LANCE R. LEFLEUR
DIRECTOR

KAY IVEY
GOVERNOR

Alabama Department of Environmental Management
adem.alabama.gov

1400 Coliseum Blvd. 36110-2400 ▪ Post Office Box 301463
Montgomery, Alabama 36130-1463
(334) 271-7700 ▪ FAX (334) 271-7950

APR 20 2021

Steven L. Fields
Senior Project Manager
Trans Ash Inc.
15300 Highway 43
Bucks, AL 36512

RE: Draft Permit
Trans Ash Borrow Pit
NPDES Permit No. AL0084174
Mobile County (097)

Dear Mr. Fields:

Transmitted herein is a draft of the above referenced permit. Please review the enclosed draft permit carefully. If previously permitted, the draft may contain additions/revisions to the language in your current permit. Please submit any comments on the draft permit to the Department within 30 days from the date of receipt of this letter.

Since the Department has made a tentative decision to issue the above referenced permit, ADEM Admin. Code r. 335-6-6-.21 requires a public notice of the draft permit followed by a period of at least 30 days for public comment before the permit can be issued. The United States Environmental Protection Agency will also receive the draft permit for review during the 30-day public comment period.

Any mining, processing, construction, land disturbance, or other regulated activity proposed to be authorized by this draft permit is prohibited prior to the effective date of the formal permit. Any mining or processing activity within the drainage basin associated with each permitted outfall which is conducted prior to Departmental receipt of certification from a professional engineer licensed to practice in the State of Alabama, that the Pollution Abatement/Prevention Plan was implemented according to the design plan, or notification from the Alabama Surface Mining Commission that the sediment control structures have been certified, is prohibited.

The Department utilizes a web-based electronic environmental (E2) reporting system for electronic DMR submittal. Please read Part I.D of the permit carefully and visit https://e2.adem.alabama.gov/npdes.

Should you have any questions concerning this matter, please contact Amber Hicks by email at amber.hicks@adem.alabama.gov or by phone at (334) 271-7975.

Sincerely,

Catherine A. McNeill, Chief
Mining and Natural Resource Section
Stormwater Management Branch
Water Division

CAM/anh File: DPER/54065

Enclosure

cc: Amber Powell, ADEM
Environmental Protection Agency Region IV
Alabama Department of Conservation and Natural Resources
U.S. Fish and Wildlife Service
Alabama Historical Commission
Advisory Council on Historic Preservation
Alabama Department of Labor

Birmingham Branch
110 Vulcan Road
Birmingham, AL 35209-4702
(205) 942-6168
(205) 941-1603 (FAX)

Decatur Branch
2715 Sandlin Road, S.W.
Decatur, AL 35603-1333
(256) 353-1713
(256) 340-9359 (FAX)

Mobile Branch
2204 Perimeter Road
Mobile, AL 36615-1131
(251) 450-3400
(251) 479-2593 (FAX)

Mobile-Coastal
3664 Dauphin Street, Suite B
Mobile, AL 36608
(251) 304-1176
(251) 304-1189 (FAX)

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM INDIVIDUAL PERMIT

PERMITTEE: Trans Ash, Inc.
15300 Highway 43
Bucks, AL 36512

FACILITY LOCATION: Trans Ash Borrow Pit
County Road 63
Chunchula, AL 36521
Mobile County
T6S, R4W ,S33

PERMIT NUMBER: AL0084174

DSN & RECEIVING STREAM: 001-1 Unnamed Tributary to Log Creek

In accordance with and subject to the provisions of the Federal Water Pollution Control Act, as amended, 33 U.S.C. §§1251-1388 (the "FWPCA"), the Alabama Water Pollution Control Act, as amended, ***Code of Alabama 1975****, §§ 22-22-1 to 22-22-14 (the "AWPCA"), the Alabama Environmental Management Act, as amended,* ***Code of Alabama 1975****, §§22-22A-1 to 22-22A-17, and rules and regulations adopted thereunder, and subject further to the terms and conditions set forth in this permit, the Permittee is hereby authorized to discharge into the above-named receiving waters.*

ISSUANCE DATE:

EFFECTIVE DATE:

EXPIRATION DATE:

DRAFT

Alabama Department of Environmental Management

MINING AND NATURAL RESOURCE SECTION

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT

TABLE OF CONTENTS

PART I DISCHARGE LIMITATIONS, CONDITIONS, AND REQUIREMENTS

A. DISCHARGE LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this Permit and lasting through the expiration date of this Permit, the Permittee is authorized to discharge from all outfalls identified on Page 1 of this Permit and described more fully in the Permittee's application, if the outfalls have been constructed and certified. Discharges shall be limited and monitored by the Permittee as specified below:

Parameter	Discharge Limitations			Monitoring Requirements	
	Daily Minimum	Monthly Average	Daily Maximum	Sample Type	Measurement Frequency[1]
pH 00400	6.0 s.u.	-------	9.0 s.u.	Grab	2/Month
Solids, Total Suspended 00530	-------	35.0 mg/L	70.0 mg/L	Grab	2/Month
Flow, In Conduit or Thru Treatment Plant[2] 50050	-------	Report MGD	Report MGD	Instantaneous	2/Month

B. REQUIREMENTS TO ACTIVATE A PROPOSED MINING OUTFALL

1. Discharge from any point source identified on Page 1 of this Permit which is a proposed outfall is not authorized by this Permit until the outfall has been constructed and certification received by the Department from a professional engineer, registered in the State of Alabama, certifying that such facility has been constructed according to good engineering practices and in accordance with the Pollution Abatement and/or Prevention (PAP) Plan.

2. Certification required by Part I.B.1. shall be submitted on a completed ADEM Form 432. The certification shall include the latitude and longitude of the constructed and certified outfall.

3. Discharge monitoring and Discharge Monitoring Report (DMR) reporting requirements described in Part I.C. of this Permit do not apply to point sources that have not been constructed and certified.

4. Upon submittal of the certification required by Part I.B.1. to the Department, all monitoring and DMR submittal requirements shall apply to the constructed and certified outfall.

C. DISCHARGE MONITORING AND RECORD KEEPING REQUIREMENTS

1. Sampling Schedule and Frequency

a. The Permittee shall collect at least one grab sample of the discharge to surface waters from each constructed and certified point source identified on Page 1 of this Permit and described more fully in the Permittee's application twice per month at a rate of at least every other week if a discharge occurs at any time during the two week period, but need

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[1] See Part I.C.2. for further measurement frequency requirements.

[2] Flow must be determined at the time of sample collection by direct measurement, calculation, or other method acceptable to the Department.

not collect more than two samples per calendar month. Each sample collected shall be analyzed for each parameter specified in Part I.A. of this Permit.

b. If the final effluent is pumped in order to discharge (e.g. from incised ponds, old highwall cuts, old pit areas or depressions, etc.), the Permittee shall collect at least one grab sample of the discharge from each point source identified on Page 1 of this Permit and described more fully in the Permittee's application each quarterly (three month) monitoring period if a discharge occurs at any time during the quarterly monitoring period which results from direct pumped drainage. Each sample collected shall be analyzed for each parameter specified in Part I.A. of this Permit.

c. The Permittee may increase the frequency of sampling listed in Parts I.C.1.a and I.C.1.b; however, all sampling results must be reported to the Department and included in any calculated results submitted to the Department in accordance with this Permit.

2. Measurement Frequency

Measurement frequency requirements found in Part I.A. shall mean:

a. A measurement frequency of one day per week shall mean sample collection on any day of discharge which occurs every calendar week.

b. A measurement frequency of two days per month shall mean sample collection on any day of discharge which occurs every other week, but need not exceed two sample days per month.

c. A measurement frequency of one day per month shall mean sample collection on any day of discharge which occurs during each calendar month.

d. A measurement frequency of one day per quarter shall mean sample collection on any day of discharge which occurs during each calendar quarter.

e. A measurement frequency of one day per six months shall mean sample collection on any day of discharge which occurs during the period of January through June and during the period of July through December.

f. A measurement frequency of one day per year shall mean sample collection on any day of discharge which occurs during each calendar year.

3. Monitoring Schedule

The Permittee shall conduct the monitoring required by Part I.A. in accordance with the following schedule:

a. MONITORING REQUIRED MORE FREQUENTLY THAN MONTHLY AND MONTHLY shall be conducted during the first full month following the effective date of coverage under this Permit and every month thereafter. More frequently than monthly and monthly monitoring may be done anytime during the month, unless restricted elsewhere in this Permit, but the results should be reported on the last Discharge Monitoring Report (DMR) due for the quarter (i.e., with the March, June, September, and December DMRs).

b. QUARTERLY MONITORING shall be conducted at least once during each calendar quarter. Calendar quarters are the periods of January through March, April through June, July through September, and October through December. The Permittee shall conduct the quarterly monitoring during the first complete calendar quarter following the effective

date of this Permit and is then required to monitor once during each quarter thereafter. Quarterly monitoring may be done anytime during the quarter, unless restricted elsewhere in this Permit, but the results should be reported on the last DMR due for the quarter (i.e., with the March, June, September, and December DMRs).

c. SEMIANNUAL MONITORING shall be conducted at least once during the period of January through June and at least once during the period of July through December. The Permittee shall conduct the semiannual monitoring during the first complete semiannual calendar period following the effective date of this Permit and is then required to monitor once during each semiannual period thereafter. Semiannual monitoring may be done anytime during the semiannual period, unless restricted elsewhere in this Permit, but it should be reported on the last DMR due for the month of the semiannual period (i.e., with the June and December DMRs).

d. ANNUAL MONITORING shall be conducted at least once during the period of January through December. The Permittee shall conduct the annual monitoring during the first complete calendar annual period following the effective date of this Permit and is then required to monitor once during each annual period thereafter. Annual monitoring may be done anytime during the year, unless restricted elsewhere in this Permit, but it should be reported on the December DMR.

4. Sampling Location

Unless restricted elsewhere in this Permit, samples collected to comply with the monitoring requirements specified in Part I.A. shall be collected at the nearest accessible location just prior to discharge and after final treatment, or at an alternate location approved in writing by the Department.

5. Representative Sampling

Sample collection and measurement actions taken as required herein shall be representative of the volume and nature of the monitored discharge and shall be in accordance with the provisions of this Permit.

6. Test Procedures

For the purpose of reporting and compliance, Permittees shall use one of the following procedures:

a. For parameters with an EPA established Minimum Level (ML), report the measured value if the analytical result is at or above the ML and report "0" for values below the ML. Test procedures for the analysis of pollutants shall conform to 40 CFR Part 136, guidelines published pursuant to Section 304(h) of the FWPCA, 33 U.S.C. Section 1314(h), and ADEM Standard Operating Procedures. If more than one method for analysis of a substance is approved for use, a method having a minimum level lower than the permit limit shall be used. If the minimum level of all methods is higher than the permit limit, the method having the lowest minimum level shall be used and a report of less than the minimum level shall be reported as zero and will constitute compliance, however should EPA approve a method with a lower minimum level during the term of this Permit the Permittee shall use the newly approved method.

b. For pollutant parameters without an established ML, an interim ML may be utilized. The interim ML shall be calculated as 3.18 times the Method Detection Level (MDL) calculated pursuant to 40 CFR Part 136, Appendix B.

Permittees may develop an effluent matrix-specific ML, where an effluent matrix prevents attainment of the established ML. However, a matrix specific ML shall be based

upon proper laboratory method and technique. Matrix-specific MLs must be approved by the Department, and may be developed by the Permittee during permit issuance, reissuance, modification, or during compliance schedule.

In either case the measured value should be reported if the analytical result is at or above the ML and "0" reported for values below the ML.

c. For parameters without an EPA established ML, interim ML, or matrix-specific ML, a report of less than the detection limit shall constitute compliance if the detection limit of all analytical methods is higher than the permit limit using the most sensitive EPA approved method. For the purpose of calculating a monthly average, "0" shall be used for values reported less than the detection limit.

The Minimum Level utilized for procedures identified in Parts I.C.6.a. and b. shall be reported on the Permittee's DMR. When an EPA approved test procedure for analysis of a pollutant does not exist, the Director shall approve the procedure to be used.

7. Recording of Results

For each measurement or sample taken pursuant to the requirements of this Permit, the Permittee shall record the following information:

a. The facility name and location, point source number, date, time, and exact place of sampling or measurements;

b. The name(s) of person(s) who obtained the samples or measurements;

c. The dates and times the analyses were performed;

d. The name(s) of the person(s) who performed the analyses;

e. The analytical techniques or methods used including source of method and method number; and

f. The results of all required analyses.

8. Routine Inspection by Permittee

a. The Permittee shall inspect all point sources identified on Page 1 of this Permit and described more fully in the Permittee's application and all treatment or control facilities or systems used by the Permittee to achieve compliance with the terms and conditions of this Permit at least as often as the applicable sampling frequency specified in Part I.C.1 of this Permit.

b. If required by the Director, the Permittee shall maintain a written log for each point source identified on Page 1 of this Permit and described more fully in the Permittee's application in which the Permittee shall record the following information:

(1) The date and time the point source and any associated treatment or control facilities or systems were inspected by the Permittee;

(2) Whether there was a discharge from the point source at the time of inspection by the Permittee;

(3) Whether a sample of the discharge from the point source was collected at the time of inspection by the Permittee;

(4) Whether all associated treatment or control facilities or systems appeared to be in good working order and operating as efficiently as possible, and if not, a description of the problems or deficiencies; and

(5) The name and signature of the person performing the inspection of the point source and associated treatment or control facilities or systems.

9. Records Retention and Production

a. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this Permit, and records of all data used to complete the above reports or the application for this Permit, for a period of at least three (3) years from the date of the sample collection, measurement, report, or application. This period may be extended by request of the Director at any time. If litigation or other enforcement action, under the AWPCA, AEMA, and/or the FWPCA, is ongoing which involves any of the above records, the records shall be kept until the litigation is resolved. Upon the written request of the Director, the Permittee shall provide the Director with a copy of any record required to be retained by this paragraph. Copies of these records should not be submitted unless requested.

b. All records required to be kept for a period of three (3) years shall be kept at the permitted facility or an alternate location approved by the Department in writing and shall be available for inspection.

10. Monitoring Equipment and Instrumentation

All equipment and instrumentation used to determine compliance with the requirements of this Permit shall be installed, maintained, and calibrated in accordance with the manufacturer's instructions or, in the absence of manufacturer's instructions, in accordance with accepted practices. The Permittee shall develop and maintain quality assurance procedures to ensure proper operation and maintenance of all equipment and instrumentation. The quality assurance procedures shall include the proper use, maintenance, and installation, when appropriate, of monitoring equipment at the plant site.

D. DISCHARGE REPORTING REQUIREMENTS

1. Requirements for Reporting of Monitoring

a. Monitoring results obtained during the previous three (3) months shall be summarized for each month on a Discharge Monitoring Report (DMR) Form approved by the Department, and submitted to the Department so that it is received by the Director no later than the 28th day of the month following the quarterly reporting period (i.e., on the 28th day of January, April, July, and October of each year).

b. The Department utilizes a web-based electronic environmental (E2) reporting system for submittal of DMRs. **Except as allowed by Part I.D.1.c. or d., the Permittee shall submit all DMRs required by Part I.D.1.a. by utilizing the E2 reporting system.** The E2 reporting system Permittee Participation Package may be downloaded online at https://e2.adem.alabama.gov/npdes.

c. If the electronic environmental (E2) reporting system is down (i.e. electronic submittal of DMR data is unable to be completed due to technical problems originating with the Department's system; this could include entry/submittal issues with an entire set of DMRs or individual parameters), permittees are not relieved of their obligation to submit DMR data to the Department by the required submittal date. However, if the E2 system is down on the 28th day of the month or is down for an extended period of time as determined by the Department when a DMR is required to be submitted, the facility may submit the data in an alternate manner and format acceptable to the Department. Preapproved alternate acceptable methods include faxing, e-mailing, mailing, or hand-delivery of data such that they are received by the required reporting date. Within five calendar days of the E2 system resuming operation, the Permittee shall enter the data into the E2 reporting system unless an alternate timeframe is approved by the Department. An attachment should be included with the E2 DMR submittal verifying the original submittal date (date of the fax, copy of dated e-mail, or hand-delivery stamped date).

d. The permittee may submit a request to the Department for a temporary electronic reporting waiver for DMR submittals. The waiver request should include the permit number; permittee name; facility/site name; facility address; name, address, and contact information for the responsible official or duly authorized representative; a detailed statement regarding the basis for requesting such a waiver; and the duration for which the waiver is requested. Approved electronic reporting waivers are not transferrable. Permittees with an approved electronic reporting waiver for DMRs may submit hard copy DMRs for the period that the approved electronic reporting waiver request is effective. The Permittee shall submit the Department-approved DMR forms to the address listed in Part I.D.1.j.

e. If the Permittee, using approved analytical methods as specified in Part I.C.6., monitors any discharge from a point source identified on Page 1 of this Permit and describe more fully in the Permittee's application more frequently than required by this Permit; the results of such monitoring shall be included in the calculation and reporting of values on the DMR Form, and the increased frequency shall be indicated on the DMR Form.

f. In the event no discharge from a point source identified on Page 1 of this Permit and described more fully in the Permittee's application occurs during a monitoring period, the Permittee shall report "No Discharge" for such period on the appropriate DMR Form.

g. The Permittee shall report "No Discharge During Quarterly Monitoring Period" on the appropriate DMR Form for each point source receiving pumped discharges pursuant to Part I.C.1.b. provided that no discharge has occurred at <u>any</u> time during the entire quarterly (three month) monitoring period.

h. Each DMR Form submitted by the Permittee to the Department in accordance with Part I.D.1. must be legible and bear an original signature or electronic signature. Photo and electronic copies of the signature are not acceptable and shall not satisfy the reporting requirements of this Permit.

i. All reports and forms required to be submitted by this Permit, the AWPCA, and the Department's rules and regulations, shall be signed by a "responsible official" of the Permittee as defined in ADEM Admin. Code r. 335-6-6-.09 or a "duly authorized representative" of such official as defined in ADEM Admin. Code r. 335-6-6-.09 and shall bear the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who

manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

j. All DMRs, reports, and forms required to be submitted by this Permit, the AWPCA and the Department's rules and regulations, shall be addressed to:

Alabama Department of Environmental Management
Water Division, Mining and Natural Resource Section
Post Office Box 301463
Montgomery, Alabama 36130-1463

Certified and Registered Mail shall be addressed to:

Alabama Department of Environmental Management
Water Division, Mining and Natural Resource Section
1400 Coliseum Boulevard
Montgomery, Alabama 36110-2059

k. Unless authorized in writing by the Department, approved reporting forms required by this Permit or the Department are not to be altered, and if copied or reproduced, must be consistent in format and identical in content to the ADEM approved form. Unauthorized alteration, falsification, or use of incorrectly reproduced forms constitutes noncompliance with the requirements of this Permit and may significantly delay processing of any request, result in denial of the request, result in permit termination, revocation, suspension, modification, or denial of a permit renewal application, or result in other enforcement action.

l. If this Permit is a reissuance, then the Permittee shall continue to submit DMRs in accordance with the requirements of their previous permit until such time as DMRs are due as discussed in Part I.D.1.

2. Noncompliance Notification

a. The Permittee must notify the Department if, for any reason, the Permittee's discharge:

(1) Potentially threatens human health or welfare;

(2) Potentially threatens fish or aquatic life;

(3) Causes an in-stream water quality criterion to be exceeded;

(4) Does not comply with an applicable toxic pollutant effluent standard or prohibition established under Section 307(a) of the FWPCA, 33 U.S.C. §1317(a);

(5) Contains a quantity of a hazardous substance which has been determined may be harmful to the public health or welfare under Section 311(b)(4) of the FWPCA, 33 U.S.C. §1321(b)(4); or

(6) Exceeds any discharge limitation for an effluent parameter as a result of an unanticipated bypass or upset.

The Permittee shall orally or electronically report any of the above occurrences, describing the circumstances and potential effects of such discharge to the Director within 24-hours after the Permittee becomes aware of the occurrence of such discharge. In addition to the oral or electronic report, the Permittee shall submit to the Director a written report as provided in Part I.D.2.c., no later than five (5) days after becoming aware of the occurrence of such discharge.

b. If for any reason, the Permittee's discharge does not comply with any limitation of this Permit, the Permittee shall submit a written report to the Director as provided in Part I.D.2.c. This report must be submitted with the next Discharge Monitoring Report required to be submitted by Part I.D.1. of this Permit after becoming aware of the occurrence of such noncompliance.

c. Form 401 or 421 must be submitted to the Director in accordance with Parts I.D.2.a. and b. The completed form must document the following information:

(1) A description of the discharge and cause of noncompliance;

(2) The period of noncompliance, including exact dates, times, and duration of the noncompliance. If not corrected by the due date of the written report, then the Permittee is to state the anticipated timeframe that is expected to transpire before the noncompliance is resolved; and

(3) A description of the steps taken and/or being taken to reduce or eliminate the noncomplying discharge and to prevent its recurrence.

3. Reduction, Suspension, or Termination of Monitoring and/or Reporting

a. The Director may, with respect to any point source identified on Page 1 of this Permit and described more fully in the Permittee's application, authorize the Permittee to reduce, suspend, or terminate the monitoring and/or reporting required by this Permit upon the submission of a written request for such reduction, suspension, or termination by the Permittee provided:

(1) All mining, processing, or disturbance in the drainage basin(s) associated with the discharge has ceased and site access is adequately restricted or controlled to preclude unpermitted and unauthorized mining, processing, transportation, or associated operations/activity;

(2) Permanent, perennial vegetation has been re-established on all areas mined or disturbed for at least one year since mining has ceased in the drainage basin(s) associated with the surface discharge, or all areas have been permanently graded such that all drainage is directed back into the mined pit to preclude all surface discharges;

(3) Unless waived in writing by the Department, the Permittee has been granted, in writing, a 100% Bond Release, if applicable, by the Alabama Department of Industrial Relations and, if applicable, by the Surface Mining Commission for all areas mined or disturbed in the drainage basin(s) associated with the discharge;

(4) Unless waived in writing by the Department, the Permittee has submitted inspection reports prepared and certified by a Professional Engineer (PE) registered in the State of Alabama or a qualified professional under the PE's direction which certify that the facility has been fully reclaimed or that water quality remediation has been achieved. The first inspection must be conducted

approximately one year prior to and the second inspection must be conducted within thirty days of the Permittee's request for termination of monitoring and reporting requirements;

(5) All surface effects of the mining activity such as fuel or chemical tanks, preparation plants or equipment, old tools or equipment, junk or debris, etc., must be removed and disposed of according to applicable state and federal regulations;

(6) The Permittee's request for termination of monitoring and reporting requirements contained in this Permit has been supported by monitoring data covering a period of at least six consecutive months or such longer period as is necessary to assure that the data reflect discharges occurring during varying seasonal climatological conditions;

(7) The Permittee has stated in its request that the samples collected and reported in the monitoring data submitted in support of the Permittee's request for monitoring termination or suspension are representative of the discharge and were collected in accordance with all Permit terms and conditions respecting sampling times (e.g., rainfall events) and methods and were analyzed in accordance with all Permit terms and conditions respecting analytical methods and procedures;

(8) The Permittee has certified that during the entire period covered by the monitoring data submitted, no chemical treatment of the discharge was provided;

(9) The Permittee's request has included the certification required by Part I.D.1.e. of this Permit; and

(10) The Permittee has certified to the Director in writing as part of the request, its compliance with (1) through (9) above.

b. It remains the responsibility of the Permittee to comply with the monitoring and reporting requirements of this Permit until written authorization to reduce, suspend, or terminate such monitoring and/or reporting is received by the Permittee from the Director.

E. OTHER REPORTING AND NOTIFICATION REQUIREMENTS

1. Anticipated Noncompliance

The Permittee shall give the Director written advance notice of any planned changes or other circumstances regarding a facility which may result in noncompliance with permit requirements.

2. Termination of Discharge

The Permittee shall notify the Director, in writing, when all discharges from any point source(s) identified on Page 1 of this Permit and described more fully in the Permittee's application have permanently ceased.

3. Updating Information

a. The Permittee shall inform the Director of any change in the Permittee's mailing address or telephone number or in the Permittee's designation of a facility contact or officer(s) having the authority and responsibility to prevent and abate violations of the AWPCA,

the AEMA, the Department's rules and regulations, and the terms and conditions of this Permit, in writing, no later than ten (10) days after such change. Upon request of the Director, the Permittee shall furnish the Director with an update of any information provided in the permit application.

b. If the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information with a written explanation for the mistake and/or omission.

4. Duty to Provide Information

a. The Permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, suspending, terminating, or revoking and reissuing this Permit, in whole or in part, or to determine compliance with this Permit. The Permittee shall also furnish to the Director upon request, copies of records required to be maintained by this Permit.

b. The Permittee shall furnish to the Director upon request, within a reasonable time, available information (name, phone number, address, and site location) which identifies offsite sources of material or natural resources (mineral, ore, or other material such as iron, coal, coke, dirt, chert, shale, clay, sand, gravel, bauxite, rock, stone, etc.) used in its operation or stored at the facility.

F. SCHEDULE OF COMPLIANCE

The Permittee shall achieve compliance with the discharge limitations specified in Part I.A. of this Permit in accordance with the following schedule:

Compliance must be achieved by the effective date of this Permit.

PART II OTHER REQUIREMENTS, RESPONSIBILITIES, AND DUTIES

A. OPERATIONAL AND MANAGEMENT REQUIREMENTS

1. Facilities Operation and Management

The Permittee shall at all times operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this Permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities only when necessary to achieve compliance with the conditions of this Permit.

2. Pollution Abatement and/or Prevention Plan

The Pollution Abatement and/or Prevention (PAP) Plan shall be prepared and certified by a registered Professional Engineer (PE), licensed to practice in the State of Alabama, and shall include at a minimum, the information indicated in ADEM Admin. Code r. 335-6-9-.03 and ADEM Admin. Code ch. 335-6-9 Appendices A and B. The PAP Plan shall become a part of this Permit and all requirements of the PAP Plan shall become requirements of this Permit pursuant to ADEM Admin. Code r. 335-6-9-.05(2).

3. Best Management Practices (BMPs)

a. Unless otherwise authorized in writing by the Director, the Permittee shall provide a means of subsurface withdrawal for any discharge from each point source identified on Page 1 of this Permit and described more fully in the Permittee's application. Notwithstanding the above provision, a means of subsurface withdrawal need not be provided for any discharge caused by a 24-hour precipitation event greater than a 10-year, 24-hour precipitation event.

b. Dilution water shall not be added to achieve compliance with discharge limitations except when the Director has granted prior written authorization for dilution to meet water quality requirements.

c. The Permittee shall minimize the contact of water with overburden, including but not limited to stabilizing disturbed areas through grading, diverting runoff, achieving quick growing stands of temporary vegetation, sealing acid-forming and toxic-forming materials, and maximizing placement of waste materials in back-fill areas.

d. The Permittee shall prepare, submit to the Department for approval, and implement a Best Management Practices (BMPs) Plan for containment of any or all process liquids or solids, in a manner such that these materials do not present a potential for discharge, if so required by the Director. When submitted and approved, the BMP Plan shall become a part of this Permit and all requirements of the BMP Plan shall become requirements of this Permit.

e. Spill Prevention, Control, and Management

The Permittee shall prepare, implement, and maintain a Spill Prevention, Control and Countermeasures (SPCC) Plan acceptable to the Department that is prepared and certified by a Professional Engineer (PE), registered in the State of Alabama, for all onsite petroleum product or other pollutant storage tanks or containers as required by applicable state (ADEM Admin. Code r. 335-6-6-.12(r)) and federal (40 C.F.R. §§112.1-.7)

regulations. The Permittee shall implement appropriate structural and/or non-structural spill prevention, control, and/or management sufficient to prevent any spills of pollutants from entering a ground or surface water of the State or a publicly or privately owned treatment works. Careful consideration should be applied for tanks or containers located near treatment ponds, water bodies, or high traffic areas. In most situations this would require construction of a containment system if the cumulative storage capacity of petroleum products or other pollutants at the facility is greater than 1320 gallons. Any containment system used to implement this requirement shall be constructed of materials compatible with the substance(s) contained and shall prevent the contamination of groundwater. Such containment systems shall be capable of retaining a volume equal to 110 percent of the capacity of the largest tank for which containment is provided. The applicant shall maintain onsite or have readily available flotation booms to contain, and sufficient material to absorb, fuel and chemical spills and leaks. Soil contaminated by chemical spills, oil spills, etc., must be immediately cleaned up or be removed and disposed of in an approved manner.

f. All surface drainage and storm water runoff which originate within or enters the Permittee's premises and which contains any pollutants or other wastes shall be discharged, if at all, from a point source identified on Page 1 of this Permit and described more fully in the Permittee's application.

g. The Permittee shall take all reasonable precautions to prevent any surface drainage or storm water runoff which originates outside the Permittee's premises and which contains any pollutants or other wastes from entering the Permittee's premises. At no time shall the Permittee discharge any such surface drainage or storm water runoff which enters the Permittee's premises if, either alone or in combination with the Permittee's effluent, the discharge would exceed any applicable discharge limitation specified in Part I.A. of this Permit.

4. Biocide Additives

a. The Permittee shall notify the Director in writing not later than sixty (60) days prior to instituting the use of any biocide corrosion inhibitor or chemical additive in any cooling or boiler system(s) regulated by this Permit. Notification is not required for additives that should not reasonably be expected to cause the cooling water or boiler water to exhibit toxicity as determined by analysis of manufacturer's data or testing by the Permittee. Such notification shall include:

(a) Name and general composition of biocide or chemical;

(b) 96-hour median tolerance limit data for organisms representative of the biota of the water(s) which the discharge(s) enter(s);

(c) Quantities to be used;

(d) Frequencies of use;

(e) Proposed discharge concentrations; and

(f) EPA registration number, if applicable.

b. The use of any biocide or chemical additive containing tributyl tin, tributyl tin oxide, zinc, chromium, or related compounds in any cooling or boiler system(s) regulated by the Permit is prohibited except as exempted below. The use of a biocide or additive containing zinc, chromium or related compounds may be used in special circumstances if (1) the permit contains limits for these substances, or (2) the applicant demonstrates

during the application process that the use of zinc, chromium or related compounds as a biocide or additive will not pose a reasonable potential to violate the applicable State water quality standards for these substances. The use of any additive, not identified in this Permit or in the application for this Permit or not exempted from notification under this Permit is prohibited, prior to a determination by the Department that permit modification to control discharge of the additive is not required or prior to issuance of a permit modification controlling discharge of the additive.

5. Facility Identification

The Permittee shall clearly display prior to commencement of any regulated activity and until permit coverage is properly terminated, the name of the Permittee, entire NPDES permit number, facility or site name, and other descriptive information deemed appropriate by the Permittee at an easily accessible location(s) to adequately identify the site, unless approved otherwise in writing by the Department. The Permittee shall repair or replace the sign(s) as necessary upon becoming aware that the identification is missing or is unreadable due to age, vandalism, theft, weather, or other reason.

6. Removed Substances

Solids, sludges, filter backwash, or any other pollutants or other wastes removed in the course of treatment or control of wastewaters shall be disposed of in a manner that complies with all applicable Department rules and regulations.

7. Loss or Failure of Treatment Facilities

Upon the loss or failure of any treatment facility, including but not limited to the loss or failure of the primary source of power of the treatment facility, the Permittee shall, where necessary to maintain compliance with the discharge limitations specified in Part I.A. of this Permit or any other terms or conditions of this Permit, cease, reduce, or otherwise control production and/or discharges until treatment is restored.

8. Duty to Mitigate

The Permittee shall promptly take all reasonable steps to minimize or prevent any violation of this Permit or to mitigate and minimize any adverse impact to waters resulting from noncompliance with any discharge limitation specified in Part I.A. of this Permit, including such accelerated or additional monitoring of the discharge and/or the receiving waterbody as is necessary to determine the nature and impact of the noncomplying discharge.

B. BYPASS AND UPSET

1. Bypass

a. Any bypass is prohibited except as provided in Parts II.B.1.b. and c..

b. A bypass is not prohibited if:

(1) It does not cause any applicable discharge limitation specified in Part I.A. of this Permit to be exceeded;

(2) The discharge resulting from such bypass enters the same receiving water as the discharge from the permitted outfall;

(3) It is necessary for essential maintenance of a treatment or control facility or system to assure efficient operation of such facility or system; and

(4) The Permittee monitors the discharge resulting from such bypass at a frequency, at least daily, sufficient to prove compliance with the discharge limitations specified in Part I.A. of this Permit.

c. A bypass is not prohibited and need not meet the discharge limitations specified in Part I.A. of this Permit if:

(1) It is unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There are no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if the Permittee could have installed adequate backup equipment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(3) The Permittee submits a written request for authorization to bypass to the Director at least ten (10) days, if possible, prior to the anticipated bypass or within 24 hours of an unanticipated bypass, the Permittee is granted such authorization, and Permittee complies with any conditions imposed by the Director to minimize any adverse impact to waters resulting from the bypass.

d. The Permittee has the burden of establishing that each of the conditions of Parts II.B.1.b. or c. have been met to qualify for an exception to the general prohibition against bypassing contained in Part II.B.1.a. and an exemption, where applicable, from the discharge limitations specified in Part I.A. of this Permit.

2. Upset

a. Except as provided in Parts II.B.2.b. and c., a discharge which results from an upset need not meet the applicable discharge limitations specified in Part I.A. of this Permit if:

(1) No later than 24-hours after becoming aware of the occurrence of the upset, the Permittee orally reports the occurrence and circumstances of the upset to the Director; and

(2) No later than five (5) days after becoming aware of the occurrence of the upset, the Permittee furnishes the Director with evidence, including properly signed, contemporaneous operating logs, design drawings, construction certification, maintenance records, weir flow measurements, dated photographs, rain gauge measurements, or other relevant evidence, demonstrating that:

(i) An upset occurred;

(ii) The Permittee can identify the specific cause(s) of the upset;

(iii) The Permittee's treatment facility was being properly operated at the time of the upset; and

(iv) The Permittee promptly took all reasonable steps to minimize any adverse impact to waters resulting from the upset.

b. Notwithstanding the provisions of Part II.B.2.a., a discharge which is an overflow from a treatment facility or system, or an excess discharge from a point source associated with a treatment facility or system and which results from a 24-hour precipitation event larger than a 10-year, 24-hour precipitation event is not exempted from the discharge limitations specified in Part I.A. of this Permit unless:

(1) The treatment facility or system is designed, constructed, and maintained to contain the maximum volume of wastewater which would be generated by the facility during a 24-hour period without an increase in volume from precipitation and the maximum volume of wastewater resulting from a 10-year, 24-hour precipitation event or to treat the maximum flow associated with these volumes.

In computing the maximum volume of wastewater which would result from a 10-year, 24-hour precipitation event, the volume which would result from all areas contributing runoff to the individual treatment facility must be included (i.e., all runoff that is not diverted from the mining area and runoff which is not diverted from the preparation plant area); and

(2) The Permittee takes all reasonable steps to maintain treatment of the wastewater and minimize the amount of overflow or excess discharge.

c. The Permittee has the burden of establishing that each of the conditions of Parts II.B.2.a. and b. have been met to qualify for an exemption from the discharge limitations specified in Part I.A. of this Permit.

C. PERMIT CONDITIONS AND RESTRICTIONS

1. Prohibition against Discharge from Facilities Not Certified

a. Notwithstanding any other provisions of this Permit, if the permitted facility has not obtained or is not required to obtain a permit from the Alabama Surface Mining Commission, any discharge(s) from any point or nonpoint source(s) from the permitted facility which was not certified to the Department on a form approved by the Department by a professional engineer, registered in the State of Alabama, as being designed, constructed, and in accordance with plans and specifications reviewed by the Department is prohibited; or

b. Notwithstanding any other provisions of this Permit, if the permitted facility has obtained or is required to obtain a permit from the Alabama Surface Mining Commission, any discharge(s) from any point or nonpoint source(s) from the permitted facility which is associated with a treatment facility which was not constructed and certified to the Alabama Surface Mining Commission pursuant to applicable provisions of said Commission's regulations, is prohibited until the Permittee submits to the Alabama Surface Mining Commission, certification by a professional engineer, registered in the State of Alabama, certifying that such facility has been constructed in accordance with plans and specifications approved by the Alabama Surface Mining Commission. This requirement shall not apply to pumped discharges from the underground works of underground coal mines where no surface structure is required by the Alabama Surface Mining Commission, provided the Department is notified in writing of the completion or installation of such facilities, and the pumped discharges will meet permit effluent limits without treatment.

2. Permit Modification, Suspension, Termination, and Revocation

a. This Permit may be modified, suspended, terminated, or revoked and reissued, in whole or in part, during its term for cause, including but not limited to, the following:

(1) The violation of any term or condition of this Permit;

(2) The obtaining of this Permit by misrepresentation or the failure to disclose fully all relevant facts;

(3) The submission of materially false or inaccurate statements or information in the permit application or reports required by the Permit;

(4) The need for a change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge;

(5) The existence of any typographical or clerical errors or of any errors in the calculation of discharge limitations;

(6) The existence of material and substantial alterations or additions to the facility or activity generating wastewater which occurred after permit issuance which justify the application of permit conditions that are different or absent in the existing permit;

(7) The threat of the Permittee's discharge on human health or welfare; or

(8) Any other cause allowed by ADEM Admin. Code ch. 335-6-6.

b. The filing of a request by the Permittee for modification, suspension, termination, or revocation and reissuance of this Permit, in whole or in part, does not stay any Permit term or condition of this Permit.

3. Automatic Expiration of Permits for New or Increased Discharges

a. Except as provided by ADEM Admin. Code r. 335-6-6-.02(g) and 335-6-6-.05, if this Permit was issued for a new discharger or new source, it shall expire eighteen months after the issuance date if construction has not begun during that eighteen month period.

b. Except as provided by ADEM Admin. Code r. 335-6-6-.02(g) and 335-6-6-.05, if any portion of this Permit was issued or modified to authorize the discharge of increased quantities of pollutants to accommodate the modification of an existing facility, that portion of this Permit shall expire eighteen months after this Permit's issuance if construction of the modification has not begun within eighteen month period.

c. Construction has begun when the owner or operator has:

(1) Begun, or caused to begin as part of a continuous on-site construction program:

(i) Any placement, assembly, or installation of facilities or equipment; or

(ii) Significant site preparation work including clearing, excavation, or removal of existing buildings, structures, or facilities which is necessary for the placement, assembly, or installation of new source facilities or equipment; or

(2) Entered into a binding contractual obligation for the purpose of placement, assembly, or installation of facilities or equipment which are intended to be used in its operation within a reasonable time. Options to purchase or contracts which can be terminated or modified without substantial loss, and contracts for feasibility, engineering, and design studies do not constitute a contractual obligation under the paragraph. The entering into a lease with the State of Alabama for exploration and production of hydrocarbons shall also be considered beginning construction.

d. The automatic expiration of this Permit for new or increased discharges if construction has not begun within the eighteen month period after the issuance of this Permit may be tolled by administrative or judicial stay.

4. Transfer of Permit

This Permit may not be transferred or the name of the Permittee changed without notice to the Director and subsequent modification or revocation and reissuance of this Permit to identify the new Permittee and to incorporate any other changes as may be required under the FWPCA or AWPCA. In the case of a change in name, ownership, or control of the Permittee's premises only, a request for permit modification in a format acceptable to the Director is required at least 30 days prior to the change. In the case of a change in name, ownership, or control of the Permittee's premises accompanied by a change or proposed change in effluent characteristics, a complete permit application is required to be submitted to the Director at least 180 days prior to the change. Whenever the Director is notified of a change in name, ownership, or control, he may decide not to modify the existing Permit and require the submission of a new permit application.

5. Groundwater

Unless authorized on page 1 of this Permit, this Permit does not authorize any discharge to groundwater. Should a threat of groundwater contamination occur, the Director may require groundwater monitoring to properly assess the degree of the problem, and the Director may require that the Permittee undertake measures to abate any such discharge and/or contamination.

6. Property and Other Rights

This Permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to persons or property or invasion of other private rights, trespass, or any infringement of Federal, State, or local laws or regulations, nor does it authorize or approve the construction of any physical structures or facilities or the undertaking of any work in any waters of the State or of the United States.

D. RESPONSIBILITIES

1. Duty to Comply

a. The Permittee must comply with all terms and conditions of this Permit. Any permit noncompliance constitutes a violation of the AWPCA, AEMA, and the FWPCA and is grounds for enforcement action, for permit termination, revocation and reissuance, suspension, modification, or denial of a permit renewal application.

b. The Permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the FWPCA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if this Permit has not yet been modified to incorporate the effluent standard, prohibition or requirement.

c. For any violation(s) of this Permit, the Permittee is subject to a civil penalty as authorized by the AWPCA, the AEMA, the FWPCA, and Code of Alabama 1975, §§22-22A-1 et. seq., as amended, and/or a criminal penalty as authorized by Code of Alabama 1975, §22-22-1 et. seq., as amended.

d. The necessity to halt or reduce production or other activities in order to maintain compliance with the conditions of this Permit shall not be a defense for a Permittee in an enforcement action.

e. Nothing in this Permit shall be construed to preclude or negate the Permittee's responsibility or liability to apply for, obtain, or comply with other ADEM, federal, state, or local government permits, certifications, licenses, or other approvals.

f. The discharge of a pollutant from a source not specifically identified in the permit application for this Permit and not specifically included in the description of an outfall in this Permit is not authorized and shall constitute noncompliance with this Permit.

g. The Permittee shall take all reasonable steps, including cessation of production or other activities, to minimize or prevent any violation of this Permit or to minimize or prevent any adverse impact of any permit violation.

2. Change in Discharge

a. The Permittee shall apply for a permit modification at least 180 days in advance of any facility expansion, production increase, process change, or other action that could result in the discharge of additional pollutants, increase the quantity of a discharged pollutant, or that could result in an additional discharge point. This requirement also applies to pollutants that are not subject to discharge limitations in this Permit. No new or increased discharge may begin until the Director has authorized it by issuance of a permit modification or a reissued permit.

b. The Permittee shall notify the Director as soon as it knows or has reason to believe that it has begun or expects to begin to discharge any pollutant listed as a toxic pollutant pursuant to Section 307(a) of the FWPCA, 33 U.S.C. §1317(a), any substance designated as a hazardous substance pursuant to Section 311(b)(2) of the FWPCA, 33 U.S.C. §1321(b)(2), any waste listed as a hazardous waste pursuant to Code of Alabama 1975, §22-30-10, or any other pollutants or other wastes which is not subject to any discharge limitations specified in Part I.A. of this Permit and was not reported in the Permittee's application, was reported in the Permittee's application in concentrations or mass rates lower than that which the Permittee expects to begin to be discharged, or has reason to believe has begun to be discharged.

3. Compliance with Toxic or Other Pollutant Effluent Standard or Prohibition

If any applicable effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Sections 301(b)(2)(C),(D),(E) and (F) of the FWPCA, 33 U.S.C. §1311(b)(2)(C),(D),(E), and (F); 304(b)(2) of the FWPCA, 33 U.S.C. §1314(b)(2); or 307(a) of the FWPCA, 33 U.S.C. §1317(a), for a toxic or other pollutant discharged by the Permittee, and such standard or prohibition is more stringent than any discharge limitation on the pollutant specified in Part I.A. of this Permit or controls a pollutant not limited in Part I.A. of this Permit, this Permit shall be modified to conform to the toxic or other pollutant effluent standard or prohibition and the Permittee shall be notified of such modification. If this Permit has not been modified to conform to the toxic or other pollutant effluent standard or prohibition before the effective date of such standard or prohibition, the authorization to discharge in this Permit shall be void to the extent that any discharge limitation on such pollutant in Part I.A.

of this Permit exceeds or is inconsistent with the established toxic or other pollutant effluent standard or prohibition.

4. Compliance with Water Quality Standards and Other Provisions

a. On the basis of the Permittee's application, plans, or other available information, the Department has determined that compliance with the terms and conditions of this Permit will assure compliance with applicable water quality standards. However, this Permit does not relieve the Permittee from compliance with applicable State water quality standards established in ADEM Admin. Code ch. 335-6-10, and does not preclude the Department from taking action as appropriate to address the potential for contravention of applicable State water quality standards which could result from discharges of pollutants from the permitted facility.

b. Compliance with Permit terms and conditions notwithstanding, if the Permittee's discharge(s) from point source(s) identified on Page 1 of this Permit cause(s) or contribute(s) to a condition in contravention of State water quality standards, the Department may require abatement action to be taken by the Permittee, modify the Permit pursuant to the Department's rules and regulations, or both.

c. If the Department determines, on the basis of a notice provided pursuant to Part II.C.2. of this Permit or any investigation, inspection, or sampling, that a modification of this Permit is necessary to assure maintenance of water quality standards or compliance with other provisions of the AWPCA or FWPCA, the Department may require such modification and, in cases of emergency, the Director may prohibit the noticed act until the Permit has been modified.

5. Compliance with Statutes and Rules

a. This Permit has been issued under ADEM Admin. Code div. 335-6. All provisions of this division, that are applicable to this Permit, are hereby made a part of this Permit. A copy of this division may be obtained for a small charge from the Office of General Counsel, Alabama Department of Environmental Management, 1400 Coliseum Blvd., Montgomery, AL 36110-2059.

b. This Permit does not authorize the noncompliance with or violation of any Laws of the State of Alabama or the United States of America or any regulations or rules implementing such laws. FWPCA, 33 U.S.C. Section 1319, and Code of Alabama 1975, Section 22-22-14.

6. Right of Entry and Inspection

The Permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law to:

a. Enter upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the Permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring Permit compliance or as otherwise authorized by the AWPCA, any substances or parameters at any location.

7. **Duty to Reapply or Notify of Intent to Cease Discharge**

a. If the Permittee intends to continue to discharge beyond the expiration date of this Permit, the Permittee shall file with the Department a complete permit application for reissuance of this Permit at least 180 days prior to its expiration.

b. If the Permittee does not desire to continue the discharge(s) allowed by this Permit, the Permittee shall notify the Department at least 180 days prior to expiration of this Permit of the Permittee's intention not to request reissuance of this Permit. This notification must include the information required in Part I.D.4.a. and be signed by an individual meeting the signatory requirements for a permit application as set forth in ADEM Admin. Code r. 335-6-6-.09.

c. Failure of the Permittee to submit to the Department a complete application for reissuance of this Permit at least 180 days prior to the expiration date of this Permit will void the automatic continuation of this Permit provided by ADEM Admin. Code r. 335-6-6-.06; and should this Permit not be reissued for any reason, any discharge after the expiration of this Permit will be an unpermitted discharge.

PART III ADDITIONAL REQUIREMENTS, CONDITIONS, AND LIMITATIONS

A. CIVIL AND CRIMINAL LIABILITY

1. Tampering

Any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained or performed under this Permit shall, upon conviction, be subject to penalties and/or imprisonment as provided by the AWPCA and/or the AEMA.

2. False Statements

Any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this Permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished as provided by applicable State and Federal law.

3. Permit Enforcement

This NPDES Permit is a Permit for the purpose of the AWPCA, the AEMA, and the FWPCA, and as such all terms, conditions, or limitations of this Permit are enforceable under State and Federal law.

4. Relief From Liability

Except as provided in Part II.B.1. (Bypass) and Part II.B.2. (Upset), nothing in this Permit shall be construed to relieve the Permittee of civil or criminal liability under the AWPCA, AEMA, or FWPCA for noncompliance with any term or condition of this Permit.

B. OIL AND HAZARDOUS SUBSTANCE LIABILITY

Nothing in this Permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties to which the Permittee is or may be subject to under Section 311 of the FWPCA, 33 U.S.C. §1321.

C. AVAILABILITY OF REPORTS

Except for data determined to be confidential under Code of Alabama 1975, §22-22-9(c), all reports prepared in accordance with the terms of this Permit shall be available for public inspection at the offices of the Department. Effluent data shall not be considered confidential. Knowingly making any false statement in any such report may result in the imposition of criminal penalties as provided for in Section 309 of the FWPCA, 33 U.S.C. §1319, and Code of Alabama 1975, §22-22-14.

D. DEFINITIONS

1. Alabama Environmental Management Act (AEMA) - means Code of Alabama 1975, §§22-22A-1 et. seq., as amended.

2. Alabama Water Pollution Control Act (AWPCA) - means Code of Alabama 1975, §§22-22-1 et. seq., as amended.

3. Average monthly discharge limitation - means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar

month divided by the number of "daily discharges" measured during that month (zero discharge days shall not be included in the number of "daily discharges" measured and a less than detectable test result shall be treated as a concentration of zero if the most sensitive EPA approved method was used).

4. Arithmetic Mean - means the summation of the individual values of any set of values divided by the number of individual values.

5. BOD - means the five-day measure of the pollutant parameter biochemical oxygen demand

6. Bypass - means the intentional diversion of waste streams from any portion of a treatment facility.

7. CBOD - means the five-day measure of the pollutant parameter carbonaceous biochemical oxygen demand.

8. Construction Sand and Gravel mine - means an area, on or beneath land, used or disturbed in activity related to the extraction, removal, or recovery of sand and/or gravel from natural or artificial deposits, including active mining, reclamation, and mineral storage areas.

9. Controlled Surface Mine Drainage – means any surface mine drainage that is pumped or siphoned from the active mining area.

10. Daily discharge - means the discharge of a pollutant measured during any consecutive 24-hour period in accordance with the sample type and analytical methodology specified by the discharge permit.

11. Daily maximum - means the highest value of any individual sample result obtained during a day.

12. Daily minimum - means the lowest value of any individual sample result obtained during a day.

13. Day - means any consecutive 24-hour period.

14. Department - means the Alabama Department of Environmental Management.

15. Director - means the Director of the Department or his authorized representative or designee.

16. Discharge - means "[t]he addition, introduction, leaking, spilling or emitting of any sewage, industrial waste, pollutant or other waste into waters of the state." Code of Alabama 1975, §22-22-1(b)(8).

17. Discharge monitoring report (DMR) - means the form approved by the Director to accomplish monitoring report requirements of an NPDES Permit.

18. DO - means dissolved oxygen.

19. E. coli – means the pollutant parameter Escherichia coli.

20. 8HC - means 8-hour composite sample, including any of the following:

    a. The mixing of at least 5 equal volume samples collected at constant time intervals of not more than 2 hours over a period of not less than 8 hours between the hours of 6:00 a.m. and 6:00 p.m. If the sampling period exceeds 8 hours, sampling may be conducted beyond the 6:00 a.m. to 6:00 p.m. period.

b. A sample continuously collected at a constant rate over period of not less than 8 hours between the hours of 6:00 a.m. and 6:00 p.m. If the sampling period exceeds 8 hours, sampling may be conducted beyond the 6:00 a.m. to 6:00 p.m. period.

21. EPA - means the United States Environmental Protection Agency.

22. Federal Water Pollution Control Act (FWPCA) - means 33 U.S.C. §§1251 et. seq., as amended.

23. Flow – means the total volume of discharge in a 24-hour period.

24. Geometric Mean - means the Nth root of the product of the individual values of any set of values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered one (1).

25. Grab Sample - means a single influent or effluent portion which is not a composite sample. The sample(s) shall be collected at the period(s) most representative of the discharge.

26. Indirect Discharger - means a nondomestic discharger who discharges pollutants to a publicly owned treatment works or a privately owned treatment facility operated by another person.

27. Industrial User - means those industries identified in the Standard Industrial Classification manual, Bureau of the Budget 1967, as amended and supplemented, under the category "Division D – Manufacturing" and such other classes of significant waste producers as, by regulation, the Director deems appropriate.

28. mg/L - means milligrams per liter of discharge.

29. MGD - means million gallons per day.

30. Monthly Average - means, other than for E. coli bacteria, the arithmetic mean of all the composite or grab samples taken for the daily discharges collected in one month period. The monthly average for E. coli bacteria is the geometric mean of daily discharge samples collected in a one month period. The monthly average for flow is the arithmetic mean of all flow measurements taken in a one month period. (Zero discharges shall not be included in the calculation of monthly averages.)

31. New Discharger - means a person owning or operating any building, structure, facility or installation:

a. From which there is or may be a discharge of pollutants;

b. From which the discharge of pollutants did not commence prior to August 13, 1979, and which is not a new source; and

c. Which has never received a final effective NPDES Permit for dischargers at that site.

32. New Source - means:

a. A new source as defined for coal mines by 40 CFR Part 434.11 (1994); and

b. Any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced:

(1) After promulgation of standards of performance under Section 306 of FWPCA which are applicable to such source; or

(2) After proposal of standards of performance in accordance with Section 306 of the FWPCA which are applicable to such source, but only if the standards are promulgated in accordance with Section 206 within 120 days of their proposal.

33. NH3-N - means the pollutant parameter ammonia, measured as nitrogen.

34. 1-year, 24-hour precipitation event - means the maximum 24-hour precipitation event with a probable recurrence interval of once in one year as defined by the National Weather Service and Technical Paper No. 40, "Rainfall Frequency Atlas of the U.S.," May 1961, or equivalent regional or rainfall probability information developed therefrom.

35. Permit application - means forms and additional information that are required by ADEM Admin. Code r. 335-6-6-.08 and applicable permit fees.

36. Point Source - means "any discernible, confined and discrete conveyance, including but not limited to any pipe, channel, ditch, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft from which pollutants are or may be discharged." Section 502(14) of the FWPCA, 33 U.S.C. §1362(14).

37. Pollutant - includes for purposes of this Permit, but is not limited to, those pollutants specified in Code of Alabama 1975, §22-22-1(b)(3) and those effluent characteristics, excluding flow, specified in Part I.A. of this Permit.

38. Pollutant of Concern - means those pollutants for which a water body is listed as impaired or which contribute to the listed impairment.

39. Pollution Abatement and/or Prevention Plan (PAP Plan) – mining operations plan developed to minimize impacts on water quality to avoid a contravention of the applicable water quality standards as defined in ADEM Admin. Code r. 335-6-9-.03

40. Preparation, Dry - means a dry preparation facility within which the mineral/material is cleaned, separated, or otherwise processed without use of water or chemical additives before it is shipped to the customer or otherwise utilized. A dry preparation plant includes all ancillary operations and structures necessary to clean, separate, or otherwise process the mineral/material, such as storage areas and loading facilities. Dry preparation also includes minor water spray(s) used solely for dust suppression on equipment and roads to minimize dust emissions.

41. Preparation, Wet - means a wet preparation facility within which the mineral/material is cleaned, separated, or otherwise processed using water or chemical additives before it is shipped to the customer or otherwise utilized. A wet preparation plant includes all ancillary operations and structures necessary to clean, separate, or otherwise process the mineral/material, such as storage areas and loading facilities. Wet preparation also includes mineral extraction/processing by dredging, slurry pumping, etc.

42. Privately Owned Treatment Works - means any devices or system which is used to treat wastes from any facility whose operator is not the operator of the treatment works, and which is not a "POTW".

43. Publicly Owned Treatment Works (POTW) - means a wastewater collection and treatment facility owned by the State, municipality, regional entity composed of two or more municipalities, or another entity created by the State or local authority for the purpose of collecting and treating municipal wastewater.

44. Receiving Stream - means the "waters" receiving a "discharge" from a "point source".

45. Severe property damage - means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

46. 10-year, 24-hour precipitation event - means that amount of precipitation which occurs during the maximum 24-hour precipitation event with a probable recurrence interval of once in ten years as defined by the National Weather Service and Technical Paper No. 40, "Rainfall Frequency Atlas of the U.S.," May 1961, or equivalent regional or rainfall probability information developed therefrom.

47. TKN - means the pollutant parameter Total Kjeldahl Nitrogen.

48. TON - means the pollutant parameter Total Organic Nitrogen.

49. TRC - means Total Residual Chlorine.

50. TSS – means the pollutant parameter Total Suspended Solids

51. Treatment facility and treatment system - means all structures which contain, convey, and as necessary, chemically or physically treat mine and/or associated preparation plant drainage, which remove pollutants limited by this Permit from such drainage or wastewater. This includes all pipes, channels, ponds, tanks, and all other equipment serving such structures.

52. 24HC - means 24-hour composite sample, including any of the following:

    a. The mixing of at least 12 equal volume samples collected at constant time intervals of not more than 2 hours over a period of 24 hours;

    b. A sample collected over a consecutive 24-hour period using an automatic sampler composite to one sample. As a minimum, samples shall be collected hourly and each shall be no more than one twenty-fourth (1/24) of the total sample volume collected; or

    c. A sample collected over a consecutive 24-hour period using an automatic composite sampler composited proportional to flow.

53. 24-hour precipitation event - means that amount of precipitation which occurs within any 24-hour period.

54. 2-year, 24-hour precipitation event - means the maximum 24-hour precipitation event with a probable recurrence interval of once in two years as defined by the National Weather Service and Technical Paper No. 40, "Rainfall Frequency Atlas of the U.S.," May 1961, or equivalent regional or rainfall probability information developed therefrom.

55. Upset - means an exceptional incident in which there is an unintentional and temporary noncompliance with technology-based permit discharge limitations because of factors beyond the control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate facilities, lack of preventive maintenance, or careless or improper operation.

56. Waters - means "[a]ll waters of any river, stream, watercourse, pond, lake, coastal, ground or surface water, wholly or partially within the State, natural or artificial. This does not include waters which are entirely confined and retained completely upon the property of a single individual, partnership, or corporation unless such waters are used in interstate commerce." Code of Alabama 1975, §22-22-1(b)(2). "Waters" include all "navigable waters" as defined in §502(7) of the FWPCA, 33 U.S.C. §1362(7), which are within the State of Alabama.

57. Week - means the period beginning at twelve midnight Saturday and ending at twelve midnight the following Saturday.

58. Weekly (7-day and calendar week) Average – is the arithmetic mean of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. The calendar week is defined as beginning on Sunday and ending on Saturday. Weekly averages shall be calculated for all calendar weeks with Saturdays in the month. If a calendar week overlaps two months (i.e., the Sunday is in one month and the Saturday in the following month), the weekly average calculated for the calendar week shall be included in the data for the month that contains the Saturday.

E. SEVERABILITY

The provisions of this Permit are severable, and if any provision of this Permit or the application of any provision of this Permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this Permit, shall not be affected thereby.

F. PROHIBITIONS AND ACTIVIES NOT AUTHORIZED

1. Discharges from disposal or landfill activities as described in ADEM Admin. Code div. 335-13 are not authorized by this Permit unless specifically approved by the Department.

2. Relocation, diversion, or other alteration of a water of the State is not authorized by this Permit unless specifically approved by the Department.

3. Lime or cement manufacturing or production and discharge of process waters from such manufacturing or production is not authorized by this Permit unless specifically approved by the Department.

4. Concrete or asphalt manufacturing or production and discharge of process waters from such manufacturing or production is not authorized by this Permit unless specifically approved by the Department.

5. The discharge of wastewater, generated by any process, facility, or by any other means not under the operational control of the Permittee or not identified in the application for this Permit or not identified specifically in the description of an outfall in this Permit is not authorized by this Permit.

G. DISCHARGES TO IMPAIRED WATERS

1. This Permit does not authorize new sources or new discharges of pollutants of concern to impaired waters unless consistent with an EPA-approved or EPA-established Total Maximum Daily Load (TMDL) and applicable State law, or unless compliance with the limitations and requirements of the Permit ensure that the discharge will not contribute to further degradation of the receiving stream. Impaired waters are those that do not meet applicable water quality standards and are identified on the State of Alabama's §303(d) list or on an EPA-approved or EPA-established TMDL. Pollutants of concern are those pollutants for which the receiving water is listed as impaired or contribute to the listed impairment.

2. Facilities that discharge into a receiving stream which is listed on the State of Alabama's §303(d) list of impaired waters, and with discharges that contain the pollutant(s) for which the waters are impaired, must within six (6) months of the Final §303(d) list approval, document in its BMP plan how the BMPs will control the discharge of the pollutant(s) of concern, and must ensure that there

will be no increase of the pollutants of concern. A monitoring plan to assess the effectiveness of the BMPs in achieving the allocations must also be included in the BMP plan.

3. If the facility discharges to impaired waters as described above, it must determine whether a TMDL has been developed and approved or established by EPA for the listed waters. If a TMDL is approved or established during this Permit cycle by EPA for any waters into which the facility discharges, the facility must review the applicable TMDL to see if it includes requirements for control of any water discharged by the Permittee. Within six (6) months of the date of TMDL approval or establishment, the facility must notify the Department on how it will modify its BMP plan to include best management practices specifically targeted to achieve the allocations prescribed by the TMDL, if necessary. Any revised BMP plans must be submitted to the Department for review. The facility must include in the BMP plan a monitoring component to assess the effectiveness of the BMPs in achieving the allocations.

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WATER DIVISION

NPDES INDIVIDUAL PERMIT RATIONALE

Company Name: Trans Ash, Inc.

Facility Name: Trans Ash Borrow Pit

County: Mobile

Permit Number: AL0084174

Prepared by: Amber Hicks

Date: November 9, 2020

Receiving Waters: Unnamed Tributary to Log Creek

Permit Coverage: Construction Sand and Gravel, Shale and Common Clay Pit and Associated Areas

SIC Codes: 1442, 1459

The Department has made a tentative determination that the available information is adequate to support issuance of this permit.

This proposed permit covers a construction sand and gravel, shale and common clay pit and associated areas which discharge to ground and surface waters.

This proposed permit authorizes treated discharges into a stream segment, other State water, or local watershed that currently has a water quality classification of Fish and Wildlife (F&W) (ADEM Admin. Code r. 335-6-10-.09). If the requirements of the proposed permit are fully implemented, the facility will not discharge pollutants at levels that will cause or contribute to a violation of the F&W classification.

Full compliance with the proposed permit terms and conditions is expected to be protective of instream water quality and ensure consistency with applicable instream State water quality standards for the receiving stream.

Technology Based Effluent Limits (TBELs) for construction sand and gravel facilities can be found in 40 CFR 436.32(1) and (2) for facilities that recycle waste water for use in processing and mine dewatering, respectively. The TBELs were promulgated for existing dischargers using the Best Practicable Control Technology Available (BPT). New Source Performance Standards (NSPS) have not yet been developed by the EPA for the construction sand and gravel subcategory.

The TBELs for 40 CFR 436 Subpart C do not include limitations for Total Suspended Solids (TSS). TSS is classified as a conventional pollutant in 40 CFR 401.16 and is expected to be discharged from this type of facility. Therefore, monthly average and daily maximum effluent limitations for TSS were prepared using Best Professional Judgment (BPJ) with consideration given to the NSPS for TSS in 40 CFR 434.35.

The instream water quality standards for pH in streams classified as Fish and Wildlife are 6.0 – 8.5 s.u. per ADEM Admin. Code r. 335-6-10-.09. However, a daily maximum pH limit of 9.0 s.u. is occasionally allowed by the Department for precipitation driven discharges. During precipitation events, if the background stream flow is expected to be great enough to allow for adequate dilution of the discharge to maintain an in-stream pH of less than or equal to 8.5 s.u., as it is in this case, a daily maximum of 9.0 s.u. is permitted. Therefore, this Permit imposed the pH limitations of 6.0 s.u. (daily minimum) and 9.0 s.u. (daily maximum). Regardless, the discharge shall not cause the in-stream pH to deviate more than 1.0 s.u. from the normal or natural pH, nor be less than 6.0 s.u. nor greater than 8.5 s.u.

The applicant has requested, in accordance with 40 CFR Part 122.21 and their NPDES permit application, a waiver from testing for the Part A, B, and C pollutants listed in the EPA Form 2C and 2D that are not addressed in their application. They have also certified that due to the processes involved in their mining activity these pollutants are believed to be not present in the waste stream.

The Pollution Abatement/Prevention (PAP) plan for this facility has been prepared by a professional engineer (PE) registered in the State of Alabama and is designed to ensure reduction of pollutants in the waste stream to a level that, if operated properly, the discharge will not contribute to or cause a violation of applicable State water quality standards. The proposed permit terms and conditions are predicated on the basis of ensuring a reduction of pollutants in the discharge to a level that reduces the potential of contributing to or causing a violation of applicable State water quality standards.

In accordance with ADEM Admin. Code r. 335-6-3-.07 the design professional engineer, as evidenced by their seal and/or signature on the application, has accepted full responsibility for the effectiveness of the waste treatment facility to treat the permittee's effluent to meet NPDES permit limitations and requirements, and to fully comply with Alabama's water quality standards, when such treatment facilities are properly operated.

If there is a reasonable potential that a pollutant present in the treated discharges from a facility could cause or contribute to a contravention of applicable State water quality standards above numeric or narrative criteria, 40 CFR Part 122 requires the Department to establish effluent limits using calculated water quality criterion, establish effluent limits on a case-by-case basis using criteria established by EPA, or establish effluent limits based on an indicator parameter. Based on available information, potential pollutants discharged from this facility, if discharged within the concentrations allowed by this permit, would not have a reasonable potential to cause or contribute to a contravention of applicable State water quality standards.

The applicant is not proposing an increase of discharges of pollutants to a water of the State with an approved Total Maximum Daily Load (TMDL).

The applicant is not proposing discharges into a stream segment or other State water that is included on Alabama's current CWA §303(d) list.

The applicant is proposing discharges of pollutant(s) to an ADEM identified Tier I water.

The proposed permit action authorizes new or increased discharges of pollutant(s) to receiving waters determined by the Department to be waters where the quality exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water (Tier II). Pursuant to ADEM Admin. Code r. 335-6-10 (Antidegradation Policy and Implementation of the Antidegradation Policy), the applicant has submitted and the Department has reviewed/considered information regarding (1) demonstration of necessity/importance, (2) alternatives analysis, and (3) if required, calculation(s) of total annualized costs for technically feasible treatment alternatives regarding the proposed new or increased discharges to Tier II waters. The Department has determined, based on the applicant's demonstration, that the proposed new or increased discharges to the Tier II waters are necessary for important economic or social development in the area in which the waters are located.

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WATER DIVISION

ANTIDEGRADATION RATIONALE

Company Name: Trans Ash, Inc.

Facility Name: Trans Ash Borrow Pit

County: Mobile

Permit Number: AL0084174

Prepared by: Amber H. Powell

Date: November 30, 2020

Receiving Waters: Unnamed Tributary to Log Creek

Stream Category: Tier II as defined by ADEM Admin. Code 335-6-10-.12

Discharge Description: Construction Sand and Gravel, Shale and Common Clay Pit, and Associated Areas

The following preliminary determination was prepared in accordance with ADEM Admin. Code 335-6-10-.12(7)(c):

The Department has reviewed the information submitted by applicant in accordance with ADEM Admin. Code 335-6-10-.12(9). The applicant has demonstrated that there are no technically or economically viable treatment options in its alternatives analysis that would completely eliminate a direct discharge.

The permit applicant has indicated that the following economic and social benefits will result from this project:

1. The Permittee will employ six to eight individuals if the NPDES permit is issued, but will reduce the number of employees if the Permit is not issued.

2. The Permittee will be providing a needed commodity for the construction of a cap for the ash pond at Alabama Power Company's Barry Steam Plant.

3. The Permittee will allow for the closure of a known environmental and possible health hazard by supplying materials for the closure.

The Department has determined that the discharge proposed by the permit applicant is necessary for important economic and social development in the area of the outfall location in the receiving water.

Reviewed By: Catherine McNeill

Date: 4-20-2021

thompson
ENGINEERING

January 28, 2021

Ms. Amber Hicks
Alabama Department of Environmental Management
transmitted via email

RE: AL0084147 – Transash Borrow Pit
Mobile County Road 78
Turnerville, Mobile County, Alabama
Thompson Engineering Project No: 20-1101-0075

Dear Ms. Hicks:

Thompson Engineering provides the following revisions and responses to the Alabama Department of Environmental Management (ADEM) request for additional information for the above referenced project.

Application:

- Part IX-Proposed Activity To Be Conducted: Missing the Primary SIC code.

  Primary SIC Code is 1481 and NAICS Code is 14819901

- Part X-Fuel Chemical Handling, Storage, & Spill Prevention & Countermeasures (SPCC Plan): A detailed SPCC Plan is required .

  There is only one 1,000–gallon double walled fuel storage tank to be located on the site. No fuels or oils are stored on-site in excess of 1,320 gallons (counting only those containers with a capacity of 55 gallons or greater); therefore, no SPCC is required by 40 CFR 112. The only other fuel (petroleum products) at the site are in operational equipment that is not counted as storage tanks.

- Part XVI- Discharge Characterization: This section was answered yes. Please complete this section and identify and list the expected discharge.

  Section has been completed.

- Part XVII- Discharge Structure Description & Pollutant Source: Some of this section is blank. Complete the chart with yes or no for the other columns.

  Section has been completed.

- Part XXI-Pollution Abatement & Prevention (PAP) Plan Summary states "Detailed plans have not been developed." Detailed plans are required with the application.

  PAP has been modified to give more detail.

2970 Cottage Hill Road, Ste. 190
Mobile, AL 36606
251.666.2443 ph. / 251.666.6422 fax
www.thompsonengineering.com

A THOMPSON HOLDINGS, INC. COMPANY

- Part XXII- Pollution Abatement & Prevention (PAP) Plan Review Checklist: Does not indicate whether measures for accessing all treatment structures and schedule for cleaning and/or abandonment are in the PAP, and if not, why.

  They are in the PAP in the BMP Appendix (Appendix C).

PAP Plan:

- Says spill pipes will be used, but Part XVII-Discharge Structure Description & Pollutant Source states the discharge structure will be "structure with floating weir."

  Has been changed to read "spill pipes and floating weirs."

- The application requested 1,037 acres of permitted area, but the maps reference only the 49 acres of the borrow pit as the "permit area" and is located within a 289 acre parcel. There is discrepancy between these areas and it is not clear what they are proposing as the permitted boundaries.

  Trans Ash has acquired the use of 1,037 acres of property which is available for surface mining in the future; however, this permit is for the initial 49 acres of property as shown in the PAP. Future permit modifications will be necessary to use these areas in the future.

- If the 49 acres is proposed as the permitted boundary, then the sediment basin is not located within the boundaries.

  The sediment basin has been relocated within the boundary. Originally, it was placed outside the boundary so that future development could occur without constructing a new basin.

- The BMPs provided are generic and not specific to the site. The Department needs to know what BMPs are specific to the site and where these will be located.

  Additional detail has been added to Part XVIII, to the BMP Appendix (Appendix C) and to the calculations (Appendix E) to satisfy this comment.

- Stream crossings will likely require permitting through the Corps of Engineers. The PAP should indicate that stream crossings will be appropriately permitted through the Corps.

  Wording added to Part XI.

- Part XVI- Reclamation Procedure: References ADIR, which is no longer in existence. It should reference Alabama Department of Labor, ADOL.

  Acknowledged and wording has been changed.

- Part XX of the PAP indicates that ASMC data isn't available since this is a new site. Noncoal sites aren't regulated by ASMC.

  Acknowledged and wording has been change to be more appropriate.

- Part XXI says that if future controls are needed, the PAP will be amended to include engineering designs. We need engineering designs specific to the proposed actions at this site before issuance of a permit.

  Wording has been changed as a word was left out of the sentence. It now reads, "If in the future, additional controls are needed, this PAP plan must be amended to include engineering design of appropriate drainage control, treatment, and discharge structures."

Revised copies of the Pollution Abatement Prevention Plan and Form 315 have been transmitted via email along with this response letter. If you need further information or have any questions, please advise.

Sincerely,

THOMPSON ENGINEERING, INC.

Suzanne Sweetser, M.S., CPESC
Senior Scientist

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (ADEM)
NPDES INDIVIDUAL PERMIT APPLICATION (MINING OPERATIONS)

Instructions: This form should be used to submit an application for an NPDES individual permit to authorize discharges from surface & underground mineral, ore, or mineral product mining, quarrying, excavation, borrowing, hydraulic mining, storage, processing, preparation, recovery, handling, loading, storing, or disposing activities, and associated areas including pre-mining site development, construction, excavation, clearing, disturbance, and reclamation. Please complete all questions. Respond with "N/A" as appropriate. Incomplete or incorrect answers or missing signatures will delay processing. Attach additional comments or information as needed. If space is insufficient, continue on an attached sheet(s) as necessary. Commencement of activities applied for as detailed in this application are not authorized until permit coverage has been issued by the Department. Please type or print legibly in blue or black ink.

Purpose of this Application

☐ Initial Permit Application for New Facility ☒ Initial Permit Application for Existing Facility (*e.g.*, facility previously permitted less than 5 acres)
☐ Modification of Existing Permit ☐ Reissuance of Existing Permit ☐ Reissuance & Modification Existing Permit
☐ Reissuance & Transfer of Existing Permit ☐ Revocation and Reissuance of Existing Permit ☐ Other _____

I. GENERAL INFORMATION

NPDES Permit Number (Not applicable if initial permit application):	County(s) in which Facility is Located:
AL 0084147	Mobile

Company/Permittee and Facility Information					
Company/Permittee Name: Trans Ash Inc.			Facility Name: Trans Ash Borrow Pit		
Mailing Address of Company/Permittee: 15300 Highway 43			Physical Address of Operation (as near as possible to main entrance): County Road 63		
City: Bucks	State: AL	Zip Code: 36512	City: Chunchula	State: AL	Zip: 36521
Permittee Phone Number: 513-256-2977	Permittee Fax Number:		Latitude and Longitude of Main Entrance: 30 58' 36.83"; -88 08' 45.40"		

Responsible Official (RO) Information					
RO Name (as described on Page 12 of this application): Steven L. Fields			RO Official Title: Senior Project Manager		
Mailing Address: 15300 Highway 43			Physical Address: 617 Shepherds Drive		
City: Bucks	State: AL	Zip Code: 36512	City: Cincinnati	State: OH	Zip Code: 45215
Phone Number: 513-260-8540	Fax Number:		Email Address: steve.fields@TransAsh.com		

Facility Contact Information				
Facility Contact Name: Jason Glasscock			Facility Contact Title: Superintendent	
Physical Address: 15300 Highway 43			Phone Number: 513-256-2977	Fax Number:
City: Bucks	State: AL	Zip Code: 36512	Email Address: Jason.glasscock@TransAsh.com	

II. MEMBER INFORMATION

A. Identify the name, title/position, and unless waived in writing by the Department, the resident address of every officer (a PO Box is not acceptable), general partner, LLP partner, LLC member, investor, director, or person performing a function similar to a director, of the applicant, and each person who is the record or beneficial owner of 10 percent or more of any class of voting stock of the applicant, or any other responsible official(s) of the applicant with legal or decision making responsibility or authority for the facility:

Name	Title/Position	Physical Address of Residence
Rudy J. Gerbus	CEO	10839 Chester Road, Cincinnati, OH 45246
Robert E. Gerbus	President	7313 Waterpoint Lane, Anderson, OH 45255
Joseph Kaldmo	Vice-President	776 Deervalley Drive, Cincinnati, OH 45245
William Fielden	CFO	5486 Taylor Made Lane, Mason, OH 45045

B. Other than the "Company/Permittee" listed in Part I, identify the name of each corporation, partnership, association, and single proprietorship for which any individual identified in Part II.A. is or was an officer, general partner, LLP partner, LLC member, investor, director, or individual performing a function similar to a director, or principal (10% or more) stockholder, that had an Alabama NPDES permit at any time during the five year (60 month) period immediately preceding the date on which this form is signed:

Name of Corporation, Partnership, Association, or Single Proprietorship	Name of Individual from Part II.A	Title/Position in Corporation, Partnership, Association, or Single Proprietorship
Trans Ash, Inc.	Robert E. Gerbus	President, 51%
	Rudy J. Gerbus	CEO, 49%

III. LEGAL STRUCTURE OF APPLICANT

A. Indicate the legal structure of the "Company/Permittee" listed in Part I:

☒ Corporation ☐ Association ☐ Individual ☐ Single Proprietorship ☐ Partnership ☐ LLP ☐ LLC

☐ Government Agency _____ ☐ Other _____

B. If not an individual, single proprietorship, or government agency, is the "Company/Permittee" listed in Part I. properly registered and in good standing with the Alabama Secretary of State's office. **(If the answer is "No," attach a letter of explanation.)** ☒ Yes ☐ No

C. Parent Corporation and Subsidiary Corporations of Applicant, if any:

None

D. Landowner(s):

Landowners are shown on the attached Drawing

E. Sub-contractor(s)/Operator(s), if known:

Trans Ash will operate the mining facility with a broker for the hauling.

IV. COMPLIANCE HISTORY

A. Has the applicant ever had any of the following:

Yes	No		
☐	☒	(1)	An Alabama NPDES, SID, or UIC permit suspended or terminated?
☐	☒	(2)	An Alabama or federal environmental permit suspended/terminated?
☐	☒	(3)	An Alabama State Oil & Gas Board permit or other approval suspended or terminated?
☐	☒	(4)	An Alabama or federal performance/environmental bond, or similar security deposited in lieu of a bond, or portion thereof, forfeited?

(If the response to any item of Part IV.A. is "Yes," attach a letter of explanation.)

B. Identify every Warning Letter, Notice of Violation (NOV), Administrative Action, or litigation issued to the applicant, parent corporation, subsidiary, general partner, LLP partner, or LLC Member and filed by ADEM or EPA during the three year (36 month) period preceding the date on which this form is signed. Indicate the date of issuance, briefly describe alleged violations, list actions (if any) to abate alleged violations, and indicate date of final resolution:

None

V. OTHER PERMITS/AUTHORIZATIONS

A. List any other NPDES, State Oil & Gas Board (OGB) Class II Injection well permits, or other environmental permits (including permit numbers), authorizations, or certifications that have been applied for or issued within the State by ADEM, EPA, Alabama Surface Mining Commission (ASMC), Alabama Department of Labor (ADOL), or other agency, to the applicant, parent corporation, subsidiary, or LLC member for this operation whether presently effective, expired, suspended, revoked or terminated:

ALG890000 - Turn west off Celeste Road in Turnerville onto Roberts Road. Follow Roberts Road approx. 1.6 miles to new entrance road on the north side of the road.

B. List any other NPDES or other ADEM permits (including permit numbers), authorizations, or certifications that have been applied for or issued within the State by ADEM, EPA, OGB, ASMC, or ADOL to the applicant, parent corporation, subsidiary, or LLC member for other facilities whether presently effective, expired, suspended, revoked, or terminated:

None

VI. PROPOSED SCHEDULE

Anticipated Activity Commencement Date:	September 2020	Anticipated Activity Completion Date:	March 2032

VII. ACTIVITY DESCRIPTION & INFORMATION

A. Proposed Total Area of the Permitted Site: 1,037 acres Proposed Total Disturbed Area of the Permitted Site: 807.6 acres

B. Township(s), Range(s), Section(s): T1N, R2W, Sections 3, 10, 11, &12

C. Detailed Directions to Site:

ALG890000 - Turn west off Celeste Road in Turnerville onto Roberts Road. Follow Roberts Road approx. 1.6 miles to new entrance road on the north side of the road.

D. Is/will this operation:

Yes	No	
☐	☒	(1) an existing facility which currently results in discharges to State waters?
☒	☐	(2) a proposed facility which will result in a discharge to State waters?
☒	☐	(3) be located within any 100-year flood plain?
☐	☒	(4) discharge to Municipal Separate Storm Sewer?
☐	☒	(5) discharge to waters of or be located in the Coastal Zone?
☐	☒	(6) need/have ADEM UIC permit coverage?
☐	☒	(7) be located on Indian/historically significant lands?
☐	☒	(8) need/have ADEM SID permit coverage?
☐	☒	(9) need/have ASMC permit coverage?
☒	☐	(10) need/have ADOL permit coverage?
☐	☒	(11) generate, treat, store, or dispose of hazardous or toxic waste? (If "Yes," attach a detailed explanation.)
☐	☒	(12) be located in or discharge to a Public Water Supply (PWS) watershed or be located within ½ mile of any PWS well?

VIII. MATERIAL TO BE REMOVED, PROCESSED, OR TRANSLOADED

List relative percentages of the mineral(s) or mineral product(s) that are proposed to be and/or are currently mined, quarried, recovered, prepared, processed, handled, transloaded, or disposed at the facility. **If more than one mineral is to be mined, list the relative percentages of each mineral by tonnage for the life of the mine.**

40%	Dirt &/or Chert	40%	Sand &/or Gravel		Coal product, coke		Talc		Crushed rock (other)
	Bentonite		Industrial Sand	20%	Shale &/or Common Clay		Marble		Sandstone
	Coal		Kaolin		Coal fines/refuse recovery		Chalk		Slag, Red Rock
	Fire clay		Iron ore		Dimension stone		Granite		Phosphate rock
	Bauxitic Clay		Bauxite Ore		Limestone, crushed limestone and dolomite				
	Gold, other trace minerals:				Other:				
	Other:				Other:				
	Other:				Other:				

IX. PROPOSED ACTIVITY TO BE CONDUCTED

A. Type(s) of activity presently conducted at applicant's existing facility or proposed to be conducted at facility (check all that apply):

☒ Surface mining	☐ Underground mining	☐ Quarrying	☐ Auger mining	☐ Hydraulic mining
☐ Within-bank mining	☐ Solution mining	☒ Mineral storing	☐ Lime production	☐ Cement production
☐ Synthetic fuel production	☐ Alternative fuels operation	☐ Mineral dry processing (crushing & screening)		☐ Mineral wet preparation
☐ Other beneficiation & manufacturing operations		☒ Mineral loading		☐ Chemical processing or leaching
☒ Grading, clearing, grubbing, *etc.*		☐ Pre-construction ponded water removal		☒ Excavation
☒ Pre-mining logging or land clearing		☐ Waterbody relocation or other alteration		☒ Creek/stream crossings
☒ Construction related temporary borrow pits/areas		☒ Mineral transportation: ☐ rail ☐ barge ☒ truck		
☐ Preparation plant waste recovery		☐ Hydraulic mining, dredging, instream or between stream-bank mining		
☒ Onsite construction debris or equipment storage/disposal		☒ Onsite mining debris or equipment storage/disposal		
☒ Reclamation of disturbed areas		☐ Chemicals used in process or wastewater treatment (coagulant, biocide, etc.)		
☐ Adjacent/associated asphalt/concrete plant(s)		☐ Low volume sewage treatment package plant		
☐ Other (Please describe):				

B. Primary SIC Code: 1481 Non-Metallic M NAICS Code: 212399 Description: 1481 Non-Metallic Minerals Mining

Secondary SIC Code: _____ NAICS Code: _____ Description: _____

C. Narrative Description of the Activity:

The site will be used as a borrow pit for capping material.

X. FUEL – CHEMICAL HANDLING, STORAGE & SPILL PREVENTION CONTROL & COUNTERMEASURES (SPCC) PLAN

A. Will fuels, chemicals, compounds, or liquid waste be used or stored onsite? ☒ Yes ☐ No

B. If "Yes," identify the fuel, chemicals, compounds, or liquid waste and indicate the volume of each:

Volume (*gallons*)	Contents	Volume (*gallons*)	Contents	Volume (*gallons*)	Contents
1,000	Diesel Fuel				

C. If "Yes", a detailed SPCC Plan with acceptable format and content, including diagrams, must be attached to application in accordance with ADEM Admin. Code R. 335-6-6-.12(r). Unless waived in writing by the Department on a programmatic, categorical, or individual compound/chemical basis, Material Safety Data Sheets (MSDS) for chemicals/compounds used or proposed to be used at the facility must be included in the SPCC Plan submittal.

XI. POLLUTION ABATEMENT & PREVENTION (PAP) PLAN

A. For non-coal mining facilities, a PAP Plan in accordance with ADEM Admin. Code r. 335-6-9-.03 has been completed and is attached as part of this application. ☒ Yes ☐ No

B. For coal mining facilities, a detailed PAP Plan has been submitted to ASMC according to submittal procedures for ASMC regulated facilities. ☐ Yes ☐ No

(1) If "Yes" to Part XI.B., provide the date that the PAP Plan was submitted to ASMC: _____

(2) If "No" to Part XI.B., provide the anticipated date that the PAP Plan will be submitted to ASMC: _____

XII. ASMC REGULATED ENTITIES

A. Is this coal mining operation regulated by ASMC? ☐ Yes ☒ No

B. If "Yes," provide copies as part of this application of any pre-mining hydrologic sampling reports and Hydrologic Monitoring Reports which have been submitted to ASMC within the 36 months prior to submittal of this application.

XIII. TOPOGRAPHIC MAP SUBMITTAL

Attach to this application a 7.5 minute series U.S.G.S. topographic map(s) or equivalent map(s) no larger than, or folded to a size of 8.5 by 11 inches (several pages may be necessary), of the area extending to at least one mile beyond property boundaries. The topographic or equivalent map(s) must include a caption indicating the name of the topographic map, name of the applicant, facility name, county, and township, range, & section(s) where the facility are located. Unless approved in advance by the Department, the topographic or equivalent map(s), at a minimum, must show:

(a) An accurate outline of the area to be covered by the permit

(b) An outline of the facility

(c) All existing and proposed disturbed areas

(d) Location of intake and discharge areas

(e) Proposed and existing discharge points

(f) Perennial, intermittent, and ephemeral streams

(g) Lakes, springs, water wells, wetlands

(h) All known facility dirt/improved access/haul roads

(i) All surrounding unimproved/improved roads

(j) High-tension power lines and railroad tracks

(l) Contour lines, township-range-section lines

(m) Drainage patterns, swales, washes

(n) All drainage conveyance/treatment structures (ditches, berms, etc.)

(o) Any other pertinent or significant feature

XIV. DETAILED FACILITY MAP SUBMITTAL

Attach to this application a 1:500 scale or better, detailed auto-CAD map(s) or equivalent map(s) no larger than, or folded to a size of 8.5 by 11 inches (several pages may be necessary), of the facility. The facility map(s) must include a caption indicating the name of the facility, name of the applicant, facility name, county, and township, range, & section(s) where the facility is located. Unless approved in advance by the Department, the facility or equivalent map(s), at a minimum, must show:

(a) Information listed in Item XIII (a) – (o) above

(b) If noncoal, detailed, planned mining progression

(c) If noncoal, location of topsoil storage areas

(d) Location of ASMC bonded increments (if applicable)

(e) Location of mining or pond cleanout waste storage/disposal areas

(f) Other information relevant to facility or operation

(g) Location of facility sign showing Permittee name, facility name, and NPDES Number

XV. RECEIVING WATERS

List the requested permit action for each outfall (issue, reissue, add, delete, move, *etc.*); outfall designation including denoting "E" for existing and "P" for proposed outfalls; name of receiving water(s); latitude and longitude (to seconds) of location(s) of each discharge point; distance of receiving water from the discharge point; number of disturbed acres; the number of drainage acres which will drain through each outfall; and if the outfall discharges to an ADEM listed CWA Section 303(d) waterbody segment or is included in a TMDL at the time of application submittal.

Action	Outfall E/P	Receiving Water	Latitude	Longitude	Distance to Rec. Water (ft)	Disturbed Area (acres)	Drainage Area (acres)	ADEM WUC	303(d) Segment (Y/N)	TMDL Segment* (Y/N)
Issue	DSN001	Unk. Trib. to Log Creek	30.980306	-88.146175	100	49	49	F&W	N	N
				-						
				-						
				-						
				-						
				-						
				-						
				-						

*If a TMDL Compliance Schedule is requested, the following should be attached as supporting documentation: (1) Justification for the requested Compliance Schedule (*e.g.*, time for design and installation of control equipment); (2) Monitoring results for the pollutant(s) of concern which have not previously been submitted to the Department including sample collection dates, analytical results in mass and concentration, methods utilized, and RL and MDL; (3) Requested interim limitations, if applicable; (4) Date of final compliance with the TMDL limitations; and (5) Any other additional information available to support the requested compliance schedule.

XVI. DISCHARGE CHARACTERIZATION

A. EPA Form 2C, EPA Form 2D, and/or ADEM Form 567 Submittal

☒ Yes, pursuant to 40 CFR 122.21, the applicant requests a waiver for completion of EPA Form 2C, EPA Form 2D, and ADEM Form 567 and certifies that the operating facility will discharge treated stormwater only; that chemical/compound additives are not used (unless waived in writing by the Department on a programmatic, categorical, or individual compound/chemical basis); that there are no process, manufacturing, or other industrial operations or wastewaters, including but not limited to lime or cement production and synfuel operations; and that coal and coal products are not mined nor stored onsite.

☐ No, the applicant does not request a waiver and a complete EPA Form 2C, EPA Form 2D, and/or ADEM Form 567 is attached.

B. The applicant is required to supply the following information separately for every proposed or existing outfall. (Attach extra sheets if necessary.) List expected average daily discharge flow rate in cfs and gpd; frequency of discharge in hours per day and days per month; average summer and winter temperature of discharge(s) in degrees centigrade; average pH in standard units; and average daily discharges in pounds per day of BOD_5, Total Suspended Solids, Total Iron, Total Manganese, and Total Aluminum (if bauxite or bauxitic clay or if otherwise believed present):

Outfall E/P	Information Source - # of Samples	Flow (cfs)	Flow (gpd)	Frequency (hours/day)	Frequency (days/month)	Sum/Win Temp, (°C)	pH (s.u.)	BOD_5 (lbs/day)	TSS (lbs/day)	Tot Fe (lbs/day)	Tot Mn (lbs/day)	Tot Al (lbs/day)
001	prev. projects	0.0189	12,205	unknown	unknown	20-25	6.0	0.204	0.713	0.061	0.004	0.002

C. The applicant is required to supply the following information separately for every proposed or existing outfall. (Attach extra sheets if necessary.) Identify and list expected average daily discharge of any other pollutant(s) listed in EPA Form 2C Tables A, B, C, D, and E that are not referenced in Part XVI.B. or otherwise submitted elsewhere, that you know is present or have reason to believe could be present in the discharge(s) at levels of concern:

Outfall E/P	Reason Believed Present	Information Source - # of Samples								
			lbs/day	mg/L	lbs/day	mg/L	lbs/day	mg/L	lbs/day	mg/L
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

XVII. DISCHARGE STRUCTURE DESCRIPTION & POLLUTANT SOURCE

The applicant is required to supply outfall number(s) as it appears on the map(s) required by this application [if this application is for a modification to an existing permit do not change the numbering sequence of the permitted outfalls], describe each, (*e.g.*, pipe, spillway, channel, tunnel, conduit, well, discrete fissure, or container), and identify the origin of pollutants. The response must be precise for each outfall. If the discharge of pollutants from any outfall is the result of commingling of waste streams from different origins, each origin must be completely described.

Outfall	Discharge structure Description	Description of Origin of pollutants	Surface Discharge	Groundwater Discharge	Wet Prep -Other Production Plant	Pumped or Controlled Discharge	Low Volume STP
DSN001	Structure with Floating Weir	Discharge from General Soil Pit	Yes	Yes	No	Yes	No

Origin of Pollutants – typical examples: **(1)** Discharge of drainage from the underground workings of an underground coal mine, **(2)** Discharge of drainage from a coal surface mine, **(3)** Discharge of drainage from a coal preparation plant and associated areas, **(4)** Discharge of process wastewater from a gravel-washing plant, **(5)** Discharge of wastewater from an existing source coal preparation plant, **(6)** Discharge of drainage from a sand and gravel pit, **(7)** Pumped discharge from a limestone quarry, **(8)** Controlled surface mine drainage (pumped or siphoned), **(9)** Discharge of drainage from mine reclamation, **(10) Other** (please describe):

(8) Controlled Surface Mine Drainage

XVIII. COOLING WATER

A. Does your facility use cooling water? ☐ Yes ☒ No

B. If "Yes," identify the source of the cooling water:

XIX. VARIANCE REQUEST

A. Do you intend to request or renew one or more of the CWA technology variances authorized at 40 CFR 122.21(m)? ☐ Yes ☒ No

B. If "Yes," select all that apply:

☐ Fundamentally different factors (CWA Section 301(n))

☐ Water quality related effluent limitations (CWA Section 302(b)(2))

☐ Non-conventional pollutants (CWA Section 301(c) and (g))

☐ Thermal discharges (CWA Section 316(a))

XX. PROPOSED NEW OR INCREASED DISCHARGES

A. Pursuant to ADEM Admin. Code ch. 335-6-10-.12(9), responses to the following questions must be provided by the applicant requesting NPDES permit coverage for new or expanded discharges of pollutant(s) to Tier 2 waters (except discharges eligible for coverage under general permits). As part of the permit application review process, the Department is required to consider, based on the applicant's demonstration, whether the proposed new or increased discharge to Tier 2 waters is necessary for important economic or social development in the area in which the waters are located.

☒ Yes. New/increased discharges of pollutant(s) or discharge locations to Tier 2 waters are proposed.

☐ No. New/increased discharges of pollutants(s) or discharge locations to Tier 2 waters are not proposed.

B. If "Yes," complete Items 1 through 6 of this Part (XIII.B.), ADEM Form 311-Alternative Analysis, and either ADEM Form 312 or ADEM Form 313-Calculation of Total Annualized Project Costs (Public-Section or Private-Sector, whichever is applicable). ADEM Form 312 or ADEM Form 313, whichever is applicable, should be completed for each technically feasible alternative evaluated on ADEM Form 311. ADEM Forms can be found on the Department's website at www.adem.alabama.gov/DeptForms. **Attach additional sheets/documentation and supporting information as needed.**

(1) What environmental or public health problem will the discharge be correcting?

The pits are proposed to supply sand, clay and general fill for the construction of a cap for the ash pond at Alabama Power Company's Barry Steam Plant. This site is a recognized environmental hazard.

(2) How much will the discharger be increasing employment (at its existing facility or as a result of locating a new facility)?

It is estimated that the soil pit will directly increase employment for 6 to 8 equipment operators and staff. However, the project to close the ash pond at Barry Steam Plant (which this project directly enables), will allow additional employment.

(3) How much reduction in employment will the discharger be avoiding?

None

(4) How much additional state or local taxes will the discharger be paying?

Unknown at this time.

(5) What public service to the community will the discharger be providing?

This project will allow for the closure of a known environmental hazard by supplying materials for the closure.

(6) What economic or social benefit will the discharger be providing to the community?

This project will allow for the closure of a known environmental and possible health hazard by supplying materials for the closure.

XXI. POLLUTION ABATEMENT & PREVENTION (PAP) PLAN SUMMARY (must be completed for all outfalls)

Yes	No	N/A	Outfall(s): DSN001
☒	☐	☐	1. Runoff from all areas of disturbance is controlled
☒	☐	☐	2. Drainage from pit area, stockpiles, and spoil areas directed to a sedimentation pond
☒	☐	☐	3. Sedimentation basin at least 0.25 acre/feet for every acre of disturbed drainage
☒	☐	☐	4. Sedimentation basin cleaned out when sediment accumulation is 60% of design capacity
☒	☐	☐	5. Trees, boulders, and other obstructions removed from pond during initial construction
☒	☐	☐	6. Width of top of dam greater than 12'
☒	☐	☐	7. Side slopes of dam no steeper than 3:1
☒	☐	☐	8. Cutoff trench at least 8' wide
☒	☐	☐	9. Side slopes of cutoff trench no less than 1:1
☒	☐	☐	10. Cutoff trench located along the centerline of the dam
☒	☐	☐	11. Cutoff trench extends at least 2' into bedrock or impervious soil
☒	☐	☐	12. Cutoff trench filled with impervious material
☒	☐	☐	13. Embankments and cutoff trench 95% compaction standard proctor ASTM
☒	☐	☐	14. Embankment free of roots, tree debris, stones >6" diameter, etc.
☒	☐	☐	15. Embankment constructed in lifts no greater than 12"
☒	☐	☐	16. Spillpipe sized to carry peak flow from a one year storm event
☒	☐	☐	17. Spillpipe will not chemically react with effluent
☒	☐	☐	18. Subsurface withdrawal
☒	☐	☐	19. Anti-seep collars extend radially at least 2' from each joint in spillpipe
☒	☐	☐	20. Splashpad at the end of the spillpipe
☒	☐	☐	21. Emergency Spillway sized for peak flow from 25-yr 24-hr event if discharge not into PWS classified stream
☐	☐	☒	22. Emergency spillway sized for peak flow from 50-yr 24-hr event if discharge is into PWS classified stream
☒	☐	☐	23. Emergency overflow at least 20' long
☒	☐	☐	24. Side slopes of emergency spillway no steeper than 2:1
☒	☐	☐	25. Emergency spillway lined with riprap or concrete
☒	☐	☐	26. Minimum of 1.5' of freeboard between normal overflow and emergency overflow
☒	☐	☐	27. Minimum of 1.5' of freeboard between max. design flow of emergency spillway and top of dam
☒	☐	☐	28. All emergency overflows are sized to handle entire drainage area for ponds in series
☒	☐	☐	29. Dam stabilized with permanent vegetation
☒	☐	☐	30. Sustained grade of haul road <10%
☒	☐	☐	31. Maximum grade of haul road <15% for no more than 300'
☒	☐	☐	32. Outer slopes of haul road no steeper than 2:1
☒	☐	☐	33. Outer slopes of haul road vegetated or otherwise stabilized
☒	☐	☐	34. Detail drawings supplied for all stream crossings
☒	☐	☐	35. Short-Term Stabilization/Grading And Temporary Vegetative Cover Plans
☒	☐	☐	36. Long-Term Stabilization/Grading And Permanent Reclamation or Water Quality Remediation Plans

IDENTIFY AND PROVIDE DETAILED EXPLANATION FOR ANY "N" OR "N/A" RESPONSE(s):

The spillway does not discharge into a PWS Classified stream.

XXII. POLLUTION ABATEMENT & PREVENTION (PAP) PLAN REVIEW CHECKLIST

Yes	No	N/A	
			General Information:
☒	☐	☐	PE Seal with License #
☒	☐	☐	Name and Address of Operator
☒	☐	☐	Legal Description of Facility
☒	☐	☐	Name of Company
☒	☐	☐	Number of Employees
☒	☐	☐	Products to be Mined
☒	☐	☐	Hours of Operation
☒	☐	☐	Water Supply and Disposition
			Maps:
☒	☐	☐	Topographic Map including Information from Part XIII (a) – (o) of this Application
☒	☐	☐	1" – 500' or Equivalent Facility Map including Information from Part XIV of this Application
			Detailed Design Diagrams:
☒	☐	☐	Plan Views
☒	☐	☐	Cross-section Views
☒	☐	☐	Method of Diverting Runoff to Treatment Basins
☒	☐	☐	Line Drawing of Water Flow through Facility with Water Balance or Pictorial Description of Water Flow
			Narrative of Operations:
☒	☐	☐	Raw Materials Defined
☒	☐	☐	Processes Defined
☒	☐	☐	Products Defined
			Schematic Diagram:
☒	☐	☐	Points of Waste Origin
☒	☐	☐	Collection System
☒	☐	☐	Disposal System
			Post Treatment Quantity and Quality of Effluent:
☒	☐	☐	Flow
☒	☐	☐	Suspended Solids
☒	☐	☐	Iron Concentration
☒	☐	☐	pH
			Description of Waste Treatment Facility:
☒	☐	☐	Pre-Treatment Measures
☒	☐	☐	Recovery System
☒	☐	☐	Expected Life of Treatment Basin
☐	☐	☐	Measures for Ensuring Access to All Treatment Structures and Related Appurtenances including Outfall Locations
☐	☐	☐	Schedule of Cleaning and/or Abandonment
			Other:
☒	☐	☐	Precipitation/Volume Calculations/Diagram Attached
☒	☐	☐	BMP Plan for Haul Roads
☒	☐	☐	Measures for Minimizing Impacts to Adjacent Stream (*e.g.*, Buffer Strips, Berms)
☒	☐	☐	Measures for Ensuring Appropriate Setbacks are Maintained at All Times
☒	☐	☐	Methods for Minimizing Nonpoint Source Discharges
☒	☐	☐	If Chemical Treatment Used, Methods for Ensuring Appropriate Dosage
☒	☐	☐	Facility Closure Plans
☒	☐	☐	PE Rationale(s) For Alternate Standards, Designs or Plans

IDENTIFY AND PROVIDE DETAILED EXPLANATION FOR ANY "N" OR "N/A" RESPONSE(s):

XXIII. INFORMATION

Contact the Department prior to submittal with any questions or to request acceptable alternate content/format.
Be advised that you are not authorized to commence regulated activity until this application can be processed, publicly noticed, and approval to proceed is received in writing from the Department.

EPA Form(s) 1 and 2F need not be submitted unless specifically required by the Department. EPA Form(s) 2C and/or 2D are required to be submitted unless the applicant is eligible for a waiver and the Department grants a waiver, or unless the relevant information required by EPA Form(s) 2C and/or 2D are submitted to the Department in an alternative format acceptable to the Department.

Planned/proposed mining sites that are greater than 5 acres, that mine/process coal or metallic mineral/ore, or that have wet or chemical processing, must apply for and obtain coverage under an Individual or General NPDES Permit prior to commencement of any land disturbance. Such Individual NPDES Permit coverage may be requested via this ADEM Form 315.

The applicant is advised to contact:

(1) The Alabama Surface Mining Commission (ASMC) if coal, coal fines, coal refuse, or other coal related materials are mined, transloaded, processed, *etc.*;
(2) The Alabama Department of Labor (ADOL) if conducting non-coal mining operations;
(3) The Alabama Historical Commission for requirements related to any potential historic or culturally significant sites;
(4) The Alabama Department of Conservation and Natural Resources (ADCNR) for requirements related to potential presence of threatened/endangered species; and
(5) The US Army Corps of Engineers, Mobile or Nashville Districts, if this project could cause fill to be placed in federal waters or could interfere with navigation.

The Department must be in receipt of a completed version of this form, including any supporting documentation, and the appropriate processing fee [including Greenfield Fee and Biomonitoring & Toxicity Limits fee(s), if applicable], prior to development of a draft NPDES permit. The completed form, supporting documentation, and the appropriate fees must be submitted to:

Water Division
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, Alabama 36130-1463
Phone: (334) 271-7823
Fax: (334) 279-3051
h2omail@adem.alabama.gov
adem.alabama.gov

XXIV. PROFESSIONAL ENGINEER (PE) CERTIFICATION

A detailed, comprehensive Pollution Abatement & Prevention (PAP) Plan must be prepared, signed, and certified by a professional engineer (PE), registered in the State of Alabama, and the PE must certify as follows:

"I certify on behalf of the applicant, that I have completed an evaluation of discharge alternatives (Item XVIII) for any proposed new or increased discharges of pollutant(s) to Tier 2 waters and reached the conclusions indicated. I certify under penalty of law that technical information and data contained in this application, and a comprehensive PAP Plan including any attached SPCC plan, maps, engineering designs, etc. acceptable to ADEM, for the prevention and minimization of all sources of pollution in stormwater and authorized related process wastewater runoff has been prepared under my supervision for this facility utilizing effective, good engineering and pollution control practices and in accordance with the provisions of ADEM Admin. Code Division 335-6 , including Chapter 335-6-9 and Appendices A & B. If the PAP Plan is properly implemented and maintained by the Permittee, discharges of pollutants can reasonably be expected to be effectively minimized to the maximum extent practicable and according to permit discharge limitations and other permit requirements. The applicant has been advised that appropriate pollution abatement/prevention facilities and structural & nonstructural management practices or Department approved equivalent management practices as detailed in the PAP Plan must be fully implemented and regularly maintained as needed at the facility in accordance with good sediment, erosion, and other pollution control practices, permit requirements, and other ADEM requirements to ensure protection of groundwater and surface water quality."

Name (type or print):	David L. Upton	PE Registration #	16898
Title:	Senior Engineer	Phone Number	251-666-2443
Address:	2970 Cottage Hill Road, Suite 190, Mobile, Al 36606		
Signature:	David L. Upton Digitally signed by David L. Upton DN: C=US, E=dupton@thompsonengineering.com, O="Thompson Engineering, Inc.", CN=David L. Upton Date: 2020.09.03 09:10:07-05'00'	Date Signed	09/03/2020

XXV. RESPONSIBLE OFFICIAL SIGNATURE*

This application must be signed and initialed by a Responsible Official of the applicant pursuant to ADEM Admin. Code Rule 335-6-6-.09 who has overall responsibility for the operation of the facility.

"I certify under penalty of law that this document, including technical information and data, the PAP Plan, including any SPCC plan, maps, engineering designs, and all other attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the PE and other person or persons under my supervision who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine or imprisonment for knowing violations. SLF *(initial here)*

"A comprehensive PAP Plan to prevent and minimize discharges of pollution to the maximum extent practicable has been prepared at my direction by a PE for this facility utilizing effective, good engineering and pollution control practices and in accordance with the provisions of ADEM Admin. Code Division 335-6, including Chapter 335-6-9 and Appendices A & B, and information contained in this application, including any attachments. I understand that regular inspections must be performed by, or under the direct supervision of, a PE and all appropriate pollution abatement/prevention facilities and structural & nonstructural management practices or Department approved equivalent management practices identified by the PE must be fully implemented prior to and concurrent with commencement of regulated activities and regularly maintained as needed at the facility in accordance with good sediment, erosion, and other pollution control practices and ADEM requirements. I understand that the PAP Plan must be fully implemented and regularly maintained so that discharges of pollutants can reasonably be expected to be effectively minimized to the maximum extent practicable and according to permit discharge limitations and other requirements to ensure protection of groundwater and surface water quality. I understand that failure to fully implement and regularly maintain required management practices for the protection of groundwater and surface water quality may subject the Permittee to appropriate enforcement action. SLF *(initial here)*

"I certify that this form has not been altered, and if copied or reproduced, is consistent in format and identical in content to the ADEM approved form. SLF *(initial here)*

"I further certify that the discharges described in this application have been tested or evaluated for the presence of non-stormwater discharges and any non-mining associated beneficiation/process pollutants and wastewaters have been fully identified." SLF *(initial here)*

"I acknowledge my understanding that if coal, coal fines, coal refuse, or other coal related materials are mined, transloaded, processed, etc., that I may be required to obtain a permit from the ASMC. SLF *(initial here)*

"I acknowledge my understanding that if non-coal, non-limestone materials are mined, transloaded, processed, etc., that I may be required to obtain a permit from the ADOL. SLF *(initial here)*

"I acknowledge my understanding that if the proposed activities will be conducted in or potentially impact waters of the state or waters of the US (including wetlands), that I may be required to obtain a permit from the USACE." SLF *(initial here)*

Name (type or print): Steven L. Fields Official Title: Senior Project Manager

Signature: Steven Fields Digitally signed by Steven Fields Date: 2020.09.08 10:17:10 -05'00' Date Signed September 9, 2020

*335-6-6-.09 Signatories to Permit Applications and Reports.

(1) The application for an NPDES permit shall be signed by a responsible official, as indicated below:

(a) In the case of a corporation, by a principal executive officer of at least the level of vice president, or a manager assigned or delegated in accordance with corporate procedures, with such delegation submitted in writing if required by the Department, who is responsible for manufacturing, production, or operating facilities and is authorized to make management decisions which govern the operation of the regulated facility;

(b) In the case of a partnership, by a general partner;

(c) In the case of a sole proprietorship, by the proprietor; or

(d) In the case of a municipal, state, federal, or other public entity by either a principal executive officer, or ranking elected official.

thompson

POLLUTION ABATEMENT PREVENTION PLAN

TRANS ASH BORROW PIT
MOBILE COUNTY, ALABAMA

September 2020
Revised
January 2021

Prepared for:

Trans Ash, Inc.
15300 Highway 43
Bucks, Alabama 36512

Certified by:

ALABAMA REGISTERED No. 16898 PROFESSIONAL ENGINEER DAVID E. UPTON

Da
Sc
AL PE 16898

2970 Cottage Hill Road
Suite 190
Mobile, AL 36606
251.666.2443 ph. / 251.666.6422 fax
www.thompsonengineering.com

A THOMPSON HOLDINGS, INC. COMPANY

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1.0 INTRODUCTION

This Pollution Abatement/Prevention (PAP) plan is required as part of an application for reissuance for an individual NPDES permit for the Trans Ash, Inc., Trans Ash Dirt Pit located in Sections 1,3,10,11 and 12, T-1-S, R-2-W in Mobile County, Alabama. This plan has been prepared in accordance with the rules and regulations of the Alabama Department of Environmental Management (ADEM). A thorough review of field conditions (topography, drainage patterns and geology) has been conducted prior to compilation and submission of this plan. The information contained herein is intended to address applicable provisions of ADEM Administrative Code R.335-6-9. The individual NPDES permit is included in Appendix A. The ADEM Master ID number for Trans Ash Dirt Pit is 54065.

No chemicals are used as dust suppressants or in any other application on the site. Additionally, no bulk liquid chemicals are stored on the site except as is included herein. The only materials that are used on site, other than the bulk materials discussed above, are diesel fuel and hydraulic oil for the rolling equipment, and lubricating oils and greases for rotating equipment. Because all fuel oils on the site are contained within operating equipment and are considered "in-use" tanks, and that the one fuel storage tank is less than 1,320 gallons no SPCC is required for this site by the regulations.

II. OWNER/OPERATOR

The owner of the Trans Ash Dirt Pit is:	Trans Ash, Inc. 617 Shepherds Drive Cincinnati, OH 45215
The operator of the Trans Ash Dirt Pit is:	Trans Ash, Inc. 617 Shepherds Drive Cincinnati, OH 45215

The mining operations are located within the property boundary described in the Legal Description included in Appendix B.

The total area of the property is approximately ± 1,040 acres of which only 49 acres are to be used at this time. Sand, clay and other general fill mined from the pit will be used for

primarily to construct a cap for the Ash Pond closure activities at Alabama Power's Barry Steam Plant in Mobile County, Alabama.

The location of the property boundary is shown in the Site Vicinity Map attached as Figure 1 and the Aerial Photograph (Figure 2).

III. GENERAL INFORMATION

The pit will be operated as a borrow pit for general fill, topsoil, and materials for construction of a cap for ash pond closure. The products to be mined from the pit are sand/clay, sand, clay and topsoil which are excavated with conventional earthmoving equipment (e.g. front-end loaders, trackhoes, and backhoes) and loaded onto haul trucks. The pit is expected to be operated depending on construction needs for the closure. When in use, the pit will normally operate Monday through Friday, dawn until dusk. The pit has no full-time employees. During borrow operation; there will generally be from two to ten people working at the pit (not counting truck drivers). The pit operations do not include any mineral preparation or screening/washing activities, and it is not anticipated that such operations may take place in the future. There is one 1,000-gallon double-walled steel fuel storage tank at the pit. Because the fuel storage is below the threshold of 1,320 gallons, a separate Spill Prevention, Control, and Countermeasure (SPCC) plan prepared in accordance with applicable regulations is not required.

This PAP Plan is being submitted as part of the individual NPDES permit issuance application process.

IV. TOPOGRAPHIC MAP

A site vicinity map showing topographic features of the area is shown on Figure 1 and an aerial photo is included as Figure 2. A map showing all of the properties leased by Trans Ash is shown on Figure 3 and a facility site map indicating areas of excavation, pit drainage, access/haul roads, etc. is shown in Figure 4. The Trans Ash Pit actually consists of the pit area that is shown on Figure 4. At the time of writing, it is anticipated that only one pit will be excavated at this time; however, other pit areas will be opened as required in the future.

V. METHOD OF DIVERTING SURFACE WATER RUNOFF

In general, the pit area from which construction materials are mined is to be configured such that surface water runoff is contained within the boundaries proposed for excavation so that most of the stormwater landing on the site will be absorbed into the ground much like an incised pit. However, larger storms (especially if they occur close to each other) can result in runoff that will be directed to a sedimentation pond(s) before discharge to surface waters.

The proposed configuration shows that surface water discharged from the pit excavation (disturbed) areas will be treated in a sedimentation pond before exiting the site under normal operating circumstances. The amount of water discharged through the pond from the site depends on a combination of geological features of the site that allow infiltration (i.e., discharge to groundwater) from rainfall that falls within the pit boundaries and residual runoff that is directed to the stormwater settling pond before discharge. Settling ponds (low areas) within the pit will be formed by excavation (with berms on the downstream edge) without the need to construct dams. The surface water discharge location (DSN 001) associated with this application considers a circumstance where accumulated storm water within the settling pond area inside the pit exceeds the capacity of the pit and settling pond to contain it by events greater than the design storm. In such event, the accumulated stormwater would overflow into drainage conveyances leading to Log Creek. Monitoring of the discharges from the sedimentation pond and the pit excavations and conditions will be conducted to assure that the pit functions as within the limits of its NPDES Permit. If in the future additional controls are needed, this PAP plan must be amended to include engineering design of appropriate drainage control, treatment, and discharge structures.

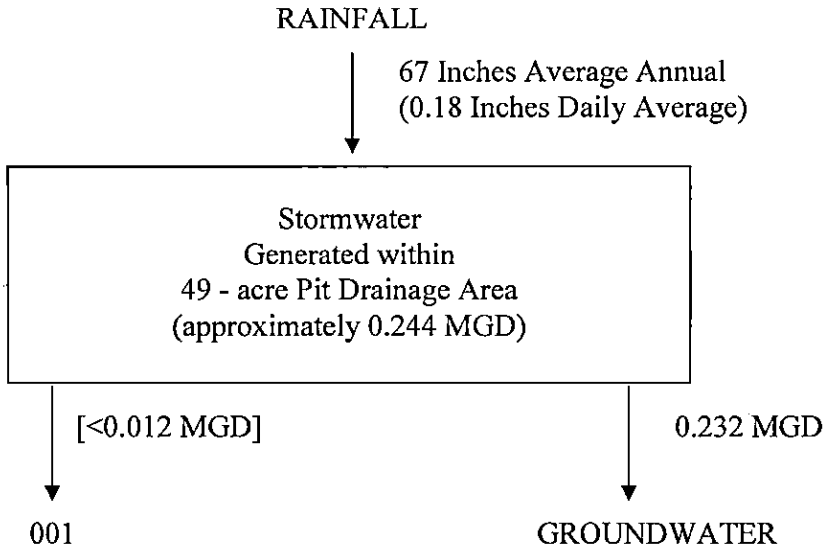
Any minor areas of disturbance that cannot feasibly be routed through the excavated pit area will have Best Management Practices (BMPs) fully implemented and maintained at all times for the control of non-point source pollution (i.e. erosion/sediment transport controls). Such areas shall be vegetated with annual and/or perennial grasses as soon as practical after land disturbance activities are completed.

VI. RAW MATERIALS, PROCESSES AND PRODUCTS

The materials to be mined are sand, clay and topsoil used in construction of a cap for the ash pond at Alabama Power Company's Barry Steam Plant and related activities. There is no mineral preparation, washing, or other processes employed at the pit and washing of sand is not anticipated in the future. Therefore, the only processes that will generate wastewater flows to Log Creek or its tributaries are those associated with removal of the soils, storage of soils and hauling the materials off-site. No chemical or aqueous dust suppressants are anticipated to be used on this site and no chemicals are stored on the site. The only materials present, other than the bulk materials, are diesel fuel, lubricants and hydraulic oils used for and contained in the mobile material handling equipment or stored in the one 1,000 gallon double-walled diesel fuel storage tank.

VII. SCHEMATIC DIAGRAM

The only "process" which results in a regulated discharge is rainfall which generates stormwater within the pit mining area. The excavation area as planned allows rainwater falling on the pit areas to flow across them and most of the water will discharge to groundwater under normal operating conditions. It is estimated that approximately 95% of the water will percolate into the soils and about 5% will runoff to the sedimentation pond. This water will be allowed to settle and the topmost layer will be skimmed off and discharged to Log Creek. Based on an average 67 inches annual rainfall for the area, and a maximum pit drainage collection area of 49 acres, a schematic representation is depicted as follows.



Calculations for the anticipated pit area is included in Appendix E. A sketch of the pond design is included in Appendix C after the Sediment Pond BMP description.

VIII. POST TREATMENT QUANTITY AND QUALITY OF EFFLUENT

Runoff calculations are provided to determine flow and to determine the size of the sedimentation pond and discharge structure. These calculations are discussed in more detail in Section XV of this plan and are included in Appendix E.

As previously noted, field examination of site topography and consideration of site geology indicates that limited surface water discharges will occur from the mining area as presently configured (i.e., 95% of the stormwater will discharge to groundwater). Stormwater that collects in the pit area will temporarily suspend soil particles; however, such suspended solids will be deposited in the lower drainage collection areas (settling ponds) of the pit and will be settled and filtered by natural processes in the ponds and through infiltration.

Concentrations of iron and other metals, conventional pollutants such as BOD and the pH range of the rainfall infiltration would not be expected to be materially altered by the mining activities.

As noted previously, the discharges associated with the application consider where accumulated stormwater in the pit may be removed by discharge during rainfall events. "Average" discharge quantities are negligible. Based on past experience with pits in the

region, pH, five-day biological oxygen demand (BOD5), total suspended solids (TSS), total iron, and total manganese, pollutant loadings potentially associated with such discharges were estimated. The following conditions, assumptions, and analytical data have been used to calculate values for the various outfalls:

Rainfall = 67 inches annual average (0.18 inch daily average)
Runoff coefficient = 0.05
BOD = <2 mg/l
TSS = 7 mg/l
Total Iron = 0.6 mg/l
Total Manganese = 0.035 mg/l
pH = 7.23 s.u.

IX. WASTE TREATMENT FACILITIES

Surface water that collects within the excavated pit area is treated by the natural processes of settling and infiltration. The life expectancy of settling basins effectively provided by the pit operations is considered to be on the order of 15 to 20 years.

As noted earlier, this PAP plan is applicable to future continuing operations where the pit excavation boundaries require discharge of stormwater to surface waters under normal operating conditions. The design of the Waste Treatment Facilities will address applicable criteria and guidance contained in ADEM Admin. Code R. 335-6-9, Appendix A, as well as other generally accepted design data sources. Drainage control structures (e.g., spill pipes and floating weirs) will be designed for peak flows from 2-year frequency storm event. Sedimentation basins (as may be required) will be designed to provide 0.25 acre-feet of storage per each acre of disturbed area, with appropriate provisions for periodic removal of accumulated sediments. Emergency spillway structures, will be designed for 25-year, 24-hour storm event (the pit is not within a public water supply watershed).

X. SEDIMENT CONTROL FOR HAUL ROADS

The sole access road to the pit mining area enters the property (from Roberts Road) at its south property boundary and is shown on Figures 1 and 2. Vegetative buffers and other effective BMPs (when and as needed) shall be implemented and maintained to control erosion and minimize potential sediment transport from the haul road. At present, the haul road does not cross drainage ways. However, should it be necessary to cross a drainage

way in the future, crushed stone surfacing will be used unless otherwise directed by the USACOE permit for the crossing. It should be noted that the majority of the haul road is scheduled to be within the confines of the developed pit area.

In order to mitigate the amount of sediments from the haul road reaching the tributaries of Log Creek, a minimum thickness of six (6) inches of stone by 20 feet in length shall be placed on each side of any branch crossing. The width of the stone shall be dictated by the use of the road but shall be a minimum of 12 feet wide. It is the responsibility of the owner to maintain the stone at the crossings.

Any concrete drainage culverts at each stream crossing shall be kept free of debris at all times to prevent "clogging" of the pipes. When clogged, the streams spill over onto the access roads providing a means for sediment to be transported into Log Creek. It should be noted that beavers are often the primary source of clogging issues at similar installations. The landowner is responsible for managing these culverts so as to keep the haul road passible.

XI. LOCATION OF ALL STREAMS ADJACENT TO MINING AREA

The Site Vicinity Map (Figure 1) depicts the streams and water bodies in the vicinity of the excavations. The actual pit excavation area will be located more than 50 feet (at its closest locations) to Log Creek or to un-named tributaries to Log Creek and outside of the wetlands delineation and flood zone.

It should be noted that any stream crossings will be required to be appropriately permitted by the US Army Corps of Engineers (USACOE).

XII. NON-POINT SOURCE POLLUTION

Since the pit area receives essentially all drainage from disturbed land areas, and accommodates this drainage by discharge to groundwater, non-point sources of pollution are not expected. As noted previously, appropriate BMPs will be implemented and maintained if it becomes infeasible to divert storm water from minor disturbance areas to the pit.

XIII. PUBLIC WATER SUPPLY IMPOUNDMENT

Stormwater from this facility will not discharge to a stream segment classified as a Public Water Supply.

XIV. SPILL PREVENTION CONTROL & COUNTERMEASURES PLAN

There is one 1,000-gallon double-walled steel bulk storage tank for petroleum products planned to be located and used at this facility. If additional storage tanks are located at the facility in the future such that the storage capacity exceeds 1,320 gallons, a Spill Prevention Control and Countermeasure (SPCC) Plan must be prepared. Petroleum products may be brought onto the site in portable, small-quantity capacities for equipment fueling and maintenance and, spill control BMPs shall be used as applicable. These may include structural BMP's and / or the mitigation any spills of pollutants from entering waters of the state. Spill control BMP's may include:

- Maintain onsite (or have readily available) sufficient absorbing material and/or flotation booms to contain and clean-up fuel or chemical spills and leaks.
- All on-site vehicles and equipment should be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage.
- Care should be taken to prevent overfilling and spillage during onsite fueling activities.
- Petroleum products, chemicals, paints, etc. should be stored in clearly labeled and tightly sealed containers.
- All spills of chemicals, paints, and petroleum products, etc. must be cleared up immediately after discovery and disposed of in accordance with applicable environmental regulations. If a spill occurs, notification to regulatory agencies may be required.

In most situations, structural spill prevention controls (when applicable) will require the construction or use of a secondary containment system. Any containment system used to implement this requirement shall be:

1) Constructed of material compatible with the substance (s) contained,
2) Sufficiently impervious to prevent the contamination of groundwater, and

3) Capable of retaining a volume equal to 100 percent of the capacity of largest tank for which containment is provided plus an allowance for rainwater. In this area the allowance is approximately 9 inches.

The Permittee shall prepare, implement, and maintain a Spill Prevention, Control and Countermeasure (SPCC) Plan if the cumulative storage capacity of fuel or other oils at the facility is greater than 1,320 gallons. The plan must be consistent with the requirements of 40 CFR 112.

XV. RUNOFF CALCULATIONS

Runoff calculations that consider a circumstance where a surface water discharge results from pumping or overflow of accumulated storm water have previously been presented. If future amendment to this PAP is required to allow for discharge for other configurations than planned in paragraph "V. METHOD OF DIVERTING SURFACE WATER RUNOFF", the Rational Method (Q=CiA) will be used for calculation of peak discharges. As may be required, sedimentation basin spill pipes and discharge weirs will be designed for two-year frequency storms, whereas emergency spillway structures will be designed for 25-year frequency, 24-hour duration events (estimated at 9.5 inches of rainfall for the project area).

XVI. RECLAMATION PROCEDURE

As mining is completed in an area, the area shall be dressed to minimize piles of dirt and intermediate low areas that would be difficult to establish vegetation. Surfaces will be graded, with terraces as necessary, to facilitate erosion control and to continue direct drainage to infiltration sumps, which will remain until reclamation is completed. Final reclamation will include establishment of permanent vegetation as needed for erosion and sediment control.

During operation and reclamation, erosion and sediment control measures such as wattles, riprap, cleared trees, and other acceptable BMPs will be used as needed.

The reclamation procedures will meet requirements of the Alabama Surface Mining Act of 1969, as amended by Act 99-579, and as regulated under permits reviewed and renewed annually by the Alabama Department of Labor (ADOL). Reclamation procedures will

commence contemporaneously with ongoing mining activities, once all mining activities are completed in a portion of the total area to be mined.

A minimum 50-foot setback (undisturbed buffer strip) will be maintained between surface mining areas and areas which could be adversely affected by mining (watercourses, adjoining properties, or other features, as applicable). The setback shall have lateral support graded to a 3:1 slope or flatter, stabilized, mulched, fertilized, and planted in native grasses and legumes.

High walls (uphill side of excavation) require grading and/or backfilling to a 3:1 or flatter slope, and shall be provided soil stabilization and/or drainage control as necessary for protection.

During reclamation, all disturbed areas will be revegetated by applying lime and/or fertilizer, as recommended by a comprehensive soil analysis, then mulched and seeded with permanent native grasses and legumes to achieve a minimum 75% vegetative cover.

Reclamation of affected land will be completed within two (2) years from the date of expiration of the Alabama Department of Labor (ADOL) permit. The summary of requirements is included in Appendix D.

XVII. BMP TYPICALS

Attached as Appendix B are erosion and sediment control, design and maintenance criteria for typical BMP's that may be employed, as applicable.

Construction Exit Pads - will be used at the intersection of any public roads and the pit entrance road.

Land Grading - will be used to provide suitable topography and move stormwater to appropriate drainage features and ultimately to the stormwater pond for treatment and discharge.

Topsoiling – Topsoil will be stockpiled as appropriate for use on the site to support grassing efforts and for use at the Ash Pond Closure Site.

Mulching - may be used as needed to protect soil surfaces that are going to be exposed to stormwater for an extended time before seeding or other vegetation establishment.

Seeding – will be used to stabilize soils for both temporary and permanent purposes. If an area is to be left disturbed for an extended period before mining, it may be seeded temporarily. If an area has been mined and will not be reused, it shall be permanently seeded.

Preservation of Vegetation – shall be used in areas that are not to be mined or as buffer areas around designated features.

Check Dams – shall be used during the mining process when concentrated flows develop and stormwater velocities get high enough to cause erosion. These may be permanent or temporary depending on the stage and location of the mining effort.

Diversions – are raised berms or depressions that are part of the *Land Grading* BMPs and carry stormwater to stable outlets that lead to temporary ponds or to the stormwater pond.

Outlet Protection – used at the exit of the stormwater pond to prevent erosion.

Flocculent – is used to enhance settling in the sediment pond. This BMP is to be used when sediment loads increase on the pond and/or enhanced settling is desired.

Sediment Barriers – Sediment barriers can be used to reduce the sediment loading from an area. They shall be used along new roadways as perimeter barriers to prevent sediment from the roads and work areas from impacting nearby spaces that are downslope.

Sediment Basin – (Sediment Pond or Stormwater Pond) is to be placed as shown on Figure 4. The minimum size of the pond is 3,991,936 gallons and shall be 450' in length and 148' in width comprising 1.53 acres. The pond must have 3:1 sides and equipped with a floating weir or skimmer as an outlet. Details are included in Appendix C after the Sediment Pond (Basin) BMP description.

XVIII. CHEMICALS/COMPOUNDS AND POTENTIAL TOXICITY SOURCES

No chemicals other than Polyacrylamide (PAM), diesel fuel, gasoline and lubrication oils are anticipated to be used on this site.

XIX EPA FORM 2D or EPA FORM 2C

A waver is requested for completion of EPA forms 2C and/or 2D as this is a new pit that has not discharged treated stormwater.

XX COPY OF ASMC REQUIRED WATER QUALITY RELATED DATA AND INFORMATION

Because this PAP is for a dirt pit that has not been constructed, no water quality data is available or has been developed. In addition, ASMC Water Quality Data is only required to be developed or submitted for Coal Mining Pits and is therefore not applicable.

XXI DESIGN DATA

If in the future, additional controls are needed, this PAP plan must be amended to include engineering design of appropriate drainage control, treatment, and discharge structures. The pertinent design data shall be incorporated via an addition to the Appendices.

REFERENCES

Illustrations, design and maintenance, and appropriate utilization of Best Management Practices (BMPs) as presented in Appendix C have been adapted from the following sources:

1) Alabama Department of Transportation. 1997. *Details of Silt Fence* in *Special and Standard Highway Drawings* (Drawing No.: EC 665-F). Montgomery, Alabama.

2) Alabama Soil and Water Conservation Committee. 2018. *Erosion, Sediment Control, and Storm Water Management on Construction Sites and Urban Areas.* Montgomery, Alabama.

3) Caraco, D. S., 2000, Watershed protection techniques, *Strengthen Silt Fences* 2 (3) pp. 424-428 In Schueler, T. R. and Holland H., 2002 The practice of watershed protection Center for Watershed Protection, Silver Spring, Maryland

4) DeWiest, D. R. and E. H. Livingston 1999. *The Florida Stormwater Erosion and Sediment Control Inspectors Manual.* Florida Department of Environmental Protection

5) Fifeld, Jerald S., 2004. *Design For Effective Sediment and Erosion Control; On Construction Sites.* Forester Press

6) Georgia Soil and Water Conservation Commission. 1997. *Field Manual for Erosion and Sediment Control in Georgia, Vegetative and Structural Best Management Practices (BMPs) for Land –Disturbing Activities.* Athens, Georgia.

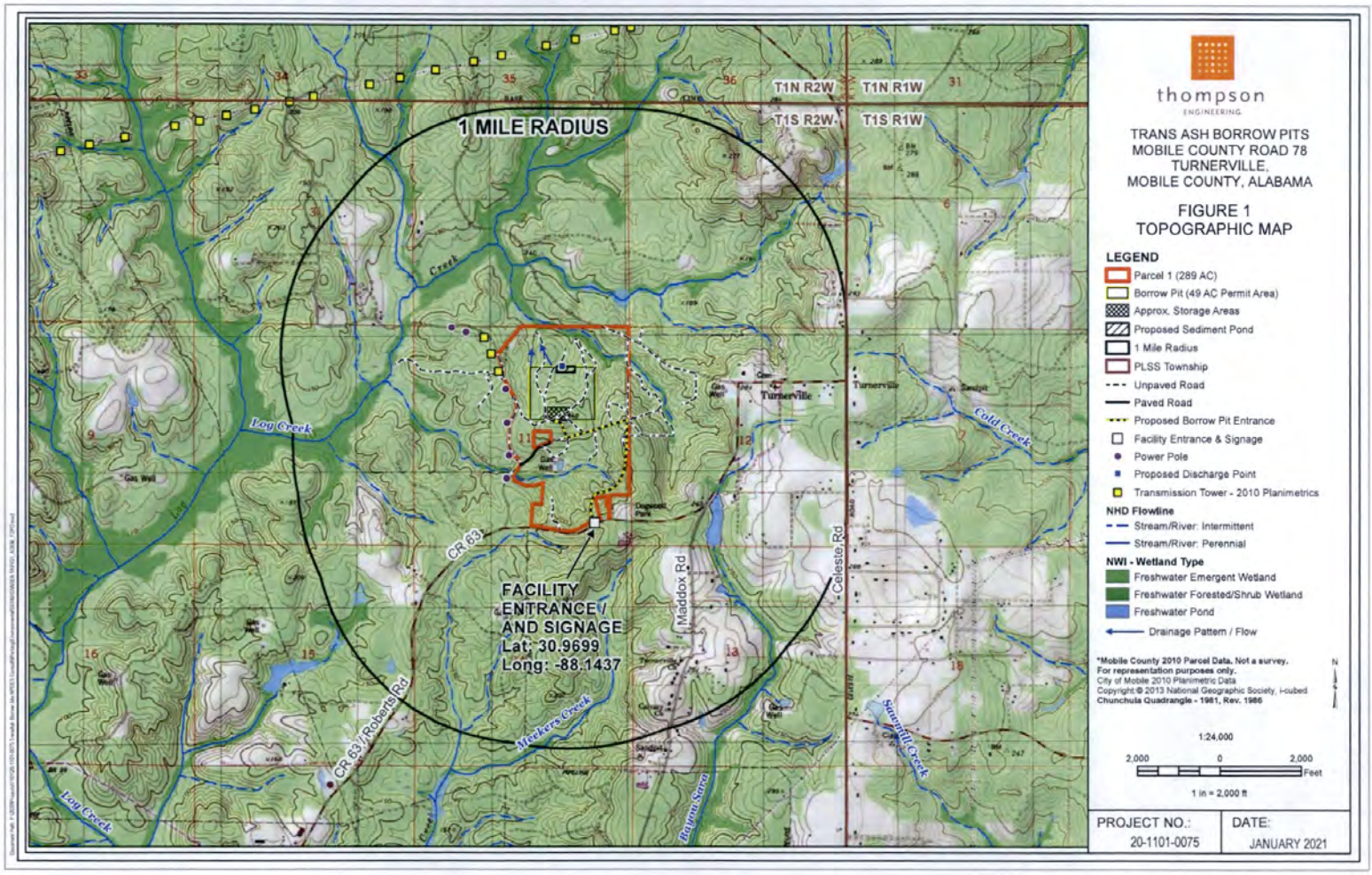
7) Georgia Soil and Water Conservation Commission. 2000. *Manual for Erosion and Sediment Control in Georgia.* Athens, Georgia.

8) Patterson, R. G. 1994. "Construction Practices: *The Good, the Bad and the Ugly.* Watershed Protection Techniques 1(3): 95-99.

9) Roberts, B.C. 1995. *Best Management Practices for Erosion and Sediment Control.* Eastern Federal Lands Highway Design, Federal Highway Administration Report No. FHWA-FLP-94-005, 21400.

10) Schueler, T. R. 2000. Watershed protection techniques, *Muddy Water In-Muddy Water Out.* 2(3): 393-403. Schueler, T. R. and Holland H., 2000. The practice of watershed protection. Center for Watershed Protection, Silver Spring, Maryland

11) United States Environmental Protection Agency, 1992. *Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices.* EPA832-R-92-005. Washington, DC.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T1N R1W
T1S R2W
T1S R1W
FACILITY ENTRANCE / AND SIGNAGE
Lat: 30.9699
Long: -88.1437
CR 63
CR 63 / Roberts Rd
Maddox Rd
Celeste Rd
Log Creek
Meekers Creek
Cold Creek
Turnerville
thompson
ENGINEERING
TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE,
MOBILE COUNTY, ALABAMA
FIGURE 1
TOPOGRAPHIC MAP
LEGEND
Parcel 1 (289 AC)
Borrow Pit (49 AC Permit Area)
Approx. Storage Areas
Proposed Sediment Pond
1 Mile Radius
PLSS Township
Unpaved Road
Paved Road
Proposed Borrow Pit Entrance
Facility Entrance & Signage
Power Pole
Proposed Discharge Point
Transmission Tower - 2010 Planimetrics
NHD Flowline
Stream/River: Intermittent
Stream/River: Perennial
NWI - Wetland Type
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Drainage Pattern / Flow
*Mobile County 2010 Parcel Data. Not a survey.
For representation purposes only.
City of Mobile 2010 Planimetric Data
Copyright © 2013 National Geographic Society, i-cubed
Chunchula Quadrangle - 1961, Rev. 1986
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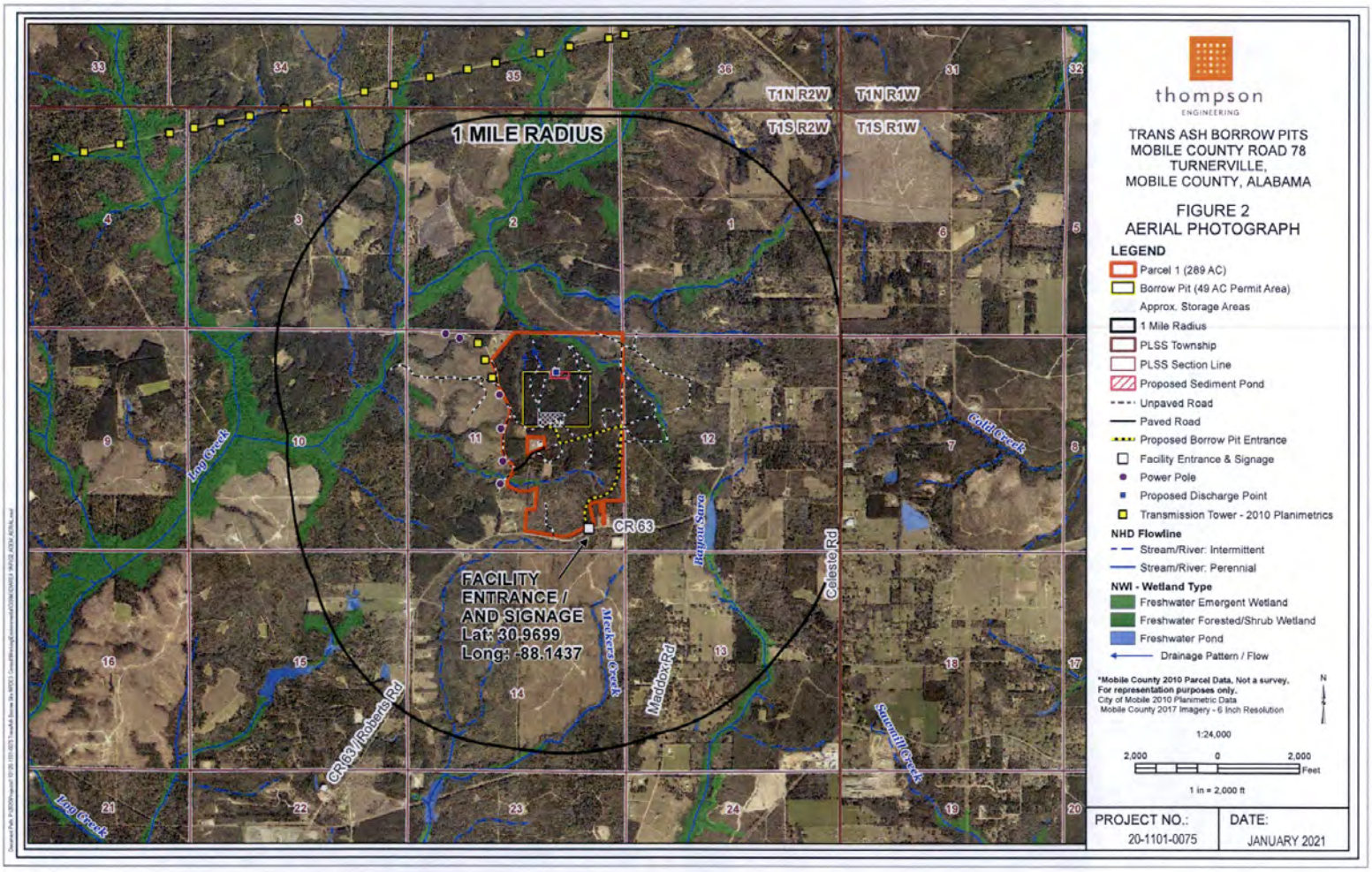
1 in = 2,000 ft
PROJECT NO.: 20-1101-0075
DATE: JANUARY 2021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T1N R2W
T1N R1W
T1S R2W
T1S R1W
CR 63
FACILITY ENTRANCE / AND SIGNAGE
Lat: 30.9699
Long: -88.1437
CR63 / Roberts Rd
Celeste Rd
Maddox Rd
Log Creek
Meckers Creek
Bayou Sara
Colitt Creek
Sawmill Creek
thompson
ENGINEERING
TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE,
MOBILE COUNTY, ALABAMA
FIGURE 2
AERIAL PHOTOGRAPH
LEGEND
Parcel 1 (269 AC)
Borrow Pit (49 AC Permit Area)
Approx. Storage Areas
1 Mile Radius
PLSS Township
PLSS Section Line
Proposed Sediment Pond
Unpaved Road
Paved Road
Proposed Borrow Pit Entrance
Facility Entrance & Signage
Power Pole
Proposed Discharge Point
Transmission Tower - 2010 Planimetrics
NHD Flowline
Stream/River: Intermittent
Stream/River: Perennial
NWI - Wetland Type
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Drainage Pattern / Flow
*Mobile County 2010 Parcel Data, Not a survey.
For representation purposes only.
City of Mobile 2010 Planimetric Data
Mobile County 2017 Imagery - 6 Inch Resolution
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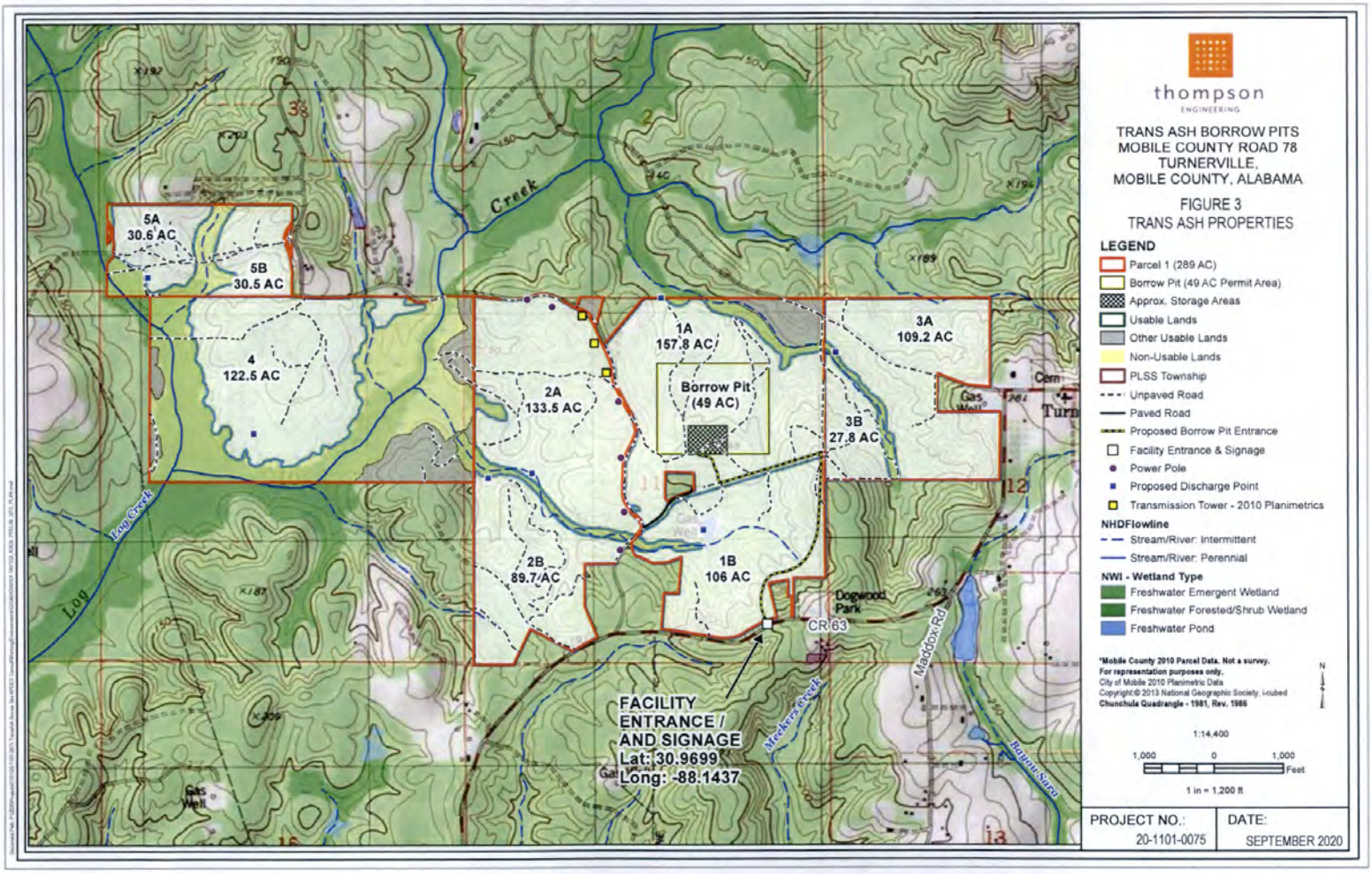
PROJECT NO.: 20-1101-0075
DATE: JANUARY 2021


5A
30.6 AC
5B
30.5 AC
4
122.5 AC
2A
133.5 AC
1A
157.8 AC
Borrow Pit
(49 AC)
3A
109.2 AC
3B
27.8 AC
2B
89.7 AC
1B
106 AC
Log Creek
Log
Creek
Dogwood
Park
CR 63
Maddox Rd
Meckers Creek
Gas
Well
FACILITY
ENTRANCE /
AND SIGNAGE
Lat: 30.9699
Long: -88.1437
thompson
ENGINEERING
TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE,
MOBILE COUNTY, ALABAMA
FIGURE 3
TRANS ASH PROPERTIES
LEGEND
Parcel 1 (289 AC)
Borrow Pit (49 AC Permit Area)
Approx. Storage Areas
Usable Lands
Other Usable Lands
Non-Usable Lands
PLSS Township
Unpaved Road
Paved Road
Proposed Borrow Pit Entrance
Facility Entrance & Signage
Power Pole
Proposed Discharge Point
Transmission Tower - 2010 Planimetrics
NHDFlowline
Stream/River: Intermittent
Stream/River: Perennial
NWI - Wetland Type
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
*Mobile County 2010 Parcel Data. Not a survey.
For representation purposes only.
City of Mobile 2010 Planimetric Data
Copyright © 2013 National Geographic Society, i-cubed
Chunchula Quadrangle - 1981, Rev. 1986
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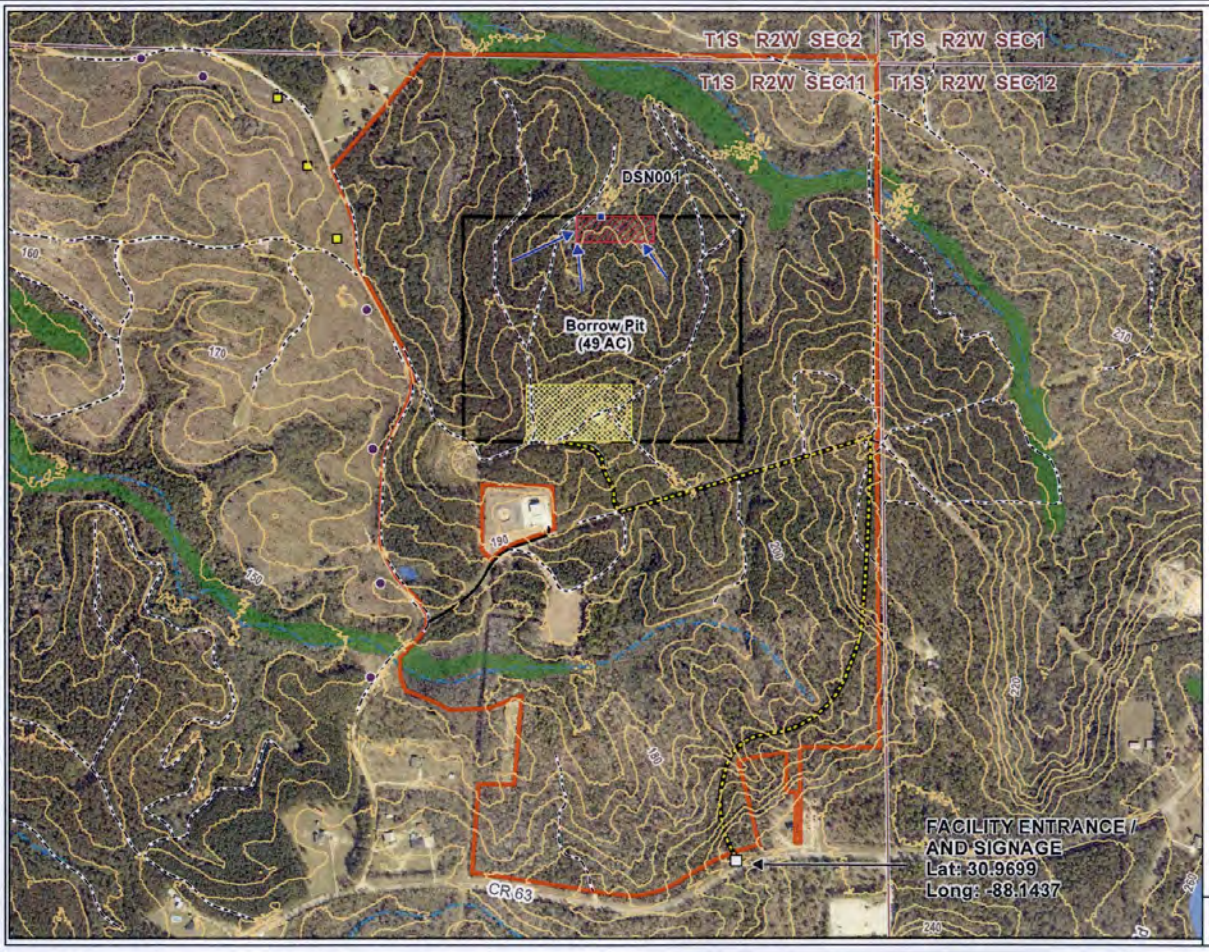
1,000 0 1,000 Feet
1 in = 1,200 ft
PROJECT NO.:
20-1101-0075
DATE:
SEPTEMBER 2020



thompson
ENGINEERING

TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE,
MOBILE COUNTY, ALABAMA

FIGURE 4
PRELIMINARY SITE PLAN
AND SEDIMENT POND LOCATIONS

LEGEND

- Parcel 1 (289 AC)
- Borrow Pit (49 AC Permit Area)
- Approx. Storage Areas
- Proposed Sediment Pond
- PLSS Section Line
- 10 Foot Contours (2014)
- Unpaved Road
- Paved Road
- Proposed Borrow Pit Entrance
- Facility Entrance & Signage
- Power Pole
- Proposed Discharge Point
- Transmission Tower - 2010 Planimetrics

NHDFlowline

- Stream/River: Intermittent

NWI - Wetland Type

- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Drainage Pattern / Flow

*Mobile County 2010 Parcel Data. Not a survey. For representation purposes only.
City of Mobile 2010 Planimetric Data
Mobile County 2017 Imagery - 6 Inch Resolution

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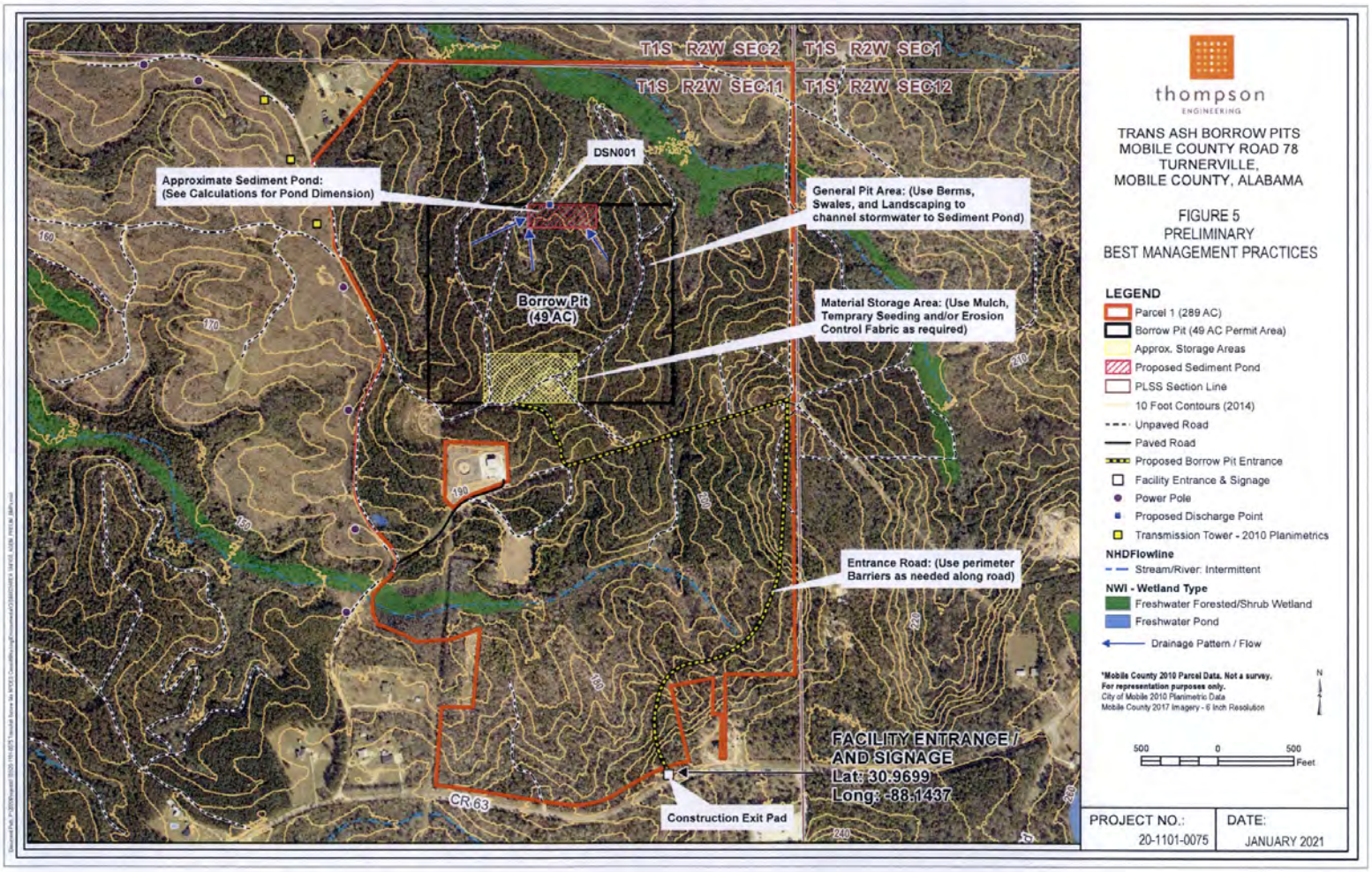
PROJECT NO.:	DATE:
20-1101-0075	JANUARY 2021


T1S R2W SEC2
T1S R2W SEC1
T1S R2W SEC11
T1S R2W SEC12
DSN001
Approximate Sediment Pond:
(See Calculations for Pond Dimension)
General Pit Area: (Use Berms, Swales, and Landscaping to channel stormwater to Sediment Pond)
Borrow Pit
(49 AC)
Material Storage Area: (Use Mulch, Temprary Seeding and/or Erosion Control Fabric as required)
Entrance Road: (Use perimeter Barriers as needed along road)
FACILITY ENTRANCE / AND SIGNAGE
Lat: 30.9699
Long: -88.1437
Construction Exit Pad
CR 63
160
170
180
190
200
210
220
230
240
thompson
ENGINEERING
TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE,
MOBILE COUNTY, ALABAMA
FIGURE 5
PRELIMINARY
BEST MANAGEMENT PRACTICES
LEGEND
Parcel 1 (289 AC)
Borrow Pit (49 AC Permit Area)
Approx. Storage Areas
Proposed Sediment Pond
PLSS Section Line
10 Foot Contours (2014)
Unpaved Road
Paved Road
Proposed Borrow Pit Entrance
Facility Entrance & Signage
Power Pole
Proposed Discharge Point
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Drainage Pattern / Flow
*Mobile County 2010 Parcel Data. Not a survey.
For representation purposes only.
City of Mobile 2010 Planimetric Data
Mobile County 2017 Imagery - 6 Inch Resolution
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Feet
PROJECT NO.: 20-1101-0075
DATE: JANUARY 2021

Appendix A

ADEM SURFACE MINING RULES

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WATER DIVISION - WATER QUALITY PROGRAM
ADMINISTRATIVE CODE

CHAPTER 335-6-9
SURFACE MINING RULES

TABLE OF CONTENTS

335-6-9-.01 Purpose. This Chapter is promulgated in order to protect, maintain and improve the quality of waters of the state and to provide for the prevention, abatement and control of new or existing water pollution associated with surface mining operations.
Author: Joe Myers
Statutory Authority: Code of Ala. 1975, §§22-22-9, 22-22A-5, 22-22A-6, 22-22A-8.
Effective: June 10, 1982. Amended: October 10, 1984.

335-6-9-.02 Definitions. The following words and phrases, unless a different meaning is plainly required by the context, shall have the following meanings:

(a) "advance prospecting" shall mean the removal of overburden for the purpose of determining the location, quality or quantity of a natural deposit in an area not to exceed two acres per forty acre tract.

(b) "discharge" shall mean any addition of any pollution to any stream.

(c) "non-point source pollution" shall mean sources, other than point sources, from which pollution is or may be added to any stream.

(d) "NPDES Rules" shall mean applicable National Pollutant Discharge Elimination System Rules of the Department.

(e) "overburden" shall mean the strata or material overlying a natural deposit of coal, lignite, bauxite, gravel, gold, marble, or any other mineral in its natural state, and shall mean such strata or material both before and after its removal by surface mining.

(f) "pit" shall mean any tract of land from which overburden has been or is being removed for the purpose of surface mining.

(g) "point source pollution" shall mean any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit or well from which pollution is or may be added to any stream.

(h) "sedimentation basin, settling pond or collection pool" shall mean any natural or artificial structure, depression or body of water into which waters used in any phase of the mineral washing process are discharged for treatment, to include solids removal, pH adjustment or other necessary operations.

(i) "stream" shall mean any body of water having a drainage area in excess of one square mile.

(j) "surface mining" shall mean all or any part of the process of recovering coal, lignite, iron, clay, sand, bauxite, gravel, ores, gold, marble or any other material or mineral by removal of such mineral from the surface or by removal or displacement of the strata or material which overlies such mineral deposits in its natural condition, and shall include but not be limited to the open-pit or open-cut method, the auger method and the highwall mining method. As used in this Chapter, "surface mining" shall not be interpreted to include dredging operations or advance prospecting.

(k) "surface mining operation" shall mean all of the premises, facilities, roads and equipment used for the process of surface mining in a designated area.

(l) "surface mining operator" shall mean any person, firm, corporation or partnership engaged in or controlling a surface mining operation including any agent or independent

contractor engaged in surface mining under a contract with such person, firm, corporation or partnership.
Author: Joe Myers
Statutory Authority: Code of Ala. 1975, §§22-22-9, 22-22A-5, 22-22A-6, 22-22A-8.
History: Effective: June 10, 1974. Amended: January 10, 1981; October 10, 1984.

335-6-9-.03 Pollution Abatement And/Or Prevention Plan.

(1) All surface mining operations shall be conducted in such a manner as to minimize their impact on water quality to avoid contravention of applicable water quality standards. To this end, all surface mine operators shall provide the Department with a pollution abatement and/or prevention plan.

(2) The pollution abatement and/or prevention plan shall be prepared and certified by a registered professional engineer, licensed to practice engineering in the State of Alabama, as required by Chapter 335-6-3, and shall be submitted in a format acceptable to the Department's staff. The plan shall include, as a minimum, the following:

(a) name and address of the operator and a legal description of the area to be mined.

(b) general information, including name and affiliation of company, number of employees, product(s) to be mined, hours of operation and water supply and disposition.

(c) topographic map showing location of mine, preparation plant, settling basin and all wastewater discharge points.

(d) method and plan for diverting surface water runoff from operational areas and mineral and refuse storage piles.

(e) narrative account of operation(s) explaining and/or defining raw materials, processes and products. Blockline or schematic diagrams indicating points of waste origin and its collection and disposal shall be included.

(f) quantity and characteristics of waste after treatment with respect to flow, suspended solids, total iron and pH.

(g) description of waste treatment facilities, pretreatment measures and recovery systems including expected life of sedimentation basins and schedules for cleaning or proper abandonment of such basins. If earthen sedimentation basins are a portion of the treatment scheme, plans for the construction of these facilities should meet minimum construction criteria as found in the Guidelines in Appendix A.

(h) a plan to eliminate or minimize sediment and other pollutants from haul roads must be included and should meet minimum design criteria as established by the Guidelines in Appendix B.

(i) location of all streams in or adjacent to the mining area and those measures which will be taken to minimize the impact on water quality when the mining operation is located in close proximity to such streams. Such measures may include but not be limited to setbacks, buffer strips or screens.

(j) those measures to be employed to minimize the effect of any non-point source pollution which may be generated as a result of the surface mining operation.

(k) all pollution abatement facilities must be certified by the design engineer as being constructed in accordance with the approved plans.

(l) the applicant shall specify if the proposed mining operation is to be constructed in the watershed of an impoundment classified as a public water supply or a direct tributary thereon.

(m) the Department shall publish, and revise as necessary, guidelines which shall be the basis for formulating pollution abatement and/or prevention plans required by this Chapter.

(n) any other information required for NPDES permit applications under applicable NPDES Rules.

Author: Joe Myers

Statutory Authority: Code of Ala. 1975, §§22-22-9, 22-22A-5, 22-22A-6, 22-22A-8.

History: Effective: June 14, 1974. Amended: January 13, 1978; October 19, 1979; January 10, 1981; October 10, 1984.

335-6-9-.04 Acceptance Of Plan. Upon review of the plan required in Rule 335-6-9-.03, the Department shall notify the

operator, in writing, of the acceptance or rejection of his plan. If such plan is accepted, the Department shall issue a permit to conduct the mining operation and operate any waste treatment facility required in the plan. If such plan is not accepted, the applicant shall be advised of the reasons of such rejection.
Author: Joe Myers
Statutory Authority: Code of Ala. 1975, §§22-22-9, 22-22A-5, 22-22A-6, 22-22A-8.
History: Effective: June 14, 1974. Amended: January 10, 1981; October 10, 1984.

335-6-9-.05 Permit Required.

(1) All surface mining operations must have an NPDES permit issued by the Department pursuant to this Chapter. Such permits shall conform with, and be issued in accordance with, NPDES Rules.

(2) The permit to conduct any surface mining operation shall be based on a determination by the Department that the pollution abatement and/or prevention plan and accompanying data submitted by the applicant is adequate to provide for protection of water quality in and adjacent to the area of operations and the pollution abatement and/or prevention plan and any amendments or modifications thereto shall become a part of the permit upon its acceptance.

(3) Any waste treatment facility required in the pollution abatement and/or prevention plan shall be specifically identified in the permit and any special conditions applicable to the operation of such facilities shall be included.

(4) Effluent limitations, for point source pollution, monitoring requirements and compliance schedules, if necessary for each applicant, will be specified in the permit conditions.

(5) Permits issued pursuant to this Rule shall be valid for a period of five years from the date of issuance, unless suspended, modified or revoked.
Author: Joe Myers
Statutory Authority: Code of Ala. 1975, §§22-22-9, 22-22A-5, 22-22A-6, 22-22A-8.
History: Effective: June 14, 1974. Amended: January 13, 1978; October 19, 1979; January 10, 1981; October 10, 1984.

335-6-9-.06 Special Limitations.

(1) No operator shall conduct his operation in such a manner as to place, or cause to be placed into a stream, soil, rock, trees, overburden or any other debris or material associated with mining operations.

(2) No untreated wastewater from a mineral preparation plant, washing operation or contaminated surface runoff from mineral storage piles or refuse piles shall be discharged into any stream.

(3) All water which is used to wash coal, gravel or other minerals shall be directed to specially constructed sedimentation basins or abandoned mines. The location and construction of such basins and/or the utilization of any abandoned mine for disposal, must be approved by the Department.

(4) No earthen sedimentation basin utilized in conjunction with mining operations shall be abandoned without staff approval or without release of all reclamation bonds by either the Alabama Surface Mining Commission or the Alabama Department of Industrial Relations. The Department staff shall be notified in writing of the intent to either abandon, reclaim or permanently leave sediment ponds with such notification including those measures to be taken by the operator to comply with this Chapter.

(5) In no event shall effluent limitations applicable to any waste treatment facility be less stringent than any applicable state law, rule, interim rule, guideline, or interim guideline, or any federal law, regulation, interim regulation, guideline or interim guideline, whichever is the more stringent, which is in effect at the time permit conditions for such facilities are derived.

Author: Joe Myers
Statutory Authority: Code of Ala. 1975, §§22-22-9, 22-22A-5, 22-22A-6, 22-22A-8.
History: Effective: June 14, 1974. Amended: January 13, 1978; January 10, 1981; October 10, 1984.

335-6-9-.07 Setbacks.

(1) All setbacks established under Alabama Law are incorporated by reference.

(2) Setbacks on other water courses shall be determined as necessary to protect water quality.
Author: Joe Myers
Statutory Authority: Code of Ala. 1975, §§22-22-9, 22-22A-5, 22-22A-6, 22-22A-8.
History: Effective: June 14, 1974. Amended: January 13, 1978; January 10, 1981; October 10, 1984.

335-6-9-.08 **Implementation.**

(1) Applicants who wish to begin a new operation shall comply with the provisions of this Chapter prior to commencing such operation.

(2) Those surface mining operators currently holding valid waste discharge permits for mineral preparation or washing facilities or surface mining permits, as issued by the Alabama Water Improvement Commission, need not apply for a new permit for such facilities until notified of any necessary revisions, deletions, additions or other changes needed to bring such permits in compliance with this Chapter.
Author: Joe Myers
Statutory Authority: Code of Ala. 1975, §§22-22-9, 22-22A-5, 22-22A-6, 22-22A-8.
History: Effective: June 14, 1974. Amended: January 13, 1978; January 10, 1981; October 10, 1984.

GUIDELINES FOR MINIMIZING THE EFFECTS OF SURFACE MINING AND SURFACE EFFECTS OF UNDERGROUND MINING ON WATER QUALITY

Recognizing that there are wide variations in the circumstances and conditions surrounding and arising out of the strip mining and underground mining processes, such variables include but not limited to topography, climatic conditions, location of material deposits and soil types, the rules adopted by the Department are of a broad, general nature. They have been designed to provide flexibility to both the Department and the mine operator in preparing a plan of operation with each plan being tailored to a specific set of conditions. The following guidelines should be used as minimum criteria in formulating any pollution abatement and/or prevention plan required by Rule 335-6-9-.03 adopted by the Department and for any plan which the technical staff may require to minimize the surface effects of underground mining on water quality.

APPENDIX A

Sedimentation Controls

(1) Pollution abatement facilities should be designed and constructed so as to control both spoil runoff and pit drainage.

(2) Pit drainage and spoil runoff should be diverted through the sedimentation basin by means of diversion ditches or normal drainage patterns. In cases where it is not practical to use this system, then natural vegetation, vegetative windrows, hay berms, earthen berms or other equally effective systems may be utilized.

(3) The sediment basin should have a minimum capacity to store 0.25 acre feet/acre of disturbed area in the drainage area. The basin shall be cleaned out when the sediment accumulation approaches 60 percent of the design capacity. All trees, boulders and other obstructions must be removed from the basin during the initial construction phase to facilitate clean-out.

(4) The dam for the sediment basin should be designed and built using the following as minimum criteria:

(a) the top of the dam should be no less than 12 feet wide.

(b) the slope on either side of the dam should be no steeper than 3:1.

(c) the dam should be constructed wide a cutoff trench at least 8 feet wide. The side slopes should be no less than 1:1. The cutoff trench shall be located on the dam centerline and be of sufficient depth (not less than 2 feet) to extend into a relatively impervious layer of soil or to bedrock and shall be filled with a relatively impervious material from which the core of the dam shall be constructed.

(d) the entire embankment and cutoff trench shall be compacted to 95 percent density, based on standard proctor as outlined in ASTM.

(e) the material placed in the embankment should be free to sod, roots, stones over 6 inches in diameter and other objectionable materials. The fill material should be placed and spread over the entire fill area, starting at the lowest point of the foundation, in layers not to exceed 12 inches in thickness.

Construction of the fill should be undertaken only at such times that the moisture content of the fill material will permit satisfactory compaction in accordance with subparagraph (4)(d) above.

(f) the spillpipe should be seized to adequately carry the expected peak flow from a one-year frequency storm.

(g) the spillpipes should be made of a material capable of withstanding chemical reactions caused by the quality of the water being discharged.

(h) the spillpipe should be equipped with a device, or constructed, such to ensure that subsurface withdrawal is accomplished in order to ensure that no floating solids are discharged.

(i) the spillpipes should be equipped with anti-seep collars at each joint which radiate at least 2 feet from the pipe in all directions. The collars and their connections to the pipe should be watertight.

(j) a splash pad or riprap should be placed under the discharge of the spillpipe, or the location of the discharge set, so as to ensure that the discharge does not erode the dam.

(k) the emergency spillway should be designed to safely carry the expected peak flow from a 25 year, 24 hour storm or shorter duration. When designing spillways that are in the drainage course of a public water supply, then 50 years, 24 hour or shorter duration data should be used. The slope of the entrance and exit to the emergency overflow should not exceed 3 percent. The emergency overflow should be constructed with a control section at least 20 feet long. The side slopes of the emergency overflow should not be steeper than 2:1. The emergency overflow should be riprapped or concreted in order to prevent erosion.

(l) there should be a minimum of 1 1/2 feet of freeboard between the normal overflow and the emergency overflow. There should be at least 1 1/2 feet of freeboard between the maximum design flow elevation in the emergency overflow and the top of the dam.

(m) if basins are built in series, then the emergency overflow for each should be designed to accommodate the entire drainage area.

(n) the dam should be sowed with both perennial and annual grasses in order to ensure erosion is minimized. Hay bails

or riprap should be placed at the toe of the dam immediately upon completion of construction.

(5) Areas in which surface mined minerals are stockpiled, and areas in which refuse resulting from any type of mining operation is or has been deposited, should be provided with diversion ditches or other appropriate methods of intercepting surface water in such a way as to minimize the possibility of sediment laden, acidic or toxic waters from such areas, being deposited into a stream.

APPENDIX B

Haul Roads

(1) In order to minimize sediment from haul roads:

(a) no sustained grade should exceed 10 percent;

(b) the maximum grade should not exceed 15 percent for 300 feet;

(c) there should not be more than 300 feet of 15 percent maximum grade for each 1,000 feet of road constructed;

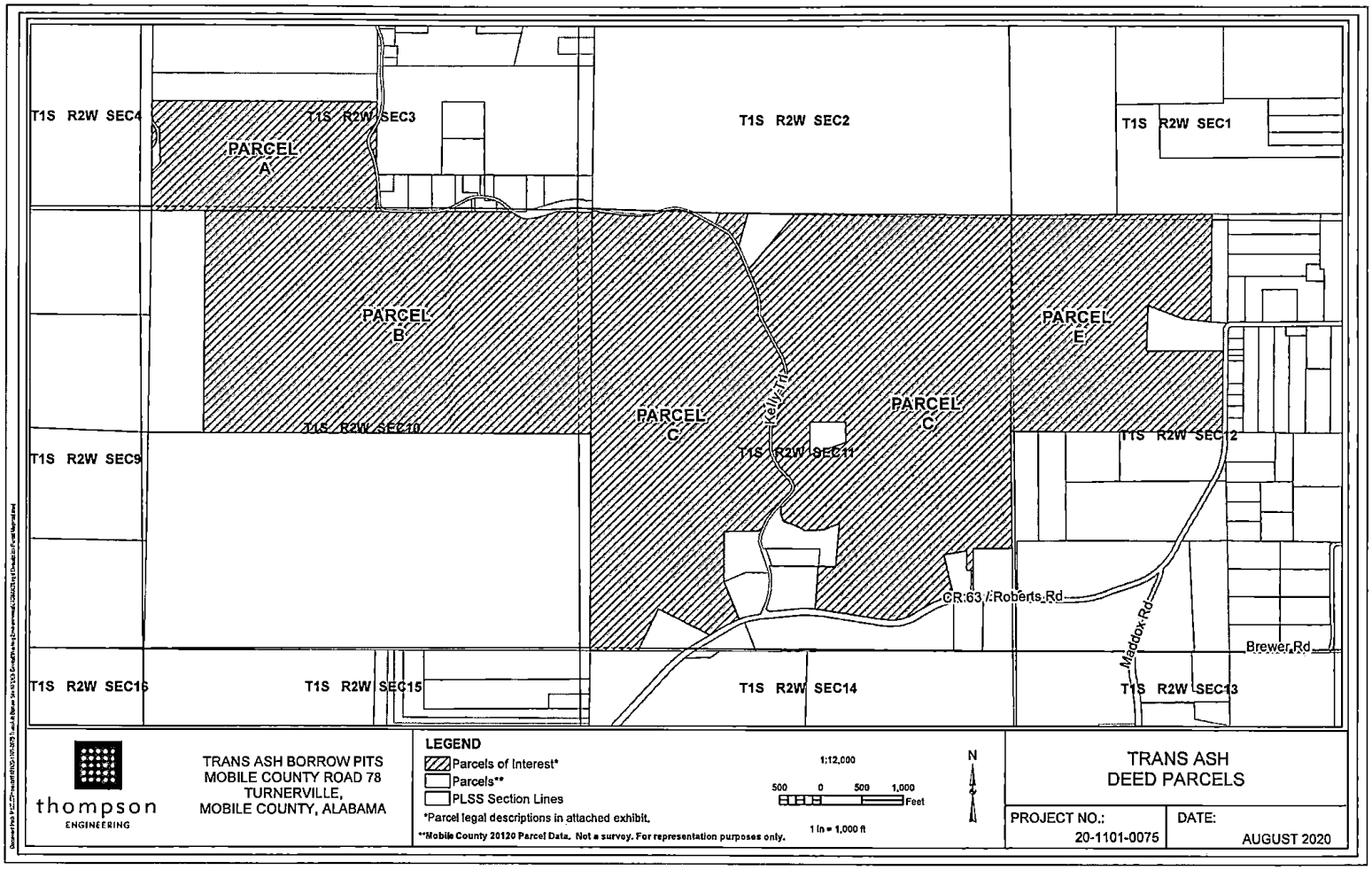
(d) the haul road, wherever possible, should be located so that runoff from the road enters a sediment basin constructed for the mining operation.

(e) outer slopes for haul roads out of the permitted area should not be steeper than 2:1 and should be seeded with annual and perennial grasses with at least 80 percent cover to avoid erosion. Where this is not possible, basins, hay filters or diversion ditches should be cut, built or placed to intercept runoff. Details outlining control measures must be included with the abatement plan.

(2) Stream crossings should be avoided; however, any crossings which are necessary and which meet technical staff approval should be detailed with drawings and any other pertinent data in the pollution abatement plan, using best engineering practices.

Appendix B

LEGAL DESCRIPTION



thompson ENGINEERING

TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE,
MOBILE COUNTY, ALABAMA

LEGEND

- Parcels of Interest*
- Parcels**
- PLSS Section Lines

*Parcel legal descriptions in attached exhibit.

**Mobile County 20120 Parcel Data. Not a survey. For representation purposes only.

1:12,000

500 0 500 1,000 Feet

1 In = 1,000 ft

N

TRANS ASH
DEED PARCELS

PROJECT NO.:	DATE:
20-1101-0075	AUGUST 2020

STATE OF ALABAMA)

COUNTY OF MOBILE)

WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS, that the undersigned, Richard Fincher, a married person, hereinafter called the Grantor, in consideration of the sum of TEN DOLLARS AND NO/100 DOLLARS ($10.00), cash, and other good and valuable considerations to said Grantor in hand paid by Melo Investments, Inc., hereinafter called the Grantee, the receipt of which is hereby acknowledged by the Grantor, does hereby, subject to the matters and things hereinafter set forth, grant, bargain, sell and convey unto the Grantee, its successors and assigns all that real property situate, lying and being in the County of Mobile, State of Alabama, described as follows, to-wit:

SEE ATTACHED EXHIBIT "A" FOR LEGAL DESCRIPTION

Together with all and singular the rights, privileges, tenements, hereditaments and appurtenances thereunto belonging or in anywise appertaining; TO HAVE AND TO HOLD the same unto the said Grantee, its successors and assigns, forever.

This conveyance is made subject to the following:

1. Excepting therefrom such oil, gas and other minerals in, on and under said real property, together with all rights in connection therewith, as have previously been reserved by or conveyed to others than the grantor.

2. Easements, reservations, restrictions, rights-of-way and setback lines as reserved and shown on record map of subdivision.

3. Such state of facts as shown on subdivision plat recorded in Map Book 100, Page 105, Map Book 106, Page 53, Map Book 106, Page 120 and Map Book 115, Page 80, Mobile County, Alabama records.

4. Title to minerals within and underlying the premises, together with all mining rights and other rights, privileges and immunities relating thereto as set out in instrument(s), recorded in Deed Book 261 N.S. Page 9; Deed Book 233 N.S. Page 319, Deed Book 302 N.S. Page 250, in the Probate Office of Mobile County, Alabama.

5. Easement for ingress and egress reserved in Article 1, Section 1.1, (i) and (ii), reservation of minerals set out in Article 1, Section 1.1, (iii), with the exception of clays, sand and gravel, contained in deed from International Paper Company to IP Timberlands Operating Company, dated March 14, 1985, recorded in Real Property Book 2813, Page 256, and Surface Use Agreement attached thereto as Exhibit "C", as amended by the Mineral and Royalty Deed from International Paper Company et al to Pure Resources, L.P., dated

October 1, 2000, recorded in Real Property Book 4944, Page 910, and the Surface Use Restrictions Agreement entered into among International Paper Company et al and Pure Resources, L.P., dated October 1, 2000, recorded in Real Property Book 4959, Page 479 in the Office of the Judge of Probate, Mobile County, Alabama.

6. Right of way and Easement from International Paper Company to Union Oil Company of California, dated January 20, 1984, recorded in Real Property Book 2613, Page 884.

7. Right of way Deed for Public Road dated February 9, 2011, and recorded in Deed Book 6758, Page 673.

8. Right of way to Mobile County by instrument recorded in Deed Book 503, Page 242.

9. Right of way and Easement from International Paper Company to Getty Oil Company, dated April 19, 1976, recorded in Real Property Book 1626, Page 489.

10. Right of way and Easement from International Paper Company to Union Oil Company of California, dated April 6, 1977, recorded in Real Property Book 1700, Page 587.

11. Right of way Easement from International Paper Company to Union Oil Company of California, dated November 9, 1981, recorded in Real Property Book 2361, Page 659.

12. Right of way Easement form IP Timberlands Operating Company, Ltd. and Union Exploration Partners, Ltd. to Alabama Power Company, recorded in Real Property Book 2969, Page 80 and Real Property Book 3083, Page 520.

13. Easement by and between the Estate of Gary S. Lambert and Alabama Power Company, dated July 25, 2012 and recorded in Book LR 7202, Page 1796.

14. Oil, gas and mineral leases and all rights in connection therewith as recorded in Real Property Book 164, Page 96; Real Property Book 166, Page 441; Real Property Book 187, Page 921; Real Property Book 197, Page 511; Real Property Book 220, Page 945; Real Property Book 1201, Page 695; Real Property Book 1298, Page 297; Real Property Book 2878, Page 456; Real Property Book 3305, Page 583 and Real Property Book 3305, Page 593.

15. Right of way Deed for Public Road granted to Mobile County dated July 3, 1950 and recorded in Deed Book 508, Page 313.

16. Access Easement by and between IP Timberlands Operating Company, Ltd. and Thomas David Jones, et ux dated February 3, 1997 and recorded in Real Property Book 4574, Page 1058.

17. Easement conveyed to Edward MacGregor Bryant, et ux, by deed recorded at Real Property Book 5273, Page 104 in the Office of the Judge of Probate, Mobile County, Alabama.

18. Subject to the rights of others to use the non-exclusive easement conveyed at Book 5205, Page 1599 in the Office of the Judge of Probate, Mobile County, Alabama.

19. Subject to the right of way of Kelly Trail.

20. Easement reserved by SP Forests LLC in that Limited Warranty Deed to Parland Ltd recorded at Book 5088, Page 919.

21. Unocal/gas well(s).

22. Right to use the sand and gravel for building and maintaining roads as set forth in Mineral and Royalty Deed to Pure Resources, L.P., recorded in Real Property Book 4944, Page 910 in the Office of the Judge of Probate, Mobile County, Alabama.

23. Unrecorded Hunting Lease Rights agreement dated September 1, 2018, between Lambert Holdings, LLC and Eugene Maherg, scheduled to expire on August 30, 2019.

THE PROPERTY CONVEYED HEREIN DOES NOT CONSTITUTE THE HOMESTEAD OF THE GRANTOR OR HIS SPOUSE.

All recording references herein are to the records in the Office of the Judge of Probate of Mobile County, Alabama.

And, except as to taxes hereafter falling due which are assumed by the Grantee herein, and except as herein otherwise provided, said Grantor does for himself and for his heirs, personal representatives hereby covenants with the Grantee herein, its successors and assigns, that he is seized of an indefeasible estate in fee simple in and to said property; that said property is free and clear of all encumbrances, and that he will forever WARRANT AND DEFEND the title thereto, and the peaceable possession thereof unto the said Grantee, its successors and assigns, against the lawful claims of all persons whomsoever.

IN WITNESS WHEREOF, the said Grantor has hereunto set his hand and seal on this the 18th day of July, 2019.

_____(SEAL)
Richard Fincher

STATE OF ALABAMA)

COUNTY OF MOBILE)

I, the undersigned authority, a Notary Public in and for said County in said State, hereby certify that Richard Fincher, whose name is signed to the foregoing instrument, and who is known to me, acknowledged before me on this day that, being informed of the contents of said instrument, he executed the same voluntarily on the day the same bears date.

Given under my hand and official seal this the 18th day of July, 2019.

MELISSA BARNETT CHASON
NOTARY PUBLIC
ALABAMA STATE AT LARGE
MY COMMISSION EXPIRES:

(NOTARIAL SEAL)

Melissa Barnett Chason
NOTARY PUBLIC
My Commission Expires: 8/3/2022

The following information is provided pursuant to Code of Alabama Section 40-22-1.

Grantee's address is:

450 State Line Rd
Wilmer AL 36587

Grantors' address is:

450 State Line Rd
Wilmer AL 36587

Property address is: 450 Stateline Road, Wilmer, AL 36587

This instrument prepared by:
J. David Brady, Jr.
ANDERS, BOYETT & BRADY, P.C.
Attorneys at Law
One Maison, Suite 203
3800 Airport Boulevard
Mobile, Alabama 36608
(251) 344-0880
84274
sc.wd

EXHIBIT "A"

PARCEL A:

South Half of the Southwest Quarter (S ½ of SW ¼) of Section 3, Township 1 South, Range 2 West, Mobile County, Alabama.

PARCEL B:

North Half (N ½) of Section 10, Township 1 South, Range 2 West, Mobile County, Alabama, LESS AND EXCEPT the following parcels:

Less and Except Parcel 1, which was conveyed to R.L. Smith by deed recorded at Book 6314, Page 903: West Half of the West Half of the Northwest Quarter (W ½ of W ½ of NW¼)of Section 10, Township 1 South, Range 2 West, more particularly described as: Beginning at the Northwest corner of Section 10, run thence South 2,640 feet, more or less; thence East 660 feet, thence North 2,640 feet; thence West 660 feet to the point of beginning.

Less and Except Parcel 2, which was conveyed to County of Mobile by deed recorded at Real Property Book 6758, Page 673: COMMENCING AT THE NORTHEAST CORNER OF SECTION 10, TOWNSHIP 1 SOUTH, RANGE 2 WEST, MOBILE COUNTY ALABAMA; THENCE RUN N 89° 20' 00" W ALONG THE NORTH LINE OF SAID SECTION 10, A DISTANCE OF 543.97 FEET TO A POINT ON THE EXISTING SOUTH LINE OF KELLY TRAIL (50' R.O.W.) AND THE POINT OF BEGINNING OF PARCEL HEREIN DESCRIBED; THENCE RUN S 73° 41' 00" W A DISTANCE OF 163.20 FEET TO THE POINT OF CURVATURE OF A CURVE TO THE RIGHT, HAVING A RADIUS OF 313.39 FEET, THENCE WESTWARDLY ALONG THE ARC OF SAID CURVE A DISTANCE OF 296.37 FEET (CHORD BEARS N 79° 44' 02" W AND MEASURES 285.85 FEET) TO A POINT ON SAID NORTH LINE OF SECTION 10; THENCE RUN S 89° 20' 00" E ALONG SAID NORTH LINE A DISTANCE OF 437.93 FEET TO THE POINT OF BEGINNING, CONTAINING 0.3890 ACRES (16,945 S.F.), MORE OR LESS.

PARCEL C:

All of Section 11, Township 1 South, Range 2 West, Mobile County, Alabama; LESS AND EXCEPT the following described parcels:

Less and Except Parcel 1: Commencing at the Southeast corner of Section 11, Township 1 South, Range 2 West, thence North 00 degrees 16 minutes 40 seconds West along the East line of said section a distance of 2596.61 feet to a point; thence South 89 degrees 43 minutes 20 seconds West a distance of 2003.94 feet to the POINT OF BEGINNING, said point being on the Northerly clearing line of an existing pipeline right of way; thence South 73 degrees 32 minutes 02 seconds West along said clearing line a distance of 461.41 feet to a point; thence North 02 degrees 47 minutes 12 seconds East a distance of 397.17 feet to a point; thence South 87 degrees 12 minutes 14 seconds East a distance of 435.00 feet to a point; thence South 02 degrees 38 minutes 47 seconds West a distance of 244.95 feet to the Point of Beginning.

Less and Except Parcel 2, which was sold to James M. Kiper, Jr by deed recorded at Real Property Book 5211, Page 1839: Commencing at the Southwest Corner of Section 11, Township 1 South, Range 2 West, Mobile County, Alabama; thence run North 01 degrees 12 minutes 27 seconds East 906.76 feet to a point; thence run South 88 degrees 47 minutes 33 seconds East 1568.02 feet to the point of beginning of the property herein described; thence run North 66 degrees 48 minutes 34 seconds East 288.70 feet to a point; thence run South 89 degrees 11 minutes 11 seconds East 274.73 feet to a point on the West line of Kelly Trail; thence run Southwardly along said West line and along a curve to the right having a radius of 803.32 feet and a delta angle of 35 degrees 33 minutes 49 seconds an arc distance of 498.62 feet (chord = South 08 degrees 41 minutes 11 seconds West, 490.65 feet) to the P.C. of a curve to the right having a radius of 25.00 feet and a delta angle of 57 degrees 42 minutes 24 seconds; thence run Southwestwardly an arc distance of 25.18 feet to a point located on the North right of way of Roberts Road, said point being on a curve to the left having a radius of 848.96 feet and a delta angle of 18 degrees 11 minutes 03 seconds; thence run Westwardly along said right of way an arc distance of 269.44 feet (chord =South 75 degrees 04 minutes 58 seconds West, 268.31 feet) to a point; thence run North 22 degrees 11 minutes 38 seconds West, 494.69 feet to the point of beginning

Less and Except Parcel 3, which was sold to Amy D. Odom by deed recorded at Real Property Book 5222, Page 1257: Commencing at the Southwest comer of Section 11, Township 1 South, Range 2 West, Mobile County, Alabama; thence run North 01 degrees 12 minutes 27 seconds East 2683.82 feet to a point; thence run East 1877.44 feet to a point; thence run North 2008.02 feet to the POINT OF BEGINNING of the property herein described; said point located on the Easterly right of way of Kelly Trail; thence run North 23 degrees 18 minutes 58 seconds West along said right of way 309.18 feet to a point; thence run North 15 degrees 47 minutes 49 seconds East 393.10 feet to a point; thence run South 89 degrees 35 minutes 13 seconds East 566.77 feet to a point; thence run South 39 degrees 57 minutes 30 seconds West 858.57 feet to the Point of Beginning.

Less and Except Parcel 4, which was sold to Benjamin John Lomax by deed recorded at Real Property Book 5385, Page 934: Commencing at the Southeast corner of Section 11, Township 1 South, Range 2 West, Mobile County, Alabama; thence North 89 degrees 59 minutes 32 seconds West along the South line of said section a distance of 2532.98 feet to a point; thence North 00 degrees 00 minutes 28 seconds East a distance of 520.84 feet to the POINT OF BEGINNING of the property herein described: said point being on the North right-of-way line of Roberts Road (80' R/W) and in a curve, concave to the South and having a radius of 1958.18 feet; thence Westwardly along the arc of said curve and said right-of-way line a distance of 309.11 feet (chord bears South 89 degrees 34 minutes 59 seconds West, 308.79 feet) to the point of tangent; thence South 85 degrees 03 minutes 39 seconds West along said right-of-way line a distance of 303.78 feet to the point of curvature of a curve to the left, concave to the South and having a radius of 998.57 feet; thence Westwardly along the arc of said curve and said right-of-way line a distance of 41.64 feet (chord bears South 83 degrees 51 minutes 58 seconds West, 41.64 feet) to a point on the West line of Kelly Trail; said point being in a curve, concave to the Northwest and having a radius of 25.00 feet; thence Northwardly along the arc of said curve and said West line a distance of 13.17 feet (chord bears North 41 degrees 35 minutes 23 seconds East, 13.02 feet) to the point of continuous curve to the left, concave to the West and having a radius of 803.32 feet; thence Northwardly along the arc of said curve and said West line a distance of 498.62 feet (chord bears North 08 degrees 41

minutes 11 seconds East, 490.65 feet) to a point; thence South 89 degrees 11 minutes 11 seconds East a distance of 25.37 feet to a point; said point being in a curve, concave to the West and having a radius of 828.32 feet; thence Northwardly along the arc of said curve a distance of 4.37 feet (chord bears North 08 degrees 56 minutes 39 seconds West, 4.37 feet) to the point of continuous curve to the left, concave to the West and having a radius of 615.61 feet; thence Northwardly along the arc of said curve a distance of 61.05 feet (chord bears North 11 degrees 56 minutes 10 seconds West, 61.03 feet) to a point; thence South 89 degrees 42 minutes 24 seconds East a distance of 602.58 feet to a point; thence South 04 degrees 52 minutes 23 seconds West a distance of 523.43 feet to the Point of Beginning.

Less and Except Parcel 5, which was sold to Julian T. Kelly by deed recorded at Real Property Book 5414, Page 631: Commencing at the Southeast comer of Section 11, Township 1 South, Range 2 West, Mobile County, Alabama; thence North 01 degrees 41 minutes 11 seconds West along the East line of said section a distance of 695.04 feet to a point on the North right-of-way line of Roberts Road (80' R/W); said point being the POINT OF BEGINNING of the property herein described; thence North 88 degrees 46 minutes 05 seconds West along said right-of-way line a distance of 470.00 feet to a point; thence North 01 degrees 13 minutes 55 seconds East a distance of 580.00 feet to a point; thence South 88 degrees 46 minutes 05 seconds East a distance of 440.43 feet to a point on the East line of said Section 11; thence South 01 degrees 41 minutes 11 seconds East, along said East line a distance of 580.75 feet to the Point of Beginning.

Less and Except Parcel 6, which was sold to Mark Jenkins, et ux by deed recorded at Real Property Book 5686, Page 945: Commencing at the Southeast corner of Section 11, Township 1 South, Range 2 West, Mobile County, Alabama; thence North 01 degrees 41 minutes 11 seconds West along the East line of said Section 11 a distance of 695.04 feet to a point on the North right-of-way line of Roberts Road (80' R/W); thence North 88 degrees 46 minutes 05 seconds West along said North right-of-way line a distance of 500.00 feet to the POINT OF BEGINNING of the property herein described; thence continue North 88 degrees 46 minutes 05 seconds West along said North right-of-way line a distance of 4.60 feet to the point of curvature of a curve to the left, concave to the South and having a radius of 991.66 feet; thence Westwardly along the arc of said curve and said North right- of-way line a distance of 205.40 feet (chord bears South 85 degrees 17 minutes 53 seconds West, 205.04 feet) to a point; thence North 13 degrees 31 minutes 33 seconds West a distance of 514.58 feet to a point; thence North 79 degrees 26 minutes 37 seconds East a distance of 285.64 feet to a point; thence South 01 degrees 13 minutes 55 seconds West a distance of 239.44 feet to a point; thence South 88 degrees 46 minutes 05 seconds East a distance of 60.00 feet to a point; thence South 01 degrees 13 minutes 55 seconds West a distance of 295.31 feet to the Point of Beginning. Said parcel being also known as Lot 1, Lambert's Dogwood Park Second Unit, according to the plat thereof recorded in Map Book 106, Page 53, of the records in the Office of the Judge of Probate of Mobile County, Alabama.

Less and Except Parcel 7, which was sold to Michael P. Stagner, et ux by deed recorded at Real Property Book 6058, Page 1435: Commencing at the Southwest corner of Section 11, Township 1 South, Range 2 West, Mobile County, Alabama; thence run North 01 degrees 11 minutes 59 seconds East, along the West line of said Section 11, a distance of 17.36 feet; thence run South 89 degrees 34 minutes 37 seconds East, along the North line of property conveyed in Real Property Book 5273, Page 104, Probate court Records, Mobile County, Alabama, a distance of 561.34 feet

to the POINT OF BEGINNING of the property herein described; thence continue South 89 degrees 34 minutes 37 seconds East, along said North boundary line, a distance of 541.93 feet to a point on the West line of Roberts Road (80 foot right-of-way), said point being on a 1975.74 foot radius curve to the right, concave Southeastwardly; thence run Northeastwardly, along said West line of Roberts Road, and along said curve, a distance of 220.33 feet (chord bears North 56 degrees 00 minutes 58 seconds East, 220.21 feet) to the point of Tangent; thence continue along the Westernmost right-of-way line of said Roberts Road, North 59 degrees 12 minutes 39 seconds East, 184.81 feet; thence run North 63 degrees 41 minutes 18 seconds West, 697.05 feet; thence run South 26 degrees 18 minutes 42 seconds West, 583.07 feet to the Point of Beginning.

Less and Except Parcel 8, which was sold to John M. Turner by deed recorded at Real Property Book 5707, Page 1194: Commencing at the Southeast corner of Section 11, Township 1 South, Range 2 West, Mobile County, Alabama; thence North 89 degrees 59 minutes 32 seconds West along the South line of said section a distance of 2532.98 feet to a point; thence North 00 degrees 00 minutes 28 seconds East a distance of 520.84 feet to a point on the North right-of-way line of Roberts Road (80' R/W); thence North 04 degrees 52 minutes 23 seconds East a distance of 523.43 feet to the POINT OF BEGINNING of the property herein described; thence North 89 degrees 42 minutes 24 seconds West for a distance of 602.58 feet to a point; said point being in a curve, concave to the West and having a radius of 615.61 feet; thence Northwardly along the arc of said curve a distance of 68.54 feet (chord bears North 17 degrees 58 minutes 00 seconds West, 68.50 feet) to the point of tangent; thence North 22 degrees 49 minutes 47 seconds West a distance of 159.79 feet to a point; thence South 89 degrees 42 minutes 24 seconds East a distance of 703.77 feet to a point; thence South 04 degrees 52 minutes 23 seconds West a distance of 212.68 feet to the Point of Beginning.

Less and Except Parcel 9, which was sold to Brent Warrick, et ux by deed recorded at Book LR 7453, Page 1267: Commencing at the Southwest corner of Section 11, Township 1 South, Range 2 West, Mobile County, Alabama, thence North 01 degree 17 minutes 09 seconds East 870.66 feet to a point, thence East 1568.29 feet to the POINT OF BEGINNING of property herein described, thence North 613.30 feet to a point, thence East 479.74 feet to a point, said point being the centerline of Kelly Trail (Dirt Road) and also being in a curve to the left and having a radius of 280.03 feet, thence along the arc of said centerline and curve 234.63 feet (chord bears South 02 degrees 40 minutes 03 seconds West 227.83 feet) to a point, thence continue along said centerline 171.23 feet to a point, said point being the point of curvature of a non-tangent curve to the right, and having a radius of 615.61 feet, thence along the arc of said centerline and curve 65.06 feet (chord bears South 17 degrees 15 minutes 38 seconds East 65.03 feet) to a point, thence South 15 degrees 29 minutes 55 seconds East and along said centerline 58.57 feet to a point, thence North 89 degrees 12 minutes 23 seconds West 305.39 feet to a point, thence South 66 degrees 48 minutes 34 seconds West 288.70 feet back to the Point of Beginning.

Less and Except Parcel 10, which was sold to Edward MacGregor Bryant, et ux by deed recorded at Real Property Book 5273, Page 104: Beginning at the Northwest Corner of Section 14, Township 1 South, Range 2 West, Mobile County, Alabama; thence run North 00 degrees 36 minutes 01 seconds East 17.36 feet to a point; thence run South 89 degrees 34 minutes 37 seconds East 1096.32 feet to a point on the Westerly right of way of Roberts Road; said point located on a curve to the left having a radius of 1442.88 feet and a delta angle of 11 degrees 47 minutes 43

seconds; thence run Southwestwardly along the Westerly right of way of Roberts Road an arc distance of 297.04 feet (chord= South 47 degrees 46 minutes 28 seconds West 296.51 feet) to the P.T. thereof; thence run South 41 degrees 52 minutes 37 seconds West continuing along said right of way 975.31 feet to the P.C. of a curve to the left having a radius of 876.46 feet and a delta angle of 22 degrees 49 minutes 43 seconds; thence run Southwestwardly continuing along said right of way an arc distance of 349.21 feet to the P.T. thereof; thence South 19 degrees 02 minutes 54 seconds West continuing along said right of way 201.24 feet to a point; thence run North 00 degrees 36 minutes 01 seconds East 1405.53 feet to the POINT OF BEGINNING; subject to dirt drives used by others across aforesaid property also subject to an easement reserved for ingress and egress described as follows: Beginning at the Northwest Corner of Section 14, Township 1 South, Range 2 West; thence run North 00 degrees 36 minutes 01 seconds East 17.36 feet to a point; thence run South 89 degrees 34 minutes 37 seconds East 1096.32 feet to a point on the Westerly right of way of Roberts Road; said point located on a curve to the left having a radius of 1442.86 feet and a delta angle of 02 degrees 12 minutes 15 seconds; thence run Southwestwardly along said right of way an arc distance of 55.50 feet to a point; thence run North 41 degrees 34 minutes 19 seconds West 32.72 feet to a point; thence run West 1031.66 feet to the Point of Beginning.

Less and Except Parcel 11, which was conveyed to Celeste Four P Land, LLC by deed recorded at Book 7328, Page 1536: Commencing at the Northwest Corner of the Northwest Quarter of Section 11, Township 1 South, Range 2 West, Mobile County, Alabama, thence South 89 degrees 35 minutes 13 seconds East along the North line of said Northwest Quarter of Section 11, a distance of 139 feet to the intersection with the centerline of Kelly Trail and the POINT OF BEGINNING of the property herein described; thence along said centerline run Southeastwardly, Eastwardly and Northeastwardly a distance of 562 feet or less to the intersection with the aforementioned North line of the Northwest Quarter of Section 11; thence North 89 degrees 35 minutes 13 seconds West along said North line a distance of 556 feet to the Point of Beginning.

Less and Except Parcel 12, which was conveyed to Celeste Four P Land, LLC by deed recorded at Book 7328, Page 1536: Commencing at the Northwest Corner of the Northwest Quarter of Section 11, Township 1 South, Range 2 West, Mobile County, Alabama; thence South 89 degrees 35 minutes 13 seconds East along the North line of said Northwest Quarter of Section 11, a distance of 1100 feet to the intersection with the centerline of Kelly Trail and the POINT OF BEGINNING of the property herein described; thence along said centerline run Southeastwardly a distance of 304 feet more or less to the intersection with the East line of a dirt trail running to the north; thence Northeastwardly along said East line a distance of 132 feet more or less to the intersection with the aforementioned North line of the Northwest Quarter of Section 11; thence North 89 degrees 35 minutes 13 seconds West along said North line a distance of 326 feet more or less to the Point of Beginning.

Less and Except Parcel 13, which was conveyed to Christopher Paul Stagner by deed recorded at Book 7555, Page 1137: A portion of Lots 8, 9, and 10, Lambert's Dogwood Park, First Unit, as recorded in Map Book 100, Page 105 in the Office of the Judge of Probate, Mobile County, Alabama, being more particularly described as follows: Commencing at the Northeast corner of Lot 11, Lambert's Dogwood Park, First Unit, as recorded in Map Book 100, Page 105 in the Office of the Judge of Probate, Mobile County, Alabama; thence run North 88 degrees 52 minutes 38 seconds West along the South right of way of Roberts Road, 422.59 feet to the POINT OF

BEGINNING, thence run South 00 degrees 23 minutes 28 seconds East, 623.80 feet to a point; thence run South 89 degrees 45 minutes 23 seconds West 352.79 feet to a point; thence run North 05 degrees 03 minutes 44 seconds West, 579.71 feet to a point on the South right of way of Roberts Road and a point on a curve to the right, having a radius of 911.66 feet and delta angle of 20 degrees 03 minutes 31 seconds; thence run Northeastwardly, along said curve and right of way, (chord bears= North 81 degrees 01 minutes 42 seconds East, 317.53 feet) an arc length of 319.26 feet to the P.T. thereof; thence run South 88 degrees 52 minutes 38 seconds East, along said right of way, 86.05 feet to the Point of Beginning.

Less and Except Parcel 14, which was conveyed to Brent Warrick, et ux by deed recorded at Real Property Book 7130, Page 1765: Begin at the Southeast corner of Lot 1, Lambert's First Addition to Kelly Trail, as recorded in Map Book 106, Page 120 in the Office of the Judge of Probate of Mobile County, Alabama; thence North 04 degrees 51 minutes 00 seconds West 212.87 feet to a point, thence North 89 degrees 42 minutes 24 seconds West 703.77 feet to the centerline of Kelly Trail (Dirt), said point being the point of curvature of a curve to the right and having a radius of 280.03 feet; thence along the arc of said curve 214.35 feet (chord bears North 00 degrees 40 minutes 16 seconds East 209.16 feet) to a point, thence along centerline of Kelly Trail North 24 degrees 58 minutes 05 seconds East 154.94 feet to a point, thence continue along said centerline of Kelly Trail North 35 degrees 45 minutes 21 seconds East 235.03 feet to a point, thence South 51 degrees 37 minutes 36 seconds East 30 feet to a point, thence South 00 degrees 56 minutes 36 seconds East 113.60 feet to a point thence South 24 degrees 08 minutes 01 seconds East 84.38 feet to a point, thence South 75 degrees 20 minutes 47 seconds East 33.18 feet to a point, thence South 68 degrees 11 minutes 24 seconds East 93.84 feet to a point, thence South 66 degrees 38 minutes 15 seconds East 60.94 feet to a point, thence South 60 degrees 52 minutes 11 seconds East 90.61 feet to a point, thence North 86 degrees 57 minutes 14 seconds East 226.41 feet to a point, thence North 69 degrees 01 minutes 21 seconds East 208.48 feet to a point, thence South 04 degrees 51 minutes 00 seconds West 525.00 feet to a point, thence North 89 degrees 41 minutes 18 seconds West 210.00 feet back to the POINT OF BEGINNING.

Less and Except Parcel 15, which was conveyed to Joseph E. Tarver, Jr., et ux by deed recorded at Real Property Book 5493, Page 944: Lot 1, Lambert's Dogwood Park, First Unit according to the plat thereof recorded in Map Book 100, Page 105 of the records in the Office of the Judge of Probate of Mobile County, Alabama.

PARCEL D:

A 50.00 foot non-exclusive easement for ingress and egress, the centerline being more particularly described as follows: Commencing at the Northeast Corner of Section 12, Township 1 South, Range 2 West, Mobile County, Alabama; thence run South 89 degrees 42 minutes 28 seconds West 2640.77 feet to a point; thence run South 00 degrees 08 minutes 56 seconds West 1327.79 feet to a point on the West line of Roberts Road and also being on a curve to the left having a delta angle of 02 degrees 56 minutes 42 seconds, a radius of 138.54 feet; thence run Southwestwardly along said curve an arc distance of 7.12 feet (chord= South 38 degrees 21 minutes 54 seconds West 7.12 feet) to the POINT OF BEGINNING; thence run North 84 degrees 21 minutes 14 seconds West 519.24 feet to a point on a curve to the right having a radius angle of 15 degrees 26 minutes 43 seconds a radius of 200.00 feet; thence run along said curve an arc distance of 53.91

feet (chord= North 76 degrees 37 minutes 51 seconds 53.75 feet) to the point of tangent thereof; thence run North 69 degrees 06 minutes 55 seconds West 424.73 feet to the point of terminus.

PARCEL E:

The Northwest Quarter (NW¼) of Section 12, Township 1 South, Range 2 West, Mobile County, Alabama; LESS AND EXCEPT the following described parcels:

Less and Except Parcel 1, which was conveyed to Bobby R. Merchant et ux by deed recorded at Real Property Book 5205, Page 1589: Beginning at the Northeast Corner of the Northwest Quarter of Section 12, Township 1 South, Range 2 West, Mobile County, Alabama; thence run South 00 degrees 08 minutes 56 seconds West 1327.79 feet to a point on the Westerly right of way of Roberts Road, said point being located on curve to the left having a radius of 138.54 feet a delta angle of 02 degrees 56 minutes 46 seconds; thence run Southwestwardly along said right of way an arc distance of 7.12 feet (chord = South 38 degrees 21 minutes 54 seconds West, 7.12 feet) to a point; thence run North 84 degrees 21 minutes 14 seconds West 197.00 feet to a point; thence run North 00 degrees 08 minutes 56 seconds East 1312.26 feet to a point; thence run North 89 degrees 04 minutes 37 seconds East 200.51 feet to the point of beginning. Together with and subject to a 50.00 foot non-exclusive easement along and parallel 25.00 feet each side of the South line of aforesaid property.

Less and Except Parcel 2, which was conveyed to John A. Garris, et ux by deed recorded at Real Property Book 5205, Page 1599: Commencing at the Northeast Corner of Section 12, Township 1 South, Range 2 West, Mobile County, Alabama; thence run South 89 degrees 42 minutes 28 seconds West 2640.77 feet to a point; thence run South 00 degrees 08 minutes 56 seconds West 1327.79 feet to a point on the West line of Roberts Road and also being on a curve to the left having a delta angle of 02 degrees 56 minutes 42 seconds, a radius of 138.54 feet; thence run Southwestwardly along said curve an arc distance of 7.12 feet (chord = South 38 degrees 21 minutes 54 seconds West 7.12 feet) to the POINT OF BEGINNING of the property herein described; thence continue Southwestwardly along aforementioned curve and West line of Roberts Road, with a delta angle of 38 degrees 40 minutes 14 seconds, an arc distance of 93.51 feet (chord = South 17 degrees 33 minutes 30 seconds West 91.75 feet) to the point of tangent thereof; thence run South 00 degrees 31 minutes 44 seconds West along said West line 258.10 feet to a point; thence run West 935.78 feet to a point; thence run North 560.49 feet to a point on the centerline of a 50.00 foot non-exclusive easement; thence run along said centerline of a 50.00 foot non-exclusive easement South 69 degrees 06 minutes 55 seconds East 424.73 feet to a point on a curve to the left having a delta angle of 15 degrees 26 minutes 43 seconds, a radius of 200.00 feet; thence run Southeastwardly along said curve an arc distance of 53.81 feet (chord= South 76 degrees 37 minutes 51 seconds East, 53.75 feet) to a point; thence run South 84 degrees 21 minutes 14 seconds East 519.24 feet to the Point of Beginning.

PARCEL F:

A 30-foot wide non-exclusive easement for ingress and egress over the South 30 feet of Section 11 lying West of Roberts Road, Township 1 South, Range 2 West, Mobile County, Alabama, as recorded in Real Property Book 1626, Page 489.

Appendix C

SUPPLEMENTAL BMP CRITERIA

Construction Exit Pad (CEP)

Practice Description

A construction pad is a stone base pad or manufactured product designed to provide a buffer area where mud and caked soil can be removed from the tires of construction vehicles to avoid transporting it onto public roads. This practice applies anywhere traffic will be leaving a construction site and moving directly onto a public road or street.

Planning Considerations

Roads and streets adjacent to construction sites should be kept clean for the general safety and welfare of the public. A construction exit pad (Figure CEP-1) should be provided where mud can be removed from construction vehicle tires before they enter a public road.

Where possible the construction exit pad should be located and constructed at a site where surface runoff from the pad will not transport sediment from the pad off the site. If the pad slope toward the road exceeds 2%, a diversion ridge 6" to 8" high with 3:1 side slopes should be constructed across the foundation approximately 15 feet from the entrance. This diversion ridge should divert surface runoff from the pad away from the road and into a sediment trap or basin.

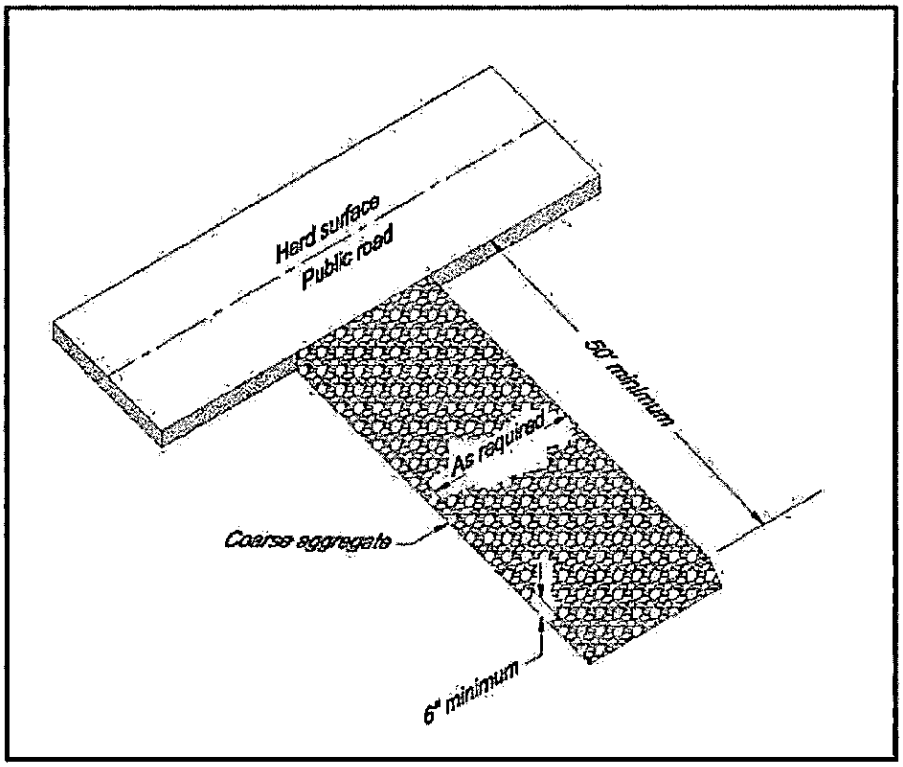


Figure CEP-1 Gravel Construction Exit

If the action of the vehicle traveling over the gravel pad does not sufficiently remove the mud or if the site is in a particularly sensitive area, a washing facility should be included with the pad (Figure CEP-2). When a washing facility is required all wash water shall be diverted to a sediment trap or basin.

If the construction exit pad is located in an area with soils that will not support traffic when wet, an underliner of geotextile will be required to provide stability to the pad.

Construction of stabilized roads throughout the development site should be considered to lessen the amount of mud transported by vehicular traffic. The construction exit pad should be located to provide for maximum use by construction vehicles.

Consideration should be given to limiting construction vehicles to only one ingress and egress point. Measures may be necessary to make existing traffic use the construction exit pad.

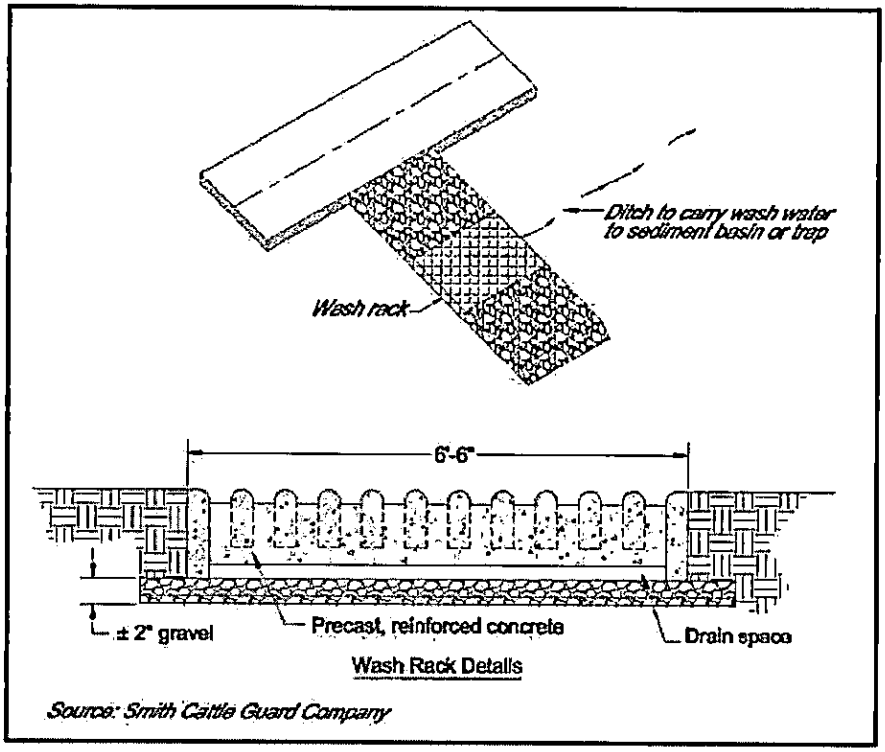


Figure CEP-2 Construction Exit with Wash Rack

Design Criteria

Aggregate size

Aggregate should be Alabama Highway Department coarse aggregate gradation No.1.

Pad Thickness

The exit pad shall have a minimum aggregate thickness of 6".

Geotextiles

A non-woven geotextile shall be placed underneath the aggregate. The geotextile shall be of the strength and durability required for the project to ensure the aggregate and soil base are stable. Generally, the non-woven geotextile should meet the requirements for a Class 2 geotextile used for separation that is found in the current version of AASHTO M288.

Pad Length

The exit pad should provide for entering and parking the longest anticipated construction vehicles. A pad is typically 50 feet long but the required length may be longer or shorter.

Pad Width

The exit pad width is typically 20 feet but may be narrower or wider to equal the full width of the vehicular egress.

Washing

A washing facility shall be provided if necessary to prevent mud and caked soil from being transported to public streets and highways. It shall be constructed of concrete, stone, and/or other durable materials. Provisions shall be provided for the mud and other material to be carried away from the washing facility to a sediment trap or basin to allow for settlement of the sediment from the runoff before it is released from the site.

Land Grading (LG)

Practice Description

Land grading is reshaping of the ground surface to provide suitable topography for buildings, facilities and other land uses, to control surface runoff, and to minimize soil erosion and sedimentation both during and after construction. This practice applies to sites where the existing topography must be modified to prepare for another land use, or where adapting proposed development to the existing landscape can reduce the erosion potential of the site and the cost of installing erosion and sediment control measures. In some instances, other practices such as diversions or benches can be used to reduce the length of continuous slopes and reduce erosion potential.

Planning Considerations

A detailed plan should be developed by a qualified design professional for all land grading activities at the project site. The plan should show all areas to be disturbed, the areas of cut, areas of fill, and the finished elevation for all graded areas. Areas that will be mowed after the site is developed should have slopes planned that are not too steep for the type of mowing equipment that will be used for regular maintenance.

The grading plan should be designed to protect existing vegetation where possible, especially around natural drainageways. Grading activities should be scheduled to minimize the area disturbed at any one time during the construction process. The plan should include provisions for stabilizing disturbed areas immediately after final grading is completed. Provisions should also be made to protect existing

underground utilities. Finally, topsoil should be removed and stockpiled for use in revegetating the site.

The grading plan should also include necessary practices for controlling sediment and erosion at the site. These practices could include stable outlets and slope breaks such as diversions or benches.

Design Criteria

Site Preparation

A detailed survey of the construction site should be performed by a qualified surveyor prior to grading plan development. This survey should include existing topographic information at the site including existing elevations, existing drainage patterns, locations of existing overhead and underground utilities, and construction limit boundaries.

The grading plan should require that the existing topsoil at sites to be graded be removed as the first step in the grading process. The plan should include a location on the construction site where topsoil will be stockpiled. Stockpiled topsoil should be protected by temporary vegetation (see Temporary Vegetation practice) or other appropriate temporary cover, such as plastic, until it is used to cover disturbed areas in advance of permanent vegetation of the site.

The grading plan should include a schedule of disturbance activities that minimizes the area disturbed at any point in time using sequencing and staging concepts. In areas where clearing of existing vegetation is planned, the area should be cleared and grubbed by removing trees, vegetation, roots and other debris such as trash. In areas to be filled all loose or weak soil and oversized rocks should be removed from the area. The foundation of the area to be filled should consist of soil or rock material of adequate strength to support the proposed fill material and the structures to be built at the site. The exact depth of material to be removed should be determined by a qualified geotechnical professional according to accepted engineering standards.

Grading

A plan for placement of fill should be developed by a qualified geotechnical professional. The plan should specify the source of fill materials, which should be obtained on site if possible. Materials used for fill, when placed according to the plans and specifications, should provide sufficient strength to support structures planned for construction at the location.

Loose fill material should be placed in layers not exceeding 9" in thickness. The materials should be compacted to a moisture content and to a dry density that will produce the design bearing strength required for structures planned at the site. A qualified geotechnical engineer should provide fill placement specifications using standard accepted engineering practices.
Long and/or steep slope lengths can result in rill and gully erosion on slopes. Erosion on these type slopes can be minimized by breaking the slope with

diversions or benches (see Diversion practice). Diversion widths should be compatible with the expected maintenance equipment. Care is needed in locating outlets that will be stable and not cause gully erosion. The following table gives general guidance on the horizontal spacing of slope breaks:

Table LG-1 Guidelines for Spacing Slope Breaks [1]

Slope (H:V)	Horizontal Spacing (Ft)
1:1	20
2:1	40
3:1	60
4:1 and 5:1	80
6:1 to 9:1	120
10:1 or flatter	200

[1] Adjustments in spacing may be made to account for soil and site conditions and professional experience of the site designer.

In areas where seepage and ground water are present subsurface drains should be installed to improve slope stability or soil bearing capacity (see Subsurface Drain practice).

Steep slopes should be avoided if possible. Slopes that are to be vegetated should be 2 horizontal to 1 vertical or flatter. If the slope is to be maintained by tractor or other equipment the slope should be 3 horizontal to 1 vertical or flatter. Slopes should be designed to blend with surrounding topography as much as possible.

Erosion Control

The grading plan should include provisions for stabilization of graded areas immediately after final grading is completed. On areas that will have no additional disturbance, permanent vegetation should be applied immediately to the site (see Permanent Seeding practice) if grading is finished during the planting season. If grading is finished outside of the recommended planting dates a temporary cover should be installed using a Temporary Seeding or other appropriate cover and the Permanent Seeding planned for the next planting period. On areas where work is to be interrupted or delayed for 14 calendar days or longer, such as topsoil stockpiles, the area should be stabilized using mulch or temporary seeding (see Mulching or Temporary Seeding practice). Other stabilization measures such as hydraulic mulch or erosion control blankets should be used in extreme conditions, such as steep slopes and channels.

Where practical, runoff from undisturbed off-site areas should be diverted around the construction site to prevent erosion on the disturbed areas (see Diversion practice).

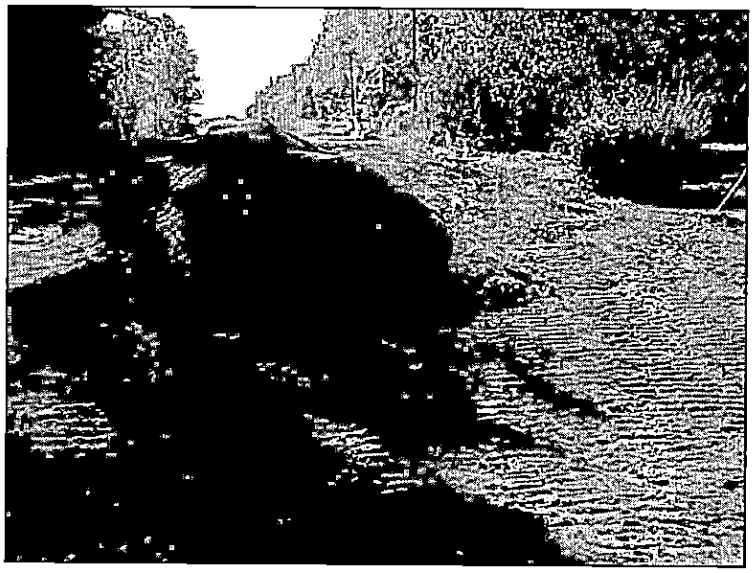
Sediment Control

Required sediment control practices should be installed before the land disturbance activities in the drainage area of the sediment control practices. Until disturbed

areas can be stabilized, appropriate sediment control measures will be maintained to minimize sediment delivery off-site. Measures should include as a minimum:

- Sediment Barriers – Placed along toes of slopes (see Sediment Barrier practice).
- Sediment Basins – Divert sediment laden runoff to basins as needed to minimize off-site sedimentation (see Sediment Basin practice).
- Inlet Protection – Where sediment-laden runoff is diverted to on-site stormwater drain inlets, the inlets should be protected with an appropriate sediment control practice.
- Stabilized Outlets – All runoff from the site should be conveyed in stabilized channels (see Grassed Swale, Lined Swale, Rip-rap Lined Swale, or other appropriate channel stabilization).

Topsoiling (TSG)



Practice Description

Topsoiling is the removal of a desirable soil surface, referred to as topsoil, at a site prior to construction and using it on areas to be vegetated. Topsoiling a site usually improves the quality of the plant growth medium at the site and increases the likelihood of successful plant establishment and performance. This practice applies to sites that are to be disturbed by excavation, compaction or filling, and to other areas where the subsoil is unsuitable for plant growth.

Planning Considerations

Topsoil is the surface layer of the soil profile, generally characterized as darker than the subsoil due to enrichment with organic matter. It is the major zone of root development and biological activity. Microorganisms that enhance plant growth thrive in this layer. Topsoil can usually be differentiated from subsoil by texture as well as color. Clay content usually increases in the subsoil.

The depth of topsoil found on an undisturbed site may be quite variable over the proposed construction area because different soils have various depths of the surface layer. On severely eroded sites the original topsoil may be non-existent with the previous subsoil now occupying the surface.

Advantages of topsoil include its high organic-matter content and friable consistency (soil aggregates can be crushed with only moderate pressure), and its

available water-holding capacity and nutrient content. Most often it is superior to subsoil in these characteristics. The texture and friability of topsoil are usually much more conducive to seedling emergence and root growth. In addition to being a better growth medium, topsoil is often less erodible than subsoil because it has less clay and more organic matter and the coarse texture of topsoil increases infiltration capacity and reduces runoff.

Although topsoil provides an excellent growth medium, there are disadvantages to its use. Stripping, stockpiling, and reapplying topsoil, or importing topsoil, increases construction time and may increase construction costs. Topsoiling can delay seeding or sodding operations, increasing the exposure time of denuded areas. Most topsoil contains weed seeds and weeds may compete with desirable species.

When properly limed and fertilized, subsoils may provide a good growth medium especially if there is adequate rainfall or irrigation water to allow root development in otherwise high-density material. However, in most instances topsoiling should be used to provide the best opportunity for successful establishment and sustainability of the planned vegetative cover.

Topsoiling is strongly recommended where ornamental plants or high-maintenance turf will be grown. Topsoiling is a recommended procedure when establishing vegetation on shallow soils, soils containing potentially toxic materials, and soils of critically low pH (high acid) levels.

If topsoiling is to be done, the following items should be considered:

- An adequate volume of topsoil should exist on the site or be available locally. Topsoil will be spread at a lightly compacted depth of 4" or greater.

- Locate the topsoil stockpile should be located so that it meets specifications and does not interfere with work on the site, block drainage or release appreciable amounts of sediment.

- Allow sufficient time in scheduling for topsoil to be spread and bonded prior to seeding, sodding, or planting.

- Take care not to apply topsoil to subsoil if the two soils have contrasting textures without disking or chiseling to create a favorable interface and bond. Sandy topsoil over clayey subsoil without disking or chiseling is a particularly poor combination, as water creeps along the junction between the soil layers and on steep slopes may cause the topsoil to slough.

Design Criteria

Materials

Field evaluation of the site should be made to determine if there is sufficient surface soil of good quality to justify stripping. Topsoil shall be friable and loamy (loam, sandy loam, silt loam, sandy clay loam, and clay loam). It shall be relatively free of debris, trash, stumps, rocks, roots and noxious weeds, and shall give evidence of being able to support healthy vegetation. It shall contain no substance that is potentially toxic to plant growth.

Topsoil should meet the following criteria:

- pH range should be from 6.0-7.0. If pH is less than 6.0, lime should be added in accordance with soil test results or in accordance with the recommendations of the vegetative establishment practice being used.
- Soluble salts shall not exceed 500 ppm.
- If additional off-site topsoil is needed, it should meet the standards stated above.
- The depth of material meeting the above qualifications should be at least 4". Soil factors such as rock fragments, slope, depth to water table, and layer thickness affect the ease of excavation and spreading of topsoil.

Generally, the upper part of the soil, which is richest in organic matter, is most desirable; however, material excavated from deeper layers may be worth storing if it meets the other criteria listed above.

Stripping

Strip only those areas that will be affected by construction or development. A normal stripping depth is 4-6" but deeper depths may be satisfactory if the soil is suitable and undercutting is allowable in locations such as buildings, water impoundment structures, roadways, etc. Appropriate sediment control measures such as sediment barriers, sediment basins, inlet protection, etc., should be in place before the topsoil is stripped. Stripping should not be done on areas intended to support conventional on-site effluent disposal lines (field lines).

Stockpiling

The stockpile location should be out of drainageways and traffic routes. Stockpiles should not be placed on steep slopes where undue erosion will take place. Measures should be taken to prevent erosion of the stockpiles. These would include:

- Mulching the stockpile when it is left inactive for over 13 days.

- Planting temporary vegetation when the stockpile is to be inactive over 30 days.

- Covering the stockpile with plastic whenever the piles are small and any soil loss would provide sediment to damage existing buildings or facilities or enter waters.
- Planting permanent vegetation when the stockpile use will be inactive over 12 months.

- In cases where the stockpile is small and will be removed in less than 14 days, it may be more practical to use a sediment barrier than an erosion control practice.

Site Preparation

Areas to be covered with topsoil shall be excavated, graded, filled and shaped to the proper lines, grades and elevations before topsoil placement is started.

The subgrades should be checked for pH and limed if it is less than 6.0. Liming shall be done in accordance with soil tests and in relation to the seeding mixture to be planted. Incorporate lime to a depth of at least 2" by disking.

Applying Topsoil

The subsoil should be disked or chiseled to a depth of 2" or more to enhance bonding of the subsoil and topsoil, immediately before placement of topsoil. Topsoil should be uniformly spread to a minimum compacted depth of 4". Required volumes of topsoil may be determined using Table TSG-1.

Table TSG-1 Volume of Soil Needed for Topsoiling

Depth to Spread (inches)	Cubic Yards Per 1,000 Sq. Ft.	Cubic Yards Per Acre
1	3.1	134
2	6.2	268
3	9.3	403
4	12.4	537
5	15.5	672
6	18.6	806

When applying topsoil, maintain needed erosion control practices such as diversions, grassed swales, lined swales, etc. Topsoil should not be spread when it or the subgrade is frozen or muddy.

Precautions should be taken to prevent layering of the topsoil over the subsoil. Mixing and bonding of the two soils should be enhanced.

Settling of the topsoil is necessary to bond the soils together, but excessive compaction should be prevented. Light compaction is necessary to increase soil strength, reduce erosion and enhance vegetation establishment.

Excessive compaction should be prohibited as it increases runoff and inhibits seed germination and root development.

Surface irregularities that would impede drainage, increase erosion or otherwise damage the site should be removed in final grading.

Chemical Stabilization (CHS)

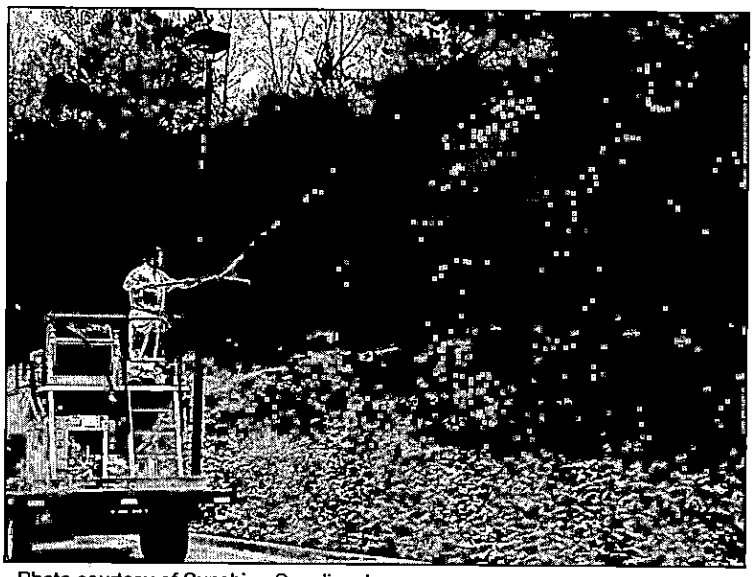


Photo courtesy of Sunshine Supplies, Inc.

Practice Description

Chemical Stabilization erosion control involves the use of products, including soil binders that help to hold the soil in place, thereby reducing soil particle detachment and short-term erosion caused by water and wind. Water-soluble polyacrylamide (PAM) is often used for this purpose. Other products may also provide this benefit. The products are typically applied with temporary seeding and or mulching on areas where the timely establishment of temporary erosion control is so critical that seeding and mulching need additional reinforcement.

Planning Considerations

Chemical Stabilization products for surface stabilization are available in different formulations should be used in combination with other Best Management Practices. The use of seed and mulch should be considered for providing erosion protection beyond the life of the chemical or soil binder. If the area where Chemical Stabilization products have been applied is disturbed, the application will need to be repeated.

Following are additional considerations to enhance the use of or avoid problems:

- Use recommended setbacks (Buffer Zone) when applying near natural water bodies.

- Application delays between product mixing and application as well as ultraviolent light exposure may decrease the performance of some products.

- Products are generally not effective in concentrated flow areas.
- Seeded areas will also need mulch.
- It is important to closely follow manufacturer's recommendations on application procedures.
- Do not use products in a way that will be toxic to aquatic organisms.
- Requests to use products not approved for Chemical Stabilization on permitted sites should be made to the state environmental agency.

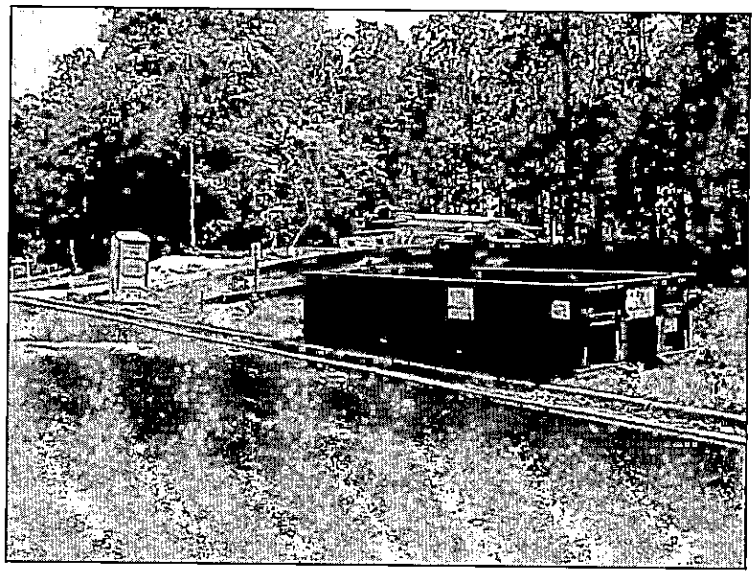
Design Criteria

Application rates shall conform to manufacturer's guidelines for application.

The following specific criteria shall be followed:

- Chemical mixtures shall be environmentally benign, harmless to fish, wildlife, and plants, and shall be non-combustible.
- Users of chemical stabilization products shall follow all Material Safety Data Sheet requirements and manufacturer's recommendations. In the case of PAM, the use of a specific product should be based on the jar test with soil from the site and there should be appropriate measures at the site to ensure that PAM is not carried in stormwater emptying directly into natural waterbodies. This means that runoff should be flowing to settling sites such as sediment basins or sediment traps or be flowing over sites such as filter strips, straw or matting that serves as a collection site for the sediments.
- Additives such as fertilizers, solubility promoters or inhibitors, etc. to chemical stabilization products shall be non-toxic.
- The manufacturer or supplier shall provide written application methods. The application method shall ensure uniform coverage to the target and avoid drift to non-target areas including waters of the state. The manufacturer or supplier shall also provide written instructions to ensure proper safety, storage, and mixing of the product.

Groundskeeping (GK)



Practice Description

Groundskeeping, or "good housekeeping", describes the various activities and measures, in addition to the specific practices used for erosion and sediment control that are essential during construction for the protection of environmental quality. Groundskeeping is applicable at all construction sites.

Planning Considerations

In addition to the sediment and erosion control practices included in the Handbook that deal directly with sediment and erosion control, some general groundskeeping practices are essential to the pollution prevention aspect of a Stormwater Pollution Prevention Plan. Groundskeeping addresses these practices. Included in the practice are the following different areas:

- Inspection and Maintenance Procedures
- Materials Inventory
- Spill Prevention and Material Management Practices
- Spill Controls
- Hazardous Products
- Air Emissions (excessive odor)
- Other Good Groundskeeping Practices (i.e. fugitive spray, excessive noise and aesthetics)

Design Criteria

Inspection and Maintenance Procedures

The following inspection and maintenance procedures need to be followed to maintain adequate sediment and erosion controls:

- All control measures need to be inspected at least once per week and following any accumulation of rainfall of ¾" or more within a 24-hour period. A more frequent inspection interval may be required by either a permitting agency or a permittee.
- All measures need to be maintained in good working order. If a repair is necessary, it should be initiated within 24 hours of report.
- Silt fence and straw bales need to be inspected weekly for proper anchorage and leakage underneath. Silt fencing should also be inspected for tears.
- Built-up sediment needs to be removed from silt barriers when it has reached ½ of the height of the barrier. Sediment needs to be placed in a stabilized site to prevent re-entry into the same site or another entrapment area.
- Sediment basins need to be inspected for depth of sediment monthly and built up sediment needs to be removed when ½ of the basin volume is filled.
- Temporary and permanent seeding and plantings need to be inspected for bare spots, washouts and unhealthy growth. A person should be designated to be responsible for maintaining planted areas until there is a uniform stand with 85% ground cover and growth has reached 1" in height.

Materials Inventory

A materials list should be compiled for items that will be stored outside on the site during construction. For example:

_____ Pipe, fittings and joint compounds for underground utility piping
_____ Gravel and stone bedding material
_____ Concrete forming materials
_____ Other (specify) _____
_____
_____
_____

Note: Fuels, oils and other petroleum products; forming oils and compounds; fertilizers; pesticides; strippers; detergents; cleaners; or any other hazardous or toxic compounds should not be stored outside on the site unless specifically agreed upon by all responsible parties, including those persons responsible for enforcing local ordinances and policies. On-site storage should meet all local, state and federal rules regarding secondary containment. Additionally, local ordinances may require fencing and security measures for storage of these products.

Spill Prevention and Material Management Practices

Petroleum Products

All vehicles kept on the site need to be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. A Spill Prevention Control and Countermeasures (SPCC) plan should be developed for the facility to address the safe storage, handling and clean-up of petroleum products and other chemicals. Petroleum products should be stored in tightly sealed containers, which are clearly labeled. If petroleum products are stored on site, a secondary containment facility will be required if the cumulative storage capacity of all tanks, greater than 55 gallons, at the site exceeds 1,320 gallons. Any asphalt substances used on-site should be applied according to the manufacturer's recommendations.

Fueling & Servicing

No fueling, servicing, maintenance, or repair of equipment or machinery should be done within 50 feet of a stream, or within 100 feet of a stream classified for public water supply (PWS) or Outstanding Alabama Water (OAW), or designated as an Outstanding National Resource Water (ONRW), or a sinkhole.

Mud Tracking

A stabilized construction entrance needs to be designated on the plan. The practice Construction Exit Pad provides design details for planning such an entrance.

Only designated entrances should be used for construction access to the site. The General Contractor should be responsible for keeping mud cleaned from adjoining streets daily if needed.

Concrete Trucks

Concrete trucks should be allowed to wash only in locations where discharge is appropriately treated to meet applicable regulatory requirements. It is not permissible to discharge concrete wash directly to streams or storm drains. Concrete wash can contain sediment, as well as, alkalinity and chemical additives that could be harmful to fish, stream bottom macroinvertebrates and wildlife.

Disposal of Oil

No fuels, oils, lubricants, solvents, or other hazardous materials can be disposed of on the site. All hazardous material must be properly disposed of in accordance with State law.

Trash/Solid Waste

The General Contractor is responsible for disposing of all solid waste from the site in accordance with State law. Dumpsters or other collection facilities must be provided as needed. Solid waste may not be buried on the site.

Sanitary Waste

The General Contractor is responsible for providing sanitary facilities on the site. Sanitary waste may be disposed only in locations having a State permit. Portable toilets should be located so that accidental spills will not discharge into a storm sewer or concentrated flow area.

Other Discharges

Water for pressure testing sanitary sewers, flushing water lines, sand blasting, concrete cleansing, etc., may be discharged only in approved areas. Discharge of hydrostatic test water may require additional permitting, particularly if chlorinated public water is used.

Spill Controls

In addition to the good housekeeping practices and material management practices listed previously, the following procedures need to be followed for spill prevention and clean-up:

- Manufacturer's recommended methods for spill cleanup needs to be clearly posted and site personnel need to be made aware of the procedures and the location of the information and cleanup supplies. Refer to material safety data sheets (Material Safety Data Sheet).
- Material and equipment necessary for spill cleanup needs to be kept in the material storage area on-site. Equipment and materials include, but are not be limited to; brooms, dust pans, mops, rags, gloves, goggles, absorbent clay (kitty litter), sand, sawdust, absorbent mats, and plastic and metal trash containers specifically for this purpose.

- All spills need to be cleaned up immediately after discovery and properly containerized for proper disposal. Burial is not acceptable.
- The spill area must be kept well ventilated and personnel need to wear appropriate protective clothing to prevent injury from contact with a hazardous substance.

- Spills of toxic or hazardous material must be reported immediately to the appropriate state or local government agency, regardless of the size.

- The spill prevention plan needs to be adjusted to include measures to prevent this type of spill from being repeated, and the plan needs to show how to clean up the spill if another one does occur.

Contaminated Soils

Removal of contaminated soils and underground storage tanks should be based on information provided by the Alabama Department of Environmental Management following a proper site assessment.

Hazardous Products

- Products must be kept in original containers unless they are not resealable. If product is transferred to a new container, it must be properly marked and labeled.
- Original labels and material safety data sheets should be retained.
- If surplus product must be disposed, disposal must be done in accordance with Alabama Department of Environmental Management regulations.

Air Emissions

Burning

Burning on the site may require a permit from the Alabama Forestry Commission. County or city ordinances may also apply. Starting disposal fires with diesel fuel or old tires is not a recommended practice. The use of burn pits with fans to generate hot disposal fires decreases the fire disposal time and minimizes smoke.

Dust Control

Apply measures that minimize dust. Stabilizing areas with mulch as soon as possible can minimize dust. Watering should be provided in unstabilized areas.

Other Good Groundskeeping Practices

The following good housekeeping practices also need to be followed during the construction of the project:

- An effort should be made to store only enough products to do the job.
- All materials stored on-site should be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products should be kept in their original containers with the original manufacturer's label.

- Whenever possible, all of a product should be used up before disposing of the container.
- Manufacturer's recommendations for proper use and disposal must be followed (see Material Safety Data Sheet).
- The site superintendent should inspect daily to ensure proper usage, storage and disposal of materials.
- Fertilizers need to be applied only in the minimum amounts recommended by the manufacturer.
- All paint containers need to be tightly sealed and stored when not required for use. Excess paint shall not be dumped into the storm sewer system but should be properly disposed of according to manufacturer's instructions (see Material Safety Data Sheet) and State regulations.
- The site should be kept clean and well groomed (trash picked up regularly, weeds mowed and signs maintained).
- Offsite fugitive spray from dust control, sand blasting and pressure washing must be minimized to the extent possible.
- Locate activities that generate odors and noise as far from surrounding properties as possible (this item includes portable toilets burn sites, fueling areas, equipment repair areas and dumpsters).

Mulching (MU)

Practice Description

Mulching is the application of plant residues such as straw or other suitable fibrous materials to the soil surface. Mulch protects the soil surface from the erosive force of raindrop impact and reduces the velocity of overland flow. It helps seedlings germinate and grow by conserving moisture, protecting against temperature extremes and controlling weeds. Mulch also maintains the infiltration capacity of the soil. Mulch can be applied to seeded areas to help establish plant cover. It can also be used in unseeded areas to protect against erosion over the winter or until final grading and shaping can be accomplished except in areas with concentrated flow.

Planning Considerations

Surface mulch is the most effective, practical means of controlling runoff and erosion on disturbed land prior to vegetation establishment. Mulch absorbs the energy associated with raindrops and thereby minimizes soil particle detachment, which is the initiation step of erosion.

Mulch also reduces soil moisture loss by evaporation, prevents crusting and sealing of the soil surface, moderates soil temperatures, and provides a suitable microclimate for seed germination.

Organic mulches such as straw, wood chips and shredded bark have been found to be very effective mulch materials. Materials containing weed and grass seeds which may compete with establishing vegetation should not be used. Also, decomposition of some wood products can tie up significant amounts of soil nitrogen, making it necessary to modify fertilization rates or add fertilizer with the mulch.

Hydraulic Erosion Control Products (HECPs) as defined by the Erosion Control Technology Council (ECTC) can also be used as effective mulch applications. HECPs are designated as 5 different types based on product characteristics and performance. Information from the ECTC table dated April 2014 is provided as Table MU-1. To ensure that you use the most valid information refer to the latest HECP specifications provided by the ECTC or the manufacturer's recommendation. The Alabama Department of Transportation (ALDOT) characterizes mulches based on performance levels identified in Sections 656 and 659 of their Standard Specifications for Highway Construction.

The choice of materials for mulching should be based on soil conditions, season, type of vegetation to establish, and size of the area. Properly applied and tacked mulch is always beneficial. Mulching is especially important when conditions of germination are not optimum, such as midsummer and early winter, and on difficult sites such as cut slopes, fill slopes and droughty soils.

Straw has traditionally been the most commonly used mulching material in conjunction with seeding. Wheat straw is the mostly commonly used straw, and can be spread by hand or with a mulch blower. If the site is susceptible to blowing wind, the straw should be tacked down with a tackifier, or a crimper to prevent loss.

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

Compost, peanut hulls, and pine straw are organic materials that potentially make excellent mulches but may only be available locally or seasonally. Creative use of these materials may reduce costs.

Jute mesh or the various types of netting is very effective in holding mulch in place on waterways and slopes before grasses become established.

Erosion control blankets promote seedling growth in the same way as organic mulches and are suited for use in areas with concentrated flows (see Erosion Control Blanket practice).

Table MU-1 Hydraulic Erosion Control Products (HECP) Specification Chart [1]

Hydraulic Erosion Control							
Type (HECP)	Term	Functional Longevity [3]	Typical Application Rates Lbs/Acre (kg/ha)	Typical Maximum Slope Gradient (h:v)	Maximum Uninterrupted Slope Length (ft)	Maximum C Factor (3 Tests)	Minimum Vegetation Establishment [6]
1	Ultra Short Term	1 month	1500—2500 (1700—2800)	≤ 5:1	20	0.3	150 %
2	Short Term	2 month	2000—3000 (2250—3400)	≤ 4:1	25	0.2	150 %
3	Moderate Term	3 month	2000—3500 (2250—3900)	≤ 3:1	50	0.1	200 %
4	Extended Term	6 month	2500—4000 (2800—4500)	≤ 2:1	75	0.05	300 %
5	Long Term	12 month	3000—4500 (3400—5100)	≤ 2:1	100	0.02	300 %

[1] This table is for general guidelines only. Refer to manufacturer for application rates, instructions, gradients, maximum continuous slope lengths and other site-specific recommendations.

[2] These categories are independent of rolled erosion control products (RECPs) categories, despite the identical names.

[3] A manufacturer's estimated time period, based upon field observations, that a material can be anticipated to provide erosion control as influenced by it composition and site-specific conditions.

[4] "C" Factor calculated as ratio of soil loss from HECP protected slope (tested at specified or greater gradient, h:v) to ratio of soil loss from unprotected (control) plot based on large-scale testing.

[5] Acceptable large-scale test methods may include ASTM D 6459, or other independent testing deemed acceptable by the engineer.

[6] Minimum vegetation establishment is calculated as outlined in ASTM D 7322 being a percentage by dividing the plant mass per area of the protected plot by the plant mass per area of the control plot.

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(Source: Erosion Control Technology Council, April 2014)

Design Criteria

Site Preparation

Before mulching, complete the required site preparation. Site preparation includes grading, if needed, and seedbed preparation and fertilizing, liming and seeding if a planting is being made by means other than hydroseeding.

Spreading the Mulch

Select a mulch material based on the site and practice requirements, availability of material, and availability of labor and equipment. Table MU-2 lists commonly used mulches.

Table MU-2 Mulching Materials and Application Rates

Material	Rate Per Acre and (Per 1000 ft.^{2})	Notes
Straw with Seed	1 ½-2 tons (70 lbs-90 lbs)	Spread by hand or machine to attain 75% groundcover; anchor when subject to blowing.
Straw Alone (no seed)	2 ½-3 tons (115 lbs-160 lbs)	Spread by hand or machine; anchor when subject to blowing.
Wood Chips	5-6 tons (225 lbs-270 lbs)	Treat with 12 lbs. nitrogen/ton.
Bark	35 cubic yards (0.8 cubic yard)	Can apply with mulch blower.
Pine Straw	1-2 tons (45 lbs-90 lbs)	Spread by hand or machine; will not blow like straw.
Peanut Hulls	10-20 tons (450 lbs-900 lbs)	Will wash off slopes. Treat with 12 lbs. nitrogen/ton.
HECPs	0.75 – 2.25 tons (35 lbs – 103 lbs)	Refer to ECTC or Manufacturer's Specifications.

Uniformly spread organic mulches by hand or with a mulch blower at a rate which provides about 75% ground cover. Spread HECPs utilizing appropriate equipment and at rates as specified When spreading straw mulch by hand, divide the area to be mulched into sections of approximately 1000 sq. ft. and place 70-90 pounds of straw (1 ½ to 2 bales) in each section to facilitate uniform distribution. Caution, an over-application of wheat straw will reduce stand success – do not over-apply wheat straw when mulching a seeding!

When straw mulch is subject to be blown away by wind, it must be anchored immediately after spreading. It is best anchored with a mulch anchoring tool.

Application of a commercial tackifier through a hydroseeder is often practical for steep slopes and can be effective on most sites. Binders (tackifiers) may be applied after mulch is spread or may be sprayed into the mulch as it is being blown onto the soil. Applying straw and binder together is the most effective

method. Liquid binders include an array of commercially available synthetic binders and organic tackifiers.

In high wind situations like roadways, crimping the mulch is the best alternative as the use of mulch binders may still result in the mulch being rolled up on the edge.

Straw mulch may also be anchored with lightweight plastic, cotton, jute, wire or paper netting which is stapled over the mulch. The manufacturer's recommendations on stapling netting should be followed.

Maintenance

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

Temporary Seeding (TS)

Practice Description

Temporary seeding is the establishment of fast-growing annual vegetation from seed on disturbed areas. Temporary vegetation provides economical erosion control for up to a year and reduces the amount of sediment moving off the site.

This practice applies where short-lived vegetation can be established before final grading or in a season not suitable for planting the desired permanent species. It helps prevent costly maintenance operations on other practices such as sediment basins and sediment barriers. In addition, it reduces problems of mud and dust production from bare soil surfaces during construction. Temporary or permanent seeding is necessary to protect earthen structures such as dikes, diversions, grass-lined channels and the banks and dams of sediment basins.

Planning Considerations

Temporary vegetative cover can provide significant short-term erosion and sediment reduction before establishing perennial vegetation.

Temporary vegetation will reduce the amount of maintenance associated with sediment basins.

Temporary vegetation is used to provide cover for no more than 1 year. Permanent vegetation should be established at the proper planting time for permanent vegetative cover.

Certain plants species used for temporary vegetation will produce large quantities of residue which can provide mulch for establishment of the permanent vegetation.

Proper seedbed preparation and selection of appropriate species are important with this practice. Failure to follow establishment guidelines and recommendations carefully may result in an inadequate or short-lived stand of vegetation that will not control erosion.

The selection of plants for temporary vegetation must be site specific. Factors that should be considered are type of soils, climate, establishment rate, and management requirements of the vegetation. Other factors that may be important are wear, mowing tolerance, and salt tolerance of vegetation.

Seeding properly carried out within the optimum dates has a higher probability of success. It is also possible to have satisfactory establishment when seeding outside these dates. However, as plantings are deviated from the optimum dates, the probability of failure increases rapidly. Seeding dates should be taken into account in scheduling land-disturbing activities.

Site quality impacts both short-term and long-term plant success. Sites that have compacted soils should be modified whenever practical to improve the potential for plant growth.

The operation of equipment is restricted on slopes steeper than 3:1, severely limiting the quality of the seedbed that can be prepared. Provisions for establishment of vegetation on steep slopes can be made during final grading. In construction of fill slopes, for example, the last 4-6" might not be compacted. A loose, rough seedbed with irregularities that hold seeds and fertilizer is essential for hydroseeding. Cut slopes should be roughened (see practice Land Grading).

Good mulching practices are critical to protect against erosion on steep slopes. When using straw, anchor with netting or asphalt. On slopes steeper than 2:1, either hydraulic mulch or erosion control blanket is more appropriate than straw to protect the slope.

The use of irrigation (temporary or permanent) will greatly improve the success of vegetation establishment.

Design Criteria

Plant Selection

Select plants that can be expected to meet planting objectives. To simplify plant selection, use Table TS-1, Commonly Used Plants for Temporary Cover and Figure TS-1, Geographical Areas for Species Adaptation and Seeding Dates. Seeding mixtures commonly specified by the Alabama Department of Transportation are an appropriate alternative for plantings on rights-of-ways. Additional information related to plantings in Alabama is found in Chapter 2 in the section Non-Woody Vegetation for Erosion and Sediment Control.

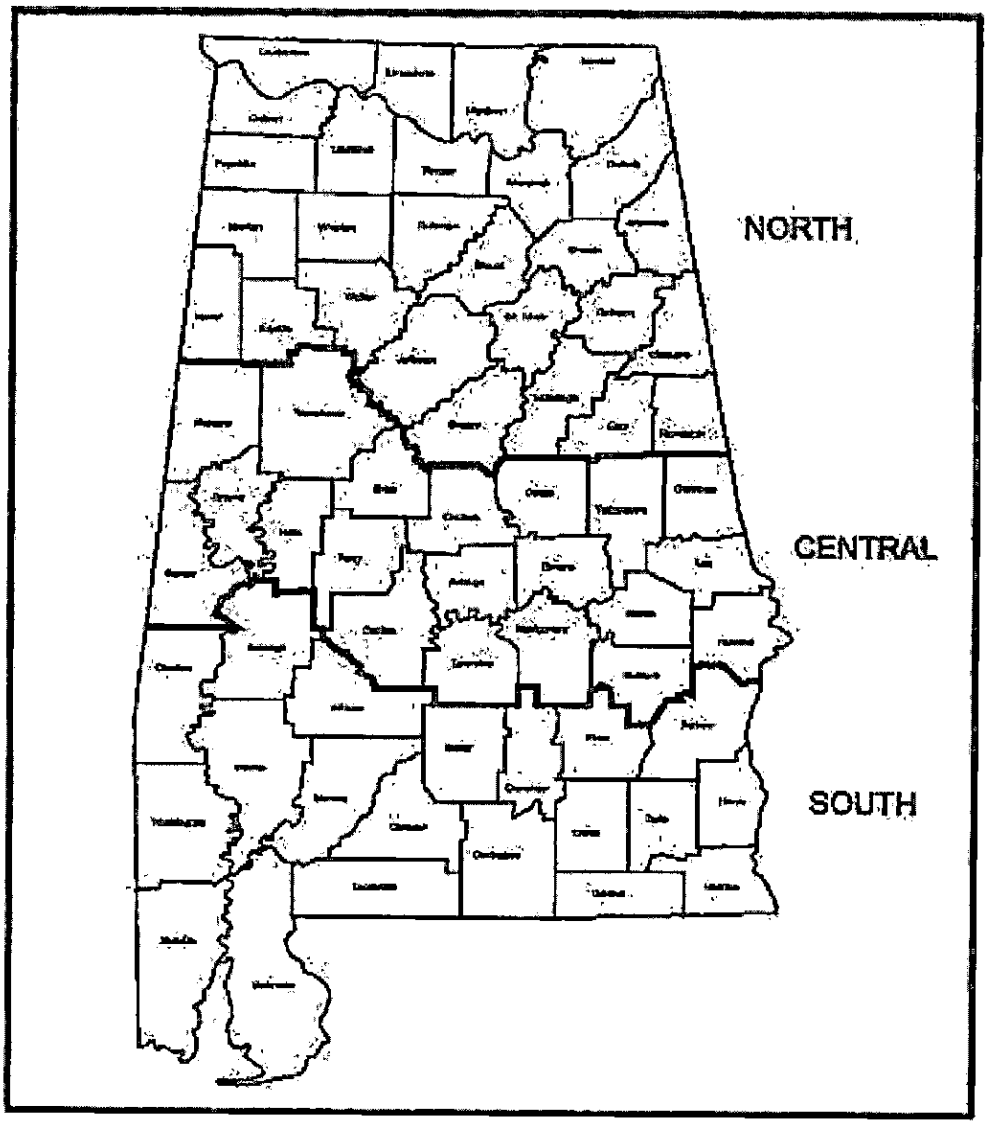

Figure TS-1 Geographical Areas for Species Adaptation and Seeding Dates

Note: Site conditions related to soils and aspect in counties adjacent to or close to county boundaries may justify adjustments in planting dates by qualified design professionals.

Table TS-I Commonly Used Plants for Temporary Cover

Species	Seeding Rate/AC PLS	North	Central	South
			Seeding Dates	
Millet, Browntop or German	40 lbs	Apr1-Aug 1	Apr1- Aug 15	Apr 1-Aug 15
Rye	3 bu	Sep I-Nov 15	Sep 15-Nov 15	Sep 15-Nov 15
Ryegrass	30 lbs	Aug I-Sep 15	Sep I-Oct 15	Sep 1-Oct 15
Sorghum-Sudan Hybrids	40 lbs	May I-Aug 1	Apr 15-Aug 1	Apr I-Aug 15
Sudangrass	40 lbs	May I-Aug I	Apr 15-Aug	Apr I-Aug 15
Wheat	3 bu	Sep I-Nov 1	Sep 15-Nov 15	Sep 15-Nov 15
Common Bermudagrass	10 lbs	Apr 1-July 1	Mar 15-July 15	Mar 1-July 15
Crimson Clover	10lbs	Sept 1-Nov 1	Sept 1-Nov 1	Sept 1-Nov 1

PLS means pure live seed and is used to adjust seeding rates. For example, to plant 10 lbs PLS of a species with germination of 80% and purity of 90%, PLS= 0.8X 0.9 = 72%. 10 lbs PLS = 10/0.72 = 13.9 lbs of the species to be planted.

Site Preparation and Soil Amendments

Complete grading and shaping before applying soil amendments if needed to provide a surface on which equipment can safely and efficiently be used to apply soil amendments and accomplish seedbed preparation and seeding.

Lime

Apply lime according to soil test recommendations. If a soil test is not available, use 1 ton of agricultural limestone or equivalent per acre on coarse textured soils and 2 tons per acre on fine textured soils. Do not apply lime to alkaline soils or to areas which have been limed during the preceding 2 years. Other liming materials that may be selected should be provided in amounts that provide equal value to the criteria listed for agricultural lime or be used in combination with agricultural limestone or Selma chalk to provide equivalent values to agricultural limestone.

Fertilizer

Apply fertilizer according to soil test results. If a soil test is not available, apply 8-24-24 fertilizer.

When vegetation has emerged to a stand and is growing, 30 to 40 lbs/acre (approximately 0.8 lbs/1000 ft^2) of additional nitrogen fertilizer should be applied.

Note: Fertilizer can be blended to meet exact fertilizer recommendations. Take soil test recommendations to local fertilizer dealer for bulk fertilizer blends. This may be more economical than bagged fertilizer.

Application of Soil Amendments

Incorporate lime and fertilizer into the top 6" of soil during seedbed preparation.

Seedbed Preparation

Good seedbed preparation is essential to successful plant establishment. A good seedbed is well pulverized, loose, and smooth. If soils become compacted during grading, loosen them to a depth of 6" to 8" using a ripper or chisel plow.

If rainfall has caused the surface to become sealed or crusted, loosen it just prior to seeding by disking, raking, harrowing, or other suitable methods. When hydroseeding methods are used, the surface should be left with a more irregular surface of clods.

Planting Methods

Seeding

Evenly apply seed using a cyclone seeder (broadcast), drill seeder, cultipacker seeder, or hydroseeder. Broadcast seeding and hydroseeding are appropriate for steep slopes where equipment cannot operate safely. Small grains should be planted no more than 1" deep, and grasses and legumes no more than ½" deep. Seed that are broadcast must be covered by raking or chain dragging, and then lightly firmed with a roller or cultipacker.

Hydroseeding

Surface roughening is particularly important when hydroseeding, as a roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydroseeding operations; large clods, stones, and irregularities provide cavities in which seeds can lodge.

Mix seed, inoculant if required, and a seed carrier with water and apply as slurry uniformly over the area to be treated. The seed carrier should be a cellulose fiber, natural wood fiber or other approved fiber mulch material which is dyed an appropriate color to facilitate uniform application of seed. Use the correct legume inoculant at 4 times the recommended rate when adding inoculant to hydroseeder slurry. The mixture should be applied within one hour after mixing to reduce damage to seed.

Fertilizer should not be mixed with the seed-inoculant mixture because fertilizer salts may damage seed and reduce germination and seedling vigor. Fertilizer may be applied with a hydro seeder as a separate operation after seedlings are established.

Mulching

The use of appropriate mulch provides instant cover and helps ensure establishment of vegetative cover under normal conditions and is essential to seeding success

under harsh site conditions (see the Mulching practice for guidance). Harsh site conditions include the following: slopes steeper than 3:1 and adverse soils (soils that are shallow to rock, rocky, or high in clay or sand). Areas with concentrated flow should be treated differently and require a practice appropriate for channel flow. (refer to Chapter 5 Runoff Conveyance for guidance).

Permanent Seeding (PS)

Practice Description

Permanent seeding is the establishment of perennial vegetation on disturbed areas from seed. Permanent vegetation provides economical long-term erosion control and helps prevent sediment from leaving the site. This practice is used when vegetation is desired and appropriate to permanently stabilize the soil.

Planning Considerations

The advantages of seeding over other means of establishing plants include the smaller initial cost, lower labor input, and greater flexibility of method.

Disadvantages of seeding include potential for erosion during the establishment stage, seasonal limitations on suitable seeding dates, and weather-related problems such as droughts.

The probability of successful plant establishment can be maximized through good planning. The selection of plants for permanent vegetation must be site specific. Factors that should be considered are type of soils, climate, establishment rate, and management requirements of the vegetation. Other factors that may be important are wear, mowing tolerance, and salt tolerance of vegetation.

Plant selection for permanent vegetation should be based on plant characteristics, site and soil conditions, time of year of planting, method of planting, and the intended use of the vegetated area. Climate factors can vary widely in Alabama. Important plant attributes are discussed in Vegetation Establishment for Erosion and Sediment Control in Chapter 2.

Plant selection may include companion plants to provide quick cover on difficult sites, late seedings, or where the desired permanent cover may be slow to establish. Annuals are usually used for companion plants and should be selected carefully to prevent using a species that provide so much competition that it prevents the establishment of the desired species.

Seeding properly carried out within the optimum dates has a higher probability of success. It is also possible to have satisfactory establishment when seeding outside these dates. However, as plantings are deviated from the optimum dates, the probability of failure increases rapidly. Seeding dates should be taken into account in scheduling land-disturbing activities.

Site quality impacts both short-term and long-term plant success. Sites that have compacted soils, soils that are shallow to rock or have textures that are too clayey or too sandy should be modified whenever practical to improve the potential for plant growth and long-term cover success.

The operation of equipment is restricted on slopes steeper than 3:1, severely limiting the quality of the seedbed that can be prepared. Provisions for establishment of vegetation on steep slopes can be made during final grading. In construction of fill slopes, for example, the last 4-6" might not be compacted. A loose, rough seedbed with irregularities that hold seeds and lime and fertilizer is essential for hydroseeding. Cut slopes should be roughened (see Land Grading practice).

Proper mulching is critical to protect against erosion on steep slopes. When using straw, anchor with netting or asphalt. On slopes steeper than 2:1, jute, excelsior, or synthetic matting may be required.

The use of irrigation (temporary or permanent) will greatly improve the success of vegetation establishment.

Design Criteria

Plant Selection

Select plants that can be expected to meet planting objectives. To simplify plant selection, use Figure PS-1 Geographical Areas for Species Adaptation and Seeding Dates and Table PS-1, Commonly Used Plants for Permanent Cover. Mixtures commonly specified by the Alabama Department of Transportation are an appropriate alternative for plantings on rights-of-ways. Additional information related to plants commonly used in Alabama is found in Chapter 2 under the section Vegetation for Erosion and Sediment Control.

The plants used for temporary vegetation may be used for companion plants provided the seeding rate of the annual species is reduced by one half. See the Temporary Seeding practice for additional information on establishing temporary vegetation. **Ryegrass or other highly competitive plants should not be used as a companion plant with a permanent seeding.**

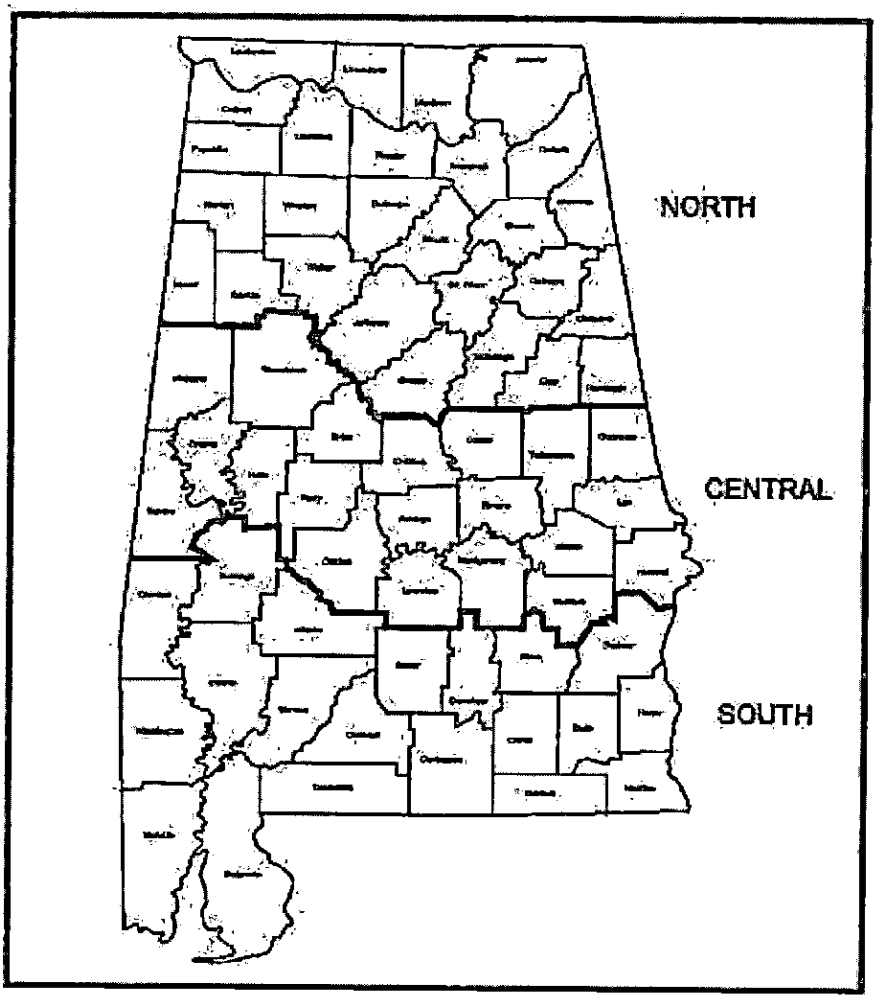

Figure PS-1 Geographical Areas for Species Adaptation and Seeding Dates

Note: Site conditions related to soils and aspect in counties adjacent to or close to county boundaries may justify adjustments in planting dates by qualified design professionals.

Table PS-1 Commonly Used Plants for Permanent Cover with Seeding Rates and Dates

Species	Seeding Rates/Ac PLS	North	Central	South
			Seeding Dates	
Bahiagrass, Pensacola	40 lbs	--	Mar 1-July 1	Feb 1-Nov 1
Bermudagrass, Common	10 lbs	Apr 1-July 1	Mar 15-July 15	Mar 1-July 15
Bahiagrass, Pensacola Bermudagrass, Common	30 lbs 5 lbs	--	Mar 1-July 1	Mar 1-July 15
Bermudagrass, Hybrid (Lawn Types)	Solid Sod	Anytime	Anytime	Anytime
Bermudagrass, Hybrid (Lawn Types)	Sprigs 1/sq ft	Mar 1-Aug 1	Mar 1-Aug 1	Feb 15-Sep 1
Fescue, Tall	40-50 lbs	Sep 1-Nov 1	Sep 1-Nov 1	--
Sericea	40-60 lbs	Mar 15-July 15	Mar 1-July 15	Feb 15-July 15
Sericea & Common Bermudagrass	40lbs 10 lbs	Mar 15-July 15	Mar 1-July 15	Feb 15-July 15
Switchgrass, Alamo	4 Lbs	Apr 1-Jun 15	Mar 15-Jun 15	Mar 15-Jun15

PLS means pure live seed and is used to adjust seeding rates. For example, to plant 10 lbs PLS of a species with germination of 80% and purity of 90%, PLS= 0.8X 0.9 = 72%. 10 lbs PLS = 10/0.72 = 13.9 lbs of the species to be planted.

Seedbed Requirements

Establishment of vegetation should not be attempted on sites that are unsuitable due to compaction or inappropriate soil texture, poor drainage, concentrated overland flow, or steepness of slope until measures have been completed to correct these problems. To maintain a good stand of vegetation, the soil must meet certain minimum requirements as a growth medium. A good growth medium should have these attributes:

- Sufficient pore space to permit root penetration.
- Enough fine-grained soil material (silt and clay) to maintain adequate moisture and nutrient supply.
- Sufficient depth of soil to provide an adequate root zone. The depth to rock or impermeable layers such as hardpans should be 12" or more, except on slopes steeper than 2:1 where topsoiling is not feasible.
- A favorable pH range for plant growth, usually 6.0-6.5.

- Sufficient nutrients (nitrogen, phosphorus and potassium) for initial plant establishment.

- Freedom from large roots, branches, stones, or large clods. Clods and stones may be left on slopes steeper than 3:1 if they are to be hydroseeded.

If any of the above attributes are not met: i.e., if the existing soil is too dense, coarse, shallow or acidic to foster vegetation – chiseling, topsoil, or special amendments should be used to improve soil conditions. The soil conditioners described below may be beneficial or topsoil may be applied (for guidance on topsoiling see Topsoiling practice). These amendments should only be necessary where soils have limitations that make them poor for plant growth or for turf establishment.

- Peat-appropriate types are sphagnum moss peat, reed-sedge peat, or peat humus, all from fresh-water sources. Peat should be shredded and conditioned in storage piles for at least 6 months after excavation.

- Sand-should be clean and free of toxic materials.

- Vermiculite-use horticultural grade.

- Rotted manure-use stable or cattle manure not containing undue amounts of straw or other bedding materials.

- Thoroughly rotted sawdust-should be free of stones and debris. Add 6 lbs of nitrogen to each cubic yard.

Soil Amendments

Liming Materials

Lime (Agricultural limestone) should have a neutralizing value of not less than 90 percent calcium carbonate equivalent and 90 percent will pass through a 10-mesh sieve and 50 percent will pass through a 60-mesh sieve.

Selma chalk should have a neutralizing value of not less than 80 percent calcium carbonate equivalent and 90 percent will pass through a 10-mesh sieve.

Other liming materials that may be selected should be provided in amounts that provide equal value to the criteria listed for agricultural lime or be used in combination with agricultural limestone or Selma chalk to provide equivalent values to agricultural limestone.

Plant Nutrients

Commercial grade fertilizers that comply with current Alabama Fertilizer Laws should be used to supply nutrients required to establish vegetation.

Lime and fertilizer needs should be determined by soil tests. Soil testing is performed by the Auburn University Soil Testing Laboratory and provides recommendations based on field tests on Alabama soils. The local county Cooperative Extension Service can provide information on obtaining soil tests. Commercial laboratories that make recommendations based on soil analysis may be used.

When soil tests are not available, use the following rates for application of soil amendments.

Sandy soils: Use 1 ton/acre (exception on sandy soils – if the cover will be tall fescue and clover) use 2 tons/acre.
Clayey soils: 2 tons/acre.
(Do not apply lime to alkaline soils).

Grasses alone: Use 400 lbs/acre of 8-24-24 or the equivalent. Apply 30 lbs of additional nitrogen when grass has emerged and begun growth (approximately 0.8lbs/1000 ft^2).
Grass-legume mixtures: Use 800 to 1200 lbs/acre of 5-10-10 or the equivalent.
Legumes Alone: Use 400 to 600 lbs/acre of 0-20-20 or the equivalent.

Note: Fertilizer can be blended to meet exact fertilizer recommendations. Take soil test recommendations to local fertilizer dealer for bulk fertilizer blends. This may be more economical than bagged fertilizer.

Application of Soil Amendments

Apply lime and fertilizer evenly and incorporate into the top 6" of soil by disking, chiseling or other suitable means during seedbed preparation. Operate machinery on the contour. On sites too steep for seedbed preparation, fertilizer and lime can be applied with a hydroseeder.

Seedbed Preparation

If needed, grade and shape to provide a surface on which equipment can safely and efficiently be used for seedbed preparation and seeding.

Install necessary sediment control practices before seedbed preparation and complete grading according to the approved plan.

Prepare a friable seedbed with tillage to a depth of at least 6". Break up large clods, alleviate compaction, and smooth and firm the soil into a uniform surface. Fill in or level depressions that can collect water.

Planting Methods

Seeding

Use certified seed for permanent seeding whenever possible. Certified seed is inspected by the Alabama Crop Improvement Association to meet high quality standards and will be tagged with a "Certified Seed" tag. (Note: all seed sold in

Alabama is required by law to be tagged to identify seed purity, germination, and presence of weed seeds. Seed must meet state standards for content of noxious weeds.)

Seeding dates are determined using Figure PS-1 and Table PS-1.

Inoculate legume seed with the Rhizobium bacteria appropriate to the species of legume. Details of legume inoculation are located in Chapter 2 in the part on Vegetation for Erosion and Sediment Control under Inoculation of Legumes.

Plant seed uniformly with a cyclone seeder, a drill seeder, a cultipacker seeder, or by hand on a fresh, firm, friable seedbed. If the seedbed has been sealed by rainfall, it should be disked so the seed will be sown into a freshly prepared seedbed.

When using broadcast-seeding methods, subdivide the area into workable sections and determine the amount of seed needed for each section. Apply one-half the seed while moving back and forth across the area, making a uniform pattern; then apply the second half in the same way, but moving at right angles to the first pass.

Cover broadcast seed by raking or chain dragging; then firm the surface with a roller or cultipacker to provide good seed contact. Small grains should be planted no more than 1" deep and grasses and legume seed no more than ½" deep.

Hydroseeding

Surface roughening is particularly important when hydroseeding, as a roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydroseeding operations; large clods, stones, and irregularities provide cavities in which seeds can lodge.

Mix seed, inoculant if required, and a seed carrier with water and apply as a slurry uniformly over the area to be treated. The seed carrier should be a cellulose fiber, natural wood fiber or other approved fiber mulch material which is dyed an appropriate color to facilitate uniform application of seed. Use the correct legume inoculant at 4 times the recommended rate when adding inoculant to a hydroseeder slurry. The mixture should be applied within one hour after mixing to reduce damage to seed.

Fertilizer should not be mixed with the seed-inoculant mixture because fertilizer salts may damage seed and reduce germination and seedling vigor.

Fertilizer may be applied with a hydroseeder as a separate operation after seedlings are established.

Lime is not normally applied with a hydraulic seeder because it is abrasive but if necessary it can be added to the seed slurry and applied at seeding or it may be applied with the fertilizer mixture. Also, lime can be blown onto steeper slopes in dry form.

Sprigging

Hybrid bermudagrass cannot be grown from seed and must be planted vegetatively. Vegetative methods of establishing common and hybrid bermudagrass, centipedegrass and zoysia include sodding, plugging and sprigging (see Sodding practice).

When sprigs are planted with a sprigging machine, furrows should be 4-6" deep and 2 feet apart. Place sprigs no farther than 2 feet apart in the row and so that at least one rooting node is in the furrow.

When broadcasting is used for sprig planting, broadcast sprigs at the specified rate (Table PS-1). Press into the top ½" to 2" of soil with a cultipacker or with a disk set nearly straight so that the sprigs are not brought back to the surface. A mulch tacking machine may be used to press sprigs into the soil.

Mulching

The use of mulch provides instant cover and helps ensure establishment of vegetation under normal conditions and is essential to seeding success under harsh site conditions (see Mulching practice). Harsh site conditions include: slopes steeper than 3:1 and adverse soils (shallow, rocky, or high in clay or sand). Areas with concentrated flow should be treated differently and require sod, a hydromulch formulated for channels or an appropriate erosion control blanket.

Irrigation

Moisture is essential for seed germination and vegetation establishment. Supplemental irrigation can be very helpful in assuring adequate stands in dry seasons or to speed development of full cover. It is a requirement for establishment of vegetation from sod and sprigs and should be used elsewhere when feasible. However, irrigation is rarely critical for low-maintenance vegetation planted at the appropriate time of the year.

Water application rates must be carefully controlled to prevent runoff. Inadequate or excessive amounts of water can be more harmful than no supplemental water.

Maintenance

Generally, a stand of vegetation cannot be determined to be fully established until soil cover has been maintained for 1 full year from planting. Inspect vegetated areas for failure and make necessary repairs and vegetate as soon as possible.

If a stand has inadequate cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand after seedbed preparation or over-seed the stand. Consider a temporary seeding if the time of year is not appropriate for establishment of permanent vegetation (see Temporary Seeding practice).

If vegetation fails to grow, a soil test should be made to determine if soil acidity or nutrient imbalance is responsible.

To attain complete establishment, fertilization is usually required in the second growing season. Turf grasses require annual maintenance fertilization. Use soil tests if possible or follow the guidelines given for the specific seeding mixtures.

Protect vegetation during its establishing period from traffic that will be harmful. If appropriate, use either temporary fences or barriers to protect areas that may be damaged by excessive traffic.

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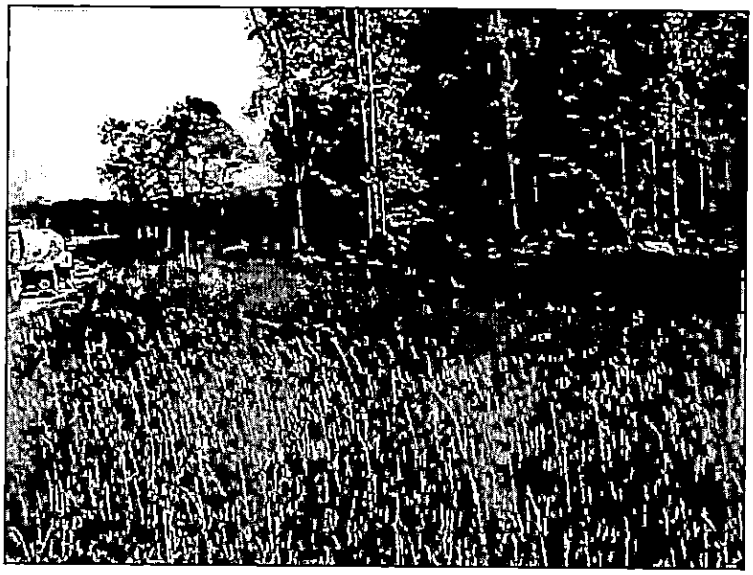
Preservation of Vegetation (PV)



Practice Description

Preservation of vegetation is the avoidance of an area during land disturbing and construction activity to prevent mechanical and other injury to desirable plants in the planned landscape. The practice provides erosion and sediment control and is applicable where vegetative cover is desired and the existing plant community is compatible with the planned landscape.

Planning Considerations

Preservation of vegetation requires good site management to minimize the impact of construction activities on existing vegetation.

Plants to save should be identified prior to any construction activity.

Proper maintenance, especially during construction, is important to ensure healthy vegetation that can control erosion.

Different species, soil types, and climatic conditions will require different maintenance activities.

Design Criteria

Mark Plant Area for Retention

Groups of plants and individual trees to be retained should be located on a plan map. Limits of clearing should be planned outside the drip line of groups or individual trees to be saved. The clearing should never be closer than 5 feet to the trunk of a tree.

Flagging or other appropriate means of marking the site of the groups of plants and individual trees to be retained should be required before construction begins Individual trees to be retained should be marked with a highly visible paint or surveyor's ribbon in a band circling the tree at a height visible to equipment operators.

Plant Protection

Restrict construction equipment, vehicular traffic, stockpiles of construction materials, topsoil etc., from the areas where plants are retained and restrict these activities from occurring within the drip line of any tree to be retained. Trees being removed shall not be pushed into trees to be retained. Equipment operators shall not clean any of their equipment by slamming it against trees to be retained.

Restrict burning of debris within 100 feet of the plants being preserved. Fires shall be limited in size to prevent damage to any nearby trees.

Toxic material shall not be stored any closer than 100 feet to the drip line of any trees to be retained. Toxic materials shall be managed and disposed of according to state laws.

Fencing and Armoring

Groups of plants and trees should be protected by fencing or armoring where necessary (See Figure PV-l). The following types of fencing or armoring may be used:

- Board Fence-Board fence may be constructed with 4" square posts set securely in the ground and protruding at least 4 feet above the ground. A minimum of 2 horizontal boards should be placed between the posts. The fence should be placed at the limits of the clearing around the drip line of the tree. If it is not practical to erect a fence at the drip line, construct a triangular fence near the trunk. The limits of clearing will still be the drip line as the root zone within the drip line will still require protection.

- Cord Fence-Posts at least 2" square or 2" in diameter set securely in the ground and protruding at least 4 feet above the ground shall be placed at the limits of clearing with 2 rows of cord ¼" or thicker at least 2 feet apart running between posts with strips of surveyor's tape tied securely to the string at intervals of 3 feet or less.

- Earth Berms-Temporary earth berms may be constructed. The base of the berm on the tree side should be located along the limits of clearing. Earth berms may not be used for this purpose if their presence will create drainage patterns that cause erosion.

- Additional Trees-Additional trees may be left standing as protection between the trees to be retained and the limits of clearing. However, for this alternative to be used, trees in the buffer must be no more than 6 feet apart to prevent passage of equipment and material through the buffer.

- Plan for these additional trees to be evaluated prior to the completion of construction and either given sufficient treatment to ensure survival or be removed.

- Trunk Armoring-As a last resort, a tree may be armored with burlap wrapping and 2" studs wired vertically no more than 2" apart to a height of 5 feet. The armoring should encircle the tree trunk. Nothing should ever be nailed to a tree. The root zone within the drip line will still require protection.

- Fencing and armoring devices should be in place before any construction work is done and should be kept in good condition for the duration of construction activities. Fencing and armoring should not be removed until the completion of the construction project.

Raising the Grade

When the ground level must be raised around an existing tree or group of trees several methods may be used to insure survival.

A well may be created around a group of trees or an individual tree slightly beyond the drip line to retain the natural soil around the feeder roots (see Figure PV-2). When the well alternative is not practical or desirable, remove vegetation and organic matter from beneath the tree or trees for 3 feet beyond the drip line and loosen the surface soil to a depth of approximately 3" without damaging the roots.

Apply fertilizer in the root area of the tree to be retained. A soil test is the best way to determine what type of fertilizer to use. In the absence of a soil test, fertilizer should be applied at the rate of 1 to 2 pounds of 10-8-6 or 10-6-4 per inch of diameter at breast height (dbh) for trees under 6" dbh and at the rate of 2 to 4 pounds of 10-8-6 or 10-6-4 per inch of dbh for trees over 6" dbh.

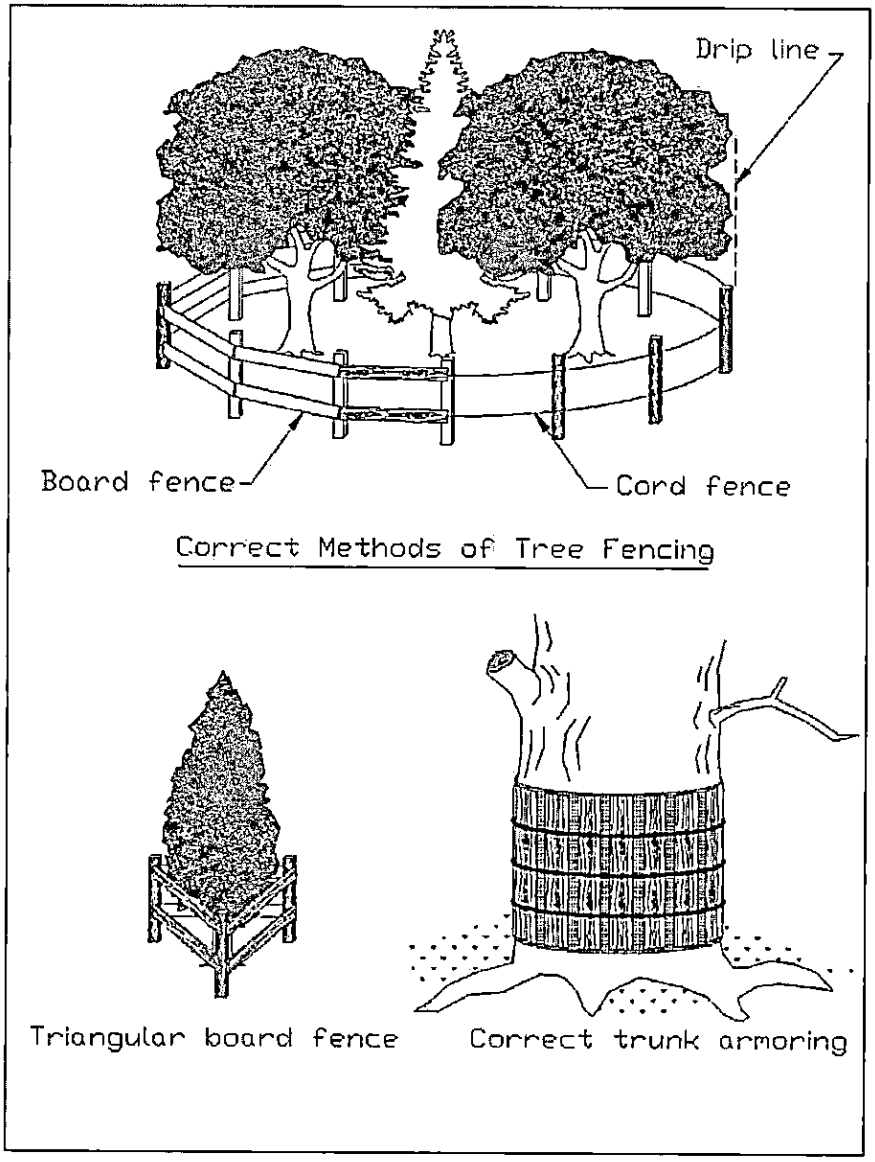


Figure PV-1 Fencing and Armoring

A dry well shall be constructed to allow for tree trunk diameter growth (see Figure PV-3). A space of at least 1 foot between the tree trunk and the well wall is adequate for old, slow growing trees. Clearance for younger trees shall be at least 2 feet. The well shall be high enough to bring the top just above the level of the proposed fill. The well wall shall taper slightly away from the tree trunk at a rate of 1" per foot of wall height.

The well wall shall be constructed of large stones, brick, building tile, concrete blocks, or cinder blocks. Openings should be left through the wall of the well to allow for free movement of air and water. Mortar shall only be used near the top of the well and only above the porous fill.

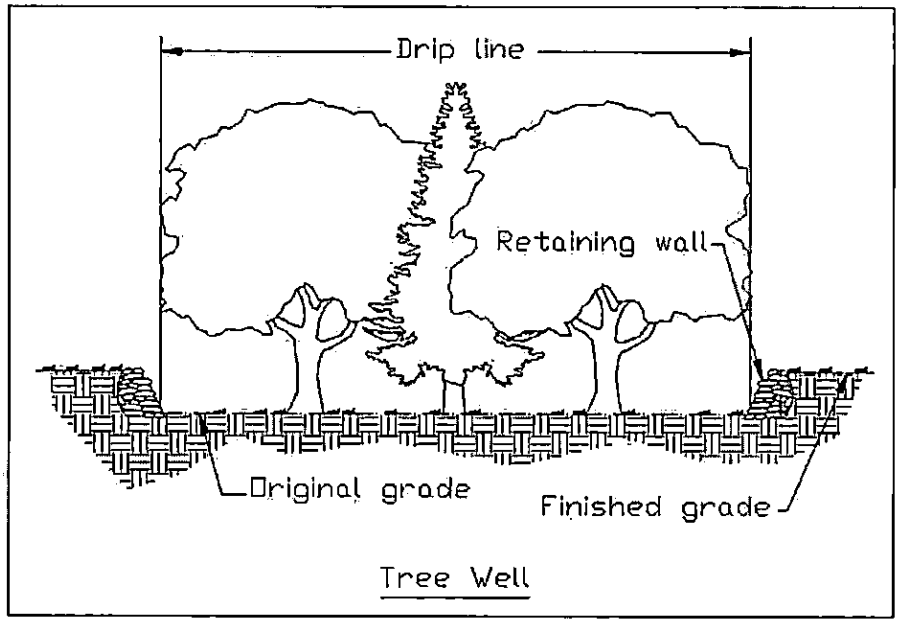


Figure PV-2 Tree Well

Drain lines composed of 4" high quality drain tiles shall begin at the lowest point inside the well and extend outward from the tree trunk in a wheel and spoke pattern with the trunk as the hub. Radial drain lines shall slope away from the well at a rate of ⅛" per foot. The circumference line of tiles should be located beneath the drip line of the trees. Vertical tiles or pipes shall be placed over the intersections of the two tile systems if a fill of more than 2 feet is contemplated. Vertical tiles shall be held in place with stone fill. Tile joints shall be tight. A few radial tiles shall extend beyond each intersection and shall slope sharply downward to insure good drainage. Tar paper or its approved equivalent shall be placed over the tile and/or pipe joints to prevent clogging and large stone shall be placed around and over drain tiles and/or pipes for protection.

A layer of 2" to 6" of stone shall be placed over the entire area under the tree from the well outward at least as far as the drip line. For fills up to 2 feet deep, a layer of stone 8" to 12" thick should be adequate.

A thick layer of this stone not to exceed 30" will be needed for deeper fills. A layer of ¾" to 1" stone covered by straw, fiberglass mat or a manufactured filter fabric shall be used to prevent soil from clogging the space between stones. Cinders shall not be used as fill material. Filling shall be completed with porous soil such as topsoil until the desired grade is reached. This soil shall be suitable to sustain specified vegetation.

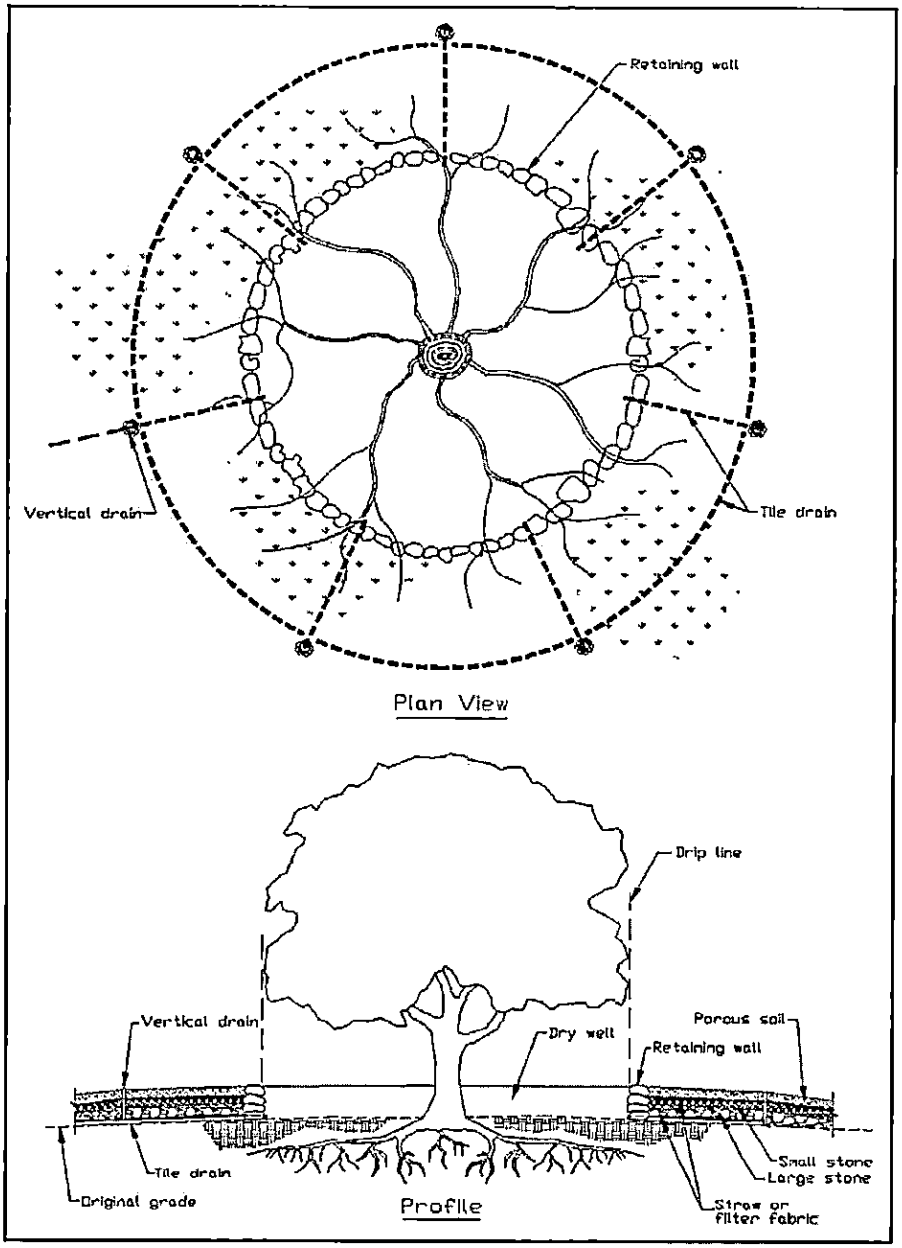


Figure PV-3 Tree Well Detail

Crushed stone shall be placed inside the dry well over the openings of the radial tiles to prevent clogging. The area between the trunk and the well wall shall either be covered by an iron grate or filled with a 50-50 mixture of crushed charcoal and sand to prevent anyone from falling into the dry well.

Where water drainage through the soil is not a problem, coarse gravel in the fill may be substituted for the tile. This material has sufficient porosity to ensure air drainage. Instead of the vertical tiles or pipes in the system, stones, crushed rock and gravel may be added so that the upper level of these porous materials slants toward the surface in the vicinity below the drip line.

Raising the grade on only one side of a tree or group of trees may be accomplished by constructing only half of one of these systems.

Lowering the Grade

Shrubs and trees shall be protected from the harmful grade cuts by the construction of a tree wall (see Figure PV-4). Following excavation, all tree roots that are exposed and/or damaged shall be trimmed cleanly and covered with moist peat moss, burlap or other suitable material to keep them from drying out.

The wall shall be constructed of large stones, brick, building tile, concrete block or cinder block. The wall should be backfilled with topsoil, peat moss, or other organic matter to retain moisture and aid in root development. Apply fertilizer and water thoroughly. The tree plants should be pruned to reduce the leaf surface in proportion to the amount of root loss. Drainage should be provided through the wall so water will not accumulate behind the wall. Lowering the grade on one side of the tree or group of trees can be accomplished by constructing only half of this system.

Trenching and Tunneling

Trenching should be done as far away from the trunks of trees as possible, preferably outside the branches or crown spreads of trees, to reduce the amount of root area damaged or killed by trenching activities. When possible, trenches should avoid large roots or root concentrations. This can be accomplished by curving the trench or by tunneling under large roots and areas of heavy root concentration. Tunneling under a species that does not have a large tap root may be preferable to trenching beside it as it has less impact on root systems (see Figure PV-5).

Roots should not be left exposed to the air but should be covered with soil as soon as possible or protected and kept moist with burlap or peat moss until the trench or tunnel can be filled. The ends of damaged and cut roots shall be cut off smoothly and moist peat moss, burlap or topsoil should be placed over the exposed area.

Trenches and tunnels shall be filled as soon as possible. Care should be taken to ensure that air spaces are not left in the soil. Peat moss or other organic matter shall be added to the fill material as an aid to inducing and developing root growth. The tree should be fertilized and mulched to stimulate new root growth and enhance general tree vigor. If a large part of the root system has been damaged the crown leaf surface area should be reduced in proportion to the root damage. This may be accomplished by pruning 20-30 percent of the crown foliage. If the roots are damaged during the winter the crown should be pruned before the next growing season. If roots are cut during the growing season, pruning should be done immediately.

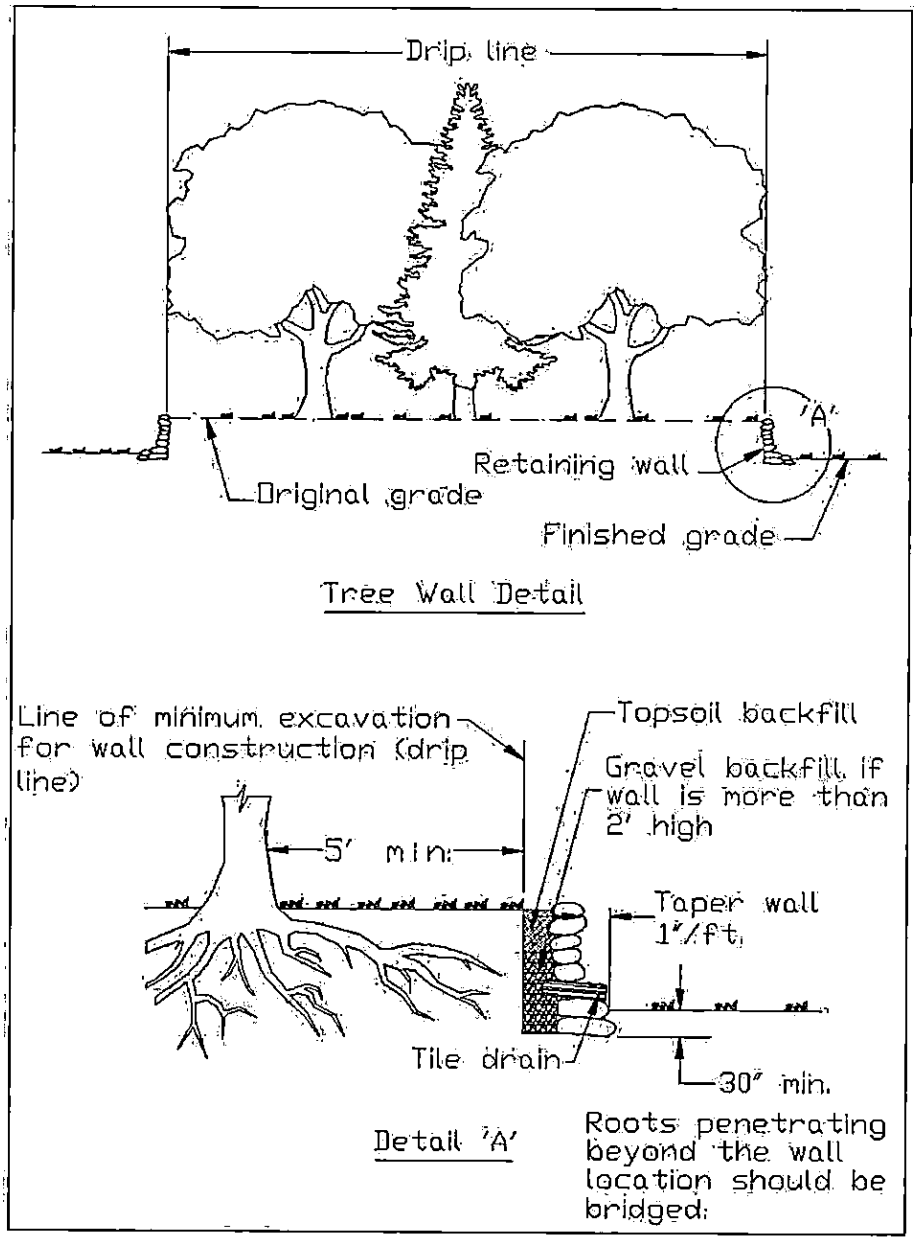


Figure PV-4 Tree Wall Detail

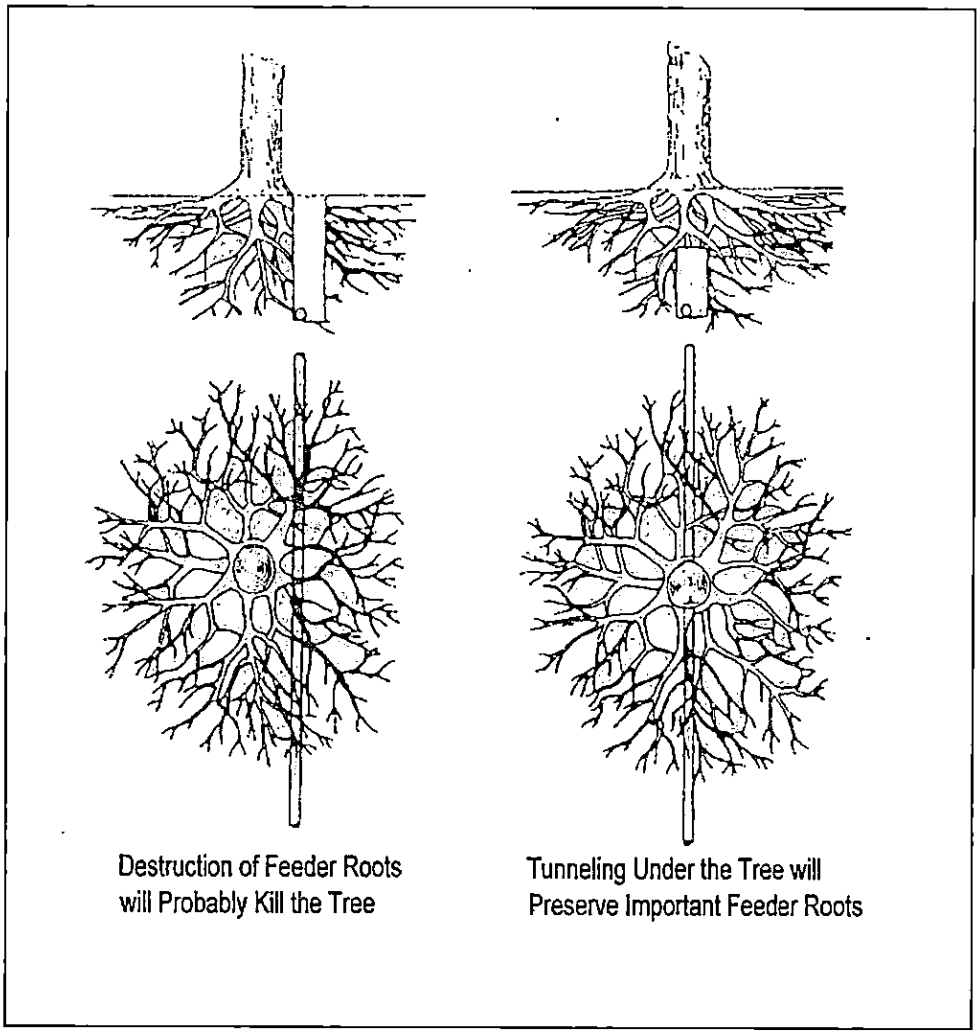


Figure PV-5 Trenching vs Tunneling

Treating Damaged Trees

When trees are damaged during construction activities certain maintenance practices can be applied to protect the health of the tree.

Soil aeration may be needed if the soil has been compacted. The soil around trees can be aerated by punching holes 1 foot deep and 18" apart under the crown of trees with an iron pipe.

Damaged roots should be cut off cleanly and moist peat moss, burlap or topsoil should be placed over the exposed area. Bark damage should be treated by removing loose bark.

Tree limbs damaged during construction or removed for any other reason shall be cut off above the collar at the branch junction.

Trees that have been stressed or damaged should be fertilized to aid their recovery.

Trees should be fertilized in the spring or fall. Fall applications are preferred.

Fertilizer should be applied to the soil over the feeder roots. In no case should it be applied closer than 3 feet to the trunk. Root systems of trees extend some distance beyond the drip line. The area to be fertilized should be increased by ¼ the area of the crown. A soil test is the best way to determine what type of fertilizer to use. In the absence of a soil test, fertilizer should be applied at the rate of 1 to 2 pounds of 10-8-6 or 10-6-4 per inch of dbh for trees under 6" dbh and at the rate of 2 to 4 pounds of 10-8-6 or 10-6-4 per inch of dbh for trees over 6" dbh.

A ground cover or organic mulch layer should be maintained around trees to prevent erosion, protect roots and to conserve water.

Check Dam (CD)

Practice Description

A check dam (also referred to as a "ditch check") is a small barrier or dam constructed across a swale, drainage ditch or other area of concentrated flow for the purpose of reducing channel erosion. Channel erosion is reduced because check dams flatten the gradient of the flow channel and slow the velocity of channel flow. Check dams do not reduce turbidity of runoff. Check dams can be constructed of rock, wattles (sometimes referred to as tubes or rolls), sand bags, or other materials that may be acceptable to the design professional. Unless installed correctly, check dams will not capture a significant amount of sediment. When installed correctly, most check dams can capture the coarser grained material, which can be significant for sandy soils. Sediment capture increases as velocity in the channel decreases by creating impoundments with the check dams. This impoundment pool creates the flattening of the gradient, greatly reducing channel erosion.

This practice applies in small open channels and drainageways, including temporary and permanent swales. Check dams are not to be used in a live stream. Situations of use include areas in need of protection during establishment of grass and areas that cannot receive a temporary or permanent non-erodible lining for an extended period.

Planning Considerations

Check dams are used in concentrated flow areas to provide temporary channel stabilization with minimal sediment retention during rainfall runoff periods on construction sites. Check dams may be constructed of rock, wattles, sand bags, or other suitable material, including manufactured products. Water flowing over a check dam creates turbulent erosive forces (super critical flow) that must be addressed to prevent erosion downstream of the check dam. Inevitably water will likely flow under check dams due to limitation with ground contact. Therefore, it is of upmost importance to ensure the performance of the check dam that erosion and scour under the check dam be minimized. This is best achieved using an underlay such as an 8-oz. nonwoven filter fabric. If the underlay is extended downstream, it will also protect the channel from super critical flows from water flowing over and under the dam.

Check dams should be planned to be compatible with the other features such as streets, walkways, trails, sediment basins and rights-of-way or property lines. Check dams are installed with the center overflow area lower in elevation than the ends to ensure flow goes over the check dam and not around. Check dams are normally constructed in series and the dams should be located at a normal interval from other grade controls such as culverts or sediment basins.

Check dams are generally used as a temporary BMP that is removed following construction to allow for final long-term stabilization of the channel. Provisions should be made to establish permanent channel linings as early as possible.

Check dams can also be used for other purposes such as the capture of sediment upstream of other practices or flocculent dosing upstream of a sediment basin.

Extensive research has been conducted by The Auburn University Erosion and Sediment Control Test Facility. The research recommendations are incorporated in the following planning considerations:

Rock Check Dams

Many check dams are constructed of rock. Rock may not be acceptable in some installations and alternative types of check dams need to be considered. Rock check dams (Figures CD-1 and CD-2) are usually installed with mechanical equipment but hand labor is likely needed to complete most installations to the quality needed. The availability and cost of commercially produced rock should be considered. The use of rock should be considered carefully in areas to be mowed. Some rock may be washed downstream and should be removed before each mowing operation. The use of geotextile can be used on the upstream face of the rock check dam to increase the sediment trapping efficiency of the rock check dam. Measures must be taken to prevent undermining of the check dam and erosion below the check dam. A non-woven geotextile underlayment should be used to prevent this from happening. The geotextile meeting AASHTO M 288 requirement for separation Class II (minimum 8-oz. fabric) should extend approximately 3 ft. upstream and downstream, and pinned securely with the upstream edge buried.

Measures to prevent downstream erosion associated with a rock check dam include placing larger rock on the downstream face of a rock dam, and providing erosion protection material just downstream of the dam.

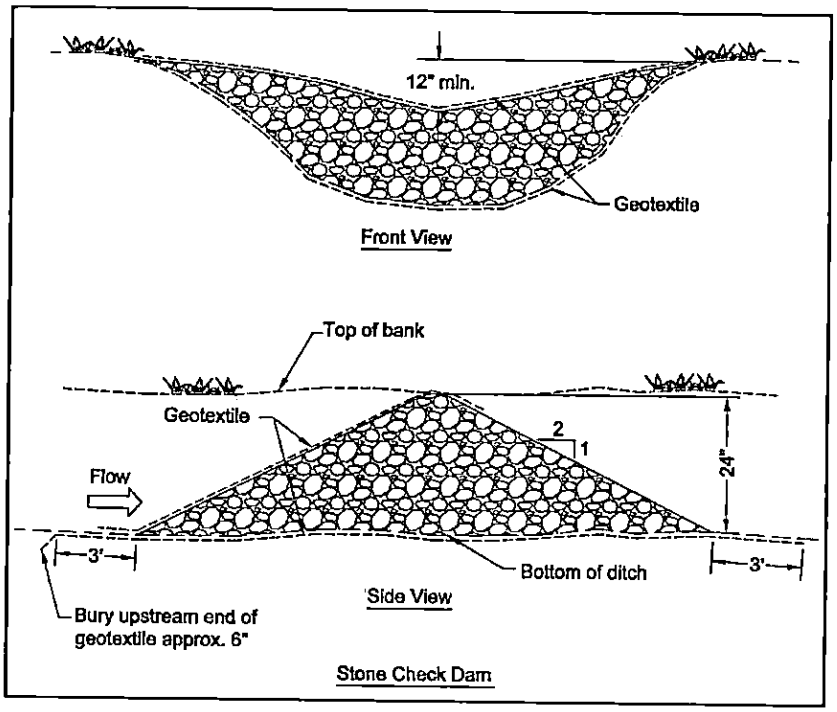


Figure CD-1 Profile and Cross-Section of Typical Rock Check Dams

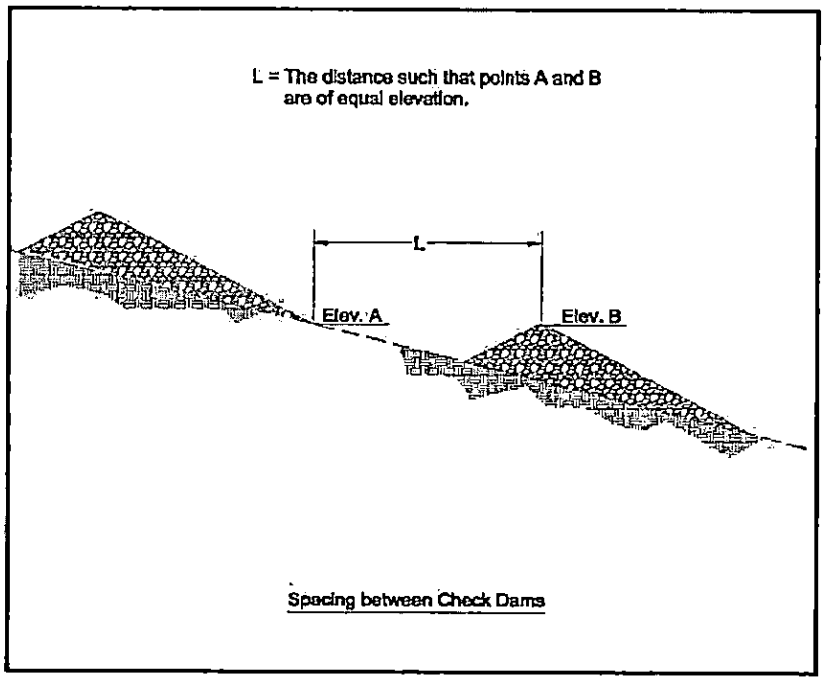


Figure CD-2 Profile of Typical Rock Check Dams

Wattle Check Dams

Wattles have been found to be best installed without trenching and on top of stapled geotextile underlayment that extends a minimum 3 ft. up and downstream from the wattle. Wattles must be properly stapled with sod staples on 10-inch centers on each side of the wattle to prevent flotation, and staked over the top using non-destructive tee-pee type staking. Wattles that provide less "flow through" create more ponding of water that increases the trapping of sediment (see Figures CD-3 and CD-4).

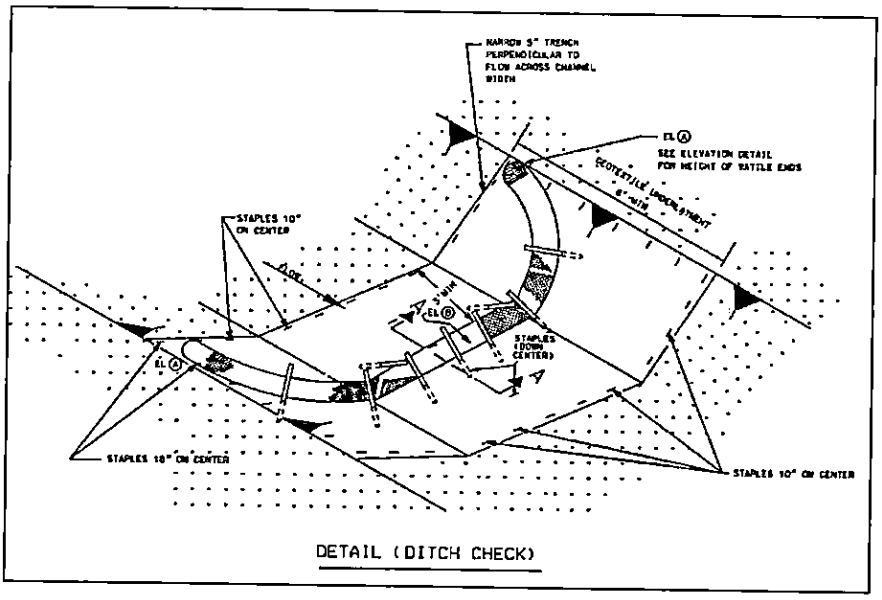


Figure CD-3 Wattle Check Dam (ditch check)

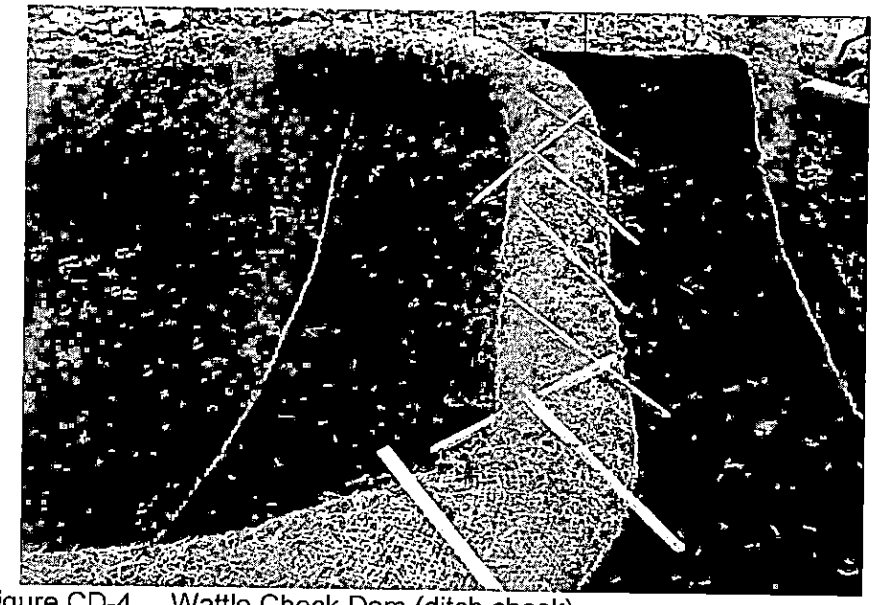


Figure CD-4 Wattle Check Dam (ditch check)
(Photo courtesy of Auburn University Erosion and Sediment Control Test Facility)

Silt Fence Check Dam

When properly designed and installed, typical silt fence materials can be utilized to construct a check dam. Geotextile underlayment should be used and the fence notched as needed to ensure the maximum depth of flow is no greater than the depth of the channel. Figures CD-5 and CD-6 show the recommended details.

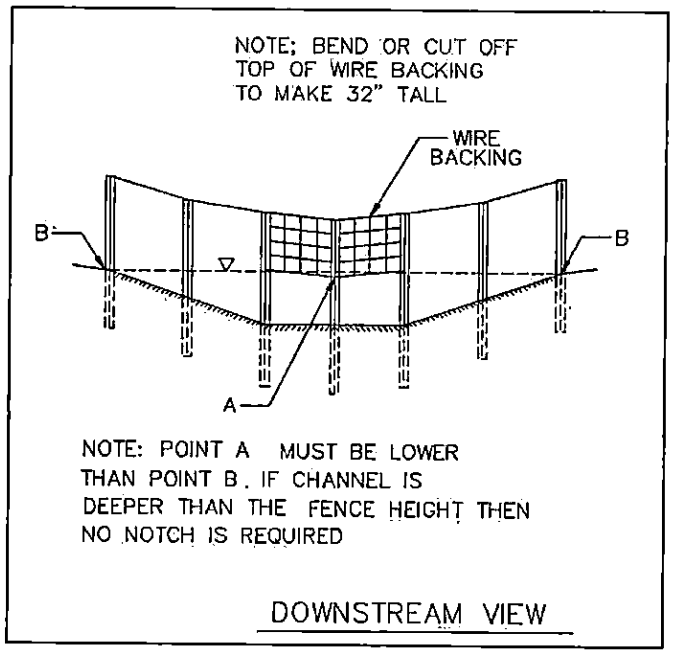


Figure CD-5 Silt Fence Check Dam Cross-Section

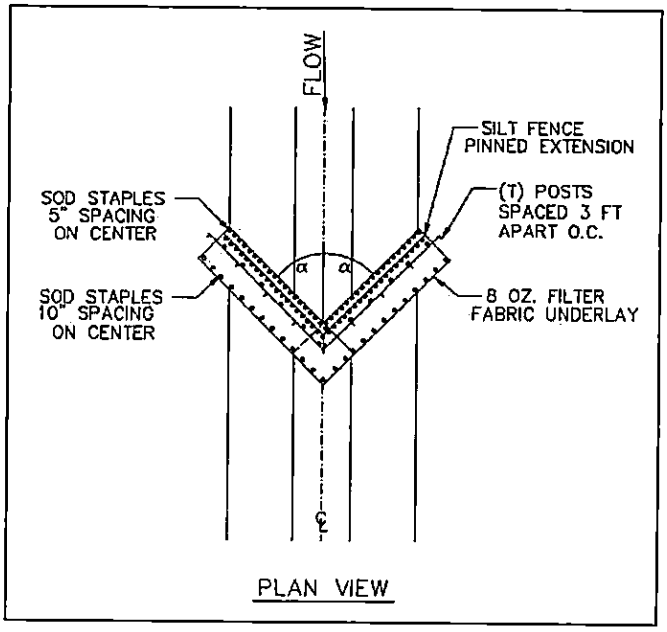


Figure CD-6 Silt Fence Check Dam Plan View

Figure CD-7 Silt Fence Check Dam
(Photo courtesy of Auburn University Erosion and Sediment Control Test Facility)

Sand Bag Check Dam

Sand bags have also been proven to be effective as check dams but only when the bags are properly oriented (See Figures CD-8 and CD-9). A geotextile underlayment that extends approximately 3 ft. upstream and downstream should also be used in earth channel situations to prevent undermining and scour.

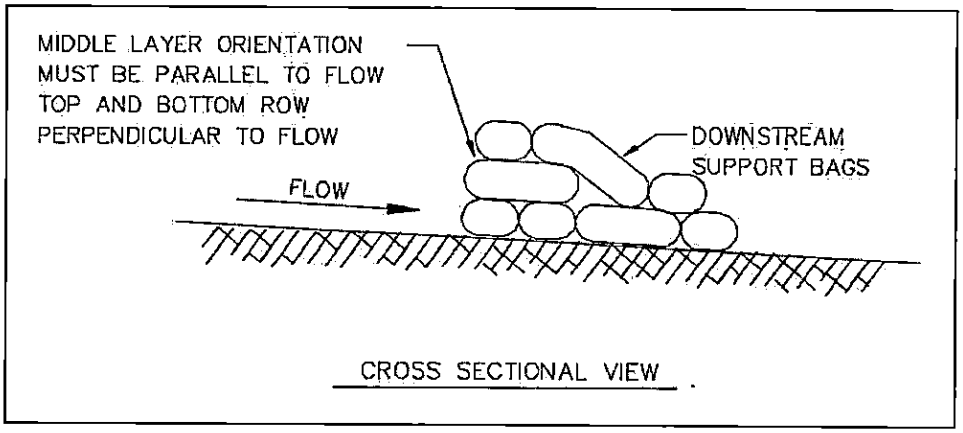


Figure CD-8 Sand Bag Check Dam Cross-Section

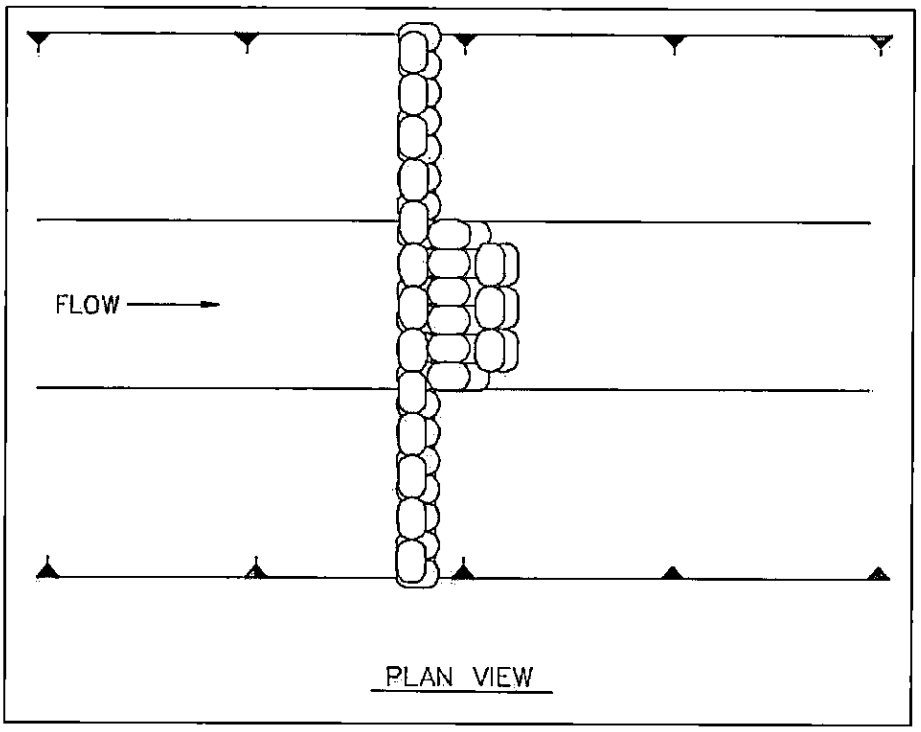


Figure CD-9 Sand Bag Check Dam Plan View

Design Criteria

Formal design is not required. The following factors should be considered when designing check dams.

Drainage Area

Generally, one acre or less.

Maximum Height

Check dam height is a function of channel geometry. Most check dams are 3 feet or less in height.

Depth of Flow

Depth of flow over a check dam is a function of the cross-section and porosity of the check dam. Generally, flows over a check dam are less than 1 foot.

The center of the dam should be constructed lower than the ends. The elevation of the center of the dam should be lower than the ends by the depth of design flow.

Side Slopes

2:1 or flatter (rock check dam).

Spacing

The elevation of the toe of the upstream dam should be at or below the elevation of crest of the downstream dam (Figure CD-2).

For example, if the channel is 3% grade, and the check dam height is 2 feet, The check dam spacing should be 67 feet:

Spacing (ft) = dam height (ft) / channel grade

Spacing = 2 ft / 0.03 = 67 feet

Geotextile

Generally, the non-woven geotextile should meet the requirements found in AASHTO M 288 Class II used for separation.

Diversion (DV)

Practice Description

A diversion is a watercourse constructed across a slope consisting of an excavated channel, a compacted ridge or a combination of both. Most diversions are constructed by excavating a channel and using the excavated material to construct a ridge on the downslope side of the channel. Right-of-way diversions and temporary diversions are sometimes constructed by making a ridge, often called a berm, from fill material.

This practice applies to sites where stormwater runoff can be redirected to permanently protect structures or areas downslope from erosion, sediment, and excessive wetness or localized flooding. Diversions may be used to temporarily divert stormwater runoff to protect disturbed areas and slopes or to retain sediment on-site during construction.

Perimeter protection is sometimes used to describe both permanent and temporary diversions used at either the upslope or downslope side of a construction area.

Right-of-way diversions, sometimes referred to as water bars, are used to shorten the flow length on a sloping right-of-way and reduce the erosion potential of the stormwater runoff.

Planning Considerations

Diversions are designed to intercept and carry excess water to a stable outlet.

Diversions can be useful tools for managing surface water flows and preventing soil erosion. On moderately sloping areas, they may be placed at intervals to trap and divert sheet flow before it has a chance to concentrate and cause rill and gully erosion.

Diversions may be placed at the top of cut or fill slopes to keep runoff from upgradient drainage areas off the slope. The following picture illustrates the placement of a diversion near the top of the slope. Diversions are sometimes built at the base of steeper slopes to protect flatter developed areas which cannot withstand runoff water from outside areas. Also, they can be used to protect structures, parking lots, adjacent properties, and other special areas from flooding.

Figure DV-1 Diversion near the top of a slope

Diversions are preferable to other types of man-made stormwater conveyance systems because they more closely simulate natural flow patterns and characteristics. Flow velocities are generally kept to a minimum. When properly coordinated into the landscape design of a site, diversions can he visually pleasing as well as functional.

As with any earthen structure, it is very important to establish adequate vegetation as soon as possible after installation. It is usually important to stabilize the drainage area above the diversion so that sediment will not enter and accumulate in the diversion channel.

Design Criteria

Location

Diversion location should be determined by considering outlet conditions, topography, land use, soil type, length of slope, seepage (where seepage is a problem) and the development layout. Outlets must be stable after the diversion empties stormwater flow into it; therefore, care should be exercised in selecting the location of the diversion and its outlet.

Capacity

The diversion channel must have a minimum capacity to carry the runoff expected from a storm frequency meeting the requirements of Table DV-1 with a freeboard of at least 0.3 foot (Figure DV-1).

The storm frequency should be used to determine the required channel capacity, Q (peak rate of runoff). The peak rate of runoff should be determined using the Natural Resources Conservation Service runoff curve no. (RCN) method or other equivalent methods.

Table DV-1 Design Frequency

Diversion Type	Typical Area of Protection	24-Hour Design Storm Frequency
Temporary	Construction Areas	2-year
	Building Sites	5-year
Permanent	Agricultural Land	10-year
	Mined Reclamation Area	10-year
	Recreation Areas	10-year
	Isolated Buildings	25-year
	Urban areas, Residential, School, Industrial Areas, etc.	50-year

Diversions designed to protect homes, schools, industrial buildings, roads, parking lots, and comparable high-risk areas, and those designed to function in connection with other structures, should have sufficient capacity to carry peak runoff expected from a storm frequency consistent with the hazard involved.

Velocities

Diversions should be designed so that the design velocities will be safe for the planned type of protective vegetation and the expected maintenance. Maximum permissible velocities are dependent upon the erosion resistance of the soil (Table DV-2) and the quality of the vegetation maintained.

Table DV-2 Permissible Velocities

Soil Texture	Velocity in Feet/Second		
	Conditions of Vegetation		
	Poor	Fair	Good
Sand, Silt, Sandy Loam, Silt Loam	1.5	2.0	3.0
Silty Clay Loam, Sandy Clay Loam	2.5	3.0	4.0
Clay	3.0	4.0	5.0

Channel Design

The diversion channel may be parabolic, trapezoidal or v-shaped as shown in Figure DV-2 and should be designed in accordance with the procedure provided in the Diversion Design section. Land slope must be considered when choosing channel dimensions. On steeper slopes, narrow and deep channels may be required. On more gentle slopes, broad, shallow channels can be used to facilitate maintenance.

Ridge Design

The supporting ridge cross section should meet the configuration and requirements of Figure DV-2.

The side slopes should be no steeper than 2:1. Side slopes should be flatter, 5:1 to 10:1, when the diversion is to be permanent with mowing and other maintenance activities performed on or around it.

The width of the ridge at the design water elevation should be a minimum of 4 feet.

The minimum freeboard should be 0.3 foot.

The design should include a 10% settlement factor.

Outlet

Diversions should have adequate outlets which will convey concentrated runoff without erosion. Acceptable outlets include practices such as Grassed Swale, Lined Swale, Drop Structure, Sediment Basin, and Stormwater Detention Basins.

Stabilization

Unless otherwise stabilized, the ridge and channel should be seeded within 13 days of installation in accordance with the applicable seeding practice, Permanent Seeding or Temporary Seeding.

Disturbed areas draining into the diversion should be seeded and mulched prior to or at the time the diversion is constructed in accordance with the Permanent Seeding or Temporary Seeding (whichever is applicable) practices.

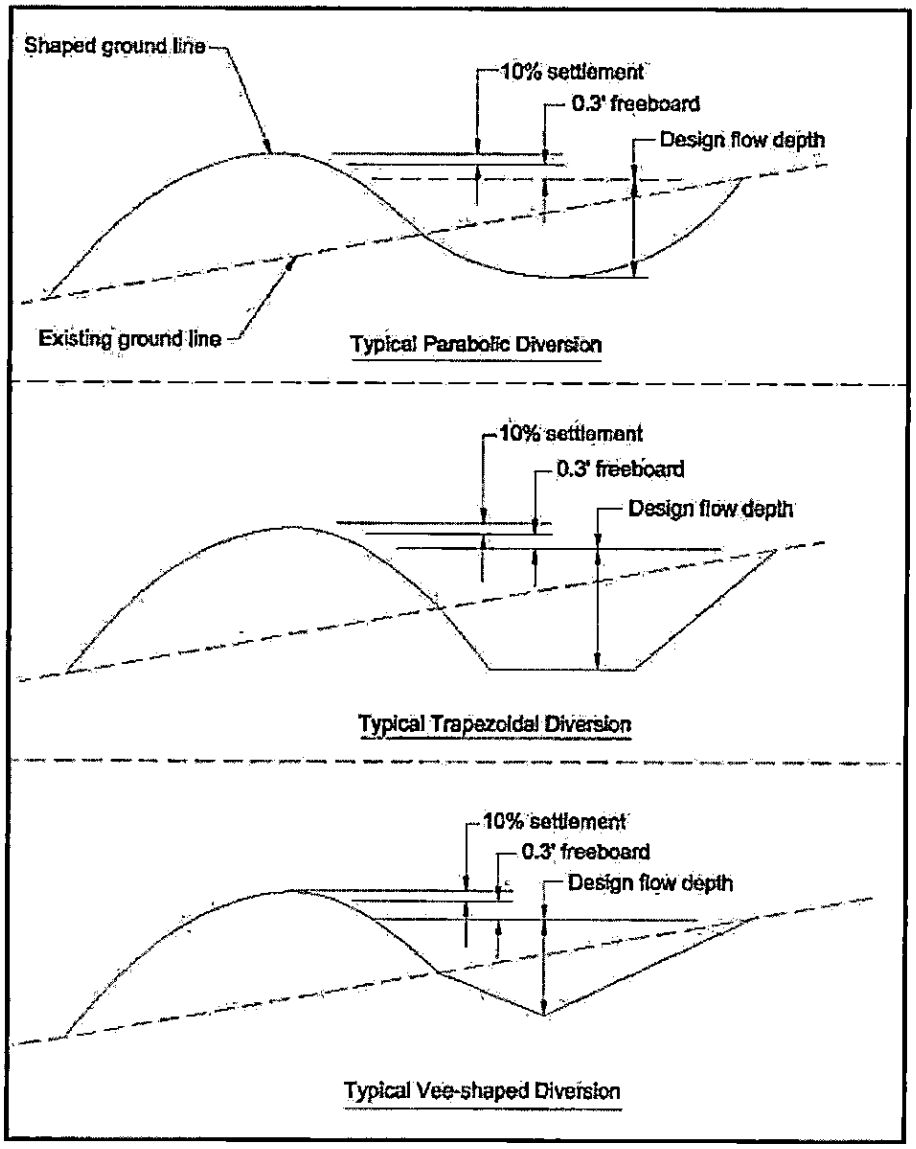


Figure DV-2 Typical Diversions Detail

Diversion Design

Note: This design example uses the Permissible Velocity approach. Diversion design using the Tractive Stress approach can also be used but is not discussed in this document.

Table DV-l through DV-16 may be used to facilitate the design of grass-lined diversions with parabolic cross sections. These tables are based on a retardance of "D" (vegetation newly cut) to determine V1 for stability considerations. To determine channel capacity, choose a retardance of "C" when proper maintenance is expected; otherwise, design channel capacity based on retardance "B". Refer to Table DV-2 for maximum permissible velocities. The permissible velocities guide the selection of V1 and should not be exceeded. It is good practice to use a value for V1 that is significantly less than the maximum allowable when choosing a design cross section. When velocities approach the maximum allowable, flatter grades should be evaluated or a more erosion resistant liner such as erosion control blanket or riprap should be considered. After the diversion dimensions are selected in the design tables, the top width should be increased by 4 feet. and the depth by 0.3 foot. for freeboard.

Example Problem

Given

Q: 30 cfs
Grade: 1%
Soil: Sandy clay loam
Condition of vegetation expected: fair
Maintenance: low; will be cut only twice a year.
Site will allow a top width of 26 feet.

Find

Diversion top width and depth that will be stable and fit site conditions.

Solution

From Table DV-2 use maximum permissible velocity of 3.0 ft./sec.

Since maintenance will be low use "B" retardance for capacity.

From Table DV-4 use retardance "D" and "B";
Grade 1.00 Percent. Top width = 21.0 feet + 4 feet = 25.0 feet.

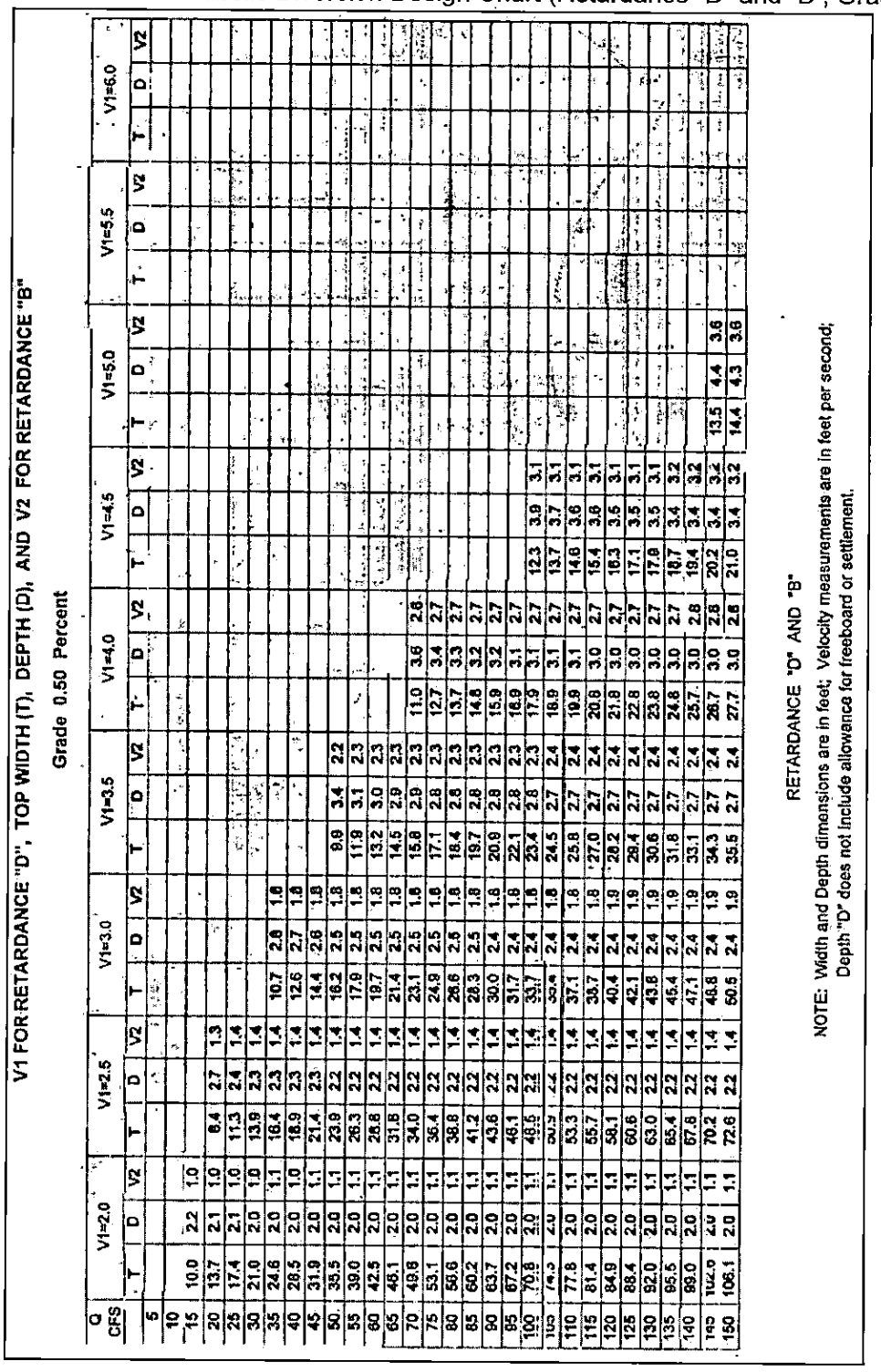
Depth = 1.6 feet + 0.3 foot = 1.9 feet.

V_2 = 1.3 ft./sec.

Note: V_1 < 3.0 ft./sec.; Top width < 26 feet, design O.K.

Note: It is good practice to select a cross section that will give a velocity, V_1, well below the maximum allowable whenever site conditions permit. Wide, shallow cross sections are more stable and require less maintenance. It is always prudent to evaluate flatter design grades to best fit diversions to the site and keep velocities well below maximum allowable.

Table DV-3 Parabolic Diversion Design Chart (Retardance "D" and "B", Grade 0.50%)



V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "B"

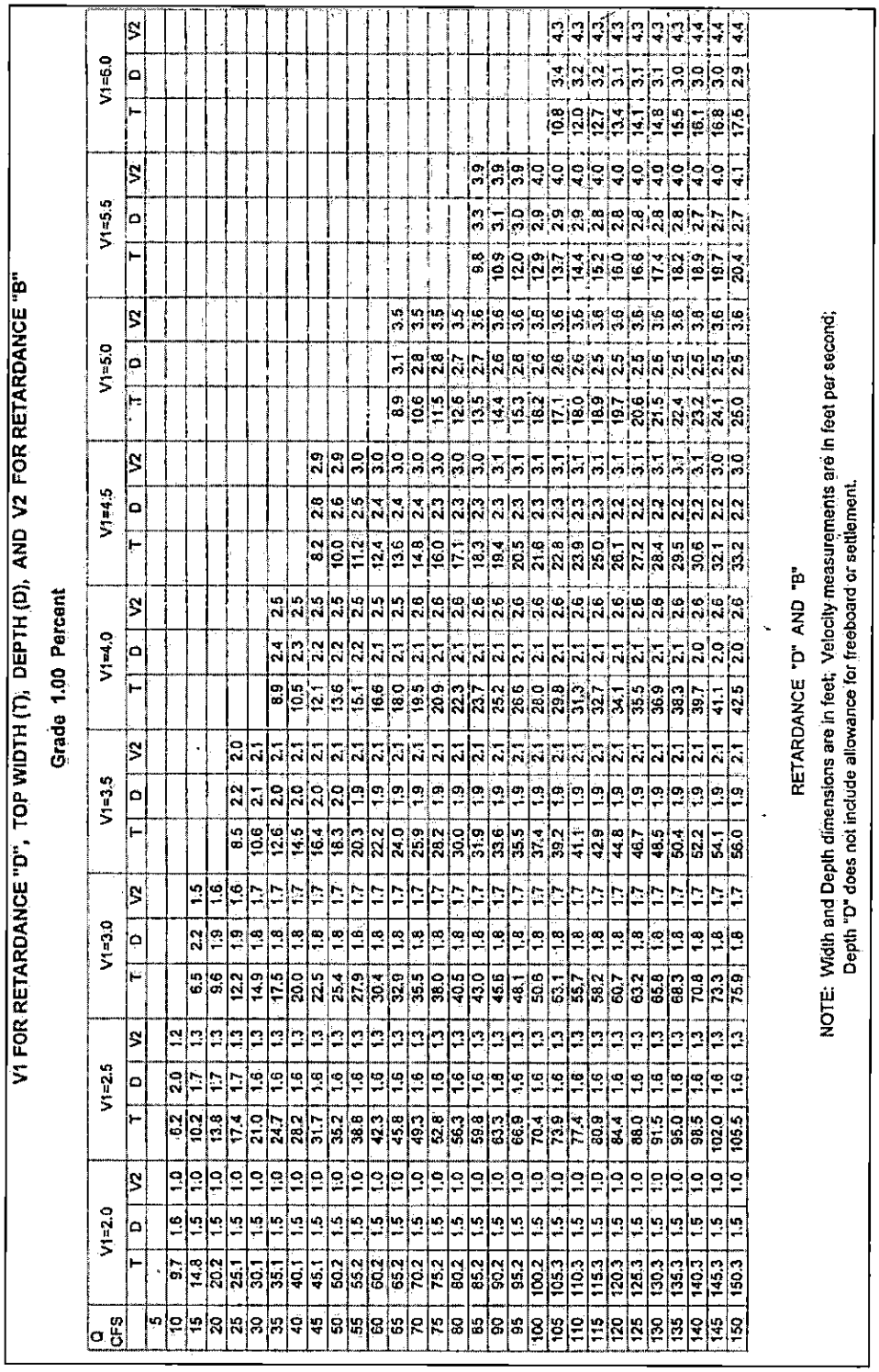
Grade 0.50 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10																											
15	10.0	2.2	1.0																								
20	13.7	2.1	1.0	8.4	2.7	1.3																					
25	17.4	2.1	1.0	11.3	2.4	1.4																					
30	21.0	2.0	1.0	13.9	2.3	1.4																					
35	24.6	2.0	1.1	16.4	2.3	1.4	10.7	2.8	1.8																		
40	28.5	2.0	1.0	18.9	2.3	1.4	12.6	2.7	1.8																		
45	31.9	2.0	1.1	21.4	2.3	1.4	14.4	2.6	1.8																		
50	35.5	2.0	1.1	23.9	2.2	1.4	16.2	2.5	1.8	9.9	3.4	2.2															
55	39.0	2.0	1.1	26.3	2.2	1.4	17.9	2.5	1.8	11.9	3.1	2.3															
60	42.5	2.0	1.1	28.8	2.2	1.4	19.7	2.5	1.8	13.2	3.0	2.3															
65	46.1	2.0	1.1	31.8	2.2	1.4	21.4	2.5	1.8	14.5	2.9	2.3															
70	49.8	2.0	1.1	34.0	2.2	1.4	23.1	2.5	1.8	15.8	2.9	2.3	11.0	3.6	2.8												
75	53.1	2.0	1.1	36.4	2.2	1.4	24.8	2.5	1.8	17.1	2.8	2.3	12.7	3.4	2.7												
80	56.6	2.0	1.1	38.8	2.2	1.4	26.6	2.5	1.8	18.4	2.8	2.3	13.7	3.3	2.7												
85	60.2	2.0	1.1	41.2	2.2	1.4	28.3	2.5	1.8	19.7	2.8	2.3	14.8	3.2	2.7												
90	63.7	2.0	1.1	43.6	2.2	1.4	30.0	2.4	1.8	20.9	2.8	2.3	15.9	3.2	2.7												
95	67.2	2.0	1.1	46.1	2.2	1.4	31.7	2.4	1.8	22.1	2.8	2.3	16.9	3.1	2.7												
100	70.8	2.0	1.1	48.5	2.2	1.4	33.7	2.4	1.8	23.4	2.8	2.3	17.9	3.1	2.7	12.3	3.9	3.1									
105	74.3	2.0	1.1	50.9	2.2	1.4	35.4	2.4	1.8	24.5	2.7	2.4	18.9	3.1	2.7	13.7	3.7	3.1									
110	77.8	2.0	1.1	53.3	2.2	1.4	37.1	2.4	1.8	25.8	2.7	2.4	19.9	3.1	2.7	14.6	3.6	3.1									
115	81.4	2.0	1.1	55.7	2.2	1.4	38.7	2.4	1.8	27.0	2.7	2.4	20.8	3.0	2.7	15.4	3.6	3.1									
120	84.9	2.0	1.1	58.1	2.2	1.4	40.4	2.4	1.8	28.2	2.7	2.4	21.8	3.0	2.7	16.3	3.5	3.1									
125	88.4	2.0	1.1	60.6	2.2	1.4	42.1	2.4	1.9	29.4	2.7	2.4	22.8	3.0	2.7	17.1	3.5	3.1									
130	92.0	2.0	1.1	63.0	2.2	1.4	43.8	2.4	1.9	30.6	2.7	2.4	23.8	3.0	2.7	17.9	3.5	3.1									
135	95.5	2.0	1.1	65.4	2.2	1.4	45.4	2.4	1.9	31.8	2.7	2.4	24.8	3.0	2.7	18.7	3.4	3.2									
140	99.0	2.0	1.1	67.8	2.2	1.4	47.1	2.4	1.9	33.1	2.7	2.4	25.7	3.0	2.8	19.4	3.4	3.2									
145	102.6	2.0	1.1	70.2	2.2	1.4	48.8	2.4	1.9	34.3	2.7	2.4	26.7	3.0	2.8	20.2	3.4	3.2	13.5	4.4	3.6						
150	106.1	2.0	1.1	72.6	2.2	1.4	50.6	2.4	1.9	35.5	2.7	2.4	27.7	3.0	2.8	21.0	3.4	3.2	14.4	4.3	3.6						

RETARDANCE "D" AND "B"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second;
Depth "D" does not include allowance for freeboard or settlement.

Table DV-4 Parabolic Diversion Design Chart (Retardance "D" and "B", Grade 1.00%)



V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "B"

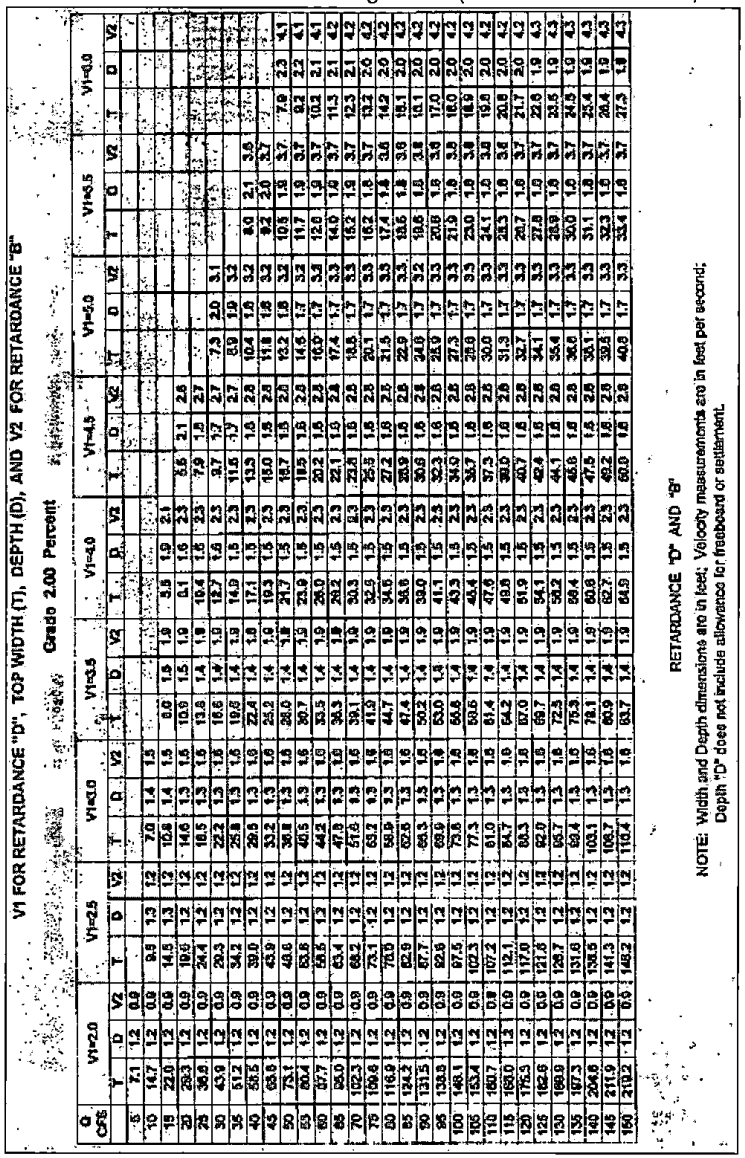
Grade 1.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10	9.7	1.6	1.0	6.2	2.0	1.2																					
15	14.8	1.5	1.0	10.2	1.7	1.3	6.5	2.2	1.5																		
20	20.2	1.5	1.0	13.8	1.7	1.3	9.6	1.9	1.6																		
25	25.1	1.5	1.0	17.4	1.7	1.3	12.2	1.9	1.6	8.5	2.2	2.0															
30	30.1	1.5	1.0	21.0	1.6	1.3	14.9	1.8	1.7	10.6	2.1	2.1															
35	35.1	1.5	1.0	24.7	1.6	1.3	17.5	1.8	1.7	12.6	2.0	2.1	8.9	2.4	2.5												
40	40.1	1.5	1.0	28.2	1.6	1.3	20.0	1.8	1.7	14.5	2.0	2.1	10.5	2.3	2.5												
45	45.1	1.5	1.0	31.7	1.8	1.3	22.5	1.8	1.7	16.4	2.0	2.1	12.1	2.2	2.5	8.2	2.8	2.9									
50	50.2	1.5	1.0	35.2	1.6	1.3	25.4	1.8	1.7	18.3	2.0	2.1	13.6	2.2	2.5	10.0	2.6	2.9									
55	55.2	1.5	1.0	38.8	1.6	1.3	27.9	1.8	1.7	20.3	1.9	2.1	15.1	2.2	2.5	11.2	2.5	3.0									
60	60.2	1.5	1.0	42.3	1.6	1.3	30.4	1.8	1.7	22.2	1.9	2.1	16.6	2.1	2.5	12.4	2.4	3.0									
65	65.2	1.5	1.0	45.8	1.6	1.3	32.9	1.8	1.7	24.0	1.9	2.1	18.0	2.1	2.5	13.6	2.4	3.0	8.9	3.1	3.5						
70	70.2	1.5	1.0	49.3	1.6	1.3	35.5	1.8	1.7	25.9	1.9	2.1	19.5	2.1	2.6	14.8	2.4	3.0	10.6	2.8	3.5						
75	75.2	1.5	1.0	52.8	1.6	1.3	38.0	1.8	1.7	28.2	1.9	2.1	20.9	2.1	2.6	16.0	2.3	3.0	11.5	2.8	3.5						
80	80.2	1.5	1.0	56.3	1.6	1.3	40.5	1.8	1.7	30.0	1.9	2.1	22.3	2.1	2.6	17.1	2.3	3.0	12.5	2.7	3.5						
85	85.2	1.5	1.0	59.8	1.6	1.3	43.0	1.8	1.7	31.9	1.9	2.1	23.7	2.1	2.6	18.3	2.3	3.0	13.5	2.7	3.6	9.8	3.3	3.9			
90	90.2	1.5	1.0	63.3	1.8	1.3	45.6	1.8	1.7	33.6	1.9	2.1	25.2	2.1	2.6	19.4	2.3	3.1	14.4	2.6	3.6	10.9	3.1	3.9			
95	95.2	1.5	1.0	66.9	1.6	1.3	48.1	1.8	1.7	35.5	1.9	2.1	26.6	2.1	2.6	20.5	2.3	3.1	15.3	2.8	3.6	12.0	3.0	3.9			
100	100.2	1.5	1.0	70.4	1.6	1.3	50.6	1.8	1.7	37.4	1.9	2.1	28.0	2.1	2.6	21.6	2.3	3.1	16.2	2.6	3.6	12.9	2.9	4.0			
105	105.3	1.5	1.0	73.9	1.6	1.3	53.1	1.8	1.7	39.2	1.9	2.1	29.8	2.1	2.6	22.8	2.3	3.1	17.1	2.6	3.6	13.7	2.9	4.0	10.8	3.4	4.3
110	110.3	1.5	1.0	77.4	1.6	1.3	55.7	1.8	1.7	41.1	1.9	2.1	31.3	2.1	2.6	23.9	2.3	3.1	18.0	2.6	3.6	14.4	2.9	4.0	12.0	3.2	4.3
115	115.3	1.5	1.0	80.9	1.6	1.3	58.2	1.8	1.7	42.9	1.9	2.1	32.7	2.1	2.6	25.0	2.3	3.1	18.9	2.5	3.6	15.2	2.8	4.0	12.7	3.2	4.3
120	120.3	1.5	1.0	84.4	1.6	1.3	60.7	1.8	1.7	44.8	1.9	2.1	34.1	2.1	2.6	26.1	2.2	3.1	19.7	2.5	3.6	16.0	2.8	4.0	13.4	3.1	4.3
125	125.3	1.5	1.0	88.0	1.6	1.3	63.2	1.8	1.7	46.7	1.9	2.1	35.5	2.1	2.6	27.2	2.2	3.1	20.6	2.5	3.6	16.6	2.8	4.0	14.1	3.1	4.3
130	130.3	1.5	1.0	91.5	1.6	1.3	65.8	1.8	1.7	48.5	1.9	2.1	36.9	2.1	2.6	28.4	2.2	3.1	21.5	2.5	3.6	17.4	2.8	4.0	14.8	3.1	4.3
135	135.3	1.5	1.0	95.0	1.6	1.3	68.3	1.8	1.7	50.4	1.9	2.1	38.3	2.1	2.6	29.5	2.2	3.1	22.4	2.5	3.6	18.2	2.8	4.0	15.5	3.0	4.3
140	140.3	1.5	1.0	98.5	1.6	1.3	70.8	1.8	1.7	52.2	1.9	2.1	39.7	2.0	2.6	30.6	2.2	3.1	23.2	2.5	3.8	18.9	2.7	4.0	16.1	3.0	4.4
145	145.3	1.5	1.0	102.0	1.6	1.3	73.3	1.8	1.7	54.1	1.9	2.1	41.1	2.0	2.6	32.1	2.2	3.0	24.1	2.5	3.6	19.7	2.7	4.0	16.8	3.0	4.4
150	150.3	1.5	1.0	105.5	1.6	1.3	75.9	1.8	1.7	56.0	1.9	2.1	42.5	2.0	2.6	33.2	2.2	3.0	25.0	2.5	3.6	20.4	2.7	4.1	17.5	2.9	4.4

RETARDANCE "D" AND "B"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second;
Depth "D" does not include allowance for freeboard or settlement.

Table DV-5 Parabolic Diversion Design Chart (Retardance "D" and "B", Grade 2.00%)



V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "B"

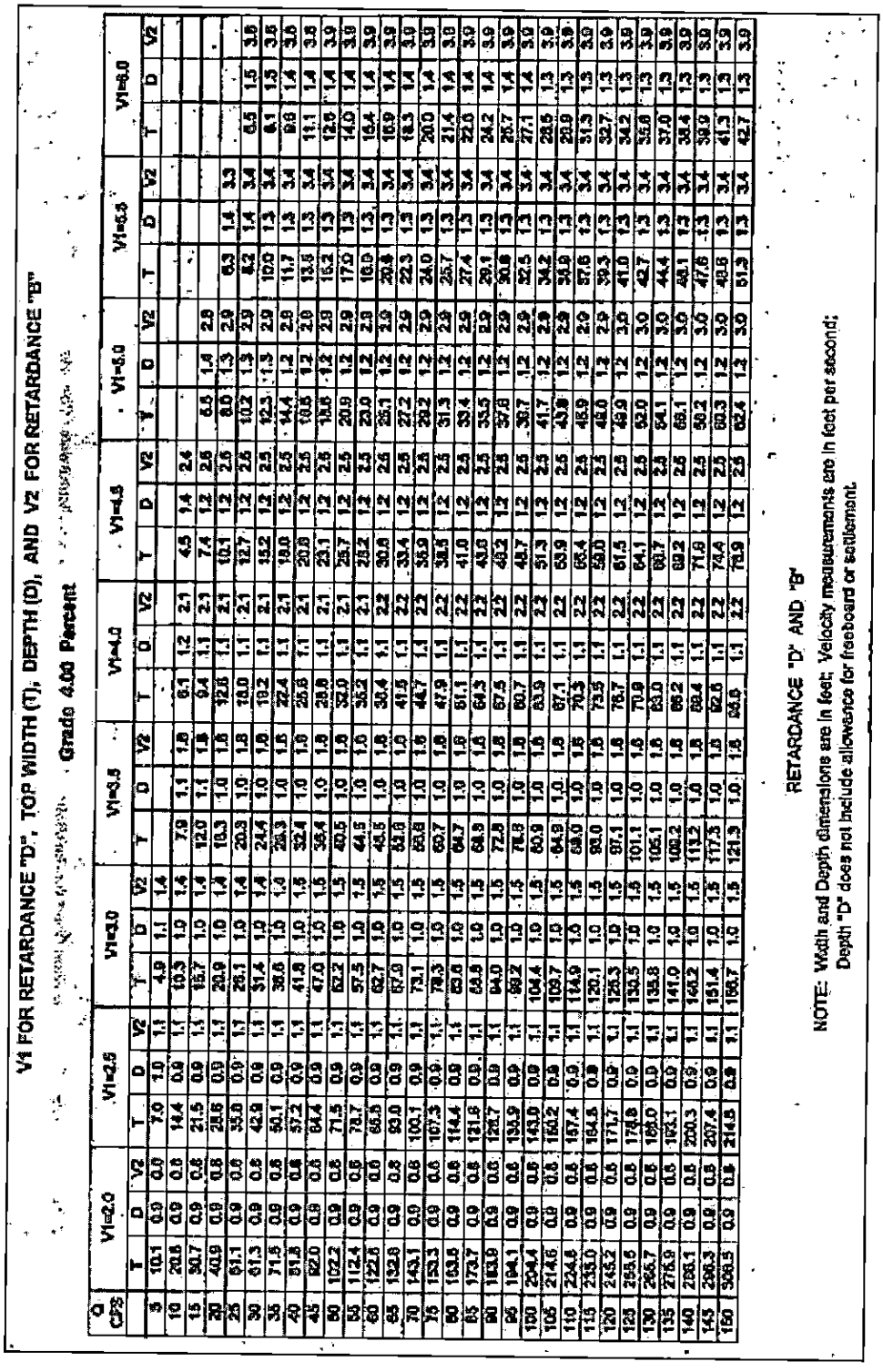
Grade 2.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	7.1	1.2	0.9	9.5	1.3	1.2	7.0	1.4	1.5																		
10	14.7	1.2	0.9	14.5	1.3	1.2	10.6	1.4	1.5	8.0	1.5	1.9	5.6	1.9	2.1												
15	22.0	1.2	0.9	19.6	1.2	1.2	14.6	1.3	1.5	10.9	1.5	1.8	8.1	1.8	2.3	6.5	2.1	2.6									
20	29.3	1.2	0.9	24.4	1.2	1.2	18.5	1.3	1.5	13.8	1.4	1.8	10.4	1.8	2.3	7.9	1.9	2.7	7.3	2.0	3.1						
25	36.6	1.2	0.9	29.3	1.2	1.2	22.2	1.3	1.5	16.6	1.4	1.8	12.7	1.8	2.3	9.7	1.7	2.7	8.9	1.9	3.2						
30	43.9	1.2	0.9	34.2	1.2	1.2	25.8	1.3	1.5	19.6	1.4	1.8	14.9	1.8	2.3	11.6	1.7	2.7	10.4	1.8	3.2	9.6	2.1	3.5			
35	51.2	1.2	0.9	39.0	1.2	1.2	29.5	1.3	1.5	22.4	1.4	1.8	17.1	1.8	2.3	13.3	1.8	2.8	11.8	1.8	3.2	10.8	2.0	3.5	9.7	2.2	3.7
40	58.5	1.2	0.9	43.9	1.2	1.2	33.2	1.3	1.6	25.2	1.4	1.8	19.3	1.8	2.3	15.0	1.8	2.8	13.2	1.8	3.2	12.0	1.8	3.5	10.8	2.0	3.7
45	65.8	1.2	0.9	48.8	1.2	1.2	36.8	1.3	1.6	28.0	1.4	1.8	21.7	1.8	2.3	16.7	1.8	2.8	14.6	1.8	3.2	13.2	1.8	3.5	11.7	1.9	3.7
50	73.1	1.2	0.9	53.6	1.2	1.2	40.5	1.3	1.6	30.7	1.4	1.9	23.9	1.8	2.3	18.5	1.8	2.8	16.0	1.8	3.2	14.5	1.7	3.5	12.9	1.9	3.7
55	80.4	1.2	0.9	58.5	1.2	1.2	44.2	1.3	1.6	33.5	1.4	1.9	26.0	1.8	2.3	20.2	1.8	2.8	17.4	1.7	3.2	15.8	1.7	3.5	14.0	1.9	3.7
60	87.7	1.2	0.9	63.4	1.2	1.2	47.8	1.3	1.6	36.3	1.4	1.9	28.2	1.8	2.3	22.1	1.8	2.8	18.8	1.7	3.3	17.1	1.7	3.5	15.2	1.9	3.7
65	95.0	1.2	0.9	68.2	1.2	1.2	51.6	1.3	1.6	39.1	1.4	1.9	30.3	1.8	2.3	23.8	1.8	2.8	20.1	1.7	3.3	18.4	1.7	3.5	16.2	1.8	3.7
70	102.3	1.2	0.9	73.1	1.2	1.2	55.2	1.3	1.6	41.9	1.4	1.9	32.5	1.8	2.3	25.5	1.8	2.8	21.5	1.7	3.3	19.7	1.7	3.5	17.4	1.8	3.7
75	109.6	1.2	0.9	78.0	1.2	1.2	58.9	1.3	1.6	44.7	1.4	1.9	34.6	1.8	2.3	27.2	1.8	2.8	22.9	1.7	3.3	20.9	1.8	3.5	18.5	1.8	3.8
80	116.9	1.2	0.9	82.9	1.2	1.2	62.6	1.3	1.6	47.4	1.4	1.9	36.8	1.8	2.3	28.9	1.8	2.8	24.3	1.7	3.3	22.2	1.8	3.5	19.6	1.8	3.8
85	124.2	1.2	0.9	87.7	1.2	1.2	66.3	1.3	1.6	50.2	1.4	1.9	39.0	1.8	2.3	30.6	1.8	2.8	24.6	1.7	3.3	23.4	1.8	3.5	20.8	1.8	3.8
90	131.5	1.2	0.9	92.5	1.2	1.2	69.9	1.3	1.6	53.0	1.4	1.9	41.1	1.8	2.3	32.3	1.8	2.8	26.0	1.7	3.3	24.6	1.8	3.5	21.9	1.8	3.8
95	138.8	1.2	0.9	97.4	1.2	1.2	73.6	1.3	1.6	55.8	1.4	1.9	43.3	1.8	2.3	34.0	1.8	2.8	27.3	1.7	3.3	25.9	1.8	3.5	23.1	1.8	3.8
100	146.1	1.2	0.9	97.5	1.2	1.2	77.3	1.3	1.6	58.6	1.4	1.9	45.4	1.8	2.3	35.7	1.8	2.8	28.6	1.7	3.3	27.1	1.8	3.5	24.1	1.8	3.8
105	153.4	1.2	0.9	102.3	1.2	1.2	81.0	1.3	1.6	61.4	1.4	1.9	47.6	1.8	2.3	37.3	1.8	2.8	30.0	1.7	3.3	28.3	1.8	3.5	25.2	1.8	3.8
110	160.7	1.2	0.9	107.2	1.2	1.2	84.7	1.3	1.6	64.2	1.4	1.9	49.8	1.8	2.3	39.0	1.8	2.8	31.3	1.7	3.3	29.5	1.8	3.5	26.3	1.8	3.8
115	168.0	1.3	0.9	112.1	1.2	1.2	88.4	1.3	1.6	67.0	1.4	1.9	51.9	1.8	2.3	40.7	1.8	2.8	32.7	1.7	3.3	30.7	1.8	3.5	27.4	1.8	3.8
120	175.3	1.2	0.9	117.0	1.2	1.2	92.0	1.3	1.6	69.7	1.4	1.9	54.1	1.8	2.3	42.4	1.8	2.8	34.1	1.7	3.3	31.9	1.8	3.5	28.5	1.8	3.8
125	182.6	1.2	0.9	121.8	1.2	1.2	95.7	1.3	1.6	72.5	1.4	1.9	56.2	1.8	2.3	44.1	1.8	2.8	35.4	1.7	3.3	33.1	1.8	3.5	29.6	1.8	3.8
130	189.9	1.2	0.9	126.7	1.2	1.2	99.4	1.3	1.6	75.3	1.4	1.9	58.4	1.8	2.3	45.8	1.8	2.8	36.8	1.7	3.3	34.3	1.8	3.5	30.7	1.8	3.8
135	197.3	1.2	0.9	131.6	1.2	1.2	103.1	1.3	1.6	78.1	1.4	1.9	60.6	1.8	2.3	47.5	1.8	2.8	38.1	1.7	3.3	35.5	1.8	3.5	31.8	1.8	3.8
140	204.6	1.2	0.9	136.5	1.2	1.2	106.7	1.3	1.6	80.9	1.4	1.9	62.7	1.8	2.3	49.2	1.8	2.8	39.5	1.7	3.3	36.8	1.8	3.5	32.9	1.8	3.8
145	211.9	1.2	0.9	141.3	1.2	1.2	110.4	1.3	1.6	83.7	1.4	1.9	64.9	1.8	2.3	50.9	1.8	2.8	40.8	1.7	3.3	38.1	1.8	3.5	33.9	1.8	3.8
150	219.2	1.2	0.9	146.2	1.2	1.2	114.2	1.3	1.6	86.5	1.4	1.9	67.1	1.8	2.3	52.6	1.8	2.8	42.2	1.7	3.3	39.4	1.8	3.5	35.0	1.8	3.8

RETARDANCE "D" AND "B"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second;
Depth "D" does not include allowance for freeboard or settlement.

Table DV-6 Parabolic Diversion Design Chart (Retardance "D" and "B", Grade 4.00%)



V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "B"

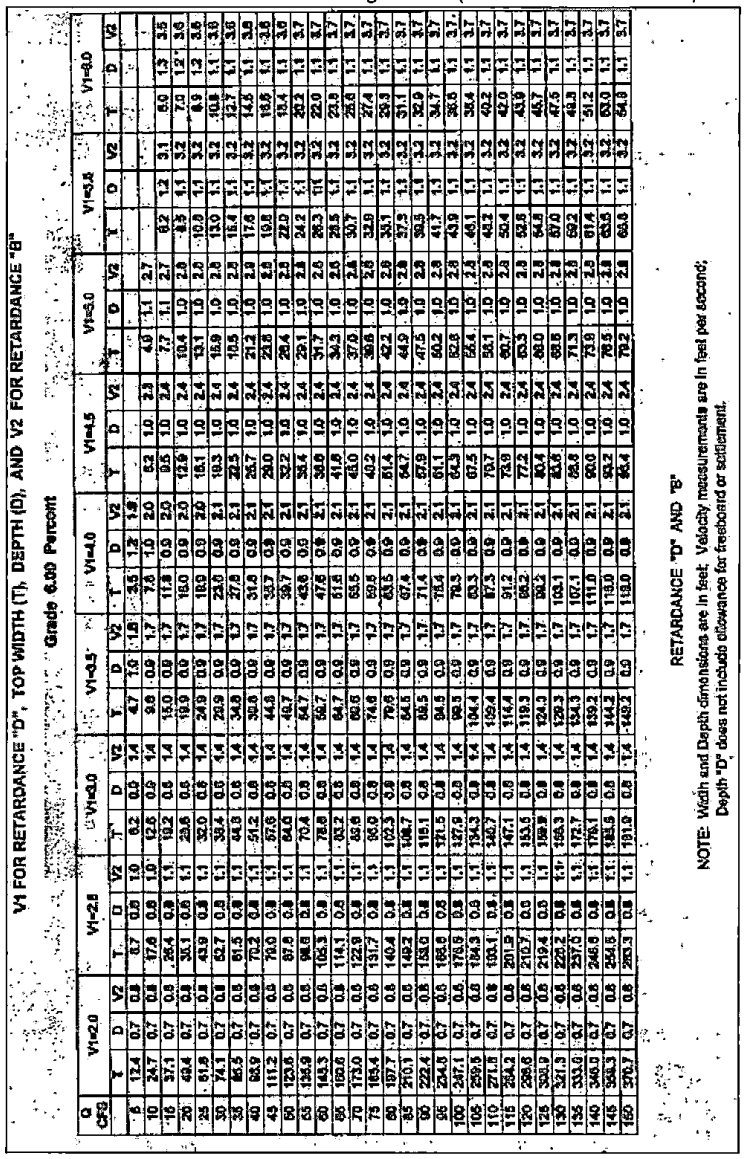
Grade 4.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	10.1	0.9	0.6	7.6	1.0	1.1	4.9	1.1	1.4																		
10	20.6	0.9	0.6	14.4	0.9	1.1	10.3	1.0	1.4	7.9	1.1	1.6	6.1	1.2	2.1	4.5	1.4	2.4									
15	30.7	0.9	0.6	21.5	0.9	1.1	15.7	1.0	1.4	12.0	1.1	1.6	9.4	1.1	2.1	7.4	1.2	2.6	6.5	1.4	2.9						
20	40.9	0.9	0.6	28.6	0.9	1.1	20.9	1.0	1.4	16.3	1.0	1.6	12.6	1.1	2.1	10.1	1.2	2.6	8.8	1.3	2.9	6.3	1.4	3.3			
25	51.1	0.9	0.6	35.8	0.9	1.1	26.1	1.0	1.4	20.3	1.0	1.6	16.0	1.1	2.1	12.7	1.2	2.6	10.2	1.3	2.9	8.2	1.4	3.4	6.5	1.5	3.6
30	61.3	0.9	0.6	42.9	0.9	1.1	31.4	1.0	1.4	24.4	1.0	1.6	19.2	1.1	2.1	15.2	1.2	2.5	12.3	1.3	2.9	10.0	1.3	3.4	8.1	1.5	3.6
35	71.5	0.9	0.6	50.1	0.9	1.1	36.6	1.0	1.4	28.3	1.0	1.6	22.4	1.1	2.1	19.0	1.2	2.5	14.4	1.2	2.9	11.7	1.3	3.4	9.6	1.4	3.6
40	81.8	0.9	0.6	57.2	0.9	1.1	41.8	1.0	1.5	32.4	1.0	1.6	25.6	1.1	2.1	20.8	1.2	2.5	16.5	1.2	2.9	13.5	1.3	3.4	11.1	1.4	3.6
45	92.0	0.9	0.6	64.4	0.9	1.1	47.0	1.0	1.5	36.4	1.0	1.6	28.8	1.1	2.1	23.1	1.2	2.5	18.6	1.2	2.9	15.2	1.3	3.4	12.6	1.4	3.6
50	102.2	0.9	0.6	71.5	0.9	1.1	52.2	1.0	1.5	40.5	1.0	1.6	32.0	1.1	2.1	25.7	1.2	2.5	20.6	1.2	2.9	17.0	1.3	3.4	14.0	1.4	3.6
55	112.4	0.9	0.6	78.7	0.9	1.1	57.5	1.0	1.5	44.5	1.0	1.6	35.2	1.1	2.1	28.2	1.2	2.5	23.0	1.2	2.9	18.8	1.3	3.4	16.4	1.4	3.6
60	122.6	0.9	0.6	85.8	0.9	1.1	62.7	1.0	1.5	48.5	1.0	1.6	38.4	1.1	2.2	30.8	1.2	2.5	25.1	1.2	2.9	20.4	1.3	3.4	16.9	1.4	3.6
65	132.8	0.9	0.8	93.0	0.9	1.1	67.9	1.0	1.5	52.6	1.0	1.6	41.5	1.1	2.2	33.4	1.2	2.5	27.2	1.2	2.9	22.3	1.3	3.4	18.5	1.4	3.6
70	143.1	0.9	0.8	100.1	0.9	1.1	73.1	1.0	1.5	56.8	1.0	1.6	44.7	1.1	2.2	36.0	1.2	2.5	29.2	1.2	2.9	24.0	1.3	3.4	20.0	1.4	3.6
75	153.3	0.9	0.8	107.3	0.9	1.1	78.3	1.0	1.5	60.7	1.0	1.6	47.9	1.1	2.2	38.5	1.2	2.5	31.3	1.2	2.9	25.7	1.3	3.4	21.4	1.4	3.6
80	163.6	0.9	0.8	114.4	0.9	1.1	83.6	1.0	1.5	64.7	1.0	1.6	51.1	1.1	2.2	41.0	1.2	2.5	33.4	1.2	2.9	27.4	1.3	3.4	22.8	1.4	3.6
85	173.7	0.9	0.8	121.6	0.9	1.1	88.8	1.0	1.5	68.8	1.0	1.6	54.3	1.1	2.2	43.6	1.2	2.5	35.5	1.2	2.9	29.1	1.3	3.4	24.2	1.4	3.6
90	183.9	0.9	0.8	128.7	0.9	1.1	94.0	1.0	1.5	72.8	1.0	1.6	57.5	1.1	2.2	46.2	1.2	2.5	37.6	1.2	2.9	30.8	1.3	3.4	25.7	1.4	3.6
95	194.1	0.9	0.8	135.9	0.9	1.1	99.2	1.0	1.5	76.8	1.0	1.6	60.7	1.1	2.2	48.7	1.2	2.5	39.7	1.2	2.9	32.5	1.3	3.4	27.1	1.4	3.6
100	204.4	0.9	0.8	143.0	0.9	1.1	104.4	1.0	1.5	80.9	1.0	1.6	63.9	1.1	2.2	51.3	1.2	2.5	41.7	1.2	2.9	34.2	1.3	3.4	28.5	1.3	3.6
105	214.6	0.9	0.8	150.2	0.9	1.1	109.7	1.0	1.5	84.9	1.0	1.6	67.1	1.1	2.2	53.9	1.2	2.5	43.8	1.2	2.9	35.9	1.3	3.4	29.9	1.3	3.6
110	224.8	0.9	0.8	157.4	0.9	1.1	114.9	1.0	1.5	88.9	1.0	1.6	70.3	1.1	2.2	56.4	1.2	2.5	45.9	1.2	2.9	37.6	1.3	3.4	31.3	1.3	3.6
115	235.0	0.9	0.8	164.5	0.9	1.1	120.1	1.0	1.5	93.0	1.0	1.6	73.5	1.1	2.2	59.0	1.2	2.5	48.0	1.2	2.9	39.3	1.3	3.4	32.7	1.3	3.6
120	245.2	0.9	0.8	171.7	0.9	1.1	125.3	1.0	1.5	97.1	1.0	1.6	76.7	1.1	2.2	61.5	1.2	2.5	49.9	1.2	3.0	41.0	1.3	3.4	34.2	1.3	3.6
125	255.5	0.9	0.8	178.8	0.9	1.1	130.5	1.0	1.5	101.1	1.0	1.6	79.9	1.1	2.2	64.1	1.2	2.5	52.0	1.2	3.0	42.7	1.3	3.4	35.6	1.3	3.6
130	265.7	0.9	0.8	186.0	0.9	1.1	135.8	1.0	1.5	105.1	1.0	1.6	83.0	1.1	2.2	66.7	1.2	2.5	54.1	1.2	3.0	44.4	1.3	3.4	37.0	1.3	3.6
135	275.9	0.9	0.8	193.1	0.9	1.1	141.0	1.0	1.5	109.2	1.0	1.6	86.2	1.1	2.2	69.2	1.2	2.5	56.1	1.2	3.0	46.1	1.3	3.4	38.4	1.3	3.6
140	286.1	0.9	0.8	200.3	0.9	1.1	146.2	1.0	1.5	113.2	1.0	1.6	89.4	1.1	2.2	71.8	1.2	2.5	58.2	1.2	3.0	47.8	1.3	3.4	39.9	1.3	3.6
145	296.3	0.9	0.8	207.4	0.9	1.1	151.4	1.0	1.5	117.3	1.0	1.6	92.6	1.1	2.2	74.4	1.2	2.5	60.3	1.2	3.0	49.6	1.3	3.4	41.3	1.3	3.6
150	306.5	0.9	0.8	214.5	0.9	1.1	156.7	1.0	1.5	121.3	1.0	1.6	95.8	1.1	2.2	76.9	1.2	2.5	62.4	1.2	3.0	51.3	1.3	3.4	42.7	1.3	3.6

RETARDANCE "D" AND "B"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second;
Depth "D" does not include allowance for freeboard or settlement.

Table DV-7 Parabolic Diversion Design Chart (Retardance "D" and "B", Grade 6.00%)



V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "B"

Grade 6.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	12.4	0.7	0.8	8.7	0.5	1.0	6.2	0.5	1.4	4.7	1.0	1.8	3.5	1.2	1.9				4.0	1.1	2.7						
10	24.7	0.7	0.8	17.6	0.6	1.0	12.6	0.6	1.4	9.6	0.9	1.7	7.6	1.0	2.0	6.2	1.0	2.3	5.1	1.1	2.7	6.2	1.2	3.1	6.0	1.3	3.5
15	37.1	0.7	0.8	26.4	0.9	1.1	18.2	0.6	1.4	15.0	0.9	1.7	11.8	0.9	2.0	9.5	1.0	2.4	7.7	1.1	2.7	8.3	1.1	3.2	7.0	1.2	3.6
20	49.4	0.7	0.8	35.1	0.6	1.1	25.6	0.6	1.4	19.9	0.9	1.7	16.0	0.9	2.0	12.9	1.0	2.4	10.4	1.0	2.8	8.5	1.1	3.2	8.9	1.2	3.6
25	61.8	0.7	0.8	43.9	0.8	1.1	32.0	0.6	1.4	24.9	0.9	1.7	19.9	0.9	2.0	16.1	1.0	2.4	13.1	1.0	2.8	10.6	1.1	3.2	10.8	1.1	3.6
30	74.1	0.7	0.8	52.7	0.8	1.1	38.4	0.6	1.4	29.9	0.9	1.7	23.9	0.9	2.1	19.3	1.0	2.4	15.9	1.0	2.8	13.0	1.1	3.2	12.7	1.1	3.6
35	86.5	0.7	0.8	61.5	0.8	1.1	44.8	0.6	1.4	34.9	0.9	1.7	27.8	0.9	2.1	22.5	1.0	2.4	18.5	1.0	2.8	15.4	1.1	3.2	14.6	1.1	3.6
40	98.9	0.7	0.8	70.2	0.8	1.1	51.2	0.6	1.4	39.8	0.9	1.7	31.8	0.9	2.1	25.7	1.0	2.4	21.2	1.0	2.8	17.6	1.1	3.2	16.5	1.1	3.6
45	111.2	0.7	0.8	79.0	0.8	1.1	57.6	0.6	1.4	44.8	0.9	1.7	35.7	0.9	2.1	29.0	1.0	2.4	23.8	1.0	2.8	19.8	1.1	3.2	18.4	1.1	3.6
50	123.6	0.7	0.8	87.8	0.8	1.1	64.0	0.6	1.4	49.7	0.9	1.7	39.7	0.9	2.1	32.2	1.0	2.4	26.4	1.0	2.8	22.0	1.1	3.2	20.2	1.1	3.7
55	136.0	0.7	0.8	96.6	0.8	1.1	70.4	0.8	1.4	54.7	0.9	1.7	43.6	0.9	2.1	35.4	1.0	2.4	29.1	1.0	2.8	24.2	1.1	3.2	22.0	1.1	3.7
60	148.3	0.7	0.8	105.3	0.8	1.1	76.8	0.8	1.4	59.7	0.9	1.7	47.6	0.9	2.1	38.6	1.0	2.4	31.7	1.0	2.8	26.3	1.1	3.2	23.9	1.1	3.7
65	160.8	0.7	0.8	114.1	0.8	1.1	83.2	0.8	1.4	64.7	0.9	1.7	51.6	0.9	2.1	41.8	1.0	2.4	34.3	1.0	2.8	28.5	1.1	3.2	25.8	1.1	3.7
70	173.0	0.7	0.8	122.9	0.8	1.1	89.6	0.8	1.4	69.6	0.9	1.7	55.5	0.9	2.1	45.0	1.0	2.4	37.0	1.0	2.8	30.7	1.1	3.2	27.8	1.1	3.7
75	185.4	0.7	0.8	131.7	0.8	1.1	96.0	0.8	1.4	74.6	0.9	1.7	59.5	0.9	2.1	48.2	1.0	2.4	39.6	1.0	2.8	32.9	1.1	3.2	29.8	1.1	3.7
80	197.7	0.7	0.8	140.4	0.8	1.1	102.3	0.8	1.4	79.6	0.9	1.7	63.5	0.9	2.1	51.4	1.0	2.4	42.2	1.0	2.8	35.1	1.1	3.2	31.8	1.1	3.7
85	210.1	0.7	0.8	149.2	0.8	1.1	108.7	0.8	1.4	84.5	0.9	1.7	67.4	0.9	2.1	54.7	1.0	2.4	44.9	1.0	2.8	37.3	1.1	3.2	33.8	1.1	3.7
90	222.4	0.7	0.8	158.0	0.8	1.1	115.1	0.8	1.4	89.5	0.9	1.7	71.4	0.9	2.1	57.9	1.0	2.4	47.5	1.0	2.8	39.5	1.1	3.2	35.8	1.1	3.7
95	234.8	0.7	0.8	166.8	0.8	1.1	121.5	0.8	1.4	94.5	0.9	1.7	75.4	0.9	2.1	61.1	1.0	2.4	50.2	1.0	2.8	41.7	1.1	3.2	37.7	1.1	3.7
100	247.1	0.7	0.8	175.5	0.8	1.1	127.9	0.8	1.4	99.3	0.9	1.7	79.3	0.9	2.1	64.3	1.0	2.4	52.8	1.0	2.8	43.9	1.1	3.2	39.6	1.1	3.7
105	259.5	0.7	0.8	184.3	0.8	1.1	134.3	0.8	1.4	104.4	0.9	1.7	83.3	0.9	2.1	67.5	1.0	2.4	55.4	1.0	2.8	46.1	1.1	3.2	38.4	1.1	3.7
110	271.8	0.7	0.8	193.1	0.8	1.1	140.7	0.8	1.4	109.4	0.9	1.7	87.3	0.9	2.1	70.7	1.0	2.4	58.1	1.0	2.8	48.2	1.1	3.2	40.2	1.1	3.7
115	284.2	0.7	0.8	201.9	0.8	1.1	147.1	0.8	1.4	114.4	0.9	1.7	91.2	0.9	2.1	73.9	1.0	2.4	60.7	1.0	2.8	50.4	1.1	3.2	42.0	1.1	3.7
120	296.6	0.7	0.8	210.7	0.8	1.1	153.5	0.8	1.4	119.3	0.9	1.7	95.2	0.9	2.1	77.2	1.0	2.4	63.3	1.0	2.8	52.6	1.1	3.2	43.9	1.1	3.7
125	309.0	0.7	0.8	219.4	0.8	1.1	159.8	0.8	1.4	124.3	0.9	1.7	99.2	0.9	2.1	80.4	1.0	2.4	66.0	1.0	2.8	54.8	1.1	3.2	45.7	1.1	3.7
130	321.3	0.7	0.8	228.2	0.8	1.1	166.3	0.8	1.4	129.3	0.9	1.7	103.1	0.9	2.1	83.6	1.0	2.4	68.6	1.0	2.8	57.0	1.1	3.2	47.5	1.1	3.7
135	333.6	0.7	0.8	237.0	0.8	1.1	172.7	0.8	1.4	134.3	0.9	1.7	107.1	0.9	2.1	86.8	1.0	2.4	71.3	1.0	2.8	59.2	1.1	3.2	49.3	1.1	3.7
140	346.0	0.7	0.8	245.8	0.8	1.1	179.1	0.8	1.4	139.2	0.9	1.7	111.0	0.9	2.1	90.0	1.0	2.4	73.9	1.0	2.8	61.4	1.1	3.2	51.2	1.1	3.7
145	358.3	0.7	0.8	254.5	0.8	1.1	185.5	0.8	1.4	144.2	0.9	1.7	115.0	0.9	2.1	93.2	1.0	2.4	76.5	1.0	2.8	63.5	1.1	3.2	53.0	1.1	3.7
150	370.7	0.7	0.8	263.3	0.8	1.1	191.9	0.8	1.4	149.2	0.9	1.7	119.0	0.8	2.1	96.4	1.0	2.4	79.2	1.0	2.8	65.8	1.1	3.2	54.8	1.1	3.7

RETARDANCE "D" AND "B"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second;
Depth "D" does not include allowance for freeboard or settlement.

Table DV-8 Parabolic Diversion Design Chart (Retardance "D" and "B", Grade 8.00%)

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "B"

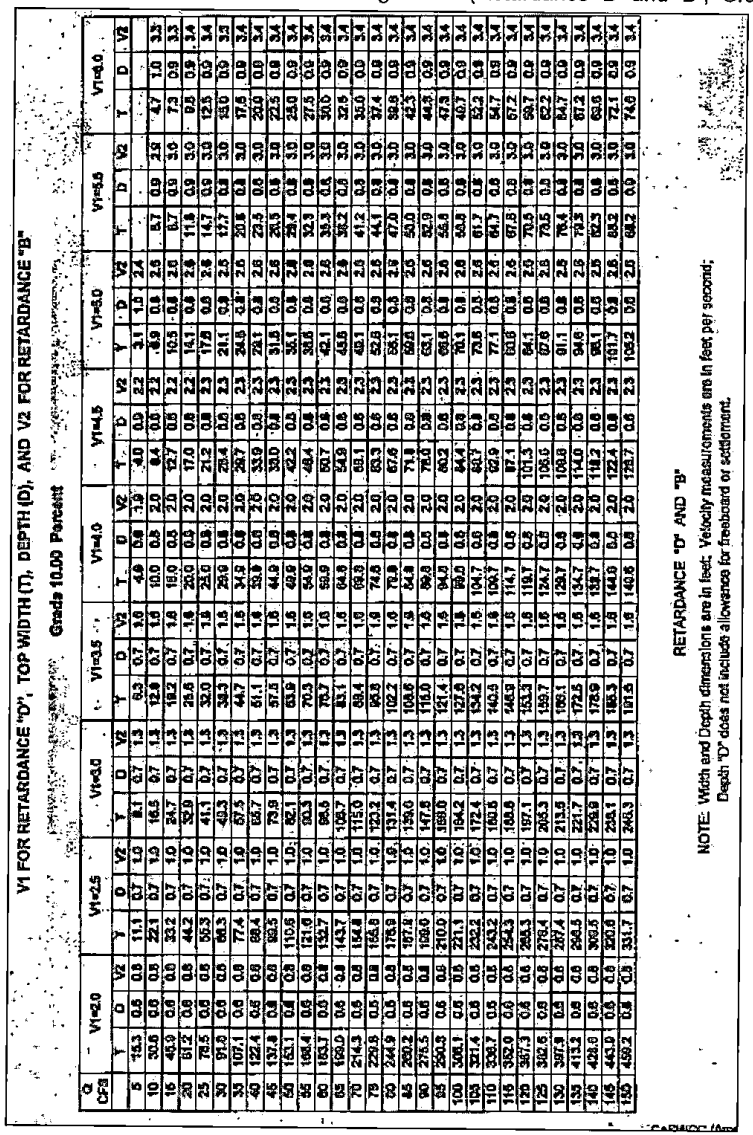
Grade 8.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	14.0	0.7	0.8	10.1	0.7	1.0	7.4	0.8	1.3	5.5	0.8	1.6	4.4	0.9	1.9	3.4	1.0	2.1									
10	28.0	0.7	0.8	20.1	0.7	1.0	15.0	0.8	1.3	11.3	0.8	1.7	9.1	0.8	2.0	7.4	0.9	2.3	6.0	0.9	2.6	4.8	1.0	3.0	3.9	1.2	3.3
15	41.9	0.7	0.8	30.1	0.7	1.0	22.4	0.8	1.3	17.0	0.8	1.7	13.8	0.8	2.0	11.4	0.9	2.3	9.2	0.9	2.7	7.6	1.0	3.0	6.3	1.0	3.4
20	55.9	0.7	0.8	40.1	0.7	1.0	29.9	0.8	1.3	22.6	0.8	1.7	18.5	0.8	2.0	15.1	0.9	2.3	12.5	0.9	2.7	10.2	1.0	3.1	8.5	1.0	3.5
25	69.9	0.7	0.8	50.1	0.7	1.0	37.3	0.8	1.3	28.2	0.8	1.7	23.1	0.8	2.0	18.8	0.9	2.3	15.6	0.9	2.7	13.0	0.9	3.1	10.8	1.0	3.5
30	83.9	0.7	0.8	60.1	0.7	1.0	44.8	0.8	1.3	33.9	0.8	1.7	27.7	0.8	2.0	22.6	0.9	2.3	18.6	0.9	2.7	15.6	0.9	3.1	13.0	1.0	3.5
35	97.9	0.7	0.8	70.1	0.7	1.0	52.3	0.8	1.3	39.5	0.8	1.7	32.3	0.8	2.0	26.3	0.9	2.3	21.7	0.9	2.7	18.2	0.9	3.1	15.3	1.0	3.5
40	111.8	0.7	0.8	80.2	0.7	1.0	59.7	0.8	1.3	45.1	0.8	1.7	36.9	0.8	2.0	30.1	0.9	2.3	24.8	0.9	2.7	20.8	0.9	3.1	17.5	1.0	3.5
45	125.8	0.7	0.8	90.2	0.7	1.0	67.2	0.8	1.3	50.8	0.8	1.7	41.5	0.8	2.0	33.8	0.9	2.3	27.9	0.9	2.7	23.3	0.9	3.1	19.7	1.0	3.5
50	139.8	0.7	0.8	100.2	0.7	1.0	74.7	0.8	1.3	56.4	0.8	1.7	46.1	0.8	2.0	37.6	0.9	2.3	31.0	0.9	2.7	25.9	0.9	3.1	21.9	1.0	3.5
55	153.8	0.7	0.8	110.2	0.7	1.0	82.1	0.8	1.3	62.1	0.8	1.7	50.7	0.8	2.0	41.3	0.9	2.3	34.1	0.9	2.7	28.5	0.9	3.1	24.0	1.0	3.5
60	167.8	0.7	0.8	120.2	0.7	1.0	89.6	0.8	1.3	67.7	0.8	1.7	55.3	0.8	2.0	45.1	0.9	2.3	37.2	0.9	2.7	31.1	0.9	3.1	26.2	1.0	3.5
65	181.7	0.7	0.8	130.3	0.7	1.0	97.0	0.8	1.3	73.3	0.8	1.7	60.0	0.8	2.0	48.8	0.9	2.3	40.3	0.9	2.7	33.7	0.9	3.1	28.4	1.0	3.5
70	195.7	0.7	0.8	140.3	0.7	1.0	104.5	0.8	1.3	79.0	0.8	1.7	64.6	0.8	2.0	52.6	0.9	2.3	43.4	0.9	2.7	36.3	0.9	3.1	30.6	1.0	3.5
75	209.7	0.7	0.8	150.3	0.7	1.0	112.0	0.8	1.3	84.6	0.8	1.7	69.2	0.8	2.0	56.3	0.9	2.3	46.6	0.9	2.7	38.9	0.9	3.1	32.8	1.0	3.5
80	223.7	0.7	0.8	160.3	0.7	1.0	119.4	0.8	1.3	90.3	0.8	1.7	73.8	0.8	2.0	60.1	0.9	2.3	49.6	0.9	2.7	41.4	0.9	3.1	35.0	1.0	3.5
85	237.7	0.7	0.8	170.3	0.7	1.0	126.9	0.8	1.3	95.9	0.8	1.7	78.4	0.8	2.0	63.8	0.9	2.3	52.7	0.9	2.7	44.0	0.9	3.1	37.1	1.0	3.5
90	251.6	0.7	0.8	180.3	0.7	1.0	134.4	0.8	1.3	101.6	0.8	1.7	83.0	0.8	2.0	67.6	0.9	2.3	55.8	0.9	2.7	46.6	0.9	3.1	39.3	1.0	3.5
95	265.6	0.7	0.8	190.4	0.7	1.0	141.8	0.8	1.3	107.2	0.8	1.7	87.6	0.8	2.0	71.3	0.9	2.3	58.9	0.9	2.7	49.2	0.9	3.1	41.5	1.0	3.5
100	279.6	0.7	0.8	200.4	0.7	1.0	149.3	0.8	1.3	112.8	0.8	1.7	92.2	0.8	2.0	75.1	0.9	2.3	62.0	0.9	2.7	51.8	0.9	3.1	43.7	1.0	3.5
105	293.6	0.7	0.8	210.4	0.7	1.0	156.8	0.8	1.3	118.5	0.8	1.7	96.8	0.8	2.0	78.9	0.9	2.3	65.1	0.9	2.7	54.4	0.9	3.1	45.9	1.0	3.5
110	307.6	0.7	0.8	220.4	0.7	1.0	164.2	0.8	1.3	124.1	0.8	1.7	101.4	0.8	2.0	82.6	0.9	2.3	68.2	0.9	2.7	57.0	0.9	3.1	48.0	1.0	3.5
115	321.6	0.7	0.8	230.4	0.7	1.0	171.7	0.8	1.3	129.8	0.8	1.7	106.1	0.8	2.0	86.4	0.9	2.3	71.3	0.9	2.7	59.6	0.9	3.1	50.2	1.0	3.5
120	335.5	0.7	0.8	240.5	0.7	1.0	179.1	0.8	1.3	135.4	0.8	1.7	110.7	0.8	2.0	90.1	0.9	2.3	74.4	0.9	2.7	62.2	0.9	3.1	52.4	1.0	3.5
125	349.5	0.7	0.8	250.5	0.7	1.0	186.6	0.8	1.3	141.0	0.8	1.7	115.3	0.8	2.0	93.9	0.9	2.3	77.5	0.9	2.7	64.7	0.9	3.1	54.6	1.0	3.5
130	363.5	0.7	0.8	260.5	0.7	1.0	194.1	0.8	1.3	146.7	0.8	1.7	119.9	0.8	2.0	97.6	0.9	2.3	80.6	0.9	2.7	67.3	0.9	3.1	56.8	1.0	3.5
135	377.5	0.7	0.8	270.5	0.7	1.0	201.5	0.8	1.3	152.3	0.8	1.7	124.5	0.8	2.0	101.4	0.9	2.3	83.7	0.9	2.7	69.9	0.9	3.1	59.0	1.0	3.5
140	391.5	0.7	0.8	280.5	0.7	1.0	209.0	0.8	1.3	158.0	0.8	1.7	129.1	0.8	2.0	105.1	0.9	2.3	86.8	0.9	2.7	72.5	0.9	3.1	61.1	1.0	3.5
145	405.4	0.7	0.8	290.6	0.7	1.0	216.5	0.8	1.3	163.6	0.8	1.7	133.7	0.8	2.0	108.9	0.9	2.3	89.9	0.9	2.7	75.1	0.9	3.1	63.3	1.0	3.5
150	419.4	0.7	0.8	300.6	0.7	1.0	223.9	0.8	1.3	169.3	0.8	1.7	138.3	0.8	2.0	112.6	0.9	2.3	93.0	0.9	2.7	77.7	0.9	3.1	65.5	1.0	3.5

RETARDANCE "D" AND "B"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second;
Depth "D" does not include allowance for freeboard or settlement.

Table DV-9 Parabolic Diversion Design Chart (Retardance "D" and "B", Grade 10.00%)



V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "B"

Grade 10.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	15.3	0.5	0.8	11.1	0.7	1.0	8.1	0.7	1.3	6.3	0.7	1.5	4.9	0.8	1.8	4.0	0.9	2.0	3.1	1.0	2.2						
10	30.6	0.6	0.8	22.1	0.7	1.0	16.5	0.7	1.3	12.8	0.7	1.5	10.0	0.8	1.8	8.4	0.8	2.0	6.6	0.8	2.2	4.9	0.8	2.5	4.7	1.0	3.3
15	45.9	0.6	0.8	33.2	0.7	1.0	24.7	0.7	1.3	19.2	0.7	1.5	15.0	0.8	1.8	12.7	0.8	2.0	10.0	0.8	2.2	7.7	0.8	2.5	7.3	0.9	3.3
20	61.2	0.6	0.8	44.2	0.7	1.0	32.9	0.7	1.3	25.6	0.7	1.5	20.0	0.8	1.8	17.0	0.8	2.2	14.1	0.8	2.5	11.8	0.9	3.0	9.8	0.9	3.4
25	76.5	0.6	0.8	55.3	0.7	1.0	41.1	0.7	1.3	32.0	0.7	1.5	25.0	0.8	1.8	21.2	0.8	2.3	17.6	0.8	2.5	14.7	0.9	3.0	12.5	0.9	3.4
30	91.8	0.6	0.8	66.3	0.7	1.0	49.3	0.7	1.3	38.3	0.7	1.5	29.9	0.8	2.0	25.4	0.8	2.3	21.1	0.8	2.5	17.7	0.8	3.0	15.0	0.9	3.5
35	107.1	0.6	0.8	77.4	0.7	1.0	57.5	0.7	1.3	44.7	0.7	1.5	34.9	0.8	2.0	29.7	0.8	2.3	24.6	0.8	2.5	20.6	0.8	3.0	17.5	0.9	3.4
40	122.4	0.6	0.8	88.4	0.7	1.0	65.7	0.7	1.3	51.1	0.7	1.5	39.9	0.8	2.0	33.9	0.8	2.3	28.1	0.8	2.5	23.5	0.8	3.0	20.0	0.9	3.4
45	137.8	0.6	0.8	99.5	0.7	1.0	73.9	0.7	1.3	57.5	0.7	1.5	44.9	0.8	2.0	38.0	0.8	2.3	31.6	0.8	2.5	26.5	0.8	3.0	22.5	0.9	3.4
50	153.1	0.6	0.8	110.6	0.7	1.0	82.1	0.7	1.3	63.9	0.7	1.5	49.8	0.8	2.0	42.2	0.8	2.3	35.1	0.8	2.5	29.4	0.8	3.0	25.0	0.9	3.4
55	168.4	0.6	0.8	121.6	0.7	1.0	90.3	0.7	1.3	70.3	0.7	1.5	54.9	0.8	2.0	46.4	0.8	2.3	38.6	0.8	2.5	32.3	0.8	3.0	27.5	0.9	3.4
60	183.7	0.6	0.8	132.7	0.7	1.0	98.6	0.7	1.3	76.7	0.7	1.5	59.9	0.8	2.0	50.7	0.8	2.3	42.1	0.8	2.5	35.3	0.8	3.0	30.0	0.9	3.4
65	199.0	0.6	0.8	143.7	0.7	1.0	106.7	0.7	1.3	83.1	0.7	1.5	64.8	0.8	2.0	54.9	0.8	2.3	45.6	0.8	2.5	38.2	0.8	3.0	32.5	0.9	3.4
70	214.3	0.6	0.8	154.8	0.7	1.0	115.0	0.7	1.3	89.4	0.7	1.5	69.8	0.8	2.0	59.1	0.8	2.3	49.1	0.8	2.5	41.2	0.8	3.0	35.0	0.9	3.4
75	229.6	0.6	0.8	165.8	0.7	1.0	123.2	0.7	1.3	95.8	0.7	1.5	74.8	0.8	2.0	63.3	0.8	2.3	52.6	0.8	2.5	44.1	0.8	3.0	37.4	0.9	3.4
80	244.9	0.6	0.8	176.9	0.7	1.0	131.4	0.7	1.3	102.2	0.7	1.5	79.8	0.8	2.0	67.6	0.8	2.3	56.1	0.8	2.5	47.0	0.8	3.0	39.8	0.9	3.4
85	260.2	0.6	0.8	187.9	0.7	1.0	139.6	0.7	1.3	108.6	0.7	1.5	84.8	0.8	2.0	71.8	0.8	2.3	59.6	0.8	2.5	50.0	0.8	3.0	42.3	0.9	3.4
90	275.5	0.6	0.8	199.0	0.7	1.0	147.8	0.7	1.3	115.0	0.7	1.5	89.8	0.8	2.0	76.0	0.8	2.3	63.1	0.8	2.5	52.9	0.8	3.0	44.8	0.9	3.4
95	290.8	0.6	0.8	210.0	0.7	1.0	156.0	0.7	1.3	121.4	0.7	1.5	94.8	0.8	2.0	80.2	0.8	2.3	66.6	0.8	2.5	55.8	0.8	3.0	47.3	0.9	3.4
100	306.1	0.6	0.8	221.1	0.7	1.0	164.2	0.7	1.3	127.8	0.7	1.5	99.8	0.8	2.0	84.4	0.8	2.3	70.1	0.8	2.5	58.8	0.8	3.0	49.7	0.9	3.4
105	321.4	0.6	0.8	232.2	0.7	1.0	172.4	0.7	1.3	134.2	0.7	1.5	104.7	0.8	2.0	88.7	0.8	2.3	73.6	0.8	2.5	61.7	0.8	3.0	52.2	0.9	3.4
110	336.7	0.6	0.8	243.2	0.7	1.0	180.5	0.7	1.3	140.5	0.7	1.5	109.7	0.8	2.0	92.9	0.8	2.3	77.1	0.8	2.5	64.7	0.8	3.0	54.7	0.9	3.4
115	352.0	0.6	0.8	254.3	0.7	1.0	188.6	0.7	1.3	146.9	0.7	1.5	114.7	0.8	2.0	97.1	0.8	2.3	80.6	0.8	2.5	67.6	0.8	3.0	57.2	0.9	3.4
120	367.3	0.6	0.8	265.3	0.7	1.0	197.1	0.7	1.3	153.3	0.7	1.5	119.7	0.8	2.0	101.3	0.8	2.3	84.1	0.8	2.5	70.5	0.8	3.0	59.7	0.9	3.4
125	382.6	0.6	0.8	276.4	0.7	1.0	205.3	0.7	1.3	159.7	0.7	1.5	124.7	0.8	2.0	106.0	0.8	2.3	87.6	0.8	2.5	73.5	0.8	3.0	62.2	0.9	3.4
130	397.9	0.6	0.8	287.4	0.7	1.0	213.5	0.7	1.3	166.1	0.7	1.5	129.7	0.8	2.0	109.8	0.8	2.3	91.1	0.8	2.5	76.4	0.8	3.0	64.7	0.9	3.4
135	413.2	0.6	0.8	298.5	0.8	1.0	221.7	0.7	1.3	172.5	0.7	1.5	134.7	0.8	2.0	114.0	0.8	2.3	94.6	0.8	2.5	79.3	0.8	3.0	67.2	0.9	3.4
140	428.5	0.6	0.8	309.5	0.7	1.0	229.9	0.7	1.3	178.9	0.7	1.5	139.7	0.8	2.0	118.2	0.8	2.3	98.1	0.8	2.5	82.3	0.8	3.0	69.6	0.9	3.4
145	443.8	0.6	0.8	320.6	0.7	1.0	238.1	0.7	1.3	185.3	0.7	1.5	144.6	0.8	2.0	122.4	0.8	2.3	101.7	0.8	2.5	85.2	0.8	3.0	72.1	0.9	3.4
150	459.2	0.6	0.8	331.7	0.7	1.0	246.3	0.7	1.3	191.6	0.7	1.5	149.6	0.8	2.0	126.7	0.8	2.3	105.2	0.8	2.5	88.2	0.8	3.0	74.6	0.9	3.4

RETARDANCE "D" AND "B"

NOTE: Width and Depth dimensions are in feet. Velocity measurements are in feet per second;
Depth "D" does not include allowance for freeboard or settlement.

Table DV-10 Parabolic Diversion Design Chart (Retardance "D" and "C", Grade .50%)

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "C"

Grade 0.50 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10																											
15	8.4	1.6	1.7																								
20	11.7	1.5	1.7	7.1	2.0	2.2																					
25	14.9	1.5	1.7	9.7	1.8	2.2																					
30	18.0	1.5	1.7	12.0	1.7	2.2																					
35	21.0	1.6	1.7	14.2	1.7	2.2	9.3	2.1	2.7																		
40	24.4	1.5	1.7	16.3	1.7	2.2	10.9	2.0	2.7																		
45	27.4	1.6	1.7	18.5	1.7	2.2	12.5	2.0	2.7																		
50	30.5	1.6	1.7	20.6	1.7	2.2	14.1	1.9	2.7	8.7	2.6	3.3															
55	33.6	1.6	1.7	22.7	1.7	2.2	15.7	1.9	2.7	10.4	2.4	3.3															
60	36.8	1.5	1.7	24.8	1.7	2.2	17.2	1.9	2.7	11.7	2.3	3.3															
65	39.6	1.6	1.7	27.3	1.7	2.2	18.8	1.9	2.7	12.9	2.3	3.3															
70	42.8	1.6	1.7	29.4	1.7	2.2	20.3	1.9	2.7	14.0	2.2	3.3	9.8	2.8	3.8												
75	45.7	1.5	1.7	31.4	1.7	2.2	21.8	1.9	2.7	15.2	2.2	3.3	11.3	2.7	3.8												
80	48.7	1.5	1.7	33.5	1.7	2.2	23.3	1.9	2.7	16.3	2.2	3.3	12.2	2.6	3.8												
85	51.7	1.5	1.7	35.6	1.6	2.2	24.8	1.9	2.7	17.4	2.2	3.3	13.2	2.5	3.8												
90	54.8	1.5	1.7	37.7	1.6	2.2	26.3	1.9	2.7	18.5	2.2	3.3	14.2	2.5	3.8												
95	57.8	1.5	1.7	39.8	1.6	2.2	27.8	1.9	2.7	19.6	2.2	3.3	15.1	2.5	3.8												
100	60.9	1.5	1.7	41.9	1.6	2.2	29.7	1.9	2.7	20.7	2.2	3.3	16.0	2.5	3.8	11.0	3.2	4.3									
105	63.9	1.5	1.7	44.0	1.6	2.2	31.2	1.9	2.7	21.8	2.2	3.3	16.9	2.5	3.8	12.3	3.0	4.3									
110	66.9	1.5	1.7	46.1	1.6	2.2	32.6	1.9	2.7	22.9	2.2	3.3	17.8	2.4	3.8	13.1	2.9	4.3									
115	70.0	1.6	1.7	48.1	1.6	2.2	34.1	1.9	2.7	24.0	2.1	3.3	18.7	2.4	3.8	13.9	2.9	4.3									
120	73.0	1.5	1.7	50.2	1.6	2.2	35.6	1.9	2.7	25.1	2.1	3.3	19.6	2.4	3.8	14.6	2.9	4.3									
125	76.1	1.5	1.7	52.3	1.6	2.2	37.1	1.9	2.7	26.2	2.1	3.3	20.5	2.4	3.8	15.4	2.8	4.3									
130	79.1	1.5	1.7	54.4	1.6	2.2	38.5	1.9	2.7	27.3	2.1	3.3	21.3	2.4	3.8	16.1	2.8	4.3									
135	82.1	1.5	1.7	56.5	1.6	2.2	40.0	1.9	2.7	28.4	2.1	3.3	22.2	2.4	3.8	16.9	2.8	4.3									
140	85.2	1.5	1.7	58.6	1.6	2.2	41.5	1.9	2.7	29.4	2.1	3.3	23.1	2.4	3.8	17.6	2.8	4.3									
145	88.2	1.5	1.7	60.7	1.6	2.2	43.0	1.9	2.7	30.5	2.1	3.3	24.0	2.4	3.8	18.3	2.8	4.3	12.3	3.7	4.9						
150	91.3	1.5	1.7	62.8	1.6	2.2	44.5	1.9	2.7	31.6	2.1	3.3	24.8	2.4	3.8	19.0	2.7	4.3	13.1	3.5	4.9						

RETARDANCE "D" AND "C"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second; Depth "D" does not include allowance for freeboard or settlement.

Table DV-11 Parabolic Diversion Design Chart (Retardance "D" and "C", Grade 1.00%)

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "C"

Grade 1.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5																											
10	8.2	1.2	1.6	5.2	1.4	2.0																					
15	12.6	1.1	1.6	8.7	1.3	2.1	5.5	1.6	2.6																		
20	17.1	1.1	1.6	11.8	1.2	2.1	8.2	1.4	2.6																		
25	21.4	1.1	1.6	14.9	1.2	2.1	10.5	1.4	2.6	7.3	1.6	3.1															
30	25.7	1.1	1.6	18.0	1.2	2.1	12.8	1.4	2.6	9.1	1.6	3.2															
35	29.9	1.1	1.6	21.2	1.2	2.1	15.0	1.3	2.6	10.9	1.5	3.1	7.8	1.8	3.7												
40	34.2	1.1	1.6	24.3	1.2	2.1	17.3	1.3	2.6	12.6	1.5	3.1	9.2	1.7	3.7												
45	38.5	1.1	1.6	27.3	1.2	2.1	19.5	1.3	2.6	14.3	1.5	3.1	10.6	1.7	3.7	7.2	2.2	4.3									
50	42.7	1.1	1.6	30.3	1.2	2.1	21.9	1.3	2.6	16.0	1.5	3.2	11.9	1.7	3.7	8.8	2.0	4.3									
55	47.0	1.1	1.6	33.3	1.2	2.1	24.1	1.3	2.6	17.7	1.5	3.2	13.3	1.7	3.7	9.9	1.9	4.3									
60	51.3	1.1	1.6	36.3	1.2	2.1	26.3	1.3	2.6	19.3	1.5	3.2	14.6	1.7	3.7	11.0	1.9	4.3									
65	55.5	1.1	1.6	39.4	1.2	2.1	28.5	1.3	2.6	21.0	1.5	3.2	15.9	1.6	3.7	12.1	1.9	4.3	8.0	2.5	4.9						
70	59.8	1.1	1.6	42.4	1.2	2.1	30.7	1.3	2.6	22.7	1.5	3.2	17.1	1.6	3.7	13.2	1.9	4.3	9.5	2.3	4.8						
75	64.1	1.1	1.6	45.4	1.2	2.1	32.9	1.3	2.6	24.6	1.5	3.1	18.5	1.6	3.7	14.2	1.8	4.3	10.4	2.2	4.9						
80	68.3	1.1	1.6	48.4	1.2	2.1	35.0	1.3	2.6	26.2	1.5	3.1	19.8	1.6	3.7	15.2	1.8	4.3	11.3	2.2	4.9						
85	72.6	1.1	1.6	51.5	1.2	2.1	37.2	1.3	2.6	27.9	1.5	3.1	21.0	1.6	3.7	16.3	1.8	4.3	12.1	2.2	4.9	8.8	2.7	5.4			
90	76.9	1.1	1.6	54.5	1.2	2.1	39.4	1.3	2.6	29.5	1.5	3.1	22.3	1.6	3.7	17.3	1.8	4.3	13.0	2.1	4.9	9.6	2.6	5.4			
95	81.1	1.1	1.6	57.5	1.2	2.1	41.6	1.3	2.6	31.1	1.5	3.1	23.6	1.6	3.7	18.3	1.8	4.3	13.8	2.1	4.9	10.9	2.5	5.3			
100	85.4	1.1	1.6	60.5	1.2	2.1	43.8	1.3	2.6	32.7	1.5	3.1	24.9	1.6	3.7	19.3	1.8	4.3	14.6	2.1	4.9	11.6	2.4	5.4			
105	89.7	1.1	1.6	63.6	1.2	2.1	46.0	1.3	2.6	34.4	1.5	3.1	26.5	1.6	3.7	20.3	1.8	4.3	15.4	2.1	4.9	12.4	2.4	5.4	9.7	2.8	5.8
110	94.0	1.1	1.6	66.6	1.2	2.1	48.2	1.3	2.6	36.0	1.5	3.1	27.7	1.6	3.7	21.3	1.8	4.3	16.2	2.1	4.9	13.1	2.4	5.4	10.8	2.8	5.8
115	98.2	1.1	1.6	69.6	1.2	2.1	50.4	1.3	2.6	37.6	1.5	3.1	29.0	1.6	3.7	22.3	1.8	4.3	17.0	2.1	4.9	13.8	2.3	5.4	11.5	2.8	5.8
120	102.5	1.1	1.6	72.6	1.2	2.1	52.5	1.3	2.6	39.3	1.5	3.1	30.2	1.6	3.7	23.3	1.8	4.3	17.9	2.1	4.9	14.5	2.3	5.4	12.2	2.8	5.8
125	106.8	1.1	1.6	75.7	1.2	2.1	54.7	1.3	2.6	40.9	1.5	3.1	31.5	1.6	3.7	24.3	1.8	4.3	18.7	2.1	4.9	15.2	2.3	5.4	12.8	2.5	5.8
130	111.0	1.1	1.6	78.7	1.2	2.1	56.9	1.3	2.6	42.5	1.5	3.1	32.7	1.6	3.7	25.3	1.8	4.3	19.4	2.1	4.9	15.9	2.3	5.4	13.4	2.5	5.8
135	115.3	1.1	1.6	81.7	1.2	2.1	59.1	1.3	2.6	44.2	1.5	3.1	34.0	1.6	3.7	26.3	1.8	4.3	20.2	2.0	4.9	16.6	2.3	5.4	14.1	2.5	5.8
140	119.6	1.1	1.6	84.7	1.2	2.1	61.3	1.3	2.6	45.8	1.5	3.1	35.2	1.6	3.7	27.3	1.8	4.3	21.0	2.0	4.9	17.2	2.3	5.4	14.7	2.5	5.8
145	123.8	1.1	1.6	87.8	1.2	2.1	63.5	1.3	2.6	47.5	1.5	3.1	36.5	1.6	3.7	28.7	1.8	4.3	21.8	2.0	4.9	17.9	2.3	5.4	15.3	2.5	5.8
150	128.1	1.1	1.6	90.8	1.2	2.1	65.7	1.3	2.6	49.1	1.5	3.1	37.8	1.6	3.7	29.7	1.8	4.3	22.6	2.0	4.9	18.6	2.3	5.4	15.9	2.4	5.8

RETARDANCE "D" AND "C"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second;
Depth "D" does not include allowance for freeboard or settlement.

Table DV-12 Parabolic Diversion Design Chart (Retardance "D" and "C", Grade 2.00%)

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "C"

Grade 2.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	5.9	0.9	1.5																								
10	12.4	0.8	1.5	8.1	0.9	2.0	5.9	1.0	2.5																		
15	18.5	0.8	1.5	12.3	0.9	2.0	9.3	1.0	2.5	6.8	1.1	3.0	4.7	1.4	3.5												
20	24.7	0.8	1.5	16.7	0.9	2.0	12.5	1.0	2.5	9.4	1.1	3.0	7.0	1.2	3.6	4.7	1.5	4.1									
25	30.8	0.8	1.5	20.8	0.9	2.0	15.9	1.0	2.4	11.8	1.1	3.0	9.0	1.2	3.5	6.8	1.3	4.1									
30	37.0	0.8	1.5	25.0	0.9	2.0	19.0	1.0	2.5	14.3	1.1	3.0	11.0	1.2	3.5	8.5	1.3	4.1	6.4	1.5	4.7						
35	43.2	0.8	1.5	29.1	0.9	2.0	22.2	1.0	2.6	16.9	1.0	3.0	12.9	1.1	3.5	10.1	1.3	4.1	7.8	1.4	4.7						
40	49.3	0.8	1.5	33.3	0.9	2.0	25.3	1.0	2.5	19.3	1.0	3.0	14.8	1.1	3.5	11.8	1.3	4.1	9.1	1.4	4.7	7.1	1.6	5.2			
45	55.5	0.8	1.5	37.4	0.9	2.0	28.5	1.0	2.5	21.7	1.0	3.0	16.7	1.1	3.5	13.1	1.3	4.1	10.4	1.4	4.7	8.2	1.6	5.2			
50	61.7	0.8	1.5	41.6	0.9	2.0	31.7	1.0	2.5	24.1	1.0	3.0	18.6	1.1	3.5	14.7	1.2	4.1	11.7	1.4	4.7	9.3	1.5	6.3	7.1	1.8	5.8
55	67.8	0.8	1.5	45.7	0.9	2.0	34.8	1.0	2.5	26.5	1.0	3.0	20.7	1.1	3.6	16.2	1.2	4.1	12.9	1.4	4.7	10.4	1.5	5.3	8.2	1.7	5.8
60	74.0	0.8	1.5	49.9	0.9	2.0	38.0	1.0	2.5	28.9	1.0	3.0	22.6	1.1	3.6	17.7	1.2	4.1	14.1	1.4	4.7	11.4	1.5	5.3	9.2	1.7	5.8
65	80.2	0.8	1.5	54.0	0.9	2.0	41.1	1.0	2.5	31.4	1.0	3.0	24.5	1.1	3.5	19.5	1.2	4.1	15.4	1.3	4.7	12.4	1.5	5.3	10.1	1.7	5.8
70	86.3	0.8	1.5	58.2	0.9	2.0	44.3	1.0	2.5	33.8	1.0	3.0	26.3	1.1	3.5	21.0	1.2	4.1	16.6	1.3	4.7	13.6	1.5	5.3	11.0	1.6	5.8
75	92.5	0.8	1.5	62.3	0.9	2.0	47.5	1.0	2.5	36.2	1.0	3.0	28.2	1.1	3.5	22.4	1.2	4.1	17.8	1.3	4.7	14.5	1.5	5.3	11.8	1.6	5.8
80	98.7	0.8	1.5	66.5	0.9	2.0	50.6	1.0	2.5	38.6	1.0	3.0	30.1	1.1	3.5	23.9	1.2	4.1	19.0	1.3	4.7	15.5	1.5	5.3	12.7	1.6	5.8
85	104.8	0.8	1.5	70.6	0.9	2.0	53.8	1.0	2.5	41.0	1.0	3.0	32.0	1.1	3.5	25.4	1.2	4.1	20.3	1.3	4.7	16.5	1.5	5.3	13.6	1.6	5.8
90	111.0	0.8	1.5	74.8	0.9	2.0	57.0	1.0	2.5	43.4	1.0	3.0	33.8	1.1	3.6	26.9	1.2	4.1	21.8	1.3	4.6	17.5	1.5	5.3	14.4	1.6	5.8
95	117.2	0.8	1.5	78.9	0.9	2.0	60.1	1.0	2.5	45.8	1.0	3.0	35.7	1.1	3.5	28.4	1.2	4.1	23.0	1.3	4.6	18.6	1.5	5.3	15.3	1.6	5.8
100	123.3	0.8	1.5	83.1	0.9	2.0	63.3	1.0	2.5	48.2	1.0	3.0	37.6	1.1	3.5	29.9	1.2	4.1	24.2	1.3	4.6	19.6	1.5	5.3	16.2	1.6	5.8
105	129.5	0.8	1.5	87.3	0.9	2.0	66.4	1.0	2.5	50.6	1.0	3.0	39.5	1.1	3.5	31.4	1.2	4.1	25.4	1.3	4.6	20.6	1.5	5.3	17.0	1.6	5.8
110	135.7	0.8	1.5	91.4	0.9	2.0	69.6	1.0	2.5	53.0	1.0	3.0	41.3	1.1	3.5	32.9	1.2	4.1	26.6	1.3	4.7	21.6	1.4	5.3	17.9	1.6	5.8
115	141.8	0.8	1.5	95.6	0.9	2.0	72.8	1.0	2.5	55.4	1.0	3.0	43.2	1.1	3.5	34.4	1.2	4.1	27.9	1.3	4.7	22.6	1.4	5.3	18.7	1.6	5.8
120	148.0	0.8	1.5	99.7	0.9	2.0	75.9	1.0	2.5	57.9	1.0	3.0	45.1	1.1	3.5	35.9	1.2	4.1	29.1	1.3	4.7	23.9	1.4	5.2	19.5	1.6	5.8
125	154.1	0.8	1.5	103.9	0.9	2.0	79.1	1.0	2.5	60.3	1.0	3.0	47.0	1.1	3.5	37.4	1.2	4.1	30.3	1.3	4.7	24.8	1.4	5.2	20.4	1.6	5.8
130	160.3	0.8	1.5	108.0	0.9	2.0	82.3	1.0	2.5	62.7	1.0	3.0	48.8	1.1	3.5	38.9	1.2	4.1	31.5	1.3	4.7	25.8	1.4	5.3	21.2	1.6	5.8
135	166.5	0.8	1.5	112.2	0.9	2.0	85.4	1.0	2.6	65.1	1.0	3.0	50.7	1.1	3.5	40.3	1.2	4.1	32.7	1.3	4.7	26.8	1.4	5.3	22.1	1.6	5.8
140	172.6	0.8	1.5	116.3	0.9	2.0	88.6	1.0	2.6	67.5	1.0	3.0	52.6	1.1	3.5	41.8	1.2	4.1	33.9	1.3	4.7	27.8	1.4	5.3	22.9	1.6	5.8
145	178.8	0.8	1.5	120.5	0.9	2.0	91.8	1.0	2.5	69.9	1.0	3.0	54.5	1.1	3.6	43.3	1.2	4.1	35.1	1.3	4.7	28.8	1.4	5.3	23.7	1.6	5.8
150	185.0	0.8	1.5	124.6	0.9	2.0	94.9	1.0	2.5	72.3	1.0	3.0	56.4	1.1	3.5	44.8	1.2	4.1	36.3	1.3	4.7	29.8	1.4	5.3	24.6	1.6	5.8

RETARDANCE "D" AND "C"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second;
Depth "D" does not include allowance for freeboard or settlement.

Table DV-13 Parabolic Diversion Design Chart (Retardance "D" and "C", Grade 4.00%)

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "C"

Grade 4.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	8.5	0.8	1.4	5.9	0.7	1.8	4.1	0.8	2.3																		
10	17.2	0.8	1.4	12.1	0.7	1.8	8.8	0.7	2.3	6.7	0.8	2.8	5.2	0.9	3.3	3.8	1.0	3.9									
15	25.8	0.8	1.4	18.1	0.7	1.8	13.4	0.7	2.3	10.3	0.8	2.8	8.1	0.8	3.4	6.4	0.9	3.9	4.9	1.0	4.5						
20	34.4	0.8	1.4	24.2	0.7	1.8	17.8	0.7	2.3	13.8	0.8	2.8	10.8	0.8	3.4	8.7	0.9	3.9	6.9	1.0	4.5	5.5	1.1	5.0			
25	43.0	0.8	1.4	30.2	0.7	1.9	22.3	0.7	2.3	17.4	0.8	2.8	13.8	0.8	3.3	10.9	0.9	3.9	8.8	1.0	4.5	7.1	1.0	5.1	5.7	1.2	5.6
30	51.6	0.8	1.4	36.3	0.7	1.9	26.7	0.7	2.3	20.8	0.8	2.8	16.5	0.8	3.3	13.2	0.9	3.9	10.7	0.9	4.5	8.7	1.0	5.1	7.1	1.1	5.6
35	60.2	0.8	1.4	42.3	0.7	1.9	31.1	0.7	2.3	24.3	0.8	2.8	19.3	0.8	3.4	15.6	0.9	3.9	12.5	0.9	4.5	10.3	1.0	5.0	8.4	1.1	5.6
40	68.8	0.8	1.4	48.3	0.7	1.9	35.6	0.7	2.3	27.8	0.8	2.8	22.0	0.8	3.4	17.8	0.9	3.9	14.4	0.9	4.5	11.8	1.0	5.0	9.8	1.1	5.7
45	77.4	0.8	1.4	54.4	0.7	1.9	40.0	0.7	2.4	31.2	0.8	2.8	24.8	0.8	3.4	20.0	0.9	3.9	16.4	0.9	4.4	13.3	1.0	5.0	11.1	1.1	5.7
50	86.0	0.8	1.4	60.4	0.7	1.9	44.5	0.7	2.4	34.7	0.8	2.8	27.5	0.8	3.4	22.2	0.9	3.9	18.2	0.9	4.4	14.9	1.0	5.0	12.3	1.1	5.7
55	94.6	0.8	1.4	66.5	0.7	1.9	48.9	0.7	2.4	38.2	0.8	2.8	30.3	0.8	3.4	24.4	0.9	3.9	20.0	0.9	4.4	16.6	1.0	5.0	13.6	1.1	5.7
60	103.2	0.8	1.4	72.5	0.7	1.9	53.4	0.7	2.4	41.7	0.8	2.8	33.0	0.8	3.4	26.6	0.9	3.9	21.8	0.9	4.5	18.1	1.0	5.0	14.9	1.1	5.7
65	111.8	0.8	1.4	78.5	0.7	1.9	57.8	0.7	2.4	45.1	0.8	2.8	35.8	0.8	3.4	28.9	0.9	3.9	23.6	0.9	4.5	19.6	1.0	5.0	16.2	1.1	5.7
70	120.4	0.8	1.4	84.6	0.7	1.9	62.3	0.7	2.4	48.6	0.8	2.8	38.6	0.8	3.4	31.1	0.9	3.9	25.4	0.9	4.5	21.1	1.0	5.0	17.7	1.1	5.6
75	129.0	0.8	1.4	90.6	0.7	1.9	66.7	0.7	2.4	52.1	0.8	2.8	41.3	0.8	3.4	33.3	0.9	3.9	27.2	0.9	4.5	22.6	1.0	5.0	19.0	1.1	5.6
80	137.6	0.8	1.4	96.7	0.7	1.9	71.2	0.7	2.4	55.5	0.8	2.8	44.1	0.8	3.4	35.5	0.9	3.9	29.1	0.9	4.5	24.1	1.0	5.0	20.2	1.1	5.6
85	146.2	0.8	1.4	102.7	0.7	1.9	75.6	0.7	2.4	59.0	0.8	2.8	46.8	0.8	3.4	37.7	0.9	3.9	30.9	0.9	4.5	25.6	1.0	5.0	21.5	1.1	5.6
90	154.8	0.8	1.4	108.7	0.7	1.9	80.0	0.7	2.4	62.5	0.8	2.8	49.6	0.8	3.4	39.9	0.9	3.9	32.7	0.9	4.5	27.1	1.0	5.0	22.8	1.1	5.6
95	163.4	0.8	1.4	114.8	0.7	1.9	84.5	0.7	2.4	65.9	0.8	2.8	52.3	0.8	3.4	42.2	0.9	3.9	34.5	0.9	4.5	28.6	1.0	5.0	24.0	1.1	5.6
100	172.0	0.8	1.4	120.8	0.7	1.9	88.9	0.7	2.4	69.4	0.8	2.8	55.1	0.8	3.4	44.4	0.9	3.9	36.3	0.9	4.5	30.1	1.0	5.0	25.3	1.1	5.6
105	180.6	0.8	1.4	126.9	0.7	1.9	93.4	0.7	2.4	72.9	0.8	2.8	57.8	0.8	3.4	46.6	0.9	3.9	38.1	0.9	4.5	31.6	1.0	5.0	26.5	1.1	5.6
110	189.2	0.8	1.4	132.9	0.7	1.9	97.8	0.7	2.4	76.3	0.8	2.8	60.6	0.8	3.4	48.8	0.9	3.9	39.9	0.9	4.5	33.1	1.0	5.0	27.8	1.1	5.6
115	197.8	0.8	1.4	138.9	0.7	1.9	102.3	0.7	2.4	79.8	0.8	2.8	63.3	0.8	3.4	51.0	0.9	3.9	41.7	0.9	4.5	34.6	1.0	5.0	29.0	1.1	5.6
120	206.4	0.8	1.4	145.0	0.7	1.9	106.7	0.7	2.4	83.3	0.8	2.8	66.1	0.8	3.4	53.3	0.9	3.9	43.6	0.9	4.5	36.1	1.0	5.0	30.2	1.1	5.7
125	215.0	0.8	1.4	151.0	0.7	1.9	111.2	0.7	2.4	86.8	0.8	2.8	68.8	0.8	3.4	55.5	0.9	3.9	45.4	0.9	4.5	37.6	1.0	5.0	31.5	1.1	5.7
130	223.7	0.8	1.4	157.1	0.7	1.9	115.6	0.7	2.4	90.2	0.8	2.8	71.6	0.8	3.4	57.7	0.9	3.9	47.2	0.9	4.5	39.1	1.0	5.0	32.7	1.1	5.7
135	232.3	0.8	1.4	163.1	0.7	1.9	120.1	0.7	2.4	93.7	0.8	2.8	74.3	0.8	3.4	59.9	0.9	3.9	49.0	0.9	4.5	40.6	1.0	5.0	34.0	1.1	5.7
140	240.9	0.8	1.4	169.1	0.7	1.9	124.5	0.7	2.4	97.2	0.8	2.8	77.1	0.8	3.4	62.1	0.9	3.9	50.8	0.9	4.5	42.1	1.0	5.0	35.2	1.1	5.7
145	249.5	0.8	1.4	175.2	0.7	1.9	129.0	0.7	2.4	100.6	0.8	2.8	79.8	0.8	3.4	64.3	0.9	3.9	52.6	0.9	4.5	43.6	1.0	5.0	36.5	1.1	5.7
150	258.1	0.8	1.4	181.2	0.7	1.9	133.4	0.7	2.4	104.1	0.8	2.8	82.6	0.8	3.4	66.6	0.9	3.9	54.4	0.9	4.5	45.1	1.0	5.0	37.8	1.1	5.7

RETARDANCE "D" AND "C"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second; Depth "D" does not include allowance for freeboard or settlement.

Table DV-14 Parabolic Diversion Design Chart (Retardance "D" and "C", Grade 6.00%)

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "C"

Grade 6.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	10.6	0.5	1.3	7.3	0.6	1.8	5.3	0.6	2.3	4.0	0.7	2.8	2.9	0.8	3.2												
10	21.1	0.5	1.3	14.7	0.6	1.8	10.9	0.6	2.3	8.4	0.7	2.8	6.6	0.7	3.2	5.3	0.8	3.8	4.2	0.8	4.3						
15	31.6	0.5	1.3	22.1	0.6	1.8	16.3	0.6	2.3	12.7	0.6	2.7	10.1	0.7	3.3	8.2	0.7	3.8	6.6	0.8	4.3	5.4	0.9	4.9	4.3	1.0	5.5
20	42.1	0.5	1.3	29.5	0.6	1.8	21.7	0.6	2.3	17.0	0.6	2.7	13.6	0.7	3.2	11.1	0.7	3.7	9.0	0.8	4.3	7.4	0.8	4.9	6.1	0.9	5.5
25	52.7	0.5	1.3	36.8	0.6	1.8	27.1	0.6	2.3	21.2	0.6	2.8	17.0	0.7	3.2	13.9	0.7	3.8	11.3	0.8	4.3	9.3	0.8	4.9	7.8	0.9	5.5
30	63.2	0.5	1.3	44.2	0.6	1.8	32.5	0.6	2.3	26.4	0.6	2.8	20.4	0.7	3.2	16.6	0.7	3.8	13.7	0.8	4.3	11.3	0.8	4.9	9.4	0.9	5.5
35	73.7	0.5	1.3	51.6	0.6	1.8	38.0	0.6	2.3	29.7	0.6	2.8	23.8	0.7	3.2	19.4	0.7	3.8	16.0	0.8	4.3	13.4	0.8	4.9	11.1	0.9	5.5
40	84.2	0.5	1.3	68.9	0.6	1.8	43.4	0.6	2.3	33.9	0.6	2.8	27.2	0.7	3.3	22.2	0.7	3.8	18.3	0.8	4.3	15.3	0.8	4.9	12.7	0.9	5.5
45	94.8	0.5	1.3	66.3	0.6	1.8	48.8	0.6	2.3	38.2	0.6	2.8	30.7	0.7	3.3	24.9	0.7	3.8	20.6	0.8	4.3	17.2	0.8	4.9	14.5	0.9	5.4
50	105.3	0.5	1.3	73.6	0.6	1.8	54.2	0.6	2.3	42.4	0.6	2.8	34.1	0.7	3.3	27.7	0.7	3.8	22.8	0.8	4.3	19.1	0.8	4.9	16.1	0.9	5.4
55	115.8	0.5	1.3	81.0	0.6	1.8	59.7	0.6	2.3	46.6	0.6	2.8	37.5	0.7	3.3	30.5	0.7	3.8	25.1	0.8	4.3	21.0	0.8	4.9	17.7	0.9	5.4
60	126.4	0.5	1.3	88.4	0.6	1.8	65.1	0.6	2.3	50.9	0.6	2.8	40.9	0.7	3.3	33.3	0.7	3.8	27.4	0.8	4.3	22.9	0.8	4.9	19.3	0.9	5.4
65	136.9	0.5	1.3	95.7	0.6	1.8	70.5	0.6	2.3	55.1	0.6	2.8	44.3	0.7	3.3	36.0	0.7	3.8	29.7	0.8	4.3	24.8	0.8	4.9	20.9	0.9	5.4
70	147.4	0.5	1.3	103.1	0.6	1.8	75.9	0.6	2.3	59.3	0.6	2.8	47.7	0.7	3.3	38.8	0.7	3.8	32.0	0.8	4.3	26.7	0.8	4.9	22.5	0.9	5.4
75	158.0	0.6	1.3	110.5	0.6	1.8	81.3	0.6	2.3	63.6	0.6	2.8	51.1	0.7	3.3	41.6	0.7	3.8	34.3	0.8	4.3	28.6	0.8	4.9	24.1	0.9	5.4
80	168.5	0.5	1.3	117.8	0.6	1.8	86.8	0.6	2.3	67.8	0.6	2.8	54.5	0.7	3.3	44.3	0.7	3.8	36.5	0.8	4.3	30.5	0.8	4.9	25.7	0.9	5.5
85	179.0	0.5	1.3	125.2	0.6	1.8	92.2	0.6	2.3	72.0	0.6	2.8	57.9	0.7	3.3	47.1	0.7	3.8	38.8	0.8	4.3	32.4	0.8	4.9	27.3	0.9	5.5
90	189.6	0.5	1.3	132.6	0.6	1.8	97.6	0.6	2.3	76.3	0.6	2.8	61.3	0.7	3.3	49.9	0.7	3.8	41.1	0.8	4.3	34.3	0.8	4.9	28.9	0.9	5.5
95	200.1	0.5	1.3	139.9	0.6	1.8	103.0	0.6	2.3	80.5	0.6	2.8	64.7	0.7	3.3	52.6	0.7	3.8	43.4	0.8	4.3	36.2	0.8	4.9	30.5	0.9	5.5
100	210.6	0.5	1.3	147.3	0.6	1.8	108.5	0.6	2.3	84.8	0.6	2.8	68.1	0.7	3.3	55.4	0.7	3.8	45.7	0.8	4.3	38.1	0.8	4.9	32.1	0.9	5.5
105	221.1	0.5	1.3	154.6	0.6	1.8	113.9	0.6	2.3	89.0	0.6	2.8	71.5	0.7	3.3	58.2	0.7	3.8	47.9	0.8	4.3	40.0	0.8	4.9	33.7	0.9	5.5
110	231.7	0.5	1.3	162.0	0.6	1.8	119.3	0.6	2.3	93.2	0.6	2.8	74.9	0.7	3.3	60.9	0.7	3.8	50.2	0.8	4.3	41.9	0.8	4.9	35.3	0.9	5.5
115	242.2	0.5	1.3	169.4	0.6	1.8	124.7	0.6	2.3	97.5	0.6	2.8	78.3	0.7	3.3	63.7	0.7	3.8	52.5	0.8	4.3	43.8	0.8	4.9	36.9	0.9	5.5
120	252.7	0.5	1.3	176.7	0.6	1.8	130.2	0.6	2.3	101.7	0.6	2.8	81.7	0.7	3.3	66.5	0.7	3.8	54.8	0.8	4.3	45.7	0.8	4.9	38.5	0.9	5.5
125	263.3	0.5	1.3	184.1	0.6	1.8	135.6	0.6	2.3	106.0	0.6	2.8	85.1	0.7	3.3	69.3	0.7	3.8	57.1	0.8	4.3	47.6	0.8	4.9	40.1	0.9	5.5
130	273.8	0.5	1.3	191.5	0.6	1.8	141.0	0.6	2.3	110.2	0.6	2.8	88.5	0.7	3.3	72.0	0.7	3.8	59.4	0.8	4.3	49.5	0.8	4.9	41.7	0.9	5.5
135	284.3	0.5	1.3	198.8	0.6	1.8	146.4	0.6	2.3	114.4	0.6	2.8	91.9	0.7	3.3	74.8	0.7	3.8	61.6	0.8	4.3	51.4	0.8	4.9	43.3	0.9	5.5
140	294.9	0.6	1.3	206.2	0.6	1.8	151.8	0.6	2.3	118.7	0.6	2.8	95.3	0.7	3.3	77.6	0.7	3.8	63.9	0.8	4.3	53.3	0.8	4.9	44.9	0.9	5.5
145	305.4	0.5	1.3	213.6	0.6	1.8	157.3	0.6	2.3	122.9	0.6	2.8	98.7	0.7	3.3	80.3	0.7	3.8	66.2	0.8	4.3	55.2	0.8	4.9	46.5	0.9	5.5
150	315.9	0.5	1.3	220.9	0.6	1.8	162.7	0.6	2.3	127.1	0.6	2.8	102.1	0.7	3.3	83.1	0.7	3.8	68.5	0.8	4.3	57.1	0.8	4.9	48.1	0.9	5.5

RETARDANCE "D" AND "C"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second;
Depth "D" does not include allowance for freeboard or settlement.

Table DV-15 Parabolic Diversion Design Chart (Retardance "D" and "C", Grade 8.00%)

V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "C"

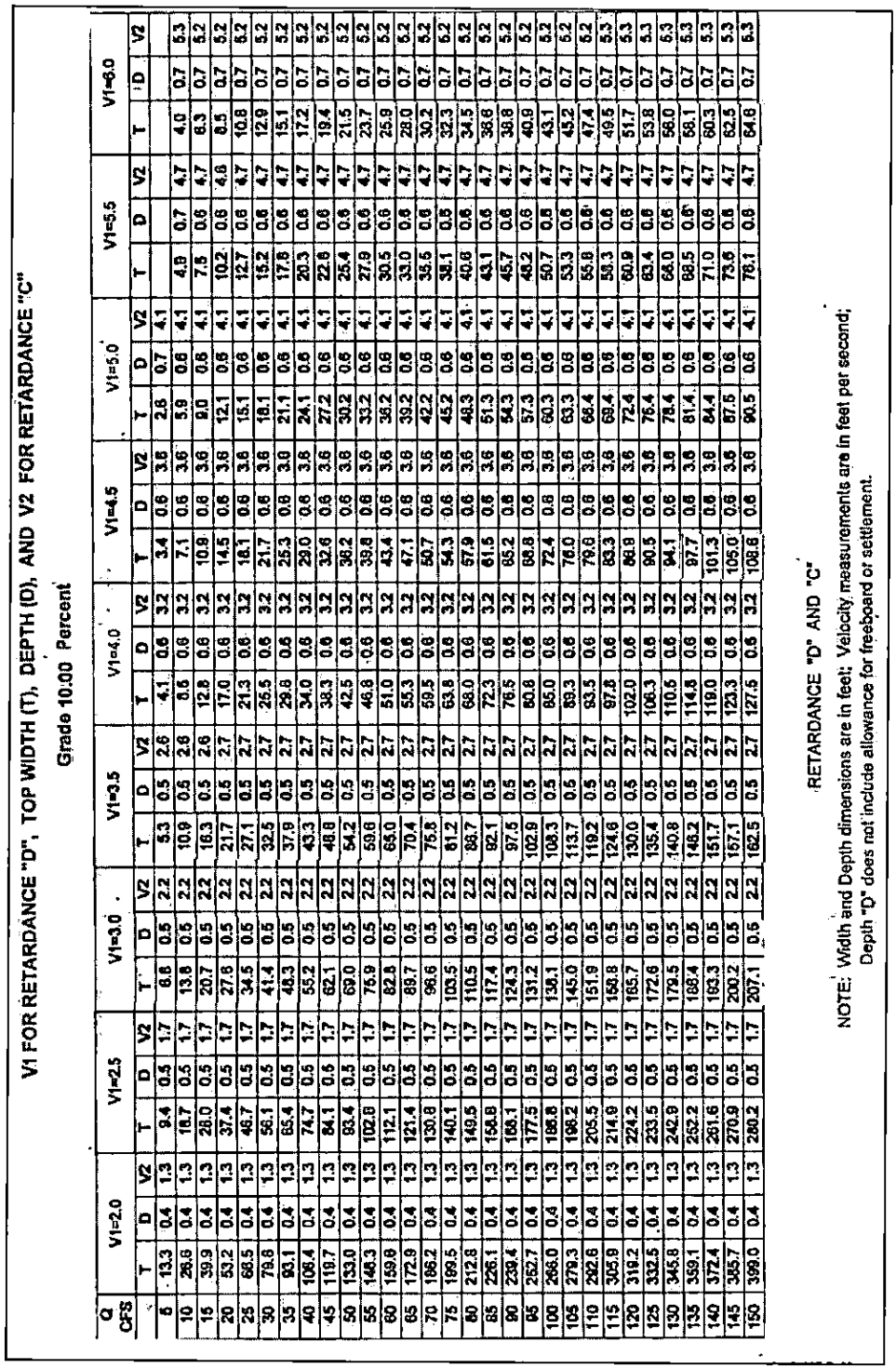
Grade 8.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	12.0	0.5	1.3	8.5	0.5	1.7	6.2	0.5	2.2	4.6	0.6	2.7	3.7	0.6	3.2	2.9	0.7	3.6									
10	24.1	0.5	1.3	16.9	0.5	1.7	12.6	0.5	2.2	9.6	0.6	2.7	7.8	0.6	3.2	6.3	0.6	3.7	5.1	0.7	4.2	4.2	0.8	4.8	3.2	0.9	5.3
15	36.1	0.5	1.3	25.3	0.5	1.7	18.9	0.5	2.2	14.4	0.6	2.7	11.8	0.6	3.2	9.7	0.6	3.7	7.9	0.7	4.2	6.5	0.7	4.8	5.4	0.8	5.3
20	48.1	0.5	1.3	33.8	0.5	1.7	25.2	0.5	2.2	19.2	0.6	2.7	15.8	0.6	3.2	12.9	0.6	3.7	10.7	0.7	4.2	8.8	0.7	4.8	7.4	0.8	5.3
25	60.1	0.5	1.3	42.2	0.5	1.7	31.5	0.5	2.2	24.0	0.6	2.7	19.7	0.6	3.2	16.2	0.6	3.7	13.4	0.7	4.2	11.2	0.7	4.7	9.3	0.8	5.3
30	72.1	0.5	1.3	50.6	0.5	1.7	37.8	0.5	2.2	28.8	0.6	2.7	23.6	0.6	3.2	19.4	0.6	3.7	16.1	0.7	4.2	13.5	0.7	4.8	11.3	0.7	5.3
35	84.1	0.5	1.3	59.1	0.5	1.7	44.1	0.5	2.2	33.6	0.6	2.7	27.6	0.6	3.2	22.6	0.6	3.7	18.7	0.7	4.2	15.7	0.7	4.8	13.3	0.7	5.3
40	96.2	0.5	1.3	67.5	0.5	1.7	50.4	0.5	2.2	38.4	0.6	2.7	31.5	0.6	3.2	25.8	0.6	3.7	21.4	0.7	4.2	17.9	0.7	4.8	15.2	0.7	5.3
45	108.2	0.5	1.3	76.0	0.5	1.7	56.7	0.5	2.2	43.2	0.6	2.7	35.4	0.6	3.2	29.0	0.6	3.7	24.1	0.7	4.2	20.2	0.7	4.8	17.1	0.7	5.3
50	120.2	0.5	1.3	84.4	0.5	1.7	63.0	0.5	2.2	48.0	0.6	2.7	39.4	0.6	3.2	32.3	0.6	3.7	26.8	0.7	4.2	22.4	0.7	4.8	19.0	0.7	5.3
55	132.2	0.5	1.3	92.8	0.5	1.7	69.3	0.5	2.2	52.8	0.6	2.7	43.3	0.6	3.2	35.5	0.6	3.7	29.4	0.7	4.2	24.7	0.7	4.8	20.9	0.7	5.3
60	144.2	0.5	1.3	101.3	0.5	1.7	75.6	0.5	2.2	57.6	0.6	2.7	47.2	0.6	3.2	38.7	0.6	3.7	32.1	0.7	4.2	26.9	0.7	4.8	22.8	0.7	5.3
65	156.3	0.5	1.3	109.7	0.5	1.7	81.8	0.5	2.2	62.4	0.6	2.7	51.2	0.6	3.2	41.9	0.6	3.7	34.8	0.7	4.2	29.1	0.7	4.8	24.7	0.7	5.3
70	168.3	0.5	1.3	118.2	0.5	1.7	88.1	0.5	2.2	67.2	0.6	2.7	55.1	0.6	3.2	45.2	0.6	3.7	37.5	0.7	4.2	31.4	0.7	4.8	26.6	0.7	5.3
75	180.3	0.5	1.3	126.6	0.5	1.7	94.4	0.5	2.2	72.0	0.6	2.7	59.0	0.6	3.2	48.4	0.6	3.7	40.1	0.7	4.2	33.6	0.7	4.8	28.5	0.7	5.3
80	192.3	0.5	1.3	135.0	0.5	1.7	100.7	0.5	2.2	76.8	0.6	2.7	63.0	0.6	3.2	51.6	0.6	3.7	42.8	0.7	4.2	35.9	0.7	4.8	30.3	0.7	5.3
85	204.3	0.5	1.3	143.5	0.5	1.7	107.0	0.5	2.2	81.6	0.6	2.7	66.9	0.6	3.2	54.9	0.6	3.7	45.5	0.7	4.2	38.1	0.7	4.8	32.2	0.7	5.3
90	216.4	0.5	1.3	151.9	0.5	1.7	113.3	0.5	2.2	86.4	0.6	2.7	70.8	0.6	3.2	58.1	0.6	3.7	48.1	0.7	4.2	40.3	0.7	4.8	34.1	0.7	5.3
95	228.4	0.5	1.3	160.3	0.5	1.7	119.6	0.5	2.2	91.2	0.6	2.7	74.8	0.6	3.2	61.3	0.6	3.7	50.8	0.7	4.2	42.6	0.7	4.8	36.0	0.7	5.3
100	240.4	0.5	1.3	168.8	0.5	1.7	125.9	0.5	2.2	96.0	0.6	2.7	78.7	0.6	3.2	64.5	0.6	3.7	53.5	0.7	4.2	44.8	0.7	4.8	37.9	0.7	5.3
105	252.4	0.5	1.3	177.2	0.5	1.7	132.2	0.5	2.2	100.8	0.6	2.7	82.6	0.6	3.2	67.8	0.6	3.7	56.2	0.7	4.2	47.1	0.7	4.8	39.8	0.7	5.3
110	264.4	0.5	1.3	185.7	0.5	1.7	138.5	0.5	2.2	105.6	0.6	2.7	86.6	0.6	3.2	71.0	0.6	3.7	58.8	0.7	4.2	49.3	0.7	4.8	41.7	0.7	5.3
115	276.5	0.5	1.3	194.1	0.5	1.7	144.8	0.5	2.2	110.4	0.6	2.7	90.5	0.6	3.2	74.2	0.6	3.7	61.5	0.7	4.2	51.6	0.7	4.8	43.6	0.7	5.3
120	288.5	0.5	1.3	202.6	0.5	1.7	151.1	0.5	2.2	115.2	0.6	2.7	94.4	0.6	3.2	77.4	0.6	3.7	64.2	0.7	4.2	53.8	0.7	4.8	45.5	0.7	5.3
125	300.5	0.5	1.3	211.0	0.5	1.7	157.4	0.5	2.2	120.0	0.6	2.7	98.4	0.6	3.2	80.7	0.6	3.7	66.9	0.7	4.2	56.0	0.7	4.8	47.4	0.7	5.3
130	312.5	0.5	1.3	219.4	0.5	1.7	163.7	0.5	2.2	124.8	0.6	2.7	102.3	0.6	3.2	83.9	0.6	3.7	69.5	0.7	4.2	58.3	0.7	4.8	49.3	0.7	5.3
135	324.5	0.5	1.3	227.9	0.5	1.7	170.0	0.5	2.2	129.6	0.6	2.7	106.2	0.6	3.2	87.1	0.6	3.7	72.2	0.7	4.2	60.5	0.7	4.8	51.2	0.7	5.3
140	336.6	0.5	1.3	236.3	0.5	1.7	176.3	0.5	2.2	134.4	0.6	2.7	110.2	0.6	3.2	90.3	0.6	3.7	74.9	0.7	4.2	62.7	0.7	4.8	53.1	0.7	5.3
145	348.6	0.5	1.3	244.7	0.5	1.7	182.6	0.5	2.2	139.2	0.6	2.7	114.1	0.6	3.2	93.6	0.6	3.7	77.6	0.7	4.2	65.0	0.7	4.8	55.0	0.7	5.3
150	360.6	0.5	1.3	253.2	0.5	1.7	188.9	0.5	2.2	144.0	0.6	2.7	118.0	0.6	3.2	96.8	0.6	3.7	80.2	0.7	4.2	67.2	0.7	4.8	56.9	0.7	5.3

RETARDANCE "D" AND "C"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second.
Depth "D" does not include allowance for freeboard or settlement

Table DV-16 Parabolic Diversion Design Chart (Retardance "D" and "C", Grade 10.00%)



V1 FOR RETARDANCE "D", TOP WIDTH (T), DEPTH (D), AND V2 FOR RETARDANCE "C"

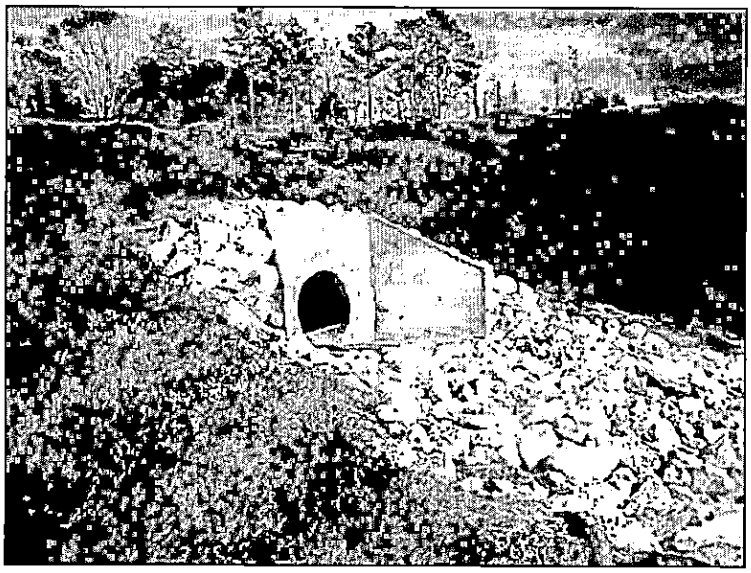
Grade 10.00 Percent

Q CFS	V1=2.0			V1=2.5			V1=3.0			V1=3.5			V1=4.0			V1=4.5			V1=5.0			V1=5.5			V1=6.0		
	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2	T	D	V2
5	13.3	0.4	1.3	9.4	0.5	1.7	6.6	0.5	2.2	5.3	0.5	2.6	4.1	0.6	3.2	3.4	0.6	3.6	2.8	0.7	4.1						
10	26.6	0.4	1.3	18.7	0.5	1.7	13.6	0.5	2.2	10.9	0.5	2.8	8.6	0.6	3.2	7.1	0.6	3.6	5.9	0.6	4.1	4.9	0.7	4.7	4.0	0.7	5.3
15	39.9	0.4	1.3	28.0	0.5	1.7	20.7	0.5	2.2	16.3	0.5	2.6	12.8	0.6	3.2	10.8	0.6	3.6	9.0	0.6	4.1	7.5	0.6	4.7	6.3	0.7	5.2
20	53.2	0.4	1.3	37.4	0.5	1.7	27.6	0.5	2.2	21.7	0.5	2.7	17.0	0.6	3.2	14.5	0.6	3.6	12.1	0.6	4.1	10.2	0.6	4.6	8.5	0.7	5.2
25	66.5	0.4	1.3	46.7	0.5	1.7	34.5	0.5	2.2	27.1	0.5	2.7	21.3	0.6	3.2	18.1	0.6	3.6	15.1	0.6	4.1	12.7	0.6	4.7	10.6	0.7	5.2
30	79.8	0.4	1.3	56.1	0.5	1.7	41.4	0.6	2.2	32.5	0.5	2.7	25.5	0.6	3.2	21.7	0.6	3.6	18.1	0.6	4.1	15.2	0.6	4.7	12.9	0.7	5.2
35	93.1	0.4	1.3	65.4	0.5	1.7	48.3	0.5	2.2	37.9	0.5	2.7	29.8	0.6	3.2	25.3	0.6	3.6	21.1	0.6	4.1	17.8	0.6	4.7	15.1	0.7	5.2
40	106.4	0.4	1.3	74.7	0.6	1.7	55.2	0.5	2.2	43.3	0.5	2.7	34.0	0.6	3.2	29.0	0.6	3.6	24.1	0.6	4.1	20.3	0.6	4.7	17.2	0.7	5.2
45	119.7	0.4	1.3	84.1	0.6	1.7	62.1	0.5	2.2	48.8	0.5	2.7	38.3	0.6	3.2	32.6	0.6	3.6	27.2	0.6	4.1	22.8	0.6	4.7	19.4	0.7	5.2
50	133.0	0.4	1.3	93.4	0.5	1.7	69.0	0.5	2.2	54.2	0.5	2.7	42.5	0.6	3.2	36.2	0.6	3.6	30.2	0.6	4.1	25.4	0.6	4.7	21.5	0.7	5.2
55	146.3	0.4	1.3	102.8	0.6	1.7	75.9	0.5	2.2	59.6	0.5	2.7	46.8	0.6	3.2	39.8	0.6	3.6	33.2	0.6	4.1	27.9	0.6	4.7	23.7	0.7	5.2
60	159.8	0.4	1.3	112.1	0.5	1.7	82.8	0.5	2.2	65.0	0.5	2.7	51.0	0.6	3.2	43.4	0.6	3.6	36.2	0.6	4.1	30.5	0.6	4.7	25.8	0.7	5.2
65	172.9	0.4	1.3	121.4	0.5	1.7	89.7	0.5	2.2	70.4	0.5	2.7	55.3	0.6	3.2	47.1	0.6	3.6	39.2	0.6	4.1	33.0	0.6	4.7	28.0	0.7	5.2
70	186.2	0.4	1.3	130.8	0.5	1.7	96.6	0.5	2.2	75.8	0.5	2.7	59.5	0.6	3.2	50.7	0.6	3.6	42.2	0.6	4.1	35.5	0.6	4.7	30.2	0.7	5.2
75	199.5	0.4	1.3	140.1	0.5	1.7	103.5	0.5	2.2	81.2	0.5	2.7	63.8	0.6	3.2	54.3	0.6	3.6	45.2	0.6	4.1	38.1	0.6	4.7	32.3	0.7	5.2
80	212.8	0.4	1.3	149.5	0.5	1.7	110.5	0.5	2.2	86.7	0.5	2.7	68.0	0.6	3.2	57.9	0.6	3.6	48.3	0.6	4.1	40.6	0.6	4.7	34.5	0.7	5.2
85	226.1	0.4	1.3	158.8	0.6	1.7	117.4	0.6	2.2	92.1	0.5	2.7	72.3	0.6	3.2	61.5	0.6	3.6	51.3	0.6	4.1	43.1	0.6	4.7	36.6	0.7	5.2
90	239.4	0.4	1.3	168.1	0.5	1.7	124.3	0.5	2.2	97.5	0.5	2.7	76.5	0.6	3.2	65.2	0.6	3.6	54.3	0.6	4.1	45.7	0.6	4.7	38.8	0.7	5.2
95	252.7	0.4	1.3	177.5	0.5	1.7	131.2	0.6	2.2	102.9	0.5	2.7	80.8	0.6	3.2	68.8	0.6	3.6	57.3	0.6	4.1	48.2	0.6	4.7	40.9	0.7	5.2
100	266.0	0.4	1.3	186.8	0.5	1.7	138.1	0.5	2.2	108.3	0.5	2.7	85.0	0.6	3.2	72.4	0.6	3.6	60.3	0.6	4.1	50.7	0.6	4.7	43.1	0.7	5.2
105	279.3	0.4	1.3	196.2	0.5	1.7	145.0	0.5	2.2	113.7	0.5	2.7	89.3	0.6	3.2	76.0	0.6	3.6	63.3	0.6	4.1	53.3	0.6	4.7	45.2	0.7	5.2
110	292.6	0.4	1.3	205.5	0.5	1.7	151.9	0.5	2.2	119.2	0.5	2.7	93.5	0.6	3.2	79.6	0.6	3.6	66.4	0.6	4.1	55.8	0.6	4.7	47.4	0.7	5.2
115	305.9	0.4	1.3	214.9	0.5	1.7	158.8	0.5	2.2	124.6	0.5	2.7	97.8	0.6	3.2	83.3	0.6	3.6	69.4	0.6	4.1	58.3	0.6	4.7	49.5	0.7	5.3
120	319.2	0.4	1.3	224.2	0.5	1.7	165.7	0.5	2.2	130.0	0.5	2.7	102.0	0.6	3.2	86.8	0.6	3.6	72.4	0.6	4.1	60.9	0.6	4.7	51.7	0.7	5.3
125	332.5	0.4	1.3	233.5	0.5	1.7	172.6	0.6	2.2	135.4	0.5	2.7	106.3	0.6	3.2	90.5	0.6	3.6	76.4	0.6	4.1	63.4	0.6	4.7	53.8	0.7	5.3
130	345.8	0.4	1.3	242.9	0.5	1.7	179.5	0.5	2.2	140.8	0.5	2.7	110.5	0.6	3.2	94.1	0.6	3.6	78.4	0.6	4.1	66.0	0.6	4.7	56.0	0.7	5.3
135	359.1	0.4	1.3	252.2	0.5	1.7	186.4	0.5	2.2	146.2	0.5	2.7	114.8	0.6	3.2	97.7	0.6	3.6	81.4	0.6	4.1	68.5	0.6	4.7	58.1	0.7	5.3
140	372.4	0.4	1.3	261.6	0.6	1.7	193.3	0.6	2.2	151.7	0.5	2.7	119.0	0.6	3.2	101.3	0.6	3.6	84.4	0.6	4.1	71.0	0.6	4.7	60.3	0.7	5.3
145	385.7	0.4	1.3	270.9	0.5	1.7	200.2	0.5	2.2	157.1	0.5	2.7	123.3	0.6	3.2	105.0	0.6	3.6	87.5	0.6	4.1	73.6	0.6	4.7	62.5	0.7	5.3
150	399.0	0.4	1.3	280.2	0.5	1.7	207.1	0.6	2.2	162.5	0.5	2.7	127.5	0.6	3.2	108.8	0.6	3.6	90.5	0.6	4.1	76.1	0.6	4.7	64.6	0.7	5.3

RETARDANCE "D" AND "C"

NOTE: Width and Depth dimensions are in feet; Velocity measurements are in feet per second;
Depth "D" does not include allowance for freeboard or settlement.

Outlet Protection (OP)



Practice Description

This practice is designed to prevent erosion at the outlet of a channel or conduit by reducing the velocity of flow and dissipating the energy. Outlet protection measures usually consist of a riprap-lined apron, a reinforced concrete flume with concrete baffles, a reinforced concrete box with chambers or baffles and possibly pre-manufactured products. This practice applies wherever high velocity discharge must be released on erodible material.

Planning Considerations

The outlets of pipes and structurally lined channels are points of critical erosion potential. Stormwater which is transported through man-made conveyance systems at design capacity generally reaches a velocity which exceeds the ability of the receiving channel or area to resist erosion. To prevent scour at stormwater outlets, a flow transition structure is required which will absorb the initial impact of the flow and reduce the flow velocity to a level which will not erode the receiving channel or area of discharge.

The most commonly used structure for outlet protection is an erosion resistant lined apron. These aprons are generally lined with loose rock riprap, grouted riprap or concrete. They are constructed at zero grade for a distance which is related to the outlet flow rate and the tailwater level. Criteria for designing these structures are contained in this practice. Several outlet conditions are shown in Figure OP-1. Example design problems for outlet protection are found at the end of this practice.

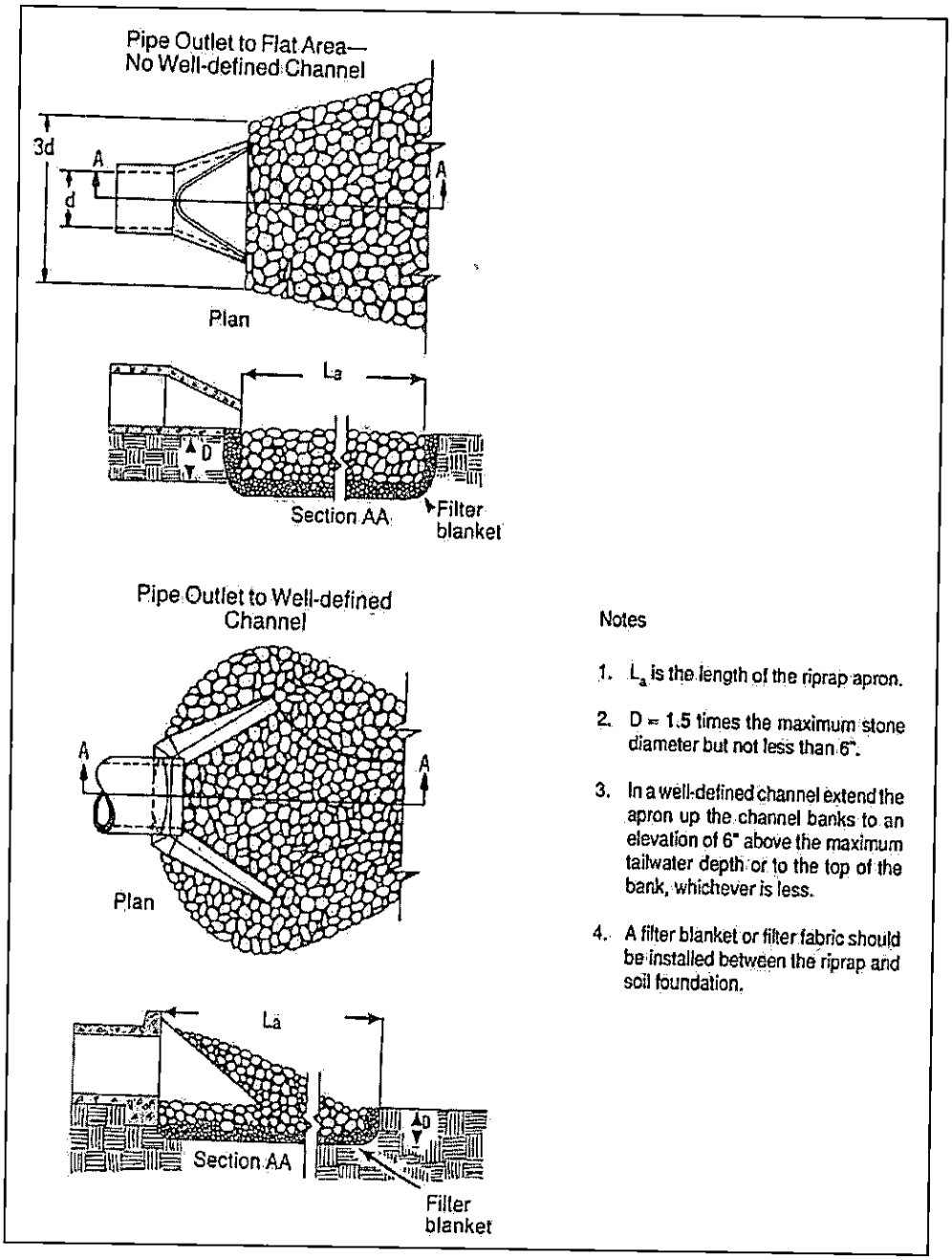


Figure OP-1 Pipe Outlet Conditions

Where the flow is excessive for the economical use of an apron, excavated stilling basins may be used. Acceptable designs for stilling basins may be found in the following documents available from the U. S. Government Printing Office.

1) Hydraulic Design of Energy Dissipaters for Culverts and Channels, Hydraulics Engineering Circular No.14, U. S. Department of Transportation, Federal Highway Administration.

2) Hydraulic Design of Stilling Basins and Energy Dissipaters, Engineering Monograph No.25 U. S. Department of Interior-Bureau of Reclamation.

Design Criteria

Structurally lined aprons at the outlets of pipes and paved channel sections should be designed according to the following criteria:

Pipe Outlets

Capacity

The structurally lined apron should have the capacity to carry the peak stormflow from the 25-year 24-hour frequency storm or the storm specified in state laws or local ordinances or the design discharge of the water conveyance structure, whichever is greatest.

Tailwater

The depth of tailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. Manning's Equation may be used to determine tailwater depth. Manning's Equation may be found in the practice Grass Swales. If the tailwater depth is less than half the diameter of the outlet pipe, it shall be classified as a Minimum Tailwater Condition. If the tailwater depth is greater than half the pipe diameter, it shall be classified as a Maximum Tailwater Condition. Pipes which outlet to flat areas, with no defined channel, may be assumed to have a Minimum Tailwater Condition.

Apron Length

The apron length should be determined from Figure OP-2 or OP-3 according to the tailwater condition.

Apron Thickness

The apron thickness should be determined by the maximum stone size (dmax), when the apron is lined with riprap. The maximum stone size shall be 1.5 x d_{50} (median stone size), as determined from Figure OP-2 or OP-3. The apron thickness shall be 1.5 x dmax.

When the apron is lined with concrete, the minimum thickness of the concrete shall be 4".

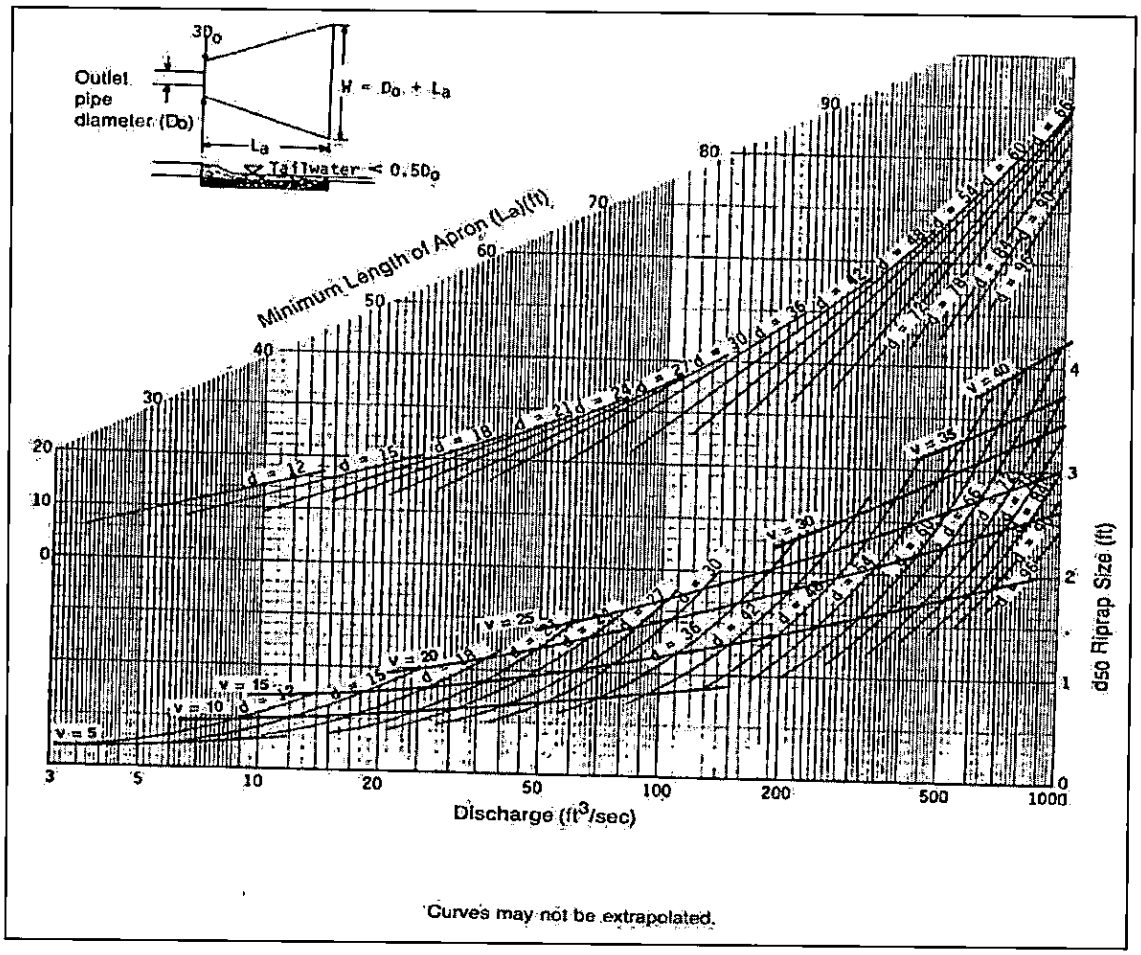


Figure OP-2 Outlet Protection Design for Tailwater < 0.5 Diameter

Apron Width

If the pipe discharges directly into a well-defined channel, the apron should extend across the channel bottom and up the channel banks to an elevation 1 foot above the maximum tailwater depth or to the top of the bank, whichever is the least.

If the pipe discharges onto a flat area with no defined channel, the width of the apron should be determined as follows:

- The upstream end of the apron, adjacent to the pipe, should have a width 3 times the diameter of the outlet pipe.
- For a Minimum Tailwater Condition, the downstream end of the apron should have a width equal to the pipe diameter plus the length of the apron obtained from the figures.
- For a Maximum Tailwater Condition, the downstream end shall have a width equal to the pipe diameter plus 0.4 times the length of the apron from Figures OP-2 or OP-3.

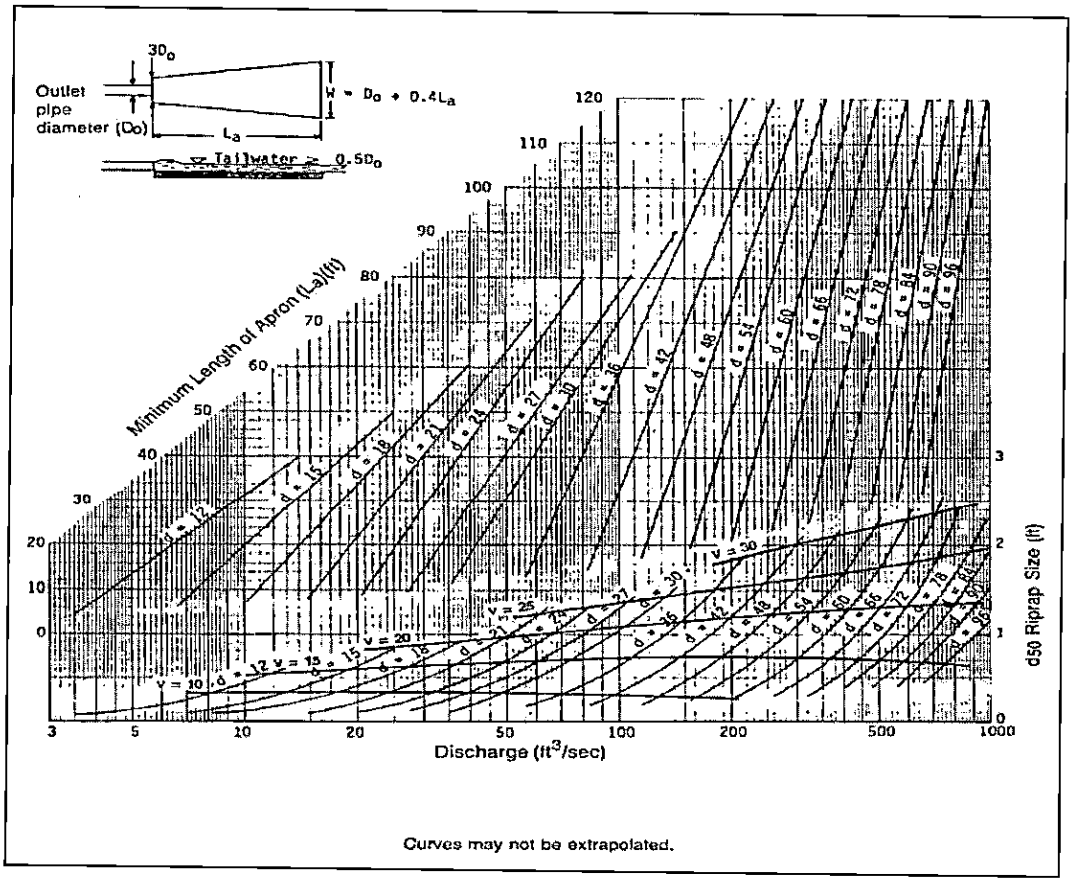


Figure OP-3 Outlet Protection Design for Tailwater ≥ 0.5 Diameter

Bottom Grade

The apron should be constructed with no slope along its length (0.0% grade). The invert elevation of the downstream end of the apron shall be equal to the elevation of the invert of the receiving channel. There shall be no overfall at the end of the apron.

Side Slope

If the pipe discharges into a well-defined channel, the side slopes of the channel should not be steeper than 2:1 (Horizontal:Vertical).

Alignment

The apron should be located so that there are no bends in the horizontal alignment.

Geotextile

When riprap is used to line the apron, non-woven geotextile should be used as a separator between the graded stone, the soil subgrade, and the abutments. Geotextile should be placed immediately adjacent to the subgrade without any voids between the fabric and the subgrade. The geotextile will prevent the migration of soil particles from the subgrade into the graded stone. The geotextile shall be of the strength and durability required for the project to ensure the aggregate and soil base are stable. Generally, the non-woven geotextile should meet the requirements found in AASHTO M288 for a Class 2 separation geotextile.

Materials

The apron may be lined with loose rock riprap, grouted riprap, or concrete. The median sized stone for riprap should be determined from the curves on Figure OP-2 and OP-3 according to the tailwater condition.

After the median stone size is determined, the gradation of rock to be used should be specified using Tables OP-2 and OP-3. Table OP-2 is used to determine the weight of the median stone size (d_{50}). Using this median weight, a gradation can be selected from Table OP-3, which shows the commercially available riprap gradations as classified by the Alabama Department of Transportation.

Stone for riprap should consist of field stone or rough unhewn quarry stone of approximately rectangular shape. The stone should be hard and angular and of such quality that it will not disintegrate on exposure to water or weathering and it shall be suitable in all other respects for the purpose intended. The specific gravity of the individual stones should be at least 2.5.

When the apron is lined with concrete, the concrete should have a minimum compressive strength at 28 days of 3000 pounds per square inch. American Concrete Institute guidelines should be used to design concrete structures and reinforcement. As a minimum, the concrete should be reinforced with steel welded wire fabric.

Table OP-2 Size of Riprap Stones

Weight	Mean Spherical Diameter (feet)	Rectangular Shape	
		Length	Width, Height (feet)
50	0.8	1.4	0.5
100	1.1	1.75	0.6
150	1.3	2.0	0.67
300	1.6	2.6	0.9
500	1.9	3.0	1.0
1000	2.2	3.7	1.25
1500	2.6	4.7	1.5
2000	2.75	5.4	1.8
4000	3.6	6.0	2.0
6000	4.0	6.9	2.3
8000	4.5	7.6	2.5
20000	6.1	10.0	3.3

Table OP-3 Graded Riprap

Class	Weight (lbs.)					
	d_{10}	d_{15}	d_{25}	d_{50}	d_{75}	d_{90}
1	10	-	-	50	-	100
2	10	-	-	80	-	200
3	-	25	-	200	-	500
4	-	-	50	500	1000	-
5	-	-	200	1000	-	2000

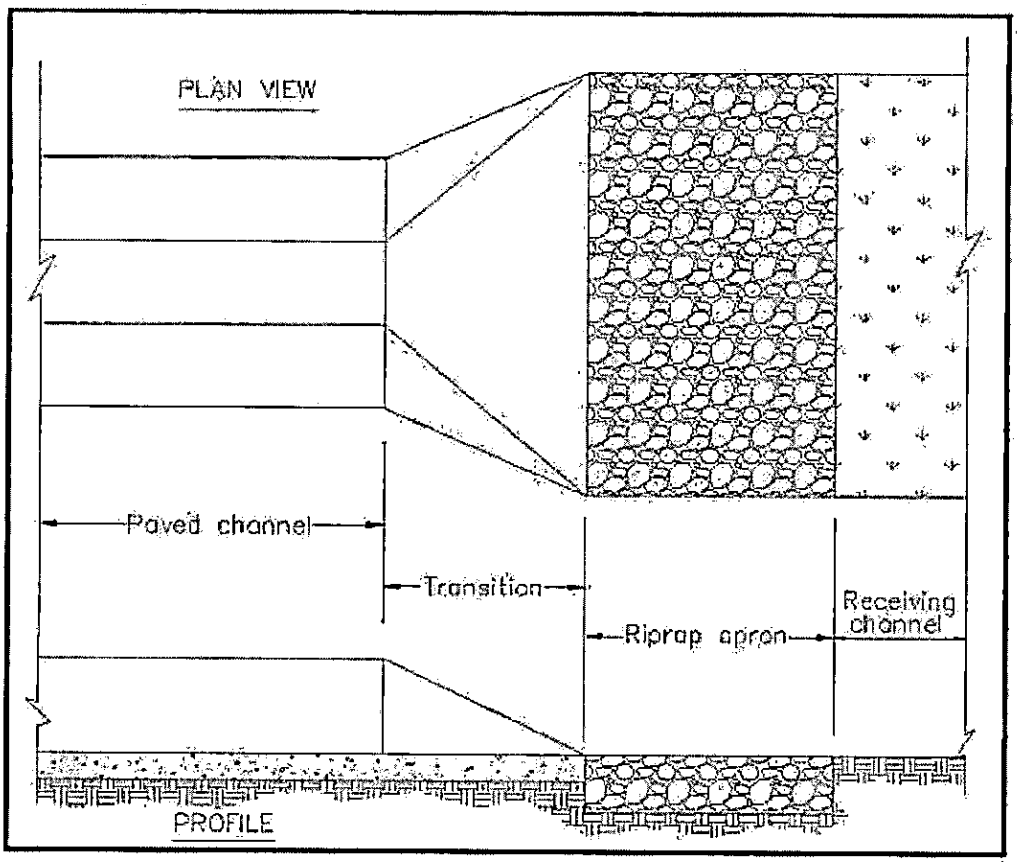


Figure OP-4 Paved Channel Outlet

1) The flow velocity at the outlet of paved channels flowing at design capacity should not exceed the velocity, which will cause erosion and instability in the receiving channel.

2) The end of the paved channel should merge smoothly with the receiving channel section. There should be no overfall at the end of the paved section. Where the bottom width of the paved channel is narrower than the bottom width of the receiving channel, a transition section should be provided. The maximum side divergence of the transition shall be 1 in 3F where

   F = v/gd, and
   F = Froude no.
   V = Velocity at beginning of transition (ft./sec.)
   d = Depth of flow at beginning of transition (feet.)
   g = 32.2 ft./sec.^{2}

3) Bends or curves in the horizontal alignment of the transition are not allowed unless the Froude no. (F) is 0.8 or less, or the section is specifically designed for turbulent flow.

Example Design Problems

Example 1

Given: An 18" pipe discharges 24 cu. ft/sec at design capacity onto a grassy slope (no defined channel).

Find: The required length, width and median stone size (d_{50}) for a riprap-lined apron.

Solution

Since the pipe discharges onto a grassy slope with no defined channel, a Minimum Tailwater Condition may be assumed.

From Figure OP-2, an apron length (La) of 20 feet and a median stone size (d_{50}) of 0.8 feet is determined.

The upstream apron width equals 3 times the pipe diameter: 3 x 1.5 feet = 4.5 feet.

The downstream apron width equals the apron length plus the pipe diameter: 20 feet + 1.5 feet = 21.5 feet.

Example 2

Given: The pipe in example No. 1 discharges into a channel with a triangular cross section, 2 feet deep and 2:1 side slopes. The channel has a 2% slope and an "n" coefficient of 0.045.

Find: The required length, width and the median stone size (d_{50}) for a riprap lining.

Solution

Determine the tailwater depth using Manning's Equation and the Continuity Equation.

$$Q = 1.49/n \; R^{2/3} S^{1/2} A$$

$$24 = 1.49/n \; [2d/4.47]^{2/3} (.02)^{1/2} (2d^2)$$

where, d = depth of tailwater
d = 1.74 feet. *

*Since d is greater than half the pipe diameter, a Maximum Tailwater Condition exists.

From Figure OP-3, a median stone size (d_{50}) of 0.5 feet. and an apron length (La) of 41 feet. is determined.

The entire channel cross section should be lined, since the maximum tailwater depth is within 1 foot of the top of the channel.

Floating Turbidity Barrier (FB)

Practice Description

A floating turbidity barrier consists of geotextile material (curtain) with floats on the top, weights on the bottom, and an anchorage system that minimizes sediment transport from a disturbed area that is adjacent to or within a body of water. The barrier provides sedimentation and turbidity protection for a watercourse from up-slope land disturbance activities where conventional erosion and sediment controls cannot be used or need supplemental sediment control, or from dredging or filling operations within a watercourse. The practice can be used in non-tidal and tidal watercourses where intrusion into the watercourse by construction activities has been permitted and subsequent sediment movement is unavoidable.

Planning Considerations

Soil loss into a watercourse results in long-term suspension of sediment. In time, the suspended sediment may travel long distances and affect widespread areas. A turbidity barrier is designed to deflect and contain sediment within a limited area and provide enough residence time so that soil particles will fall out of suspension and not travel to other areas.

Turbidity barrier types must be selected based on the flow conditions within the waterbody, whether it is a flowing channel, lake, pond, or a tidal watercourse. The specifications contained within this practice pertain to minimal and moderate flow conditions where the velocity of flow may reach 5 ft/sec (or a current of approximately 3 knots). For situations where there are greater flow velocities or

currents, a qualified design professional and product manufacturer should be consulted.

Consideration must also be given to the direction of water movement in channel flow situations. Turbidity barriers are not designed to act as water impoundment dams and cannot be expected to stop the flow of a significant volume of water. They are designed and installed to trap sediment, not to halt the movement of water itself. In most situations, turbidity barriers should not be installed across channel flows. There is an exception to this rule. This occurs when there is a danger of creating a sediment buildup in the middle of a watercourse, thereby blocking access or creating a sediment bar. Curtains have been used effectively in large areas of moving water by forming a very long-sided, sharp "V" to deflect clean water around a work site, confining a large part of the sediment-laden water to the work area inside the "V" and direct much of the sediment toward the shoreline. Care must be taken, however, not to install the curtain perpendicular to the water current.

In tidal or moving water conditions, provisions must be made to allow the volume of water contained within the barrier to change. Since the bottom of the barrier is weighted and external anchors are frequently added, the volume of water contained within the curtain will be much greater at high tide verses low tide and measures must be taken to prevent the curtain from submerging. In addition to allowing slack in the curtain to rise and fall, water must be allowed to flow through the curtain if the curtain is to remain in roughly the same place and maintain the same shape. Normally, this is achieved by constructing part of the curtain from a heavy woven filter fabric. The fabric allows the water to pass through the curtain, but retains the sediment particles. Consideration should be given to the volume of water that must pass through the fabric and sediment particle size when specifying fabric permeability.

Sediment, which has been deflected and settled out by the curtain, may be removed if so directed by the on-site inspector or the permitting agency. However, consideration must be given to the probable outcome of the procedure, which may create more of a sediment problem by resuspension of particles and by accidental dumping of the material by the equipment involved. It is, therefore, recommended that the soil particles trapped by a turbidity curtain only be removed if there has been a significant change in the original contours of the affected area in the watercourse. Regardless of the decision made, soil particles should always be allowed to settle for a minimum of 6-12 hours before removal by equipment or before removal of a turbidity curtain.

It is imperative that all measures in the erosion control plan be used to keep sediment out of the watercourse. However, when proximity to the watercourse makes successfully mitigating sediment loss impossible, the use of the turbidity curtain during land disturbance is essential. Under no circumstances should permitted land disturbing activities create violations of water quality standards.

Design Criteria

Floating turbidity barriers are normally classified into 3 types:

- Type I (see Figure FB-1) is used in protected areas where there is no current and the area is sheltered from wind and waves.
- Type II (see Figure FB-1) is used in areas where there may be small to moderate current (up to 2 knots or 3.5 ft/sec) and/or wind and wave action can affect the curtain.
- Type III (see Figure FB-2) is used in areas where considerable current (up to 3 knots or 5 ft/sec) may be present, where tidal action may be present, and/or where the curtain is potentially subject to wind and wave action.

Turbidity curtains should extend the entire depth of the watercourse whenever the watercourse in question is not subject to tidal action and/or significant wind and wave forces. This prevents sediment-laden water from escaping under the barrier, scouring and resuspending additional sediments.

In tidal and/or wind and wave action situations, the curtain should never be so long as to touch the bottom. A minimum 1-foot gap should exist between the weighted, lower end of the skirt and the bottom at "mean" low water. Movement of the lower skirt over the bottom due to tidal reverses or wind and wave action on the flotation system may fan and stir sediments already settled out.

In tidal and/or wind and wave action situations, it is seldom practical to extend a turbidity curtain depth lower than 10 to 12 feet below the surface, even in deep water. Curtains which are installed deeper than this will be subjected to very large loads with consequent strain on curtain materials and the mooring system. In addition, a curtain installed in such a manner can "billow up" toward the surface under the pressure of the moving water, which will result in an effective depth which is significantly less than the skirt depth.

Turbidity curtains should be located parallel to the direction of flow of a moving body of water. Turbidity curtains should not be placed across the main flow of a significant body of moving water.

When sizing the length of the floating curtain, allow an additional 10-20% variance in the straight-line measurements. This will allow for measuring errors, make installing easier and reduce stress from potential wave action during high winds.

An attempt should be made to avoid an excessive number of joints in the curtain. A minimum continuous span of 50 feet between joints is a good "rule of thumb."

For stability reasons, a maximum span of 100 feet between anchor or stake locations is also a good rule to follow.

The ends of the curtain, both floating upper and weighted lower, should extend well up onto the shoreline, especially if high water conditions are expected. The

ends should be secured firmly to the shoreline to fully enclose the area where sediment may enter the water.

When there is a specific need to extend the curtain to the bottom of the watercourse in tidal or moving water conditions, a heavy woven pervious filter fabric may be substituted for the normally recommended impervious geotextile. This creates a "flow-through" medium, which significantly reduces the pressure on the curtain and will help to keep it in the same relative location and shape during the rise and fall of tidal waters.

Typical installation layouts of turbidity curtains can be seen in Figure FB-3. The number and spacing of external anchors will vary depending on current velocities and potential wind and wave action. Manufacturer's recommendations should be followed.

In navigable waters, additional permits may be required from the Corps of Engineers or other regulatory agencies if the barrier creates an obstruction to navigation.

Materials and Installation Requirements

Barriers should be a bright color (yellow or "international" orange) that will attract the attention of nearby boaters. The curtain fabric must meet the minimum requirements noted in Table FB-1.

Seams in the fabric should be either vulcanized welded or sewn, and should develop the full strength of the fabric.

Flotation devices should be flexible, buoyant units contained in an individual flotation sleeve or collar attached to the curtain. Buoyancy provided by the flotation units should be sufficient to support the weight of the curtain and maintain a freeboard of at least 3" above the water surface level.

Load lines must be fabricated into the bottom of all floating turbidity curtains. Type II and Type III curtains must have load lines also fabricated into the top of the fabric. The top load line should consist of woven webbing or vinyl-sheathed steel cable and should have break strength in excess of 10,000 pounds (5 t). The supplemental (bottom) load line should consist of a chain incorporated into the bottom hem of the curtain of sufficient weight to serve as ballast to hold the curtain in a vertical position. Additional anchorage should be provided as necessary. The load lines should have suitable connecting devices which develop the full breaking strength for connecting to load lines in adjacent sections (See Figures FB-1 and FB-2 which portray this orientation)

Table FB-1 Curtain Fabric Material Requirements for Floating Turbidity Barriers

Characteristic Test Method	16 Oz Nominal Laminated	18 Oz Laminated	22 Oz Coated	Geotextile Filter
Construction	Vinyl Laminate On 1300 Denier 9 X 9 Scrim	Vinyl Laminate On1300 Denier 9 X 9 Scrim	Vinyl Coated On Woven 6 Oz Polyester Base	Woven Polypropylene
Weight Astm D-751-95 Sec 16	Nominal 16 Oz/Sq Yd 376 Gr/Sq M	18 Oz/Sq Yd 423 Gr/Sq M	22 Oz/Sq Yd 517 Gr/Sq M	7.5 Oz/Sq Yd 176 Gr/Sq M
Adhesion Astm D-751-95 Sec 43.1.2	15 Lb/In 14 Dan/5 Cm	15 Lb/In 14 Dan/5 Cm	14 Lb/In 13 Dan/5 Cm	Not Applicable
Tensile Strength Astm D-751-95 Sec 12	324 X 271 Lb/In 308 X 258 Dan/5 Cm	397 X 373 Lb/In 378 X 363 Dan/5 Cm	500 X 400 Lb/In 476 X 389 Dan / 5 Cm	350 X 250 Lb/ In 333 X 230 Dan / 5 Cm
Tear Strength Astm D-751-95 Sec 29	76 X 104 Lb/In 72 X 99 Dan/5 Cm	96 X 86 Lb/In 91 X 82 Dan/5 CM	132 X 143 Lb/In 126 X 136 Dan / 5 Cm	95 X 55 Lb/In 90 X 52 Dan / 5 Cm
Hydrostatic Astm D-751-95 Sec 34.2	385 Lb/Sq In 2674 Kpa	385 Lb/Sq In 674 Kpa	881 Lb/Sq In 6118 Kpa	Not Applicable

External anchors may consist of 2" x 4" or 2½" minimum diameter wooden stakes, or 1.33 pounds/linear foot steel posts when Type I installation is used. When Type II or Type III installations are used, bottom anchors should be used.

Bottom anchors must be sufficient to hold the curtain in the same position relative to the bottom of the watercourse without interfering with the action of the curtain. The anchor may dig into the bottom (grappling hook, plow or fluke-type) or may be weighted (mushroom type) and should be attached to a floating anchor buoy via an anchor line. The anchor line would then run from the buoy to the top load line of the curtain. When used with Type III installations, these lines must contain enough slack to allow the buoy and curtain to float freely with tidal changes without pulling the buoy or curtain down and must be checked regularly to make sure they do not become entangled with debris. As previously noted, anchor spacing will vary with current velocity and expected wind and wave action. Manufacturer's recommendations should be followed. See orientation of external anchors and anchor buoys for tidal installation in Figure FB-2.

Installing 2 parallel curtains, separated at regular intervals by 10 feet long wooden boards or lengths of pipe can increase the effectiveness of the barrier.

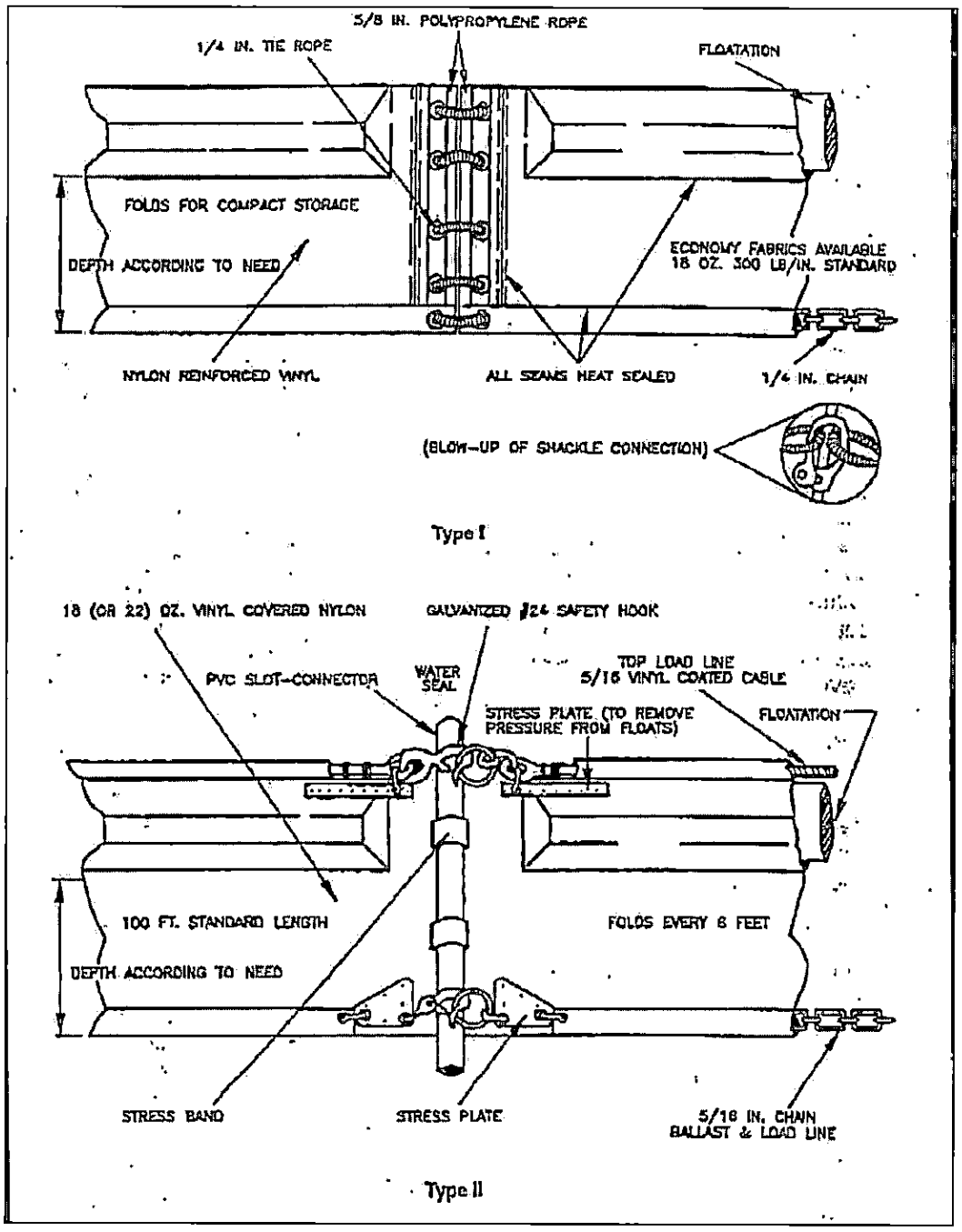


Figure FB-1 Type I and II Floating Turbidity Barriers
(Source: American Boom and Barrier Corp. product literature)

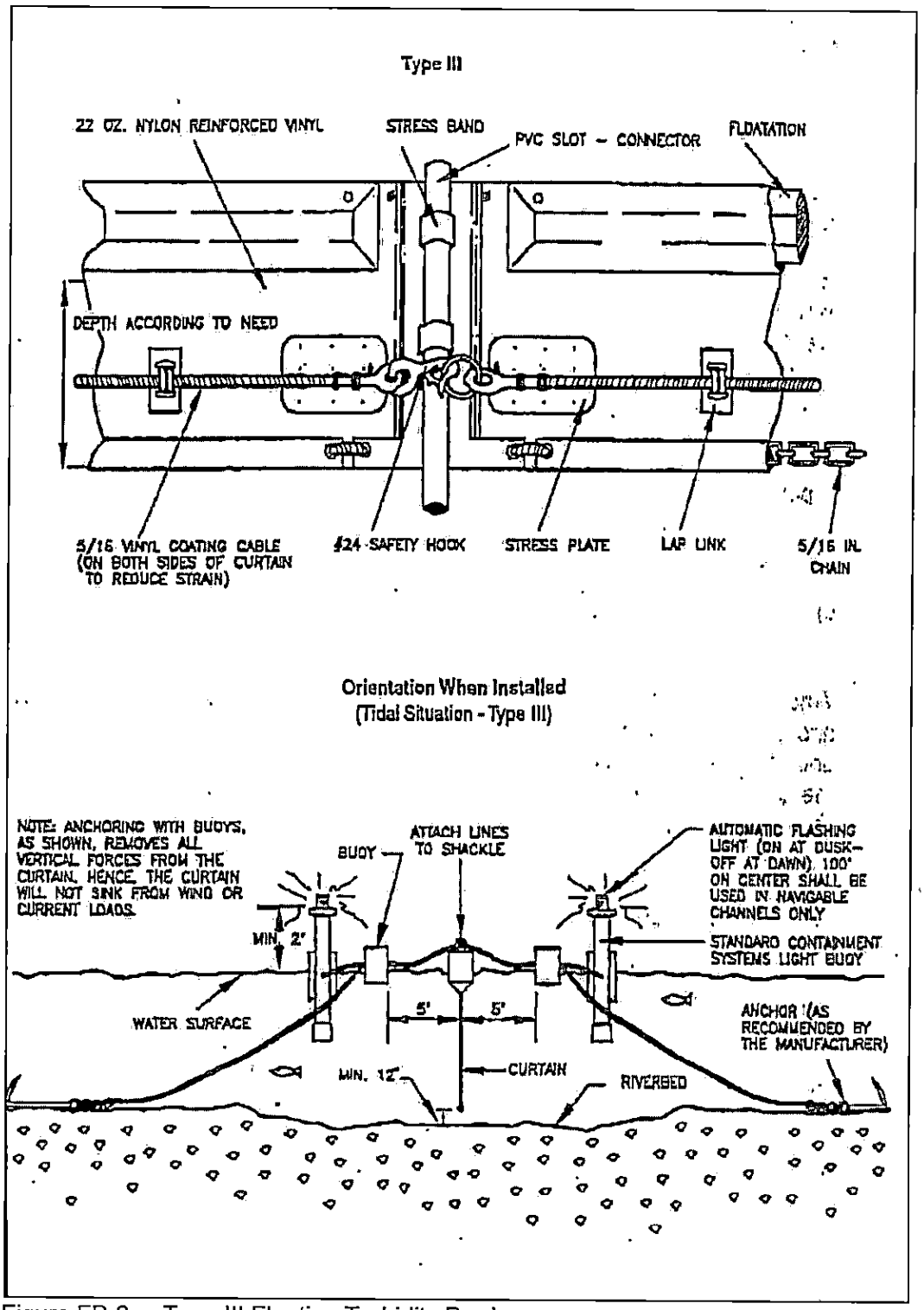


Figure FB-2 Type III Floating Turbidity Barrier
(Source: American Boom and Barrier Corp. product literature)

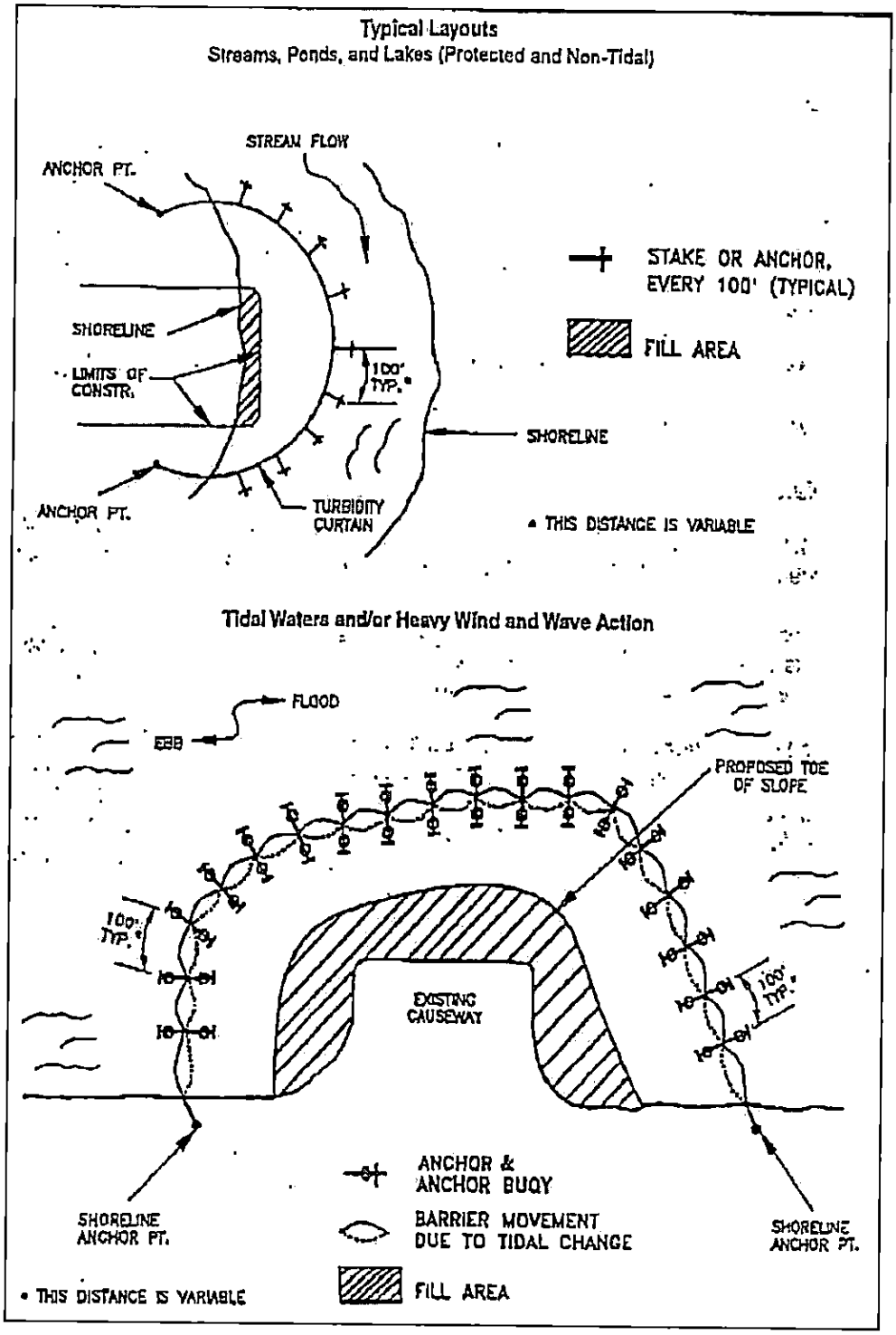
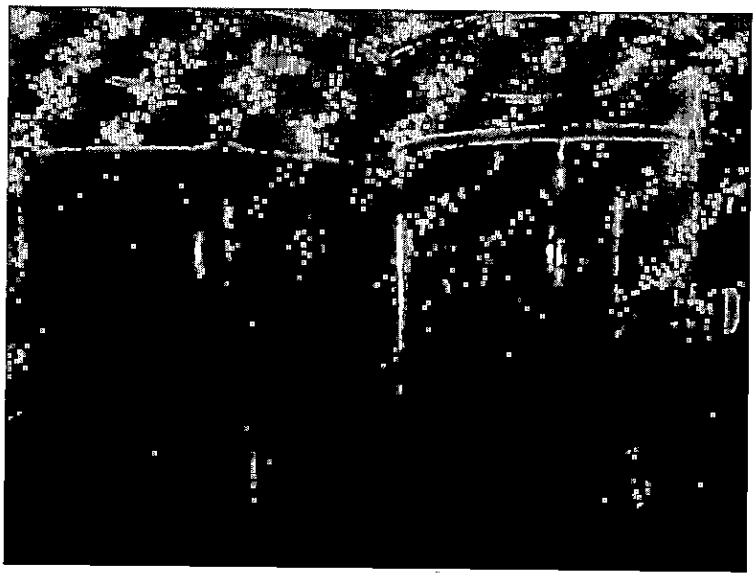


Figure FB-3 Typical Installation Layouts
(Source Florida Department of Transportation Road and Design Specifications)

Flocculant (FL)



Practice Description

Flocculation is the chemical process of causing small, suspended soil particles to be drawn together to form "flocs". These flocs more readily settle out compared to the individual particles due to their relatively greater mass. Products that cause flocculation of suspended soil particles (Flocculants) are often used to help polish, or minimize turbidity of stormwater runoff from construction sites. These products may contain both manufactured and natural polymers.

Planning Considerations

Products containing polyacrylamide (PAM) are commonly used in construction. PAM is a term describing a wide variety of chemicals based on the acrylamide unit. Products containing chitosan have also shown to be effective in reducing turbidity in stormwater runoff and are also commonly used in the US. Chitosan is a naturally occurring polymer.

When properly applied at the recommended rates, flocculants can be used as polishing agents to remove sediments from turbid runoff water on a construction site. If conventional erosion and sediment control are not being properly implemented to the fullest extent, flocculants will have little or no effect on the quality of the runoff from a construction site. Most flocculant products are available in emulsions, powders, gel bars, logs, tablets, and socks.

When including flocculant as a treatment option on a project, the following items must be addressed:

- Some state regulatory agencies do not allow the use of flocculants for turbidity management. Flocculants are allowed in Alabama.
- Flocculant products should be tested for ecotoxicity and proven to not be toxic if used in accordance with the manufacturer's recommended application rates.
- Material Safety Data Sheets (MSDS) should be stored and available onsite.
- Areas where flocculant is applied must drain to a sediment basin or other BMP that promotes settling for final flocculation prior to discharging from the site.
- Adequate mixing is necessary for flocculant to be fully effective. Passive treatment using the turbulent flow of water in a channel or at the outlet of a pipe as the mixing method is encouraged.
- Adequate time and laminar flow (calm flow) or ponding is necessary to promote effective and efficient flocculation.
- Flocculant must be reapplied as it becomes bound with sediment particles with each rain event or other new flow.
- Flocculants that are water soluble dissolve slowly and may require considerable agitation and time to dissolve.
- Soil tests, such as the "jar test", are required to ensure that the flocculant is properly matched with the anticipated soils suspended in the runoff.
- Manufacturer's application or dosage rates and application instructions should be followed closely based on specific site conditions and soils.

Design Criteria

Flocculants mixed with water after heavy sediment loads and particles have been removed can greatly reduce turbidity and suspended solids concentrations. Flocculants are commonly used to passively treat construction stormwater runoff in a conveyance, within sediment basins, or with other sediment traps, barriers or other practices. Flocculants may also be used in conjunction with erosion control practices and products to better manage raindrop and rill erosion. Flocculant is also used as a part of active treatment systems. It is critical that precautions are taken to minimize the potential for over application of flocculant or the release of flocs into receiving waters.

The following basic guidelines, at a minimum, should be followed when specifying or using flocculant:

1. Completely understand any regulatory requirements concerning the use of flocculants.
2. Choose the appropriate flocculant for the soil type.
3. Choose flocculants deemed non-toxic based on toxicity reports related to the planned use.
4. Adhere to manufacturer recommendations and MSDS for specification and application.

5. Use flocculants in conjunction with other appropriate BMPs. Pretreatment to remove heavy loads and larger particles should take place in advance of flocculant introduction when possible.
6. Do not apply flocculants directly to streams, wetlands, or other waters of the state.
7. Provide provisions for capturing flocs prior to their entering receiving waters.
8. Use of multiple types of flocculants in the same watershed should be avoided. Without a full understanding of the chemical interactions of each flocculant there is a possibility the two flocculants could interact with each other, reducing the overall effectiveness.
9. Dry form (powder) may be applied by hand spreader or mechanical spreader. Mixing with dry silica sand will aid in spreading. Pre-mixing of dry form flocculants into fertilizer, seed or other soil amendments is allowable.
10. Solid forms of flocculant shall be applied following site testing results to ensure proper placement and performance and shall meet or exceed state and federal water quality requirements. Logs, blocks, and tablets must be installed up gradient from the sediment capture BMP. Solid forms of flocculant should be protected from the sun and remain hydrated if possible.
11. Some flocculants involve a two-component system and generally are provided in the form of "socks." Manufacturer recommendations for installation and matching the components should be followed closely.

Materials and Installation Requirements

One of the key factors in making a flocculant work is to ensure that it is dissolved and thoroughly mixed with the runoff water, which can be accomplished in several ways. Introducing the flocculant to the runoff at a point of high velocity will help to provide the turbulence and mixing needed to maximize the suspended sediment exposure to the flocculant. Examples include a storm drain junction box where a pipe is dropping water, inside a slope drain, or other areas of falling or fast-moving water upslope from a sediment capture BMP.

Another option for introducing flocculant into runoff involves running the water over a solid form of flocculant. Powders can be sprinkled on various practices such as check dams and materials, such as jute, coir, or other geotextiles. When wet, flocculants could become very sticky, and bind to the geotextile fabric. The product binds to the material, and resists removal by flowing water rendering it ineffective for turbidity control.

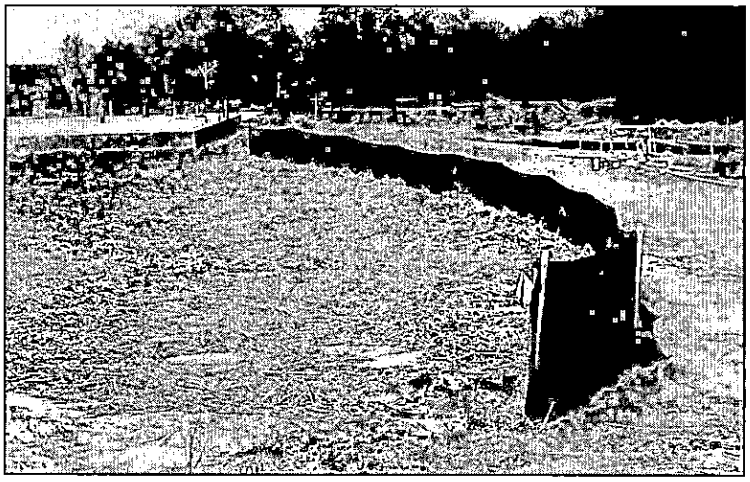
Flocculant logs are designed to be placed in flowing water to dissolve the flocculant from the log somewhat proportionately to flow. While using these solid forms does not have the same challenges as liquid forms, they do have drawbacks. The amount of flocculant released is not adjustable and is generally unknown, so the user should adjust the system by moving or adding logs to get the desired effect. Because flocculant blocks can be sticky when wet, it can accumulate

materials from the runoff and become coated, releasing little flocculant. The solid forms also tend to harden when allowed to dry. This causes less flocculant to be released initially during the next storm until the log becomes moist again.

To avoid these problems, the user must do two things to ensure flocculant releases from the solid form:

- Reduce sediment load in the runoff upstream of the flocculant location. This avoids burying the flocculant under accumulated sediment.
- Create constant flow across or onto the solid flocculant. The flow will help dissolve and mix the flocculant as well as prevent suspended solids from sticking to the product.

Sediment Barrier (SB)



Practice Description

A sediment barrier is a temporary structure used across a landscape mostly on the contour to reduce the quantity of sediment that is moving downslope. The most commonly used barrier is a silt fence (a geotextile fabric that is trenched into the ground and attached to supporting posts and possibly reinforced with a wire fence or polypropylene netting). Other barrier materials could include sand bags, wattles, and various man-made materials and devices that can be used in a similar manner as a silt fence.

This practice applies where sheet and rill erosion occurs on small disturbed areas. Barriers intercept runoff from upslope to form ponds that temporarily store runoff and allow sediment to settle out of the water and remain on the construction site.

Planning Considerations

Sediment barriers may be used on developing sites. It is important that they be installed on the contour so that flow will not concentrate and cause overtopping due to lack of storage capacity. It is also important that the ends of sediment barriers are turned upslope to prevent runoff from bypass around the ends of the barrier. Prevention of scouring, erosion, and undermining at and under sediment barriers is also of upmost importance to ensure maximum impoundment capabilities.

The most commonly used sediment barriers are silt fences and manufactured sediment logs (often referred to as wattles or sediment retention fiber rolls). Manufactured sediment logs should be installed according to manufacturer's recommendations.

The success of silt fences depends on a proper installation (on the contour with each end turned up slope) that causes the fence to develop maximum efficiency of sediment trapping. Silt fences should be carefully installed to meet the intended purpose. Silt fences are effective at trapping coarse sediment but do not effectively reduce turbidity as water passes through the geotextile fabric.

A silt fence is specifically designed to retain sediment transported by sheet flow from disturbed areas, while allowing water to pass through the fence. Water flow through the silt fence often decreases over time as silts and trash "blind" or seal the geotextile fabric. Silt fences should be installed to be stable under the flows expected from the site. Generally, silt fences should not be installed across streams, ditches, waterways, or other concentrated flow areas. When properly designed and installed, silt fence can be used as a Check Dam (See Check Dam).

Silt fences are composed of geotextile (i.e., woven and non-woven) supported between steel or wooden posts. Silt fences are commercially available with geotextile attached to the post and can be rolled out and installed by driving the post into the ground. This type of silt fence is simple to install, but more expensive than some other installations. Silt fences must be trenched in at the bottom to prevent runoff from undermining the fence and developing rills under the fence. Locations with high runoff flows or velocities should use either a wire or polypropylene net reinforcement. In addition, decreasing the spacing between support posts will improve the structural integrity of the silt fence in these areas.

Design professionals should consider specifying an "off-set" trench installation. This involves a conventional 6 in. x 6 in. trench to bury the geotextile with the posts and wire installed 6 in. downslope of the trench. The wire is on top of the ground surface and not in a trench. This installation has proven to have less potential for undermining than any installation tested at the Auburn University Erosion and Sediment Control Test Facility.

A rather recent innovation that is still being tested and refined is referred to as a "sediment retention barrier with flocculant." It is used to introduce flocculant to turbid runoff causing flocculation. A sediment retention barrier should only be used in conjunction with effective erosion and sediment control practices upstream that have removed sediment and turbidity as much as possible without chemical additive. The measure consists of a double row of netting on the contour that allows runoff to easily pass through. Material such as jute is secured to the ground between the rows of netting and adjacent to the downslope row. Loose straw is placed between the rows (see Figure SB-1). An approved flocculant powder is added at a designed rate to all the jute and in layers within the straw. The measure is located upstream of sediment control (sediment basin, sediment trap, or sediment barrier) which will pond, allow for flocs to settle, and capture flocs prior to runoff leaving the site. Design professionals should get details needed to design this measure from a research professional or a qualified industry representative.

Figure SB-1 Sediment Retention Barrier

Design Criteria (for silt fence)

Silt fence installations are normally limited to situations in which only sheet or overland flow is expected because the practice cannot pass the volumes of water generated by channelized flows. Silt fences are normally constructed of synthetic fabric (geotextile) and the life is expected to be the duration of most construction projects. Silt fence geotextile should conform to the property requirements found in AASHTO M288 shown in Table SB-1 as follows:

Table SB-1 Silt Fence Geotextile Fabric Requirements per AASHTO M288

Requirement	Test Methods	Units	Type A supported fence	Type B unsupported fence
Grab Strength	ASTM			
Machine Direction	D4632/D4632M	N	400	550
X-Machine Direction			400	450
Permittivity	ASTM D4491	sec^{-1}	0.05	0.05
Apparent Opening Size	ASTM D4751	mm	0.60 max avg roll value	0.60 max avg roll value
Ultraviolet stability (retained strength)	ASTM D4355/4355M	%	70% after 500 h of exposure	70% after 500 h of exposure

Note: ALDOT has an approved products list for geotextile

The drainage area behind the silt fence should not exceed ¼ acre per 100 linear feet of silt fence for non-reinforced fence and ½ acre per 100 feet of reinforced silt fence. When all runoff from the drainage area is to be stored behind the fence (i.e. there is no stormwater disposal system in place) the maximum slope length behind the fence should not exceed those shown in Table SB-2.

Table SB-2 Slope Limitations for Silt Fence

Land Slope (Percent)	Maximum Slope Length Above Fence (Feet)
<2	100
2 to 5	75
5 to 10	50
10 to 20*	25
>20	15

*In areas where the slope is greater than 10%, a flat area length of 10 feet between the toe of the slope to the fence should be provided.

Type A Silt Fence

Type A fence shall be a minimum of 24" and not more than 32" above ground with wire reinforcements and is used on sites needing the highest degree of protection by a silt fence. The wire reinforcement is necessary because this type of silt fence is used for the highest flow situations and has almost 3 times the flow rate as Type B silt fence. Wire fence should be made of 14-gauge wire with 6 in. x 6 in. openings (Note: ALDOT wire spacing may differ). Type A silt fence should be used where runoff flows or velocities are particularly high or where slopes exceed a vertical height of 10 feet. Staked tie backs on each end of a Type A silt fence may be necessary to prevent overturning. Tie backs should also be used at points of possible concentration and overtopping if site conditions do not allow for the silt fence to be installed on the contour.

Provide a riprap splash pad with a geotextile underlay or other outlet protection device for any point where flow may overtop the silt fence.

The silt fence should be installed as shown in Figure SB-2. Maximum post spacing is 10 ft. In situations where runoff flows parallel with the silt fence when in perimeter control applications, 10 ft. spacing is adequate. J-hooks should also be considered for long parallel flow scenarios to slow flow velocity and create areas of impoundments, thereby reducing scour potential under the silt fence. For the portion of the silt fence that creates the J-hook impoundment area, the post spacing should be reduced to 5 ft. to support the hydrostatic loads. For all installations that intercept flow perpendicularly to the slope causing a concentrated impoundment, the maximum post spacing should be reduced to 5 ft. Materials for posts, post size, and fasteners are shown in Tables SB-3 and SB-4. Do not use "light weight" steel posts commonly found at building supply stores. Details for overlap of Type A silt fence is available from The Alabama Department of Transportation construction drawings.

Geotextile silt fence material should be looped over each post and the top of the wire to prevent sagging. A "hog ring" attachment should be made each 2 feet along the top of the wire.

Table SB-3 Post Size for Silt Fence

	Minimum Length	Type of Post	Size of Post
Type A	5'	Steel "T" Post	1.25 lb./ft. min.
Type B	4'	Soft Wood Oak Steel	3" diameter or 2X4 1.5" X 1.5" 1.25 lb./ft. min.

Table SB-4 Wood Post Fasteners for Silt Fence

	Gauge	Crown	Legs	Staples/Post
Wire Staples	17 min.	¾" wide	½" long	5 min.
	Gauge	**Length**	**Button Heads**	**Nail/Post**
Nails	14 min.	1"	¾" long	4 min.

Type B Silt Fence

This 36" wide geotextile fabric should be used on developments where the life of the project is short (6 months or less) and there is less need for protection from a silt fence.

The silt fence should be installed as shown in Figure SB-3. Post spacing is either 4 ft. or 6 ft. based on geotextile elongation % (see note on Figure SB-3). Materials for posts and fasteners are shown in Tables SB-3 and SB-4. Details for overlap of the silt fence and fastener placement are shown in Figure SB-4.

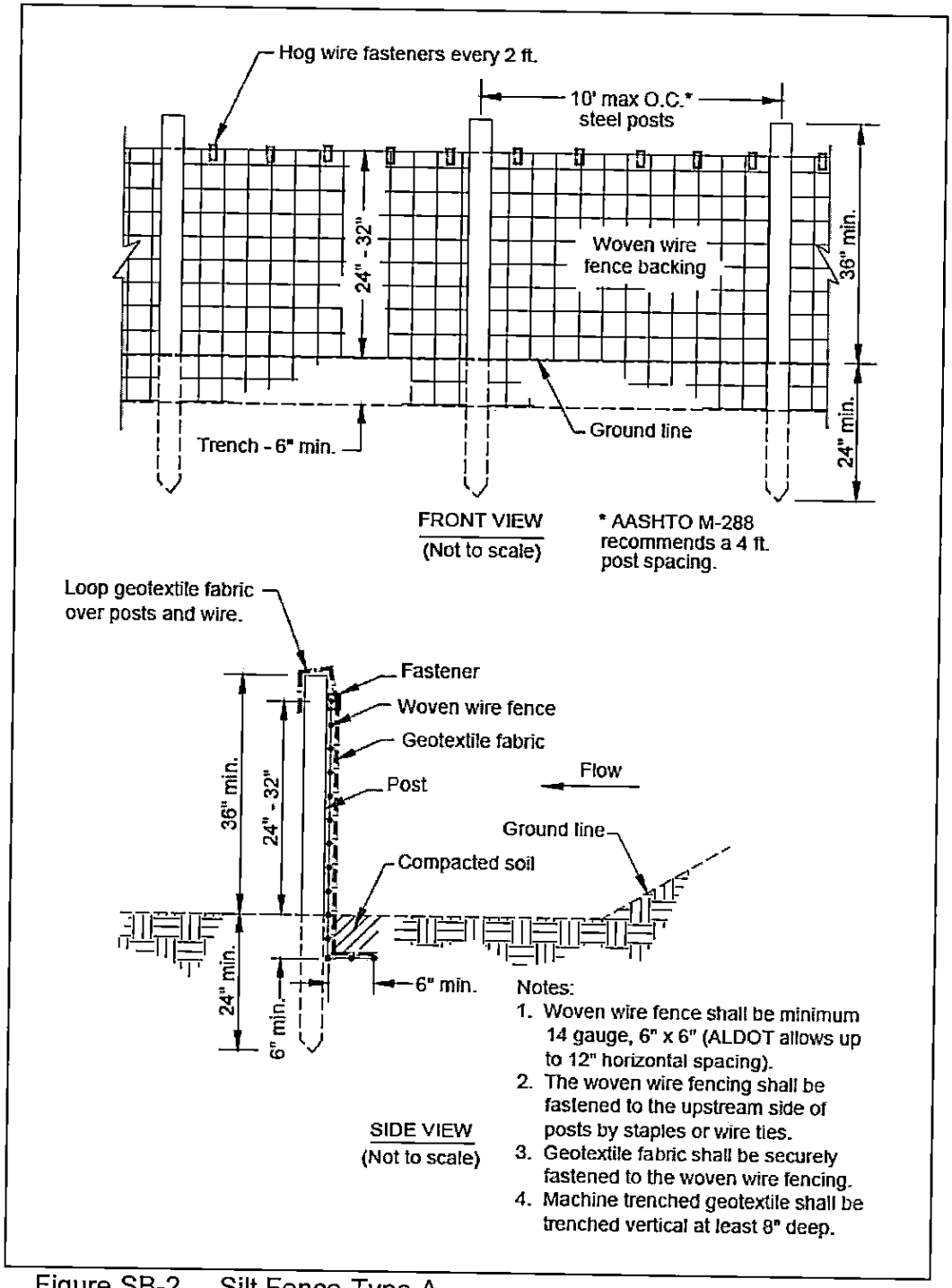


Figure SB-2 Silt Fence-Type A
(For post material requirements see Tables SB-3 and SB-4)

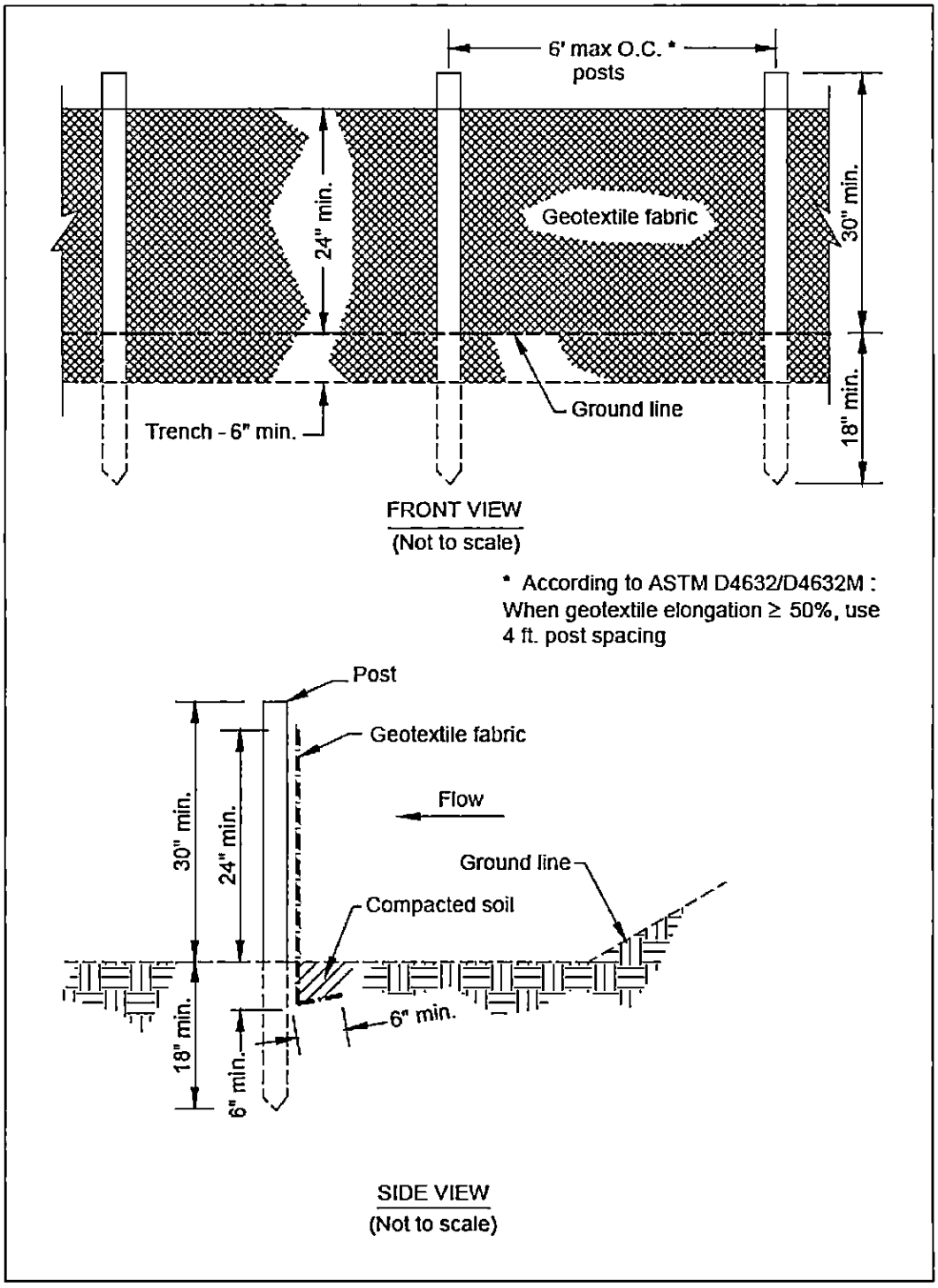
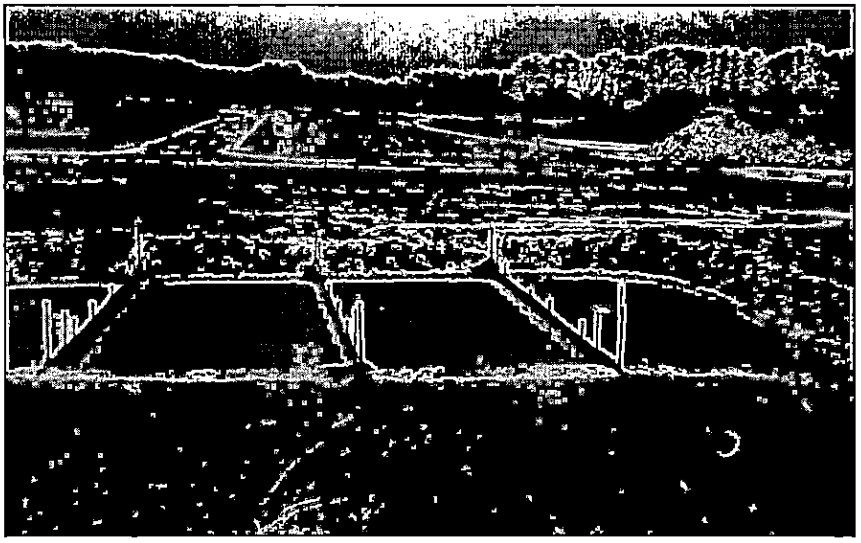


Figure SB-3 Silt Fence - Type B

(1) For post material requirements see Tables SB-3 and SB-4

Sediment Basin (SBN)



Practice Description

An earthen embankment suitably located to capture runoff, with an auxiliary spillway lined to prevent spillway erosion, interior porous baffles to reduce turbulence and evenly distribute flows, and equipped with a floating skimmer or other approved surface dewatering device that removes water from the top of the basin. Flocculants are commonly used with a sediment basin to reduce turbidity and increase trapping efficiency.

Planning Considerations

Sediment basins are needed where drainage areas are too large for other sediment control practices.

Select locations for basins during initial site evaluation. Locate basin so that sudden failure should not cause loss of life or serious property damage. Install sediment basins before any site grading takes place within the drainage area.

Select sediment basin sites to capture sediment from all areas that are not treated adequately by other sediment control measures. Always consider access for cleanout and disposal of the trapped sediment. Locations where a pond can be formed by constructing a low dam across a natural swale are generally preferred to sites that require excavation. Where practical, divert sediment-free runoff away

from the basin. Ensure the slopes of the basin are stabilized to prevent erosion by vegetating or using a non-woven geotextile.

Because the auxiliary spillway is used relatively frequently, it is generally stabilized using geotextile and riprap that can withstand the expected flows and velocities without causing erosion. The spillway should be placed as far from the inlet of the basin as possible to maximize sedimentation before discharge. The spillway should be in natural ground (not over the embankment) to the greatest extent possible.

The use of approved flocculants properly introduced into the turbid runoff water should be considered to help polish the discharge from the basin for meeting turbidity requirements. Flocculant is best introduced upstream of the basin in a turbulent flow area.

A forebay or sump area prior to the basin should be considered for capture of heavier soil particles. Forebays also provide a more localized area for removing captured sediment and can extend maintenance cycles for the basin.

Sediment Basin technology can be retrofitted on Stormwater Detention Basins during the construction phase of a project.

Inlet Structure

Turbid runoff should be directed to an inlet structure that conveys the runoff into the basin without causing erosion of the basin itself. The inlet structure must be positioned so that flows enter the basin from the opposite side of the discharge outlet.

Baffles

Porous baffles should be installed perpendicular between the inlet and outlet of the basin to effectively spread the flow across the entire width of a sediment basin and cause increased deposition within the basin. Water flows through the baffle material, but is slowed sufficiently to impound flow, causing it to spread across the entire width of the baffle (Figure SBN-1). Spreading the flow in this manner uses the full cross section of the basin and reduces turbulence, which shortens the time required for sediment to be deposited.

The installation should be similar to a sediment barrier (silt fence) (Figure SBN-2) using posts and wire backing. The most effective material for a baffle is two layers of 700 - 900 g/m^2 coir erosion blanket (Figure SBN-3). Other materials proven by research to be equivalent in this application may be used. A support wire or rope across the top will help prevent excessive sagging if the material is attached to it with appropriate ties. Another option is to use a sawhorse type of support with the legs stabilized with rebar inserted into the basin floor. These structures work well and can be prefabricated off site and quickly installed.

Baffles need to be installed correctly to fully provide their benefits. Refer to Figure SBN-2 and the following key points:

- The baffle material needs to be secured at the bottom and sides by using staples or stakes, trenching, or securing horizontally to the bottom. Flow should not be allowed under, over, or around the baffle. The height of the baffle should be the full depth of the basin, including the freeboard depth and depth of flow over the auxiliary spillway.
- Most of the sediment will accumulate in the first bay, so this should be readily accessible for maintenance.

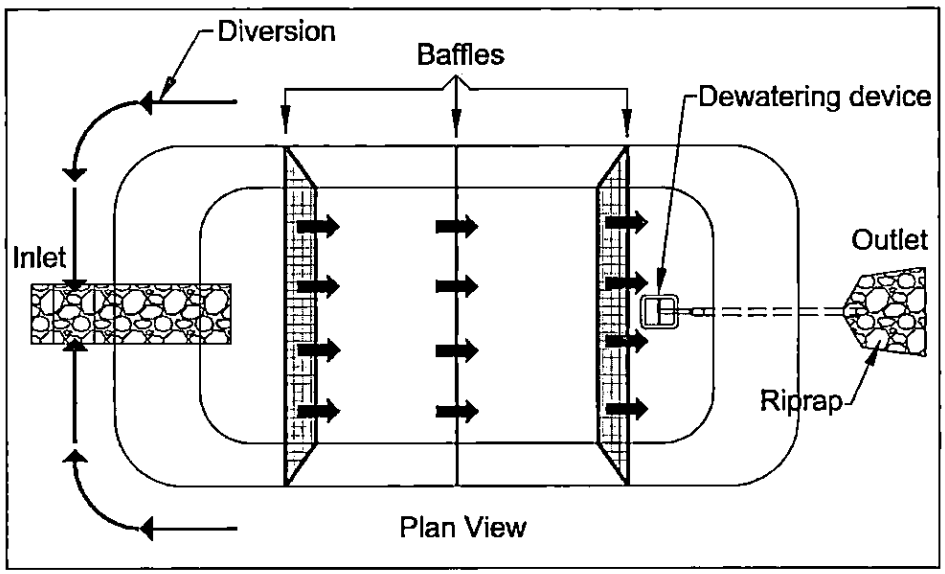


Figure SBN-1 Porous baffles in a sediment basin
(from North Carolina Erosion and Sediment Control Planning and Design Manual.)

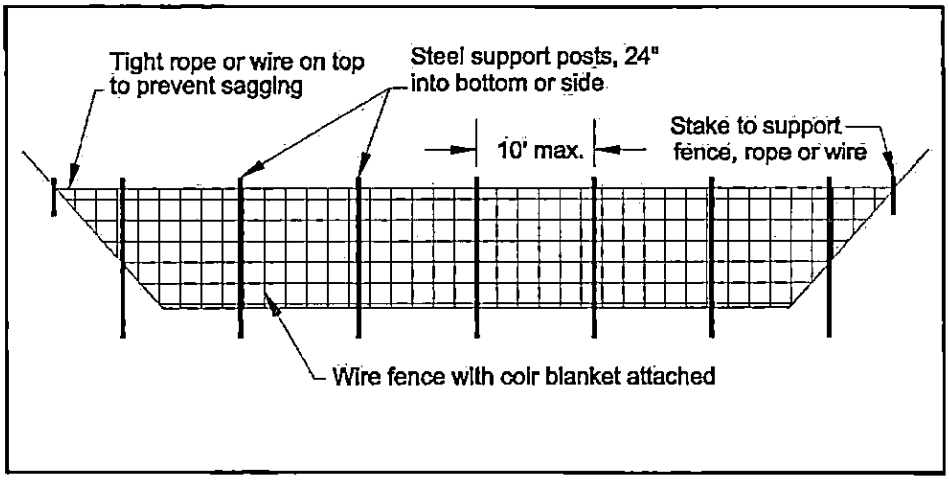


Figure SBN-2: Cross-section of a porous baffle in a sediment basin
Note there is no weir because the water flows through the baffle material
(from North Carolina Erosion and Sediment Control Planning and Design Manual.)

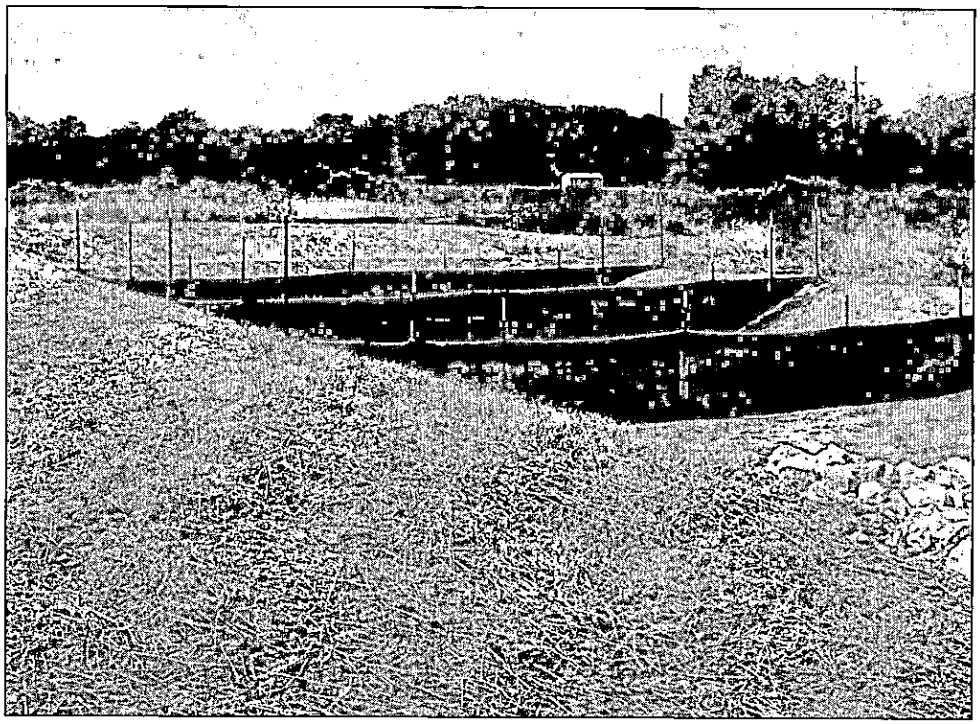


Figure SBN-3: Example of porous baffle made of 700 g/m^2 coir erosion blanket as viewed from the inlet

Basin Dewatering

Sediment basins should be dewatered from the surface. A device often used for this is a skimmer that withdraws water from the basin's water surface, thus removing the highest quality water for delivery to the uncontrolled environment. One type of skimmer is shown in Figure SBN-4. By properly sizing the skimmer's control orifice, the skimmer can be made to dewater a design hydrologic event in a prescribed period.

An advantage of the skimmer is that it can be reused on future projects. Skimmers are generally maintenance free, but may require occasional maintenance to remove debris from the orifice.

All basin dewatering devices must dewater the basin from the top of the water surface. The rate of dewatering must be controlled. A dewatering time of 48 to 120 hours (2 to 5 days) is required for the basin to function properly.

If turbidity requirements are unattainable, the designer may want to consider adding a valve to the outlet of the discharge pipe to contain turbid runoff. This provides additional settling time and may allow the captured water to be actively treated with flocculant prior to discharge, if deemed necessary. However, if the treated water is not timely discharged, the basin storage volume will not be available for subsequent rainfall events occurring on site that result in additional runoff.

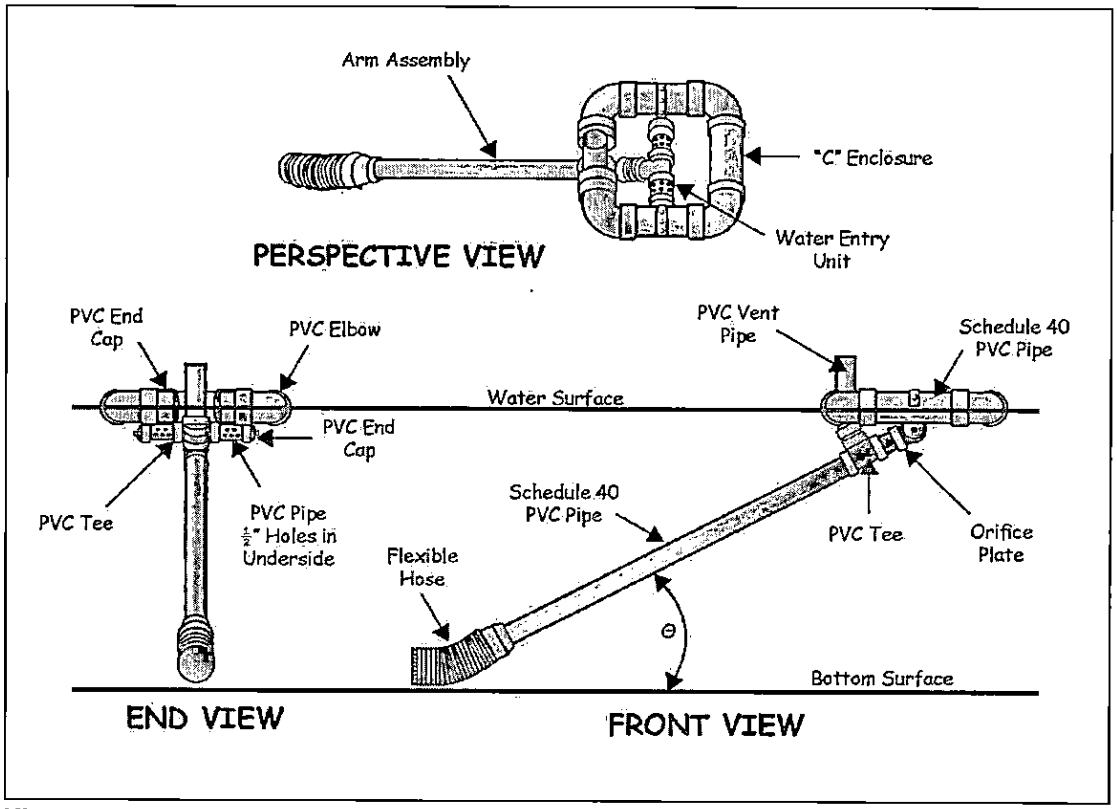


Figure SBN-4: Schematic of a skimmer
(from Pennsylvania Erosion and Sediment Pollution Control Manual, March, 2000)

Design Criteria

Summary:	**Temporary Sediment Trap**
Auxiliary Spillway:	Trapezoidal open channel spillway with non-erosive lining. 10 – year, 24 – hour rainfall event
Recommended Maximum Drainage Area:	10 acres
Minimum Volume:	3,600 cubic feet per acre of drainage area
Minimum L/W Ratio:	2:1
Minimum Depth:	2 feet
Dewatering Mechanism:	Skimmer(s) or other approved basin dewatering device.
Dewatering Time:	2 – 5 days
Baffles Required:	3

Compliance with Laws and Regulations

Design and construction should comply with state and local laws, ordinances, rules and regulations.

Design Basin Life

Structures intended for more than 3 years of use should be designed as permanent structures. Procedures outlined in this section do not apply to permanent structures.

Dam Height

To ensure public safety, the maximum dam height should be 10 feet, measured from the designed (settled) top elevation of the dam to the lowest point at the downstream toe.

Drainage Area

To minimize risk to the public and environment, the maximum drainage area for each sediment basin should be minimized. Diverting water from undisturbed areas can reduce the size of the basin. The recommended maximum drainage area is 10 acres.

Basin Locations

Select areas that:

- Are not intermittent or perennial streams
- Allow a maximum amount of construction runoff to be brought into the structure
- Provide capacity for storage of sediment from as much of the planned disturbed area as practical
- Exclude runoff from undisturbed areas where practical
- Provide access for sediment removal throughout the life of the project
- Interfere minimally with construction activities

Basin Shape

Ensure that the flow length to basin width ratio is 2:1 or larger to improve trapping efficiency. Length is measured at the elevation associated with the minimum storage volume. Generally, the bottom of the basin should be level to ensure the baffles function properly. The area between the inlet and first baffle can be designed with reverse grade to improve the trapping efficiency.

Research has shown that the surface area of the basin should be maximized to improve trapping efficiency. Results of tests show that a surface area of 325 sq. ft. per cubic feet per second of discharge associated with the peak discharge for the 10-year, 24-hour event, is needed for effective trapping efficiency. Designers should check to see if this surface area is possible on the site.

Storage Volume

Ensure that the sediment storage volume of the basin is at least 3,600 cubic feet per acre for the area draining into the basin. Volume is measured below the crest of the auxiliary spillway crest. Remove sediment from the basin when approximately one-half of the sediment storage volume has been filled.

Runoff in excess of 1 inch per acre from the drainage basin will not be contained in the 3,600 cubic feet per acre requirement. More storage volume may be needed for local conditions or requirements. Adding dead storage may be necessary on some sites in order to retain a portion of the runoff within the basin.

Baffles

Space the baffles to create equal zones of volume within the basin.

The top of the baffle should be the same elevation as the maximum water depth flowing through the auxiliary spillway. Baffles are most effective at a height of 3 feet; however, site conditions may warrant taller baffles.

Baffles should be designed to go up the sides of the basin banks so water does not flow around the baffles. Most of the sediment will be captured in the first bay. Smaller particle size sediments are captured in the latter bays.

The design life of the baffle fabric can be up to 3 years, but may need to be replaced more often if damaged or clogged.

Spillway Capacity

The auxiliary spillway system must carry the peak runoff from the 10-year 24-hour storm with a minimum 1 foot of freeboard (distance between the surface of the water with the spillway flowing full and the top of the embankment). Base runoff computations on the most severe soil cover conditions expected in the drainage area during the effective life of the structure.

Sediment Cleanout Elevation

Determine the elevation at which the invert of the basin would be half-full. This elevation should also be marked in the field with a permanent stake set at this ground elevation (not the top of the stake).

Basin Dewatering

The basin should be provided with a surface outlet. A floating skimmer should be attached to a Schedule 40 PVC barrel pipe of the same diameter as the skimmer arm. The skimmer apparatus will control the rate of dewatering. The skimmer should be sized to dewater the basin in 48-120 hours (2-5 days). The barrel pipe should be located under the embankment with at least one anti-seep collar at the center of the embankment projecting a minimum of 1.5 ft. in all directions from the pipe. A drainage diaphragm can be used in lieu of an anti-seep collar. The barrel pipe outlet must be stable and not cause erosion.

Skimmer Orifice Diameter

Skimmer Selection Procedure

The manufacturer's skimmer performance charts are recommended for use in selecting skimmers for use in dewatering sediment control basins. Always verify performance with the manufacturer's information.

Required input data:
Basin volume = _____ ft^3
Desired dewatering time = _____ days

Procedure:
1. First use the basin volume (ft^3) and the desired dewatering time (days) and determine the required skimmer outflow rate in cubic feet per day (ft^3/d) from the following equation

$$Q = \frac{V}{t_d}$$

2. Scan the manufacturer's skimmer performance charts and select the (a) skimmer size and (b) the skimmer orifice diameter (in inches) if desired.

Example: Select a skimmer that will dewater a 20,000 ft^3 sediment basin in 3 days.

Solution: First compute the required outflow rate as

$$Q = \frac{V}{t_d} = \frac{20000 ft^3}{3d} = 6670 ft^3 / d$$

Now go to the manufacturer's selection charts and select an appropriate skimmer. For example, a 2-inch skimmer with no orifice could have an outflow rate of 5,429 ft^3/d, which will require about 3.5 days to dewater the basin. A 4-inch skimmer with a 2.5-inch diameter orifice could have an outflow rate of 8,181 ft^3/d and dewater the basin in about 2.5 days.

Example: A More Precise Alternative: Most skimmers come with a plastic plug that can be drilled forming a hole that will limit the skimmer's outflow to any desired rate. Thus, for a specific skimmer the orifice that will dewater a basin in a more precisely chosen time can be determined. The flow through an orifice can be computed as

$$Q = CA\sqrt{2gH}$$

where C is the orifice coefficient (usually taken to be 0.6), A is the orifice cross-sectional area in ft^2, g is the acceleration of gravity (32.2 ft./sec^2), and H is the driving head on the orifice center in feet. The orifice equation can be simplified to yield the orifice flow in gpm using the diameter D (in inches) and the head in feet as

$$Q = 12D^2\sqrt{H}\ .$$

Or the orifice flow in ft^3/d using the diameter D (in inches) and the head in feet as

$$Q = 2310D^2\sqrt{H}\ .$$

If we solve the orifice equation for the orifice diameter using the desired outflow rate (6670 ft^3/d) and the head driving water through the skimmer (0.333 ft. for a 4-inch skimmer) as

$$D = \sqrt{\frac{Q}{2310\sqrt{H}}} = \sqrt{\frac{6670}{2310\sqrt{0.333}}} = 2.24 inches$$

We see that if the plastic plug were drilled to a diameter of 2.24 inches and placed in a 4-inch skimmer, the dewater rate would be 6,670 ft^3/d and the 20,000 ft^3 basin would dewater in 3 days.

Outlet Protection

Provide outlet protection to ensure erosion does not occur at the pipe outlet.

Basin Auxiliary Spillway

The auxiliary spillway should carry the peak runoff from a 10-year storm. The spillway should have a minimum 10-foot bottom width, 0.5-foot flow depth, and 1-foot freeboard above the design water surface.

Construct the entire flow area of the spillway in undisturbed soil to the greatest extent possible. Cross section should be trapezoidal, with side slopes 3:1 or flatter for grass spillways (Figure SBN-5) and 2:1 for riprap. Select a vegetated lining to meet flow requirements and site conditions.

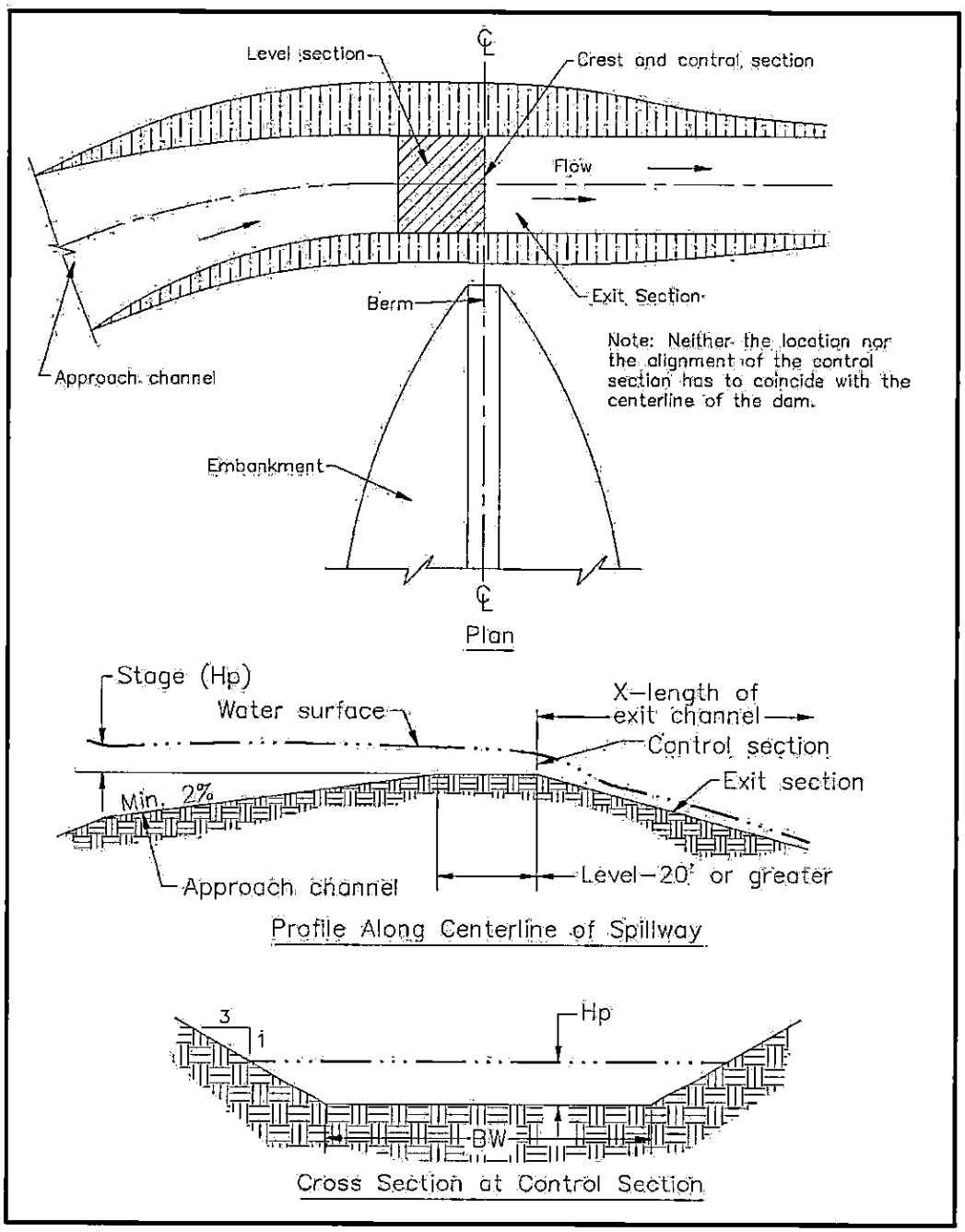


Figure SBN-5: Excavated grass spillway views

Inlet Section

Ensure that the approach section has a slope toward the impoundment area of not less than 2% and is flared at its entrance, gradually reducing to the design width of the control section. The inlet portion of the spillway may be curved to improve alignment.

The Control Section

The control section of the spillway should be level and straight and at least 20 ft. long for grass spillways and 10 feet for riprap. Determine the width and depth for the required capacity and site conditions. Wide, shallow spillways are preferred because they reduce outlet velocities.

The Outlet Section

The outlet section of the spillway should be straight, aligned and sloped to assure supercritical flow with exit velocities not exceeding values acceptable for site conditions.

Outlet Velocity

Ensure that the velocity of flow from the basin is nonerosive for existing site conditions. It may be necessary to stabilize the downstream areas or the receiving channels.

Embankment

Embankments should not exceed 10 feet in height, measured at the center line from the original ground surface to the designed (settled) top elevation of the embankment. Keep a minimum of 1 foot between the designed (settled) top of the dam and the design water level in the auxiliary spillway. Additional freeboard may be added to the embankment height which allows flow through a designated bypass location. Construct embankments with a minimum top width of 8 feet and side slopes of 2.5:1 or flatter.

There should be a cutoff trench in stable soil material under the dam at the centerline. The trench should be at least 2 feet deep with 1.5:1 side slopes, and sufficiently wide (at least 8 ft.) to allow compaction by machine.

Embankment material should be a stable mineral soil, free of roots, woody vegetation, rocks or other objectionable materials, with adequate moisture for compaction. Place fill in 9-inch layers through the length of dam and compact by routing construction hauling equipment over it. Maintain moisture and compaction requirements according to the plans and specifications. Hauling or compaction equipment must traverse each layer so that the entire surface has been compacted by at least one pass of the equipment wheels or tracks.

Excavation

Where sediment pools are formed or enlarged by excavation, keep side slopes at 2:1 or flatter for safety.

Erosion Protection

Minimize the area disturbed during construction. Divert surface water from disturbed areas. When possible, delay clearing the sediment impoundment area until the dam is in place. Keep the remaining temporary pool area undisturbed. Stabilize the spillway, embankment, and all disturbed areas with permanent vegetation. The basin bottom should also be established to a vegetative cover or covered with non-woven geotextile to prevent erosion of the basin itself and promote sediment deposition.

Trap Efficiency

Improve sediment basin trapping efficiency by employing the following considerations in the basin design:

- Surface area—In the design of the settling pond, allow the largest surface area possible. The shallower the pool, the better.
- Length—Maximize the length-to-width ratio of the basin to provide the longest flow path possible.
- Baffles—Provide a minimum of three porous baffles to evenly distribute flow across the basin and reduce turbulence.
- Inlets—Area between the sediment inlets and the basin bottom should be stabilized by geotextile material, riprap with geotextile, a pipe drop, or other similar methods (Figure SBN-6 shows the area with rocks). Inlets to basin should be located the greatest distance possible from the spillway.
- Dewatering—Allow the maximum reasonable detention period before the basin is completely dewatered (minimum of at least 48 hours).
- Inflow rate—Reduce the inflow velocity to nonerosive rates and divert all sediment-free runoff
- Establish permanent vegetation in the bottom and side slopes of the basin.
- Introduce the appropriate flocculent material at the turbulent entrance of the runoff water into the basin. Apply the flocculent according to manufacturer's recommendations.

Safety

Avoid steep side slopes. Fence basins properly and mark them with warning signs if trespassing is likely. Follow all State and local safety requirements.

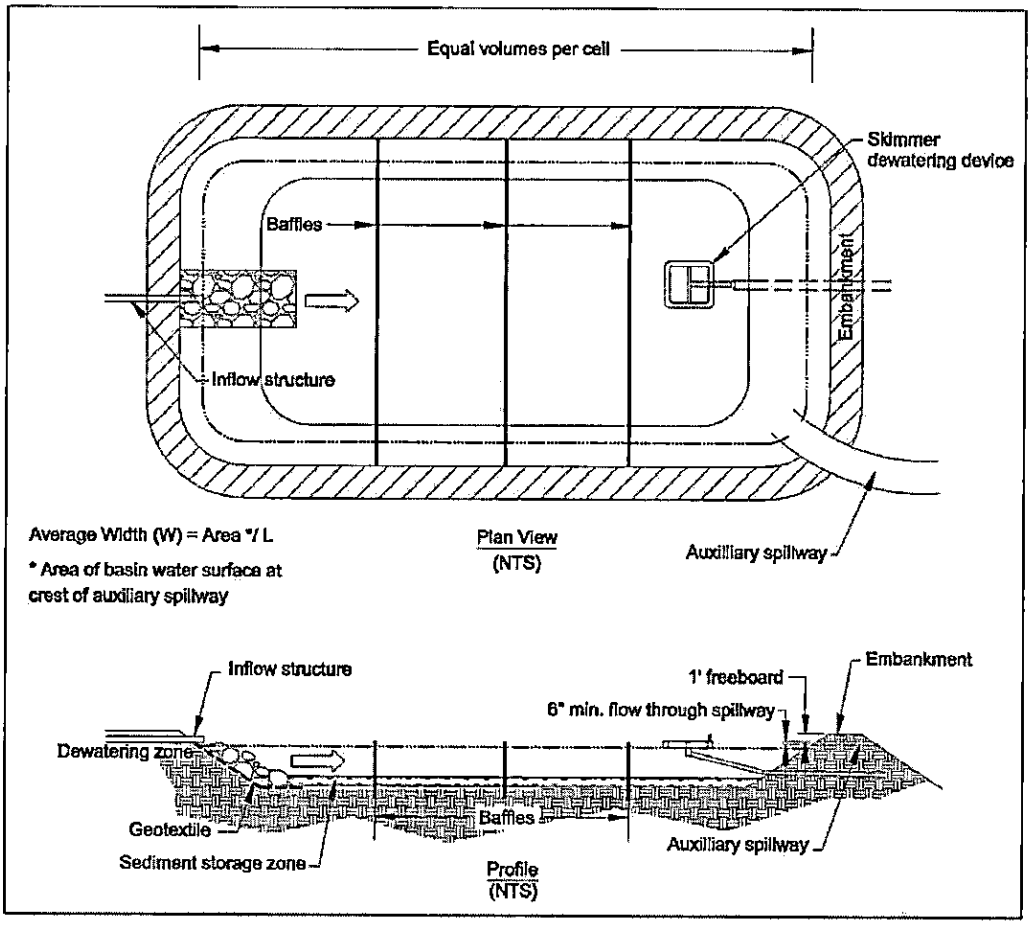


Figure SBN-6: Example of a sediment basin with a skimmer outlet and auxiliary spillway
(modified from Pennsylvania Erosion and Sediment Control Manual, March 2000)

Design Procedure

Step 1. Determine peak flow, Q_{10}, for the basin drainage area using the NRCS runoff curve number method.

Step 2. Determine any site limitations for the sediment pool elevation, auxiliary spillway or top of the dam.

Step 3. Determine basin volumes:

- Compute minimum volume required (3,600 ft^3/acre of drainage area).
- Specify sediment cleanout level to be clearly marked (one-half the design volume). Specify that the basin area is to be cleared after the dam is built.

Step 4. Determine area of basin, shape of basin, and baffles:

- Check length/width ratio (should be 2:1 or larger) and the surface area (325 sq.ft./Qp10).
- Ensure the bottom of the basin is level.
- Design and locate a minimum of 3 coir baffles. The baffle spacing should produce equal volumes of storage within the basin when the basin if full. The top elevation of the baffles will be set in Step 7.

Step 5. Size the skimmer, skimmer orifice, and barrel pipe.

Use Table SBN-1 or the precise alternative design to size the orifice. Generally, a Schedule 40 PVC barrel pipe the same size as the skimmer arm is used under the embankment.

Step 6. Design the anti-seep collar.

Ensure that antiseep collar is no closer than 2 ft from a pipe joint and as close to the center of the embankment as possible. Collar must project at least 1.5 ft. from the pipe and be watertight.

Step 7. Determine the auxiliary spillway dimensions.

Size the spillway bottom width and flow depth to handle the Q_{10} peak flow. Tables SBN-1 and SBN-2 can be used for the design process for grassed auxiliary spillways. Use appropriate design procedures for spillways with other surfaces. Set top of baffles at the elevation of the designed maximum flow depth of the auxiliary spillway.

Step 8. Spillway approach section.

Adjust the spillway alignment so that the control section and outlet section are straight. The entrance width should be 1.5 times the width of the control section with a smooth transition to the width of the control section. Approach channel should slope toward the reservoir no less than 2%.

Step 9. Spillway control section.

- Locate the control section in natural ground to the greatest extent possible.
- Keep a level area to extend at least 20 ft. (grass) or 10 ft. (riprap) upstream from the outlet end of the control section to ensure a straight alignment.
- Side slopes should be 3:1 (grass) or 2:1 (riprap).

Step 10. Design spillway exit section.

- Spillway exit should align with the control section and have the same bottom width and side slopes.
- Slope should be sufficient to maintain supercritical flow, but make sure it does not create erosive velocities for site conditions. (Stay within slope ranges in appropriate design tables.)
- Extend the exit channel to a point where the water may be released without damage.

Step 11. Size the embankment.

- Set the design elevation of the top of the dam a minimum of 1 ft. above the water surface for the design flow in the auxiliary spillway.
- Constructed height should be 10% greater than the design to allow for settlement.
- Set side slopes 2.5:1 or flatter.
- Determine depth of cutoff trench from site borings. It should extend to a stable, tight soil layer (a minimum of 2 ft. deep).
- Select borrow site remembering that the spillway cut may provide a significant amount of fill.

Step 12. Erosion control

- Select surface stabilization measures to control erosion.
- Select groundcover for auxiliary spillway to provide protection for design flow velocity and site conditions. Riprap stone over geotextile fabric may be required in erodible soils or when the spillway is not in undisturbed soils.
- Establish all disturbed areas including the basin bottom and side slopes to vegetation (see the Permanent Seeding practice).

Step 13. Safety.

- Construct a fence and install warning signs as needed.

Table SBN-1 Design Table for Vegetated Spillways Excavated in Erosion Resistant Soils (side slopes 3 horizontal: 1 vertical)

Discharge Q CFS	Slope Range		Bottom Width Feet	Stage Feet
	Minimum Percent	Maximum Percent		
15	3.3	12.2	8	.83
	3.5	18.2	12	.69
20	3.1	8.9	8	.97
	3.2	13.0	12	.81
	3.3	17.3	16	.70
25	2.9	7.1	8	1.09
	3.2	9.9	12	.91
	3.3	13.2	16	.79
	3.3	17.2	20	.70
30	2.9	6.0	8	1.20
	3.0	8.2	12	1.01
	3.0	10.7	16	.88
	3.3	13.8	20	.78
35	2.8	5.1	8	1.30
	2.9	6.9	12	1.10
	3.1	9.0	16	.94
	3.1	11.3	20	.85
	3.2	14.1	24	.77
40	2.7	4.5	8	1.40
	2.9	6.0	12	1.18
	2.9	7.6	16	1.03
	3.1	9.7	20	.91
	3.1	11.9	24	.83
45	2.6	4.1	8	1.49
	2.8	5.3	12	1.25
	2.9	6.7	16	1.09
	3.0	8.4	20	.98
	3.0	10.4	24	.89
50	2.7	3.7	8	1.57
	2.8	4.7	12	1.33
	2.8	6.0	16	1.16
	2.9	7.3	20	1.03
	3.1	9.0	24	.94
60	2.6	3.1	8	1.73
	2.7	3.9	12	1.47
	2.7	4.8	16	1.28
	2.9	5.9	20	1.15
	2.9	7.3	24	1.05
	3.0	8.6	28	.97
70	2.5	2.8	8	1.88
	2.6	3.3	12	1.60
	2.6	4.1	16	1.40
	2.7	5.0	20	1.26
	2.8	6.1	24	1.15
	2.9	7.0	28	1.05
80	2.5	2.9	12	1.72
	2.6	3.6	16	1.51
	2.7	4.3	20	1.35

Discharge Q CFS	Slope Range		Bottom Width Feet	Stage Feet
	Minimum Percent	Maximum Percent		
80	2.8	5.2	24	1.24
	2.8	5.9	28	1.14
	2.9	7.0	32	1.06
90	2.5	2.6	12	1.84
	2.5	3.1	16	1.61
	2.6	3.8	20	1.45
	2.7	4.5	24	1.32
	2.8	5.3	28	1.22
	2.8	6.1	32	1.14
100	2.5	2.8	16	1.71
	2.6	3.3	20	1.54
	2.6	4.0	24	1.41
	2.7	4.8	28	1.30
	2.7	5.3	32	1.21
	2.8	6.1	36	1.13
120	2.5	2.8	20	1.71
	2.6	3.2	24	1.56
	2.7	3.8	28	1.44
	2.7	4.2	32	1.34
	2.7	4.8	36	1.26
140	2.5	2.7	24	1.71
	2.5	3.2	28	1.58
	2.6	3.6	32	1.47
	2.6	4.0	36	1.38
	2.7	4.5	40	1.30
160	2.5	2.7	28	1.70
	2.6	3.1	32	1.58
	2.6	3.4	36	1.49
	2.6	3.8	40	1.40
	2.7	4.3	44	1.33
180	2.4	2.7	32	1.72
	2.4	3.0	36	1.60
	2.5	3.4	40	1.51
	2.6	3.7	44	1.43
200	2.5	2.7	36	1.70
	2.5	2.9	40	1.60
	2.5	3.3	44	1.52
	2.6	3.6	48	1.45
220	2.4	2.6	40	1.70
	2.5	2.9	44	1.61
	2.5	3.2	48	1.53
240	2.5	2.6	44	1.70
	2.5	2.9	48	1.62
	2.6	3.2	52	1.54
260	2.4	2.6	48	1.70
	2.5	2.9	52	1.62
280	2.4	2.6	52	1.70
300	2.5	2.6	56	1.69

Example of Table Use:

Given: Discharge, Q_{10} = 87 cfs, Spillway slope (exit section) = 4%.

Find: Bottom Width and Stage in Spillway.

Procedure: Using a discharge of 90 cfs, note that the spillway (exit section) slope falls within slope ranges corresponding to bottom widths of 24, 28, and 32 ft. Use bottom width of 32 ft, to minimize velocity. Stage in the spillway is 1.14 ft.

Note: Computations are based on: Roughness coefficient, n = 0.40 and a maximum velocity of 5.50 ft. per sec.

Table SBN-2 Design Table for Vegetated Spillways Excavated in Very Erodible Soils (side slopes 3 horizontal: 1 vertical)

Discharge Q CFS	Slope Range		Bottom Width Feet	Stage Feet
	Minimum Percent	Maximum Percent		
10	3.5	4.7	8	.68
15	3.4	4.4	12	.69
	3.4	5.9	16	.60
20	3.3	3.3	12	.80
	3.3	4.1	16	.70
	3.5	5.3	20	.62
25	3.3	3.3	16	.79
	3.3	4.0	20	.70
	3.5	4.9	24	.64
30	3.3	3.3	20	.78
	3.3	4.0	24	.71
	3.4	4.7	28	.65
	3.4	5.5	32	.61
35	3.2	3.2	24	.77
	3.3	3.9	28	.71
	3.5	4.6	32	.66
	3.5	5.2	36	.62
40	3.3	3.3	28	.76
	3.4	3.8	32	.71
	3.4	4.4	36	.67
	3.4	5.0	40	.64
45	3.3	3.3	32	.76
	3.4	3.8	36	.71
	3.4	4.3	40	.67
	3.4	4.8	44	.64
50	3.3	3.3	36	.75
	3.3	3.8	40	.71
	3.3	4.3	44	.68
60	3.2	3.2	44	.75
	3.2	3.7	48	.72
70	3.3	3.3	52	.75
80	3.1	3.1	56	.78

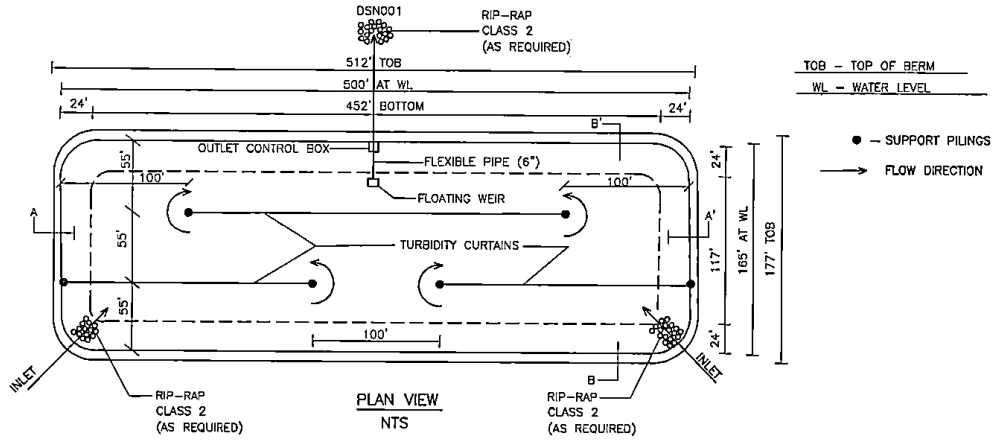
Example of Table Use:

Given: Discharge, Q_{10} = 38 cfs, Spillway slope (exit section) = 4%.

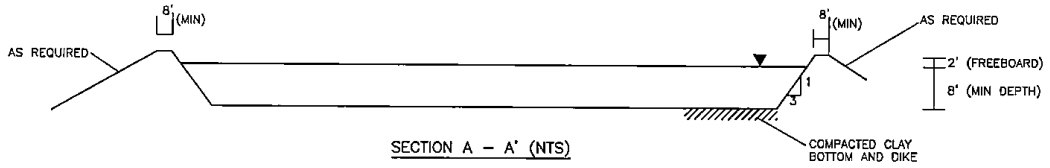
Find: Bottom Width and Stage in Spillway.

Procedure: Using a discharge of 40 cfs, note that the spillway (exit section) slope falls within slope ranges corresponding to bottom widths of 36 and 40 ft. Use bottom width of 40 ft., to minimize velocity. Stage in the spillway is 0.64 ft.

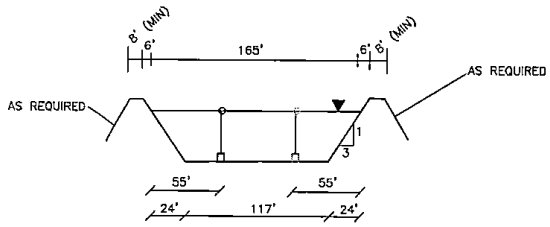
Note: Computations are based on: Roughness coefficient, n = 0.40 and a maximum velocity of 3.50 ft. per sec.



PLAN VIEW
NTS



SECTION A - A' (NTS)



SECTION B - B' (NTS)

NOTES:

1. Outlet Box Top shall have grate and shall be 9' above bottom.
2. Outlet box, floating weir and flexible pipe shall conform to BMP's presented in Appendix.
3. Pond shall have a compacted clay bottom and dike. Compaction requirements will depend on soils found on-site and test results of said soils.
4. The information depicted is intended to provide visual aid within the context of this report and should not be used as a sole reference in precise dimensioning of features indicated.

TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE, MOBILE COUNTY, ALABAMA

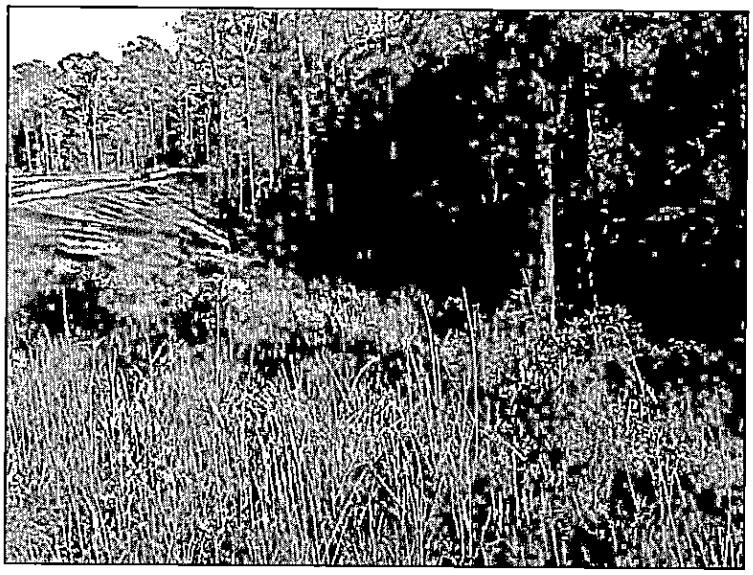
thompson
ENGINEERING

SEDIMENT POND
BEST MANAGEMENT PRACTICE

PROJECT NO: 20-1101-0075

DATE: JANUARY 2021

Buffer Zone (BZ)



Practice Description

A buffer zone is a strip of plants adjacent to land-disturbing sites or bordering streams, lakes, and wetlands which provides streambank stability, reduces scour erosion, reduces storm runoff velocities and filters sediment in stormwater. This practice applies on construction sites and other disturbed areas that can support vegetation and can be particularly effective on floodplains, next to wetlands, along streambanks and on steep, unstable slopes.

Planning Considerations

The width and plant composition of a buffer zone will determine its effectiveness.

There is no ideal width and plant community for buffer zones. A buffer zone 50 feet wide with desirable vegetation may provide significant protection of a perennial stream, water body or wetland. Adjustments can be made to account for the purpose(s) of the buffer and landscape characteristics.

Three zones are typically recognized in the buffer area. If planned to be 45 to 55 feet wide, the recommended width and plant categories are described in the following listings:

- Zone 1: the first 15 to 20 feet nearest the stream. Cover is close growing trees (commonly 6 to 10 feet apart).
- Zone 2: the next 10 to 15 feet. Cover is trees or trees and shrubs.
- Zone 3: the next 20 feet. Cover is grass or dense groundcover.

Note: All widths are for one side of the stream only and are measured from top of stream bank.

Existing vegetation should be considered for retention, especially hardwoods that are in Zones 1 and 2.

Buffer Zone 3 may be established with a grass planting or with close-growing groundcover that will provide dense cover to filter sediment. Where topography accommodates sheet flow from the adjacent landscape, Zone 3 should be retained or developed as a Filter Strip.

Necessary site preparation and planting for establishing new buffers should be done at a time and manner to insure survival and growth of selected species.

Buffer zones may become part of the overall landscape of the project.

The layout and density of the buffer should complement natural features and mimic natural riparian forests.

Design Criteria

Installation (Preservation)

Evaluate vegetation and landscape features in proposed buffer zone to determine potential for existing plant community to maintain streambank stability, prevent sheet, rill and scour erosion, reduce stormwater velocities and filter sediment.

Dedicate a vegetated zone to effectively minimize streambank and shoreline erosion, prevent sheet, rill and scour erosion in the buffer zone and remove sediment from sheet flow from the disturbed area. Initially estimate a width of 50 feet wide adjacent to the stream (each side), water body or wetland. Adjust the width to account for slope of the land adjacent to the stream and the purposes of the buffer. If the buffer is planned to trap sediment in sheet flow the width should be increased 2 feet for every 1% slope measured along a line perpendicular to the streambank and immediately downslope of the disturbed area. If the buffer is not planned to trap sediment and only bank stabilization is the purpose of the buffer only Zones 1 and 2 are required and the adjustment for slope of the adjacent land is not essential.

Installation (Plantings)

Width and Zone Requirements

Use guidance under Installation (Preservation) to determine width and zone requirements.

Site Preparation

Plan appropriate site preparation to provide a suitable planting medium for grass, or trees and shrubs.

Plan to install sediment and erosion control measures such as silt fence and diversions if zones are graded before seedbed preparation.

If significant compaction exists, plan for chiseling or subsoiling.

For Zone 3 plantings, clear area of clods, rocks, etc. that would interfere with seedbed preparation; smooth the area, to encourage sheet flow, before the soil amendments are applied and firm the soil after the soil amendments are applied. Follow guidelines in the Filter Strip practice Design Criteria if Zone 3 is to be used to filter sheet flow from the adjacent construction area.

Soil Amendments (lime and fertilizer)

Plan soil amendments using design criteria for the appropriate category (Permanent Seeding, Tree Planting on Disturbed Areas, and Shrub, Vine and Groundcover Planting). Incorporate amendments to a depth of 4" to 6" with a disk or chisel plow.

Plantings

Plan the vegetation for buffer zones using Design Criteria for Permanent Seeding, Tree Planting on Disturbed Areas, and/or Shrub, Vine and Groundcover Planting. No invasive species shall be used. If trees are planted, at least 2 hardwood species should be used.

Mulching

Plan to mulch shaped areas, and other areas that are bare using the Mulching practice Design Criteria.

Appendix D

SUMMARY REQUIREMENTS OF ADOL

Summary Requirements
ALABAMA SURFACE MINING ACT OF 1969
Administered by the Alabama Department of Labor

Minerals Covered:

- Clay, sand, gravel, ores, and other minerals

Minerals Exempt:

- Limestone, marble, dolomite, and coal.

Permit Procedure:

- Submit a completed "**Application for Surface Mining Permit and Comprehensive Reclamation Plan**" along with the $250.00 permit fee.
- Post a cash, surety, or negotiable bond with the application, made payable to **Commissioner, Alabama Department of Labor**, in the amount of $2,500.00 per acre to be disturbed.

Duties of the Operator:

- Construct and post a permanent marker with company name and file number.
- Restrict public access as a safety precaution.
- Control erosion and off-site siltation.
- Avoid damage to adjoining property and streams, leaving a minimum 50-foot setback.
- After mining, grade site to rolling topography.
- Slope or bench highwalls on a 3:1 or flatter slope.
- Apply soil amendments as recommended by a comprehensive soil analysis, then apply mulch and plant permanent grass (minimum 75% cover) and trees (minimum 425/acre).

Bond Release Procedures:

- Compete grading and re-vegetation within 2 years after permit expires.
- Notify the Department to schedule a reclamation inspection.
- Reclamation must be approved by a registered forester employed by ADOL.
- Bond Release Report signed by Commissioner; ADOL will initiate bond release.
- Bond will be returned to the operator or surety company as applicable.

Site Inspections by ADOL:

- Determine location, site conditions, reclamation status, permit and bond status.
- Identify worker and equipment hazards.
- Ensure compliance with Open Pit and Quarry Safety Rules.

Note: For complete requirements, see the Code of Alabama, 1975, §§ 9-16-1 through 9-16-15 (Alabama Surface Mining Act of 1969, as amended), and Open Pit and Quarry Safety Rules of the State of Alabama, Department of Labor, Inspections Division, 649 Monroe Street, Montgomery, AL 36131-5200 or call (334) 242-8265.

Appendix E

CALCULATIONS

Trans Ash Inc.

NPDES Permit Application

Trans Ash 49 Acre Site

Loading Calculations

January 15, 2021

Rainfall =		67	inches per year	
		0.18	inches per day	
		0.02	feet per day	

Preliminary Pond Loading and Sizing Calculations

49 Acre Pond

Drainage Area =		**49.0**	acres	
Average Stormwater per day =		0.75	acre-ft	
		244,109	gallons	
Runoff Coefficient =		0.05		
Calculated Average Daily Discharge =		12,205	gallons per day	
		0.0122	MGD	
		0.0189	cfs	
Groundwater Fraction		231,904	gallons	
Groundwater Fraction		0.2319	MGD	
Runoff Fraction		12,205	gallons	
Runoff Fraction		0.0122	MGD	
Calculated Loadings				
pH (estimated)	6.0	stu		
BOD5	2	mg/l	0.2037	#/day
TSS	7	mg/l	0.7130	#/day
Total Iron	0.6	mg/l	0.0611	#/day
Total Manganese	0.035	mg/l	0.0036	#/day
Total Aluminum	0.02	mg/l	0.0020	#/day

Concentrations assumed from similar projects.

Preliminary Pond Sizing				
Minimum Pond Capacity	0.25	acre-feet/acre		
Minimum Total Pond Capacity	12.25	acre-feet		
	533,610	cubic feet		
	3,991,936	gallons		
Pond Area	**66,701**	sf @	**8**	feet depth
(see Actual Dimensions for final layout)	**1.53**	acres (Nominal)		
	450	Length (Nominal)		
	148	Width (Nominal)		

Notes:

1. Ponds must have 3:1 sides.
2. Effluent structures must use floating weirs or skimmers.
3. Dam or berm separating pond from waterways must be no less than 12 feet wide.
4. See Chapter 335-6-9 "Surface Mining Rules" for additional requirements.

Trans Ash Inc.

NPDES Permit Application

Trans Ash 49 Acre Site

Stormwater Pond Design

January 15, 2021

Lagoon Sizing Analysis

Pond Type:	**Single Cell Pond**				
Length (Actual)		**500**	feet		
Width (Actual)		**165**	feet		
Depth (average)		**8**	feet		
Surface Area		82,500	sf	**1.89**	acres
Assumed Side Slopes		3	horizonal to	**1**	vertical
Bottom Length		452	feet		
Bottom Width		117	feet		
Bottom Area		52,884	sf	1.21	acres
Volume of Pond		538,462	cf	**4,028,238**	gallons
Skimmer (Dewatering Device) Calcs					
Desired Dewatering Time		3	days		
Skimmer Outflow Rate		179,487	cu.ft./day	2.08	cfs
Use: (from Manufacturer's Information)					
8"	Marlee Skimmer	**6"**	Flex Pipe		
8"	Faircloth Skimmer	**6"**	Flex Pipe		
Outfall Pipe Size:		**14"**	ID at Min. grade		
Outlet Structure Size:		**24"**	ID Minimum		

thompson
ENGINEERING

SPILL PREVENTION, CONTROL, AND COUNTERMEASURE (SPCC) PLAN

for

TRANS ASH BORROW PIT
15300 HIGHWAY 43
BUCKS, ALABAMA 36512

JANUARY 2021

RECEIVED
JAN 28 2021
STORM WATER
MANAGEMENT BRANCH

Prepared for:

Trans Ash, Inc.
617 Shepherds Drive
Cincinnati, OH 45215

THOMPSON PROJECT NO.: 20-1101-0075

2970 Cottage Hill Road, suite 190
Mobile, AL 36606
251.666.2443 ph. / 251.666.6422 fax
www.thompsonengineering.com

A THOMPSON HOLDINGS, INC. COMPANY

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MANAGEMENT APPROVAL

Spill Prevention, Control, and Countermeasure (SPCC) Plan

for

TRANS ASH, INC.
560 HOOKS LAKE ROAD
MALCOLM, ALABAMA 36556

This plan has been reviewed by the management of Trans Ash, Inc.and has our full approval. We hereby adopt this SPCC Plan into the operation of our facility and agree to commit the necessary resources to implement the SPCC plan.

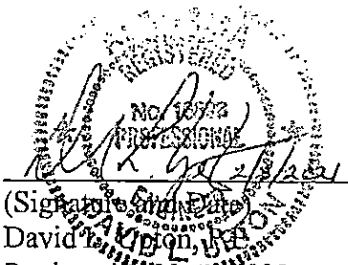
_____ _____
(Signature) (Date)

Steven L. Fields, Senior Project Manager
Name and Title

ENGINEER'S CERTIFICATION

The undersigned hereby certifies and attests:

- that I am familiar with the requirements of 40 CFR 112 (Oil Pollution Prevention);
- that I and/or persons working under my supervision have visited and examined the facility;
- that the SPCC Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards, and with the requirements of 40 CFR 112;
- that procedures for required inspections and testing have been established; and
- that the SPCC Plan is adequate for the facility.



(Signature and Date)
David L. Upton, PE
Registration No.: 16898
State of Registration: Alabama

(SEAL)

RECORD OF PLAN REVIEW

In accordance with 40 CFR 112.5, this SPCC plan shall be amended whenever there is a change in facility design, construction, operation, or maintenance, which materially affects the facility's potential for discharge of oil (into or upon navigable waters of the United States or adjoining shorelines) in quantities that may be harmful, as described in 40 CFR 110.

A review and evaluation of this SPCC plan is conducted at least once every five years. This SPCC plan will be amended within six months of the review to include more effective prevention and control technology if: (1) such technology will significantly reduce the likelihood of a spill event at the facility, and (2) such technology has been field-proven at the time of review. Any amendment to this SPCC plan shall be certified by a Professional Engineer in accordance with 40 CFR 112.3(d), and will be implemented as soon as possible, but not later than six months following preparation of the amendment. Documentation of each plan review and evaluation by facility management, indicating whether the plan requires amendment, will be provided on the log below.

Date of Review	Signature	Is Amendment Required? (Y/N)	Comments

SCHEDULE FOR IMPLEMENTATION

In accordance with 40 CFR 112.7, if the SPCC plan calls for additional facilities or procedures, methods, or equipment not yet fully operational, these items should be discussed in separate paragraphs, and the details of installation and operational start-up should be explained separately.

Listed in the following discussion are items of this SPCC Plan that are not yet fully operational at the time of issuance of this SPCC Plan.

- Minor additional facilities or equipment necessary to implement this SPCC plan were identified. These items consist of:
  - None at the time of writing.
- Certain procedures or methods provided in this plan are supplemental to, or different from, previous practices (for example, inspections and recordkeeping) and require implementation.

SPCC regulations (40 CFR 112.5) require that amendments to the plan be fully implemented as soon as possible, and no later than six months after the plan amendment.

CROSS-REFERENCE TO 40 CFR 112 REGULATIONS

40 CFR 112 REGULATION SECTION NUMBER	SPCC PLAN SECTION NUMBER
40 CFR 112.3(d)	PE Certification page iv
40 CFR 112.6(b)	Plan Review and Amendment page v
40 CFR 112.7 – 1st paragraph (un-numbered)	**Management Approval**..... page iii **Schedule for Implementation**..... page vi **Cross-reference**..... page vii
40 CFR 112.7 (a)(1)	**1.0** General Information **4.0** Potential Spills – Prediction and Control **5.0** Conformance with Specific Spill Prevention and Control Guidelines **Table 1** **Figures 1, 2 and 3**
40 CFR 112.7 (a)(2)	If applicable, allowable deviations or nonconformance from 40 CFR 112 requirements are discussed in the relevant plan section.
40 CFR 112.7 (a)(3)	**4.0** Potential Spills – Prediction and Control **5.0** Conformance with Specific Spill Prevention and Control Guidelines **9.0** Spill Contingency Procedures **Table 1** **Figures 1, 2 and 3**
40 CFR 112.7 (a)(4)	**9.0** Spill Contingency Procedures
40 CFR 112.7 (a)(5)	**9.0** Spill Contingency Procedures
40 CFR 112.7 (b)	**4.3** Potential Spill Prediction Scenarios **Table 1** **Figures 1, 2 and 3**
40 CFR 112.7 (c)	**4.0** Potential Spills – Prediction and Control **5.0** Conformance with Specific Spill Prevention and Control Guidelines **Table 1** **Figures 1, 2 and 3**

CROSS-REFERENCE TO 40 CFR 112 REGULATIONS (CONTINUED)

40 CFR 112 REGULATION SECTION NUMBER	SPCC PLAN SECTION NUMBER
40 CFR 112.7 (d)	**4.5** Containment Practicability/Spill Contingency Commitment
40 CFR 112.7 (e)	**6.0** Inspections, Tests, and Records **Appendices B and C**
40 CFR 112.7 (f)	**1.0** General Information **8.0** Personnel, Training, and Discharge Prevention Procedures **9.0** Spill Contingency Procedures
40 CFR 112.7 (g)	**7.0** Security
40 CFR 112.7 (h)	**4.0** Potential Spills – Prediction and Control **5.4** Facility Tank Car and Tank Truck Loading and Unloading Rack
40 CFR 112.7 (i)	**Not Applicable (no field-constructed containers)**
40 CFR 112.7 (j)	**5.0** Conformance with Specific Spill Prevention and Control Guidelines **(Note: No applicable, more stringent, state rules have been issued.)**
40 CFR 112.7 (k)	**4.1.3** Oil-filled Operational Equipment
40 CFR 112.8 (b)	**5.1** Facility Drainage Control
40 CFR 112.8 (c)	**4.1** General Description of Facility Oil Storage and Handling **4.2** Designation of Oil Storage Areas **5.2** Bulk Storage Containers **Table 1**
40 CFR 112.8 (d)	**4.1** General Description of Facility Oil Storage and Handling **5.3** Facility Transfer Operations
40 CFR 112.9 and subsequent sections	**Not Applicable**

1.0 GENERAL INFORMATION

1.1. Name, Location, and Address

Name: Trans Ash Borrow Pit.

Location: Roberts Road
Turnerville, AL 36512

(See Figure 1 for Site Vicinity Map)

Mailing Address: 15300 Highway 43
Bucks, Alabama 36512

1.2. Facility Contacts

Contact	Title	Office Phone
Steven L. Fields	Senior Project Manager	513-260-8540 (Work Cell)
Charles Davidson	General Superintendent	513-502-8364 (Work Cell)

1.3. Function of Facility

The Trans Ash facility is a borrow pit for general fill, topsoil, and materials for construction of a cap for ash pond closure. The products to be mined from the pit are sand/clay, sand, clay and topsoil which are excavated with conventional earthmoving equipment (e.g. front-end loaders, trackhoes, and backhoes) and loaded onto haul trucks. The pit is expected to be operated depending on construction needs for the closure. When in use, the pit will normally operate Monday through Friday, dawn until dusk. During borrow operation; there will generally be from two to ten people working at the pit (not counting truck drivers). The facility is operated by Trans Ash Inc. of Cincinnati, Ohio and is located on Roberts Road, Turnerville, Mobile County, Alabama.

1.4. Owner/Operator

Steven L. Fields
Senior Project Manager
Trans Ash, Inc.
617 Shepherds Drive
Cincinnati, OH 45215

(513) 260-8540

1.5. Designated Person Accountable for Spill Prevention

Contact	Title	Office Phone
Charles Davidson	General Superintendent	(513) 502-8364 (Work Cell)

1.6. Applicability of Substantial Harm Criteria

In accordance with 40 CFR 112.20(e), the "significant and substantial harm criteria" certification form required by Appendix C to 40 CFR 112 has been completed and is contained in Appendix B of this SPCC Plan. This facility does not meet the substantial harm criteria, and therefore is not required to prepare an "OPA 90" Facility Response Plan.

APPLICABILITY OF REGULATIONS

2.1 Federal Regulations

Oil Spill Regulations (40 CFR 112)

U.S. Environmental Protection Agency (USEPA) regulation (40 CFR 112) establishes the requirements for preparation and implementation of a SPCC Plan for a non-transportation related facility with oil storage above certain threshold quantities (oil being loosely defined to include petroleum-related products, including various fuels and lubricating oils, as well as non-petroleum oils). These requirements exclude facilities, due to their geographical location, that could not reasonably be expected to discharge oil in harmful quantities (as defined in 40 CFR Part 110) into the navigable waters of the United States or adjoining shorelines.

A facility is required to prepare a SPCC Plan if it has total underground storage capacity in excess of 42,000 gallons (excluding underground storage tanks that are subject to technical requirements of 40 CFR 280 or corollary state regulations), or has total aboveground storage capacity in excess of 1,320 gallons (counting only those containers with a capacity of 55 gallons or greater). Containers that are considered "permanently closed" (as defined in 40 CFR 112.2) are not included in the inventory. The SPCC Plan must be certified by a Registered Professional Engineer. It should be noted that this plan is being required as a provision of their ADEM permit to operate even though they do not meet the 1,320 gallon capacity trigger for an SPCC.

2.2 State of Alabama Regulations

The State of Alabama has not promulgated separate regulations specific to oil pollution prevention or SPCC Plans. However, the Alabama Department of Environmental Management (ADEM) exercises jurisdiction over pollutant discharges (including oil) to Waters of the State pursuant to the Alabama Water Pollution Control Act, and ADEM Admin. Code Chapter 335-6-6 (National Pollutant Discharge Elimination System). Through its issuance of NPDES permits, ADEM may require an SPCC plan to be developed and may enforce its provisions.

3.0 PLAN REVIEW AND AMENDMENT

3.1 Amendment of SPCC Plan Ordered by USEPA [40 CFR 112.4]

If the facility discharges oil in a quantity of more than 1,000 gallons in a single incident into or upon navigable waters or adjoining shorelines, or if more than 42 gallons of oil are discharged in each of two spill events occurring within any 12-month period, a special report shall be submitted to the Regional Administrator of the U.S. Environmental Protection Agency (USEPA) in accordance with 40 CFR 112.4, with a copy sent to the state agency in charge of oil pollution activities (ADEM). Subsequent to review of the submittal, the Regional Administrator may require amendment to the SPCC Plan.

3.2 Amendment of SPCC Plan by Owner/Operator [40 CFR 112.5(a)]

This plan shall be amended whenever there is a change in facility design, construction, ownership, operations, or maintenance, which materially affects the facility's potential for discharge of oil. Such amendments shall be fully implemented as soon as possible, but not later than six (6) months after such change occurs. Also, the plan shall be modified when the procedures contained herein are found to be inadequate.

No amendment to the SPCC Plan shall be effective to satisfy the requirements of this section unless it has been certified by a Professional Engineer in accordance with USEPA regulations at 40 CFR 112.3(d).

3.3 Management Review of SPCC Plan [40 CFR 112.5(b)]

The SPCC Plan shall be reviewed at least once every five years, and amended (as necessary) to include more effective prevention and control technology, if such technology will significantly reduce the likelihood of a spill, and has been "field-proven" at the time of the review. Such amendments to the SPCC Plan shall be implemented as soon as possible, and not later than six months following the plan amendment.

A written and signed statement shall be placed in the SPCC Plan during the management review stating that a review was performed and the modifications to the SPCC plan that were made (see "Record of Plan Review" page at the front of this SPCC Plan). Modifications to the SPCC Plan do not have to be certified by a Professional Engineer for routine updating (for example, name and telephone number changes) but certification is required if the changes constitute a plan amendment.

4.0 POTENTIAL SPILLS – PREDICTION AND CONTROL

4.1 General Description of Facility Oil Storage and Handling

4.1.1 Spill History

The facility has not had a discharge of over 1,000 gallons of oil/fuel into navigable waters and reportable spills over the last 12-month period. In addition, no significant oil spills have occurred due to the aboveground storage tanks in the last 10 years.

4.1.2 Designation of Oil and Hazardous Substances Storage Areas

An inventory of aboveground bulk oil storage containers and hazardous substances is presented in Table 1, and a drawing showing bulk oil storage and hazardous substances container locations is included in Figure 3.

All aboveground tanks receive periodic visual inspections. On all external examinations, checks are made for signs of deterioration and leaks. All leaks found receive special maintenance priority. See Section 6.0 for further description of inspections and recordkeeping.

1,000-gallon Aboveground Storage Tank

One 1,000-gallon diesel Aboveground Storage Tank (AST) is located to the east of the entrance road to the facility as shown on Figure 3. This tank is a double-walled tank, thereby providing secondary containment, and vehicles and equipment are filled from at fuel dispenser mounted to the tank. The tank is located on a gravel base that is visible from all sides so that any leaks or spillage is readily seen. The tank is filled from a port on the top of the tank and filling is accomplished by licensed fuel contractors who park their truck adjacent to the tank when refilling the tank. The area where the fuel is dispensed and where the fuel truck is parked is graveled but does not have permanent secondary containment in the form of berms, curbing, drainage to sumps, or similar features. However, general topographic features of the site should allow for containment of spills that could occur during loading/unloading, and the risk of impact on navigable waters from such a spill is considered minimal. Spill kits are located nearby if needed.

4.1.3 Facility Transfer Operations

The 1,000-gallon diesel fuel tank is filled by a fill connection on top of the tank. It is connected to a fuel dispenser located next to the tank.

Minor transfer operations (e.g., from portable tanks or drums to equipment), the primary oil transfer at the facility is at the Maintenance Building for used oil and the Transformer Shop for new and used transformer oils.

The used oil drums are filled by hand pumps or by pouring from a bucket. When full, these drums are then picked up by the oil recycler for recycle/disposal.

4.1.4 Oil-Filled Operational Equipment (Transformers and Regulators)

Oil-filled operational equipment is equipment that includes an oil storage container (or multiple containers) in which the oil is present solely to support the function of the apparatus or the device. It is not considered a bulk storage container and does not include oil-filled manufacturing equipment (flow-through process). Some examples of oil-filled operational equipment include, but are not limited to: hydraulic systems, lubricating systems (e.g., those for pumps, compressors, and other rotating equipment including, pump-jack lubrication systems), gear boxes, machining coolant systems, heat transfer systems, transformers, circuit breakers, electrical switches, and other systems containing oil solely to enable the operation of the device. Oil-filled operational equipment must meet the general secondary containment requirements of 40 CFR 112.7(c), but not the specific secondary containment requirements for bulk storage containers of 40 CFR 112.8(c)(2.).

4.2 Facility Drainage Description

Storm water discharges occur primarily via sheet flow at the site with only two areas sufficiently concentrated to drain to the stormwater pond and ultimately through its outfall. Water not soaking into the ground enters an intermittent unnamed tributary to Log Creek, a tributary to Chickasaw Creek and the Mobile River.

Stormwater runoff from the petroleum storage area sheetflows, to a stormwater pond, then is discharged to Log Creek. However, the areas where the tank is located and where various oil-filled equipment is stored is paved with rock and soil. As such, an oil spill from any of the tanks and equipment is not likely to reach the stormwater system before being detected and mitigated. A site plan, depicting the downstream inlets and general stormwater flow patterns is presented in Figure 3.

4.3 Potential Spill Prediction Scenarios [ref. 40 CFR 112.7(b)]

The purpose of this discussion is to describe the nature and characteristics of potential spill occurrences, and applicable control measures. Potential spills may occur with any of the following:

- equipment failure (e.g. tank rupture or leaks, leak in piping, malfunction of dispenser)
- operational errors (e.g. tank overfill, spillage)
- vandalism (tampering with tanks and dispensers), and
- damage to tanks, dikes, and dispensers during hurricanes, tornadoes, flood conditions, or other natural disasters.

Potential spills may be expected primarily at the oil storage areas and/or oil transfer areas. Potential spills may range from relatively minor occurrences (e.g. small leakage from valve) to major occurrences (e.g. catastrophic failure of a storage tank or spill from a single compartment of a fully loaded tanker truck).

Prevention of spills at the storage tanks and transfer areas will be accomplished most readily by routine visual inspection and maintenance of equipment (tanks, piping,

connections and hoses) and by operational care during tank filling and transfer operations to prevent accidental overfill and/or spillage.

Table 1 provides capacities of various bulk oil storage containers (i.e., maximum volumes of potential spills) and, with reference to Figure 3, indicates the flow path of a potential spill.

4.4 Containment and/or Diversionary Structures or Equipment [ref. 40 CFR 112.7(c)]

As noted in the previous descriptions of storage areas and facility drainage, secondary containment is provided for bulk oil storage containers. Additionally, at locations where direct secondary containment is not provided (such as oil-filled equipment, oil transfer piping, and loading/unloading areas), the general topographic features of the site provide for diversion and containment of spills which could occur. [Also, see Section 5.4 of this SPCC plan for further discussion of loading/unloading areas.]

4.5 Containment Practicability / Spill Contingency Commitment [ref. 40 CFR 112.7(d)]

The installation of structures and equipment to provide containment and prevent discharges from reaching navigable waters has been considered practicable and implemented. Nevertheless, certain portions of the facility where oil and wastes are transferred or dispensed may not have complete physical secondary containment. Therefore, the facility maintains a strong contingency plan for expeditious and coordinated response to a spill should such occur (see Section 9.0 of this SPCC Plan).

5.0 CONFORMANCE WITH SPECIFIC SPILL PREVENTION AND CONTROL GUIDELINES

5.1 Facility Drainage Control [ref. 40 CFR 112.8(b)]

Conformance with applicable provisions is demonstrated. Refer to Sections 4.1, 4.2, 4.3, and 4.4 of this SPCC Plan.

Since the 1,000-gallon diesel storage tank is "double-walled" which provides secondary containment, routine drainage from "diked areas" is not required.

5.2 Bulk Storage Containers [ref. 40 CFR 112.8(c)]

Conformance with applicable provisions is demonstrated, including:

- compatibility of tank materials with contents
- secondary containment
- inspection of diked area drainage
- periodic integrity testing and/or visual inspections
- "fail-safe" engineering features (as applicable)
- visible oil leak corrections

Refer to Sections 4.1, 4.2, and 5.1 of this SPCC Plan.

Refer to Section 6.0 of this SPCC plan for descriptions of inspections and tests.

Provisions of 40 CFR 112.8(c)(4, 5, 7, 9, and 11) pertaining to control of leakage from internal steam heating coils, corrosion protection of buried metallic storage tanks, partially buried metallic storage tanks, treatment system effluent observation, and positioning of mobile/portable tanks are not applicable.

5.3 Facility Transfer Operations [ref. 40 CFR 112.8(d)]

Refer to Section 4.1.3 of this SPCC Plan. Except at the diesel fuel tank, transfer of oils and hazardous materials is minimal and provisions of 40 CFR 112.8(d) is not applicable.

Loading and unloading operations for the diesel fuel, hydraulic oil and motor tanks are discussed in Section 4.1.3. These tanks are located above ground, highly visible and easily inspected. They are compatible with their contents and the fittings are properly located. When the tanks are emptied, they are emptied by pumping.

5.4 Facility Tank Car and Tank Truck Loading/Unloading Rack [ref. 40 CFR 112.7(h)]

Note: This facility does not have a traditional "loading rack" or "unloading rack" (a shelter and associated equipment designed to transfer product to or from storage tanks to or from tank cars or tank trucks). Guidance from USEPA indicates that provisions of 40 CFR 112.7(h) are applicable strictly to loading/unloading "racks," and that other loading/unloading areas are only subject to the general containment requirements of 40 CFR 112.7(c). [Also, see Section 4.4 of this SPCC

Plan.] The facility loading/unloading areas are considered to demonstrate conformance with applicable regulatory provisions, as discussed further below.

(1) Containment system for truck loading/unloading areas: The loading/unloading areas for the bulk oil storage tanks do not have physical secondary containment such as berms, curbing, drainage to sumps, or similar features. USEPA regulations at 40 CFR 112.8(h) (1) for loading/unloading racks require a containment system designed to hold the maximum capacity of any single compartment of a tank truck. Since the facility does not have a "loading/unloading rack," the requirement is not strictly applicable. A latitude of engineering judgment is allowed when assessing equivalent conformance of loading/unloading areas (not including "racks") with the more general containment provisions of 40 CFR 112.7(c). Overall factors relating to the risk and significance of a potential spill during loading/unloading should be considered. Such factors include the proximity of surface waters, frequency of loading/unloading operations, and use of standard operating procedures (SOPs) to prevent potential tank overfills or to respond expeditiously and appropriately should a spill occur. Based on the tanks' locations away from surface waters and/or within controlled storm water management areas, and the infrequency of loading/unloading operations, the risk of a significant spill event affecting waters of the United States or adjoining shorelines is considered to be minor, and equivalent conformance is considered to be demonstrated as long as the facility maintains continued diligence and adherence to standard operating procedures. These procedures should include (but not necessarily be limited to):

- tank gauging/volume calculation prior to loading/unloading to assure that overfill (of bulk storage tank) cannot occur
- loading/unloading operation must be continually attended by truck driver and by designated facility personnel
- use of only trained personnel to attend loading/unloading operation
- contingency plan for immediate shut-down of loading/unloading operation if equipment failure occurs (such as hose rupture)
- readily-available spill response equipment at the site

(2) Interlocked warning light or physical barrier system: Not considered applicable to this facility since there is no "loading/unloading rack." Equivalent conformance with applicable provisions of the regulations is considered demonstrated by continued diligence and adherence to standard operating procedures.

(3) Examination of lowermost drains/outlets of vehicle prior to filling or departure: Not considered applicable to this facility since there is no "loading/unloading rack." Equivalent conformance with applicable provisions of the regulations is considered demonstrated by continued diligence and adherence to standard operating procedures.

6.0 INSPECTIONS, TESTS AND RECORDS [ref. 40 CFR 112.7(e)]

6.1 Testing and Inspections

The following testing and inspections are conducted as described in written procedures and reported on standard forms (see Appendices C and D).

A. Bulk Storage Containers

All tanks and associated areas are visually inspected at least monthly. This includes visual inspection of the tank and support structure for evidence of physical damage, corrosion, drip marks, discoloration, cracks, deterioration, etc. Areas around the tank are inspected for evidence of debris accumulation, oil spills or leaks, foundation settlement, gaps between tank and foundation, cracks in the concrete slab or walls, damage caused by vegetation roots, etc. The original of the inspection report form (Appendix C) is filed on-site.

USEPA regulations at 40 CFR 112.8(c)(6) require that each aboveground container be tested for integrity on a regular schedule, and that visual inspections must be combined with another testing technique such as hydrostatic testing, radiographic testing, ultrasonic testing, acoustic emissions testing, or another system of non-destructive shell testing. However, USEPA guidance also provides that visual inspection alone may suffice, subject to good engineering practice, for certain smaller shop-built containers in which internal corrosion poses minimal risk of failure; which are inspected at least monthly; and for which all sides are visible (i.e., the container has no contact with the ground). Clarifications of the mechanical integrity testing guidance for such containers have been issued from USEPA. For well-designed shop-built containers with a shell capacity of 30,000 gallons or under, USEPA states that combining appropriate visual inspection with the measures described below would generally provide environmental protection equivalent to that provided by visual inspection plus another form of testing. Specifically, USEPA generally believes that visual inspection plus elevation of a shop-built container in a manner that decreases corrosion potential (as compared to a container in a contact with soil) and makes all sides of the container, including the bottom, visible during inspection (e.g., where the containers are mounted on structural supports, saddles, or some forms of grillage) would be considered "equivalent."

- The 1,000-gallon diesel fuel AST is a "double-walled tank". Monitoring of the tank is performed by visual inspection on a monthly basis. This is considered an adequate test of the tank's integrity and conforms to good engineering practice and applicable industry standards.
- Based on the USEPA guidance previously discussed for smaller, shop-built containers, with consideration of the specific features of 1,000-gallon diesel tank, the program of periodic visual inspections and both interstitial space and containment monitoring is considered to demonstrate equivalent conformance with applicable regulations.

B. Drainage from Diked/Containment Areas

Not applicable as the tank is double-walled and therefore has secondary containment built into it. Additional secondary containment such as diked areas are not required.

6.2 Recordkeeping

The original inspection records required in this section shall be signed and dated by the inspector and maintained in permanent files at the facility. The SPCC regulations require that all records shall be maintained for a minimum period of three years.

7.0 SECURITY [ref. 40 CFR 112.7(g)]

1. The tank is contained within the secured area of the facility and is locked when not in use.

2. The valve on the 1,000-gallon AST is located on top of the tank. Diesel fuel must be pumped out of the tank, therefore valve security, as far as spills, is not of concern at this time.

3. Loading/unloading connections are discussed, along with valve security in the above paragraph.

4. Lighting is strategically placed about the facility so that spills or leaks at bulk storage tanks, valves, pumps, etc. can easily be observed during nighttime hours.

8.0 PERSONNEL, TRAINING, AND DISCHARGE PREVENTION PROCEDURES [ref. 40 CFR 112.7(f)]

The designated person who is responsible for oil spill prevention is listed in Section 1.0 of this SPCC Plan.

Personnel shall be instructed in the operation and maintenance of equipment to prevent discharges of oil and hazardous materials, discharge procedure protocols, applicable pollution control laws and regulations, general facility operations, and the contents of the SPCC plan.

Formal safety meetings are held regularly to discuss operating procedures, spill prevention, and spill reporting (internal reporting within the facility). Such briefings shall be conducted frequently enough to assure adequate understanding of the SPCC Plan (at least annually), and shall highlight and describe known spill event or failures, malfunctioning components, and recently developed precautionary measures.

Records of personnel training related to this SPCC Plan shall be maintained a minimum of three years. Appendix E contains a suggested form for logging training personnel.

9.0 SPILL CONTINGENCY PROCEDURES

9.1 General

The purpose of this section is to provide guidance for response actions to be implemented to contain a spill or discharge of any magnitude. The goal of the response actions is to prevent oil and hazardous substances from reaching navigable waters, or any drains, sewers, ditches, etc. that lead to navigable waters. The procedures outlined in this SPCC plan are designed to contain a spill or discharge of oil anywhere in the facility.

9.2 Organizational Responsibilities

Note: See Section 9.3, Emergency Notification Call Lists, for names and contact information.

Employee and Supervisor

Each employee has the responsibility of reporting a spill, seepage, or potential pollution incident (of any size and at any location) to their immediate supervisor. The supervisor shall report the incident to the facility's On-scene Coordinator (OSC) or Alternate OSC.

The employee shall take immediate action to stop source of the spill (i.e. by closing the necessary valves, etc.), as long as no personal danger is involved and if the action (based on training and knowledge of the area) directly relates to his or her job.

If the incident poses an immediate threat to safety or property beyond the capabilities of internal response, the supervisor is responsible for requesting assistance from local emergency response agencies (i.e., Fire Department).

On-scene Coordinator (OSC) and Alternate OSC

The OSC is the ranking individual at the scene of a release incident who coordinates and directs response efforts to control and clean up the spill. The responsibility for initial emergency response management at the facility lies with Charles Davidson, the General Superintendent, who assumes the role of OSC. In the absence of the General Superintendent, the facility Person-In-Charge assumes command until relieved by higher management.

The OSC must make an initial determination of the nature, severity, and level of response necessary for the incident. The OSC is responsible to issue all required regulatory agency notifications (see Section 9.6). Specifically, the OSC must determine if the spill constitutes a **Reportable Discharge** and provide notification to the **National Response Center** and/or other agencies as required.

Response Team (RT)

The RT performs response actions as directed by the OSC. The RT is composed of designated facility emergency response personnel, who are trained and approved to participate in response actions.

Oil Spill Response Contractors

Oil Spill Response Contractors are outside organizations with specialized capabilities in control and cleanup of oil release incidents. The responsibility for mobilizing an Oil Response Contractor lies with OSC.

9.3 EMERGENCY NOTIFICATION CALL LISTS

Emergency Telephone Call List	
Names	**Emergency Phone Numbers**
Local Fire and Emergency Services	**911**
National Response Center (NRC) (Mandatory Notification)	**(800) 424-8802 (24 Hours)**
Alabama Department of Environmental Management (ADEM)	(251) 450-3400 (Mobile Field Office) (800) 843-0699 (24 Hours, Alabama EMA)
U.S. Environmental Protection Agency Region IV, Atlanta, Georgia	(404) 562-8700 (24-hours)
Mobile County Emergency Management	(251) 460-8000
Local Health Provider: USA Health University Hospital 2451 USA Medical Center Dr. Mobile, AL 36617	(251) 471-7000

[1]Companies being referenced or listed in this Plan does not constitute an endorsement by Thompson Engineering or Trans Ash, Inc.

Contact	Position	Work Phone	Work Cell Phone
Charles Davidson	General Superintendent/ On-Scene Coordinator (OSC)	(513) 502-8364	(513) 502-8364

Oil Spill Response Contractors	
Names	Emergency Phone Numbers
Oil Recovery of Alabama	(251) 690-9010; (800) 350-0443
United States Environmental Services	(251) 679-6638; (888) 279-9930
Aaron Oil	(251) 479-1616; (800) 239-4549

9.4 Immediate Response Action Procedures

In the event of a spill, the first priority is to provide medical first aid and health/safety assistance to affected personnel. The individual or individuals first observing a spill should then take immediate actions to control the spill, if such actions are practical, taking into account personal safety.

Personnel immediately on the scene must act appropriately but not recklessly. Personnel should not enter into a situation involving imminent risk to human health or life. In all instances, common sense, good judgment, training, and experience should prevail.

After immediate actions have been taken to ensure personal safety, control the spill source, and contain the spill (if possible). Additional response actions, including cleanup and disposal options, will depend on specific factors associated with the incident, such as quantity and type of materials, whether it is contained on-site, whether it poses imminent risks to human health or the environment, and so forth.

The following are general steps to follow in the event of a spill incident.

1. Provide medical first aid and health/safety assistance to affected individuals and implement safety and spill control measures for the area (if practical, without further endangerment of additional personnel). Eliminate the source of the spill or release (shut-off controls, valves, etc.), if it can be done safely.

2. The person discovering the spill should notify his/her supervisor.

3. Identify the spilled material type and quantity, and assess severity of the emergency. Depending on the situation, notify local fire and emergency agencies.

4. Isolate the area from other activity, if necessary. Identify other potential hazards in the spill area.

5. Notify the facility On-Scene Coordinator (OSC) or Alternate OSC. The OSC or alternate is responsible for regulatory agency notifications (if required) and to mobilize contract Oil Spill Response Contractors, if needed. Reporting periods vary depending on the type of material spilled. For hazardous and extremely hazardous materials, the reporting period may be as short as 15 minutes after discovery of the spill. In any case, reporting of spills should be done as soon as is possible.

6. If the spill is minor and response is within the facility's capabilities, assemble Response Team (RT) and direct RT clean-up. Assure that appropriate Personal Protective Equipment (PPE) is worn by the RT.

7. The RT will contain the spill (for example using temporary berms, or diversion ditches) to as small an area as possible, and prevent it from leaving facility boundaries. Select appropriate cleanup procedures and materials and arrange for appropriate disposal. Disposal methods must be in accordance with all applicable state and federal regulations. The nearest Subtitle D Landfill to the site is the Washington County Landfill.

8. Prepare and submit after-incident reports.

In the case of all spills, handling of contaminated materials and/or attempting to stop releases, restrict all sources of ignition and wear appropriate PPE. When a spill does occur, the Material Safety Data Sheet (MSDS) should be consulted to determine appropriate personnel protection requirements.

9.5 Facility Response Equipment

The following table lists equipment available at the facility for responding to small spills.

Response Equipment

- Spill Kit - rolls and pads of absorbent material, absorbent boom, disposable hazmat bags, and eye protection)
- Personal Protective Equipment - hard hats, shields, chemical resistant suits, boots, gloves
- Fire Extinguishers

Additional heavy earth moving equipment such as a front-end loaders, bulldozers, and backhoes, may be available (depending on their current deployment at the time of the spill) for spill containment, disposal, and cleanup.

9.6 Regulatory Notification and Reporting Procedures

9.6.1 Oil Spill Notifications

There is no quantitative definition that triggers reporting requirements for an oil spill. A **Reportable Spill** for Federal regulatory requirements is defined in 40 CFR 110 as "a discharge of such quantities of oil into or upon the navigable waters of the United States or adjoining shorelines determined to be harmful to the public welfare of the United States . . . to include discharges which violate applicable water quality standards or cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines, or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines."

Therefore, in order to determine whether an oil spill requires Federal notification, it must be determined whether the oil has entered (or poses a threat to enter) navigable waters of the United States. The definition of "navigable waters of the United States" (which may be found in 40 CFR 110) is very broad. In general, it includes nearly all surface waters, tributaries (including intermittent streams), and adjacent wetlands. As a matter of practice, Federal notification is likely required for any oil spill that has migrated off-site by surface drainage (or threatens to migrate off-site) and/or has entered a storm drain that flows off-site.

An oil spill that requires Federal notification must be reported to the National Response Center (NRC). This notification must be done as soon as possible after the spill is discovered.

An example notification form containing information required for NRC notification is contained in Appendix D. It is not necessary to compile all information before calling NRC.

In addition, the State of Alabama includes groundwater in the definition of the "waters of the State," and discharge of oil into groundwater would constitute a reportable spill to the State. Therefore, an oil spill incident that enters soil and threatens to reach groundwater may require state notification (but not necessarily Federal notification).

Oil spill incidents requiring state notification must be reported to the Alabama Department of Environmental Management (ADEM).

9.6.2 Post-spill reporting

Whenever more than 1,000 gallons of oil are discharged into navigable waters in a single incident, or more than 42 gallons of oil are discharged in each of two incidents occurring within any 12-month period, a written report must be submitted to the USEPA Regional Administrator:

US Environmental Protection Agency
Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-3104

(404) 562-8651

This report must also be sent to the state agency responsible for oil pollution control activities:

Alabama Department of Environmental Management
Field Operations Division
P.O. Box 301463
Montgomery, AL 36130-1463
(334) 394-4382

These requirements are defined in 40 CFR 112.4. The report must contain the following:

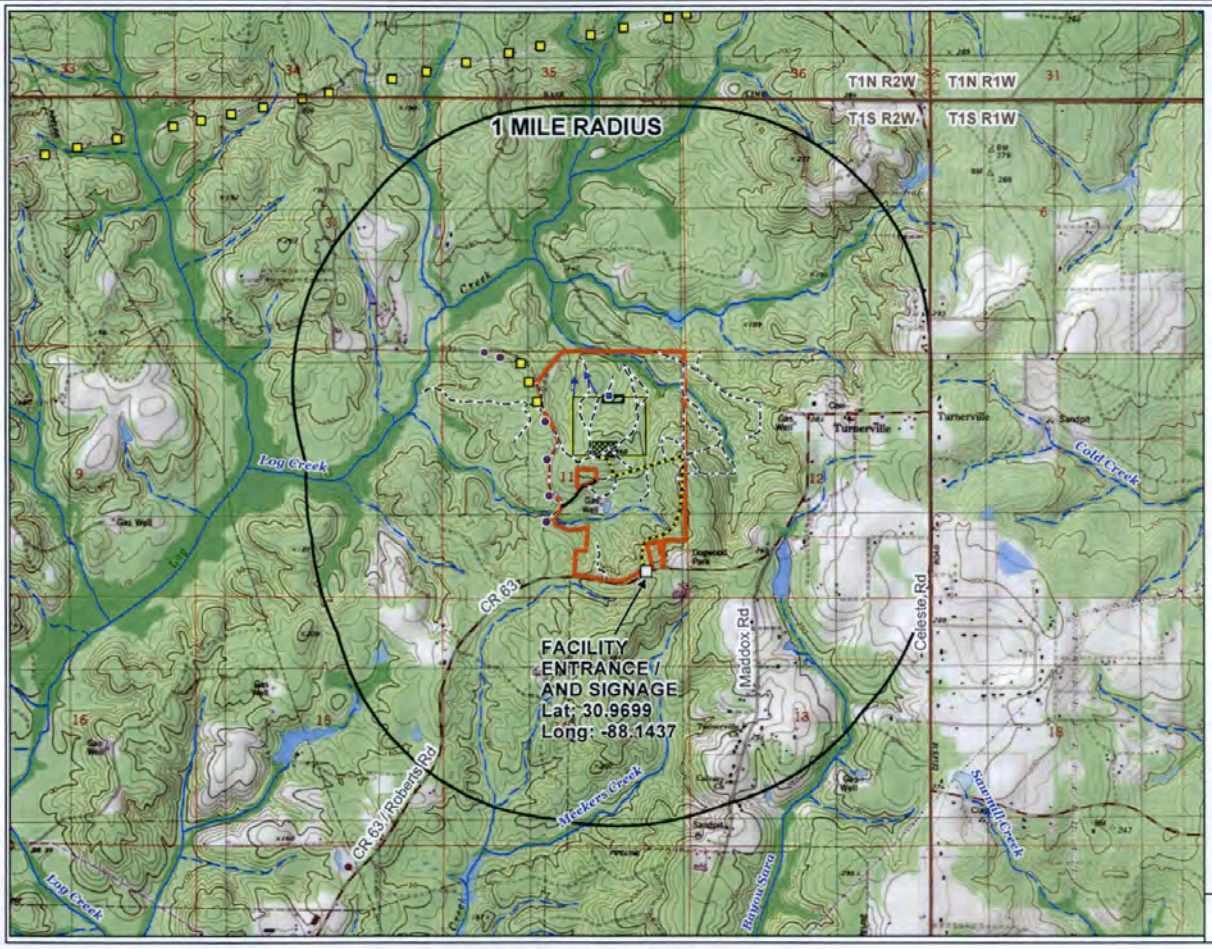
- Name of facility
- Name(s) of the owner or operator of the facility
- Location of the facility
- Maximum storage or handling capacity of the facility and normal daily throughput
- An adequate description of the facility, including maps, flow diagrams, and topographical maps (provide a complete copy of the SPCC plan)
- The cause(s) of such discharges, including a failure analysis of system or subsystem in which the failure occurred

- Corrective actions and/or countermeasures taken, including a description of equipment repairs and/or replacements
- Additional preventive measure(s) taken or contemplated to minimize the possibility of recurrence
- Such other information as the Regional Administrator may reasonably require as pertinent to the plan or discharge

The USEPA will determine the need for a written incident report for hazardous substance releases on an individual basis. This determination is primarily based on the telephone report to the NRC outlined in Paragraph 9.6.2, above.

Table 1 – Aboveground Oil Storage Container Inventory

ID No.	*Area or Location*	*Container Contents or Equipment Description*	*Container Volume (gallons)*	*Secondary Containment?*	*Dike Net Volume (gallons)*	*Comments and Prediction of Oil Discharge*
1	East side of Entrance Road at Site	Diesel	1,000	Yes, Double Walled Tank	N/A	Spills from the Diesel Tank would most likely flow in a northerly direction toward the stormwater pond. Should the spill reach the pond, flow would be through it to its discharge point and to a tributary to the Log Creek



thompson
ENGINEERING

TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE,
MOBILE COUNTY, ALABAMA

FIGURE 1
TOPOGRAPHIC MAP

LEGEND

- Parcel 1 (289 AC)
- Borrow Pit (49 AC Permit Area)
- Approx. Storage Areas
- Proposed Sediment Pond
- 1 Mile Radius
- PLSS Township
- Unpaved Road
- Paved Road
- Proposed Borrow Pit Entrance
- Facility Entrance & Signage
- Power Pole
- Proposed Discharge Point
- Transmission Tower - 2010 Planimetrics

NHD Flowline

- Stream/River: Intermittent
- Stream/River: Perennial

NWI - Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Drainage Pattern / Flow

*Mobile County 2010 Parcel Data, Not a survey.
For representation purposes only.
City of Mobile 2010 Planimetric Data
Copyright © 2013 National Geographic Society, i-cubed
Chunchula Quadrangle - 1981, Rev. 1986

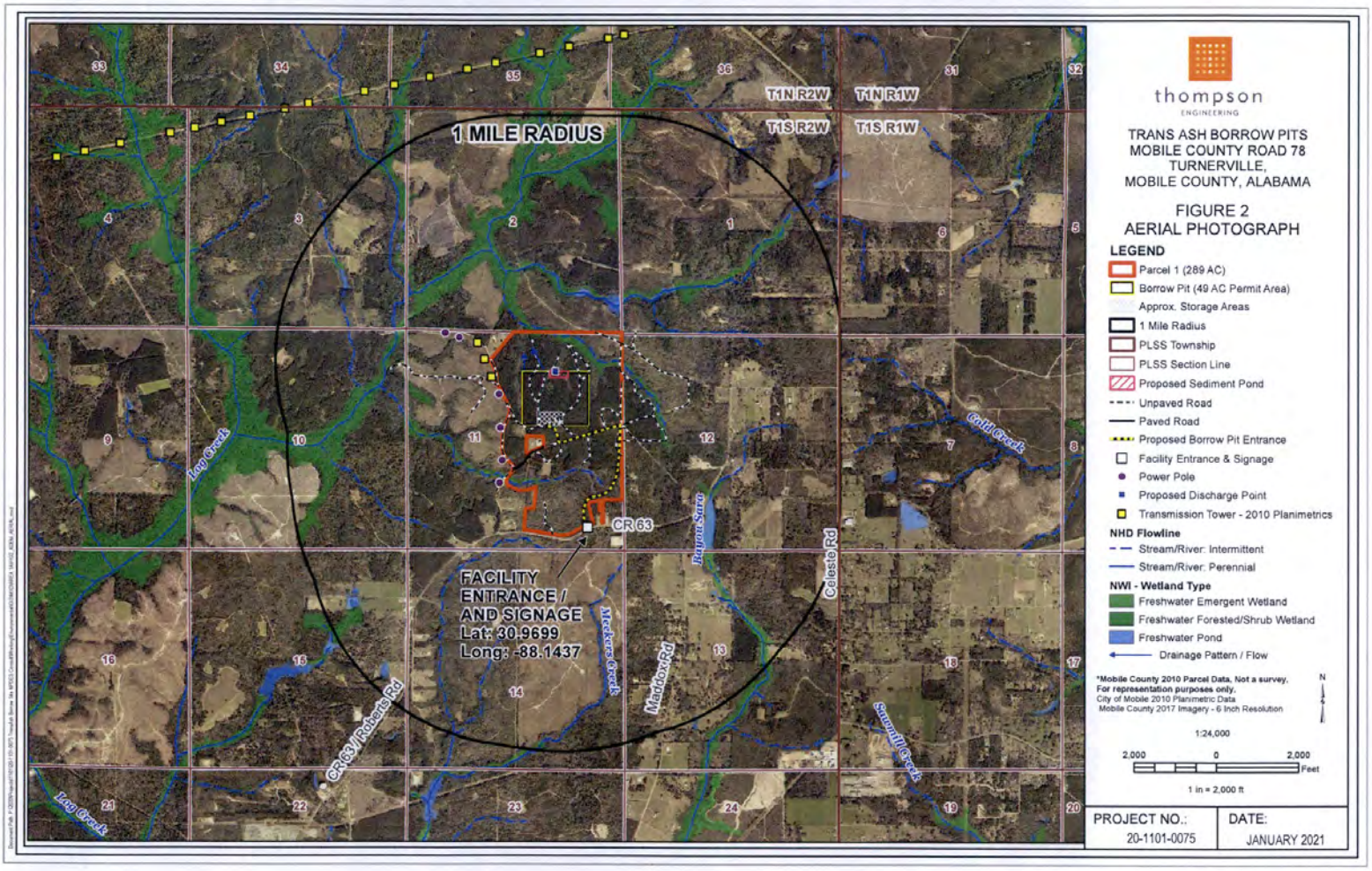
N

1:24,000

2,000 0 2,000 Feet

1 in = 2,000 ft

PROJECT NO.:	DATE:
20-1101-0075	JANUARY 2021


1 MILE RADIUS
T1N R2W
T1N R1W
T1S R2W
T1S R1W
CR 63
FACILITY ENTRANCE / AND SIGNAGE
Lat: 30.9699
Long: -88.1437
CR 63/ Roberts Rd
Celeste Rd
Maddox Rd
Meckers Creek
Bayou Sara
Log Creek
Cold Creek
Sawmill Creek
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TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE,
MOBILE COUNTY, ALABAMA
FIGURE 2
AERIAL PHOTOGRAPH
LEGEND
Parcel 1 (289 AC)
Borrow Pit (49 AC Permit Area)
Approx. Storage Areas
1 Mile Radius
PLSS Township
PLSS Section Line
Proposed Sediment Pond
Unpaved Road
Paved Road
Proposed Borrow Pit Entrance
Facility Entrance & Signage
Power Pole
Proposed Discharge Point
Transmission Tower - 2010 Planimetrics
NHD Flowline
Stream/River: Intermittent
Stream/River: Perennial
NWI - Wetland Type
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Drainage Pattern / Flow
*Mobile County 2010 Parcel Data, Not a survey.
For representation purposes only.
City of Mobile 2010 Planimetric Data
Mobile County 2017 Imagery - 6 Inch Resolution
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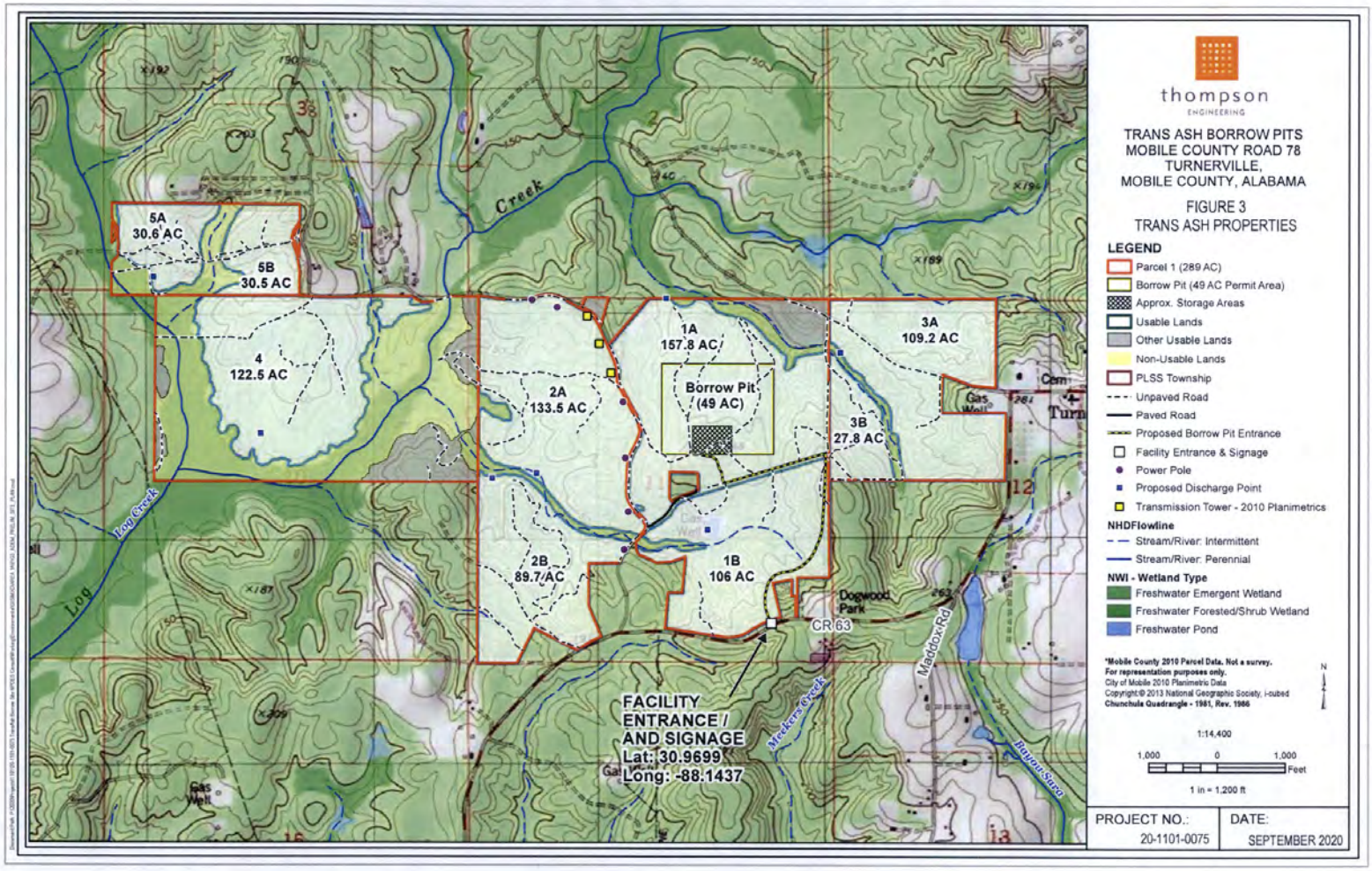
1 in = 2,000 ft
PROJECT NO.: 20-1101-0075
DATE: JANUARY 2021


5A
30.6 AC
5B
30.5 AC
4
122.5 AC
1A
157.8 AC
Borrow Pit
(49 AC)
2A
133.5 AC
3A
109.2 AC
3B
27.8 AC
2B
89.7 AC
1B
106 AC
Creek
Log Creek
Log
Dogwood
Park
CR 63
Maddox Rd
Meekers Creek
Bayou Sara
Gas
Well
FACILITY
ENTRANCE /
AND SIGNAGE
Lat: 30.9699
Long: -88.1437
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TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE,
MOBILE COUNTY, ALABAMA
FIGURE 3
TRANS ASH PROPERTIES
LEGEND
Parcel 1 (289 AC)
Borrow Pit (49 AC Permit Area)
Approx. Storage Areas
Usable Lands
Other Usable Lands
Non-Usable Lands
PLSS Township
Unpaved Road
Paved Road
Proposed Borrow Pit Entrance
Facility Entrance & Signage
Power Pole
Proposed Discharge Point
Transmission Tower - 2010 Planimetrics
NHDFlowline
Stream/River: Intermittent
Stream/River: Perennial
NWI - Wetland Type
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
*Mobile County 2010 Parcel Data. Not a survey.
For representation purposes only.
City of Mobile 2010 Planimetric Data
Copyright© 2013 National Geographic Society, i-cubed
Chunchula Quadrangle - 1981, Rev. 1986
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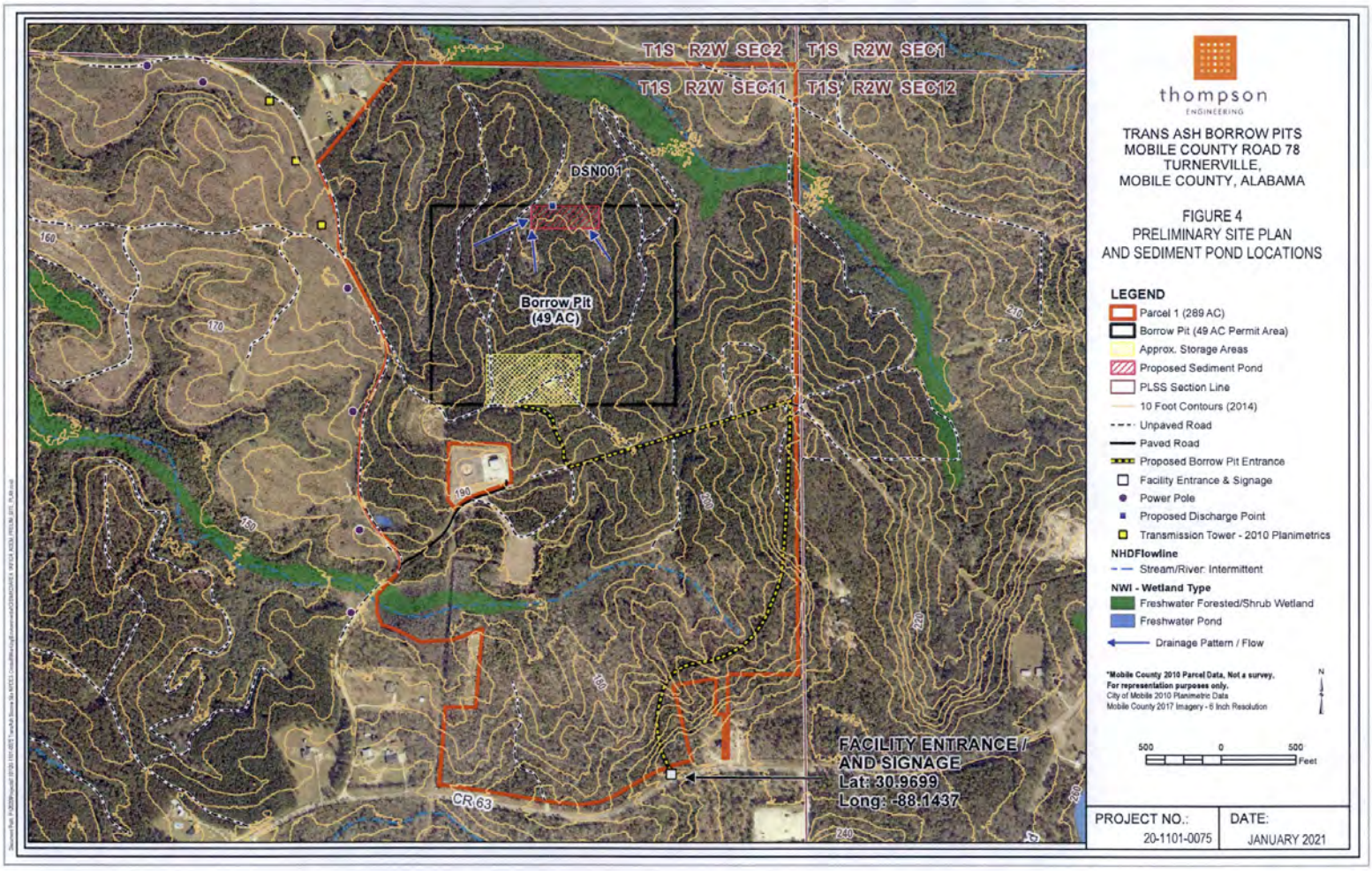
1 in = 1,200 ft
PROJECT NO.:
20-1101-0075
DATE:
SEPTEMBER 2020


T1S R2W SEC2
T1S R2W SEC1
T1S R2W SEC11
T1S R2W SEC12
DSN001
Borrow Pit
(49 AC)
160
170
190
150
200
210
220
230
240
CR 63
FACILITY ENTRANCE /
AND SIGNAGE
Lat: 30.9699
Long: -88.1437
thompson
ENGINEERING
TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE,
MOBILE COUNTY, ALABAMA
FIGURE 4
PRELIMINARY SITE PLAN
AND SEDIMENT POND LOCATIONS
LEGEND
Parcel 1 (289 AC)
Borrow Pit (49 AC Permit Area)
Approx. Storage Areas
Proposed Sediment Pond
PLSS Section Line
10 Foot Contours (2014)
Unpaved Road
Paved Road
Proposed Borrow Pit Entrance
Facility Entrance & Signage
Power Pole
Proposed Discharge Point
Transmission Tower - 2010 Planimetrics
NHDFlowline
Stream/River: Intermittent
NWI - Wetland Type
Freshwater Forested/Shrub Wetland
Freshwater Pond
Drainage Pattern / Flow
*Mobile County 2010 Parcel Data, Not a survey.
For representation purposes only.
City of Mobile 2010 Planimetric Data
Mobile County 2017 Imagery - 6 Inch Resolution
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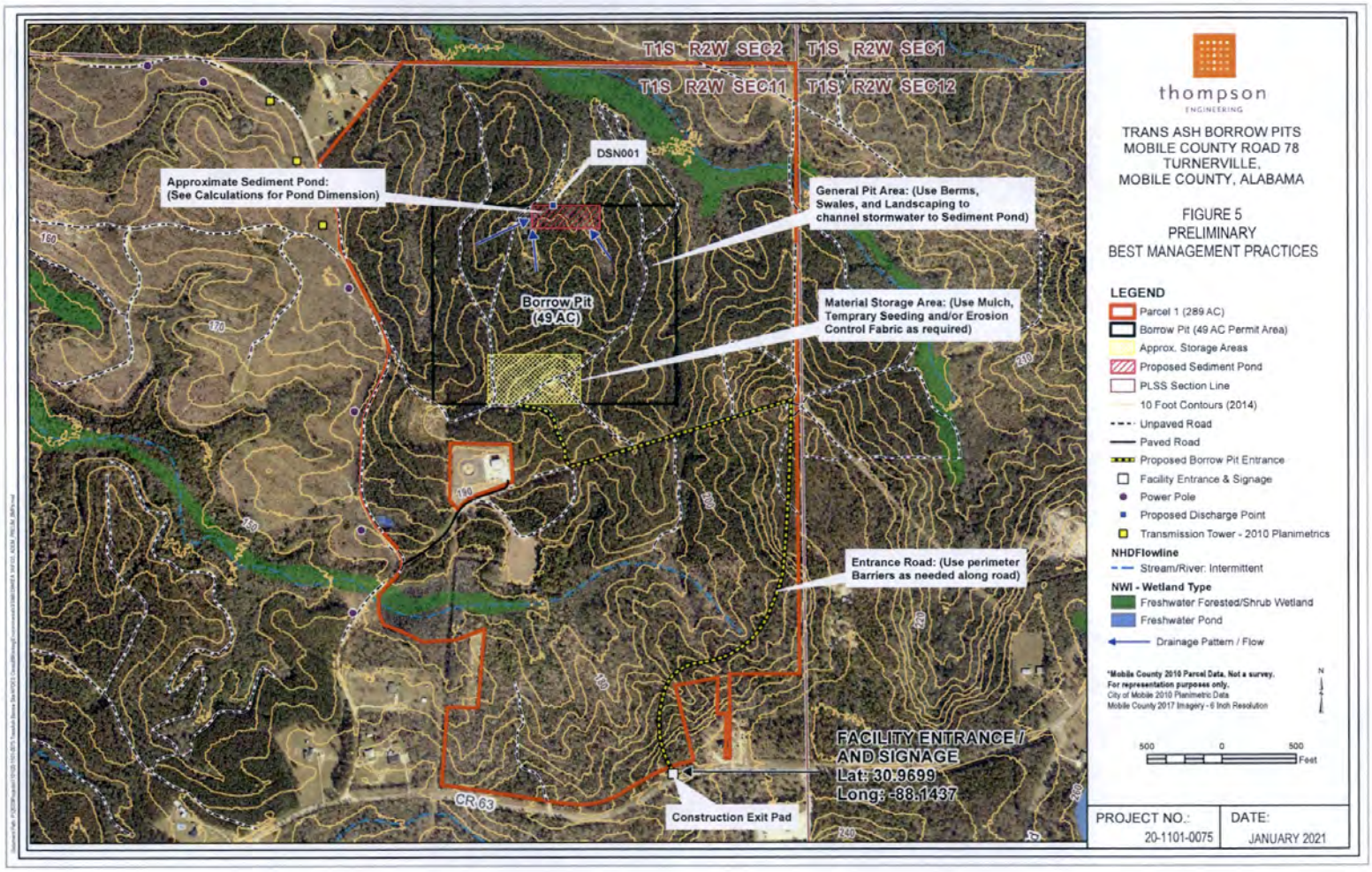
Feet
PROJECT NO.:
20-1101-0075
DATE:
JANUARY 2021


T1S R2W SEC2
T1S R2W SEC1
T1S R2W SEC11
T1S R2W SEC12
DSN001
Approximate Sediment Pond:
(See Calculations for Pond Dimension)
General Pit Area: (Use Berms, Swales, and Landscaping to channel stormwater to Sediment Pond)
Borrow Pit (49 AC)
Material Storage Area: (Use Mulch, Temprary Seeding and/or Erosion Control Fabric as required)
Entrance Road: (Use perimeter Barriers as needed along road)
FACILITY ENTRANCE / AND SIGNAGE
Lat: 30.9699
Long: -88.1437
Construction Exit Pad
CR 63
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TRANS ASH BORROW PITS
MOBILE COUNTY ROAD 78
TURNERVILLE,
MOBILE COUNTY, ALABAMA
FIGURE 5
PRELIMINARY
BEST MANAGEMENT PRACTICES
LEGEND
Parcel 1 (289 AC)
Borrow Pit (49 AC Permit Area)
Approx. Storage Areas
Proposed Sediment Pond
PLSS Section Line
10 Foot Contours (2014)
Unpaved Road
Paved Road
Proposed Borrow Pit Entrance
Facility Entrance & Signage
Power Pole
Proposed Discharge Point
Transmission Tower - 2010 Planimetrics
NHDFlowline
Stream/River: Intermittent
NWI - Wetland Type
Freshwater Forested/Shrub Wetland
Freshwater Pond
Drainage Pattern / Flow
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For representation purposes only.
City of Mobile 2010 Planimetric Data
Mobile County 2017 Imagery - 6 Inch Resolution
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Feet
PROJECT NO.: 20-1101-0075
DATE: JANUARY 2021

APPENDIX A

ACRONYMS

ACRONYMS

ADEM	Alabama Department of Environmental Management
ALDOT	Alabama Department of Transportation
AMSA	Area Maintenance Support Activity
API	American Petroleum Institute
ARE	Army Environmental
AST	Aboveground Storage Tank
CFMO-ENV	Construction and Facilities Management Office – Environmental Office
CFR	Code of Federal Regulations
CSMS	Combined Support Maintenance Shop
ECO	Environmental Compliance Officer
FMS	Field Maintenance Shop
HAZMAT	Hazardous Materials
HEMTT	Heavy Expanded Mobility Tactical Truck
HW	Hazardous Waste
JFHQ	Joint Force Headquarters
LPL	Local Purchase List
MFT	Mobile Fuel Truck
NGB	National Guard Bureau
NRC	National Response Center
NSN	National Stock Number
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration
OWS	Oil Water Separator
PE	Professional Engineer
POL	Petroleum, Oil, and Lubricants
RQ	Reportable Quantity
SOP	Standard Operating Procedures
SPCC	Spill Prevention, Control, and Countermeasure
SRC	Spill Response Coordinator
SRT	Spill Response Team
TPU	Tank and Pump Unit
TSCA	Toxic Substances Control Act
USEPA	United States Environmental Protection Agency

APPENDIX B

CERTIFICATION OF THE APPLICABILITY OF SUBSTANTIAL HARM CRITERIA

Certification of the Applicability of Substantial Harm Criteria
[40 C FR 112, Appendix C, Attachment C-II]

Does the facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?

Yes ☐ No ☒

Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and, within any storage area, does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation?

Yes ☐ No ☒

Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Appendix C or a comparable formula) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments?

Yes ☐ No ☒

Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula in Appendix C or a comparable formula) such that a discharge from the facility would shut down a public drinking water intake?

Yes ☐ No ☒

Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last five years?

Yes ☐ No ☒

Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining information, I believe that the submitted information is true, accurate and complete.

Signature: _____

Name (Please type or print): **Steven L. Fields**

Title: **Senior Project Manager**

Date: _____

Notes:

- Explanations of terms can be found in Appendix C to 40 CFR 112. If a comparable formula to the ones contained in Attachment C-III is used to establish the appropriate distance to fish and wildlife and sensitive environments or public drinking water intakes, documentation of the reliability and analytical soundness of the formula must be attached to this form.
- For further description of fish and wildlife and sensitive environments, see Appendix I, II and III to DOC/NOAA's "Guidance for Facility and Vessel Response Plan: Fish and Wildlife and Sensitive Environments" (see Appendix E to 40 CFR 112, Section 10, for availability) and the applicable Area Contingency Plan.

APPENDIX C

INSPECTION PROCEDURES AND REPORT FORMS

PROCEDURE FOR BULK OIL STORAGE CONTAINER INSPECTIONS

1. Visual Inspection Criteria:

Item	Things to Look For During the Inspection
Areas around containers	Debris inside the area, oil spills or leaks, cracks in the vessel walls or base, physical damage to surrounding walls from vehicles, foundation settlement.
Container Condition (incl. Support Structure if applicable)	Physical damage, corrosion, leaks, spills, cracks. Fill port should be closed and container labeled.
Valves, piping, connections, etc.	Condition of valves, piping, connections, hoses, etc. Is there evidence of deterioration or damage? Is there evidence of spills or leakage?

2. Frequency: The frequency of inspections shall be monthly.
3. Records: Inspection records are recorded on standard forms, see attached.

BULK OIL STORAGE CONTAINER INSPECTION REPORT

Inspection Report for: _____ _____
Month Year

Indicate if satisfactory by checking table with response of Yes, No, or NA (not applicable). See instructions on previous page.

Container Number & Description	**Product in Interstitial Space?**			**Container Condition (incl. Support Structure) satisfactory?**			**Diked Area around tank satisfactory?**			**Valves, Piping, Connections, etc. Satisfactory?**		
	Yes	No	NA	Yes	No	NA	Yes	No	NA	Yes	No	NA
3,000-gal Diesel Tank												
500-gal. Hydraulic Oil Tank												

Comments (describe deficiencies noted, action items that need to be taken, etc. Reference tank number). All "No" responses will require an answer.

_____

_____

_____

Inspection Performed by:

_____ _____ _____
Print Name Signature Date

Distribution: Submit original completed form to designated individual for permanent file retention.

APPENDIX D

NOTIFICATION FORM FOR REPORTABLE SPILLS

NOTIFICATION FORM FOR REPORTABLE SPILL TO THE NATIONAL RESPONSE CENTER (NRC)*

INVOLVED PARTIES	
(A) Reporting Party	(B) Suspected Responsible Party
Names:	Names:
Phones: ( )	Phones: ( )
Company:	Company:
Position: Address	Organization Type: Private citizen — Private enterprise Public utility — Local government State government — Federal government
City:	City:
State	State:
Zip	Zip:

Were Materials Released (Y/N)?

Calling for Responsible Party (Y/N)?

INCIDENT DESCRIPTION

Source and/or Cause of Incident:_____ **Weather Conditions:**_____

Date:___/_____/_____ **Time:**_____

Cause:_____

Incident Address/Location:_____ **Nearest City:**_____
Distance from City:_____

Storage Tank Container Type - Aboveground (Y/N) Underground (Y/N) Unknown

Tank Capacity:_____ **Facility Capacity:**_____
Latitude Degrees:_____ **Longitude Degrees:**_____ **Mile Post or River Mile:**_____

MATERIALS

Released Quantity: _____ **Released Material:**_____
Quantity in Water: _____ **Unit of Measure:** _____

REMEDIAL ACTION

Actions Taken to Correct or Mitigate Incident:_____

IMPACT

Number of Injuries: _____ **Number of Fatalities:**_____
Were There Evacuations (Y/N/U)? _____ **Number Evacuated:**_____
Was there any Damage (Y/N/U)? _____ **Damage in Dollars:**_____

ADDITIONAL INFORMATION

Any information about the incident not recorded elsewhere in the report:

CALLER NOTIFICATIONS

EPA **STATE** **USCG** **OTHER (DESC)**

*[This form summarizes information to be reported to NRC. It is not necessary to wait for all information before calling NRC.]

APPENDIX E

TRAINING LOGS

PERSONNEL TRAINING LOG

NAME	DATE	NO. OF HOURS	TYPE OF TRAINING

APPENDIX F

GUIDELINES FOR FACILITY LOADING AND UNLOADING OPERATIONS

DEPARTMENT OF TRANSPORTATION GUIDELINES FOR UNLOADING DIESEL FUEL/GASOLINE (CLASS 3 FLAMABLE LIQUID)

- NO SMOKING WHILE LOADING OR UNLOADING
- KEEP FIRE AWAY, LOADING AND UNLOADING
- UNLOADING: A MOTOR CARRIER WHO TRANSPORTS HAZARDOUS MATERIALS BY CARGO TANK MUST ENSURE THAT THE CARGO TANK IS ATTENDED BY A QUALIFIED PERSON AT ALL TIMES DURING UNLOADING
- A PERSON "ATTENDS "THE LOADING OR UNLOADING OF A CARGO TANK IF, THROUGHOUT THE PROCESS, HAS AN UNOBSTRUCTED VIEW OF THE CARGO TANK, AND IS WITHIN 25 FEET OF THE CARGO TANK
- A PERSON IS QUALIFIED IF HE HAS BEEN MADE AWARE OF THE NATURE OF THE HAZARDOUS MATERIAL WHICH IS TO BE LOADED OR UNLOADED, HE HAS BEEN INSTRUCTED ON THE PROCEDURES TO BE FOLLOWED IN EMERGENCIES, HE IS AUTHORIZED TO MOVE THE CARGO TANK, AND HE HAS THE MEANS TO DO SO.
- A DELIVERY HOSE, WHEN ATTACHED TO THE CARGO TANK IS CONSIDERED A PART OF THE VEHICLE
- ENGINE STOPPED: UNLESS THE ENGINE OF A CARGO TANK MOTOR VEHICLE IS TO BE USED FOR THE OPERATION OF A PUMP, NO CLASS 3 MATERIAL SHALL BE LOADED INTO OR UNLOADED FROM ANY CARGO TANK MOTOR VEHICLE WHILE THE ENGINE IS RUNNING
- BONDING AND GROUNDING OF CONTAINERS IS REQUIRED

FACILITY LOADING AND UNLOADING OPERATIONS

FILLING OF STORAGE TANKS:

1. CONNECT TRANSFER HOSE TO TERMINAL CONNECTION OF TANK FILL LINE.

2. BEGIN TRANSFER OF OIL OR DIESEL OR GASOLINE. FILLING PROCEDURES MUST MEET ALL DOT REQUIREMENTS.

3. TRANSFER OPERATIONS MUST BE COMPLETED BEFORE DISCONNECTING TRANSFER LINE.

4. WHEN DISCONNECTING TRANSFER LINES, ENSURE THAT NO FUEL OR OIL IS SPILLED ONTO THE GROUND OR OUTSIDE THE CONTAINMENT.

5. THE PERSON ACCOUNTABLE FOR OIL SPILL PREVENTION IN THE AREA OF A SPILL MUST BE CONTACTED IMMEDIATELY IF ANY MATERIAL IS SPILLED TO THE GROUND DURING THE UNLOADING PROCESS.

6. THE SPILL MUST BE CLEANED UP FOLLOWING THE PROCEDURES OUTLINED IN THIS SPCC PLAN.

SPECIFIC SPILL RESPONSE ACTIONS FOR VARIOUS MATERIALS

The information contained in the following specific spill response actions is general in nature. When and if a spill does occur, the MSDS should be used for response actions.

a. Acid Spills: If at all possible, remain upwind, utilize proper personal protective equipment, neutralize the spill, and then clean-up the spill.

   (1) Personal Protective Equipment: Use 18" rubber or neoprene gloves, rubber or neoprene apron, rubber high top boots or overshoes, long sleeve shirt, and full-face shield or approved NIOSH full face piece mask with organic/acid gas, high efficiency cartridge.

   (2) Neutralization: Add sodium bicarbonate to the acid spill until it is completely covered. Test the pH for a reading of 6 to 8.

   (3) Cleanup: Add sawdust or clay until the acid and sodium are completely covered. Remove the material with a non-sparking shovel and place into a plastic, glass or rubber container. Use the proper DOT label, and hazardous waste label marked "ACID WASTE" with accumulation start date. Contact manufacturer or ADEM for disposal instructions.

b. Antifreeze Spills: Provide adequate ventilation, proper personal protective equipment, and then clean-up the spill.

   (1) Personal Protective Equipment: Use 18" rubber or neoprene gloves rubber or neoprene apron, rubber high top boots or overshoes, disposable coveralls, long sleeve shirt, and a face shield or goggles.

   (2) Spill Control Actions: Close off any entrance to nearby surface water drainage, use dirt or absorbent material to control the spread of the material.

   (3) Cleanup: Collect material in drums. Contact manufacturer or ADEM for disposal instructions.

c. Caustic Spills: If at all possible, remain upwind, utilize proper personal equipment, neutralize the spill, and then cleanup the spill.

   (1) Personal Protective Equipment: Use 18" rubber or neoprene gloves, rubber high top boots or overshoes, long sleeve shirt, disposable coveralls with hood, and a full-face shield or approved NIOSH full face piece mask with a high efficiency dust, fume: and mist cartridge.

   (2) Neutralization: Add 6N hydrochloric acid (one part water to one part concentrated HCL) to a liquid caustic spill. If the spill is a solid, containerize as much as possible, then add water to the remaining material. Test the pH for a reading of 5 to 8.

   (3) Cleanup: Add absorbent if necessary. Scoop up spent solid, absorbent material with non-sparking shovel and place into proper waste container. Use the proper DOT label and, hazardous waste label marked "CAUSTIC WASTE" with accumulation start date. Contact manufacturer or ADEM for disposal instructions.

d. Flammable or Combustible: Keep flammable liquids away from any potential heat, spark, or flame source, utilize proper personal protective equipment, absorb the material, and then cleanup the spill.

   (1) Personal Protective Equipment: Use 18" rubber or neoprene gloves, rubber or neoprene' apron, rubber high top boots or overshoes, disposable coveralls, and a full-face shield.
   (2) Spill Control Actions: Enclose spilled liquid with dike and absorb.

(3) Cleanup: Use enough absorbent to soak up all spilled liquid. Remove the material with a non-sparking shovel and place material into a proper container. Use the proper DOT label, and hazardous waste label marked "FLAMMABLE or COMBUSTIBLE WASTE" with accumulation start date. Contact manufacturer or ADEM for disposal instructions.

e. Pesticide Spills: Keep flammable liquids away from any potential heat, sparks or flame sources, utilize proper personal protective equipment, neutralize the spill, and then cleanup, the spill.

(1) Personal Protective Equipment: Use a cotton duck, impermeable apron which has both sides chloroprene rubber coated, rubber high top boots, or overshoes, cotton cap, rubber gloves, natural or synthetic and organic solvent resistant, full face shield or approved NIOSH full face piece mask with pesticide mist cartridge.

(2) Additional Protective Equipment: Pest control personnel require additional items which are prescribed in USAEHA Guide to Protective Equipment for Pest Control Personnel, dated June 1977.

(3) Spill Control Actions: Enclose liquid spills with a dike, cover pesticide powers or dust with plastic, tarp, or lightly wet down to prevent blowing. Close off entrances to sewer intakes or surface water ditches. Recover as much free product as possible.

(4) Neutralization: Add sodium hypochlorite (bleach) and cover with lime.

(5) Cleanup: Add absorbent, remove material, and place into proper container. Contact manufacturer or ADEM for disposal instructions.

f. POL Products (Oils, Breakthrough, Hydraulic, and Transmission Fluids): Provide adequate ventilation, utilize proper personal protective equipment, absorb spilled material, and then cleanup the spill.

(1) Personal Protective Equipment: Use 18" rubber or neoprene gloves, rubber high top boots or overshoes, long sleeve shirt, disposable coveralls, and full-face shield or goggles.

(2) Spill Control Actions: Close off the entrance to any nearby surface or water drainage ditches/channels. Enclose spilled liquid with dike and absorb.

(3) Cleanup: Add absorbent material and place into proper container. Contact manufacturer or ADEM for, disposal instructions.

APPENDIX G

SPCC REGULATIONS
40 CFR PART 112