C Streets, N.W., Washington D.C. 20240.**

**(1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.**

**(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.**

_____

**Name and Title of Authorized Representative**

_____

**Signature** **Date**

## ARTICLE V - SPECIAL CONDITIONS
### Instructions for Certification Regarding Lobbying

1. This certification and a disclosure form should be filed by each person as required, with each submission that initiates agency consideration of such person for: (1) award of a Federal contract, grant, or cooperative agreement exceeding $100,000 or (2) an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

2. This certification and a disclosure form should be filed by each person as required, upon receipt by such person of (1) a Federal contract, grant, or cooperative agreement exceeding $100,000, or (2) a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000, unless such person previously filed a certification, and a disclosure form, if required, at the time agency consideration was initiated.

3. Any person who requests or receives from a person referred to in paragraphs (1) and (2) above: (1) a subcontract exceeding $100,000 at any tier under a Federal contract; (2) a subgrant, contract, or subcontract exceeding $100,000 at any tier under a Federal grant; (3) a contract or subcontract exceeding $100,000 at any tier under a Federal loan exceeding $150,000; or (4) a contract or subcontract exceeding $100,000 at any tier under a Federal cooperative agreement, shall file a certification, and a disclosure form, as required, to the next tier above.

4. All disclosure forms, but not certifications, shall be forwarded from tier to tier until received by the person referred to in paragraphs(1) or (2) above. That person shall forward all disclosure forms to the appropriate Bureau/Office within the Department of the Interior.

5. Any certification or disclosure form filed under paragraph (4) above shall be treated as a material representation of fact upon which all receiving tiers shall rely. All liability arising from an erroneous representation shall be borne solely by the tier filing that representation and shall not be shared by any tier to which the erroneous representation is forwarded. Submitting an erroneous certification or disclosure constitutes a failure to file the required certification or disclosure, respectively. If a person fails to file a required certification or disclosure, the United States may pursue all available remedies, including those authorized by Section 1352, title 31, U.S. Code.

**U. S. Department of the Interior**
**CERTIFICATION REGARDING LOBBYING**

---

**This certification is required by Section 1352, title 31, U. S. Code, entitled "Limitation on use of appropriated funds to influence certain Federal contracting and financial transactions."**

**(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)**

**Certification for Contracts, Grants, Loans, and Cooperative Agreements**

---

**The undersigned certifies, to the best of his or her knowledge and belief, that:**

**(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.**

**(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions. To obtain a Standard Form LLL, contact DEP or the U.S. Office of Surface Mining, 603 Morris Street, Charleston, WV 25301, phone number 347-7158.**

**(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly.**

**This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.**

**Signature** _____ **Date** _____

# DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352
(See reverse for public burden disclosure.)

Approved by OMB
0348-0046

| 1. Type of Federal Action: | 2. Status of Federal Action: | 3. Report Type: |
|---|---|---|
| ☐ a. contract<br>b. grant<br>c. cooperative agreement<br>d. loan<br>e. loan guarantee<br>f. loan insurance | ☐ a. bid/offer/application<br>b. initial award<br>c. post-award | ☐ a. initial filing<br>b. material change<br>**For Material Change Only:**<br>year _____ quarter _____<br>date of last report _____ |

| 4. Name and Address of Reporting Entity: | 5. If Reporting Entity in No. 4 is a Subawardee, Enter Name and Address of Prime: |
|---|---|
| ☐ Prime ☐ Subawardee<br>Tier _____, *if known*:<br><br>**Congressional District**, *if known*: 4c | <br><br>**Congressional District**, *if known*: |
| **6. Federal Department/Agency:** | **7. Federal Program Name/Description:**<br><br>CFDA Number, *if applicable*: _____ |
| **8. Federal Action Number**, *if known*: | **9. Award Amount**, *if known*:<br>$ |
| **10. a. Name and Address of Lobbying Registrant**<br>(*if individual, last name, first name, MI*): | **b. Individuals Performing Services** (*including address if different from No. 10a*)<br>(*last name, first name, MI*): |
| **11.** Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure. | Signature: _____<br>Print Name: _____<br>Title: _____<br>Telephone No.: _____ Date: _____ |
| **Federal Use Only:** | Authorized for Local Reproduction<br>Standard Form LLL (Rev. 7-97) |

## INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.

2. Identify the status of the covered Federal action.

3. Identify the appropriate classification of this report. If this is a followup report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.

4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.

5. If the organization filing the report in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.

6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.

7. Enter the Federal program name or description for the covered Federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.

8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitation for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Include prefixes, e.g., "RFP-DE-90-001."

9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.

10. (a) Enter the full name, address, city, State and zip code of the lobbying registrant under the Lobbying Disclosure Act of 1995 engaged by the reporting entity identified in item 4 to influence the covered Federal action.

    (b) Enter the full names of the individual(s) performing services, and include full address if different from 10 (a). Enter Last Name, First Name, and Middle Initial (MI).

11. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

# WAGE AND HOUR INFORMATION

# PREVAILING WAGE RATES

## can be obtained by contacting:

**WV Division of Labor**
**Capitol Complex**
**Bldg. 6, Room 749B**
**Charleston, WV 25305**

**Phone: (304) 558-7890**

**Website: www.sos.wv.gov**

# CONSTRUCTION SPECIFICATIONS

SPECIFICATIONS

FOR:

# PEPPER PORTALS AND DRAINAGE
# ELK DISTRICT
# BARBOUR COUNTY, WEST VIRGINIA

*SUBMITTED TO:*

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF ABANDONED MINE LANDS
101 CAMBRIDGE PLACE
BRIDGEPORT, WV 26330

*PREPARED BY:*

HATCH MOTT MACDONALD
2601 CRANBERRY SQUARE
MORGANTOWN, WV 26508

April 9, 2014

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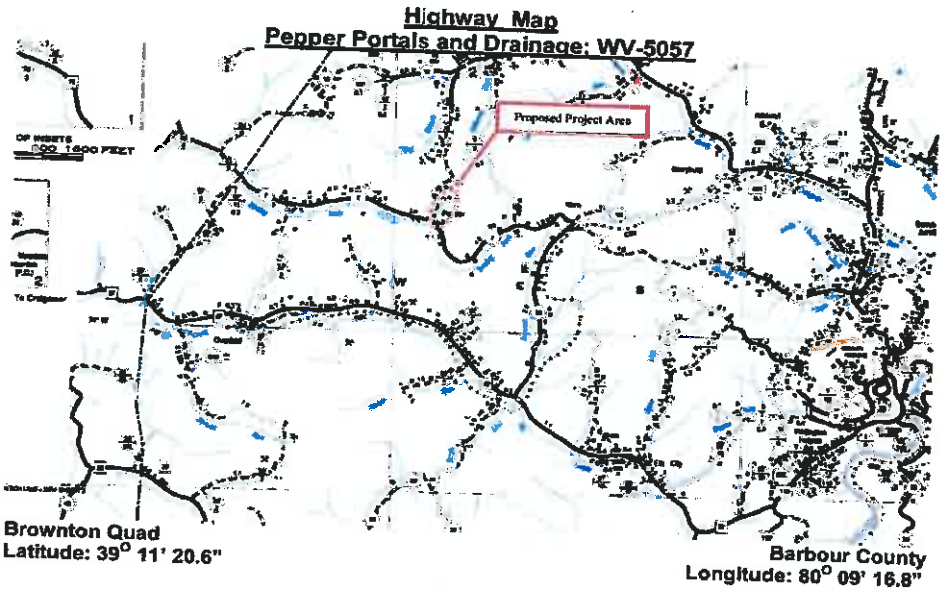
# I. SPECIAL PROVISIONS

## 1.0 LOCATION / SITE DESCRIPTION

Pepper Portals and Drainage project covers approximately 14 acres which includes a small landslide, 1,750 feet of highwall that is approximately 25-35 feet high, a collapsed portal with mine drainage, steep spoil piles, a subsidence sinkhole, and miscellaneous trash. The highwall is mostly vertical and unvegetated and there are small impoundments trapped in the pit causing slope stability issues. The subsidence feature is located on a nearby property and is partially filled with landowner garbage and debris.

**Directions to sites:**

From intersection of US 119 and SR 57, south of Philippi, drive 4.3 miles west on SR 57. Turn right on Stewarts Run Road, CR 18, and drive 2.8 miles to CR 7, Brushy Fork Road. Continue west on CR 7 and drive 2.5 miles to the site located on the right (north) side of CR 7.




Barbour County Highway Map (NTS)

## 2.0 REFERENCE SPECIFICATIONS / DEFINITIONS

All references to "Owner" in these Specifications shall mean West Virginia Department of Environmental Protection (WVDEP), Office of Abandoned Mine Lands.

All reference to "Engineer" in these Specifications shall mean the Owner's Engineer or authorized representative or the WVDEP.

All reference to "ASTM" shall mean the American Society of Testing and Material Specifications, latest edition unless otherwise noted.

All reference to "AASHTO Specifications" shall mean the Standard Specifications for Transportation Materials and Methods of Sampling and Testing by the American Association of State Highway and Transportation Officials, latest edition, and all subsequent addenda thereto.

All reference to "WVDOH Standard Specifications" shall mean State of West Virginia Department of Transportation, Division of Highways Standard Specifications for Roads and Bridges, latest edition, and all-subsequent addenda thereto.

All references to the "Contractor" shall be understood to mean the successful bidder and/or firm or corporation undertaking the execution of the work under the terms of these Specifications.

All reference to "OSHA" shall be understood to mean The Occupational Safety and Health Administration and the standards set in the Occupational Safety and Health Act of 1970.

All reference to "refuse" and/or "mine spoil" shall be understood to mean all coal refuse, shale, sandstone and other rock fragments that were generated and disposed of as such within the project area during mining and processing of coal.

All reference to "AMD" shall be understood to mean all acid or alkaline mine drainage discharges from the project site.

All reference to "OSMRE" shall be understood to mean Office of Surface Mining Reclamation and Enforcement.

All reference to "NEPA" shall be understood to mean the National Environment Policy Act.

## 3.0 SCOPE OF WORK

The work covered by the Special Provisions and Technical Specifications consists of furnishing all labor, plant, power, equipment and supplies, and performing all operations necessary for the completion of the project. The Contractor shall perform all operations necessary for:

- clearing and grubbing at the site, and removal or responsibly burning of debris as permitted, trash, tree roots, and associated materials;
- construction and installation of support areas, and maintenance of access roads to the site, including the repair and replacement of asphalt and pavement;
- eliminating highwalls per Contract Drawings by placing suitable mine spoil or other acceptable material against the face;
- construction and installation of drainage control items;
- installation of wet mine seals;
- stabilization of a subsidence feature and small landslide per Contract Drawings;
- providing sediment control;
- revegetation of disturbed areas;

The Contractor also shall be responsible for surveying, including establishing construction baseline, measuring and developing all completed quantities on the job, and for ordering, purchase and delivery of any and all materials required for construction or required for development of support areas. The Contractor shall perform all other operations as incidental to the program as specified herein.

## 4.0 BIDDERS TO EXAMINE LOCATIONS

Prospective bidders are required to examine the locations of the proposed work and to determine, each in their own way, the difficulties which may be encountered in the prosecution of the same. The submission of a bid shall be prima facie evidence that such examination and determinations have been made by the Bidder. No claims for additional compensation will be considered by the Owner based on obstruction or conditions at the location of the work, which may

add to the difficulties or costs of construction, even though such obstructions or conditions are not shown on the Contract Drawings or indicated in the other construction documents. Prospective bidders are advised that should they deem it necessary to obtain any subsurface samples of test borings, etc., at the site, they shall obtain their own permission from the landowners.

## 5.0 SCHEDULE OF WORK

Before commencing work on this project, the Contractor shall prepare and submit a schedule of construction activities for approval by the Owner.

The Contractor shall provide adequate supervision, labor, tools, equipment, and materials to prosecute the work energetically and complete the work within the time specified.

It is the intention not to delay the work for the checking of lines or grades, but if necessary, working operations shall be suspended for such reasonable time as the Engineer may require for the purpose. No special compensation shall be paid for the cost to the Contractor for any of the work or delay occasioned by checking lines and grades, by making other necessary measurements, or by inspection.

The Contractor's work hours for this project shall be from 7:00am to 7:00pm, Monday through Saturday. Work on Sunday and major holidays, as defined by the Engineer, will not be allowed on this project.

## 6.0 MEASUREMENT OF QUANTITIES

The Contractor shall be responsible for providing all necessary volumetric, dimension, and weight measurement equipment necessary to prosecute the work as shown on the Contract Drawings and to accurately determine quantities for payment of Contract Bid Items as approved by the Engineer. Such measurements and equipment shall be subject to the approval of the Engineer for use in this project.

## 7.0 BORROW (DISPOSAL) AREAS

All borrow (disposal) areas must be approved by WVDEP. Should the Contractor decide to obtain and utilize any borrow areas outside of construction limits, or move material from one property owner to another unless designated, the Contractor shall be responsible to obtain from the property owner(s) of the borrow (disposal) areas all necessary rights of entry, including rights of entry for WVDEP and OSMRE, for inspection purposes. The said rights of entry agreement must

state that the property owner(s) indemnify and hold harmless the WVDEP from all liability and/or damages resulting from the contractor's use of property for which the contractor was to obtain rights of entry for borrow, disposal, access or other purposes. Said indemnification shall include, but is not limited to, liability and damages resulting from the contractor's failure to obtain any or not all the rights of entry; failure to obtain the proper rights of entry; failure to utilize appropriate language in the rights of entry agreements; or failure to obtain permission and signature of all persons or entities holding a legal interest in the subject property(ies) covered by the rights of entry.

The Contractor also shall submit a borrow area reclamation plan for prior approval by WVDEP. The Contractor shall observe the following NEPA compliance schedule relative to selecting and utilizing any off site borrow areas and/or any waste disposal areas.

a. No borrow (disposal) site operations will affect a site listed in, eligible for, or proposed to be listed in the National Register of Historic Places.

b. No borrow (disposal) operations will be located within one-quarter mile of any Federally listed, established or prospective component of the National Wild and Scenic River System under 16 USC 1274 and 1276.

c. Borrow (disposal) site operations will not cause a significant encroachment within the base floodplain (CE.O. 11988: Floodplain Management).

d. Borrow (disposal) site operations will not be located in or affect a critical habitat of a Federally listed endangered or threatened species under 16 USC 1531, et. seq.

e. No borrow (disposal) operations will occur in wetland areas which are designated by appropriate agencies.

f. Borrow (disposal) site operations will be consistent with any approved plans governing ambient air quality.

g. Adherence to these mitigation measures does not relieve the Contractor of the obligation or responsibility to obtain any other Federal, State, or local approvals required to use borrow (disposal) areas and conduct such activities.

h. Documentation: Copies of borrow (disposal) site approvals and concurrences will be submitted to the WVDEP prior to the commencement of reclamation activities.

i. Site Monitoring: Borrow (disposal) activities will be monitored by the State to ensure compliance with contractual requirements, applicable Federal, State, and local laws, and any permit conditions.

## 8.0 DISPOSAL OF UNSUITABLE MATERIAL

All waste areas shall be obtained in accordance with Special Provisions Section 7.0 of these specifications. All unsuitable materials (wood, trash, debris, and garbage), as determined by the Engineer, shall be wasted by the Contractor, at his/her expense, outside the limits of work conforming to the requirements of the applicable sub-sections of Section 4.0 of these Specifications. Wood may be burned in conformity with the applicable sub-sections of Section 4.0 of these Specifications.

The Contractor shall observe the NEPA compliance schedule relative to selecting and utilizing any off-site disposal areas in accordance with Special Provisions Section 7.0 of these Specifications.

## 9.0 INTERPRETATION OF APPROXIMATE ESTIMATE OF QUANTITIES

The estimate of quantities of work to be done and/or materials to be furnished under the Special Provisions and Technical Specifications, as shown on the Contract Bid Schedule, is approximate and is given only as a basis of calculation upon which the award of the Contract is to be made. WVDEP reserves the right to increase or decrease any or all of the quantities of work or to omit any of them, as it may deem necessary.

## 10.0 SAFETY

All regulations of the Occupational Safety and Health Act of 1970 (OSHA) are in effect for this Contract. WVDEP shall not be liable for any citations received by the Contractor as a result of failure to comply with applicable OSHA standards. Compensation is to be included in the various items of the Contract for the expense involved in complying with these standards. In addition, the Contractor shall comply with Section 107.7 of the WVDOH Standard Specifications regarding public convenience and safety.

## 11.0 REGULATIONS

All appropriate Township, County, State, and Federal regulations shall apply to this Contract. It shall be the Contractor's sole responsibility to be aware of these regulations and to comply with them. WVDEP shall not be liable for any citations received by the Contractor. The Contractor shall keep the existing roads open and safe to public vehicular traffic at all times and shall provide appropriate barriers and warning devices as directed by the Engineer.

## 12.0 LAWS TO BE OBSERVED

The Contractor shall at all times, observe, comply with, and post as required all Federal, State, and local laws, ordinances, and regulations in any manner affecting the conduct of the work or applying to employees on the project as well as all orders or decrees which have been or may be promulgated or enacted by any legal bodies or tribunals having authority or jurisdiction over the work, materials, employees, or Contract. The Contractor shall protect and indemnify WVDEP and its representatives against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree whether by the Contractor or by the Contractor's employees.

## 13.0 PERMITS, LICENSES AND FEES

The WVDEP shall provide the NPDES Stormwater permit from the Division of Water and Waste Management, a WVDOH Encroachment permit if required, the Water Quality Certification from the Division of Water and Waste Management and an ACOE Regional permit if required. The Contractor, after award of the Contract, shall become Co-Applicant to the NPDES permit as per Article III-General Conditions, Section 7.0.

The Contractor shall procure all other permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work. Permits required for this project may include but not be limited to: a Stream Activity permit from the WV Division of Natural Resources and burning permits from WV Division of Forestry and WVDEP, Division of Air Quality. A copy of the permits as procured shall be furnished to the Owner prior to initiation of the work under this Contract.

## 14.0. ELECTRICITY, WATER SUPPLY AND SANITARY FACILITIES

There are no available supplies at the site of electricity and water, and additionally, there are no sanitary facilities. Arrangements for electric service, water supply and sanitary facilities shall be made by the Contractor, and all costs for such arrangements shall be borne by the Contractor at no additional cost to the WVDEP.

## 15.0 UTILITIES AND OTHER OBSTRUCTIONS

The Contractor shall be solely responsible to correctly locate all existing active underground and overhead utilities at the project site and take precautions to avoid damage to them. Any existing utility lines damaged by the Contractor shall be replaced or repaired by the Contractor at no cost to the Owner. The Contractor shall notify the utility companies likely to be affected well in advance and before beginning any work within the project sites. In the event of damage to the existing utilities or other facilities, the Contractor shall notify the affected utility Owner(s) and the Engineer immediately and make, or have made, all necessary repairs and bear the expense thereof and resulting damaged caused thereby. It shall be the responsibility of the Contractor to arrange for relocating the utility lines, where required and as directed by the Engineer, in accordance with the guidelines set forth by the utility company, prior to beginning construction. The Contractor will be reimbursed for actual charges invoiced by the Utility Company, except for utilities that are subject to regulation by the Public Service Commission, in which case, payment will be made directly to the affected utility by the WVDEP. The utility companies and West Virginia Miss Utility (WVMIS) must be contacted by the Contractor at least one week prior to commencement of construction activities for the purpose of field locating and marking utility owned facilities within the project area.

The name and phone number of the WVMIS Utility location service is as follows:

WVMIS
1-800-245-4848/811

## 16.0 SITE CLEANUP

Before the project shall be considered as having been satisfactorily completed, the Contractor shall clean and remove, from the project site, all surplus and discarded materials, and equipment and shall further remove all debris and objectionable materials of any kind from areas used or disturbed by the construction operations within, or within sight of, the project area. The Contractor shall be responsible for the removal of the project sign prior to the final inspection of the project, and upon approval from the WVDEP.

## 17.0 ROCK BLASTING

All blasting operations shall be conducted in strict accordance with applicable State and Federal laws relating to rock blasting and the storage and use of explosives. The Contractor shall maintain and keep in full force and effect blasting insurance to protect and indemnify the Owner and/or his agents or representative from claims for damages and shall defend all suits at law. The Contractor shall submit to the Owner a request for permission to blast rock, a reclamation plan for the area to be disturbed, and proof of blasting insurance coverage prior to initiating blasting operations. Failure to obtain approval for blasting prior to initiating the work will result in no payment for items utilizing this rock.

## 18.0 TEMPORARY ACCESS ROADS

The Contractor shall construct and maintain temporary access roads for convenient access to the various parts of the work, and for other necessary purposes incidental to the performance of this Contract. The location of access roads shall be approved by the Engineer prior to construction. No separate payment for construction and maintenance of such roads will be made. The Contractor shall erect such temporary fences or guards as may be necessary to keep unauthorized persons away from the work. Grading and surfacing of temporary access roads, excavations, fills and embankments for purposes of construction, or for convenience, beyond the limits of ordered excavations and all temporary fences and guards, shall be provided by the Contractor and shall be maintained in good condition. The Contractor shall be required to maintain all roads used by the hauling equipment in a dust-controlled condition. These roads which have been upgraded are to remain in that condition upon completion.

The Constructed Access Road, as identified on the Contract Drawings, shall be upgraded and remain so upon project completion.

The Contractor shall be required to obtain a right of entry agreement from any property owner(s) prior to the utilization or construction of any access outside of the construction limits shown on the plans. Such agreement shall require the property owner(s) to indemnify and hold WVDEP harmless from any and all injuries or damages, whatsoever, resulting from the Contractor's use of the property.

## 19.0 TRAFFIC CONTROL

The Contractor shall maintain and protect traffic, protect the work in progress, protect adjacent property from excess dust resulting from the construction and maintain traffic through, around, or adjacent to the construction area. All materials used for traffic control shall be in accordance with the current WVDOH manual: "Traffic Control for Streets and Highway Construction and Maintenance

Operations." A copy of the operational plan accepted by the WVDOH shall be submitted to the WVDEP for approval prior to its implementation. All traffic control required during the work shall be considered incidental to the project.

## 20.0 SITE CONDITIONS AND ENVIRONMENTAL PROTECTION

Conditions at the site shall be examined by the Contractor, and he/she shall assume responsibility as to the contours and the character of the earth, rock, water and other items that may be encountered during the excavation and filling operations.

The Contractor shall be responsible for controlling and handling water encountered during construction, including dewatering of mine pools for mine seal installations, by providing equipment and labor to insure safe and proper construction. The Contractor shall submit a plan to the WVDEP at the pre-construction meeting for approval. The WVDEP's approval of this plan does not relieve the Contractor of his responsibility for controlling water.

The Contractor shall be responsible for the operation and maintenance of any required diversion or pumping facilities for removing ground water from work areas during progress of the work under this Contract.

The Contractor shall be responsible for furnishing all materials, equipment, labor and incidentals necessary for the installation of silt barriers and check dams as designated in the Contract Drawings. Sediment control shall be placed on regraded areas concurrent with construction and prior to revegetation.

The Contractor shall be responsible for implementing the measures called for in the NPDES Stormwater permit provided by the WVDEP for erosion and sediment control. Sediment control measures shall be in-place and operational prior to any disturbance occurring in the project area. The WVDEP's approval of this plan does not relieve the Contractor of his responsibility to be in compliance with any laws and/or permits.

The Contractor shall take any necessary steps to prevent erosion or silting problems from occurring and to minimize pollution or sedimentation of the stream. If any such problems develop, the Contractor shall be responsible to take immediate corrective action.

The Contractor shall be responsible for the repair or replacement of streets or driveways (asphalt, gravel or concrete), trees, shrubs, fences, or any other physical features disturbed by construction which were not included in the proposed scope of work for the project to original condition or better at their own expense.

The Contractor shall be responsible for the replacement of any existing boundary or corner markers disturbed by construction activities.

## 21.0 CONTROL AND REVIEW OF WORK BY THE ENGINEER

All services rendered by the Engineer consist of professional opinions and recommendations made in accordance with generally accepted engineering practice. Under no circumstances is it the intent of the Engineer to directly control the physical activities of the Contractor or the Contractor's worker's accomplishment of work on this project.

The presence of the WVDEP's Field Representative and/or Engineer at the site is to provide the WVDEP a continuing source of professional advice, opinions and recommendations based upon the Field Representative's and/or Engineer's observations of the Contractor's work and does not include any superintending, supervision or direction of the actual work of the Contractor or the Contractor's workers.

Any construction review of the Contractor's performance conducted by the Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, or near the construction site.

## 22.0 CITATION OF OTHER SPECIFICATIONS

Whenever the Specifications for this Contract refer to the specifications of any society, institute, association or government organization, then such specifications cited shall become a part of this Contract as if written in full. Commonly used abbreviations have the following meanings:

ASTM - American Society for Testing Materials

ASA - American Standards Association

AWWA - American Water Works Association

AASHTO - American Association of State Highway and Transportation Officials

ACI - American Concrete Institute

WVDOT – West Virginia Department of Transportation

WVDOH – West Virginia Division of Highways

Where reference is made to a specification, it shall be the latest revision at the time called for bids, except as noted on the Contract Drawings or elsewhere herein.

## 23.0 NPDES STORMWATER PERMIT GUIDELINES

### VEGETATIVE PRACTICES

Except as noted below, stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than seven days after the construction activity in that portion of the site has permanently ceased.

- Where the initiation of stabilization measures by the fourth day after construction activity temporarily or permanently ceases is precluded by snow cover, stabilization measures shall be initiated as soon as conditions allow.

- Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g., the total time period that construction activity is temporarily halted is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the seventh day after construction activities have temporarily ceased.

Areas where the seed has failed to germinate adequately (uniform perennial vegetative cover with a density of 70%) within 30 days after seeding and mulching must be reseeded immediately, or as soon as weather conditions allow.

Diversions must be stabilized prior to becoming functional.

### MAINTENANCE & INSPECTION

At a minimum, all erosion and sediment controls on the site will be inspected at least once every seven calendar days and within 24 hours after any storm event of greater than 0.5 inches of rain per 24-hour period.

All controls should be cleaned out when sediment reaches one half the sediment capacity of that control.

Inspection and maintenance records must be kept onsite.

### EROSION & SEDIMENT CONTROL CONSTRUCTION SEQUENCE

1. Install stabilized construction entrance as shown on site plans.
2. Install perimeter sediment control devices as shown on site plans.
3. Clear and grub site.
4. Provide sediment control for any topsoil stockpiles.
5. Commence rough grading of site. Continue to maintain and inspect all erosion and sediment controls.
6. Install additional erosion and sediment controls as shown on site plans.

7. Fine grade site.
8. Permanently seed and mulch all disturbed areas within 7 days of reaching final grade.
9. Upon completion of project including adequate stabilization, remove all remaining erosion and sediment controls.

# II: TECHNICAL SPECIFICATIONS

# II. TECHNICAL SPECIFICATIONS

## 1.0 MOBILIZATION AND DEMOBILIZATION

### 1.1 Description

This work shall consist of the performance of construction preparatory operations, including the movement of personnel and equipment to the project site and for the establishment of the Contractor's field office and other facilities necessary to begin work on a substantial portion of the contract. This work shall also include all demobilization activities.

### 1.2 Method of Measurement

The method of measurement for determining the Mobilization and Demobilization work, done as described above, will be on a lump sum basis with partial payments as listed below.

### 1.3 Basis of Payment

The bid for Mobilization and Demobilization shall be a lump sum bid item and shall not be more than ten (10) percent of the total bid amount for the project. Partial payments will be as listed below.

**1.3.1** One-half of the amount bid will be released to the Contractor with the first estimate payable, not less than 15 days after the start of work at the project site.

**1.3.2** The final one-half of the amount bid shall be released with the estimate payable after work is accepted by the WVDEP and when all "As Built" drawings are submitted and approved by WVDEP.

Nothing herein shall be construed to limit or preclude partial payments otherwise provided for by the Contract.

No deduction will be made, nor will any increase be made, in the lump sum Mobilization and Demobilization bid item amount regardless of decreases or increases in the final total contract amount or for any other cause.

### 1.4 Pay Item

Item 1.0 **"Mobilization and Demobilization"**, shall be a lump sum bid item. Total for this item shall not be more than ten (10) percent of the total bid amount for the project.

## 2.0 CONSTRUCTION LAYOUT STAKES

### 2.1 Description

This item shall consist of furnishing, placing, replacing and maintaining construction layout stakes, baseline stations, primary control points and any disturbed property location monuments as necessary for the proper performance of the work under this contract. It further consists of determining the exact units of measurement for payment. It also consists of checking and making any field adjustment to the plan grades and elevations that may be necessary due to the inconsistency in material compaction.

Additionally, this item shall also include the generation of cross-sections of the site indicating pre-construction and post-construction lines for submission to the WVDEP. "As-Built" drawings shall be provided by the Contractor prior to the Final Inspection Meeting.

### 2.2 Materials

Materials necessary for this item include, but are not limited to; survey equipment, survey stakes, flagging, drafting media, etc.

### 2.3 Construction Methods

**2.3.1** The Engineer will initially establish necessary benchmarks prior to the beginning of the project. From those benchmarks and back site information supplied by the Engineer, the Contractor shall make all calculations necessary to layout the work and shall furnish, place and maintain all layout stakes needed to complete the work as outlined in the Specifications and Contract Drawings.

**2.3.2** The Contractor shall supply all labor and materials necessary to establish additional benchmarks, horizontal control, vertical control, reference points, etc. as needed to ensure a proper layout. The Contractor shall be responsible for having the layout staking work conform to the lines, grades, elevation, and dimensions called for on the Contract Drawings. As survey records are completed during the progress of the work, copies shall be submitted by the Contractor to the WVDEP. Any inspection or checking of the Contractor's layout by the WVDEP and the acceptance of all or any part of the layout shall not relieve the Contractor of his responsibility to secure the proper dimensions, grades, and elevations.

**2.3.3** It shall be the responsibility of the Contractor to maintain and preserve all stakes and benchmarks, including existing property line markers, and to have them reset at his expense in the event they are disturbed in any way. Primary control points shall be established by the Contractor to reestablish baseline stations should they be disturbed. At a minimum, the Contractor shall confirm the location of existing baseline stations by field survey of each station's relationship to a suitable primary control point.

**2.3.4** The Contractor shall layout the work using standard methods, competent personnel and suitable equipment. The layout work shall be carried out under the direction of a State of West Virginia Registered Professional Engineer or Licensed Land Surveyor.

**2.3.5** The Contractor shall submit to the WVDEP pre-construction cross-sections and notes for approval prior to the start of any earth moving activities. The Contractor shall then submit to the WVDEP as-built cross-sections and notes as soon as practical after the completion of construction. Failure to submit the cross-section information could delay any future alteration to the total amount bid for earthwork and/or delay payments for earthwork.

**2.3.6** Acceptable cross-sections shall be drawn or reproduced on mylar film or prepared in AutoCAD format at the appropriate scale so they may be directly overlaid on the cross-sections contained in the Contract Drawings. Each 24" x 36" sheet shall be lightly gridded at 10 lines per inch with heavier index lines every inch. Station numbers, elevations, baseline offset distances, cross-section lines and types, date, responsible parties and a legend shall be clearly illustrated. Cross-sections which do not encompass all areas of both earthwork excavation and fill placement shall be considered incomplete without exception.

**2.3.7** All calculations, sections, plans, survey notes and other documents produced pursuant hereto shall be certified as correct by a State of West Virginia Registered Professional Engineer or Licensed Land Surveyor.

**2.3.8** Sufficient time shall be allotted to the WVDEP to review the submittals and investigate any and all discrepancies relating to cross-sections submitted throughout the course of construction.

**2.3.9** The Contractor shall provide the WVDEP with "As-Built" drawings prior to the Final Inspection Meeting. The "As-Builts" submittals shall include, two (2) hard copies and an electronic submission in Adobe (.pdf) and AutoCAD 2007 (.dwg) formats.

"As-Builts" shall be certified by a Registered Professional Engineer or a Licensed Land Surveyor.

**2.3.10** The "As-Built" plans shall include the vertical and horizontal locations of all buried components depicted on the plans and herein specified:

a. As-built plans shall include the vertical and horizontal locations of all installed pipes and associated drop inlets.
b. In addition, as-built plans shall show the vertical and horizontal location of any and all mine seals and subsurface drains, including bottom of drain, pipe inverts, and top of buried subsurface drain, installed for this project.

## 2.4 Method of Measurement

The method of measurement for determining the quantity of Construction Layout Stakes work done as described above will be on a lump sum basis. Payment will be for; furnishing, setting, maintaining and resetting the stakes when necessary, providing survey personnel, equipment, materials, and all incidentals necessary to perform the work, and providing the WVDEP pre-construction and post-construction cross-sections and "As-Built" drawings as described herein.

## 2.5 Basis of Payment

The quantity of work done will be paid at the contract lump sum bid price for this item, which payment shall be full compensation for doing all the work herein prescribed in a workmanlike and acceptable manner, including but not limited to; all labor, materials, tools, equipment, supplies, and incidentals necessary to complete the work.

No deduction or increase will be made in the lump sum Construction Layout Stakes item amount regardless of increases or decreases in the final total amount or for any other cause.

## 2.6 Pay Item

Item 2.0 **"Construction Layout Stakes"**, shall be a lump sum bid item. Total for this item shall not be more than five (5) percent of the total bid amount for the project.

## 3.0 QUALITY CONTROL

### 3.1 Description

To assure the materials supplied and the work performed are in conformance with these specifications.

### 3.2 Applicable Publications

Related materials and work shall comply with, but not be limited to, the provisions of the following codes, standards and specifications:

| | |
|---|---|
| ASTM D-698 | "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort", 2007 Edition. |
| ASTM D-1556 | "Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method" |
| ASTM D-2922 | "Standard Test Methods for Density of Soil and Soil-Aggregate In-Place by Nuclear Methods" |
| ASTM D-3017 | "Standard Test Methods for Water Content of Soil and Rock In-Place by Nuclear Methods" |
| EPA-600/2-76-184 | "Extensive Overburden Potentials for Soil and Water Quality" |
| ACI 301 | "Specifications for Structural Concrete For Buildings". |
| ASTM C-31 | "Standard Method of Making and Curing Concrete Test Specimens in the Field". |
| ASTM C-39 | "Standard Test Method For Compressive Strength of Cylindrical Concrete Specimens". |
| ASTM C-172 | "Fresh Concrete Sampling". |

### 3.3 Submittals

**3.3.1** Two (2) copies of shop drawings, catalog cuts and material certifications shall be submitted by the Contractor to the WVDEP for all off site materials to be incorporated into the work.

**3.3.2** Prior to incorporation of these items into the work, written approval must be obtained from the WVDEP.

## 3.4 Construction Methods

**3.4.1** The Contractor shall furnish the services of their own testing laboratory, or select an independent lab which is under the supervision of a State of West Virginia Registered Professional Engineer and approved by the WVDEP.

**3.4.2** Testing for compaction, aggregate, rock, soil nutrient and lime requirements, etc. shall be performed as required by these Specifications or as requested by the WVDEP in writing. The locations and time of any specified testing, or the need and extent of any additional testing, shall be determined by the WVDEP.

**3.4.3** The Contractor shall perform accepted laboratory testing procedures to determine if the compaction characteristics of the backfill and mine spoil are acceptable for use as cover and/or fill material. Testing shall be at a frequency approved by WVDEP. One lot (5 tests) per day during fill placement shall serve as a minimum. Field density tests shall also be performed as needed and in accordance with these Specifications. All test results shall be submitted to the WVDEP for approval of compaction criteria prior to and after compaction to verify that the required compaction is obtained.

**3.4.4** Only new and first class materials conforming to the requirements of these Specifications shall be used unless otherwise specified. When requested by the WVDEP, the Contractor shall furnish a written statement of the origin, composition, and manufacturer of any or all materials (manufactured, produced, or grown) that are to be used in the work. The sources of supply of each material used shall be approved by the WVDEP before delivery. If, at any time, sources previously approved fail to produce results acceptable to the WVDEP, the Contractor shall furnish materials from other approved sources.

## 3.5 Method of Measurement

The method of measurement for determining the quantity of Quality Control work done as described above will be on a lump sum basis.

## 3.6 Basis of Payment

The quantity of work done will be paid at the contract lump sum bid price for this item, which payment shall be full compensation for doing all the work herein prescribed in a workmanlike and acceptable manner, including but not limited to; all labor, materials, tools, equipment, supplies, and incidentals necessary to complete the work.

## 3.7 Pay Item

Item 3.0 **"Quality Control"**, shall be a lump sum bid item. Total for this item shall not be more than three (3) percent of the total bid amount for the project.

## 4.0 SITE PREPARATION

### 4.1 Description

Work performed under this section shall include the removal and disposal of all trees, stumps, shrubs and any other vegetation, wood, debris, concrete, garbage of any nature and designated structures from the limits of the areas to be developed and any other areas as directed by the WVDEP. This work shall also include the preservation from injury to all vegetation, utilities or other objects to remain.

### 4.2 Materials

Trunk damage to trees shall be painted with an antiseptic and water proof paint with an asphaltic base. This paint shall not contain coal-tar creosote, turpentine or other materials harmful to plants or animals.

### 4.3 Construction Methods

**4.3.1** The specific areas to be cleared and grubbed are as shown on the Contract Drawings and are generally described as, but not limited to, those specific areas of excavation, backfill, drainage structure installation, or access road construction.

**4.3.2** The Contractor shall clear the site within the limits of the areas to be reclaimed. The WVDEP shall exercise control over clearing and shall designate all trees, plants and other objects to be removed or to remain.

This work shall also include the preservation from injury or defacement of all trees designated to remain. All timber eight (8) inches in diameter and larger at stump height shall be saw cut prior to grubbing operations. Timber shall be topped with the branches removed and stacked and stockpiled in an appropriate manner in an accessible location approved by the WVDEP on the property from which it was cut. Timber to be stockpiled shall not be pushed down by equipment prior to being cut nor can it be indiscriminately shoved into a stockpile.

**4.3.3** Clearing and grubbing shall be completed prior to initiation of earthwork operations.

All areas cleared and grubbed beyond the designated construction area, whether knowingly or accidentally, shall be replanted and otherwise restored to a condition equal to that existing prior to the commencement of the work, and at the expense of the Contractor.

**4.3.4** All stumps, roots, buried logs and brush shall be removed. Grass, however, may be incorporated into the re-soiling material. Tap roots and other projections over one and one-half (1 ½) inches in diameter shall be grubbed out to a depth of at least ten (10) inches below the planned subgrade or slope elevation. All holes remaining after the grubbing operation shall have the sides broken down to flatten out the slopes, and shall be filled with suitable materials, moistened and properly compacted.

**4.3.5** Cleared and grubbed areas shall be worked to provide positive drainage and prevent ponding of water.

**4.3.6** All organic material shall be burned completely to ash or otherwise removed from the site and disposed of in a manner approved by the WVDEP. Burning of combustible material will not be permitted on or near refuse, mine portals, or within close proximity to coal seams or utilities. It shall be the responsibility of the Contractor to obtain all necessary permits and licenses required prior to burning the material. A plan indicating the location of material to be burned and all fire control measures to be implemented and copies of permits and licenses shall be submitted to the WVDEP for approval.

**4.3.7** All other materials generated from required clearing and grubbing operations shall be removed and disposed of by the Contractor. Any structures, garbage, construction debris, mining debris, etc. shall be disposed of in approved waste areas or landfills. It shall be the responsibility of the Contractor to obtain, at no expense to the WVDEP, all necessary waste areas or landfills for the disposal of waste materials in accordance with any applicable Local, State, and/or Federal regulations including compliance with NEPA requirements (See Special Provisions Section 7.0 for NEPA Compliance Schedule). All waste areas must be approved by the WVDEP, and the Contractor must provide a reclamation plan for approval. In addition, for all waste areas outside the construction limits, the Contractor must obtain from the property owner a right-of-entry agreement in which the property owner indemnifies and holds the WVDEP harmless from any and all injuries or damages whatsoever resulting from the use of property.

**4.3.8** It shall be the sole responsibility of the Contractor to correctly locate and avoid all overhead and underground utilities, facilities and other structures and appurtenances. The Contractor shall employ all necessary precautions and methods to insure the protection of all utilities and/or other facilities during the construction. In the event damage does occur, the Contractor shall

notify the affected owner and the WVDEP immediately and initiate immediate repair.

The contractor shall bear all expenses associated with the repair of the damaged utility and/or other facility, and any liability resulting from the interruption of service or use.

**4.3.9** Trash, garbage, railroad ties, roofing shingles, tires, plastic, metal and other unsuitable material resulting from demolition shall be disposed of by the Contractor at his/her own responsibility and expense outside the work limits in an approved landfill, as approved by the WVDEP, unless otherwise directed.

## 4.4 Method of Measurement

The method of measurement for Site Preparation will be on a lump sum basis. Removal of timber, shrubs, and debris will not be measured but will be considered incidental to the clearing and grubbing operations.

The method of measurement for Demolition of Structures will be on a lump sum basis. Removal of equipment, garbage, rubble, structures, and debris will not be measured but will be considered incidental to the demolition operations.

## 4.5 Basis of Payment

The quantity of work done will be paid at the contract lump sum bid price for these items, which payment shall be full compensation for doing all the work herein prescribed in a workmanlike and acceptable manner, including but not limited to; all labor, materials, tools, equipment, supplies, and incidentals necessary to complete the work.

No deduction or increase will be made in the lump sum Clearing and Grubbing or Demolition of Structures amount regardless of decreases or increases in the final total contract amount or for any other cause.

## 4.6 Pay Item

Item 4.0 **"Site Preparation"**, shall be a lump sum bid item. Total for this item shall not be more than seven (7) percent of the total bid amount for the project.

## 5.0 EROSION AND SEDIMENT CONTROL

### 5.1 Description

This item shall consist of furnishing all materials, equipment, labor and incidentals necessary for, and the installation of super silt fencing and Erosion Control Wattles and rock check dams as designated in the Contract Drawings. Erosion and sediment control shall be placed on regraded outslope areas concurrent with construction and prior to revegetation. Installation locations are shown in the Contract Drawings. Additional locations may be added at the discretion of the WVDEP.

### 5.2 Materials

**5.2.1** The synthetic filter fabric used for the super silt fence shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier as conforming to WVDOT specifications.

**5.2.2** The support posts for the super silt fence shall be 2 ½" diameter x 72" in length galvanized steel pipe weighing 3.65 pounds per linear foot of post.

**5.2.3** The chain link fabric for the super silt fence shall be a galvanized steel no. 9 wire woven in a 2" diamond mesh pattern, 48" in height.

**5.2.4** Erosion Control Wattles shall be 12', 20' or 25' in length.

**5.2.5** Post to secure Erosion Control Wattles shall consist of live stakes or wood stakes 1" x 1" x 24".

**5.2.6** Stone for rock check dams shall consist of 3" to 6" riprap and shall conform to the requirements detailed in Section 7.2.2.

### 5.3 Maintenance

During the course of the project, erosion and sediment control devices shall be maintained in sound condition, and accumulations of silt, which may threaten their effectiveness, shall be removed. Silt removed from the erosion and sediment control structures should be spread in the general vicinity, except when such practices may be detrimental to the environment and/or the project.

Upon the completion of the project, the WVDEP may direct the Contractor to remove, clean or replace erosion and sediment control structures and

revegetate such disturbances in accordance with the appropriate section(s) of these Specifications.

## 5.4 Installation

**5.4.1** Wattle installation:
Trenching – Use a hand tool such as a mattock or pick to score the ground. Using a shovel dig the trench to the needed depth. Soil from excavating the trenches can be placed on the uphill, or flow side, of the trench to be used during installation.
Installing – Lay the first Straw Wattle snugly in the trench. No daylight should be seen under the wattle. Pack soil from trenching against the Wattle on the uphill side. When installing running lengths of Straw wattles, butt the second Wattle tightly against the first. Do not overlap the ends. Stake the Straw Wattles at each end and four foot on center.

Stakes should be driven through the middle of the Wattle, leaving 2-3 inches of the stake protruding above the Wattle. (Specialty Construction Supply)

**5.4.2** Rock check dams shall be installed in accordance with the details on the contract drawings. The rock check dams shall be installed so that the dam is at least 6 inches lower than the outer edges so that high flows go over the center of the dam and not around the edges. The maximum height of the dam should be 3 feet. Maximum distance between rock check dams is 300 feet.

**5.4.3** The super silt fence shall be installed in a continuous length along the contour. When a joint is unavoidable, the filter cloth shall be overlapped, folded and stapled together to prevent sediment bypass.

**5.4.4** The super silt fence shall be 36" above the original grade with 12" of the filter cloth and fence fabric embedded into the ground.

**5.4.5** The super silt fence support posts shall be driven 36" into the ground.

**5.4.6** The fence fabric of the super silt fence shall be securely attached to the support posts with galvanized wire ties. The filter fabric shall be secured to the fence fabric with ties spaced at 24" intervals.

**5.4.7** Stabilized construction entrances shall be constructed in accordance with the details on the Contract Drawings. The stone should be 3"-6" in diameter. The length of the entrance is as required, but not less than 70 feet. The thickness should be not less than 6 inches. The width of the entrance shall be a minimum of 12

feet, but not less than the full width at points where ingress and egress occurs. Adequate protection of utility lines must be provided in the form of soil cover, matting, or land bridging if necessary. Contractor is responsible for any utility damages.

## 5.5 Method of Measurement

Measurement shall be to the nearest bid unit of erosion and sediment control placed in conformance with Contract Drawings and accepted by the WVDEP. Only that erosion and sediment control which is illustrated in the Contract Drawings shall be included for measurement. Any additional erosion and sediment control, installed by the Contractor to meet any applicable State or Federal law or regulation, shall be the Contractor's sole responsibility and all costs pursuant thereto shall be born fully by the Contractor.

Any erosion and sediment control, which is not illustrated in the Contract Drawings that the Contractor may install to protect streams or for other purposes, shall not be included for measurement, and shall be the sole responsibility of the Contractor. However, any erosion and sediment control, approved by the WVDEP prior to placement shall be included for measurement.

## 5.6 Basis for Payment

Payment shall be at the bid unit price of erosion and sediment control item installed by the Contractor and accepted by the WVDEP. Payment shall constitute full compensation for all materials, labor, equipment and incidentals necessary to perform the work. Additionally, payment shall constitute full compensation for any required maintenance, sediment removal, and disposal of installed erosion and sediment control features.

## 5.7 Pay Item

Item 5.1 **"Super Silt Fence"**, shall be a per linear foot bid item.

Item 5.2 **"Erosion Control Wattles"**, shall be a per linear foot bid item.

Item 5.3 **"Rock Check Dam"**, shall be a per each bid item.

Item 5.4 **"Stabilized Construction Entrance"**, shall be a per each bid item.

Item 5.5 **"Riprap Dissipater"**, shall be a per each bid item.

## 6.0 REVEGETATION

### 6.1 Description

This work shall cover all operations incidental to the establishment of vegetation within the limits of construction, as shown on the Contract Drawings, and within any other areas as approved by the WVDEP.

This work also includes the furnishing and the application of fertilizer, agricultural lime and mulch. The work shall also consist of furnishing and planting of all seed, herbaceous materials, cuttings, and tree seedlings of the kinds specified at the locations shown on the Contract Drawings in accordance with these Specifications and as designated herein.

No areas outside of the limits of construction shall be disturbed without prior approval from the WVDEP. Work outside the construction limits shall require WVDEP approval and a right of entry from the Landowner. The Contractor, at no expense to the WVDEP, shall revegetate any areas outside of the limits of construction that were disturbed by the Contractor without WVDEP authorization. Areas disturbed outside of the limits of construction shall be seeded/planted with plant materials appropriate for site conditions as prescribed herein.

### 6.2 Materials

Prior to bidding, the Contractor shall verify all sources of supply to insure that size, species, variety, and quality of plants specified can be supplied. At least one week prior to delivery, the Contractor shall notify the WVDEP of the source of the seed, herbaceous materials, cuttings, and tree seedlings. West Virginia suppliers of plant materials are preferred.

#### 6.2.1 Fertilizer

The commercial fertilizer to be used shall consist of a 10-20-20 grade or equivalent, of uniform composition, and furnished in standard containers. These containers, in accordance with applicable State and Federal laws, must be clearly marked with the following information:

**a.** Weight
**b.** Name of Plant Nutrient
**c.** Guaranteed Nutrient Percentages

Fertilization rates shall be applied at a rate of 1000 lbs/acre. Fertilizer shall be applied in conjunction with appropriate seed mixture in all areas.

### 6.2.2 Lime

The lime to be used will be an agricultural grade pulverized limestone, containing not less than 75% total carbonates. Fineness will be such that not less than 75% will pass through a #100 sieve, and 100 percent will pass through a #10 sieve.

Lime requirement shall be formulated from soil test results. Lime should be thoroughly mixed into the top three (3) inches of soil. In the absence of soil testing a rate of three (3) tons per acre will serve as the preferred minimum.

### 6.2.3 Seed Mixtures

The variety of grass and legume seed furnished for the project shall bear a tag, in accordance with applicable State and Federal laws, with the following information listed:

1. Lot Number
2. Seed Producer Name
3. Percent Purity
4. Percent Germination
5. Date of Germination Testing
6. Weed Seed Content (should be <0.25% by weight)

All leguminous seed shall be inoculated with the specified strain of rhizobium, which shall be a pure culture of bacteria selected for maximum vitality. Each package of rhizobium shall be properly stored prior to use and will be acceptable for use only before the expiration date indicated on that package. The inoculants shall be applied at the recommended rate for broadcast seeding and at a rate five (5) times greater when used in a hydro-seeding mixture.

### 6.2.3.1 Temporary Ground Cover

All stockpiles and other disturbed areas which will require further additional disturbance which will be delayed for a period of three (3) weeks or longer, shall be seeded as follows.

| TEMPORARY SEED MIXTURE | | | | |
|---|---|---|---|---|
| Variety of Seed | Spring<br>3/15 – 5/15 | Summer<br>5/16 – 8/15 | Fall<br>8/16 – 10/15 | Winter<br>10/16 – 11/15 |
| Annual Ryegrass<br>(Lolium multiflorum) | 40 lbs/acre | | 40 lbs/acre | |
| German Millett *<br>(Setaria italica) | | 40 lbs/acre | | |
| Cereal Rye<br>(Secale cereale) | | | | 170 lbs/acre |

* Do not use Japanese Millet.

All areas to be temporarily seeded, which are to be re-disturbed, shall be fertilized according to Section 6.2.1 of these Specifications. Lime shall be applied according to Section 6.2.2 and mulch shall be applied according to Section 6.2.4, both per these Specifications.

### 6.2.3.2 Permanent Ground Cover

Permanent vegetation shall be established on all areas reaching final grade, or other areas not likely to be destroyed by further construction activities. Any areas which reach final grade between May 16 and August 15 or between October 16 and November 15 shall be seeded with the appropriate temporary seed mixture according to Section 6.2.3.1. These areas shall then be reseeded with a permanent seed mixture, without Annual Ryegrass, during the next defined seeding period according to this section. The actual date of permanent seeding will require the Engineer's approval.

| PERMANENT SEED MIXTURE | | |
|---|---|---|
| Variety of Seed* | Spring<br>3/15 – 5/15 | Fall<br>8/16 – 10/15 |
| Orchardgrass<br>(Dactylis glomerata) | 30 lbs/acre | 30 lbs/acre |
| Birdsfoot Trefoil (1)<br>(Lotus corniculatus) | 15 lbs/acre | 15 lbs/acre |
| Red Clover<br>(Trifolium pratense) | 10 lbs/acre | 10 lbs/acre |
| Annual Ryegrass (2)<br>(Lolium multiflorum) | 25 lbs/acre | 25 lbs/acre |
| Spring Oats<br>or<br>Winter Wheat | 35 lbs/acre<br><br>0 lbs/acre | 0 lbs/acre<br><br>90 lbs/acre |

(1) Herbaceous legumes must be treated with the appropriate bacterium before seeding. On areas which are steeply sloping (steeper than 1.7:1), slide prone, swales, or drainage conveyance structures, substitute Crown vetch (Coronilla varia) at 20 lbs/acre for Birdsfoot Trefoil.

(2) Use Annual Ryegrass only in mixtures seeded after August 1st and before May 1st.

* Use only certified "blue tag" seed. Seed-rate suggested is for pure live seed (PLS) in lbs/acre.

### 6.2.4 Mulch Material

Mulch shall consist of baled straw mulch or wood cellulose fiber. Straw mulch shall be applied at a rate of 2 tons/acre. The straw mulch shall be anchored with 100 gals/acre asphalt emulsion or 750 lbs/acre wood cellulose fiber. Wood cellulose fiber mulch may only be used on slopes steeper than 2H:1V at a rate of 1,500 lbs/acre, and only with the approval of the WVDEP.

### 6.2.5 Water

Water utilized for hydro-seeding and other applications shall be reasonably free of injurious or other toxic substances harmful to plant life. The source of water is subject to the approval of the WVDEP.

## 6.3 Construction Methods

**6.3.1** All specified revegetation activities shall be conducted immediately following completion of final grading activities to utilize the fine soil material as a seedbed and before this material is lost. If revegetation is delayed for a period of three (3) weeks or longer, then said areas shall be temporarily protected with the temporary ground cover described in Section 6.2.3.1.

**6.3.2** Seedbed preparation and seeding/planting shall take place progressively, as various regraded areas are brought to final grade.

**6.3.3** All seeding/planting operations shall be performed immediately following seedbed preparation, in such a manner that the seed is applied in the specified quantities, and uniformly, on the designated areas.

**6.3.4** Any area failing to establish a vegetative stand, due to weather or adverse soil conditions, shall be revegetated in accordance with these Specifications.

**6.3.5** The Contractor shall maintain and protect all seeded/planted areas until final acceptance of the project. All graded and reseeded areas shall be protected from any further equipment traffic, and any damaged areas shall be reworked and reseeded.

**6.3.6** A second and third seeding/planting will be applied as needed, or as required by the WVDEP.

## 6.4 Method of Measurement

**6.4.1** There shall be no method of measurement for temporary seeding. Temporary seeding shall be incidental to the revegetation type specified in the Contract Drawings.

**6.4.2** The method of measurement for Revegetation will be per plan view acre, field measured and rounded to the nearest whole acre. Payment will be for completed work which shall include all equipment, labor and materials, including but not limited to; lime, fertilizer, mulch and seed necessary for the first seeding/planting of the specified revegetation. Subsequent steps will not be measured or paid for but will considered incidental to initial seeding/planting.

**6.4.3** The Contractor shall be paid only for those areas disturbed and revegetated during operations necessary for completion of the work. The quantity shall not include areas disturbed for storage facilities and staging areas unless prior approval was obtained from the WVDEP. No payment shall be made for any seeding/planting conducted after the final inspection as this work is considered warranty.

## 6.5 Basis of Payment

**6.5.1** The quantities of work done will be paid at the contract unit price bid as listed below, which price and payment shall be full

compensation for doing all the work herein prescribed in a workmanlike and acceptable manner including; the furnishing of all labor, materials, tools, equipment, supplies, and incidentals necessary to complete the work.

**6.5.2** No payment will be made for seeding/planting after the initial application. All work done after initial seeding/planting will be done as maintenance of a completed phase of work or as warranty work after the final inspection.

## 6.6 Pay Items

Item 6.0 **"Revegetation"**, shall be a per plan view acre bid item.

## 7.0 DRAINAGE STRUCTURES

### 7.1 Description

This work shall consist of furnishing all labor, equipment and materials necessary to construct the Drainage Structures shown on the Contract Drawings. Drainage Structures may include, but are not limited to, vegetated, riprap, and grouted riprap drainage channels and low water crossings.

### 7.2 Materials

#### 7.2.1 Excavated Material

This material shall consist of mine spoil, refuse, natural ground and rock. All excavation shall be considered incidental to the work and the cost of this excavation shall be included in the unit bid price for each Drainage Structure item constructed.

#### 7.2.2 Riprap

The Contractor should be aware that no provisions have been made to obtain rock on site. All rock riprap used throughout the project site shall consist of locally available, commercially purchased, calcareous stone (except as noted otherwise) meeting the following requirements. The rock riprap required for the drainage channels shall have a calcium carbonate equivalency of 70% or greater. The rock riprap shall have a maximum loss of thirty percent when subjected to five (5) cycles of the Sodium Sulfate Soundness Test – ASTM C88 (ASTM C88-99a Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate), as modified by ASHTO T-104. The use of on-site rock materials for riprap may be permitted with prior approval from the WVDEP in special circumstances. In order to be considered for use as riprap, the rock shall be subjected to laboratory testing and is required to be certified by the testing laboratory as non-acid producing. A certification on calcium carbonate equivalency and sodium sulfate soundness test shall be submitted to the WVDEP prior to delivery.

Riprap sizing shall be as specified in the drainage channel summaries on the Contract Drawings or as approved by the WVDEP.

### 7.2.3 Low Water Crossings

The stone utilized for the low water crossings shall be 6 inch diameter riprap that meets the requirements noted in Section 7.2.2. The surface voids of the low water crossing shall be filled with washed 1½ inch diameter stone.

### 7.2.4 Grout

If grout is to be used in the drainage channels, it shall be a grout mixture as indicated in the concrete mix design specifications listed below. The amount of water shall be approved or as designated by WVDEP.

CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trail mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trail mixes.
2. Mix proportions shall be based on comprehensive strength as determined by test specimens fabricated in accordance with ASTM C192/C192M and tested in accordance with ASTM C39.
3. Prepare alternate design mixes when the characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

B. Cementitious Materials: no mix shall contain more than one type of non-portland cementitious material. Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Ground Granulated Blast-Furnace Slag: 40 percent
2. Fly Ash: 15 percent

C. Cementitious Materials:

1. Cement replacement: Total cementitious material in all concrete mixes shall be comprised of Portland cement and at least 10%, but not greater than 15%, fly ash, by weight or Portland cement and at least 20%, but

not greater than 40%, ground granulated blast-furnace slag, by weight.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

E. Admixtures: Use admixtures according to manufacturers written instructions.

1. Use water-reducing or high-range water-reducing admixture in concrete.
2. Use high-range water-reducing admixture in pumped concrete, concrete required to be watertight and concrete with a water-cementitious material ratio below 0.50.
3. Use water-reducing and retarding admixture when required by high temperatures, low humidity or other adverse placement conditions.

F. Slump Limit: 4 inches, 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

G. Aggregate Materials: C-33 Natural Sand

CONCRETE MIXTURES FOR RIPRAP GROUT

A. RipRap Grout:

1. Minimum Compressive Strength: 2000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.46.
3. Air Content: 6%, plus or minus 1.5%, at the point of delivery.
4. Minimum Cementitious Materials Content: 650lb/cu.yd.

### 7.2.5 Synthetic Liner

The synthetic liner should be a woven polypropylene geotextile equivalent to a Mirafi FW 300 series and able to control velocities of 8 ft/sec or greater.

## 7.3 Construction Methods

### 7.3.1 Riprap Drainage Channel

**7.3.1.1** All riprap drainage channels shall be constructed as shown on the Contract Drawings or as directed by the WVDEP. Structures shall be installed to the lines and grades shown on the Contract Drawings. Final grading shall be performed to eliminate any irregularities in grade which might impound water.

**7.3.1.2** The excavation shall be done in a safe and careful manner. Construction shall begin at the outlet end so that ponding and wet excavation conditions are held to a minimum.

**7.3.1.3** The final location of the Drainage Structures may be adjusted by the WVDEP in the field as conditions warrant.

**7.3.1.4** The areas to receive Drainage Structures shall be cleared and grubbed in accordance with Section 4.0 of these Specifications.

**7.3.1.5** Excavation for all structures is unclassified and considered incidental to the re-grading and Drainage Structures installation. No additional compensation will be considered for rock excavation. All areas disturbed during construction of the ditch will be revegetated in accordance with Section 6.0 of these Specifications.

**7.3.1.6** Where ditches are to receive riprap, the subgrade shall be excavated such that final grade meets those shown on the Contract Drawings and the required depths are achieved. The subgrade shall be compacted before placing riprap. In areas where refuse material is encountered the area shall be over-excavated by 12 inches.

**7.3.1.7** Riprap shall be placed to the required thickness in one operation without damaging or displacing the underlying material. Riprap shall be placed in accordance with Section 218.3.2, West Virginia Division of Transportation Standard Specification for Roads and Bridges, latest edition. Stone shall be

delivered, stockpiled and placed in such a manner as to keep the material from being segregated. Placement by hand may be required.

### 7.3.2 Synthetic Drainage Channel

Synthetic drainage channels shall be seeded, reinforced, limed, fertilized and mulched in accordance with Section 6.0, **"Revegetation"**, of these Specifications. The synthetic liner should be placed in accordance with the detail provided in contract drawings and meeting manufacturer specifications.

## 7.4 Method of Measurement

**7.4.1** Excavation for all Drainage Structures will be considered incidental to the drainage structure, and will be paid for in the unit bid price of the structure installed.

**7.4.2** The method of measurement for the drainage channel lining, including vegetation and/or riprap shall be included in the unit bid price of the drainage structure installed.

**7.4.3** The method of measurement for the riprap dissipaters shall be included in the pay item for the respective drainage channel for which it is associated.

**7.4.4** The method of measurement for the "**15-inch HDPE Culvert**" and the "**24-inch HDPE Culvert**" shall be to the linear foot of culvert constructed and include material, labor, and equipment to install as shown on the Contract Drawings.

**7.4.5** The method of measurement for the "**Grouted Riprap Vee Drainage Channel – Type A**", "**Synthetic Lined Vee Drainage Channel – Type B**", "**Riprap Trapezoidal Drainage Channel – Type C**", and "**Grouted Riprap Trapezoidal Drainage Channel – Type D**" shall be to the linear foot of channel constructed and include all materials, labor, and equipment to install as shown on the Contract Drawings.

**7.4.6** All excavation associated with items in Section 7.0 shall not be measured, but shall be included within the associated drainage structure, and not in Item 8.0,"**Unclassified Excavation".**

**7.4.7** Surveying shall be incidental to work performed under this section. Payment for surveying shall be indicated under Item 2.0, **"Construction Layout Stakes."**

**7.4.8** The method of measurement for "**Low Water Crossing**", shall be per each item installed.

## 7.5 Pay Items

Item 7.1 "**15-inch HDPE Culvert**", shall be a per linear foot bid item.

Item 7.2 "**24-inch HDPE Culvert**", shall be a per linear foot bid item.

Item 7.3 "**Grouted Riprap Vee Drainage Channel – Type A**", shall be a per linear foot bid item.

Item 7.4 "**Synthetic Lined Vee Drainage Channel – Type B**", shall be a per linear foot bid item.

Item 7.5 "**Riprap Trapezoidal Drainage Channel – Type C**", shall be per linear foot bid item.

Item 7.6 "**Grouted Riprap Trapezoidal Drainage Channel – Type D**", shall be per linear foot bid item.

Item 7.7 "**Low Water Crossing**", shall be bid per each item.

## 8.0 UNCLASSIFIED EXCAVATION

### 8.1 Description

This work shall consist of excavating, transporting, stockpiling, placing and compacting mine spoil, soil, rock, coal refuse or other materials encountered in the grading of the refuse disposal area and any other indicated incidental work. It shall also include the regrading and covering of areas of coal refuse and/or spoil to eliminate erosion rills and gullies and to establish and promote positive drainage and vegetative cover to these areas.

### 8.2 Materials

Fill material for embankments shall be considered a mixture of any or all of mine spoil, soil, rock, or coal refuse.

### 8.3 Borrow/Disposal Area

There are no borrow/disposal areas needed for balance of general excavation and fill quantities on this project. If off site borrow/disposal areas should be necessary to provide for material shortages or excess material disposal, then the Contractor is responsible for locating these areas and obtaining right-of-entry agreements in which the property owner indemnifies and holds WVDEP/OSMRE harmless from any injury or damage whatsoever resulting from the Contractor's use of the property. All prospective Contractors and Bidders must obtain their own permission from the landowner for any subsurface tests, borings, or pits. The Contractor shall be held responsible for compliance with all NEPA requirements and shall provide proof of such compliance to the WVDEP. The Contractor shall submit a reclamation plan to the WVDEP and must obtain approval for plan prior to any disturbance to the disposal site.

### 8.4 Soil Cover

This work consists of covering all areas having exposed refuse at the final grades with a twelve (12) inch thick layer of suitable soil material. The soil shall be obtained in conjunction with clearing and grubbing operations, regrading, drainage feature excavation, and/or from determined off-site soil borrow areas. Excavation of soil cover shall be as per Section 8.5.1. On site material used as soil cover must be used on the property of origination. However, the Contractor is responsible for securing an off-site borrow, or off-property borrow area in the event that adequate soil is not available on site at no additional cost to WVDEP. If, during the course of construction, the need for off-site borrow, or off-property borrow areas becomes evident, the Contractor shall obtain prior

approval from the WVDEP for such borrowing and the borrow area must comply with the attached NEPA regulations. The Contractor shall obtain Right-of-Entry Agreements for any soil or rock borrow areas outside the construction limits which provide for entry by the WVDEP and OSMRE for inspection purposes, with such agreements stating that the property owner(s) indemnifies and holds the WVDEP and OSMRE harmless from injury or damage whatsoever resulting from the use of the property. The Contractor shall obtain a written agreement for any soil or rock borrow material to be utilized on other property, at no additional cost to WVDEP.

On-site soil encountered in areas of proposed disturbance should be utilized for later revegetation whenever possible. The soil materials present in all areas to be excavated or filled shall be gathered and stockpiled in a suitable location, at the discretion of the WVDEP. Where required, strip soil to whatever depths encountered in a manner to prevent intermixing with underlying subsoils. Disturbance of the subsoils is to be minimized whenever possible. Remove heavy growths of grass from areas before stripping. Satisfactory soil is considered to be reasonably free of subsoil, clay clumps, stones and other objects over four (4) inches in diameter, and shall be free of objectionable material. Stockpile soil in storage piles in an area that will not create slope instability and provide free drainage of surface water. Cover stockpiles or use temporary seeding, if necessary, to prevent wind erosion.

The regrading plan shall be conducted in a manner such that a twelve (12) inch thick layer of soil material is uniformly spread over any areas of exposed refuse resulting from the regrading operation. Regrading shall be to the lines and grades shown on the Contract Drawings and the final grade line includes the twelve (12) inch thick layer of soil cover. The soil cover shall not be compacted to the specifications stated for fill compaction, but shall be placed in a manner to allow for proper establishment of vegetation as described in the seedbed preparation portion of the Revegetation specifications. The required soil amendments are to be incorporated into this top-dressing material while it is in a loose state, to facilitate proper mixing of these materials within the soil matrix. The soil cover shall then be prepared by tracking-in with a dozer perpendicular to the slope. The WVDEP may require that the soil cover be scarified prior to seeding if compaction is considered excessive or if rills develop.

## 8.5 Construction Methods

### 8.5.1 Excavation

Material excavation shall consist of the required removal of materials from the areas shown and the sloping and finishing of the

areas to the required lines and grades as shown on the Contract Drawings. The slopes may be varied only by permission of the WVDEP. Any excavation beyond planned grades will not be paid for unless prior authorization is obtained from the Engineer. Slopes shall be trimmed neatly to present a uniform surface, free from hollows and protrusions and loose or overhanging rocks. The tops of all slopes shall be rounded to form a smooth, uniform transition to the existing ground. Areas cut to grade in refuse are to be undercut twelve (12) inches below the final grades shown on the reclamation plan with final grades achieved with soil cover material.

The reclamation approach described in these construction specifications is intended to provide a lasting, stable configuration. The Contractor is required to exercise care to avoid conditions which may result in unstable conditions during the construction process. The Contractor shall be responsible for protecting any residences from damage.

The Contractor must utilize material removal techniques, which are generally considered to be conducive to retaining slope stability. Additionally, disturbed slopes shall be brought to the design template as soon as practical and shall be protected in accordance with Section 6.0, **"Revegetation"**.

### 8.5.2 Material Placement

Depositing and compacting fill in layers shall be started at the lowest point in the fill below grade, at the bottom of ravines and at the toe of the slope on side hill fills. Prior to fill placement, the existing foundation for the embankment will be proof-rolled and all unsuitable material, as determined by the WVDEP, will be removed.

Excavated material shall be placed in embankments in successive layers not to exceed one (1) foot in thickness before compaction. The layers shall be constructed approximately horizontal. Each layer, before starting the next, shall be leveled and smoothed by means of power driven graders, dozers, or other suitable equipment with adequate weight, capacity, and power to do the work. Layers shall be extended across the entire fill at the level of deposition unless otherwise authorized by the WVDEP. Each layer, before starting the next, shall be compacted.

Fill materials to be used in any area of an embankment shall be free from trash, debris, frozen soil, organic material or other foreign material.

Embankment fill and embankment subgrade materials shall be compacted to at least 90% of Standard Proctor maximum dry density at a moisture content of not less than 2% below nor greater than 3% above optimum. Testing shall be at a frequency approved by the WVDEP. One test per day during fill placement shall serve as a minimum.

Embankment fill material which does not contain sufficient moisture to be compacted to the requirements specified herein shall receive applications of water necessary for compaction. Water shall be applied with suitable sprinkling devices and shall be thoroughly incorporated into the material which is to be compacted. Embankment fill material which contains excess moisture shall be dried prior to compaction. Sufficient discing equipment shall be continuously available at the site and shall be used to add water to or remove excess moisture from fill materials.

At the close of each day's work, or when work is to be stopped for a period of time, the entire surface of the compacted fill shall be sealed by a method approved by the WVDEP. If, after a prolonged rainfall, the top surface of any embankment is too wet and/or plastic to work properly, the top material shall be removed to expose firm material. Ruts in the surface of any layer shall be suitably filled or eliminated by grading before compaction. The disturbed areas will be revegetated according to Section 6.0, **"Revegetation"**.

## 8.6 Method of Measurement

The method of measurement for excavation shall be by the cubic yard, which shall be the material actually moved and disposed of as herein described, measured in its original location and determined from volume calculations. Acceptable volume calculations of cut material are: The average end method based on as-built cross-sectional areas. Or the Contractor has the option of performing a topographic survey of the finished ground to produce a surface that can be compared to the original (existing) ground surface using a computer-aided drafting program. It is recommended that the comparison of the finished and original ground surfaces be calculated using the grid volume method with a cut/fill factor of one foot (1'). Field survey and volume calculations shall be certified by a Professional Land Surveyor or Professional Engineer. No separate payment will be made for ditch, underdrain, or any other incidental work referred to under **"Unclassified Excavation"**, or any regrading of refuse where there are no cross-sections.

There shall be no measurement for excavated material for soil cover as payment for this work shall be incidental to Item 8.0, **"Unclassified Excavation"**.

There shall be no measurement of regrading of refuse areas where there are no cross-sections, as payment for this work shall be incidental to Item 8.0, **"Unclassified Excavation"**.

The method of measurement for liming, fertilizing, seeding and mulching soil borrow areas located within the construction limits as addressed in this item is to be included under Section 6.0, **"Revegetation"**, as contained elsewhere in these specifications.

## 8.7 Basis of Payment

Payment for material excavated, transported, and/or backfilled to achieve the final grades will be by the unit price bid for **"Unclassified Excavation"**.

## 8.8 Pay Item

Item 8.0, **"Unclassified Excavation"**, shall be a per cubic yard bid item.

## 9.0 MINE SEALS

### 9.1 Description

This work shall consist of dewatering the existing mine pool, excavating the mine opening, installing wet mine seals and backfilling the opening to near original grade. There are wet mine seal details shown in the Contract Drawings. The specific seal that is needed for each mine opening is shown on the Contract Drawings, but shall be subject to change based on the conditions encountered when the mine entry is opened up during construction and as approved by the WVDEP. It shall be constructed in accordance with the typical details at the locations shown on the Contract Drawings. Materials shall conform to those listed below.

The length of the 12-inch diameter conveyance pipes and any associated cleanouts may vary based on the conditions revealed at the time of construction and the final grades that are achieved.

### 9.2 Materials

#### 9.2.1 3" to 6" Stone

The stone shall consist of sound, durable 3" to 6" non-calcareous stone such as that is commercially available. Crushed stone shall consist of particles of clean, hard, tough, durable rock, free from adherent coating and meeting the requirements of Section 703.1 of the WVDOT Standard Specifications. Stone shall have a maximum weighted loss of twelve (12) percent when subjected to five (5) cycles of the Sodium Sulfate Soundness Test – ASTM C88 (ASTM C99-99a Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate), as modified by the American Association of State Highway and Transportation Officials (AASHTO) T-104. Non-calcareous stone shall exhibit a fizz of zero (0) when subjected to dilute hydrochloric acid. A laboratory certification of soundness and fizz shall be submitted to the WVDEP prior to delivery.

In addition, sufficient 3" to 6" non-calcareous crushed stone shall be obtained to level the pipe in the Wet Mine Seals as shown on the Contract Drawings.

#### 9.2.2 1 ½ inch Crusher Run Stone

1 ½ inch crusher run stone shall be non-calcareous and shall conform to specifications as found under Section 704.2, Stone and Crushed Aggregate, in the West Virginia Division of

Transportation, Standard Specifications Roads and Bridges, latest edition.

### 9.2.3 Filter Fabric

Filter fabric shall be as specified in Section 715.11.4 of the WVDOT Standard Specifications for Roads and Bridges, latest edition.

### 9.2.4 Pipe

The Modified Mine Seal drain pipe (two pipes required) system shall consist of custom perforated 12-inch diameter PVC SDR 35 pipe extending a minimum of two joints from where the SDR 35 pipe that lies within the stone bulkhead connects to the 90 degree elbow.

Perforations shall be one inch (1") in diameter as shown in the Contract Drawings for any Wet Mine Seal or applicable Bat Gate Mine Seal.

The mine seal conveyance pipes (two required per wet seal and applicable bat gate seal) shall be solid 12-inch PVC SDR 35 pipe and shall begin at the end of the mine seal pay item and be installed to an approved discharge point as shown on the Contract Drawings.

Animal guards shall be constructed and installed on the downstream end of each of the two (2) outlet/conveyance pipes as detailed on the Contract Drawings. Cleanouts, if required, shall be installed along the two (2) outlet/conveyance pipe alignments and shall consist of necessary wye fittings and connections compatible with SDR 35 PVC pipe and extending from the outlet pipe to final grades shown on the Contract Drawings.

## 9.3 Construction Methods

**9.3.1** Excavation of the mine opening shall proceed in a manner which will control any release of the mine pool. The opening shall be cleaned of debris to the satisfaction of the WVDEP. Once the opening has been cleaned a minimum six (6) inch layer of stone shall be placed as pipe bedding. The pipes with risers shall be attached to steel plates and placed in the openings as shown on the attached Plans. The stone bulkhead will be constructed and covered with one layer of filter fabric and compacted clay and soil cover as shown on the Contract Drawings. Solid pipe shall extend from the

wet mine seal to a riprap channel discharging one foot above the invert of the channel. All pipes shall have a minimum grade of two (2) percent.
The Contractor shall be solely responsible for any damages caused by dewatering activities.

**9.3.2** A Dewatering Plan shall be submitted and approved by the Engineer prior to any work taking place. In the event pumping is required to dewater a site a straw bale/silt fence pit shall be constructed to intercept the effluent prior to entering waters of the state. This structure shall be located in such a manner that outfall is located with close proximity of a natural riprap lined drain. If necessary, the Contractor shall install (inline and prior to the pit) and operate a water treatment system utilizing soda ash briquettes in a manner approved by the engineer to maintain a pH between 6.0 and 9.0 in all water above base flow while dewatering mine.

**9.3.3** The modified wet mine seals will require excavation into the mine entries/collapsed portals for proper installation. The Contractor shall safely perform this work after taking all necessary precautions with regard to control and treatment of the impounded water, with all work being performed at the risk of the Contractor. The WVDEP accepts no responsibility or liability for any related construction activities. A Dewatering Plan shall be submitted to the WVDEP for approval prior to seal construction, with pool reduction possibly being provided from above with a well-point system or a similar dewatering scheme.

Construction of modified wet mine seals shall be in accordance with the Contract Drawing details. Filter fabric shall separate all aggregate/soil interfaces. The clay seal and pipe outlet trenches shall be compacted in accordance with Section 8.0 of these specifications. The Contractor shall adhere to OSHA Regulation 29 CFR Part 1926 during all excavation and trenching activities.

**9.3.4** Any monitoring wells or piezometers which have been left on this project must be removed and abandoned by a person who has been certified by the State of West Virginia in accordance with 47CSR59, "Monitoring Well Regulations". This certification is necessary for any person to operate in the State of West Virginia and includes construction, installation, alteration and/or abandonment of any monitoring wells and select boreholes. The costs for removal and abandonment shall be considered as incidental to mine seal installation.

## 9.4 Method of Measurement

**9.4.1** Modified Wet Mine Seals shall be measured per mine seal installed and shall include all excavation, dewatering, stone, filter fabric, and pipe necessary to complete the seal. The end of the mine seal shall be considered to be at the end of the outlet pipe where it exits from the compacted backfill. If solid pipe is required to convey the mine discharge to the collection channel, then it shall begin at the end of the seal and shall be considered to be conveyance pipe.

**9.4.4** The method of measurement for the construction of the 12-inch PVC SDR 35 drainage conveyance pipe (associated with the wet seals) shall be on a linear foot basis of the solid pipe as measured from the end of the mine seal to the approved discharge point and measured in place per single run of pipe. Trench excavation, furnishing and placement of the pipe and fittings, any necessary cleanouts, compacted on-site backfill, riprap dissipaters, where required at pipe outlet or ultimate drainage discharge, and minor grading, including all ancillary materials and operations required to construct the drainage conveyance pipes, will not be measured, but shall be considered incidental to this construction.

**9.4.5** Soda Ash Briquettes shall be measured per 50# bag used.

**9.4.6** Straw Bale/Silt Fence Pits shall be measured per each pit installed.

## 9.5 Pay Items

Item 9.1 **"Modified Wet Mine Seal"**, shall be a per each bid item.

Item 9.2, **"Soda Ash Briquettes, 50 lb. Bag"**, shall be a per each bid item.

Item 9.3, **"Straw Bale/Silt Fence Pit"**, shall be a per each bid item.

Item 9.4, **"12-inch Conveyance Pipe - Solid"**, shall be a per linear ft bid item.

## 10.0 UNDERDRAINS

### 10.1 Description

The underdrains shall be constructed as shown on the Contract Drawings, or as directed by the WVDEP. The contractor shall attempt to excavate and maintain the sides of each trench in a vertical position.

### 10.2 Materials

**10.2.1** Stone for underdrain shall consist of sound, durable 3" to 6" non-calcareous stone such as that commercially available. Crushed stone shall consist of particles of clean, hard, tough, durable rock, free from adherent coating and meeting the requirements of Section 703.1 of the WVDOH Standard Specifications for Roads and Bridges, Adopted 2000. Stone shall have a maximum weighted loss of twelve (12) percent when subjected to five cycles of the Sodium Sulfate Soundness Test – ASTM C88 (ASTM C88-99a Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate), as modified by the American Association of State Highway and Transportation Officials (AASHTO) T-104. Non-calcareous stone shall exhibit a fizz of zero(0) when subjected to dilute hydrochloric acid. A laboratory certification of soundness and fizz shall be submitted to the WVDEP prior to delivery.

**10.2.2** Filter fabric for the underdrain shall be non-woven type, meeting the requirements of Section 715.11.4 of the WVDOH Standard Specifications for Roads and Bridges, latest edition.

**10.2.3** Pipe shall consist of perforated 12-inch diameter PVC SDR 35 grade within the underdrain and solid 12-inch diameter PVC SDR 35 grade from the underdrain to the riprap channel. Clean outs shall consist of necessary "ell" fittings and connections compatible with SDR 35 PVC pipe. End caps shall consist of 12-inch diameter PVC SDR 35 grade.

### 10.3 Construction Methods

**10.3.1** Trench width for the underdrains shall be as indicated on the typical details provided in the Contract Drawings. Trenching will involve excavation of in-place material including soil and rock.

**10.3.2** Trench exceeding five (5) feet in depth shall be supported in compliance with OSHA requirements. Trench bottom shall be cleared of any loose debris and any standing water.

**10.3.3** Filter fabric shall be installed in the trench as shown on the Contract Drawings. The aggregate shall be placed carefully to prevent puncturing, tearing, or shifting of the filter fabric. The filter fabric shall not be installed over the ends of the underdrains where the rock shall daylight directly into existing or modified drainage ways.

**10.3.4** Animal guards shall be constructed and installed on the downstream end of each outlet pipe as detailed on the plans. These guards will be installed the same day to prevent animal entry during non-work time.

**10.3.5** End caps or end line cleanouts, as indicated on the Contract Drawings, shall be installed on the upstream end of the SDR 35 PVC pipe with the underdrain.

## 10.4 Method of Measurement

The method of measurement for the Underdrains shall be per linear foot installed and include all materials, labor, and equipment to install as shown on the Contract Drawings.

All excavation is unclassified; no additional compensation will be made for rock excavation.

## 10.5 Basis for Payment

Payment for the installation of underdrains shall be at the unit bid price for **"Underdrains".**

## 10.6 Pay Items

Item 10.0 **"Underdrains"**, shall be per linear foot bid item.

## 11.0 UTILITIES

### 11.1 Description

This work shall consist of all necessary measures to locate, relocate, maintain and protect all utilities within the limits of work specified herein and on the Contract Drawings.

The Contractor shall be responsible for making all necessary arrangements and/or performing all necessary work to the satisfaction of each affected utility company and the West Virginia Department of Highways in connection with the disturbances within their respective rights-of-way or services.

The Contractor shall be solely responsible for locating all utilities within the limits of work. All damages made to existing utilities by the Contractor shall be the sole responsibility of the Contractor.

In the event damage does occur, the Contractor shall notify each affected Owner and the WVDEP immediately, and make or have made all necessary repairs and bear the expenses thereof and of resulting damage caused thereby.

### 11.2 Materials

All materials used for utility related disturbances shall be in accordance with these Specifications, or as directed by the affected utility.

### 11.3 Construction Methods

All work shall be in accordance with these Specifications, or with those methods as directed by the affected utility.

### 11.4 Method of Measurement

Payment will be made for utility relocation at actual invoice cost from the affected utility as approved by WVDEP.

## 13.0 ACCESS ROADS

### 13.1 Description

This work shall consist of all necessary measures to locate, upgrade, maintain, and install the access road according to the Contract Drawings and these specifications. The Contractor shall locate and protect all existing utilities and maintain access at all times to landowners served by the existing portions of the access.

The Contractor shall be responsible for making all necessary arrangements and/or performing all necessary work to the satisfaction of each affected utility company, private property owner, and the West Virginia Department of Highways in connection with any disturbances within their respective rights-of-way or services.

The Contractor shall be solely responsible for locating all utilities within the limits of work. All damages made to existing utilities by the Contractor shall be the sole responsibility of the Contractor.

In the event damage does occur, the Contractor shall notify each affected Owner and the WVDEP immediately, and make or have made all necessary repairs and bear the expenses thereof and of resulting damage caused thereby.

### 13.2 Access Road Construction

The existing access along jeep trails, from the stabilized construction entrance to the project site, shall be upgraded, as needed, and remain so at the completion of the project. Contractor will inspect the access route and make necessary improvements to meet construction needs and to protect against any erosion and sediment discharges. A stabilized construction entrance shall be installed and maintained, throughout the project, at the access entrance to County Route 7. All materials used for this access shall be in accordance with these Specifications, or as directed by the WVDEP.

Contractor shall be responsible for constructing and maintaining a stable roadway suitable for 4-wheel drive vehicle travel throughout the project life. All aggregates used in the construction and maintenance of the access shall be WVDOT approved.

The access road from the stabilized construction entrance to the project site has not been designed. It is the responsibility of the Contractor to determine the quantity and location of all erosion and sediment control associated with this section of access road. Typical details for the access road construction have been provided in the Contract Drawings.

A laydown or temporary storage area measuring 50' by 100', as shown on the Contract Drawings, may be constructed adjacent to the access road in the field area. This area must be completely reclaimed upon completion. All rock shall be removed, the topsoil replaced, and revegetated.

Metal farm gates shall be installed at locations shown on the Contract Drawings. The gates shall adhere to the specifications provided on, and be installed according to, the Contract Drawings.

## 13.3 Gabion Baskets

Gabion baskets shall consist of rectangular wire mesh formed containers filled with rock. Rock for the gabion baskets shall be hard, durable and clean stone. Wire for fabrication and assembly shall be hot-dipped galvanized with a coating of 0.7 oz. / SF and conforming to ASTM A 641, Class 3, and Soft Temper with a tensile strength of 60,000 psi.

### 13.3.1 Gabion Baskets

**13.3.1.1** Foundations for the gabion baskets must be free of unsuitable materials, drained of groundwater and seeps and be properly graded and compacted. The foundation shall be inspected and approved by the Owner prior to the actual start of gabion construction.

**13.3.1.2** Assembly of the baskets and placement of rock within the gabions shall produce a neat face and shall be in accordance with the approved manufacturer's instructions and specifications.

**13.3.1.3** Gabion baskets shall be constructed as shown on the contract plans. The baskets must be stretched tight and the sides protected to ensure that they are not distorted while being filled. Each layer of baskets must be laced together and filled in one foot layers. After each lift, two connecting wires must be placed between each lift in each cell of all exposed faces to further maintain their form. Some hand placement will be necessary to properly distribute the stone for a flat surface on top and to prevent any voids within the baskets. The lids must then be stretched tightly shut while wiring the gabions to prevent movement of the stone fill.

## 13.4 Materials

**13.4.1** All aggregate shall be WVDOT approved and as shown in the Contract Drawings.

**13.4.2** Filter fabric shall be used in the construction of the access road. Filter fabric is only to be used in areas where needed, as approved by WVDEP.

**13.4.3** Three (3) metal farm gates specified and installed as shown on the Contract Drawings.

**13.4.3** Temporary and permanent fences specified and installed as shown on the Contract Drawings.

## 13.5 Method of Measurement

All costs including equipment, labor, and materials used to install, maintain, and reclaim these items shall be included and considered incidental to the item.

## 13.6 Basis for Payment

The method of measurement for **"Access Road"** shall be by the linear foot for materials (stone and filter cloth) and placement of materials.

The method of measurement for **"Farm Gates"** shall be per each bid item.

The method of measurement for **"Stone Filled Gabion Baskets"** shall be by the cubic yard of gabion baskets in place.

The method of measurement for "**Temporary Fence**" and "**Permanent Fence**" shall be by the linear foot.

## 13.6 Pay Items

Item 13.1 **"Access Road"**, shall be lump sum item.

Item 13.2 **"Farm Gates"**, shall be a per each.

Item 13.3 **"Stone Filled Gabion Baskets"**, shall be a per cubic yard.

Item 13.4 "**Temporary Fence**", shall be a per linear foot bid item.

Item 13.5 "**Permanent Fence**", shall be a per linear foot bid item.

## 14.0 TEST BORING LOGS

The final exploratory boring logs for the test borings identified on the Contract Drawings are attached within this section of the specifications. The exploratory borings shown on the Contract Drawings or attached to these specifications, depicting subsurface conditions are thought to be representative but cannot be guaranteed accurate. In the event others make conclusions or recommendations based on the test boring data shown, such conclusions or recommendations are the responsibility of the others.

The Contractor shall have satisfied himself by personal examination of subsurface samples from test borings, by a visit to the site and by such other means as he may have chosen, as to the actual conditions and requirements of the work. No allowance will be made for any claim that the bid was based upon incomplete information as to the nature and character of the site, the work involved, or for materials of an unexpected character found in excavations.

All Contractors and prospective bidders must receive permission from the Landowner before obtaining any subsurface samples and/or test borings holding WVDEP harmless against any injury or damage whatsoever resulting from this use of the property.

## 15.0 ENCAPSULATED AGGREGATE PLUG

### 15.1 Description

The work within this item will include the necessary labor, equipment, and materials to repair the designated sinkhole or depression features show on the drawings. Excavation of unclassified material to investigate and prepare each sinkhole or depression for placement of geosynthetic filter fabric and aggregate to construct an aggregate plug.

### 15.2 Materials

#### 15.2.1 Aggregate

Coarse aggregate shall be 12" riprap stone, uniformly graded and conform to the standards and specifications of Table 704.3 of the WVDOH Standards and Specifications.

#### 15.2.2 Filter Fabric

Geosythetic reinforcement shall be a woven filter fabric such as Propex Geotex315ST or equivalent.

### 15.3 Construction Methods

#### 15.3.1 Excavation

Each site shall be excavated to a depth sufficient or 10 feet minimum to determine if the sinkhole feature is a result of a mine shaft, ventilation or power boring, subsidence, drainage problem, etc. Using equipment, the contractor will probe the bottom and sides of the area to identify any potential construction material such as capping or shaft timbers or materials. Upon completion of initial investigation, the bottom of excavation will be compacted to extent possible with excavator and the sides graded to a 2H/1V slope to prepare for the aggregate plug installation. The bottom dimensions will allow a minimum of 3 feet surrounding any area suspected to be unstable or related to the vertical shaft or subsidence feature.

#### 15.3.2 Fabric Placement

Fabric shall be placed in a manner to provide full encapsulation of the aggregate material to be placed. The fabric will be placed in a continuous piece to fully cover the bottom and provide side and top overlap. A minimum of two pieces placed perpendicular to each

other shall be used. Additional pieces may be required, depending on size and configuration.

### 15.3.3 Aggregate Placement

Stone shall be placed into excavation upon completion of proper placement of filter fabric. The stone shall form a layer of 2 feet minimum and be leveled using excavator. Fabric will then be overlapped and folded to completely enclose aggregate. Earthen fill from excavation will be used to cover plug with a minimum of 2 feet of soil. Site shall be graded to approximate original contour and revegetated.

## 15.4 Basis of Payment

15.4.1 The per each sum shall be considered full compensation for doing all the work herein prescribed in a workmanlike and acceptable manner; including the furnishing of all labor, materials, tools, equipment, supplies and incidentals necessary to complete the work.

15.4.2 No payment will be made for seeding after the initial seeding. All work done after initial seeding will be done as maintenance of a completed phase of work or as warranty work after the final inspection.

## 15.5 Pay Items

**Item 15.0** **"Encapsulated Aggregate Plug"**, shall be per each.

Hatch Mott MacDonald

# CALCULATION BRIEF

**West Virginia Department of Environmental Protection**

## PEPPER PORTALS AND DRAINAGE

**Elk District, Barbour County, West Virginia**

**November 11, 2014**

## Pepper Portals Access Excavation Volumes

| Station ID | Cut Area Sq. Ft. | Cut Area Cu. Ft. | Fill Area Sq. Ft. | Fill Area Cu. Ft. |
|---|---|---|---|---|
| 0 | 0 | | | |
| 50 | 106.2292 | 2655.73 | 0 | 0 |
| 100 | 7.6443 | 2846.8375 | 1.2047 | 30.1175 |
| 150 | 3.9159 | 289.005 | 7.0101 | 205.37 |
| 200 | 1.3354 | 131.2825 | 13.0638 | 501.8475 |
| 250 | 6.393 | 193.21 | 0.9833 | 351.1775 |
| 300 | 61.8281 | 1705.5275 | 0 | 24.5825 |
| 350 | 73.8216 | 3391.2425 | 2.647 | 66.175 |
| 400 | 16.655 | 2261.915 | 36.3115 | 973.9625 |
| 450 | 6.7058 | 584.02 | 92.9451 | 3231.415 |
| 500 | 6.7116 | 335.435 | 21.8145 | 2868.99 |
| 550 | 500.1269 | 12670.9625 | 17.9546 | 994.2275 |
| 600 | 801.43 | 32538.9225 | 0 | 448.865 |
| 650 | 1412.9351 | 55359.1275 | 0 | 0 |
| 700 | 1272.9054 | 67146.0125 | 117.0859 | 2927.1475 |
| 750 | 2167.1447 | 86001.2525 | 0 | 2927.1475 |
| 800 | 1413.9858 | 89528.2625 | 0 | 0 |
| 850 | 1022.6667 | 60916.3125 | 33.679 | 841.975 |
| 900 | 405.6949 | 35709.04 | 214.1259 | 6195.1225 |
| 950 | 180.3277 | 14650.565 | 303.6001 | 12943.15 |

| | | | |
|---|---|---|---|
| **Total Cut Cu. Ft.** | 468914.6625 | **Total Fill Cu. Ft.** | 36831.2725 |
| **Total Cut Cu. Yds.** | 17367.20972 | **Total Fill Cu. Yds.** | 1364.074056 |
| | | **Net Cu. Yds.** | 16003.13567 |

# Pepper Portals Baseline Excavation Volumes

| Station ID | Cut Area Sq. Ft. | Cut Area Cu. Ft. | Fill Area Sq. Ft. | Fill Area Cu. Ft. |
|---|---|---|---|---|
| 10000 | 595.9 | | | |
| 10050 | 994.6 | 39762.5 | 0 | 0 |
| 10100 | 1446.8 | 61035 | 0 | 0 |
| 10150 | 0 | 36170 | 484.1368 | 12103.42 |
| 10200 | 0 | 0 | 631.0743 | 27880.2775 |
| 10250 | 0 | 0 | 654.4565 | 32138.27 |
| 10300 | 40.7062 | 1017.655 | 786.2606 | 36017.9275 |
| 10350 | 52.9979 | 2342.6025 | 785.3793 | 39290.9975 |
| 10400 | 17.8319 | 1770.745 | 1245.914 | 50782.3325 |
| 10450 | 13.2775 | 777.735 | 908.2404 | 53853.86 |
| 10500 | 190.1644 | 5086.0475 | 804.008 | 42806.21 |
| 10550 | 347.2916 | 13436.4 | 374.1689 | 29454.4225 |
| 10600 | 303.5959 | 16272.1875 | 461.9504 | 20902.9825 |
| 10650 | 417.8801 | 18036.9 | 914.0335 | 34399.5975 |
| 10700 | 493.1877 | 22776.695 | 1400.721 | 57868.8625 |
| 10750 | 0 | 12329.6925 | 1853.5301 | 81356.2775 |
| 10800 | 488.4829 | 12212.0725 | 1644.6057 | 87453.395 |
| 10850 | 1244.3646 | 43321.1875 | 1370.9811 | 75389.67 |
| 10900 | 392.2138 | 40914.46 | 1425.294 | 69906.8775 |
| 10950 | 387.2613 | 19486.8775 | 1175.7437 | 65025.9425 |
| 11000 | 359.4399 | 18667.53 | 1717.6003 | 72333.6 |
| 11050 | 180.4586 | 13497.4625 | 3421.7812 | 128484.5375 |
| 11100 | 1898.0082 | 51961.67 | 2080.3696 | 137553.77 |
| 11150 | 2776.6309 | 116865.9775 | 2054.7838 | 103378.835 |
| 11200 | 2845.479 | 140552.7475 | 2087.5132 | 103557.425 |
| 11250 | 2708.6404 | 138852.985 | 2219.2169 | 107668.2525 |
| 11300 | 2156.0437 | 121617.1025 | 2081.8962 | 107527.8275 |
| 11350 | 1138.8898 | 82373.3375 | 2189.6916 | 106789.695 |
| 11400 | 2295.4836 | 85859.335 | 1985.2485 | 104373.5025 |
| 11450 | 3941.4512 | 155923.37 | 1763.4982 | 93718.6675 |
| 11500 | 3452.345 | 184844.905 | 1648.3087 | 85295.1725 |
| 11550 | 2163.4846 | 140395.74 | 1562.0314 | 80258.5025 |
| 11600 | 403.8651 | 64183.7425 | 1651.0867 | 80327.9525 |
| 11650 | 0 | 10096.6275 | 671.6321 | 58067.97 |

| | | | |
|---|---|---|---|
| **Total Cut Cu. Ft.** | [illegible] | **Total Fill Cu. Ft.** | [illegible] |
| **Total Cut Cu. Yds.** | [illegible] | **Total Fill Cu. Yds.** | [illegible] |
| | | **Net Cu. Yds.** | [illegible] |

4724.07407 6048.62787
4724.55379

DITCHES

| | C | I | A | = | Q |
|---|---|---|---|---|---|
| #1 | 0.65 | 3.55 | 0.20 | | **2.35** |
| #2 | 0.65 | 3.55 | 1.73 | | 3.99 |
| #2 forest | 0.2 | 3.55 | 2.77 | | 1.97 |
| #2 Total | | | | | **5.96** |
| #3 | 0.65 | 3.55 | 1.97 | | 4.55 |
| #3 forest | 0.2 | 3.55 | 5.18 | | 3.68 |
| #3 Total | | | | | **8.22** |
| #4 | 0.65 | 3.55 | 0.06 | | 0.14 |
| #4 Total | | | | | **14.32** |
| #5 | 0.65 | 3.55 | 2.00 | | 4.62 |
| #5 forest | 0.2 | 3.55 | 8.25 | | 5.86 |
| #5 Total | | | | | **10.47** |
| #6 | 0.65 | 3.55 | 0.19 | | 0.44 |
| #6 Forest | 0.2 | 3.55 | 1.13 | | 0.80 |
| #6 Total | | | | | **11.71** |
| | | | | | |
| Road Culvert forest | 0.2 | 3.55 | 6.95 | | 4.93 |
| Road Culvert | 0.65 | 3.55 | 1.74 | | 4.02 |
| Road Culvert Total | | | | | **8.95** |
| | | | | | |
| Road Culvert 3forest | 0.2 | 3.55 | 0.06 | | 0.04 |
| Road Culvert 3forest | 0.65 | 3.55 | 0.89 | | 2.05 |
| Road Culvert Total | | | | | **2.10** |
| | | | | | |
| Road Culvert 2forest | 0.2 | 3.55 | 1.10 | | 0.78 |
| Road Culvert 2forest | 0.65 | 3.55 | 0.48 | | 1.11 |
| Road Culvert Total | | | | | **1.89** |

# Culvert Calculator Report
## Wet Seal - ME-1

Solve For: Headwater Elevation

| Culvert Summary | | | | | |
|---|---|---|---|---|---|
| Allowable HW Elevation | 0.00 | ft | Headwater Depth/Height | 0.24 | |
| Computed Headwater Elev | 1,298.24 | ft | Discharge | 0.33 | cfs |
| Inlet Control HW Elev. | 1,298.22 | ft | Tailwater Elevation | 0.00 | ft |
| Outlet Control HW Elev. | 1,298.24 | ft | Control Type | Entrance Control | |

| Grades | | | | | |
|---|---|---|---|---|---|
| Upstream Invert | 1,298.00 | ft | Downstream Invert | 1,296.00 | ft |
| Length | 170.00 | ft | Constructed Slope | 0.011765 | ft/ft |

| Hydraulic Profile | | | | | |
|---|---|---|---|---|---|
| Profile | S2 | | Depth, Downstream | 0.14 | ft |
| Slope Type | Steep | | Normal Depth | 0.14 | ft |
| Flow Regime | Supercritical | | Critical Depth | 0.17 | ft |
| Velocity Downstream | 2.59 | ft/s | Critical Slope | 0.005038 | ft/ft |

| Section | | | | | |
|---|---|---|---|---|---|
| Section Shape | Circular | | Mannings Coefficient | 0.012 | |
| Section Material | HDPE (Smooth Interior) | | Span | 1.00 | ft |
| Section Size | 12 inch | | Rise | 1.00 | ft |
| Number Sections | 2 | | | | |

| Outlet Control Properties | | | | | |
|---|---|---|---|---|---|
| Outlet Control HW Elev. | 1,298.24 | ft | Upstream Velocity Head | 0.06 | ft |
| Ke | 0.20 | | Entrance Loss | 0.01 | ft |

| Inlet Control Properties | | | | | |
|---|---|---|---|---|---|
| Inlet Control HW Elev. | 1,298.22 | ft | Flow Control | N/A | |
| Inlet Type | Groove end projecting | | Area Full | 1.6 | ft² |
| K | 0.00450 | | HDS 5 Chart | 1 | |
| M | 2.00000 | | HDS 5 Scale | 3 | |
| C | 0.03170 | | Equation Form | 1 | |
| Y | 0.69000 | | | | |

# Culvert Calculator Report
## ACCESS STATION 0+05

Solve For: Headwater Elevation

| Culvert Summary | | | |
|---|---|---|---|
| Allowable HW Elevation | 1,162.20 ft | Headwater Depth/Height | 0.57 |
| Computed Headwater Elev | 1,160.33 ft | Discharge | 4.93 cfs |
| Inlet Control HW Elev. | 1,160.28 ft | Tailwater Elevation | 0.00 ft |
| Outlet Control HW Elev. | 1,160.33 ft | Control Type | Entrance Control |

| Grades | | | |
|---|---|---|---|
| Upstream Invert | 1,159.20 ft | Downstream Invert | 1,158.70 ft |
| Length | 62.00 ft | Constructed Slope | 0.008065 ft/ft |

| Hydraulic Profile | | | |
|---|---|---|---|
| Profile | S2 | Depth, Downstream | 0.64 ft |
| Slope Type | Steep | Normal Depth | 0.64 ft |
| Flow Regime | Supercritical | Critical Depth | 0.78 ft |
| Velocity Downstream | 5.65 ft/s | Critical Slope | 0.003875 ft/ft |

| Section | | | |
|---|---|---|---|
| Section Shape | Circular | Mannings Coefficient | 0.012 |
| Section Material | HDPE (Smooth Interior) | Span | 2.00 ft |
| Section Size | 24 inch | Rise | 2.00 ft |
| Number Sections | 1 | | |

| Outlet Control Properties | | | |
|---|---|---|---|
| Outlet Control HW Elev. | 1,160.33 ft | Upstream Velocity Head | 0.29 ft |
| Ke | 0.20 | Entrance Loss | 0.06 ft |

| Inlet Control Properties | | | |
|---|---|---|---|
| Inlet Control HW Elev. | 1,160.28 ft | Flow Control | N/A |
| Inlet Type | Groove end projecting | Area Full | 3.1 ft² |
| K | 0.00450 | HDS 5 Chart | 1 |
| M | 2.00000 | HDS 5 Scale | 3 |
| C | 0.03170 | Equation Form | 1 |
| Y | 0.69000 | | |

# Culvert Calculator Report
## ACCESS STATION 3+30

Solve For: Headwater Elevation

| Culvert Summary | | | |
|---|---|---|---|
| Allowable HW Elevation | 1,227.00 ft | Headwater Depth/Height | 0.91 |
| Computed Headwater Elev | 1,226.64 ft | Discharge | 1.89 cfs |
| Inlet Control HW Elev. | 1,226.57 ft | Tailwater Elevation | 0.00 ft |
| Outlet Control HW Elev. | 1,226.64 ft | Control Type | Entrance Control |

| Grades | | | |
|---|---|---|---|
| Upstream Invert | 1,225.50 ft | Downstream Invert | 1,224.00 ft |
| Length | 21.00 ft | Constructed Slope | 0.071429 ft/ft |

| Hydraulic Profile | | | |
|---|---|---|---|
| Profile | S2 | Depth, Downstream | 0.41 ft |
| Slope Type | Steep | Normal Depth | 0.27 ft |
| Flow Regime | Supercritical | Critical Depth | 0.55 ft |
| Velocity Downstream | 5.38 ft/s | Critical Slope | 0.004636 ft/ft |

| Section | | | |
|---|---|---|---|
| Section Shape | Circular | Mannings Coefficient | 0.012 |
| Section Material | HDPE (Smooth Interior) | Span | 1.25 ft |
| Section Size | 15 inch | Rise | 1.25 ft |
| Number Sections | 1 | | |

| Outlet Control Properties | | | |
|---|---|---|---|
| Outlet Control HW Elev. | 1,226.64 ft | Upstream Velocity Head | 0.32 ft |
| Ke | 0.20 | Entrance Loss | 0.06 ft |

| Inlet Control Properties | | | |
|---|---|---|---|
| Inlet Control HW Elev. | 1,226.57 ft | Flow Control | N/A |
| Inlet Type | Groove end projecting | Area Full | 1.2 ft² |
| K | 0.00450 | HDS 5 Chart | 1 |
| M | 2.00000 | HDS 5 Scale | 3 |
| C | 0.03170 | Equation Form | 1 |
| Y | 0.69000 | | |

# Culvert Calculator Report
## ACCESS STATION 6+04

Solve For: Headwater Elevation

| Culvert Summary | | | |
|---|---|---|---|
| Allowable HW Elevation | 1,255.50 ft | Headwater Depth/Height | 0.68 |
| Computed Headwater Elev | 1,254.15 ft | Discharge | 2.10 cfs |
| Inlet Control HW Elev. | 1,254.09 ft | Tailwater Elevation | 0.00 ft |
| Outlet Control HW Elev. | 1,254.15 ft | Control Type | Entrance Control |

| Grades | | | |
|---|---|---|---|
| Upstream Invert | 1,253.30 ft | Downstream Invert | 1,252.00 ft |
| Length | 32.00 ft | Constructed Slope | 0.040625 ft/ft |

| Hydraulic Profile | | | |
|---|---|---|---|
| Profile | S2 | Depth, Downstream | 0.34 ft |
| Slope Type | Steep | Normal Depth | 0.33 ft |
| Flow Regime | Supercritical | Critical Depth | 0.58 ft |
| Velocity Downstream | 7.92 ft/s | Critical Slope | 0.004716 ft/ft |

| Section | | | |
|---|---|---|---|
| Section Shape | Circular | Mannings Coefficient | 0.012 |
| Section Material | HDPE (Smooth Interior) | Span | 1.25 ft |
| Section Size | 15 inch | Rise | 1.25 ft |
| Number Sections | 1 | | |

| Outlet Control Properties | | | |
|---|---|---|---|
| Outlet Control HW Elev. | 1,254.15 ft | Upstream Velocity Head | 0.22 ft |
| Ke | 0.20 | Entrance Loss | 0.04 ft |

| Inlet Control Properties | | | |
|---|---|---|---|
| Inlet Control HW Elev. | 1,254.09 ft | Flow Control | N/A |
| Inlet Type | Groove end projecting | Area Full | 1.2 ft² |
| K | 0.00450 | HDS 5 Chart | 1 |
| M | 2.00000 | HDS 5 Scale | 3 |
| C | 0.03170 | Equation Form | 1 |
| Y | 0.69000 | | |

# Shear Stress Calculations

## Collection Ditch #1

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+00-0+30 | 0.49 | 0.053 | 10 | Synthetic Mat | 1.62 | --- |
| 0+30-0+63 | 0.47 | 0.061 | 10 | Synthetic Mat | 1.79 | --- |
| 0+63-1+11 | 0.36 | 0.25 | 10 | Synthetic Mat | 5.62 | --- |
| 1+11-3+11 | 0.38 | 0.2 | 10 | Synthetic Mat | 4.74 | --- |
| 3+11-3+47 | 0.37 | 0.228 | 10 | Synthetic Mat | 5.26 | --- |
| 3+47-3+67 | 0.34 | 0.225 | 10 | Synthetic Mat | 4.77 | --- |
| 3+67-4+67 | 0.42 | 0.08 | 10 | Synthetic Mat | 2.10 | --- |
| 4+67-4+99 | 0.33 | 0.188 | 10 | Synthetic Mat | 3.87 | --- |
| 4+99-5+12 | 0.35 | 0.154 | 10 | Synthetic Mat | 3.36 | --- |
| 5+12-6+81 | 0.4 | 0.071 | 10 | Synthetic Mat | 1.77 | --- |
| 6+81-9+74 | 0.38 | 0.157 | 10 | Synthetic Mat | 3.72 | --- |

## Collection Ditch #2

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+00-6+84 | 0.83 | 0.02 | 10 | Synthetic Mat | 1.04 | --- |

## Collection Ditch #3

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+00-5+07 | 0.94 | 0.02 | 10 | Synthetic Mat | 1.17 | --- |

## Collection Ditch #4

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+00-1+34 | 1.11 | 0.239 | 3 | 12" Rock Rip Rap | 16.55 | Slush Grouted |
| 1+34-1+62 | 1.39 | 0.071 | 3 | 12" Rock Rip Rap | 6.16 | Slush Grouted |
| 1+62-1+75 | 1.72 | 0.023 | 3 | 12" Rock Rip Rap | 2.47 | --- |

## Collection Ditch #5

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+00-4+46 | 1.02 | 0.02 | 10 | Synthetic Mat | 1.27 | --- |

## Collection Ditch #6

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+05-0+27 | 1.14 | 0.136 | 3 | 12" Rock Rip Rap | 9.67 | Slush Grouted |
| 0+27-0+68 | 1.38 | 0.049 | 3 | 12" Rock Rip Rap | 4.22 | Slush Grouted |
| 0+68-1+56 | 0.99 | 0.294 | 3 | 12" Rock Rip Rap | 18.16 | Slush Grouted |
| 1+56-1+75 | 0.91 | 0.468 | 3 | 12" Rock Rip Rap | 26.57 | Slush Grouted |
| 1+75-2+03 | 1.05 | 0.211 | 3 | 12" Rock Rip Rap | 13.82 | Slush Grouted |
| 2+03-2+48 | 1.64 | 0.02 | 3 | 12" Rock Rip Rap | 2.05 | --- |

# Worksheet for CHANNEL #1 - 0+00-0+30

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.05300 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.35 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.49 | ft |
| Flow Area | 0.47 | $ft^2$ |
| Wetted Perimeter | 2.18 | ft |
| Hydraulic Radius | 0.22 | ft |
| Top Width | 1.95 | ft |
| Critical Depth | 0.61 | ft |
| Critical Slope | 0.01568 | ft/ft |
| Velocity | 4.95 | ft/s |
| Velocity Head | 0.38 | ft |
| Specific Energy | 0.87 | ft |
| Froude Number | 1.77 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.49 | ft |
| Critical Depth | 0.61 | ft |
| Channel Slope | 0.05300 | ft/ft |
| Critical Slope | 0.01568 | ft/ft |

# Worksheet for CHANNEL #1 - 0+30-0+63

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.06100 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.35 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.47 | ft |
| Flow Area | 0.45 | $ft^2$ |
| Wetted Perimeter | 2.12 | ft |
| Hydraulic Radius | 0.21 | ft |
| Top Width | 1.90 | ft |
| Critical Depth | 0.61 | ft |
| Critical Slope | 0.01568 | ft/ft |
| Velocity | 5.22 | ft/s |
| Velocity Head | 0.42 | ft |
| Specific Energy | 0.90 | ft |
| Froude Number | 1.89 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.47 | ft |
| Critical Depth | 0.61 | ft |
| Channel Slope | 0.06100 | ft/ft |
| Critical Slope | 0.01568 | ft/ft |

# Worksheet for CHANNEL #1 - 0+63-1+11

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.25000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.35 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.36 | ft |
| Flow Area | 0.27 | $ft^2$ |
| Wetted Perimeter | 1.63 | ft |
| Hydraulic Radius | 0.16 | ft |
| Top Width | 1.46 | ft |
| Critical Depth | 0.61 | ft |
| Critical Slope | 0.01568 | ft/ft |
| Velocity | 8.86 | ft/s |
| Velocity Head | 1.22 | ft |
| Specific Energy | 1.58 | ft |
| Froude Number | 3.66 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.36 | ft |
| Critical Depth | 0.61 | ft |
| Channel Slope | 0.25000 | ft/ft |
| Critical Slope | 0.01568 | ft/ft |

# Worksheet for CHANNEL #1 - 1+11-3+11

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.20000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.35 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.38 | ft |
| Flow Area | 0.29 | $ft^2$ |
| Wetted Perimeter | 1.70 | ft |
| Hydraulic Radius | 0.17 | ft |
| Top Width | 1.52 | ft |
| Critical Depth | 0.61 | ft |
| Critical Slope | 0.01568 | ft/ft |
| Velocity | 8.15 | ft/s |
| Velocity Head | 1.03 | ft |
| Specific Energy | 1.41 | ft |
| Froude Number | 3.30 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.38 | ft |
| Critical Depth | 0.61 | ft |
| Channel Slope | 0.20000 | ft/ft |
| Critical Slope | 0.01568 | ft/ft |

# Worksheet for CHANNEL #1 - 3+11-3+47

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.22800 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.35 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.37 | ft |
| Flow Area | 0.27 | $ft^2$ |
| Wetted Perimeter | 1.66 | ft |
| Hydraulic Radius | 0.17 | ft |
| Top Width | 1.48 | ft |
| Critical Depth | 0.61 | ft |
| Critical Slope | 0.01568 | ft/ft |
| Velocity | 8.56 | ft/s |
| Velocity Head | 1.14 | ft |
| Specific Energy | 1.51 | ft |
| Froude Number | 3.51 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.37 | ft |
| Critical Depth | 0.61 | ft |
| Channel Slope | 0.22800 | ft/ft |
| Critical Slope | 0.01568 | ft/ft |

# Worksheet for CHANNEL #1 - 3+47-3+67

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.22500 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 1.89 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.34 | ft |
| Flow Area | 0.23 | $ft^2$ |
| Wetted Perimeter | 1.53 | ft |
| Hydraulic Radius | 0.15 | ft |
| Top Width | 1.37 | ft |
| Critical Depth | 0.56 | ft |
| Critical Slope | 0.01615 | ft/ft |
| Velocity | 8.07 | ft/s |
| Velocity Head | 1.01 | ft |
| Specific Energy | 1.35 | ft |
| Froude Number | 3.44 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.34 | ft |
| Critical Depth | 0.56 | ft |
| Channel Slope | 0.22500 | ft/ft |
| Critical Slope | 0.01615 | ft/ft |

# Worksheet for CHANNEL #1 - 3+67-4+67

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.08000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 1.89 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.42 | ft |
| Flow Area | 0.35 | $ft^2$ |
| Wetted Perimeter | 1.86 | ft |
| Hydraulic Radius | 0.19 | ft |
| Top Width | 1.66 | ft |
| Critical Depth | 0.56 | ft |
| Critical Slope | 0.01614 | ft/ft |
| Velocity | 5.47 | ft/s |
| Velocity Head | 0.47 | ft |
| Specific Energy | 0.88 | ft |
| Froude Number | 2.12 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.42 | ft |
| Critical Depth | 0.56 | ft |
| Channel Slope | 0.08000 | ft/ft |
| Critical Slope | 0.01614 | ft/ft |

# Worksheet for CHANNEL #1 - 4+67-4+99

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.18800 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 1.62 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.33 | ft |
| Flow Area | 0.22 | $ft^2$ |
| Wetted Perimeter | 1.49 | ft |
| Hydraulic Radius | 0.15 | ft |
| Top Width | 1.34 | ft |
| Critical Depth | 0.53 | ft |
| Critical Slope | 0.01648 | ft/ft |
| Velocity | 7.26 | ft/s |
| Velocity Head | 0.82 | ft |
| Specific Energy | 1.15 | ft |
| Froude Number | 3.13 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.33 | ft |
| Critical Depth | 0.53 | ft |
| Channel Slope | 0.18800 | ft/ft |
| Critical Slope | 0.01648 | ft/ft |

# Worksheet for CHANNEL #1 - 4+99-5+12

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.15400 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 1.62 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.35 | ft |
| Flow Area | 0.24 | $ft^2$ |
| Wetted Perimeter | 1.55 | ft |
| Hydraulic Radius | 0.16 | ft |
| Top Width | 1.39 | ft |
| Critical Depth | 0.53 | ft |
| Critical Slope | 0.01648 | ft/ft |
| Velocity | 6.73 | ft/s |
| Velocity Head | 0.70 | ft |
| Specific Energy | 1.05 | ft |
| Froude Number | 2.85 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.35 | ft |
| Critical Depth | 0.53 | ft |
| Channel Slope | 0.15400 | ft/ft |
| Critical Slope | 0.01648 | ft/ft |

# Worksheet for CHANNEL #1 - 5+12-6+81

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.07100 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 1.62 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.40 | ft |
| Flow Area | 0.32 | $ft^2$ |
| Wetted Perimeter | 1.79 | ft |
| Hydraulic Radius | 0.18 | ft |
| Top Width | 1.60 | ft |
| Critical Depth | 0.53 | ft |
| Critical Slope | 0.01648 | ft/ft |
| Velocity | 5.04 | ft/s |
| Velocity Head | 0.39 | ft |
| Specific Energy | 0.80 | ft |
| Froude Number | 1.98 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.40 | ft |
| Critical Depth | 0.53 | ft |
| Channel Slope | 0.07100 | ft/ft |
| Critical Slope | 0.01648 | ft/ft |

# Worksheet for CHANNEL #1 - 6+81-9+74

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.15700 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.10 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.38 | ft |
| Flow Area | 0.29 | $ft^2$ |
| Wetted Perimeter | 1.70 | ft |
| Hydraulic Radius | 0.17 | ft |
| Top Width | 1.52 | ft |
| Critical Depth | 0.59 | ft |
| Critical Slope | 0.01592 | ft/ft |
| Velocity | 7.24 | ft/s |
| Velocity Head | 0.81 | ft |
| Specific Energy | 1.20 | ft |
| Froude Number | 2.92 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.38 | ft |
| Critical Depth | 0.59 | ft |
| Channel Slope | 0.15700 | ft/ft |
| Critical Slope | 0.01592 | ft/ft |

# Worksheet for CHANNEL #2

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.02000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 5.96 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.83 | ft |
| Flow Area | 1.37 | $ft^2$ |
| Wetted Perimeter | 3.71 | ft |
| Hydraulic Radius | 0.37 | ft |
| Top Width | 3.32 | ft |
| Critical Depth | 0.89 | ft |
| Critical Slope | 0.01385 | ft/ft |
| Velocity | 4.34 | ft/s |
| Velocity Head | 0.29 | ft |
| Specific Energy | 1.12 | ft |
| Froude Number | 1.19 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.83 | ft |
| Critical Depth | 0.89 | ft |
| Channel Slope | 0.02000 | ft/ft |
| Critical Slope | 0.01385 | ft/ft |

# Worksheet for CHANNEL #3

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.02000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 8.22 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.94 | ft |
| Flow Area | 1.75 | $ft^2$ |
| Wetted Perimeter | 4.18 | ft |
| Hydraulic Radius | 0.42 | ft |
| Top Width | 3.74 | ft |
| Critical Depth | 1.01 | ft |
| Critical Slope | 0.01327 | ft/ft |
| Velocity | 4.70 | ft/s |
| Velocity Head | 0.34 | ft |
| Specific Energy | 1.28 | ft |
| Froude Number | 1.21 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.94 | ft |
| Critical Depth | 1.01 | ft |
| Channel Slope | 0.02000 | ft/ft |
| Critical Slope | 0.01327 | ft/ft |

# Worksheet for CHANNEL #4 - 0+00-1+34

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.23900 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 14.32 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.11 | ft |
| Flow Area | 2.46 | $ft^2$ |
| Wetted Perimeter | 4.96 | ft |
| Hydraulic Radius | 0.50 | ft |
| Top Width | 4.43 | ft |
| Critical Depth | 1.26 | ft |
| Critical Slope | 0.11997 | ft/ft |
| Velocity | 5.83 | ft/s |
| Velocity Head | 0.53 | ft |
| Specific Energy | 1.64 | ft |
| Froude Number | 1.38 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.11 | ft |
| Critical Depth | 1.26 | ft |
| Channel Slope | 0.23900 | ft/ft |
| Critical Slope | 0.11997 | ft/ft |

# Worksheet for CHANNEL #4 - 1+34-1+50

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.07100 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 14.32 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.39 | ft |
| Flow Area | 3.87 | $ft^2$ |
| Wetted Perimeter | 6.22 | ft |
| Hydraulic Radius | 0.62 | ft |
| Top Width | 5.57 | ft |
| Critical Depth | 1.26 | ft |
| Critical Slope | 0.11998 | ft/ft |
| Velocity | 3.70 | ft/s |
| Velocity Head | 0.21 | ft |
| Specific Energy | 1.60 | ft |
| Froude Number | 0.78 | |
| Flow Type | Subcritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.39 | ft |
| Critical Depth | 1.26 | ft |
| Channel Slope | 0.07100 | ft/ft |
| Critical Slope | 0.11998 | ft/ft |

# Worksheet for CHANNEL #5

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.02000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 10.47 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.02 | ft |
| Flow Area | 2.10 | $ft^2$ |
| Wetted Perimeter | 4.58 | ft |
| Hydraulic Radius | 0.46 | ft |
| Top Width | 4.10 | ft |
| Critical Depth | 1.11 | ft |
| Critical Slope | 0.01285 | ft/ft |
| Velocity | 4.99 | ft/s |
| Velocity Head | 0.39 | ft |
| Specific Energy | 1.41 | ft |
| Froude Number | 1.23 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.02 | ft |
| Critical Depth | 1.11 | ft |
| Channel Slope | 0.02000 | ft/ft |
| Critical Slope | 0.01285 | ft/ft |

# Worksheet for CHANNEL #6 - 0+05-0+27

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.13600 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.14 | ft |
| Flow Area | 2.61 | $ft^2$ |
| Wetted Perimeter | 5.11 | ft |
| Hydraulic Radius | 0.51 | ft |
| Top Width | 4.57 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12324 | ft/ft |
| Velocity | 4.49 | ft/s |
| Velocity Head | 0.31 | ft |
| Specific Energy | 1.46 | ft |
| Froude Number | 1.05 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.14 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.13600 | ft/ft |
| Critical Slope | 0.12324 | ft/ft |

# Worksheet for CHANNEL #6 - 0+27-0+68

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.04900 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.38 | ft |
| Flow Area | 3.83 | $ft^2$ |
| Wetted Perimeter | 6.18 | ft |
| Hydraulic Radius | 0.62 | ft |
| Top Width | 5.53 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12324 | ft/ft |
| Velocity | 3.06 | ft/s |
| Velocity Head | 0.15 | ft |
| Specific Energy | 1.53 | ft |
| Froude Number | 0.65 | |
| Flow Type | Subcritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.38 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.04900 | ft/ft |
| Critical Slope | 0.12324 | ft/ft |

# Worksheet for CHANNEL #6 - 0+68-1+56

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.29400 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.99 | ft |
| Flow Area | 1.95 | ft² |
| Wetted Perimeter | 4.42 | ft |
| Hydraulic Radius | 0.44 | ft |
| Top Width | 3.95 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12324 | ft/ft |
| Velocity | 5.99 | ft/s |
| Velocity Head | 0.56 | ft |
| Specific Energy | 1.55 | ft |
| Froude Number | 1.50 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.99 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.29400 | ft/ft |
| Critical Slope | 0.12324 | ft/ft |

# Worksheet for CHANNEL #6 - 1+56-1+75

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.46800 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.91 | ft |
| Flow Area | 1.64 | $ft^2$ |
| Wetted Perimeter | 4.05 | ft |
| Hydraulic Radius | 0.41 | ft |
| Top Width | 3.62 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12323 | ft/ft |
| Velocity | 7.14 | ft/s |
| Velocity Head | 0.79 | ft |
| Specific Energy | 1.70 | ft |
| Froude Number | 1.87 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.91 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.46800 | ft/ft |
| Critical Slope | 0.12323 | ft/ft |

# Worksheet for CHANNEL #6 - 1+75-2+03

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.21100 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.05 | ft |
| Flow Area | 2.21 | ft² |
| Wetted Perimeter | 4.70 | ft |
| Hydraulic Radius | 0.47 | ft |
| Top Width | 4.21 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12324 | ft/ft |
| Velocity | 5.29 | ft/s |
| Velocity Head | 0.44 | ft |
| Specific Energy | 1.49 | ft |
| Froude Number | 1.29 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.05 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.21100 | ft/ft |
| Critical Slope | 0.12324 | ft/ft |

# Worksheet for CHANNEL #6 - 2+03-2+48

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.02000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.64 | ft |
| Flow Area | 5.35 | $ft^2$ |
| Wetted Perimeter | 7.32 | ft |
| Hydraulic Radius | 0.73 | ft |
| Top Width | 6.54 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12324 | ft/ft |
| Velocity | 2.19 | ft/s |
| Velocity Head | 0.07 | ft |
| Specific Energy | 1.71 | ft |
| Froude Number | 0.43 | |
| Flow Type | Subcritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.64 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.02000 | ft/ft |
| Critical Slope | 0.12324 | ft/ft |

SPECIFICATIONS

FOR:

# PEPPER PORTALS AND DRAINAGE

# ELK DISTRICT

# BARBOUR COUNTY, WEST VIRGINIA

*SUBMITTED TO:*

WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF ABANDONED MINE LANDS
101 CAMBRIDGE PLACE
BRIDGEPORT, WV 26330

*PREPARED BY:*

HATCH MOTT MACDONALD
2601 CRANBERRY SQUARE
MORGANTOWN, WV 26508

April 9, 2014

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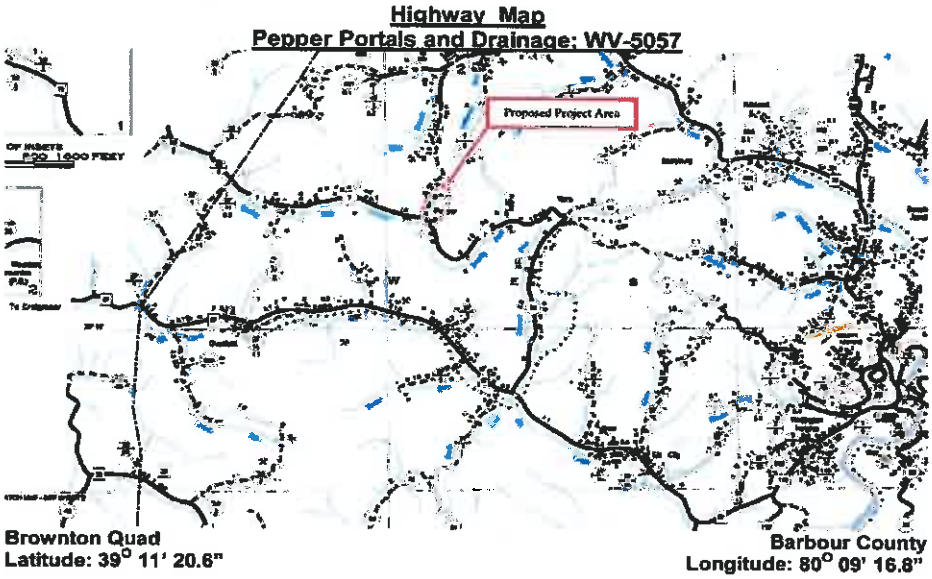
# I. SPECIAL PROVISIONS

## 1.0 LOCATION / SITE DESCRIPTION

Pepper Portals and Drainage project covers approximately 14 acres which includes a small landslide, 1,750 feet of highwall that is approximately 25-35 feet high, a collapsed portal with mine drainage, steep spoil piles, a subsidence sinkhole, and miscellaneous trash. The highwall is mostly vertical and unvegetated and there are small impoundments trapped in the pit causing slope stability issues. The subsidence feature is located on a nearby property and is partially filled with landowner garbage and debris.

**Directions to sites:**

From intersection of US 119 and SR 57, south of Philippi, drive 4.3 miles west on SR 57. Turn right on Stewarts Run Road, CR 18, and drive 2.8 miles to CR 7, Brushy Fork Road. Continue west on CR 7 and drive 2.5 miles to the site located on the right (north) side of CR 7.




Barbour County Highway Map (NTS)

## 2.0 REFERENCE SPECIFICATIONS / DEFINITIONS

All references to "Owner" in these Specifications shall mean West Virginia Department of Environmental Protection (WVDEP), Office of Abandoned Mine Lands.

All reference to "Engineer" in these Specifications shall mean the Owner's Engineer or authorized representative or the WVDEP.

All reference to "ASTM" shall mean the American Society of Testing and Material Specifications, latest edition unless otherwise noted.

All reference to "AASHTO Specifications" shall mean the Standard Specifications for Transportation Materials and Methods of Sampling and Testing by the American Association of State Highway and Transportation Officials, latest edition, and all subsequent addenda thereto.

All reference to "WVDOH Standard Specifications" shall mean State of West Virginia Department of Transportation, Division of Highways Standard Specifications for Roads and Bridges, latest edition, and all-subsequent addenda thereto.

All references to the "Contractor" shall be understood to mean the successful bidder and/or firm or corporation undertaking the execution of the work under the terms of these Specifications.

All reference to "OSHA" shall be understood to mean The Occupational Safety and Health Administration and the standards set in the Occupational Safety and Health Act of 1970.

All reference to "refuse" and/or "mine spoil" shall be understood to mean all coal refuse, shale, sandstone and other rock fragments that were generated and disposed of as such within the project area during mining and processing of coal.

All reference to "AMD" shall be understood to mean all acid or alkaline mine drainage discharges from the project site.

All reference to "OSMRE" shall be understood to mean Office of Surface Mining Reclamation and Enforcement.

All reference to "NEPA" shall be understood to mean the National Environment Policy Act.

## 3.0 SCOPE OF WORK

The work covered by the Special Provisions and Technical Specifications consists of furnishing all labor, plant, power, equipment and supplies, and performing all operations necessary for the completion of the project. The Contractor shall perform all operations necessary for:

- clearing and grubbing at the site, and removal or responsibly burning of debris as permitted, trash, tree roots, and associated materials;
- construction and installation of support areas, and maintenance of access roads to the site, including the repair and replacement of asphalt and pavement;
- eliminating highwalls per Contract Drawings by placing suitable mine spoil or other acceptable material against the face;
- construction and installation of drainage control items;
- installation of wet mine seals;
- stabilization of a subsidence feature and small landslide per Contract Drawings;
- providing sediment control;
- revegetation of disturbed areas;

The Contractor also shall be responsible for surveying, including establishing construction baseline, measuring and developing all completed quantities on the job, and for ordering, purchase and delivery of any and all materials required for construction or required for development of support areas. The Contractor shall perform all other operations as incidental to the program as specified herein.

## 4.0 BIDDERS TO EXAMINE LOCATIONS

Prospective bidders are required to examine the locations of the proposed work and to determine, each in their own way, the difficulties which may be encountered in the prosecution of the same. The submission of a bid shall be prima facie evidence that such examination and determinations have been made by the Bidder. No claims for additional compensation will be considered by the Owner based on obstruction or conditions at the location of the work, which may

add to the difficulties or costs of construction, even though such obstructions or conditions are not shown on the Contract Drawings or indicated in the other construction documents. Prospective bidders are advised that should they deem it necessary to obtain any subsurface samples of test borings, etc., at the site, they shall obtain their own permission from the landowners.

## 5.0 SCHEDULE OF WORK

Before commencing work on this project, the Contractor shall prepare and submit a schedule of construction activities for approval by the Owner.

The Contractor shall provide adequate supervision, labor, tools, equipment, and materials to prosecute the work energetically and complete the work within the time specified.

It is the intention not to delay the work for the checking of lines or grades, but if necessary, working operations shall be suspended for such reasonable time as the Engineer may require for the purpose. No special compensation shall be paid for the cost to the Contractor for any of the work or delay occasioned by checking lines and grades, by making other necessary measurements, or by inspection.

The Contractor's work hours for this project shall be from 7:00am to 7:00pm, Monday through Saturday. Work on Sunday and major holidays, as defined by the Engineer, will not be allowed on this project.

## 6.0 MEASUREMENT OF QUANTITIES

The Contractor shall be responsible for providing all necessary volumetric, dimension, and weight measurement equipment necessary to prosecute the work as shown on the Contract Drawings and to accurately determine quantities for payment of Contract Bid Items as approved by the Engineer. Such measurements and equipment shall be subject to the approval of the Engineer for use in this project.

## 7.0 BORROW (DISPOSAL) AREAS

All borrow (disposal) areas must be approved by WVDEP. Should the Contractor decide to obtain and utilize any borrow areas outside of construction limits, or move material from one property owner to another unless designated, the Contractor shall be responsible to obtain from the property owner(s) of the borrow (disposal) areas all necessary rights of entry, including rights of entry for WVDEP and OSMRE, for inspection purposes. The said rights of entry agreement must

state that the property owner(s) indemnify and hold harmless the WVDEP from all liability and/or damages resulting from the contractor's use of property for which the contractor was to obtain rights of entry for borrow, disposal, access or other purposes. Said indemnification shall include, but is not limited to, liability and damages resulting from the contractor's failure to obtain any or not all the rights of entry; failure to obtain the proper rights of entry; failure to utilize appropriate language in the rights of entry agreements; or failure to obtain permission and signature of all persons or entities holding a legal interest in the subject property(ies) covered by the rights of entry.

The Contractor also shall submit a borrow area reclamation plan for prior approval by WVDEP. The Contractor shall observe the following NEPA compliance schedule relative to selecting and utilizing any off site borrow areas and/or any waste disposal areas.

a. No borrow (disposal) site operations will affect a site listed in, eligible for, or proposed to be listed in the National Register of Historic Places.

b. No borrow (disposal) operations will be located within one-quarter mile of any Federally listed, established or prospective component of the National Wild and Scenic River System under 16 USC 1274 and 1276.

c. Borrow (disposal) site operations will not cause a significant encroachment within the base floodplain (CE.O. 11988: Floodplain Management).

d. Borrow (disposal) site operations will not be located in or affect a critical habitat of a Federally listed endangered or threatened species under 16 USC 1531, et. seq.

e. No borrow (disposal) operations will occur in wetland areas which are designated by appropriate agencies.

f. Borrow (disposal) site operations will be consistent with any approved plans governing ambient air quality.

g. Adherence to these mitigation measures does not relieve the Contractor of the obligation or responsibility to obtain any other Federal, State, or local approvals required to use borrow (disposal) areas and conduct such activities.

h. Documentation: Copies of borrow (disposal) site approvals and concurrences will be submitted to the WVDEP prior to the commencement of reclamation activities.

i. Site Monitoring: Borrow (disposal) activities will be monitored by the State to ensure compliance with contractual requirements, applicable Federal, State, and local laws, and any permit conditions.

## 8.0 DISPOSAL OF UNSUITABLE MATERIAL

All waste areas shall be obtained in accordance with Special Provisions Section 7.0 of these specifications. All unsuitable materials (wood, trash, debris, and garbage), as determined by the Engineer, shall be wasted by the Contractor, at his/her expense, outside the limits of work conforming to the requirements of the applicable sub-sections of Section 4.0 of these Specifications. Wood may be burned in conformity with the applicable sub-sections of Section 4.0 of these Specifications.

The Contractor shall observe the NEPA compliance schedule relative to selecting and utilizing any off-site disposal areas in accordance with Special Provisions Section 7.0 of these Specifications.

## 9.0 INTERPRETATION OF APPROXIMATE ESTIMATE OF QUANTITIES

The estimate of quantities of work to be done and/or materials to be furnished under the Special Provisions and Technical Specifications, as shown on the Contract Bid Schedule, is approximate and is given only as a basis of calculation upon which the award of the Contract is to be made. WVDEP reserves the right to increase or decrease any or all of the quantities of work or to omit any of them, as it may deem necessary.

## 10.0 SAFETY

All regulations of the Occupational Safety and Health Act of 1970 (OSHA) are in effect for this Contract. WVDEP shall not be liable for any citations received by the Contractor as a result of failure to comply with applicable OSHA standards. Compensation is to be included in the various items of the Contract for the expense involved in complying with these standards. In addition, the Contractor shall comply with Section 107.7 of the WVDOH Standard Specifications regarding public convenience and safety.

## 11.0 REGULATIONS

All appropriate Township, County, State, and Federal regulations shall apply to this Contract. It shall be the Contractor's sole responsibility to be aware of these regulations and to comply with them. WVDEP shall not be liable for any citations received by the Contractor. The Contractor shall keep the existing roads open and safe to public vehicular traffic at all times and shall provide appropriate barriers and warning devices as directed by the Engineer.

## 12.0 LAWS TO BE OBSERVED

The Contractor shall at all times, observe, comply with, and post as required all Federal, State, and local laws, ordinances, and regulations in any manner affecting the conduct of the work or applying to employees on the project as well as all orders or decrees which have been or may be promulgated or enacted by any legal bodies or tribunals having authority or jurisdiction over the work, materials, employees, or Contract. The Contractor shall protect and indemnify WVDEP and its representatives against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree whether by the Contractor or by the Contractor's employees.

## 13.0 PERMITS, LICENSES AND FEES

The WVDEP shall provide the NPDES Stormwater permit from the Division of Water and Waste Management, a WVDOH Encroachment permit if required, the Water Quality Certification from the Division of Water and Waste Management and an ACOE Regional permit if required. The Contractor, after award of the Contract, shall become Co-Applicant to the NPDES permit as per Article III-General Conditions, Section 7.0.

The Contractor shall procure all other permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work. Permits required for this project may include but not be limited to: a Stream Activity permit from the WV Division of Natural Resources and burning permits from WV Division of Forestry and WVDEP, Division of Air Quality. A copy of the permits as procured shall be furnished to the Owner prior to initiation of the work under this Contract.

## 14.0. ELECTRICITY, WATER SUPPLY AND SANITARY FACILITIES

There are no available supplies at the site of electricity and water, and additionally, there are no sanitary facilities. Arrangements for electric service, water supply and sanitary facilities shall be made by the Contractor, and all costs for such arrangements shall be borne by the Contractor at no additional cost to the WVDEP.

## 15.0 UTILITIES AND OTHER OBSTRUCTIONS

The Contractor shall be solely responsible to correctly locate all existing active underground and overhead utilities at the project site and take precautions to avoid damage to them. Any existing utility lines damaged by the Contractor shall be replaced or repaired by the Contractor at no cost to the Owner. The Contractor shall notify the utility companies likely to be affected well in advance and before beginning any work within the project sites. In the event of damage to the existing utilities or other facilities, the Contractor shall notify the affected utility Owner(s) and the Engineer immediately and make, or have made, all necessary repairs and bear the expense thereof and resulting damaged caused thereby. It shall be the responsibility of the Contractor to arrange for relocating the utility lines, where required and as directed by the Engineer, in accordance with the guidelines set forth by the utility company, prior to beginning construction. The Contractor will be reimbursed for actual charges invoiced by the Utility Company, except for utilities that are subject to regulation by the Public Service Commission, in which case, payment will be made directly to the affected utility by the WVDEP. The utility companies and West Virginia Miss Utility (WVMIS) must be contacted by the Contractor at least one week prior to commencement of construction activities for the purpose of field locating and marking utility owned facilities within the project area.

The name and phone number of the WVMIS Utility location service is as follows:

WVMIS
1-800-245-4848/811

## 16.0 SITE CLEANUP

Before the project shall be considered as having been satisfactorily completed, the Contractor shall clean and remove, from the project site, all surplus and discarded materials, and equipment and shall further remove all debris and objectionable materials of any kind from areas used or disturbed by the construction operations within, or within sight of, the project area. The Contractor shall be responsible for the removal of the project sign prior to the final inspection of the project, and upon approval from the WVDEP.

## 17.0 ROCK BLASTING

All blasting operations shall be conducted in strict accordance with applicable State and Federal laws relating to rock blasting and the storage and use of explosives. The Contractor shall maintain and keep in full force and effect blasting insurance to protect and indemnify the Owner and/or his agents or representative from claims for damages and shall defend all suits at law. The Contractor shall submit to the Owner a request for permission to blast rock, a reclamation plan for the area to be disturbed, and proof of blasting insurance coverage prior to initiating blasting operations. Failure to obtain approval for blasting prior to initiating the work will result in no payment for items utilizing this rock.

## 18.0 TEMPORARY ACCESS ROADS

The Contractor shall construct and maintain temporary access roads for convenient access to the various parts of the work, and for other necessary purposes incidental to the performance of this Contract. The location of access roads shall be approved by the Engineer prior to construction. No separate payment for construction and maintenance of such roads will be made. The Contractor shall erect such temporary fences or guards as may be necessary to keep unauthorized persons away from the work. Grading and surfacing of temporary access roads, excavations, fills and embankments for purposes of construction, or for convenience, beyond the limits of ordered excavations and all temporary fences and guards, shall be provided by the Contractor and shall be maintained in good condition. The Contractor shall be required to maintain all roads used by the hauling equipment in a dust-controlled condition. These roads which have been upgraded are to remain in that condition upon completion.

The Constructed Access Road, as identified on the Contract Drawings, shall be upgraded and remain so upon project completion.

The Contractor shall be required to obtain a right of entry agreement from any property owner(s) prior to the utilization or construction of any access outside of the construction limits shown on the plans. Such agreement shall require the property owner(s) to indemnify and hold WVDEP harmless from any and all injuries or damages, whatsoever, resulting from the Contractor's use of the property.

## 19.0 TRAFFIC CONTROL

The Contractor shall maintain and protect traffic, protect the work in progress, protect adjacent property from excess dust resulting from the construction and maintain traffic through, around, or adjacent to the construction area. All materials used for traffic control shall be in accordance with the current WVDOH manual: "Traffic Control for Streets and Highway Construction and Maintenance

Operations." A copy of the operational plan accepted by the WVDOH shall be submitted to the WVDEP for approval prior to its implementation. All traffic control required during the work shall be considered incidental to the project.

## 20.0 SITE CONDITIONS AND ENVIRONMENTAL PROTECTION

Conditions at the site shall be examined by the Contractor, and he/she shall assume responsibility as to the contours and the character of the earth, rock, water and other items that may be encountered during the excavation and filling operations.
The Contractor shall be responsible for controlling and handling water encountered during construction, including dewatering of mine pools for mine seal installations, by providing equipment and labor to insure safe and proper construction. The Contractor shall submit a plan to the WVDEP at the pre-construction meeting for approval. The WVDEP's approval of this plan does not relieve the Contractor of his responsibility for controlling water.

The Contractor shall be responsible for the operation and maintenance of any required diversion or pumping facilities for removing ground water from work areas during progress of the work under this Contract.

The Contractor shall be responsible for furnishing all materials, equipment, labor and incidentals necessary for the installation of silt barriers and check dams as designated in the Contract Drawings. Sediment control shall be placed on regraded areas concurrent with construction and prior to revegetation.

The Contractor shall be responsible for implementing the measures called for in the NPDES Stormwater permit provided by the WVDEP for erosion and sediment control. Sediment control measures shall be in-place and operational prior to any disturbance occurring in the project area. The WVDEP's approval of this plan does not relieve the Contractor of his responsibility to be in compliance with any laws and/or permits.

The Contractor shall take any necessary steps to prevent erosion or silting problems from occurring and to minimize pollution or sedimentation of the stream. If any such problems develop, the Contractor shall be responsible to take immediate corrective action.

The Contractor shall be responsible for the repair or replacement of streets or driveways (asphalt, gravel or concrete), trees, shrubs, fences, or any other physical features disturbed by construction which were not included in the proposed scope of work for the project to original condition or better at their own expense.

The Contractor shall be responsible for the replacement of any existing boundary or corner markers disturbed by construction activities.

## 21.0 CONTROL AND REVIEW OF WORK BY THE ENGINEER

All services rendered by the Engineer consist of professional opinions and recommendations made in accordance with generally accepted engineering practice. Under no circumstances is it the intent of the Engineer to directly control the physical activities of the Contractor or the Contractor's worker's accomplishment of work on this project.

The presence of the WVDEP's Field Representative and/or Engineer at the site is to provide the WVDEP a continuing source of professional advice, opinions and recommendations based upon the Field Representative's and/or Engineer's observations of the Contractor's work and does not include any superintending, supervision or direction of the actual work of the Contractor or the Contractor's workers.

Any construction review of the Contractor's performance conducted by the Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, or near the construction site.

## 22.0 CITATION OF OTHER SPECIFICATIONS

Whenever the Specifications for this Contract refer to the specifications of any society, institute, association or government organization, then such specifications cited shall become a part of this Contract as if written in full. Commonly used abbreviations have the following meanings:

ASTM - American Society for Testing Materials

ASA - American Standards Association

AWWA - American Water Works Association

AASHTO - American Association of State Highway and Transportation Officials

ACI - American Concrete Institute

WVDOT – West Virginia Department of Transportation

WVDOH – West Virginia Division of Highways

Where reference is made to a specification, it shall be the latest revision at the time called for bids, except as noted on the Contract Drawings or elsewhere herein.

## 23.0 NPDES STORMWATER PERMIT GUIDELINES

### VEGETATIVE PRACTICES

Except as noted below, stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than seven days after the construction activity in that portion of the site has permanently ceased.

- Where the initiation of stabilization measures by the fourth day after construction activity temporarily or permanently ceases is precluded by snow cover, stabilization measures shall be initiated as soon as conditions allow.

- Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g., the total time period that construction activity is temporarily halted is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the seventh day after construction activities have temporarily ceased.

Areas where the seed has failed to germinate adequately (uniform perennial vegetative cover with a density of 70%) within 30 days after seeding and mulching must be reseeded immediately, or as soon as weather conditions allow.

Diversions must be stabilized prior to becoming functional.

### MAINTENANCE & INSPECTION

At a minimum, all erosion and sediment controls on the site will be inspected at least once every seven calendar days and within 24 hours after any storm event of greater than 0.5 inches of rain per 24-hour period.

All controls should be cleaned out when sediment reaches one half the sediment capacity of that control.

Inspection and maintenance records must be kept onsite.

### EROSION & SEDIMENT CONTROL CONSTRUCTION SEQUENCE

1. Install stabilized construction entrance as shown on site plans.
2. Install perimeter sediment control devices as shown on site plans.
3. Clear and grub site.
4. Provide sediment control for any topsoil stockpiles.
5. Commence rough grading of site. Continue to maintain and inspect all erosion and sediment controls.
6. Install additional erosion and sediment controls as shown on site plans.

7. Fine grade site.
8. Permanently seed and mulch all disturbed areas within 7 days of reaching final grade.
9. Upon completion of project including adequate stabilization, remove all remaining erosion and sediment controls.

# II: TECHNICAL SPECIFICATIONS

# II. TECHNICAL SPECIFICATIONS

## 1.0 MOBILIZATION AND DEMOBILIZATION

### 1.1 Description

This work shall consist of the performance of construction preparatory operations, including the movement of personnel and equipment to the project site and for the establishment of the Contractor's field office and other facilities necessary to begin work on a substantial portion of the contract. This work shall also include all demobilization activities.

### 1.2 Method of Measurement

The method of measurement for determining the Mobilization and Demobilization work, done as described above, will be on a lump sum basis with partial payments as listed below.

### 1.3 Basis of Payment

The bid for Mobilization and Demobilization shall be a lump sum bid item and shall not be more than ten (10) percent of the total bid amount for the project. Partial payments will be as listed below.

**1.3.1** One-half of the amount bid will be released to the Contractor with the first estimate payable, not less than 15 days after the start of work at the project site.

**1.3.2** The final one-half of the amount bid shall be released with the estimate payable after work is accepted by the WVDEP and when all "As Built" drawings are submitted and approved by WVDEP.

Nothing herein shall be construed to limit or preclude partial payments otherwise provided for by the Contract.

No deduction will be made, nor will any increase be made, in the lump sum Mobilization and Demobilization bid item amount regardless of decreases or increases in the final total contract amount or for any other cause.

### 1.4 Pay Item

Item 1.0 **"Mobilization and Demobilization"**, shall be a lump sum bid item. Total for this item shall not be more than ten (10) percent of the total bid amount for the project.

## 2.0 CONSTRUCTION LAYOUT STAKES

### 2.1 Description

This item shall consist of furnishing, placing, replacing and maintaining construction layout stakes, baseline stations, primary control points and any disturbed property location monuments as necessary for the proper performance of the work under this contract. It further consists of determining the exact units of measurement for payment. It also consists of checking and making any field adjustment to the plan grades and elevations that may be necessary due to the inconsistency in material compaction.

Additionally, this item shall also include the generation of cross-sections of the site indicating pre-construction and post-construction lines for submission to the WVDEP. "As-Built" drawings shall be provided by the Contractor prior to the Final Inspection Meeting.

### 2.2 Materials

Materials necessary for this item include, but are not limited to; survey equipment, survey stakes, flagging, drafting media, etc.

### 2.3 Construction Methods

**2.3.1** The Engineer will initially establish necessary benchmarks prior to the beginning of the project. From those benchmarks and back site information supplied by the Engineer, the Contractor shall make all calculations necessary to layout the work and shall furnish, place and maintain all layout stakes needed to complete the work as outlined in the Specifications and Contract Drawings.

**2.3.2** The Contractor shall supply all labor and materials necessary to establish additional benchmarks, horizontal control, vertical control, reference points, etc. as needed to ensure a proper layout. The Contractor shall be responsible for having the layout staking work conform to the lines, grades, elevation, and dimensions called for on the Contract Drawings. As survey records are completed during the progress of the work, copies shall be submitted by the Contractor to the WVDEP. Any inspection or checking of the Contractor's layout by the WVDEP and the acceptance of all or any part of the layout shall not relieve the Contractor of his responsibility to secure the proper dimensions, grades, and elevations.

**2.3.3** It shall be the responsibility of the Contractor to maintain and preserve all stakes and benchmarks, including existing property line markers, and to have them reset at his expense in the event they are disturbed in any way. Primary control points shall be established by the Contractor to reestablish baseline stations should they be disturbed. At a minimum, the Contractor shall confirm the location of existing baseline stations by field survey of each station's relationship to a suitable primary control point.

**2.3.4** The Contractor shall layout the work using standard methods, competent personnel and suitable equipment. The layout work shall be carried out under the direction of a State of West Virginia Registered Professional Engineer or Licensed Land Surveyor.

**2.3.5** The Contractor shall submit to the WVDEP pre-construction cross-sections and notes for approval prior to the start of any earth moving activities. The Contractor shall then submit to the WVDEP as-built cross-sections and notes as soon as practical after the completion of construction. Failure to submit the cross-section information could delay any future alteration to the total amount bid for earthwork and/or delay payments for earthwork.

**2.3.6** Acceptable cross-sections shall be drawn or reproduced on mylar film or prepared in AutoCAD format at the appropriate scale so they may be directly overlaid on the cross-sections contained in the Contract Drawings. Each 24" x 36" sheet shall be lightly gridded at 10 lines per inch with heavier index lines every inch. Station numbers, elevations, baseline offset distances, cross-section lines and types, date, responsible parties and a legend shall be clearly illustrated. Cross-sections which do not encompass all areas of both earthwork excavation and fill placement shall be considered incomplete without exception.

**2.3.7** All calculations, sections, plans, survey notes and other documents produced pursuant hereto shall be certified as correct by a State of West Virginia Registered Professional Engineer or Licensed Land Surveyor.

**2.3.8** Sufficient time shall be allotted to the WVDEP to review the submittals and investigate any and all discrepancies relating to cross-sections submitted throughout the course of construction.

**2.3.9** The Contractor shall provide the WVDEP with "As-Built" drawings prior to the Final Inspection Meeting. The "As-Builts" submittals shall include, two (2) hard copies and an electronic submission in Adobe (.pdf) and AutoCAD 2007 (.dwg) formats.

"As-Builts" shall be certified by a Registered Professional Engineer or a Licensed Land Surveyor.

**2.3.10** The "As-Built" plans shall include the vertical and horizontal locations of all buried components depicted on the plans and herein specified:

a. As-built plans shall include the vertical and horizontal locations of all installed pipes and associated drop inlets.
b. In addition, as-built plans shall show the vertical and horizontal location of any and all mine seals and subsurface drains, including bottom of drain, pipe inverts, and top of buried subsurface drain, installed for this project.

## 2.4 Method of Measurement

The method of measurement for determining the quantity of Construction Layout Stakes work done as described above will be on a lump sum basis. Payment will be for; furnishing, setting, maintaining and resetting the stakes when necessary, providing survey personnel, equipment, materials, and all incidentals necessary to perform the work, and providing the WVDEP pre-construction and post-construction cross-sections and "As-Built" drawings as described herein.

## 2.5 Basis of Payment

The quantity of work done will be paid at the contract lump sum bid price for this item, which payment shall be full compensation for doing all the work herein prescribed in a workmanlike and acceptable manner, including but not limited to; all labor, materials, tools, equipment, supplies, and incidentals necessary to complete the work.

No deduction or increase will be made in the lump sum Construction Layout Stakes item amount regardless of increases or decreases in the final total amount or for any other cause.

## 2.6 Pay Item

Item 2.0 **"Construction Layout Stakes"**, shall be a lump sum bid item. Total for this item shall not be more than five (5) percent of the total bid amount for the project.

## 3.0 QUALITY CONTROL

### 3.1 Description

To assure the materials supplied and the work performed are in conformance with these specifications.

### 3.2 Applicable Publications

Related materials and work shall comply with, but not be limited to, the provisions of the following codes, standards and specifications:

| | |
|---|---|
| ASTM D-698 | "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort", 2007 Edition. |
| ASTM D-1556 | "Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method" |
| ASTM D-2922 | "Standard Test Methods for Density of Soil and Soil-Aggregate In-Place by Nuclear Methods" |
| ASTM D-3017 | "Standard Test Methods for Water Content of Soil and Rock In-Place by Nuclear Methods" |
| EPA-600/2-76-184 | "Extensive Overburden Potentials for Soil and Water Quality" |
| ACI 301 | "Specifications for Structural Concrete For Buildings". |
| ASTM C-31 | "Standard Method of Making and Curing Concrete Test Specimens in the Field". |
| ASTM C-39 | "Standard Test Method For Compressive Strength of Cylindrical Concrete Specimens". |
| ASTM C-172 | "Fresh Concrete Sampling". |

### 3.3 Submittals

**3.3.1** Two (2) copies of shop drawings, catalog cuts and material certifications shall be submitted by the Contractor to the WVDEP for all off site materials to be incorporated into the work.

**3.3.2** Prior to incorporation of these items into the work, written approval must be obtained from the WVDEP.

## 3.4 Construction Methods

**3.4.1** The Contractor shall furnish the services of their own testing laboratory, or select an independent lab which is under the supervision of a State of West Virginia Registered Professional Engineer and approved by the WVDEP.

**3.4.2** Testing for compaction, aggregate, rock, soil nutrient and lime requirements, etc. shall be performed as required by these Specifications or as requested by the WVDEP in writing. The locations and time of any specified testing, or the need and extent of any additional testing, shall be determined by the WVDEP.

**3.4.3** The Contractor shall perform accepted laboratory testing procedures to determine if the compaction characteristics of the backfill and mine spoil are acceptable for use as cover and/or fill material. Testing shall be at a frequency approved by WVDEP. One lot (5 tests) per day during fill placement shall serve as a minimum. Field density tests shall also be performed as needed and in accordance with these Specifications. All test results shall be submitted to the WVDEP for approval of compaction criteria prior to and after compaction to verify that the required compaction is obtained.

**3.4.4** Only new and first class materials conforming to the requirements of these Specifications shall be used unless otherwise specified. When requested by the WVDEP, the Contractor shall furnish a written statement of the origin, composition, and manufacturer of any or all materials (manufactured, produced, or grown) that are to be used in the work. The sources of supply of each material used shall be approved by the WVDEP before delivery. If, at any time, sources previously approved fail to produce results acceptable to the WVDEP, the Contractor shall furnish materials from other approved sources.

## 3.5 Method of Measurement

The method of measurement for determining the quantity of Quality Control work done as described above will be on a lump sum basis.

## 3.6 Basis of Payment

The quantity of work done will be paid at the contract lump sum bid price for this item, which payment shall be full compensation for doing all the work herein prescribed in a workmanlike and acceptable manner, including but not limited to; all labor, materials, tools, equipment, supplies, and incidentals necessary to complete the work.

## 3.7 Pay Item

Item 3.0 **"Quality Control"**, shall be a lump sum bid item. Total for this item shall not be more than three (3) percent of the total bid amount for the project.

## 4.0 SITE PREPARATION

### 4.1 Description

Work performed under this section shall include the removal and disposal of all trees, stumps, shrubs and any other vegetation, wood, debris, concrete, garbage of any nature and designated structures from the limits of the areas to be developed and any other areas as directed by the WVDEP. This work shall also include the preservation from injury to all vegetation, utilities or other objects to remain.

### 4.2 Materials

Trunk damage to trees shall be painted with an antiseptic and water proof paint with an asphaltic base. This paint shall not contain coal-tar creosote, turpentine or other materials harmful to plants or animals.

### 4.3 Construction Methods

**4.3.1** The specific areas to be cleared and grubbed are as shown on the Contract Drawings and are generally described as, but not limited to, those specific areas of excavation, backfill, drainage structure installation, or access road construction.

**4.3.2** The Contractor shall clear the site within the limits of the areas to be reclaimed. The WVDEP shall exercise control over clearing and shall designate all trees, plants and other objects to be removed or to remain.

This work shall also include the preservation from injury or defacement of all trees designated to remain. All timber eight (8) inches in diameter and larger at stump height shall be saw cut prior to grubbing operations. Timber shall be topped with the branches removed and stacked and stockpiled in an appropriate manner in an accessible location approved by the WVDEP on the property from which it was cut. Timber to be stockpiled shall not be pushed down by equipment prior to being cut nor can it be indiscriminately shoved into a stockpile.

**4.3.3** Clearing and grubbing shall be completed prior to initiation of earthwork operations.

All areas cleared and grubbed beyond the designated construction area, whether knowingly or accidentally, shall be replanted and otherwise restored to a condition equal to that existing prior to the commencement of the work, and at the expense of the Contractor.

**4.3.4** All stumps, roots, buried logs and brush shall be removed. Grass, however, may be incorporated into the re-soiling material. Tap roots and other projections over one and one-half (1 ½) inches in diameter shall be grubbed out to a depth of at least ten (10) inches below the planned subgrade or slope elevation. All holes remaining after the grubbing operation shall have the sides broken down to flatten out the slopes, and shall be filled with suitable materials, moistened and properly compacted.

**4.3.5** Cleared and grubbed areas shall be worked to provide positive drainage and prevent ponding of water.

**4.3.6** All organic material shall be burned completely to ash or otherwise removed from the site and disposed of in a manner approved by the WVDEP. Burning of combustible material will not be permitted on or near refuse, mine portals, or within close proximity to coal seams or utilities. It shall be the responsibility of the Contractor to obtain all necessary permits and licenses required prior to burning the material. A plan indicating the location of material to be burned and all fire control measures to be implemented and copies of permits and licenses shall be submitted to the WVDEP for approval.

**4.3.7** All other materials generated from required clearing and grubbing operations shall be removed and disposed of by the Contractor. Any structures, garbage, construction debris, mining debris, etc. shall be disposed of in approved waste areas or landfills. It shall be the responsibility of the Contractor to obtain, at no expense to the WVDEP, all necessary waste areas or landfills for the disposal of waste materials in accordance with any applicable Local, State, and/or Federal regulations including compliance with NEPA requirements (See Special Provisions Section 7.0 for NEPA Compliance Schedule). All waste areas must be approved by the WVDEP, and the Contractor must provide a reclamation plan for approval. In addition, for all waste areas outside the construction limits, the Contractor must obtain from the property owner a right-of-entry agreement in which the property owner indemnifies and holds the WVDEP harmless from any and all injuries or damages whatsoever resulting from the use of property.

**4.3.8** It shall be the sole responsibility of the Contractor to correctly locate and avoid all overhead and underground utilities, facilities and other structures and appurtenances. The Contractor shall employ all necessary precautions and methods to insure the protection of all utilities and/or other facilities during the construction. In the event damage does occur, the Contractor shall

notify the affected owner and the WVDEP immediately and initiate immediate repair.

The contractor shall bear all expenses associated with the repair of the damaged utility and/or other facility, and any liability resulting from the interruption of service or use.

**4.3.9** Trash, garbage, railroad ties, roofing shingles, tires, plastic, metal and other unsuitable material resulting from demolition shall be disposed of by the Contractor at his/her own responsibility and expense outside the work limits in an approved landfill, as approved by the WVDEP, unless otherwise directed.

## 4.4 Method of Measurement

The method of measurement for Site Preparation will be on a lump sum basis. Removal of timber, shrubs, and debris will not be measured but will be considered incidental to the clearing and grubbing operations.

The method of measurement for Demolition of Structures will be on a lump sum basis. Removal of equipment, garbage, rubble, structures, and debris will not be measured but will be considered incidental to the demolition operations.

## 4.5 Basis of Payment

The quantity of work done will be paid at the contract lump sum bid price for these items, which payment shall be full compensation for doing all the work herein prescribed in a workmanlike and acceptable manner, including but not limited to; all labor, materials, tools, equipment, supplies, and incidentals necessary to complete the work.

No deduction or increase will be made in the lump sum Clearing and Grubbing or Demolition of Structures amount regardless of decreases or increases in the final total contract amount or for any other cause.

## 4.6 Pay Item

Item 4.0 **"Site Preparation"**, shall be a lump sum bid item. Total for this item shall not be more than seven (7) percent of the total bid amount for the project.

## 5.0 EROSION AND SEDIMENT CONTROL

### 5.1 Description

This item shall consist of furnishing all materials, equipment, labor and incidentals necessary for, and the installation of super silt fencing and Erosion Control Wattles and rock check dams as designated in the Contract Drawings. Erosion and sediment control shall be placed on regraded outslope areas concurrent with construction and prior to revegetation. Installation locations are shown in the Contract Drawings. Additional locations may be added at the discretion of the WVDEP.

### 5.2 Materials

**5.2.1** The synthetic filter fabric used for the super silt fence shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier as conforming to WVDOT specifications.

**5.2.2** The support posts for the super silt fence shall be 2 ½" diameter x 72" in length galvanized steel pipe weighing 3.65 pounds per linear foot of post.

**5.2.3** The chain link fabric for the super silt fence shall be a galvanized steel no. 9 wire woven in a 2" diamond mesh pattern, 48" in height.

**5.2.4** Erosion Control Wattles shall be 12', 20' or 25' in length.

**5.2.5** Post to secure Erosion Control Wattles shall consist of live stakes or wood stakes 1" x 1" x 24".

**5.2.6** Stone for rock check dams shall consist of 3" to 6" riprap and shall conform to the requirements detailed in Section 7.2.2.

### 5.3 Maintenance

During the course of the project, erosion and sediment control devices shall be maintained in sound condition, and accumulations of silt, which may threaten their effectiveness, shall be removed. Silt removed from the erosion and sediment control structures should be spread in the general vicinity, except when such practices may be detrimental to the environment and/or the project.

Upon the completion of the project, the WVDEP may direct the Contractor to remove, clean or replace erosion and sediment control structures and

revegetate such disturbances in accordance with the appropriate section(s) of these Specifications.

## 5.4 Installation

**5.4.1** Wattle installation:
Trenching – Use a hand tool such as a mattock or pick to score the ground. Using a shovel dig the trench to the needed depth. Soil from excavating the trenches can be placed on the uphill, or flow side, of the trench to be used during installation.
Installing – Lay the first Straw Wattle snugly in the trench. No daylight should be seen under the wattle. Pack soil from trenching against the Wattle on the uphill side. When installing running lengths of Straw wattles, butt the second Wattle tightly against the first. Do not overlap the ends. Stake the Straw Wattles at each end and four foot on center.

Stakes should be driven through the middle of the Wattle, leaving 2-3 inches of the stake protruding above the Wattle. (Specialty Construction Supply)

**5.4.2** Rock check dams shall be installed in accordance with the details on the contract drawings. The rock check dams shall be installed so that the dam is at least 6 inches lower than the outer edges so that high flows go over the center of the dam and not around the edges. The maximum height of the dam should be 3 feet. Maximum distance between rock check dams is 300 feet.

**5.4.3** The super silt fence shall be installed in a continuous length along the contour. When a joint is unavoidable, the filter cloth shall be overlapped, folded and stapled together to prevent sediment bypass.

**5.4.4** The super silt fence shall be 36" above the original grade with 12" of the filter cloth and fence fabric embedded into the ground.

**5.4.5** The super silt fence support posts shall be driven 36" into the ground.

**5.4.6** The fence fabric of the super silt fence shall be securely attached to the support posts with galvanized wire ties. The filter fabric shall be secured to the fence fabric with ties spaced at 24" intervals.

**5.4.7** Stabilized construction entrances shall be constructed in accordance with the details on the Contract Drawings. The stone should be 3"-6" in diameter. The length of the entrance is as required, but not less than 70 feet. The thickness should be not less than 6 inches. The width of the entrance shall be a minimum of 12

feet, but not less than the full width at points where ingress and egress occurs. Adequate protection of utility lines must be provided in the form of soil cover, matting, or land bridging if necessary. Contractor is responsible for any utility damages.

## 5.5 Method of Measurement

Measurement shall be to the nearest bid unit of erosion and sediment control placed in conformance with Contract Drawings and accepted by the WVDEP. Only that erosion and sediment control which is illustrated in the Contract Drawings shall be included for measurement. Any additional erosion and sediment control, installed by the Contractor to meet any applicable State or Federal law or regulation, shall be the Contractor's sole responsibility and all costs pursuant thereto shall be born fully by the Contractor.

Any erosion and sediment control, which is not illustrated in the Contract Drawings that the Contractor may install to protect streams or for other purposes, shall not be included for measurement, and shall be the sole responsibility of the Contractor. However, any erosion and sediment control, approved by the WVDEP prior to placement shall be included for measurement.

## 5.6 Basis for Payment

Payment shall be at the bid unit price of erosion and sediment control item installed by the Contractor and accepted by the WVDEP. Payment shall constitute full compensation for all materials, labor, equipment and incidentals necessary to perform the work. Additionally, payment shall constitute full compensation for any required maintenance, sediment removal, and disposal of installed erosion and sediment control features.

## 5.7 Pay Item

Item 5.1 **"Super Silt Fence"**, shall be a per linear foot bid item.

Item 5.2 **"Erosion Control Wattles"**, shall be a per linear foot bid item.

Item 5.3 **"Rock Check Dam"**, shall be a per each bid item.

Item 5.4 **"Stabilized Construction Entrance"**, shall be a per each bid item.

Item 5.5 **"Riprap Dissipater"**, shall be a per each bid item.

## 6.0 REVEGETATION

### 6.1 Description

This work shall cover all operations incidental to the establishment of vegetation within the limits of construction, as shown on the Contract Drawings, and within any other areas as approved by the WVDEP.

This work also includes the furnishing and the application of fertilizer, agricultural lime and mulch. The work shall also consist of furnishing and planting of all seed, herbaceous materials, cuttings, and tree seedlings of the kinds specified at the locations shown on the Contract Drawings in accordance with these Specifications and as designated herein.

No areas outside of the limits of construction shall be disturbed without prior approval from the WVDEP. Work outside the construction limits shall require WVDEP approval and a right of entry from the Landowner. The Contractor, at no expense to the WVDEP, shall revegetate any areas outside of the limits of construction that were disturbed by the Contractor without WVDEP authorization. Areas disturbed outside of the limits of construction shall be seeded/planted with plant materials appropriate for site conditions as prescribed herein.

### 6.2 Materials

Prior to bidding, the Contractor shall verify all sources of supply to insure that size, species, variety, and quality of plants specified can be supplied. At least one week prior to delivery, the Contractor shall notify the WVDEP of the source of the seed, herbaceous materials, cuttings, and tree seedlings. West Virginia suppliers of plant materials are preferred.

#### 6.2.1 Fertilizer

The commercial fertilizer to be used shall consist of a 10-20-20 grade or equivalent, of uniform composition, and furnished in standard containers. These containers, in accordance with applicable State and Federal laws, must be clearly marked with the following information:

**a.** Weight
**b.** Name of Plant Nutrient
**c.** Guaranteed Nutrient Percentages

Fertilization rates shall be applied at a rate of 1000 lbs/acre. Fertilizer shall be applied in conjunction with appropriate seed mixture in all areas.

### 6.2.2 Lime

The lime to be used will be an agricultural grade pulverized limestone, containing not less than 75% total carbonates. Fineness will be such that not less than 75% will pass through a #100 sieve, and 100 percent will pass through a #10 sieve.

Lime requirement shall be formulated from soil test results. Lime should be thoroughly mixed into the top three (3) inches of soil. In the absence of soil testing a rate of three (3) tons per acre will serve as the preferred minimum.

### 6.2.3 Seed Mixtures

The variety of grass and legume seed furnished for the project shall bear a tag, in accordance with applicable State and Federal laws, with the following information listed:

1. Lot Number
2. Seed Producer Name
3. Percent Purity
4. Percent Germination
5. Date of Germination Testing
6. Weed Seed Content (should be <0.25% by weight)

All leguminous seed shall be inoculated with the specified strain of rhizobium, which shall be a pure culture of bacteria selected for maximum vitality. Each package of rhizobium shall be properly stored prior to use and will be acceptable for use only before the expiration date indicated on that package. The inoculants shall be applied at the recommended rate for broadcast seeding and at a rate five (5) times greater when used in a hydro-seeding mixture.

### 6.2.3.1 Temporary Ground Cover

All stockpiles and other disturbed areas which will require further additional disturbance which will be delayed for a period of three (3) weeks or longer, shall be seeded as follows.

| TEMPORARY SEED MIXTURE | | | | |
|---|---|---|---|---|
| Variety of Seed | Spring<br>3/15 – 5/15 | Summer<br>5/16 – 8/15 | Fall<br>8/16 – 10/15 | Winter<br>10/16 – 11/15 |
| Annual Ryegrass<br>(Lolium multiflorum) | 40 lbs/acre | | 40 lbs/acre | |
| German Millett *<br>(Setaria italica) | | 40 lbs/acre | | |
| Cereal Rye<br>(Secale cereale) | | | | 170 lbs/acre |

* Do not use Japanese Millet.

All areas to be temporarily seeded, which are to be re-disturbed, shall be fertilized according to Section 6.2.1 of these Specifications. Lime shall be applied according to Section 6.2.2 and mulch shall be applied according to Section 6.2.4, both per these Specifications.

### 6.2.3.2 Permanent Ground Cover

Permanent vegetation shall be established on all areas reaching final grade, or other areas not likely to be destroyed by further construction activities. Any areas which reach final grade between May 16 and August 15 or between October 16 and November 15 shall be seeded with the appropriate temporary seed mixture according to Section 6.2.3.1. These areas shall then be reseeded with a permanent seed mixture, without Annual Ryegrass, during the next defined seeding period according to this section. The actual date of permanent seeding will require the Engineer's approval.

| PERMANENT SEED MIXTURE | | |
|---|---|---|
| Variety of Seed* | Spring<br>3/15 – 5/15 | Fall<br>8/16 – 10/15 |
| Orchardgrass<br>(Dactylis glomerata) | 30 lbs/acre | 30 lbs/acre |
| Birdsfoot Trefoil (1)<br>(Lotus corniculatus) | 15 lbs/acre | 15 lbs/acre |
| Red Clover<br>(Trifolium pratense) | 10 lbs/acre | 10 lbs/acre |
| Annual Ryegrass (2)<br>(Lolium multiflorum) | 25 lbs/acre | 25 lbs/acre |
| Spring Oats<br>or<br>Winter Wheat | 35 lbs/acre<br><br>0 lbs/acre | 0 lbs/acre<br><br>90 lbs/acre |

(1) Herbaceous legumes must be treated with the appropriate bacterium before seeding. On areas which are steeply sloping (steeper than 1.7:1), slide prone, swales, or drainage conveyance structures, substitute Crown vetch (Coronilla varia) at 20 lbs/acre for Birdsfoot Trefoil.

(2) Use Annual Ryegrass only in mixtures seeded after August 1st and before May 1st.

* Use only certified "blue tag" seed. Seed-rate suggested is for pure live seed (PLS) in lbs/acre.

### 6.2.4 Mulch Material

Mulch shall consist of baled straw mulch or wood cellulose fiber. Straw mulch shall be applied at a rate of 2 tons/acre. The straw mulch shall be anchored with 100 gals/acre asphalt emulsion or 750 lbs/acre wood cellulose fiber. Wood cellulose fiber mulch may only be used on slopes steeper than 2H:1V at a rate of 1,500 lbs/acre, and only with the approval of the WVDEP.

### 6.2.5 Water

Water utilized for hydro-seeding and other applications shall be reasonably free of injurious or other toxic substances harmful to plant life. The source of water is subject to the approval of the WVDEP.

## 6.3 Construction Methods

**6.3.1** All specified revegetation activities shall be conducted immediately following completion of final grading activities to utilize the fine soil material as a seedbed and before this material is lost. If revegetation is delayed for a period of three (3) weeks or longer, then said areas shall be temporarily protected with the temporary ground cover described in Section 6.2.3.1.

**6.3.2** Seedbed preparation and seeding/planting shall take place progressively, as various regraded areas are brought to final grade.

**6.3.3** All seeding/planting operations shall be performed immediately following seedbed preparation, in such a manner that the seed is applied in the specified quantities, and uniformly, on the designated areas.

**6.3.4** Any area failing to establish a vegetative stand, due to weather or adverse soil conditions, shall be revegetated in accordance with these Specifications.

**6.3.5** The Contractor shall maintain and protect all seeded/planted areas until final acceptance of the project. All graded and reseeded areas shall be protected from any further equipment traffic, and any damaged areas shall be reworked and reseeded.

**6.3.6** A second and third seeding/planting will be applied as needed, or as required by the WVDEP.

## 6.4 Method of Measurement

**6.4.1** There shall be no method of measurement for temporary seeding. Temporary seeding shall be incidental to the revegetation type specified in the Contract Drawings.

**6.4.2** The method of measurement for Revegetation will be per plan view acre, field measured and rounded to the nearest whole acre. Payment will be for completed work which shall include all equipment, labor and materials, including but not limited to; lime, fertilizer, mulch and seed necessary for the first seeding/planting of the specified revegetation. Subsequent steps will not be measured or paid for but will considered incidental to initial seeding/planting.

**6.4.3** The Contractor shall be paid only for those areas disturbed and revegetated during operations necessary for completion of the work. The quantity shall not include areas disturbed for storage facilities and staging areas unless prior approval was obtained from the WVDEP. No payment shall be made for any seeding/planting conducted after the final inspection as this work is considered warranty.

## 6.5 Basis of Payment

**6.5.1** The quantities of work done will be paid at the contract unit price bid as listed below, which price and payment shall be full

compensation for doing all the work herein prescribed in a workmanlike and acceptable manner including; the furnishing of all labor, materials, tools, equipment, supplies, and incidentals necessary to complete the work.

**6.5.2** No payment will be made for seeding/planting after the initial application. All work done after initial seeding/planting will be done as maintenance of a completed phase of work or as warranty work after the final inspection.

## 6.6 Pay Items

Item 6.0 **"Revegetation"**, shall be a per plan view acre bid item.

## 7.0 DRAINAGE STRUCTURES

### 7.1 Description

This work shall consist of furnishing all labor, equipment and materials necessary to construct the Drainage Structures shown on the Contract Drawings. Drainage Structures may include, but are not limited to, vegetated, riprap, and grouted riprap drainage channels and low water crossings.

### 7.2 Materials

#### 7.2.1 Excavated Material

This material shall consist of mine spoil, refuse, natural ground and rock. All excavation shall be considered incidental to the work and the cost of this excavation shall be included in the unit bid price for each Drainage Structure item constructed.

#### 7.2.2 Riprap

The Contractor should be aware that no provisions have been made to obtain rock on site. All rock riprap used throughout the project site shall consist of locally available, commercially purchased, calcareous stone (except as noted otherwise) meeting the following requirements. The rock riprap required for the drainage channels shall have a calcium carbonate equivalency of 70% or greater. The rock riprap shall have a maximum loss of thirty percent when subjected to five (5) cycles of the Sodium Sulfate Soundness Test – ASTM C88 (ASTM C88-99a Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate), as modified by ASHTO T-104. The use of on-site rock materials for riprap may be permitted with prior approval from the WVDEP in special circumstances. In order to be considered for use as riprap, the rock shall be subjected to laboratory testing and is required to be certified by the testing laboratory as non-acid producing. A certification on calcium carbonate equivalency and sodium sulfate soundness test shall be submitted to the WVDEP prior to delivery.

Riprap sizing shall be as specified in the drainage channel summaries on the Contract Drawings or as approved by the WVDEP.

### 7.2.3 Low Water Crossings

The stone utilized for the low water crossings shall be 6 inch diameter riprap that meets the requirements noted in Section 7.2.2. The surface voids of the low water crossing shall be filled with washed 1½ inch diameter stone.

### 7.2.4 Grout

If grout is to be used in the drainage channels, it shall be a grout mixture as indicated in the concrete mix design specifications listed below. The amount of water shall be approved or as designated by WVDEP.

CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trail mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trail mixes.
2. Mix proportions shall be based on comprehensive strength as determined by test specimens fabricated in accordance with ASTM C192/C192M and tested in accordance with ASTM C39.
3. Prepare alternate design mixes when the characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

B. Cementitious Materials: no mix shall contain more than one type of non-portland cementitious material. Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Ground Granulated Blast-Furnace Slag: 40 percent
2. Fly Ash: 15 percent

C. Cementitious Materials:

1. Cement replacement: Total cementitious material in all concrete mixes shall be comprised of Portland cement and at least 10%, but not greater than 15%, fly ash, by weight or Portland cement and at least 20%, but

not greater than 40%, ground granulated blast-furnace slag, by weight.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

E. Admixtures: Use admixtures according to manufacturers written instructions.

1. Use water-reducing or high-range water-reducing admixture in concrete.
2. Use high-range water-reducing admixture in pumped concrete, concrete required to be watertight and concrete with a water-cementitious material ratio below 0.50.
3. Use water-reducing and retarding admixture when required by high temperatures, low humidity or other adverse placement conditions.

F. Slump Limit: 4 inches, 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

G. Aggregate Materials: C-33 Natural Sand

CONCRETE MIXTURES FOR RIPRAP GROUT

A. RipRap Grout:

1. Minimum Compressive Strength: 2000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.46.
3. Air Content: 6%, plus or minus 1.5%, at the point of delivery.
4. Minimum Cementitious Materials Content: 650lb/cu.yd.

### 7.2.5 Synthetic Liner

The synthetic liner should be a woven polypropylene geotextile equivalent to a Mirafi FW 300 series and able to control velocities of 8 ft/sec or greater.

## 7.3 Construction Methods

### 7.3.1 Riprap Drainage Channel

**7.3.1.1** All riprap drainage channels shall be constructed as shown on the Contract Drawings or as directed by the WVDEP. Structures shall be installed to the lines and grades shown on the Contract Drawings. Final grading shall be performed to eliminate any irregularities in grade which might impound water.

**7.3.1.2** The excavation shall be done in a safe and careful manner. Construction shall begin at the outlet end so that ponding and wet excavation conditions are held to a minimum.

**7.3.1.3** The final location of the Drainage Structures may be adjusted by the WVDEP in the field as conditions warrant.

**7.3.1.4** The areas to receive Drainage Structures shall be cleared and grubbed in accordance with Section 4.0 of these Specifications.

**7.3.1.5** Excavation for all structures is unclassified and considered incidental to the re-grading and Drainage Structures installation. No additional compensation will be considered for rock excavation. All areas disturbed during construction of the ditch will be revegetated in accordance with Section 6.0 of these Specifications.

**7.3.1.6** Where ditches are to receive riprap, the subgrade shall be excavated such that final grade meets those shown on the Contract Drawings and the required depths are achieved. The subgrade shall be compacted before placing riprap. In areas where refuse material is encountered the area shall be over-excavated by 12 inches.

**7.3.1.7** Riprap shall be placed to the required thickness in one operation without damaging or displacing the underlying material. Riprap shall be placed in accordance with Section 218.3.2, West Virginia Division of Transportation Standard Specification for Roads and Bridges, latest edition. Stone shall be

delivered, stockpiled and placed in such a manner as to keep the material from being segregated. Placement by hand may be required.

### 7.3.2 Synthetic Drainage Channel

Synthetic drainage channels shall be seeded, reinforced, limed, fertilized and mulched in accordance with Section 6.0, **"Revegetation"**, of these Specifications. The synthetic liner should be placed in accordance with the detail provided in contract drawings and meeting manufacturer specifications.

## 7.4 Method of Measurement

**7.4.1** Excavation for all Drainage Structures will be considered incidental to the drainage structure, and will be paid for in the unit bid price of the structure installed.

**7.4.2** The method of measurement for the drainage channel lining, including vegetation and/or riprap shall be included in the unit bid price of the drainage structure installed.

**7.4.3** The method of measurement for the riprap dissipaters shall be included in the pay item for the respective drainage channel for which it is associated.

**7.4.4** The method of measurement for the "**15-inch HDPE Culvert**" and the "**24-inch HDPE Culvert**" shall be to the linear foot of culvert constructed and include material, labor, and equipment to install as shown on the Contract Drawings.

**7.4.5** The method of measurement for the "**Grouted Riprap Vee Drainage Channel – Type A**", "**Synthetic Lined Vee Drainage Channel – Type B**", "**Riprap Trapezoidal Drainage Channel – Type C**", and "**Grouted Riprap Trapezoidal Drainage Channel – Type D**" shall be to the linear foot of channel constructed and include all materials, labor, and equipment to install as shown on the Contract Drawings.

**7.4.6** All excavation associated with items in Section 7.0 shall not be measured, but shall be included within the associated drainage structure, and not in Item 8.0,"**Unclassified Excavation**".

**7.4.7** Surveying shall be incidental to work performed under this section. Payment for surveying shall be indicated under Item 2.0, **"Construction Layout Stakes."**

**7.4.8** The method of measurement for "**Low Water Crossing**", shall be per each item installed.

## 7.5 Pay Items

Item 7.1 **"15-inch HDPE Culvert"**, shall be a per linear foot bid item.

Item 7.2 **"24-inch HDPE Culvert"**, shall be a per linear foot bid item.

Item 7.3 **"Grouted Riprap Vee Drainage Channel – Type A"**, shall be a per linear foot bid item.

Item 7.4 **"Synthetic Lined Vee Drainage Channel – Type B"**, shall be a per linear foot bid item.

Item 7.5 **"Riprap Trapezoidal Drainage Channel – Type C"**, shall be per linear foot bid item.

Item 7.6 **"Grouted Riprap Trapezoidal Drainage Channel – Type D"**, shall be per linear foot bid item.

Item 7.7 **"Low Water Crossing"**, shall be bid per each item.

## 8.0 UNCLASSIFIED EXCAVATION

### 8.1 Description

This work shall consist of excavating, transporting, stockpiling, placing and compacting mine spoil, soil, rock, coal refuse or other materials encountered in the grading of the refuse disposal area and any other indicated incidental work. It shall also include the regrading and covering of areas of coal refuse and/or spoil to eliminate erosion rills and gullies and to establish and promote positive drainage and vegetative cover to these areas.

### 8.2 Materials

Fill material for embankments shall be considered a mixture of any or all of mine spoil, soil, rock, or coal refuse.

### 8.3 Borrow/Disposal Area

There are no borrow/disposal areas needed for balance of general excavation and fill quantities on this project. If off site borrow/disposal areas should be necessary to provide for material shortages or excess material disposal, then the Contractor is responsible for locating these areas and obtaining right-of-entry agreements in which the property owner indemnifies and holds WVDEP/OSMRE harmless from any injury or damage whatsoever resulting from the Contractor's use of the property. All prospective Contractors and Bidders must obtain their own permission from the landowner for any subsurface tests, borings, or pits. The Contractor shall be held responsible for compliance with all NEPA requirements and shall provide proof of such compliance to the WVDEP. The Contractor shall submit a reclamation plan to the WVDEP and must obtain approval for plan prior to any disturbance to the disposal site.

### 8.4 Soil Cover

This work consists of covering all areas having exposed refuse at the final grades with a twelve (12) inch thick layer of suitable soil material. The soil shall be obtained in conjunction with clearing and grubbing operations, regrading, drainage feature excavation, and/or from determined off-site soil borrow areas. Excavation of soil cover shall be as per Section 8.5.1. On site material used as soil cover must be used on the property of origination. However, the Contractor is responsible for securing an off-site borrow, or off-property borrow area in the event that adequate soil is not available on site at no additional cost to WVDEP. If, during the course of construction, the need for off-site borrow, or off-property borrow areas becomes evident, the Contractor shall obtain prior

approval from the WVDEP for such borrowing and the borrow area must comply with the attached NEPA regulations. The Contractor shall obtain Right-of-Entry Agreements for any soil or rock borrow areas outside the construction limits which provide for entry by the WVDEP and OSMRE for inspection purposes, with such agreements stating that the property owner(s) indemnifies and holds the WVDEP and OSMRE harmless from injury or damage whatsoever resulting from the use of the property. The Contractor shall obtain a written agreement for any soil or rock borrow material to be utilized on other property, at no additional cost to WVDEP.

On-site soil encountered in areas of proposed disturbance should be utilized for later revegetation whenever possible. The soil materials present in all areas to be excavated or filled shall be gathered and stockpiled in a suitable location, at the discretion of the WVDEP. Where required, strip soil to whatever depths encountered in a manner to prevent intermixing with underlying subsoils. Disturbance of the subsoils is to be minimized whenever possible. Remove heavy growths of grass from areas before stripping. Satisfactory soil is considered to be reasonably free of subsoil, clay clumps, stones and other objects over four (4) inches in diameter, and shall be free of objectionable material. Stockpile soil in storage piles in an area that will not create slope instability and provide free drainage of surface water. Cover stockpiles or use temporary seeding, if necessary, to prevent wind erosion.

The regrading plan shall be conducted in a manner such that a twelve (12) inch thick layer of soil material is uniformly spread over any areas of exposed refuse resulting from the regrading operation. Regrading shall be to the lines and grades shown on the Contract Drawings and the final grade line includes the twelve (12) inch thick layer of soil cover. The soil cover shall not be compacted to the specifications stated for fill compaction, but shall be placed in a manner to allow for proper establishment of vegetation as described in the seedbed preparation portion of the Revegetation specifications. The required soil amendments are to be incorporated into this top-dressing material while it is in a loose state, to facilitate proper mixing of these materials within the soil matrix. The soil cover shall then be prepared by tracking-in with a dozer perpendicular to the slope. The WVDEP may require that the soil cover be scarified prior to seeding if compaction is considered excessive or if rills develop.

## 8.5 Construction Methods

### 8.5.1 Excavation

Material excavation shall consist of the required removal of materials from the areas shown and the sloping and finishing of the

areas to the required lines and grades as shown on the Contract Drawings. The slopes may be varied only by permission of the WVDEP. Any excavation beyond planned grades will not be paid for unless prior authorization is obtained from the Engineer. Slopes shall be trimmed neatly to present a uniform surface, free from hollows and protrusions and loose or overhanging rocks. The tops of all slopes shall be rounded to form a smooth, uniform transition to the existing ground. Areas cut to grade in refuse are to be undercut twelve (12) inches below the final grades shown on the reclamation plan with final grades achieved with soil cover material.

The reclamation approach described in these construction specifications is intended to provide a lasting, stable configuration. The Contractor is required to exercise care to avoid conditions which may result in unstable conditions during the construction process. The Contractor shall be responsible for protecting any residences from damage.

The Contractor must utilize material removal techniques, which are generally considered to be conducive to retaining slope stability. Additionally, disturbed slopes shall be brought to the design template as soon as practical and shall be protected in accordance with Section 6.0, **"Revegetation"**.

### 8.5.2 Material Placement

Depositing and compacting fill in layers shall be started at the lowest point in the fill below grade, at the bottom of ravines and at the toe of the slope on side hill fills. Prior to fill placement, the existing foundation for the embankment will be proof-rolled and all unsuitable material, as determined by the WVDEP, will be removed.

Excavated material shall be placed in embankments in successive layers not to exceed one (1) foot in thickness before compaction. The layers shall be constructed approximately horizontal. Each layer, before starting the next, shall be leveled and smoothed by means of power driven graders, dozers, or other suitable equipment with adequate weight, capacity, and power to do the work. Layers shall be extended across the entire fill at the level of deposition unless otherwise authorized by the WVDEP. Each layer, before starting the next, shall be compacted.

Fill materials to be used in any area of an embankment shall be free from trash, debris, frozen soil, organic material or other foreign material.

Embankment fill and embankment subgrade materials shall be compacted to at least 90% of Standard Proctor maximum dry density at a moisture content of not less than 2% below nor greater than 3% above optimum. Testing shall be at a frequency approved by the WVDEP. One test per day during fill placement shall serve as a minimum.

Embankment fill material which does not contain sufficient moisture to be compacted to the requirements specified herein shall receive applications of water necessary for compaction. Water shall be applied with suitable sprinkling devices and shall be thoroughly incorporated into the material which is to be compacted. Embankment fill material which contains excess moisture shall be dried prior to compaction. Sufficient discing equipment shall be continuously available at the site and shall be used to add water to or remove excess moisture from fill materials.

At the close of each day's work, or when work is to be stopped for a period of time, the entire surface of the compacted fill shall be sealed by a method approved by the WVDEP. If, after a prolonged rainfall, the top surface of any embankment is too wet and/or plastic to work properly, the top material shall be removed to expose firm material. Ruts in the surface of any layer shall be suitably filled or eliminated by grading before compaction. The disturbed areas will be revegetated according to Section 6.0, **"Revegetation"**.

## 8.6 Method of Measurement

The method of measurement for excavation shall be by the cubic yard, which shall be the material actually moved and disposed of as herein described, measured in its original location and determined from volume calculations. Acceptable volume calculations of cut material are: The average end method based on as-built cross-sectional areas. Or the Contractor has the option of performing a topographic survey of the finished ground to produce a surface that can be compared to the original (existing) ground surface using a computer-aided drafting program. It is recommended that the comparison of the finished and original ground surfaces be calculated using the grid volume method with a cut/fill factor of one foot (1'). Field survey and volume calculations shall be certified by a Professional Land Surveyor or Professional Engineer. No separate payment will be made for ditch, underdrain, or any other incidental work referred to under **"Unclassified Excavation"**, or any regrading of refuse where there are no cross-sections.

There shall be no measurement for excavated material for soil cover as payment for this work shall be incidental to Item 8.0, **"Unclassified Excavation"**.

There shall be no measurement of regrading of refuse areas where there are no cross-sections, as payment for this work shall be incidental to Item 8.0, **"Unclassified Excavation"**.

The method of measurement for liming, fertilizing, seeding and mulching soil borrow areas located within the construction limits as addressed in this item is to be included under Section 6.0, **"Revegetation"**, as contained elsewhere in these specifications.

## 8.7 Basis of Payment

Payment for material excavated, transported, and/or backfilled to achieve the final grades will be by the unit price bid for **"Unclassified Excavation"**.

## 8.8 Pay Item

Item 8.0, **"Unclassified Excavation"**, shall be a per cubic yard bid item.

## 9.0 MINE SEALS

### 9.1 Description

This work shall consist of dewatering the existing mine pool, excavating the mine opening, installing wet mine seals and backfilling the opening to near original grade. There are wet mine seal details shown in the Contract Drawings. The specific seal that is needed for each mine opening is shown on the Contract Drawings, but shall be subject to change based on the conditions encountered when the mine entry is opened up during construction and as approved by the WVDEP. It shall be constructed in accordance with the typical details at the locations shown on the Contract Drawings. Materials shall conform to those listed below.

The length of the 12-inch diameter conveyance pipes and any associated cleanouts may vary based on the conditions revealed at the time of construction and the final grades that are achieved.

### 9.2 Materials

#### 9.2.1 3" to 6" Stone

The stone shall consist of sound, durable 3" to 6" non-calcareous stone such as that is commercially available. Crushed stone shall consist of particles of clean, hard, tough, durable rock, free from adherent coating and meeting the requirements of Section 703.1 of the WVDOT Standard Specifications. Stone shall have a maximum weighted loss of twelve (12) percent when subjected to five (5) cycles of the Sodium Sulfate Soundness Test – ASTM C88 (ASTM C99-99a Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate), as modified by the American Association of State Highway and Transportation Officials (AASHTO) T-104. Non-calcareous stone shall exhibit a fizz of zero (0) when subjected to dilute hydrochloric acid. A laboratory certification of soundness and fizz shall be submitted to the WVDEP prior to delivery.

In addition, sufficient 3" to 6" non-calcareous crushed stone shall be obtained to level the pipe in the Wet Mine Seals as shown on the Contract Drawings.

#### 9.2.2 1 ½ inch Crusher Run Stone

1 ½ inch crusher run stone shall be non-calcareous and shall conform to specifications as found under Section 704.2, Stone and Crushed Aggregate, in the West Virginia Division of

Transportation, Standard Specifications Roads and Bridges, latest edition.

### 9.2.3 Filter Fabric

Filter fabric shall be as specified in Section 715.11.4 of the WVDOT Standard Specifications for Roads and Bridges, latest edition.

### 9.2.4 Pipe

The Modified Mine Seal drain pipe (two pipes required) system shall consist of custom perforated 12-inch diameter PVC SDR 35 pipe extending a minimum of two joints from where the SDR 35 pipe that lies within the stone bulkhead connects to the 90 degree elbow.

Perforations shall be one inch (1") in diameter as shown in the Contract Drawings for any Wet Mine Seal or applicable Bat Gate Mine Seal.

The mine seal conveyance pipes (two required per wet seal and applicable bat gate seal) shall be solid 12-inch PVC SDR 35 pipe and shall begin at the end of the mine seal pay item and be installed to an approved discharge point as shown on the Contract Drawings.

Animal guards shall be constructed and installed on the downstream end of each of the two (2) outlet/conveyance pipes as detailed on the Contract Drawings. Cleanouts, if required, shall be installed along the two (2) outlet/conveyance pipe alignments and shall consist of necessary wye fittings and connections compatible with SDR 35 PVC pipe and extending from the outlet pipe to final grades shown on the Contract Drawings.

## 9.3 Construction Methods

**9.3.1** Excavation of the mine opening shall proceed in a manner which will control any release of the mine pool. The opening shall be cleaned of debris to the satisfaction of the WVDEP. Once the opening has been cleaned a minimum six (6) inch layer of stone shall be placed as pipe bedding. The pipes with risers shall be attached to steel plates and placed in the openings as shown on the attached Plans. The stone bulkhead will be constructed and covered with one layer of filter fabric and compacted clay and soil cover as shown on the Contract Drawings. Solid pipe shall extend from the

wet mine seal to a riprap channel discharging one foot above the invert of the channel. All pipes shall have a minimum grade of two (2) percent.
The Contractor shall be solely responsible for any damages caused by dewatering activities.

**9.3.2** A Dewatering Plan shall be submitted and approved by the Engineer prior to any work taking place. In the event pumping is required to dewater a site a straw bale/silt fence pit shall be constructed to intercept the effluent prior to entering waters of the state. This structure shall be located in such a manner that outfall is located with close proximity of a natural riprap lined drain. If necessary, the Contractor shall install (inline and prior to the pit) and operate a water treatment system utilizing soda ash briquettes in a manner approved by the engineer to maintain a pH between 6.0 and 9.0 in all water above base flow while dewatering mine.

**9.3.3** The modified wet mine seals will require excavation into the mine entries/collapsed portals for proper installation. The Contractor shall safely perform this work after taking all necessary precautions with regard to control and treatment of the impounded water, with all work being performed at the risk of the Contractor. The WVDEP accepts no responsibility or liability for any related construction activities. A Dewatering Plan shall be submitted to the WVDEP for approval prior to seal construction, with pool reduction possibly being provided from above with a well-point system or a similar dewatering scheme.

Construction of modified wet mine seals shall be in accordance with the Contract Drawing details. Filter fabric shall separate all aggregate/soil interfaces. The clay seal and pipe outlet trenches shall be compacted in accordance with Section 8.0 of these specifications. The Contractor shall adhere to OSHA Regulation 29 CFR Part 1926 during all excavation and trenching activities.

**9.3.4** Any monitoring wells or piezometers which have been left on this project must be removed and abandoned by a person who has been certified by the State of West Virginia in accordance with 47CSR59, "Monitoring Well Regulations". This certification is necessary for any person to operate in the State of West Virginia and includes construction, installation, alteration and/or abandonment of any monitoring wells and select boreholes. The costs for removal and abandonment shall be considered as incidental to mine seal installation.

## 9.4 Method of Measurement

**9.4.1** Modified Wet Mine Seals shall be measured per mine seal installed and shall include all excavation, dewatering, stone, filter fabric, and pipe necessary to complete the seal. The end of the mine seal shall be considered to be at the end of the outlet pipe where it exits from the compacted backfill. If solid pipe is required to convey the mine discharge to the collection channel, then it shall begin at the end of the seal and shall be considered to be conveyance pipe.

**9.4.4** The method of measurement for the construction of the 12-inch PVC SDR 35 drainage conveyance pipe (associated with the wet seals) shall be on a linear foot basis of the solid pipe as measured from the end of the mine seal to the approved discharge point and measured in place per single run of pipe. Trench excavation, furnishing and placement of the pipe and fittings, any necessary cleanouts, compacted on-site backfill, riprap dissipaters, where required at pipe outlet or ultimate drainage discharge, and minor grading, including all ancillary materials and operations required to construct the drainage conveyance pipes, will not be measured, but shall be considered incidental to this construction.

**9.4.5** Soda Ash Briquettes shall be measured per 50# bag used.

**9.4.6** Straw Bale/Silt Fence Pits shall be measured per each pit installed.

## 9.5 Pay Items

Item 9.1 **"Modified Wet Mine Seal"**, shall be a per each bid item.

Item 9.2, **"Soda Ash Briquettes, 50 lb. Bag"**, shall be a per each bid item.

Item 9.3, **"Straw Bale/Silt Fence Pit"**, shall be a per each bid item.

Item 9.4, **"12-inch Conveyance Pipe - Solid"**, shall be a per linear ft bid item.

## 10.0 UNDERDRAINS

### 10.1 Description

The underdrains shall be constructed as shown on the Contract Drawings, or as directed by the WVDEP. The contractor shall attempt to excavate and maintain the sides of each trench in a vertical position.

### 10.2 Materials

**10.2.1** Stone for underdrain shall consist of sound, durable 3" to 6" non-calcareous stone such as that commercially available. Crushed stone shall consist of particles of clean, hard, tough, durable rock, free from adherent coating and meeting the requirements of Section 703.1 of the WVDOH Standard Specifications for Roads and Bridges, Adopted 2000. Stone shall have a maximum weighted loss of twelve (12) percent when subjected to five cycles of the Sodium Sulfate Soundness Test – ASTM C88 (ASTM C88-99a Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate), as modified by the American Association of State Highway and Transportation Officials (AASHTO) T-104. Non-calcareous stone shall exhibit a fizz of zero(0) when subjected to dilute hydrochloric acid. A laboratory certification of soundness and fizz shall be submitted to the WVDEP prior to delivery.

**10.2.2** Filter fabric for the underdrain shall be non-woven type, meeting the requirements of Section 715.11.4 of the WVDOH Standard Specifications for Roads and Bridges, latest edition.

**10.2.3** Pipe shall consist of perforated 12-inch diameter PVC SDR 35 grade within the underdrain and solid 12-inch diameter PVC SDR 35 grade from the underdrain to the riprap channel. Clean outs shall consist of necessary "ell" fittings and connections compatible with SDR 35 PVC pipe. End caps shall consist of 12-inch diameter PVC SDR 35 grade.

### 10.3 Construction Methods

**10.3.1** Trench width for the underdrains shall be as indicated on the typical details provided in the Contract Drawings. Trenching will involve excavation of in-place material including soil and rock.

**10.3.2** Trench exceeding five (5) feet in depth shall be supported in compliance with OSHA requirements. Trench bottom shall be cleared of any loose debris and any standing water.

**10.3.3** Filter fabric shall be installed in the trench as shown on the Contract Drawings. The aggregate shall be placed carefully to prevent puncturing, tearing, or shifting of the filter fabric. The filter fabric shall not be installed over the ends of the underdrains where the rock shall daylight directly into existing or modified drainage ways.

**10.3.4** Animal guards shall be constructed and installed on the downstream end of each outlet pipe as detailed on the plans. These guards will be installed the same day to prevent animal entry during non-work time.

**10.3.5** End caps or end line cleanouts, as indicated on the Contract Drawings, shall be installed on the upstream end of the SDR 35 PVC pipe with the underdrain.

## 10.4 Method of Measurement

The method of measurement for the Underdrains shall be per linear foot installed and include all materials, labor, and equipment to install as shown on the Contract Drawings.

All excavation is unclassified; no additional compensation will be made for rock excavation.

## 10.5 Basis for Payment

Payment for the installation of underdrains shall be at the unit bid price for **"Underdrains".**

## 10.6 Pay Items

Item 10.0 **"Underdrains"**, shall be per linear foot bid item.

## 11.0 UTILITIES

### 11.1 Description

This work shall consist of all necessary measures to locate, relocate, maintain and protect all utilities within the limits of work specified herein and on the Contract Drawings.

The Contractor shall be responsible for making all necessary arrangements and/or performing all necessary work to the satisfaction of each affected utility company and the West Virginia Department of Highways in connection with the disturbances within their respective rights-of-way or services.

The Contractor shall be solely responsible for locating all utilities within the limits of work. All damages made to existing utilities by the Contractor shall be the sole responsibility of the Contractor.

In the event damage does occur, the Contractor shall notify each affected Owner and the WVDEP immediately, and make or have made all necessary repairs and bear the expenses thereof and of resulting damage caused thereby.

### 11.2 Materials

All materials used for utility related disturbances shall be in accordance with these Specifications, or as directed by the affected utility.

### 11.3 Construction Methods

All work shall be in accordance with these Specifications, or with those methods as directed by the affected utility.

### 11.4 Method of Measurement

Payment will be made for utility relocation at actual invoice cost from the affected utility as approved by WVDEP.

## 13.0 ACCESS ROADS

### 13.1 Description

This work shall consist of all necessary measures to locate, upgrade, maintain, and install the access road according to the Contract Drawings and these specifications. The Contractor shall locate and protect all existing utilities and maintain access at all times to landowners served by the existing portions of the access.

The Contractor shall be responsible for making all necessary arrangements and/or performing all necessary work to the satisfaction of each affected utility company, private property owner, and the West Virginia Department of Highways in connection with any disturbances within their respective rights-of-way or services.

The Contractor shall be solely responsible for locating all utilities within the limits of work. All damages made to existing utilities by the Contractor shall be the sole responsibility of the Contractor.

In the event damage does occur, the Contractor shall notify each affected Owner and the WVDEP immediately, and make or have made all necessary repairs and bear the expenses thereof and of resulting damage caused thereby.

### 13.2 Access Road Construction

The existing access along jeep trails, from the stabilized construction entrance to the project site, shall be upgraded, as needed, and remain so at the completion of the project. Contractor will inspect the access route and make necessary improvements to meet construction needs and to protect against any erosion and sediment discharges. A stabilized construction entrance shall be installed and maintained, throughout the project, at the access entrance to County Route 7. All materials used for this access shall be in accordance with these Specifications, or as directed by the WVDEP.

Contractor shall be responsible for constructing and maintaining a stable roadway suitable for 4-wheel drive vehicle travel throughout the project life. All aggregates used in the construction and maintenance of the access shall be WVDOT approved.

The access road from the stabilized construction entrance to the project site has not been designed. It is the responsibility of the Contractor to determine the quantity and location of all erosion and sediment control associated with this section of access road. Typical details for the access road construction have been provided in the Contract Drawings.

A laydown or temporary storage area measuring 50' by 100', as shown on the Contract Drawings, may be constructed adjacent to the access road in the field area. This area must be completely reclaimed upon completion. All rock shall be removed, the topsoil replaced, and revegetated.

Metal farm gates shall be installed at locations shown on the Contract Drawings. The gates shall adhere to the specifications provided on, and be installed according to, the Contract Drawings.

## 13.3 Gabion Baskets

Gabion baskets shall consist of rectangular wire mesh formed containers filled with rock. Rock for the gabion baskets shall be hard, durable and clean stone. Wire for fabrication and assembly shall be hot-dipped galvanized with a coating of 0.7 oz. / SF and conforming to ASTM A 641, Class 3, and Soft Temper with a tensile strength of 60,000 psi.

### 13.3.1 Gabion Baskets

**13.3.1.1** Foundations for the gabion baskets must be free of unsuitable materials, drained of groundwater and seeps and be properly graded and compacted. The foundation shall be inspected and approved by the Owner prior to the actual start of gabion construction.

**13.3.1.2** Assembly of the baskets and placement of rock within the gabions shall produce a neat face and shall be in accordance with the approved manufacturer's instructions and specifications.

**13.3.1.3** Gabion baskets shall be constructed as shown on the contract plans. The baskets must be stretched tight and the sides protected to ensure that they are not distorted while being filled. Each layer of baskets must be laced together and filled in one foot layers. After each lift, two connecting wires must be placed between each lift in each cell of all exposed faces to further maintain their form. Some hand placement will be necessary to properly distribute the stone for a flat surface on top and to prevent any voids within the baskets. The lids must then be stretched tightly shut while wiring the gabions to prevent movement of the stone fill.

## 13.4 Materials

**13.4.1** All aggregate shall be WVDOT approved and as shown in the Contract Drawings.

**13.4.2** Filter fabric shall be used in the construction of the access road. Filter fabric is only to be used in areas where needed, as approved by WVDEP.

**13.4.3** Three (3) metal farm gates specified and installed as shown on the Contract Drawings.

**13.4.3** Temporary and permanent fences specified and installed as shown on the Contract Drawings.

## 13.5 Method of Measurement

All costs including equipment, labor, and materials used to install, maintain, and reclaim these items shall be included and considered incidental to the item.

## 13.6 Basis for Payment

The method of measurement for **"Access Road"** shall be by the linear foot for materials (stone and filter cloth) and placement of materials.

The method of measurement for **"Farm Gates"** shall be per each bid item.

The method of measurement for **"Stone Filled Gabion Baskets"** shall be by the cubic yard of gabion baskets in place.

The method of measurement for "**Temporary Fence**" and "**Permanent Fence**" shall be by the linear foot.

## 13.6 Pay Items

Item 13.1 **"Access Road"**, shall be lump sum item.

Item 13.2 **"Farm Gates"**, shall be a per each.

Item 13.3 **"Stone Filled Gabion Baskets"**, shall be a per cubic yard.

Item 13.4 "**Temporary Fence**", shall be **a** per linear foot bid item.

Item 13.5 "**Permanent Fence**", shall be a per linear foot bid item.

## 14.0 TEST BORING LOGS

The final exploratory boring logs for the test borings identified on the Contract Drawings are attached within this section of the specifications. The exploratory borings shown on the Contract Drawings or attached to these specifications, depicting subsurface conditions are thought to be representative but cannot be guaranteed accurate. In the event others make conclusions or recommendations based on the test boring data shown, such conclusions or recommendations are the responsibility of the others.

The Contractor shall have satisfied himself by personal examination of subsurface samples from test borings, by a visit to the site and by such other means as he may have chosen, as to the actual conditions and requirements of the work. No allowance will be made for any claim that the bid was based upon incomplete information as to the nature and character of the site, the work involved, or for materials of an unexpected character found in excavations.

All Contractors and prospective bidders must receive permission from the Landowner before obtaining any subsurface samples and/or test borings holding WVDEP harmless against any injury or damage whatsoever resulting from this use of the property.

## 15.0 ENCAPSULATED AGGREGATE PLUG

### 15.1 Description

The work within this item will include the necessary labor, equipment, and materials to repair the designated sinkhole or depression features show on the drawings. Excavation of unclassified material to investigate and prepare each sinkhole or depression for placement of geosynthetic filter fabric and aggregate to construct an aggregate plug.

### 15.2 Materials

#### 15.2.1 Aggregate

Coarse aggregate shall be 12" riprap stone, uniformly graded and conform to the standards and specifications of Table 704.3 of the WVDOH Standards and Specifications.

#### 15.2.2 Filter Fabric

Geosythetic reinforcement shall be a woven filter fabric such as Propex Geotex315ST or equivalent.

### 15.3 Construction Methods

#### 15.3.1 Excavation

Each site shall be excavated to a depth sufficient or 10 feet minimum to determine if the sinkhole feature is a result of a mine shaft, ventilation or power boring, subsidence, drainage problem, etc. Using equipment, the contractor will probe the bottom and sides of the area to identify any potential construction material such as capping or shaft timbers or materials. Upon completion of initial investigation, the bottom of excavation will be compacted to extent possible with excavator and the sides graded to a 2H/1V slope to prepare for the aggregate plug installation. The bottom dimensions will allow a minimum of 3 feet surrounding any area suspected to be unstable or related to the vertical shaft or subsidence feature.

#### 15.3.2 Fabric Placement

Fabric shall be placed in a manner to provide full encapsulation of the aggregate material to be placed. The fabric will be placed in a continuous piece to fully cover the bottom and provide side and top overlap. A minimum of two pieces placed perpendicular to each

other shall be used. Additional pieces may be required, depending on size and configuration.

### 15.3.3 Aggregate Placement

Stone shall be placed into excavation upon completion of proper placement of filter fabric. The stone shall form a layer of 2 feet minimum and be leveled using excavator. Fabric will then be overlapped and folded to completely enclose aggregate. Earthen fill from excavation will be used to cover plug with a minimum of 2 feet of soil. Site shall be graded to approximate original contour and revegetated.

## 15.4 Basis of Payment

15.4.1 The per each sum shall be considered full compensation for doing all the work herein prescribed in a workmanlike and acceptable manner; including the furnishing of all labor, materials, tools, equipment, supplies and incidentals necessary to complete the work.

15.4.2 No payment will be made for seeding after the initial seeding. All work done after initial seeding will be done as maintenance of a completed phase of work or as warranty work after the final inspection.

## 15.5 Pay Items

**Item 15.0** **"Encapsulated Aggregate Plug"**, shall be per each.

Hatch Mott MacDonald

# CALCULATION BRIEF

**West Virginia Department of Environmental Protection**

## PEPPER PORTALS AND DRAINAGE

**Elk District, Barbour County, West Virginia**

**November 11, 2014**

# Pepper Portals Access Excavation Volumes

| Station ID | Cut Area Sq. Ft. | Cut Area Cu. Ft. | Fill Area Sq. Ft. | Fill Area Cu. Ft. |
|---|---|---|---|---|
| 0 | 0 | | | |
| 50 | 106.2292 | 2655.73 | 0 | 0 |
| 100 | 7.6443 | 2846.8375 | 1.2047 | 30.1175 |
| 150 | 3.9159 | 289.005 | 7.0101 | 205.37 |
| 200 | 1.3354 | 131.2825 | 13.0638 | 501.8475 |
| 250 | 6.393 | 193.21 | 0.9833 | 351.1775 |
| 300 | 61.8281 | 1705.5275 | 0 | 24.5825 |
| 350 | 73.8216 | 3391.2425 | 2.647 | 66.175 |
| 400 | 16.655 | 2261.915 | 36.3115 | 973.9625 |
| 450 | 6.7058 | 584.02 | 92.9451 | 3231.415 |
| 500 | 6.7116 | 335.435 | 21.8145 | 2868.99 |
| 550 | 500.1269 | 12670.9625 | 17.9546 | 994.2275 |
| 600 | 801.43 | 32538.9225 | 0 | 448.865 |
| 650 | 1412.9351 | 55359.1275 | 0 | 0 |
| 700 | 1272.9054 | 67146.0125 | 117.0859 | 2927.1475 |
| 750 | 2167.1447 | 86001.2525 | 0 | 2927.1475 |
| 800 | 1413.9858 | 89528.2625 | 0 | 0 |
| 850 | 1022.6667 | 60916.3125 | 33.679 | 841.975 |
| 900 | 405.6949 | 35709.04 | 214.1259 | 6195.1225 |
| 950 | 180.3277 | 14650.565 | 303.6001 | 12943.15 |

| | | | |
|---|---|---|---|
| **Total Cut Cu. Ft.** | 466914.6626 | **Total Fill Cu. Ft.** | 35531.2725 |
| **Total Cut Cu. Yds.** | 17367.20972 | **Total Fill Cu. Yds.** | 1316.973056 |
| | | **Net Cu. Yds.** | 16050.23667 |

# Pepper Portals Baseline Excavation Volumes

| Station ID | Cut Area Sq. Ft. | Cut Area Cu. Ft. | Fill Area Sq. Ft. | Fill Area Cu. Ft. |
|---|---|---|---|---|
| 10000 | 595.9 | | | |
| 10050 | 994.6 | 39762.5 | 0 | 0 |
| 10100 | 1446.8 | 61035 | 0 | 0 |
| 10150 | 0 | 36170 | 484.1368 | 12103.42 |
| 10200 | 0 | 0 | 631.0743 | 27880.2775 |
| 10250 | 0 | 0 | 654.4565 | 32138.27 |
| 10300 | 40.7062 | 1017.655 | 786.2606 | 36017.9275 |
| 10350 | 52.9979 | 2342.6025 | 785.3793 | 39290.9975 |
| 10400 | 17.8319 | 1770.745 | 1245.914 | 50782.3325 |
| 10450 | 13.2775 | 777.735 | 908.2404 | 53853.86 |
| 10500 | 190.1644 | 5086.0475 | 804.008 | 42806.21 |
| 10550 | 347.2916 | 13436.4 | 374.1689 | 29454.4225 |
| 10600 | 303.5959 | 16272.1875 | 461.9504 | 20902.9825 |
| 10650 | 417.8801 | 18036.9 | 914.0335 | 34399.5975 |
| 10700 | 493.1877 | 22776.695 | 1400.721 | 57868.8625 |
| 10750 | 0 | 12329.6925 | 1853.5301 | 81356.2775 |
| 10800 | 488.4829 | 12212.0725 | 1644.6057 | 87453.395 |
| 10850 | 1244.3646 | 43321.1875 | 1370.9811 | 75389.67 |
| 10900 | 392.2138 | 40914.46 | 1425.294 | 69906.8775 |
| 10950 | 387.2613 | 19486.8775 | 1175.7437 | 65025.9425 |
| 11000 | 359.4399 | 18667.53 | 1717.6003 | 72333.6 |
| 11050 | 180.4586 | 13497.4625 | 3421.7812 | 128484.5375 |
| 11100 | 1898.0082 | 51961.67 | 2080.3696 | 137553.77 |
| 11150 | 2776.6309 | 116865.9775 | 2054.7838 | 103378.835 |
| 11200 | 2845.479 | 140552.7475 | 2087.5132 | 103557.425 |
| 11250 | 2708.6404 | 138852.985 | 2219.2169 | 107668.2525 |
| 11300 | 2156.0437 | 121617.1025 | 2081.8962 | 107527.8275 |
| 11350 | 1138.8898 | 82373.3375 | 2189.6916 | 106789.695 |
| 11400 | 2295.4836 | 85859.335 | 1985.2485 | 104373.5025 |
| 11450 | 3941.4512 | 155923.37 | 1763.4982 | 93718.6675 |
| 11500 | 3452.345 | 184844.905 | 1648.3087 | 85295.1725 |
| 11550 | 2163.4846 | 140395.74 | 1562.0314 | 80258.5025 |
| 11600 | 403.8651 | 64183.7425 | 1651.0867 | 80327.9525 |
| 11650 | 0 | 10096.6275 | 671.6321 | 58067.97 |

| | | | |
|---|---|---|---|
| **Total Cut Cu. Ft.** | [redacted] | **Total Fill Cu. Ft.** | [redacted] |
| **Total Cut Cu. Yds.** | [redacted] | **Total Fill Cu. Yds.** | [redacted] |
| | | **Net Cu. Yds.** | [redacted] |

4724.07407 6048.62787
4724.55379

DITCHES

| | C | I | A | = | Q |
|---|---|---|---|---|---|
| #1 | 0.65 | 3.55 | 0.20 | | **2.35** |
| #2 | 0.65 | 3.55 | 1.73 | | 3.99 |
| #2 forest | 0.2 | 3.55 | 2.77 | | 1.97 |
| #2 Total | | | | | **5.96** |
| #3 | 0.65 | 3.55 | 1.97 | | 4.55 |
| #3 forest | 0.2 | 3.55 | 5.18 | | 3.68 |
| #3 Total | | | | | **8.22** |
| #4 | 0.65 | 3.55 | 0.06 | | 0.14 |
| #4 Total | | | | | **14.32** |
| #5 | 0.65 | 3.55 | 2.00 | | 4.62 |
| #5 forest | 0.2 | 3.55 | 8.25 | | 5.86 |
| #5 Total | | | | | **10.47** |
| #6 | 0.65 | 3.55 | 0.19 | | 0.44 |
| #6 Forest | 0.2 | 3.55 | 1.13 | | 0.80 |
| #6 Total | | | | | **11.71** |
| | | | | | |
| Road Culvert forest | 0.2 | 3.55 | 6.95 | | 4.93 |
| Road Culvert | 0.65 | 3.55 | 1.74 | | 4.02 |
| Road Culvert Total | | | | | **8.95** |
| | | | | | |
| Road Culvert 3forest | 0.2 | 3.55 | 0.06 | | 0.04 |
| Road Culvert 3forest | 0.65 | 3.55 | 0.89 | | 2.05 |
| Road Culvert Total | | | | | **2.10** |
| | | | | | |
| Road Culvert 2forest | 0.2 | 3.55 | 1.10 | | 0.78 |
| Road Culvert 2forest | 0.65 | 3.55 | 0.48 | | 1.11 |
| Road Culvert Total | | | | | **1.89** |

# Culvert Calculator Report
## Wet Seal - ME-1

Solve For: Headwater Elevation

| Culvert Summary | | | | | |
|---|---|---|---|---|---|
| Allowable HW Elevation | 0.00 | ft | Headwater Depth/Height | 0.24 | |
| Computed Headwater Elev | 1,298.24 | ft | Discharge | 0.33 | cfs |
| Inlet Control HW Elev. | 1,298.22 | ft | Tailwater Elevation | 0.00 | ft |
| Outlet Control HW Elev. | 1,298.24 | ft | Control Type | Entrance Control | |

| Grades | | | | | |
|---|---|---|---|---|---|
| Upstream Invert | 1,298.00 | ft | Downstream Invert | 1,296.00 | ft |
| Length | 170.00 | ft | Constructed Slope | 0.011765 | ft/ft |

| Hydraulic Profile | | | | | |
|---|---|---|---|---|---|
| Profile | S2 | | Depth, Downstream | 0.14 | ft |
| Slope Type | Steep | | Normal Depth | 0.14 | ft |
| Flow Regime | Supercritical | | Critical Depth | 0.17 | ft |
| Velocity Downstream | 2.59 | ft/s | Critical Slope | 0.005038 | ft/ft |

| Section | | | | | |
|---|---|---|---|---|---|
| Section Shape | Circular | | Mannings Coefficient | 0.012 | |
| Section Material | HDPE (Smooth Interior) | | Span | 1.00 | ft |
| Section Size | 12 inch | | Rise | 1.00 | ft |
| Number Sections | 2 | | | | |

| Outlet Control Properties | | | | | |
|---|---|---|---|---|---|
| Outlet Control HW Elev. | 1,298.24 | ft | Upstream Velocity Head | 0.06 | ft |
| Ke | 0.20 | | Entrance Loss | 0.01 | ft |

| Inlet Control Properties | | | | | |
|---|---|---|---|---|---|
| Inlet Control HW Elev. | 1,298.22 | ft | Flow Control | N/A | |
| Inlet Type | Groove end projecting | | Area Full | 1.6 | $ft^2$ |
| K | 0.00450 | | HDS 5 Chart | 1 | |
| M | 2.00000 | | HDS 5 Scale | 3 | |
| C | 0.03170 | | Equation Form | 1 | |
| Y | 0.69000 | | | | |

# Culvert Calculator Report
## ACCESS STATION 0+05

Solve For: Headwater Elevation

| Culvert Summary | | | | | |
|---|---|---|---|---|---|
| Allowable HW Elevation | 1,162.20 | ft | Headwater Depth/Height | 0.57 | |
| Computed Headwater Elev | 1,160.33 | ft | Discharge | 4.93 | cfs |
| Inlet Control HW Elev. | 1,160.28 | ft | Tailwater Elevation | 0.00 | ft |
| Outlet Control HW Elev. | 1,160.33 | ft | Control Type | Entrance Control | |

| Grades | | | | | |
|---|---|---|---|---|---|
| Upstream Invert | 1,159.20 | ft | Downstream Invert | 1,158.70 | ft |
| Length | 62.00 | ft | Constructed Slope | 0.008065 | ft/ft |

| Hydraulic Profile | | | | | |
|---|---|---|---|---|---|
| Profile | S2 | | Depth, Downstream | 0.64 | ft |
| Slope Type | Steep | | Normal Depth | 0.64 | ft |
| Flow Regime | Supercritical | | Critical Depth | 0.78 | ft |
| Velocity Downstream | 5.65 | ft/s | Critical Slope | 0.003875 | ft/ft |

| Section | | | | | |
|---|---|---|---|---|---|
| Section Shape | Circular | | Mannings Coefficient | 0.012 | |
| Section Material | HDPE (Smooth Interior) | | Span | 2.00 | ft |
| Section Size | 24 inch | | Rise | 2.00 | ft |
| Number Sections | 1 | | | | |

| Outlet Control Properties | | | | | |
|---|---|---|---|---|---|
| Outlet Control HW Elev. | 1,160.33 | ft | Upstream Velocity Head | 0.29 | ft |
| Ke | 0.20 | | Entrance Loss | 0.06 | ft |

| Inlet Control Properties | | | | | |
|---|---|---|---|---|---|
| Inlet Control HW Elev. | 1,160.28 | ft | Flow Control | N/A | |
| Inlet Type | Groove end projecting | | Area Full | 3.1 | ft² |
| K | 0.00450 | | HDS 5 Chart | 1 | |
| M | 2.00000 | | HDS 5 Scale | 3 | |
| C | 0.03170 | | Equation Form | 1 | |
| Y | 0.69000 | | | | |

# Culvert Calculator Report
## ACCESS STATION 3+30

Solve For: Headwater Elevation

| Culvert Summary | | | | | |
|---|---|---|---|---|---|
| Allowable HW Elevation | 1,227.00 | ft | Headwater Depth/Height | 0.91 | |
| Computed Headwater Elev | 1,226.64 | ft | Discharge | 1.89 | cfs |
| Inlet Control HW Elev. | 1,226.57 | ft | Tailwater Elevation | 0.00 | ft |
| Outlet Control HW Elev. | 1,226.64 | ft | Control Type | Entrance Control | |

| Grades | | | | | |
|---|---|---|---|---|---|
| Upstream Invert | 1,225.50 | ft | Downstream Invert | 1,224.00 | ft |
| Length | 21.00 | ft | Constructed Slope | 0.071429 | ft/ft |

| Hydraulic Profile | | | | | |
|---|---|---|---|---|---|
| Profile | S2 | | Depth, Downstream | 0.41 | ft |
| Slope Type | Steep | | Normal Depth | 0.27 | ft |
| Flow Regime | Supercritical | | Critical Depth | 0.55 | ft |
| Velocity Downstream | 5.38 | ft/s | Critical Slope | 0.004636 | ft/ft |

| Section | | | | | |
|---|---|---|---|---|---|
| Section Shape | Circular | | Mannings Coefficient | 0.012 | |
| Section Material | HDPE (Smooth Interior) | | Span | 1.25 | ft |
| Section Size | 15 inch | | Rise | 1.25 | ft |
| Number Sections | 1 | | | | |

| Outlet Control Properties | | | | | |
|---|---|---|---|---|---|
| Outlet Control HW Elev. | 1,226.64 | ft | Upstream Velocity Head | 0.32 | ft |
| Ke | 0.20 | | Entrance Loss | 0.06 | ft |

| Inlet Control Properties | | | | | |
|---|---|---|---|---|---|
| Inlet Control HW Elev. | 1,226.57 | ft | Flow Control | N/A | |
| Inlet Type | Groove end projecting | | Area Full | 1.2 | ft² |
| K | 0.00450 | | HDS 5 Chart | 1 | |
| M | 2.00000 | | HDS 5 Scale | 3 | |
| C | 0.03170 | | Equation Form | 1 | |
| Y | 0.69000 | | | | |

# Culvert Calculator Report
## ACCESS STATION 6+04

Solve For: Headwater Elevation

| Culvert Summary | | | | | |
|---|---|---|---|---|---|
| Allowable HW Elevation | 1,255.50 | ft | Headwater Depth/Height | 0.68 | |
| Computed Headwater Elev | 1,254.15 | ft | Discharge | 2.10 | cfs |
| Inlet Control HW Elev. | 1,254.09 | ft | Tailwater Elevation | 0.00 | ft |
| Outlet Control HW Elev. | 1,254.15 | ft | Control Type | Entrance Control | |

| Grades | | | | | |
|---|---|---|---|---|---|
| Upstream Invert | 1,253.30 | ft | Downstream Invert | 1,252.00 | ft |
| Length | 32.00 | ft | Constructed Slope | 0.040625 | ft/ft |

| Hydraulic Profile | | | | | |
|---|---|---|---|---|---|
| Profile | S2 | | Depth, Downstream | 0.34 | ft |
| Slope Type | Steep | | Normal Depth | 0.33 | ft |
| Flow Regime | Supercritical | | Critical Depth | 0.58 | ft |
| Velocity Downstream | 7.92 | ft/s | Critical Slope | 0.004716 | ft/ft |

| Section | | | | | |
|---|---|---|---|---|---|
| Section Shape | Circular | | Mannings Coefficient | 0.012 | |
| Section Material | HDPE (Smooth Interior) | | Span | 1.25 | ft |
| Section Size | 15 Inch | | Rise | 1.25 | ft |
| Number Sections | 1 | | | | |

| Outlet Control Properties | | | | | |
|---|---|---|---|---|---|
| Outlet Control HW Elev. | 1,254.15 | ft | Upstream Velocity Head | 0.22 | ft |
| Ke | 0.20 | | Entrance Loss | 0.04 | ft |

| Inlet Control Properties | | | | | |
|---|---|---|---|---|---|
| Inlet Control HW Elev. | 1,254.09 | ft | Flow Control | N/A | |
| Inlet Type | Groove end projecting | | Area Full | 1.2 | ft² |
| K | 0.00450 | | HDS 5 Chart | 1 | |
| M | 2.00000 | | HDS 5 Scale | 3 | |
| C | 0.03170 | | Equation Form | 1 | |
| Y | 0.69000 | | | | |

# Shear Stress Calculations

## Collection Ditch #1

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+00-0+30 | 0.49 | 0.053 | 10 | Synthetic Mat | 1.62 | — |
| 0+30-0+63 | 0.47 | 0.061 | 10 | Synthetic Mat | 1.79 | — |
| 0+63-1+11 | 0.36 | 0.25 | 10 | Synthetic Mat | 5.62 | --- |
| 1+11-3+11 | 0.38 | 0.2 | 10 | Synthetic Mat | 4.74 | --- |
| 3+11-3+47 | 0.37 | 0.228 | 10 | Synthetic Mat | 5.26 | --- |
| 3+47-3+67 | 0.34 | 0.225 | 10 | Synthetic Mat | 4.77 | --- |
| 3+67-4+67 | 0.42 | 0.08 | 10 | Synthetic Mat | 2.10 | --- |
| 4+67-4+99 | 0.33 | 0.188 | 10 | Synthetic Mat | 3.87 | — |
| 4+99-5+12 | 0.35 | 0.154 | 10 | Synthetic Mat | 3.36 | --- |
| 5+12-6+81 | 0.4 | 0.071 | 10 | Synthetic Mat | 1.77 | --- |
| 6+81-9+74 | 0.38 | 0.157 | 10 | Synthetic Mat | 3.72 | — |

## Collection Ditch #2

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+00-6+84 | 0.83 | 0.02 | 10 | Synthetic Mat | 1.04 | --- |

## Collection Ditch #3

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+00-5+07 | 0.94 | 0.02 | 10 | Synthetic Mat | 1.17 | --- |

## Collection Ditch #4

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+00-1+34 | 1.11 | 0.239 | 3 | 12" Rock Rip Rap | 16.55 | Slush Grouted |
| 1+34-1+62 | 1.39 | 0.071 | 3 | 12" Rock Rip Rap | 6.16 | Slush Grouted |
| 1+62-1+75 | 1.72 | 0.023 | 3 | 12" Rock Rip Rap | 2.47 | --- |

## Collection Ditch #5

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+00-4+46 | 1.02 | 0.02 | 10 | Synthetic Mat | 1.27 | --- |

## Collection Ditch #6

| Station | Depth of Flow | Channel Bed Slope | Maximum $\tau$ | Lining Type | $\tau_d$ | Additional Lining |
|---|---|---|---|---|---|---|
| 0+05-0+27 | 1.14 | 0.136 | 3 | 12" Rock Rip Rap | 9.67 | Slush Grouted |
| 0+27-0+68 | 1.38 | 0.049 | 3 | 12" Rock Rip Rap | 4.22 | Slush Grouted |
| 0+68-1+56 | 0.99 | 0.294 | 3 | 12" Rock Rip Rap | 18.16 | Slush Grouted |
| 1+56-1+75 | 0.91 | 0.468 | 3 | 12" Rock Rip Rap | 26.57 | Slush Grouted |
| 1+75-2+03 | 1.05 | 0.211 | 3 | 12" Rock Rip Rap | 13.82 | Slush Grouted |
| 2+03-2+48 | 1.64 | 0.02 | 3 | 12" Rock Rip Rap | 2.05 | --- |

# Worksheet for CHANNEL #1 - 0+00-0+30

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.05300 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.35 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.49 | ft |
| Flow Area | 0.47 | $ft^2$ |
| Wetted Perimeter | 2.18 | ft |
| Hydraulic Radius | 0.22 | ft |
| Top Width | 1.95 | ft |
| Critical Depth | 0.61 | ft |
| Critical Slope | 0.01568 | ft/ft |
| Velocity | 4.95 | ft/s |
| Velocity Head | 0.38 | ft |
| Specific Energy | 0.87 | ft |
| Froude Number | 1.77 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.49 | ft |
| Critical Depth | 0.61 | ft |
| Channel Slope | 0.05300 | ft/ft |
| Critical Slope | 0.01568 | ft/ft |

# Worksheet for CHANNEL #1 - 0+30-0+63

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.06100 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.35 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.47 | ft |
| Flow Area | 0.45 | $ft^2$ |
| Wetted Perimeter | 2.12 | ft |
| Hydraulic Radius | 0.21 | ft |
| Top Width | 1.90 | ft |
| Critical Depth | 0.61 | ft |
| Critical Slope | 0.01568 | ft/ft |
| Velocity | 5.22 | ft/s |
| Velocity Head | 0.42 | ft |
| Specific Energy | 0.90 | ft |
| Froude Number | 1.89 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.47 | ft |
| Critical Depth | 0.61 | ft |
| Channel Slope | 0.06100 | ft/ft |
| Critical Slope | 0.01568 | ft/ft |

# Worksheet for CHANNEL #1 - 0+63-1+11

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.25000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.35 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.36 | ft |
| Flow Area | 0.27 | $ft^2$ |
| Wetted Perimeter | 1.63 | ft |
| Hydraulic Radius | 0.16 | ft |
| Top Width | 1.46 | ft |
| Critical Depth | 0.61 | ft |
| Critical Slope | 0.01568 | ft/ft |
| Velocity | 8.86 | ft/s |
| Velocity Head | 1.22 | ft |
| Specific Energy | 1.58 | ft |
| Froude Number | 3.66 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.36 | ft |
| Critical Depth | 0.61 | ft |
| Channel Slope | 0.25000 | ft/ft |
| Critical Slope | 0.01568 | ft/ft |

# Worksheet for CHANNEL #1 - 1+11-3+11

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.20000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.35 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.38 | ft |
| Flow Area | 0.29 | $ft^2$ |
| Wetted Perimeter | 1.70 | ft |
| Hydraulic Radius | 0.17 | ft |
| Top Width | 1.52 | ft |
| Critical Depth | 0.61 | ft |
| Critical Slope | 0.01568 | ft/ft |
| Velocity | 8.15 | ft/s |
| Velocity Head | 1.03 | ft |
| Specific Energy | 1.41 | ft |
| Froude Number | 3.30 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.38 | ft |
| Critical Depth | 0.61 | ft |
| Channel Slope | 0.20000 | ft/ft |
| Critical Slope | 0.01568 | ft/ft |

# Worksheet for CHANNEL #1 - 3+11-3+47

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.22800 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.35 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.37 | ft |
| Flow Area | 0.27 | ft² |
| Wetted Perimeter | 1.66 | ft |
| Hydraulic Radius | 0.17 | ft |
| Top Width | 1.48 | ft |
| Critical Depth | 0.61 | ft |
| Critical Slope | 0.01568 | ft/ft |
| Velocity | 8.56 | ft/s |
| Velocity Head | 1.14 | ft |
| Specific Energy | 1.51 | ft |
| Froude Number | 3.51 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.37 | ft |
| Critical Depth | 0.61 | ft |
| Channel Slope | 0.22800 | ft/ft |
| Critical Slope | 0.01568 | ft/ft |

# Worksheet for CHANNEL #1 - 3+47-3+67

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.22500 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 1.89 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.34 | ft |
| Flow Area | 0.23 | $ft^2$ |
| Wetted Perimeter | 1.53 | ft |
| Hydraulic Radius | 0.15 | ft |
| Top Width | 1.37 | ft |
| Critical Depth | 0.56 | ft |
| Critical Slope | 0.01615 | ft/ft |
| Velocity | 8.07 | ft/s |
| Velocity Head | 1.01 | ft |
| Specific Energy | 1.35 | ft |
| Froude Number | 3.44 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.34 | ft |
| Critical Depth | 0.56 | ft |
| Channel Slope | 0.22500 | ft/ft |
| Critical Slope | 0.01615 | ft/ft |

# Worksheet for CHANNEL #1 - 3+67-4+67

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.08000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 1.89 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.42 | ft |
| Flow Area | 0.35 | $ft^2$ |
| Wetted Perimeter | 1.86 | ft |
| Hydraulic Radius | 0.19 | ft |
| Top Width | 1.66 | ft |
| Critical Depth | 0.56 | ft |
| Critical Slope | 0.01614 | ft/ft |
| Velocity | 5.47 | ft/s |
| Velocity Head | 0.47 | ft |
| Specific Energy | 0.88 | ft |
| Froude Number | 2.12 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.42 | ft |
| Critical Depth | 0.56 | ft |
| Channel Slope | 0.08000 | ft/ft |
| Critical Slope | 0.01614 | ft/ft |

# Worksheet for CHANNEL #1 - 4+67-4+99

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.18800 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 1.62 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.33 | ft |
| Flow Area | 0.22 | $ft^2$ |
| Wetted Perimeter | 1.49 | ft |
| Hydraulic Radius | 0.15 | ft |
| Top Width | 1.34 | ft |
| Critical Depth | 0.53 | ft |
| Critical Slope | 0.01648 | ft/ft |
| Velocity | 7.26 | ft/s |
| Velocity Head | 0.82 | ft |
| Specific Energy | 1.15 | ft |
| Froude Number | 3.13 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.33 | ft |
| Critical Depth | 0.53 | ft |
| Channel Slope | 0.18800 | ft/ft |
| Critical Slope | 0.01648 | ft/ft |

# Worksheet for CHANNEL #1 - 4+99-5+12

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.15400 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 1.62 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.35 | ft |
| Flow Area | 0.24 | $ft^2$ |
| Wetted Perimeter | 1.55 | ft |
| Hydraulic Radius | 0.16 | ft |
| Top Width | 1.39 | ft |
| Critical Depth | 0.53 | ft |
| Critical Slope | 0.01648 | ft/ft |
| Velocity | 6.73 | ft/s |
| Velocity Head | 0.70 | ft |
| Specific Energy | 1.05 | ft |
| Froude Number | 2.85 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.35 | ft |
| Critical Depth | 0.53 | ft |
| Channel Slope | 0.15400 | ft/ft |
| Critical Slope | 0.01648 | ft/ft |

# Worksheet for CHANNEL #1 - 5+12-6+81

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.07100 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 1.62 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.40 | ft |
| Flow Area | 0.32 | $ft^2$ |
| Wetted Perimeter | 1.79 | ft |
| Hydraulic Radius | 0.18 | ft |
| Top Width | 1.60 | ft |
| Critical Depth | 0.53 | ft |
| Critical Slope | 0.01648 | ft/ft |
| Velocity | 5.04 | ft/s |
| Velocity Head | 0.39 | ft |
| Specific Energy | 0.80 | ft |
| Froude Number | 1.98 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.40 | ft |
| Critical Depth | 0.53 | ft |
| Channel Slope | 0.07100 | ft/ft |
| Critical Slope | 0.01648 | ft/ft |

# Worksheet for CHANNEL #1 - 6+81-9+74

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.15700 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 2.10 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.38 | ft |
| Flow Area | 0.29 | $ft^2$ |
| Wetted Perimeter | 1.70 | ft |
| Hydraulic Radius | 0.17 | ft |
| Top Width | 1.52 | ft |
| Critical Depth | 0.59 | ft |
| Critical Slope | 0.01592 | ft/ft |
| Velocity | 7.24 | ft/s |
| Velocity Head | 0.81 | ft |
| Specific Energy | 1.20 | ft |
| Froude Number | 2.92 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.38 | ft |
| Critical Depth | 0.59 | ft |
| Channel Slope | 0.15700 | ft/ft |
| Critical Slope | 0.01592 | ft/ft |

# Worksheet for CHANNEL #2

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.02000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 5.96 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.83 | ft |
| Flow Area | 1.37 | $ft^2$ |
| Wetted Perimeter | 3.71 | ft |
| Hydraulic Radius | 0.37 | ft |
| Top Width | 3.32 | ft |
| Critical Depth | 0.89 | ft |
| Critical Slope | 0.01385 | ft/ft |
| Velocity | 4.34 | ft/s |
| Velocity Head | 0.29 | ft |
| Specific Energy | 1.12 | ft |
| Froude Number | 1.19 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.83 | ft |
| Critical Depth | 0.89 | ft |
| Channel Slope | 0.02000 | ft/ft |
| Critical Slope | 0.01385 | ft/ft |

# Worksheet for CHANNEL #3

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.02000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 8.22 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.94 | ft |
| Flow Area | 1.75 | $ft^2$ |
| Wetted Perimeter | 4.18 | ft |
| Hydraulic Radius | 0.42 | ft |
| Top Width | 3.74 | ft |
| Critical Depth | 1.01 | ft |
| Critical Slope | 0.01327 | ft/ft |
| Velocity | 4.70 | ft/s |
| Velocity Head | 0.34 | ft |
| Specific Energy | 1.28 | ft |
| Froude Number | 1.21 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.94 | ft |
| Critical Depth | 1.01 | ft |
| Channel Slope | 0.02000 | ft/ft |
| Critical Slope | 0.01327 | ft/ft |

# Worksheet for CHANNEL #4 - 0+00-1+34

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.23900 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 14.32 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.11 | ft |
| Flow Area | 2.46 | $ft^2$ |
| Wetted Perimeter | 4.96 | ft |
| Hydraulic Radius | 0.50 | ft |
| Top Width | 4.43 | ft |
| Critical Depth | 1.26 | ft |
| Critical Slope | 0.11997 | ft/ft |
| Velocity | 5.83 | ft/s |
| Velocity Head | 0.53 | ft |
| Specific Energy | 1.64 | ft |
| Froude Number | 1.38 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.11 | ft |
| Critical Depth | 1.26 | ft |
| Channel Slope | 0.23900 | ft/ft |
| Critical Slope | 0.11997 | ft/ft |

# Worksheet for CHANNEL #4 - 1+34-1+50

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.07100 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 14.32 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.39 | ft |
| Flow Area | 3.87 | $ft^2$ |
| Wetted Perimeter | 6.22 | ft |
| Hydraulic Radius | 0.62 | ft |
| Top Width | 5.57 | ft |
| Critical Depth | 1.26 | ft |
| Critical Slope | 0.11998 | ft/ft |
| Velocity | 3.70 | ft/s |
| Velocity Head | 0.21 | ft |
| Specific Energy | 1.60 | ft |
| Froude Number | 0.78 | |
| Flow Type | Subcritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.39 | ft |
| Critical Depth | 1.26 | ft |
| Channel Slope | 0.07100 | ft/ft |
| Critical Slope | 0.11998 | ft/ft |

# Worksheet for CHANNEL #5

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.025 | |
| Channel Slope | 0.02000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 10.47 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.02 | ft |
| Flow Area | 2.10 | $ft^2$ |
| Wetted Perimeter | 4.58 | ft |
| Hydraulic Radius | 0.46 | ft |
| Top Width | 4.10 | ft |
| Critical Depth | 1.11 | ft |
| Critical Slope | 0.01285 | ft/ft |
| Velocity | 4.99 | ft/s |
| Velocity Head | 0.39 | ft |
| Specific Energy | 1.41 | ft |
| Froude Number | 1.23 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.02 | ft |
| Critical Depth | 1.11 | ft |
| Channel Slope | 0.02000 | ft/ft |
| Critical Slope | 0.01285 | ft/ft |

# Worksheet for CHANNEL #6 - 0+05-0+27

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.13600 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.14 | ft |
| Flow Area | 2.61 | $ft^2$ |
| Wetted Perimeter | 5.11 | ft |
| Hydraulic Radius | 0.51 | ft |
| Top Width | 4.57 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12324 | ft/ft |
| Velocity | 4.49 | ft/s |
| Velocity Head | 0.31 | ft |
| Specific Energy | 1.46 | ft |
| Froude Number | 1.05 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.14 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.13600 | ft/ft |
| Critical Slope | 0.12324 | ft/ft |

# Worksheet for CHANNEL #6 - 0+27-0+68

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.04900 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.38 | ft |
| Flow Area | 3.83 | $ft^2$ |
| Wetted Perimeter | 6.18 | ft |
| Hydraulic Radius | 0.62 | ft |
| Top Width | 5.53 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12324 | ft/ft |
| Velocity | 3.06 | ft/s |
| Velocity Head | 0.15 | ft |
| Specific Energy | 1.53 | ft |
| Froude Number | 0.65 | |
| Flow Type | Subcritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.38 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.04900 | ft/ft |
| Critical Slope | 0.12324 | ft/ft |

# Worksheet for CHANNEL #6 - 0+68-1+56

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.29400 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.99 | ft |
| Flow Area | 1.95 | $ft^2$ |
| Wetted Perimeter | 4.42 | ft |
| Hydraulic Radius | 0.44 | ft |
| Top Width | 3.95 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12324 | ft/ft |
| Velocity | 5.99 | ft/s |
| Velocity Head | 0.56 | ft |
| Specific Energy | 1.55 | ft |
| Froude Number | 1.50 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.99 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.29400 | ft/ft |
| Critical Slope | 0.12324 | ft/ft |

# Worksheet for CHANNEL #6 - 1+56-1+75

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.46800 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.91 | ft |
| Flow Area | 1.64 | $ft^2$ |
| Wetted Perimeter | 4.05 | ft |
| Hydraulic Radius | 0.41 | ft |
| Top Width | 3.62 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12323 | ft/ft |
| Velocity | 7.14 | ft/s |
| Velocity Head | 0.79 | ft |
| Specific Energy | 1.70 | ft |
| Froude Number | 1.87 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.91 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.46800 | ft/ft |
| Critical Slope | 0.12323 | ft/ft |

# Worksheet for CHANNEL #6 - 1+75-2+03

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.21100 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.05 | ft |
| Flow Area | 2.21 | $ft^2$ |
| Wetted Perimeter | 4.70 | ft |
| Hydraulic Radius | 0.47 | ft |
| Top Width | 4.21 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12324 | ft/ft |
| Velocity | 5.29 | ft/s |
| Velocity Head | 0.44 | ft |
| Specific Energy | 1.49 | ft |
| Froude Number | 1.29 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.05 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.21100 | ft/ft |
| Critical Slope | 0.12324 | ft/ft |

# Worksheet for CHANNEL #6 - 2+03-2+48

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.078 | |
| Channel Slope | 0.02000 | ft/ft |
| Left Side Slope | 2.00 | ft/ft (H:V) |
| Right Side Slope | 2.00 | ft/ft (H:V) |
| Discharge | 11.71 | $ft^3/s$ |

## Results

| | | |
|---|---|---|
| Normal Depth | 1.64 | ft |
| Flow Area | 5.35 | $ft^2$ |
| Wetted Perimeter | 7.32 | ft |
| Hydraulic Radius | 0.73 | ft |
| Top Width | 6.54 | ft |
| Critical Depth | 1.16 | ft |
| Critical Slope | 0.12324 | ft/ft |
| Velocity | 2.19 | ft/s |
| Velocity Head | 0.07 | ft |
| Specific Energy | 1.71 | ft |
| Froude Number | 0.43 | |
| Flow Type | Subcritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.64 | ft |
| Critical Depth | 1.16 | ft |
| Channel Slope | 0.02000 | ft/ft |
| Critical Slope | 0.12324 | ft/ft |

# Pepper Portals & Drainage
## DEP17115
### Contractor's Bid Sheet

Company Name:_____

Address:_____

_____

**The DEP reserves the right to request additional information and supporting documentation regarding unit prices when the unit price appears to be unreasonable.**

| ITEM NO. | QUANTITY | DESCRIPTION | UNIT PRICE | AMOUNT |
|---|---|---|---|---|
| | | | | |
| 1.0 | 1 LS | Mobilization and Demobilization (Shall not exceed 10% of total) | | $ |
| 2.0 | 1 LS | Construction Layout (Shall not exceed 5% of total) | | $ |
| 3.0 | 1 LS | Quality Control (Shall not exceed 3% of total) | | $ |
| 4.0 | 1 LS | Site Preparation (Shall not exceed 7% of total) | | $ |
| 5.1 | 1900 LF | Super Silt Fence | | $ |
| 5.2 | 8100 LF | Erosion Control Wattles | | $ |
| 5.3 | 61 EA | Rock Check Dams | | $ |
| 5.4 | 2 EA | Stabilized Construction Entrances | | $ |
| 5.5 | 3 EA | RipRap Dissipaters | | $ |
| 6.0 | 14.2 AC | Revegetation | | $ |
| 7.1 | 130 LF | 15-inch HDPE Culvert | | $ |
| 7.2 | 68 LF | 24-inch HDPE Culvert | | $ |
| 7.3 | 150 LF | Grouted Riprap Vee Drainage Channel – Type A | | $ |
| 7.4 | 2611 LF | Synthetic Lined Vee Drainage Channel – Type B | | $ |
| 7.5 | 45 LF | Riprap Trapezoidal Drainage Channel – Type C | | |
| 7.6 | 198 LF | Grouted Riprap Trapezoidal Drainage Channel – Type D | | $ |
| 7.7 | 1 EA | Low Water Crossing | | $ |
| 8.0 | 79309 CY | Unclassified Excavation | | $ |
| 9.1 | 1 EA | Modified Wet Mine Seal | | $ |
| 9.2 | 25 EA | Soda Ash Briquettes, 50 lb. Bag | | $ |
| 9.3 | 1 EA | Straw Bale/Silt Fence Pit | | $ |
| 9.4 | 314 LF | 12-inch Conveyance Pipe Solid | | $ |
| 10.0 | 100 LF | Underdrains | | $ |
| 13.1 | 982 LF | Access Road | | $ |
| 13.2 | 3 EA | Farm Gates | | $ |
| 13.3 | 126 CY | Stone Filled Gabion Baskets | | $ |
| 13.4 | 140 LF | Temporary Fence | | $ |
| 13.5 | 150 LF | Permanent Fence | | $ |
| 15.0 | 1 EA | Encapsulated Aggregate Plug | | $ |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | **TOTAL** | | $ |
| | | | | |