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C: Holt
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McKenna
Shead, Davis
Knauer, Jon
Brattebo, C

COMMONWEALTH of VIRGINIA

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

DEPARTMENT OF ENVIRONMENTAL QUALITY
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Robert G. Burnley
Director

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ENV file (ltr)
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September 28, 2005

Ms. Paige Holt
Environmental Manager
Alliant Ammunition and Powder Company, LLC
Radford Army Ammunition Plant
Route 114, P.O. Box 1
Radford, Virginia 24141

Re: Radford Army Ammunition Plant, Radford, VA
EPA ID No. VA1210020730
Final Permit for Treatment of Hazardous Waste at the Open Burning Ground[1] (OB Grounds/X01)

Dear Ms. Holt:

Enclosed is the final hazardous waste management facility permit for treatment of hazardous waste at the Open Burning Ground issued on September 28, 2005 to Radford Army Ammunition Plant.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date of service of this decision to initiate an appeal by filing a notice of appeal with:

Robert G. Burnley
Director, Department of Environmental Quality
629 East Main Street
P.O. Box 10009
Richmond, Virginia 23240-0009

In the event that this decision is served to you by mail, three days are added to this period. Please refer to Part 2A of the rules of the Supreme Court of Virginia, which describes

[1] PIOP
RCRA Permit Issued with HSWA Requirements, Corrective Action Schedule Not Necessary/OP200PG
Final Permit Effective October 28, 2005/OP205

the required contents of the Notice of Appeal, including specification of the Circuit Court to which the appeal is taken, and additional requirements governing appeals from decisions of administrative agencies.

Also enclosed is a copy of the transcript from the August 15, 2005 public hearing. The Department has received your comments and the U.S. Army's comments provided by letters dated September 1, 2005 and August 17, 2005, respectively. Comments have been incorporated into the permit, as appropriate. Enclosed is a summary of the Department's responses to the comments followed by copies of the comments themselves. Please note that no other comments were received during the public comment period.

The Department appreciated the courtesy and professionalism shown during the permitting process. If we can provide further assistance, please contact Matthew M. Stepien at (804) 698-4026 or by e-mail at mmstepien@deq.virginia.gov.

Sincerely,

Leslie A Romanchik

for Robert G. Burnley
Director

Enclosures
1 – Permit
2 – Public Hearing Transcript
3 – Comment Response Summary

cc: Robert N. Davie, III
Radford Army Ammunition Plant
SMARF-OP, P. O. Box 2
Radford, Virginia 24141-0099

Carol Johnson, US EPA Region III, (3WC21)
Aziz Farahmand – VDEQ-WCRO
Leslie Romanchik, VDEQ-CO (w/o enclosures)
Hassan Vakili, VDEQ-CO (w/o enclosures)
Dan Gwinner, VDEQ-CO [OP160DP] (w/o enclosures)
Edith Cornell, VDEQ-CO
Central Hazardous Waste Files

Public Hearing Transcript

Date/Time:	Monday August 15, 2005
Location:	New River Valley Competitiveness Center 6580 Valley Center Drive Radford, VA 24141
Applicant:	Radford Army Ammunition Plant (EPA ID# VA1210020730)
Type of Facility:	Hazardous Waste Treatment Permit for the Open Burning Grounds
Facility Name:	Radford Army Ammunition Plant
Facility Location:	Radford, Virginia
Purpose:	To solicit verbal comments concerning the technical merits of the Draft Treatment Permit for the Open Burning Grounds
Comment Period:	Began: July 15, 2005 Ends: September 1, 2005 @ 5:00 P.M.
Hearing Officer:	Erich Weissbart Environmental Engineer Senior Phone - (804) 698 – 4393
Permit Writer:	Matthew M. Stepien Environmental Engineer Senior Phone - (804) 698-4026
Mailing Address:	Virginia Department of Environmental Quality Division of Waste Program Coordination Office of Waste Permitting P.O. Box 10009 Richmond, Virginia 23240-0009

Enclosure 2

The Hearing Officer:

"It is now 7:05 PM, Monday August 15, 2005.

This hearing is now called to order. My name is Erich Weissbart, a Sr. Environmental Engineer for the Central Office within the Virginia Department of Environmental Quality. Today, I will function as the Hearing Officer for this meeting.

This public hearing is being held in the New River Valley Competitiveness Center, Training Room, at 6580 Valley Center Drive, Radford, VA. It is being held pursuant to Chapter 14, § 10.1- 1426 of the Code of Virginia (1950) as amended, and the requirements of Amendment 15A, 9 VAC 20-60-124, 260-264, 266, 268, and 270, of the Virginia Hazardous Waste Management Regulations, (Title 9, Virginia Administrative Code 9 VAC 20-60), which adopt by reference 40 CFR Parts 124, 260-264, 266, 268, and 270.

The purpose of this hearing is to allow the public the opportunity to evaluate the ability of the Radford Army Ammunition Plant, to comply with the applicable hazardous waste management requirements promulgated under Subtitle C of the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), 42 U.S.C. §§ 6921-6939(b). If approved the current draft permit would allow Radford Army Ammunition Plant to treat hazardous waste by way of Open Burning at its facility.

In accordance with Chapter 14, Article 4, § 10.1-1402 of the Va. Code, a notice of this hearing was published in The Roanoke Times newspaper on Friday, July 15, 2005. Radio advertisement of the hearing was made on WXLK-FM in Roanoke, Virginia on Friday, July 15, 2005. It is a requirement, that the draft permit is advertised and vented to public comment, which is the purpose of this hearing tonight. The public comment period will extend until 5:00 P.M. on Thursday, September 1, 2005. During this period, the Department of Environmental Quality will be accepting any comments on the proposed draft permit.

During this hearing, public comments are encouraged on the technical merits of the draft permit. In order to be recognized to speak on this project, you must sign the official register located at the back of the room.

I invite anyone who wishes to speak at this hearing but has not yet registered, to sign the Official Register at this time.

{Pause}

You will be called to come forward and speak one person at a time and in the order that's written

Enclosure 2

on the Official Register for this Public Hearing. Please speak clearly so your comments can be accurately and completely recorded into the official record of this hearing. All questions and comments are to be directed to me. You are requested to give your full name and mailing address prior to making your comments. This will provide the Department with the information needed to provide you with a written response to your verbal comments. You are requested to limit your comment period to a maximum of 10 minutes in order to ensure that all who are present and desire to speak will be allowed an opportunity to do so.

Comments on the draft permit, that are made after the hearing today, should be in writing and addressed to Matthew Stepien, Department of Environmental Quality, Office of Waste Permitting, P.O. Box 10009, Richmond, Virginia 23240-0009.

Mr. Stepien, would you please stand up and be recognized. Thank You.

Mr. Stepien is the permit writer for this project. At this time, he is the person who is designated as the Department's contact for this project.

Mr. Matthew Stepien will respond to technical questions presented at this hearing, which are specific to this project, in writing. These types of questions typically require additional evaluation of the site plans and the draft permit to ensure that no details are missed and to consider all the relevant issues. Therefore, to ensure that only accurate responses to those technical questions are given, verbal responses to your technical questions will not be provided tonight. After this hearing, Mr. Stepien and I will be available to answer questions regarding the administrative procedures involved with issuing a permit, time schedules, and processing activities. We will also answer general questions about the facilities and the draft permit.

After the comment period, the Director of the Virginia Department of Environmental Quality will consider all verbal and written comments received. He will then determine if the facility's draft permit is to be issued to the Radford Army Ammunition Plant, as proposed.

Mr. Stepien, would you please bring forth the Official Register. Thank You.

{Pause} {Project Engineer Brings document forth)

The Official Register indicates that there are no names of anyone who wishes to speak on the record at this time.

If there is anyone present that has not signed and wishes to have his or her comments entered into the official record, please come forward at this time.

Let the record of this preceding show that no persons are present that wish to comment at this

Enclosure 2

time.

Since there is no one present who wishes to speak at this time; I hereby declare that this meeting is adjourned as of this time, 7:13 PM, Monday, August 15, 2005."

Hearing is ended.

Enclosure 2

COMMENT RESPONSE SUMMARY
FINAL PERMIT FOR TREATMENT OF HAZARDOUS WASTE AT THE OPEN BURNING GROUNDS
RADFORD ARMY AMMUNITION PLANT (RFAAP)

Comments from Radford Army Ammunition Plant (letter dated August 17, 2005)

1. *Table II.E-2 Personnel Training Summary of RFAAP Hazardous Waste Program*
ACO staff titles, responsibilities need to be revised as follows:
Title: ACO Safety Risk Manager
Responsibilities: Oversight of operating contractor in safety management.
Title: ACO Environmental Engineer
Responsibility: Oversight of operating contractor in solid/hazardous waste management.

DEQ Response:
The Final Permit has been revised accordingly.

Comments from Alliant Ammunition and Powder Company LLC (letter dated August 30, 2005)

GENERAL COMMENTS

1. *Page II (prior to table of contents): DEQ states: "This permit is effective as of September 30, 2005 and shall remain in effect until September 15, 2015 . . . ." Why does this say the permit expires 15 days short of a full 10 years? The page headers elsewhere in the permit state the permit has an expiration date of September 30, 2015.*

   DEQ Response:
   See 40 CFR 124.15. Permit is effective 30-days from decision date and expires in 10-years. This page has been modified as appropriate.

2. *I.E.2 (and several others): The draft permit generally requires the use of EPA's SW-846 methods as the exclusive sampling and analytical methods. EPA has just promulgated a rule to "allow more flexibility when conducting RCRA-related sampling and analysis by removing from the regulations a requirement to use the methods found in . . . SW-846." 70 Fed. Reg. 34538 (June 14, 2005). EPA says the new rule "is an important step forward in implementing the use of a performance-based approach" to sampling and analysis for RCRA purposes. Radford AAP would like the permit to allow flexibility to use "performance-based" sampling and analytical techniques other than those specified in SW-846. Although EPA's new regulations are not automatically applicable in Virginia (they will not apply in Virginia until the Virginia Waste Management Board adopts them), the flexibility under the federal rules on the presumption the Waste Board will adopt EPA's performance-based approach into Virginia's regulations in the near future.*

   DEQ Response:
   Radford AAP must comply with SW-846 as stated in Section I.E.2. If and when the new EPA regulations are adopted by the Virginia Waste Management Board, Radford AAP will then have the opportunity to amend the permit to include the new regulations.

3. *§ I.H: The citation should be to 9 VAC 20-60-270 B 15, not 5.*

   DEQ Response:
   Section I.H has been changed to say B 15.

4. *§ I.J.1: This section states: "These documents shall be maintained until post-closure is completed and certified . . . ." There is not post Closure in this permit.*

   DEQ Response:
   Section I.J.1 will read "These documents shall be maintained until closure is completed and certified...."

5. *§ II.E: DEQ refers to "the handling of reactive waste detailed in Attachment III.1.C. We could not find the reference.*

   DEQ Response:
   This reference does not apply and will be deleted from the permit.

6. *§ II.I.2.a.iii: This section concludes with "(NOT APPLICABLE)." Then why did DEQ include it in the draft permit?*

DEQ Response:
This section has been deleted from the permit.

7. *Module II – List of Attachments: Attachment II.C is listed as "Sampling Monitoring Program" but the correct title is "Soil Monitoring Program."*

DEQ Response:
Module II – List of Attachments has been changed to say "Soil Monitoring Program."

8. *Attachment II-B, § II.B.8(a): DEQ refers to "the Waste Analysis Plan . . . described in Section BB.1." I think this should be Section II.B.1.*

DEQ Response:
Section II.B.8 (a) has been changed to refer to II.B.1.

9. *Attachment II-B, § II.B.8(e): DEQ cites 40 CFR 264.23(c). There is no section 264.23.*

DEQ Response:
Since this section is Not Applicable it has been deleted from the permit.

10. *Attachment II-B, § II.B.8(f): DEQ cites 40 CFR 264.14(b)(6). There is no subsection (b)(6).*

DEQ Response:
This section should have been referencing 40 CFR 264.13 (b)(6) and the change has been made to the permit.

11. *Attachment II.B, Appendix II.B-1, Table 1: The table entries for Waste Groups 17, 18, and 19 refer to "Appendix 3.6 Constituents." This is apparently a reference to an appendix in the old Virginia Hazardous Waste Management Regulations ("VHWMR") that no longer exists. It ceased to exist several years ago when Virginia changed the VHWMR to a format that incorporates the federal RCRA regulations by reference. The table should refer to 40 CFR Part 61, App. VIII.*

DEQ Response:
Table 1 in Appendix II.B-1 has been changed to reference 40 CFR Part 61, App VIII.

MODULE II GENERAL FACILITY CONDITIONS

ATTACHMENT II.F CONTINGENCY PLAN

1. *Section 2.3 Wastes Managed*
The following is missing from 2.3.1.b.: "ii. 2,4-Dinitrotoluene (hazardous waste number D030); and/or"

DEQ Response:
Subsection ii will be added to Section 2.3.1.b.

2. *Section 6.6 Disposal of Miscellaneous Waste and Debris*

This section should be re-numbered as Section 6.5.

DEQ Response:
This section has been renumbered to 6.5.

3. ***Section 6.7 Post-Emergency Equipment Maintenance***
This section should be re-numbered as Section 6.6.

DEQ Response:
This section has been renumbered to 6.6.

4. ***Table 6 Emergency Equipment Locations at RFAAP***
Table 2 does not include Building 1908 – Absorbent materials/booms.

DEQ Response:
Table 6 of Attachment II.F will be modified to include Building 1908.

ATTACHMENT II.G. CLOSURE PLAN

5. ***Section 5.2.2 Closure Alternatives for Soil and Groundwater***
Bullet item 1 should be modified as follows: "If soils in the area of the OB Ground have been impacted; and"

DEQ Response:
Bullet 1 of Section 5.2.2 has been modified to say "If soils in the area of the OB Ground have been impacted; and"

6. ***Section 6.5.1 OB Ground***
In the fourth sentence of the third paragraph, the word "towl" should be changed to "total."

DEQ Response:
The fourth sentence of the third paragraph in Section 6.5.1 has been changed to say total.

7. ***Section 6.5.1 OB Ground***
In the last paragraph last sentence please revise as follows: "If clean closure cannot be achieved then the facility will be closed in accordance with the applicable regulations or as a landfill."

DEQ Response:
The last sentence of the last paragraph in Section 6.5.1 will read as follows, "If clean closure can not be achieved then the facility will close as a landfill or in accordance with the applicable regulations."

8. ***Table 1 Hazardous Constituents Contained in Wastes Treated at the Incinerator***
The title of Table 1 should be changed to Hazardous Constituents Contained in Wastes Treated at the Open Burning Ground.

DEQ Response:
The title to Table 1 will be changed to Hazardous Constituents Contained in Wastes Treated at the Open Burning Ground.

MODULE III OPERATING CONDITIONS

1. ***Paragraph III.C.2 and III.C.6:***
Please remove "Nitrocellulose skid burn". It should read "skid burn".

DEQ Response:
Paragraph III.C.2 and III.C.6 have been changed to read skid burn.

2. ***Paragraph III.C.4:***
Please clarify two issues in this sentence:
"If the precipitation forecast is greater than 50% and the winds are > 20 miles per hour the area manager will not allow open burning operations to commence."
   1. *Should the "and" be an "or"?*
   2. *If the precipitation forecast is greater than 50% for the day BUT the forecast is late afternoon showers or thunderstorms may we burn prior to the forecast precipitation? We can use the local weather service as well as forecasts provided by Internet providers such as weatherunderground or the weather channel.*

DEQ Response:
The sentence mentioned above in Section III.C.4 will be modified to read, "If the precipitation forecast is greater than 50% OR the winds are > 20 miles per hour the area manager will not allow open burning operations to commence."

The following sentence will be included in the permit to address item 2 above, "If a precipitation forecast of greater than 50% is predicted by the weather service providers within 3 hours of the start of a burn then the area manager will not allow open burning to commence. "

3. ***Paragraph III.C.5:***
Please add that waste may also be received in DOT approved fiber drums.

DEQ Response:
This will be added to Section III.C.5.

4. ***Paragraph III.H:***
This section requires compliance with the recordkeeping and reporting requirements in 40 CFR 264.1035 and 1036. These regulations are contained in 40 CFR Part 264, Subpart AA – Air Emissions Standards for Process Vents. Why are these recordkeeping and reporting requirements applied to open burning? The specified records don't fit open burning.

DEQ Response:
Section III.H will be revised to state the following: "The permittee shall comply with all applicable procedures for recordkeeping and reporting requirements provided in 40 CFR

264.73 (b) and 268.7, along with, the Inspection Schedule presented in Attachment II.D. Also refer to III.C.7 and Section II.I."

5. ***Table III-1:***
Radford notes that the performance standards presented in Table III-1 are extremely protective values, as based on the human health and screening-level ecological risk assessments (HHRA and SLERA). As directed specifically by the VADEQ, Radford had incorporated numerous conservative assumptions into the HHRA and SLERA. The combined effect of these multiple conservative assumptions has resulted in a considerable overstatement of risks associated with operations at the Open Burning Ground. Use of these highly conservative risk estimates to develop performance standards has placed more stringent limits on burning ground operations than is reasonable in order to assure protection of human health and the environment. Specific technical considerations that have led Radford to the conclusion that risks have been overstated as presented in the HHRA and SLERA include the following:
The assumptions used in the risk assessment were a combination of upper-bound or worst-case values along with some central tendency values, which overall would result in an overstatement of risks associated with emissions from the Open Burning Ground. Upper-bound or worst-case were used for those assumptions that had the largest influence on estimated risks. The estimates of emissions to the air and the particle deposition rate onto the ground both were highly conservative and had significant effects on the estimated risks. By themselves, these two assumptions resulted in significant overstatement of risks associated with operations at the Open Burning Ground.

- *VADEQ required Radford to use generic, literature-based emissions factor (BangBox data, developed at the Dugway Proving Ground in Utah) to evaluate emissions from the Open Burning Ground. In many cases the emissions factors and list of constituents based on the BangBox data were developed from waste streams that do not resemble the waste streams generated at Radford. In addition, Radford had expressed concerns about the data quality for the Bangbox data, and had argued from the beginning of the risk assessment process for relying on site-specific data rather than the Bangbox data. Use of the Bangbox data in the risk assessment resulted in risks being projected for the Open Burning Ground that, in all likelihood, would not be present based on actual open burning operations. Therefore, performance standards based on risk estimates developed with BangBox emissions factors would be overly protective of human health and the environment.*

- *VADEQ required Radford to present in the HHRA a subsistence farmer exposure scenario for risk management considerations. The subsistence farmer was assumed to live continuously at a location next to the fenceline of the Radford facility, consume homegrown produce and livestock produce assumed to be affected by emissions from the Open Burning Ground. The subsistence farmer was assumed to be exposed to the maximum impacts from open burning operations, for purposes of the HHRA. The results from that scenario have been used to develop performance standards for the Open Burning Ground. As noted in the HHRA report, and based on current and anticipated land uses, a subsistence farmer scenario is very unlikely to be present around the Radford facility. Therefore, using a subsistence farmer scenario in the HHRA resulted in risks being projected for the Open Burning Ground that are highly unlikely to be present. Performance standards based on the subsistence farmer scenario would be overly protective for the land uses and populations more likely to be present around the Radford facility.*

- *Performance standards are based on an overly conservative assessment of ecological risks. These ecological risks in the SLERA were developed using an assumption that emissions from the Open Burning Ground that deposited onto the ground were mixed into only the top one centimeter of soil. While Radford presented to VADEQ technically defensible arguments for why that mixing depth was overly conservative, VADEQ directed Radford to use the one centimeter value for assessing potential ecological pathways of exposure from soil, resulting in highly conservative ecological risk estimates, which translated into overly protective performance standards.*

In nearly all cases where assumptions have been incorporated into the HHRA and SLERA, values have been selected for those assumptions that systematically overstate risks potentially associated with emissions from the Open Burning Ground. The combined effect of these multiple conservative assumptions

has resulted in a considerable overstatement of risks associated with operations at the Open Burning Ground, and correspondingly has affected the performance standards as shown in Table III-1.

DEQ Response:
There were many challenges and uncertainties faced when it came to developing the risk assessment for Radford AAP. However, in order to provide the maximum level of protection to human health and the environment, the most conservative approach was taken.

ATTACHMENT III.A

6. *Please include in the permit that the intent of the permit is for Radford AAP to construct Stormwater Management Improvements. The specifications are to be used as guidelines and are not a binding condition of the permit. We intend to have the same company that submitted this plan provide us with QA/QC during construction. An as built document will be submitted to DEQ upon completion. We are requesting flexibility during construction.*

DEQ Response:
The following notice will be added to Attachment III.A:

Notice:

Radford Army Ammunitions Plant (RFAAP) must comply with the design of the Stormwater Management Improvements provided in this attachment. If RFAAP wishes to change the design that has already been approved by the Department of Environmental Quality (Department) then they will need to submit a written document to the Department summarizing the changes in which they intend to make. The Department will have the right to approve or disapprove any changes. Construction design drawings will be submitted to the Department before (if changed from original) the project begins and as-built drawings will be submitted to the Department after completion of the project. A change in materials of construction will not need Department pre-approval unless the changes affect the design.

MODULE IV DETECTION MONITORING

IV.B. DETECTION MONITORING REQUIREMENTS

1. *Paragraph IV.B.2 states that groundwater will be monitored at the OBG semiannually. Based on this paragraph and subsequently throughout the module Radford AAP will collect a single sample from each well on a semi annual basis. Please verify that this is the intent of the permit.*

DEQ Response:
Groundwater samples will be collected semiannually.

IV.G. STATISTICAL PROCEDURES
IV.G.1.a.

2. *Permit Condition IV.G.1.a. states: "If the appropriate statistical test (specified in Attachment IV.A, Appendix 6 and/or approved by the Director) indicates that the difference between the established*

background (or upgradient well concentration) and the downgradient well concentration is significant, the Permittee may repeat the procedure with a fresh sample from the monitoring well collected within thirty (30) days of the original sample."

The Permittees recognize that the timeframe for the collection of verification samples is not specifically defined in 40 CFR 264.98, and that the deadline stated in Permit Condition IV.G.1.a. of "within thirty (30) days of the original sample" is not achievable to obtain a validated result. The Permittees believe that changing the timeframe for the collection of verification samples to "within thirty (30) days from the date the analytical results are available from the laboratory performing the analyses" would be sufficient to meet the intent of the regulations.

DEQ Response:
The struck out text has been deleted and the bolded text added to module section IV.G.1.a:
"If the appropriate statistical test (specified in IV.A, Appendix 6 and/or approved by the Director) indicates that the difference between the established background (or upgradient well concentration) and the downgradient well concentration is significant, the Permittee may ~~repeat the procedure with a fresh sample from the monitoring well collected within thirty (30) days of the original sample~~ **resample within thirty (30) days of receipt of original laboratory data, not to exceed sixty days (60) from the date of original sample collection.**"

IV.H. MONITORING PROGRAM AND DATA EVALUATION
IV.H.5.c.

3. *Permit Condition IV.H.5.c. should be modified as follows: "For any Appendix IX constituents detected the Permittee may resample within thirty (30) days **from the date the analytical results are available from the laboratory performing the analyses,** and repeat the analysis for those constituents detected If the results of the second analysis confirm the initial results, **the Appendix IX constituents detected at concentrations above their respective quantitation limits** will form the basis for Compliance Monitoring.*
Please note that similar modifications should be made to Permit Conditions IV.H.5.d., IV.H.5.e.i., and IV.H.5.e.iv.

DEQ Response:
The bolded text has been added to module section IV.H.5.c:
"For any Appendix IX constituents detected, the Permittee may resample within thirty (30) days **from the date of the laboratory report**, and repeat the analysis for those constituents detected. If the results of the second analysis confirm the initial results, the detected Appendix IX constituents will form the basis for Compliance Monitoring."

No further revisions were made to the requested sections. It is the instrument detection limit for a constituent which is significant and not the laboratory derived reporting limit.

IV.H.6.d.

4. *The reference to 40 CFR 264.99 should be changed to 40 CFR 264.98.*

DEQ Response:
The reference is revised.

IV.J. ASSURANCE OF DETECTION

5. *Permit Condition IV.J. states: "The Permittee shall demonstrate to the Director that groundwater monitoring and corrective action measures necessary to achieve compliance with the groundwater protection standard under 40 CFR 264.92 are taken during the term of the Permit."*
Groundwater protection standards as defined under 40 CFR 264.92 are not applicable to Detection Monitoring Programs under 40 CFR 264.98, but are applicable only to Compliance Monitoring Programs under 40 CFR 264.99 and Corrective Action Programs under 40 CFR 264.100. Therefore, Permit Condition IV.J. should be removed from Permit Module IV.

DEQ Response:
The struck out text has been deleted and the bolded text added to module section IV.J.:
"The Permittee shall demonstrate to the Director that groundwater monitoring ~~and corrective action~~ measures necessary to achieve compliance with the ~~groundwater protection standard~~ **monitoring requirements** under 40 CFR 264.98~~2~~ are taken during the term of the Permit."

ATTACHMENT IV.A GROUNDWATER MONITORING PROGRAM SAMPLING AND ANALYSIS PLAN

I.C.4. WELL PURGING
I.C.5 GROUNDWATER SAMPLING EQUIPMENT

6. *Sections I.C.4. and I.C.5 do not include the low flow well purging and sampling procedures as specified in section 4.5 of the September 2003 Detection Groundwater Monitoring Program for the Open Burning Ground. Low flow sampling is the primary method by which groundwater samples are collected at Radford AAP. The low flow well purging and sampling procedures specified in section 4.5 of the September 2003 Detection Groundwater Monitoring Program for the Open Burning Ground were based on USEPA's "Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells" (1996), USEPA's "Ground Water Issue, Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures" (1996), and Alliant Techsystems' "Low-Flow Groundwater Sampling and Analysis Plan" (2002). Sections I.C.4 and I.C.5 should be modified to include the low flow well purging and sampling procedures as specified in section 4.5 of the September 2003 Detection Groundwater Monitoring Program for the Open Burning Ground. These methods are also in Radford AAP's Post Closure Care Permits with DEQ.*

DEQ Response:
Sections I.C.4., I.C.5., and I.C.7. of the Sampling and Analysis Plan were revised to include specific procedures associated with dedicated sampling equipment and micropurging.

I.C.6 DECONTAMINATION

7. *The last paragraph in Section I.C.6 should be modified as follows: "All decontamination water that is generated during sampling activities will be collected in containers and subsequently emptied into the Biological Wastewater Treatment Plant at Radford AAP. Disposable items will be disposed of as solid waste in an approved, permitted landfill."*

DEQ Response:
Section I.C.6. was revised per above.

I.D. FIELD AND LABORATORY QA/QC PROGRAM

8. *The second bullet item should be modified as follows: "One equipment rinsate (required only when non-disposable and non-dedicated equipment is being used)."*

DEQ Response:
Section I.D. was revised per above.

III.C. DATA QUALITY OBJECTIVE

9. *The following sentence should be added at the end of Section III.C.: "If an ACL or an EPA Region III Tap Water Risk Based Concentration for a specific constituent is less than the lowest LOQ listed in SW-846 for that constituent, then the lowest LOQ listed in SW-846 should be used."*

DEQ Response:
The following sentence was added to III.C.: "If an ACL or EPA Region III Tap Water RBC for a specific constituent is less than the lowest LOQ listed in SW-846 for that constituent, then an appropriate, DEQ approved, LOQ should be used."

ATTACHMENT IV.B

10. *The following constituents listed Attachment IV.B are not in 40 CFR 261 Appendix VIII (Hazardous Constituents) or in 40 CFR 264 Appendix IX (Ground-Water Monitoring List): Please provide the basis for including the non energetic constituents.*

- *Energetics*
  2,4,6-trinitrotoluene *3-nitrotoluene* *HMX*
  2-amino-4,6-dinitrotoluene *4-amino-2,6-dinitrotoluene* *RDX*
  2-nitrotoluene *4-nitrotoluene* *Tetryl*
- *Total Metals*
  Aluminum *Calcium* *Iron*
- *Miscellaneous*
  Nitrate *Nitrite*

The COPC list for the SMP was established to provide a baseline of potential hazardous constituents in the soil at the OBG. Those constituents could potentially be present due to airborne deposition associated with the burning operations at the unit. We currently have no reliable data regarding the presence, or absence, of hazardous constituents in the soil at the site. Therefore, we have chosen to collect an absolute worst case suite of hazardous constituents in an effort to accurately develop a defensible baseline assessment of the potential soil chemistry. The COPC list was developed from a Master List of Potential Constituents that was compiled as part of the Human Health Risk Assessment (HHRA) for the unit. The Master List was derived from empirical studies (bang box) tests as well as interpretations of existing waste inventories for the unit. The Master List was developed to address the universe of possible constituents, combustion byproducts and daughter compounds that might be associated with the waste stream itself and the operation of the unit. Accordingly, when developing the COPC list for the SMP, we proposed to sample for a large subset of the Master List under the auspice that we would be addressing a similar universe of constituents. However, as discussed, and stated, in the plan we are committed to sampling for this expanded list for no more than two (2) semi-annual events. Following those 2 events, the SMP indicates that we will reduce the list of constituents to only those constituents that have been detected above their respective action levels (typically the Region III industrial RBC). It is very possible, and likely, that the list of constituents that matriculate out of the first 2 events of sampling will be significantly smaller than the baseline list. One significant piece of evidence supporting the likelihood of limited detections is the long history of groundwater monitoring data at the site.

There are eight (8) plus years of defensible ground water analytical data for the unit. These data indicate that there is no significant impacts to the groundwater from any constituent in the waste inventory. At the time of the RCRA Post-Closure Part B permit application for the unit, the groundwater monitoring COPC list was carefully addressed by DEQ personnel responsible for development of the permit. The resulting current list of constituents was determined to accurately monitor the potential for impacts to groundwater based on historical monitoring

results and waste inventories for the site. Additionally, historic monitoring for the Appendix IX list of Hazardous Constituents at the site accurately determined that the current list of constituents adequately represents the groundwater geochemistry at the site.

Based on this information, it is reasonable to indicate that the recent proposed revisions to the groundwater monitoring COPC list based on the SMP are not appropriate as presented. Alternatively, RAAP may propose a more empirical approach to the development of a revised groundwater monitoring COPC list. Following implementation of the first 2 semi-annual soil monitoring events associated with the SMP, RAAP may consider revising the groundwater COPC list for any constituents detected above the respective risk based action levels for those constituents. As the data will be collected in a reasonably short widow of time (within 12 months), it seems prudent to wait and operate from some degree of analytical certainty, rather than apply the "broad net" approach to both the soil and groundwater media concurrently.

DEQ Response:
The basis for the proposed list of monitoring constituents was the facility's proposed soil monitoring list, the proposed groundwater monitoring list, and the current groundwater monitoring list. Since the above constituents are not considered hazardous constituents (not in Appendix VIII or Appendix IX constituent lists) they are removed from the groundwater monitoring list.

ATTACHMENT IV.C INITIAL BACKGROUND CONCENTRATIONS

11. *There are no background concentrations listed in Attachment IV.C.*

DEQ Response:
The Permittee should calculate and propose the initial background concentrations to be listed in Attachment IV.C. (see Permit Module section IV.D.2)

FROM THE COVER PAGE (of August 30, 2005 Letter)

Our major concerns are in Module IV. DEQ has added constituents based on the Soil Monitoring Program. The Human Health and Screening Level Ecological Risk Assessments were not allowed a 5 cm mixing zone yet groundwater program is insisting on analyzing for the same constituents 66 cm below ground surface. Please help us understand the scientific basis for the discrepancy.

It appears that Module IV left out the low flow monitoring method from Radford AAP's sampling plan. We have had these dedicated pumps in use since prior to 1999. The information was in the submitted plan and is also in the Post Closure care permits. A brief documentation of the detection Monitoring program is included it the comments.

DEQ Response:
The purpose of Module IV is to prescribe the minimum requirements of the Permittee's Detection Monitoring Program and not the specifics of sampling or analysis. Attachment IV.A includes requirements of a sampling and analysis program. Attachment IV.A incorporates the elements necessary to conduct proper sampling and analysis without prescribing specific requirements, i.e., how to collect groundwater samples; however, see DEQ response to comment number 6.

FINAL

PERMIT FOR THE TREATMENT OF HAZARDOUS WASTE BY OPEN BURNING

United States Army (Owner)

Alliant Ammunition and Powder Company, LLC (Operator)

Radford Army Ammunition Plant
State Route 114
Radford, Virginia 24141
EPA ID No. VA1210020730

COMMONWEALTH of VIRGINIA

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
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Robert G. Burnley
Director

(804) 698-4000
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PERMIT FOR THE TREATMENT OF HAZARDOUS WASTE BY OPEN BURNING

United States Army (Owner)
Alliant Ammunition and Powder Company, LLC (Operator)

Radford Army Ammunition Plant
State Route 114
Radford, Virginia 24141
EPA ID No. VA1210020730

Pursuant to Chapter 14, Article 4, Title 10.1, Code of Virginia (1950), as amended, and regulations promulgated thereunder by the Virginia Department of Environmental Quality, a Permit is issued to the United States Army and to Alliant Ammunition and Powder Company, LLC (hereinafter called the Permittees):

1) to treat hazardous waste by open burning.

The Permittees may treat by open burning only wastes generated at the facility. The facility being permitted is located in Montgomery County at Route 114, P.O. Box 1, Radford, Virginia at 37° 11'N latitude and 80° 33'W longitude.

The Permittees shall comply with all terms and conditions set forth in this Permit including all attachments. If the Permit and the attachments conflict, the wording of the Permit shall prevail. The Permittees shall also comply with all applicable regulations contained in the Virginia Hazardous Waste Management Regulations (VHWMR) as codified in Title 9 of the Virginia Administrative Code, Agency 20, Chapter 60 (9 VAC 20-60) and in 40 CFR 124, 260, 261, 262, 264, 265, 268, and 270 as adopted by reference in these regulations (for convenience, wherever regulations adopted by reference are cited in this Permit and the attachments, citations will be only those from 40 CFR). The Commonwealth of Virginia has received authorization for these programs under Section 3006(b) of the *Resource Conservation and Recovery Act* (RCRA), 42 U.S.C. § 6926(b), to administer and enforce in lieu of the federal hazardous waste management program under RCRA. Applicable regulations are those which are in effect on the date of final administrative action on this Permit (9 VAC 20-60) and as well as any self implementing

statutory provisions and related regulations which are automatically applicable to the Permittees' hazardous waste management activities, notwithstanding the conditions of this Permit.

This Permit is based on the administrative record and the assumption that the information submitted by the Permittees and contained in the administrative record is complete and accurate. The Permittees' failure in the application or during the Permit issuance process to fully disclose all relevant facts, or the Permittees' misrepresentation of any relevant facts at any time, shall be grounds for the termination or modification of this Permit pursuant to 40 CFR 124.5, 270.41, and 270.43 and shall also be grounds for initiation of an enforcement action. The Permittees' shall inform the Department of any deviations from permit conditions or changes from information provided in the application. In particular, the Permittees shall inform the Department of any proposed changes that might affect the ability of the Permittees to comply with applicable regulations and/or permit conditions, or which alter any of the conditions of the Permit in any way.

This Permit is effective as of October 28, 2005 and shall remain in effect until October 28, 2015 unless revoked and reissued in accordance with 40 CFR 124.5 and 270.41, terminated in accordance with 40 CFR 270.43, or continued in accordance with VHWMR 9 VAC 20-60-270.B.5.

Sept 28, 2005
Date Signed

Leslie A Romanchik
for Robert G. Burnley
Director
Department of Environmental Quality

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DEFINITIONS

For the purposes of this Permit, the following definitions shall apply:

a. "EPA" means the United States Environmental Protection Agency.

b. "Facility" means all contiguous portions of the Radford Army Ammunition Plant under the control of either the United States Army or Alliant Ammunition and Powder Company, LLC as identified in the physical description of the property (including structures, appurtenances, and improvements) set forth in Attachment II.A (see Module II) of this Permit.

c. "Hazardous waste" means a hazardous waste as defined in 40 CFR 261.3.

d. "Operating record" means written or electronic records of all maintenance, monitoring, inspection, calibration, or performance testing-or other data as may be required-to demonstrate compliance with this Permit, document noncompliance with this Permit, or document actions taken to remedy noncompliance with this Permit. Minimum lists of documents that must be included in the operating record are identified at 40 CFR Part 264.73(b).

e. "Permittee" refers to both the U. S. Army and Alliant Ammunition and Powder Company, LLC

f. "RCRA" means the Resource Conservation and Recovery Act of 1980 as amended by HSWA in 1984.

g. "RCRA Permit" means the full permit, with RCRA and HSWA portions.

h. "TEQ" is the acronym for toxicity equivalent quotient meaning the international method of relating the toxicity of various dioxin/furan congeners to the toxicity of 2,3,7,8-TCDD

i. All definitions contained in 40 CFR Sections 124.2, 260.10, 270.2, 264.141, 264.1031, 264.1051, and 264.1081 are hereby incorporated, in their entirety, by reference into this Permit. Any of the definitions used above shall supersede any definition of the same term given in 40 CFR Sections 124.2, 260.10, 270.2, 264.141, 264.1031, 264.1051, and 264.1081. Where terms are not defined in the regulations or the Permit, the meaning associated with such terms shall be defined by a standard dictionary reference or the generally accepted scientific or industrial meaning of the term.

j. Throughout the Permit, all references to 40 C.F.R. parts 124, 261-266, 268, 270, 273, 279, are as adopted by reference in the *Virginia Hazardous Waste Management Regulations,* 9 VAC 20-60.

ABBREVIATIONS AND ACRONYMS

For the purposes of this Permit, the following abbreviations and acronyms shall apply:

acfm	actual cubic feet per minute
APC	air pollution control
AWFCO	automatic waste feed cutoff
Btu	British thermal unit
CFR	Code of Federal Regulations
Cl_2	chlorine gas
DRE	destruction and removal efficiency
EPA	United States Environmental Protection Agency
HCl	hydrogen chloride
HW	hazardous waste
lbs/hr	pounds per hour
mg/dscm	milligrams per dry standard cubic meter
MMBtu	million British thermal units
O_2	molecular oxygen
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
POHC	principal organic hazardous constituent
ppm	parts per million
ppmv	parts per million by volume
psig	pounds per square inch gage
RCRA	Resource Conservation and Recovery Act
TEQ	toxicity equivalent quotient
°F	degrees Fahrenheit

If, subsequent to the issuance of this Permit, regulations are promulgated which redefine any of the above terms, the Department may, at its discretion, apply the new definition, abbreviation, and acronyms to this Permit.

MODULE I – STANDARD CONDITIONS

I.A. EFFECT OF PERMIT

This Permit, issued by the Director pursuant to 40 CFR 270.1(c)(4), authorizes only the management of hazardous waste expressly described in this Permit and in accordance with the conditions of this Permit and with the applicable provisions of 9 VAC 20-60. Any management of hazardous waste by the Permittees in the permitted treatment and storage area or in the closed hazardous waste management units (HWMUs) which is not authorized by this Permit or 9 VAC 20-60, and for which a permit is required under Chapter 14, Article 4, Title 10.1, Code of Virginia (1950), as amended, is prohibited. Compliance with this Permit generally constitutes compliance, for the purposes of enforcement, with Chapter 14, Article 4, Title 10.1-1426, Code of Virginia (1950), as amended. This Permit does not convey any property rights of any sort, or any exclusive privilege. Possession of a permit does not authorize any injury to persons or property or invasion of other private rights, or any infringement of Commonwealth or local laws or regulations. Compliance with the terms of this Permit may not constitute a defense to any action brought under Chapter 14, Article 8, Code of Virginia (1950), as amended, or any other Commonwealth law governing protection of the public or the environment.

I.B. PERMIT ACTIONS

I.B.1. This Permit may be modified, revoked and reissued, or terminated for cause as specified in 40 CFR 124.5, 270.30(f), 270.41, and 270.43. The filing of a request by the Permittees for a permit modification, revocation and reissuance, or termination, or the notification of planned changes or anticipated noncompliance does not stay the applicability or enforceability of any permit condition.

I.B.2. Permit modifications at the request of the Permittees shall be done as specified by 40 CFR 270.42.

I.C. SEVERABILITY

I.C.1. 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. Invalidation of any Commonwealth or Federal statutory or regulatory provision which forms the basis for any condition of this Permit does not affect the validity of any other Commonwealth or Federal statutory or regulatory basis for said condition.

I.C.2. In the event that a condition of this Permit is stayed for any reason, the Permittees shall continue to comply with the related applicable and relevant interim status

standards in 40 CFR 270.10(e) until final resolution of the stayed condition unless the Director determines compliance with the related applicable and relevant interim status standards would be technologically incompatible with compliance with other conditions of this Permit which have not been stayed.

I.D. DUTIES AND REQUIREMENTS

I.D.1. Duty to Comply

The Permittees shall comply with all conditions of this Permit, except that the Permittees need not comply with the conditions of this Permit to the extent and for the duration such noncompliance is authorized by an emergency permit (see 40 CFR 270.61). Any permit noncompliance, except under the terms of an emergency permit, constitutes a violation of Title 10.1 Code of Virginia (1950), as amended and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

I.D.2. Duty to Reapply

If the Permittees wish to continue an activity regulated by this Permit after the expiration date of this Permit, the Permittees shall apply for and obtain a new permit as specified below.

a. The Permittees shall submit a new application at least 180 days before the expiration date of the Permit, unless a later date has been granted by the Director.

b. Pursuant to 40 CFR 270.10(h), the Director shall not grant permission for an application to be submitted later than the expiration date of the existing permit.

I.D.3. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for the Permittees in an enforcement action to argue that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Permit.

I.D.4. Duty to Mitigate

In the event of noncompliance with the Permit, the Permittees shall take all reasonable steps to minimize releases to the environment, and shall carry out such measures as are reasonable to prevent significant adverse impacts on human health or the environment.

I.D.5. Proper Operation and Maintenance

The Permittees shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittees 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 quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Permit.

I.D.6. Duty to Provide Information

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

I.D.7. Inspection and Entry

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

a. Enter at reasonable times upon the Permittees' premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this Permit;

b. Have access to and copy, at reasonable times, any records that must be kept under 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 9 VAC 20-60, any substances or parameters at any location.

I.D.8. Reporting Planned Changes

The Permittees shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. This notice shall include a description of all incidents of noncompliance reasonably expected to result from the proposed changes.

I.D.9. Anticipated Noncompliance

The Permittees shall give advance written notice to the Director of any planned changes in the permitted facility or activity that may result in noncompliance with Permit requirements.

I.D.10. New and Modified Portions of Any Waste Management Unit

The Permittees shall not store or treat hazardous waste in any new or modified portion of the hazardous waste management unit, except as provided in 40 CFR 270.42, until the Permittees have submitted to the Director, by certified mail or hand delivery, a letter signed by the Permittees and a professional engineer registered by the Commonwealth stating that the facility has been constructed or modified in compliance with the Permit; and:

a. The Director has inspected the modified or newly constructed facility and finds it is in compliance with the conditions of the Permit; or

b. Within 15 days of the date of submission of the letter required pursuant to Permit Condition I.D.10, if the Permittees have not received notice from the Director of his intent to inspect, prior inspection is waived and the Permittees may commence treatment of hazardous waste.

I.D.11. Twenty-four Hour Reporting

The Permittees shall report to the Director any noncompliance which may endanger human health or the environment. In addition, the Permittees shall also report any circumstance which required the contingency plan to be implemented regardless whether it was on or off-site. Information shall be provided orally within twenty-four (24) hours from the time the Permittees become aware of the circumstances. The information specified in a. and b. below shall be included as information that shall be reported orally within 24 hours.

a. Information concerning the release of any hazardous waste that may cause an endangerment to public drinking water supplies shall be reported.

b. Any information of a release or discharge of hazardous waste, or of a fire or explosion at the facility, which could threaten the environment or human health outside the facility shall be reported. The description of the occurrence and its cause shall include:

i. Name, address, and telephone number of the owner or operator;

ii. Name, address, and telephone number of the facility;

iii. Date, time, and type of incident;

iv. Names and quantities of material(s) involved;

v. The extent of injuries, if any;

vi. An assessment of actual or potential hazard to the environment and human health outside the facility, where this is applicable; and

vii. Estimated quantity and disposition of recovered material that resulted from the incident.

c. A written submission shall also be provided to the Director within five (5) days of the time the Permittees become aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the periods of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. The Director may waive the 5-day notice requirement in favor of a written report within fifteen (15) days prepared pursuant to Permit Condition II.H.5 and 40 CFR 270.30(l)(6)(iii).

I.D.12. Other Noncompliance

The Permittees shall report all other instances of noncompliance not otherwise reported pursuant to Permit Conditions I.D.11, I.D.13, and I.E.1 at the time monitoring reports are submitted. The reports shall contain the information listed in Permit Condition I.D.11.

I.D.13. Other Information

Whenever the Permittees become aware that they failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application or in any report to the Director, the Permittees shall promptly submit such facts or information to the Director.

I.E. MONITORING AND RECORDS

I.E.1. Monitoring Reports

Monitoring shall be performed and results shall be reported at the intervals specified in the Permit.

I.E.2. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample of the waste to be analyzed must be the appropriate method

specified in 40 CFR 261, Appendix I, or an equivalent method approved by the EPA. Laboratory methods must be those specified in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846* (3rd ed.; November, 1986, as updated), *Standard Methods of Wastewater Analysis* (16th ed.; 1985), an equivalent method approved by the EPA, or RFAAP Laboratory methods specified in Table 1 of Attachment II.B. (See Module II, Attachment II.B - Waste Analysis Plan.)

I.E.3. The Permittees 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 and records required by this Permit, all certifications required by 40 CFR 264.73(b)(9), and records of all data used to complete the application for this Permit, for a period of at least 3 years (or longer if specified elsewhere in this Permit) from the date of the sample collection, measurement, report, certification, or application. These retention periods may be extended by the request of the Director at any time and are automatically extended during the course of any unresolved enforcement actions regarding this facility.

Records of monitoring information shall include at a minimum:

a. The date, exact place, and time of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such analyses.

I.F. COMPLIANCE NOT CONSTITUTING DEFENSE

Compliance with the terms of this Permit does not constitute a defense to any action brought under Chapter 14, Article 8 of Title 10.1, Code of Virginia (1950) as amended or any other Commonwealth law governing protection of the public or the environment.

I.G. TRANSFER OF PERMITS

This Permit is not transferrable to any person except after notice to the Director. The Director may require modification or revocation and reissuance pursuant to 40 CFR 124.5, 270.40, 270.41, 270.42, and 270.43 to change the name of the Permittees and incorporate such other requirements as may be necessary. Before

transferring ownership or operation of the facility during its operating life, the Permittees shall notify the new owner or operator in writing of the requirements of 9 VAC 20-60-264 and 40 CFR 270.

I.H. PERMIT EXPIRATION AND CONTINUATION

Pursuant to 9 VAC 20-60-270 B 15 this Permit will remain in force until the effective date of a new permit if the Permittees have submitted a timely, complete application pursuant to Permit Condition I.D.2.a and through no fault of the Permittees, the Director has not issued a new permit with an effective date on or before the expiration date of this Permit. All conditions of the continued Permit shall remain fully effective and enforceable.

I.I. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE DEPARTMENT

I.I.1. Biennial Report

The Permittees shall submit a biennial report to the Department which covers facility activities during the previous year. At a minimum this report will include:

a. The generator biennial report pursuant to 40 CFR 262.41; and

b. The hazardous waste management facility biennial report pursuant to 40 CFR 270.30(l)(9).

I.I.2. All reports, notifications or other submissions which are required by this Permit to be sent or given to the Director should be sent certified mail, sent by certified carrier, or be hand-delivered to:

Director, Office of Waste Permitting
Department of Environmental Quality
PO Box 10009
Richmond, Virginia 23240-0009
Telephone Number (804) 698-4000

Copies of all such correspondence should also be sent to:

Director, West Central Regional Office
Department of Environmental Quality
3019 Peters Creek Road
Roanoke, VA 24019

Section Chief, Hazardous Waste Management Division
Environmental Protection Agency, Region III
1650 Arch Street

Philadelphia, PA 19103-2029

I.I.3. Signatory Requirements

All applications, reports, or information submitted to the Director shall be signed and certified as specified by 40 CFR 270.11.

I.J. DOCUMENTS TO BE MAINTAINED AT THE FACILITY SITE

I.J.1. Current copies of the following documents, as amended, revised, and modified, shall be maintained at the facility. These documents shall be maintained until closure is completed and certified by the Permittees and by an independent, Virginia-registered professional engineer, unless a lesser time is specified in the Permit.

a. The Permit, including all attachments;

b. All Part B Permit Applications supporting the Permit;

c. The facility operating record required by 40 CFR 264.73, Permit Condition II.I.2.;

d. Inspection schedules and logs required by 40 CFR 264.15(b)(2) and 264.15(d);

e. Personnel training documents and records required by 40 CFR 264.16 and this Permit;

f. Closure Plans, as required by 40 CFR 264.112(a) and this Permit;

g. Post-Closure Plans, as required by 40 CFR 264.118(a) and this Permit;

MODULE II – GENERAL FACILITY CONDITIONS

II.A. WASTE ANALYSIS

II.A.1. General Waste Analysis

The Permittees shall follow the procedures described in the Waste Analysis Plan, Attachment II.B. Waste analysis shall require, at a minimum, the maintenance of proper functional instruments, use of approved sampling and analytical methods, verification of the validity of sampling and analytical procedures, and correct calculations. If the Permittees do not have sufficient capability for analysis, then the Permittees shall inform the laboratory performing the analysis that the laboratory must operate under the waste analysis conditions placed on the Permittees.

II.B. SECURITY

The Permittees shall comply with the security provisions of 40 CFR 264.14. The security provisions shall follow the outline in Attachment II.H.

II.C. GENERAL INSPECTION REQUIREMENTS

The Permittees shall follow the inspection schedule set out in the Inspection Schedule, Attachment II.D. The Permittees shall remedy any deterioration or malfunction discovered during an inspection as required by 40 CFR 264.15(c). Records of inspections shall be kept as required by 40 CFR 264.15(d) and Permit Condition II.I.2.d.v.

II.D. PERSONNEL TRAINING

The Permittees shall conduct personnel training as required by 40 CFR 264.16. This training program shall follow Personnel Training, Attachment II.E. The Permittees shall maintain training documents and records as required by 40 CFR 264.16(d)(4) and 264.16(e) as well as Permit Conditions II.I.2.b.vi. and II.I.2.d.iii.

II.E. GENERAL REQUIREMENTS FOR REACTIVE WASTE

The Permittees shall comply with the requirements of 40 CFR 264.17.

II.F. FLOODPLAIN STANDARD

The Permittees shall comply with the requirements of 40 CFR 264.18(b). The Permittees shall follow the flood plan in Attachment II.I.

II.G. PREPAREDNESS AND PREVENTION

II.G.1. Design and Operation of Facility

The Permittees shall maintain and operate the facility to minimize the possibility of a fire, explosion, or any unplanned sudden or nonsudden release of hazardous waste constituents to air, soil, or surface water that could threaten human health or the environment.

II.G.2. Required Equipment

At a minimum, the Permittees shall equip the facility with the equipment set forth in the Contingency Plan, Attachment II.F, as required by 40 CFR 264.32.

II.G.3. Testing and Maintenance of Equipment

The Permittees shall test and maintain the equipment specified in Permit Condition II.G.2 and in Attachment II.F as necessary to assure its proper operation in time of emergency.

II.G.4. Access to Communications or Alarm System

The Permittees shall maintain access to the communication or alarm system as required by 40 CFR 264.34.

II.G.5. Arrangements with Local Authorities

The Permittees shall maintain arrangements with State and local authorities as required by 40 CFR 264.37. If State and local officials refuse to enter into or renew existing preparedness and prevention arrangements with the Permittees, the Permittees shall document this refusal in the operating record pursuant to Permit Condition II.I.2.e.iv.

II.H. CONTINGENCY PLAN

II.H.1. Implementation of Plan

The Permittees shall immediately carry out the provisions of the Contingency Plan, Attachment II.F, and follow the emergency procedures described by 40 CFR 264.56, whenever there is an imminent or actual fire, explosion, or release of hazardous waste or constituents which threaten or could threaten human health or the environment. The Permittees shall comply with the reporting requirements provided in I.D.11.

II.H.2. Copies of Plan

The Permittees shall comply with the requirements of 40 CFR 264.53.

II.H.3. Amendments to Plan

The Permittees shall review and immediately amend, if necessary, the contingency plan, as required by 40 CFR 264.54.

II.H.4. Emergency Coordinator

The Permittees shall comply with the requirements of 40 CFR 264.55.

II.H.5. Emergency Procedures

The Permittees shall comply with the requirements of 40 CFR 264.56 including the recordkeeping and reporting requirements specified in Permit Condition II.I.2.a.iv.

II.I. RECORDKEEPING AND REPORTING

II.I.1. Notification, Certification, and Recordkeeping Requirements

In addition to the recordkeeping and reporting requirements specified elsewhere in this Permit, the Permittees shall comply with all the applicable notification, certification, and recordkeeping requirements described in 40 CFR 264.73(b)(12) and 268.7.

II.I.2. Operating Record

The Permittees shall maintain a written operating record at the facility, consisting of records kept for the lengths of time specified below. The record can be a compilation of various documents. The operating record shall include, but not be limited to, the information listed below:

a. The following records shall be maintained until closure is complete and certified:

i. A current map showing the location of hazardous waste management units and non-regulated units within the facility;

ii. A map showing all locations of past hazardous waste management units if different from present locations;

iii. The time, date, and details of any incident that requires implementation of the contingency plan, including copies of all reports

prepared pursuant to 40 CFR 264.56(j) and Permit Condition II.H.5. or I.D.11.c.;

iv. All reporting and submittals prepared pursuant to Permit Condition I.D.13;

v. Records and results of waste analyses required by 40 CFR 264.13, pursuant to 40 CFR 264.73(b)(3), which shall include at a minimum:

A. The date(s), exact place, and times of sampling or measurements;

B. The name of the individual(s) who performed the sampling or measurements;

C. The date(s) analyses were performed, demonstrating that holding times for the methods specified in the Waste Analysis Plan, Attachment II.B were satisfied;

D. The name of the individual(s) who performed the analyses;

E. The analytical techniques or method used;

F. The analytical results;

G. The QA/QC summary; and

H. The type and model number of the equipment used for analysis.

vi. All waste determinations, waste profiles, and waste feed composition determinations made pursuant to the Waste Analysis Plan, Attachment II.B.

vii. Certifications pursuant to 40 CFR 264.73(b)(9) (Waste Reduction Plan); and

viii. The notice and certification required by a generator under 40 CFR 268.7 (Land Disposal Restrictions).

b. The following records shall be maintained until post-closure is complete and certified:

i. Records of spills and releases required by existing environmental laws, including, but not limited to ∋103 of the Comprehensive Environmental Response, Compensation and Liability Act;

ii. Written reports and records of verbal notification to the Director and the Administrator to address releases, fires, and explosions;

iii. All reports of noncompliance pursuant to Permit Condition I.D.12.;

iv. All reports prepared pursuant to Permit Condition I.D.11.;

v. Records of all monitoring information pursuant to Permit Condition I.E.; and

vi. Training records of current facility personnel.

c. The following records shall be maintained for a minimum of 5 years. This time period may be extended by the Department in the event of enforcement action or notification by the Department that an investigation is ongoing.

i. Facility operation and maintenance records and reports prepared pursuant to this Permit; and

ii. Progress reports and any required notifications prepared pursuant to this Permit.

d. The following records shall be maintained for a minimum of 3 years. This time period may be extended by the Department in the event of enforcement action or notification by the Department that an investigation is ongoing.

i. Generator biennial reports submitted in compliance with 40 CFR 262.41;

ii. Facility biennial reports submitted in compliance with 40 CFR 264.75;

iii. Training records of former facility personnel;

iv. Records of all monitoring information pursuant to Permit Condition I.E.3.; and

v. Records of all inspections, pursuant to 40 CFR 264.15(d), which shall include at a minimum:

A. The date and time of the inspection;

B. The name of the person performing the inspection;

C. A notation of the observations made; and

D. The date and nature of any repairs or remedial actions.

e. Current copies of the following documents as amended, revised, and modified shall be maintained at the facility until closure and corrective action are complete and certified:

i. Contingency Plan;

ii. Personnel Training;

iii. Waste Analysis Plan;

iv. Documentation of arrangements made with local authorities pursuant to 40 CFR 264.37;

v. Closure Plan;

II.J. CLOSURE

II.J.1. Performance Standard

The Permittees shall close the permitted treatment and storage area as required by 40 CFR 264.111, and in accordance with the Closure Plan, Attachment II.G.

II.J.2. Amendments to Closure Plan

The Permittees shall amend the closure plan in accordance with 40 CFR 264.112 whenever necessary.

II.J.3. Notification of Closure

The Permittees shall notify the Director at least 45 days prior to the date they expect to begin closure as required by 40 CFR 264.112(d).

II.J.4. Time Allowed for Closure

After receiving the final volume of hazardous waste, the Permittees shall treat or remove from the permitted treatment and storage area all hazardous waste and shall complete closure activities in accordance with the schedules specified in the Closure Plan, Attachment II.G.

II.J.5. Disposal or Decontamination of Equipment

The Permittees shall decontaminate and/or dispose of all facility equipment as required by 40 CFR 264.114 and the Closure Plan, Attachment II.G.

II.J.6. Certification of Closure

The Permittees shall certify that the permitted treatment and storage area has been closed in accordance with the specifications in the closure plan as required by 40 CFR 264.115.

MODULE II – LIST OF ATTACHMENTS

The following Attachments are incorporated, in their entirety, by reference into this Permit. These incorporated attachments are enforceable conditions of this Permit. Some of the documents contain excerpts from the Permittees' Hazardous Waste Permit Application. The Department has, as deemed necessary, modified specific language excerpted from the permit application. Additional modifications are prescribed in the Permit Conditions (Modules I through IX), and thereby supersede the language of the attachments. Facility operations shall be in accordance with the contents of the Attachments and this Permit.

Attachment II.A – Facility Description

Attachment II.B – Waste Analysis Plan

Attachment II.C – Soil Monitoring Program

Attachment II.D – Inspection Schedule

Attachment II.E – Personnel Training

Attachment II.F – Contingency Plan

Attachment II.G – Closure Plan

Attachment II.H – Security Provisions

Attachment II.I – 100-Year Floodplain Protection Plan

ATTACHMENT II.A

FACILITY DESCRIPTION

ATTACHMENT II.A – FACILITY DESCRIPTION

II.A.1. Facility

The Radford Army Ammunition Plant (RFAAP) encompasses approximately 4,104 acres of land and is located in southwest Virginia in Pulaski and Montgomery Counties (Figure II.A-1). The RFAAP is located approximately 5 miles northeast of the city of Radford, 10 miles west of Blacksburg, and 47 miles southwest of Roanoke. The New River separates Pulaski and Montgomery Counties and also divides the RFAAP into two (2) portions commonly known as the Horseshoe Area and the Main Manufacturing Area. These areas, and the approximate outline of the RFAAP boundary, are shown in Figure II.A-2.

For the purposes of this Permit, the facility consists of all contiguous portions of the RFAAP under the control or either the United States Army or Alliant Ammunition and Powder Company, LLC. The facility specifically includes both the Horseshoe Area and the Main Manufacturing Area.

II.A.2. Permitted Open Burning Grounds

Pursuant to 40 CFR 270.1(c)(4), this Permit is effective for only a portion of the facility. The "permitted treatment area" is located in the southeast portion of the Horseshoe Area (in the loop of the river) on the northern bank of the New River within the 100-year floodplain. Figures II.A-3 and II.A-4 show the approximate location and boundary of the area, respectively. Figure II.A-6 depicts the land use with 3 kilometers of the "permitted open burning grounds."

The location of the Open Burning Ground in relation to the rest of the RAAP facility is shown in Figure II.A-4. Open burning operations are conducted in an area approximately 100 feet by 1,500 feet. Open burning operations are conducted in 6 ft by 18 ft pans situated on raised pads about 250 sq. ft in size. There are 8 pads at the Open Burning Ground, each containing 2 burn pans for a total of 16 pans. A plan-view of the Open Burning Ground is shown in Figure II.A-5.

On a routine daily basis, the pans on alternate pads are loaded during the morning hours. The criteria for selecting wastes to be burned are the accumulation start date and theoretical burn rate of the material. The theoretical burn rate is used to ensure that fast burning material is not covered by slower burning material. The waste capacity of each pan is 1,000 pounds. The operator may burn considerably less material to prevent untreated material from landing on the soil.

Some of the wastes received at the Open Burning Ground require an aid to burning. These wastes are placed on pallets to allow air circulation under the

waste. The pallets are covered with cardboard that is soaked with diesel fuel. The waste is spread onto the cardboard and soaked with diesel fuel.

Factors considered in determining if to burn waste on a specific day are: precipitation forecast, wind speed river level and excessive rainfall in the headwaters of the New River in North Carolina. If there is a chance of 50% or higher precipitation for afternoon hours, ignition of the pans may occur in the morning hours. If there is a chance of 50% or higher precipitation for morning hours, ignition of the pans may occur in the afternoon. If winds are less than 20 miles per hour and there is no precipitation at the time of ignition, burning operations will commence. Once a pan is loaded with waste, the waste cannot be safely removed from the pan. If the pans are loaded and the wind exceeds 20 mph burning may commence only with the acknowledgement of the Safety or Environmental Manager or their designate. The burning ground will not operate during precipitation nor will operators work during a thunderstorm in the local vicinity.

II.A.3. Auer Land Use Analysis

The Auer land use analysis method specifies that the land is considered rural if less than 50 percent of the land is considered industrial, commercial, or compact residential. The specific land use types considered urban are Category I1, I2, C1, R2, or R3 as described in Table II.A-1. Much of the land area within the circle was within the boundaries of the RFAAP facility, and was considered urban due to the facility's industrial use. Table II.A-1 and Figures II.A-6 and II.A-7 illustrate the land use for the area is approximately 35% urban (approximately 9,900,000 square meters out of a total 28,274,334 square meters). Almost all of the area outside the facility is rural and approximately 65% or 18,400,000 m^2 of the entire 3 km radius circle is rural in nature.

TABLE II.A-1

LAND USE CLASSIFICATIONS FOR AUER LAND USE ANALYSIS

Classification	Description		
	Use	Structures	Vegetation
I1	Heavy Industrial	Major chemical, steel, fabrication industries; generally 3-5 story buildings, flat roofs	Grass tree growth extremely rare; <5% vegetation
I2	Light-Moderate Industrial	Rail yards, truck depots, warehouses, industrial parks, minor fabrications; generally 1-3 story buildings, flat roofs	Very limited grass, tree almost total absent; <5% vegetation
CT	Commercial	Office and apartment buildings, hotels; >10 story heights, flat roofs	Limited grass and trees; <15% vegetation
R1	Common Residential	Single family dwelling with normal easements; generally one story, pitched roof structures; frequent driveways	Abundant grass lawns and light-moderately wooded; >70% vegetation
R2	Compact Residential	Single, some multiple, family dwelling with close spacing; generally <2 story, pitched roof structures; garages (via alley), no driveways	Limited lawn sizes and shade trees; <30% vegetation
R3	Compact Residential	Old multi-family dwellings with close (<2m) lateral separation; generally 2 story, flat roof structures; garages (via alley) and ashpits, no driveways	Limited lawn sizes, old established shade trees; <35% vegetation
R4	Estate Residential	Expansive family dwelling on multi-acre tracts	Abundant grass lawns and lightly wooded; >80% vegetation
A1	Metropolitan Natural	Major municipal, state or federal parks, golf courses, cemeteries, campuses; occasional single-story structures	Nearly total grass and lightly wooded; >95% vegetation
A2	Agricultural Rural	---	Local crops (e.g., corn, soybean); >95% vegetation
A3	Undeveloped	Uncultivated; wasteland	Mostly wild grasses and weeds, lightly wooded; >90% vegetation
A4	Undeveloped Rural	---	Heavily wooded; >95% vegetation
A5	Water Surfaces	Rivers, lakes	---

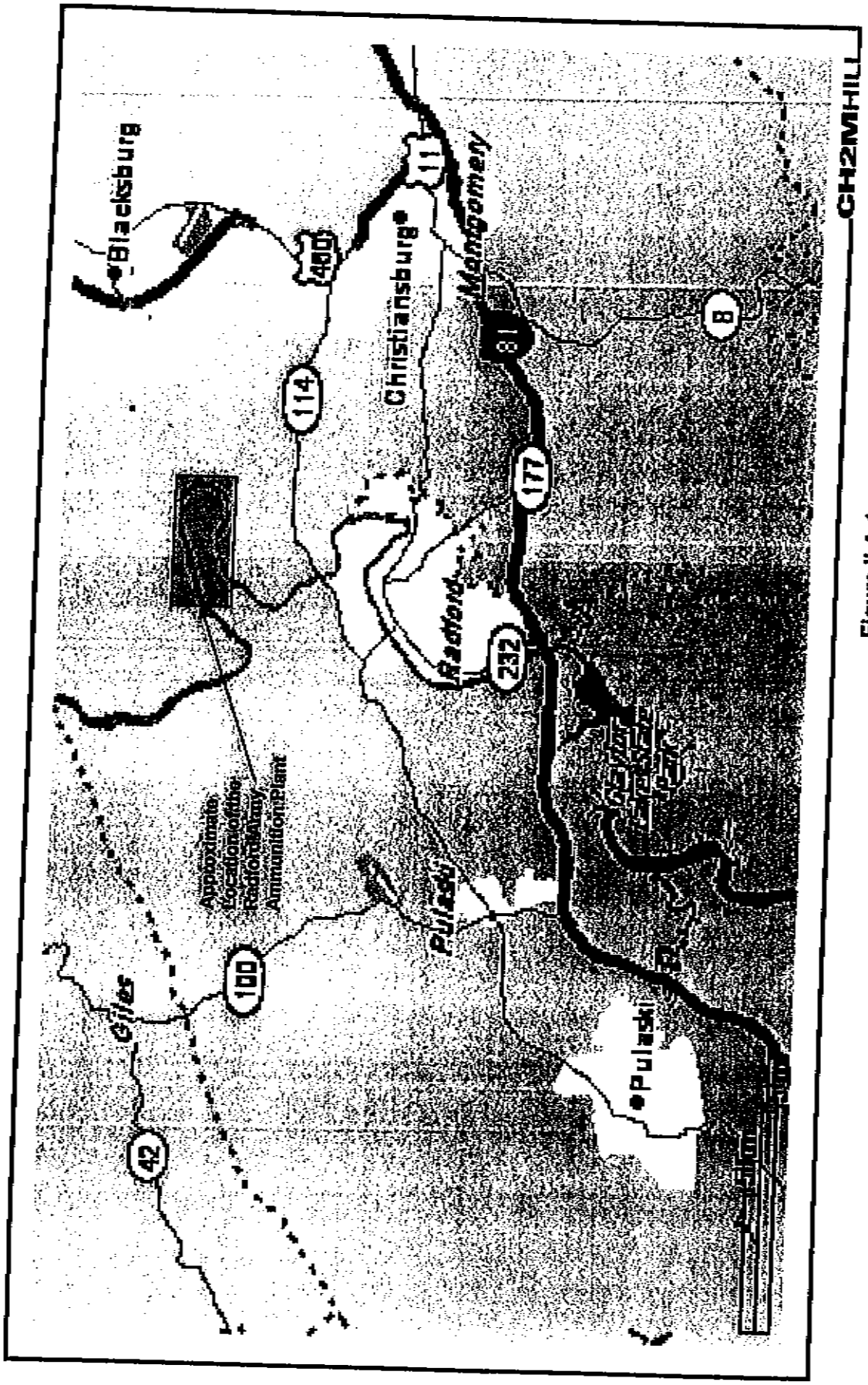


Figure II.A-1
Facility Location
Open Burning Ground
Radford Army Ammunition Plant, Radford, VA

FIGURE II.A-1

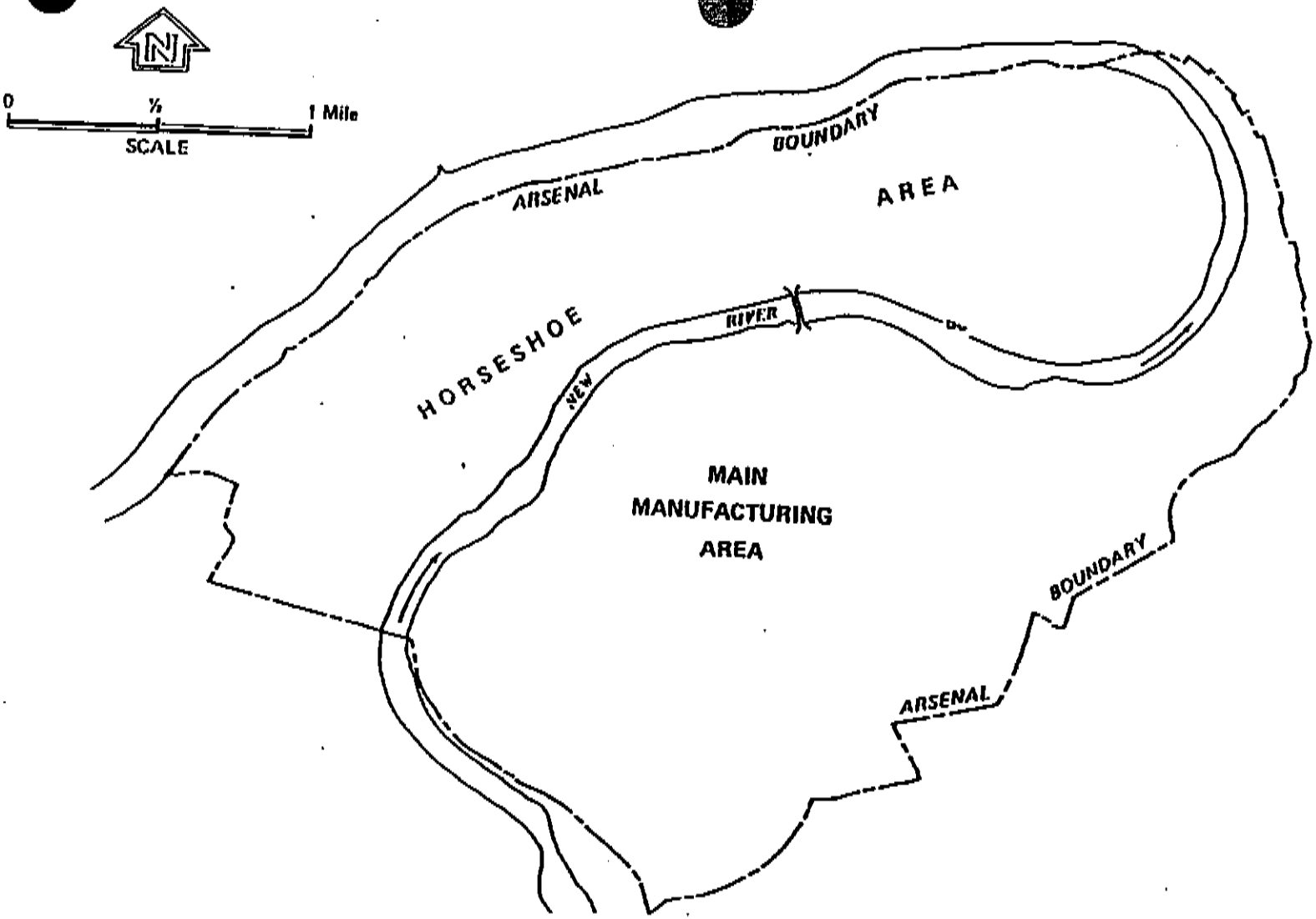
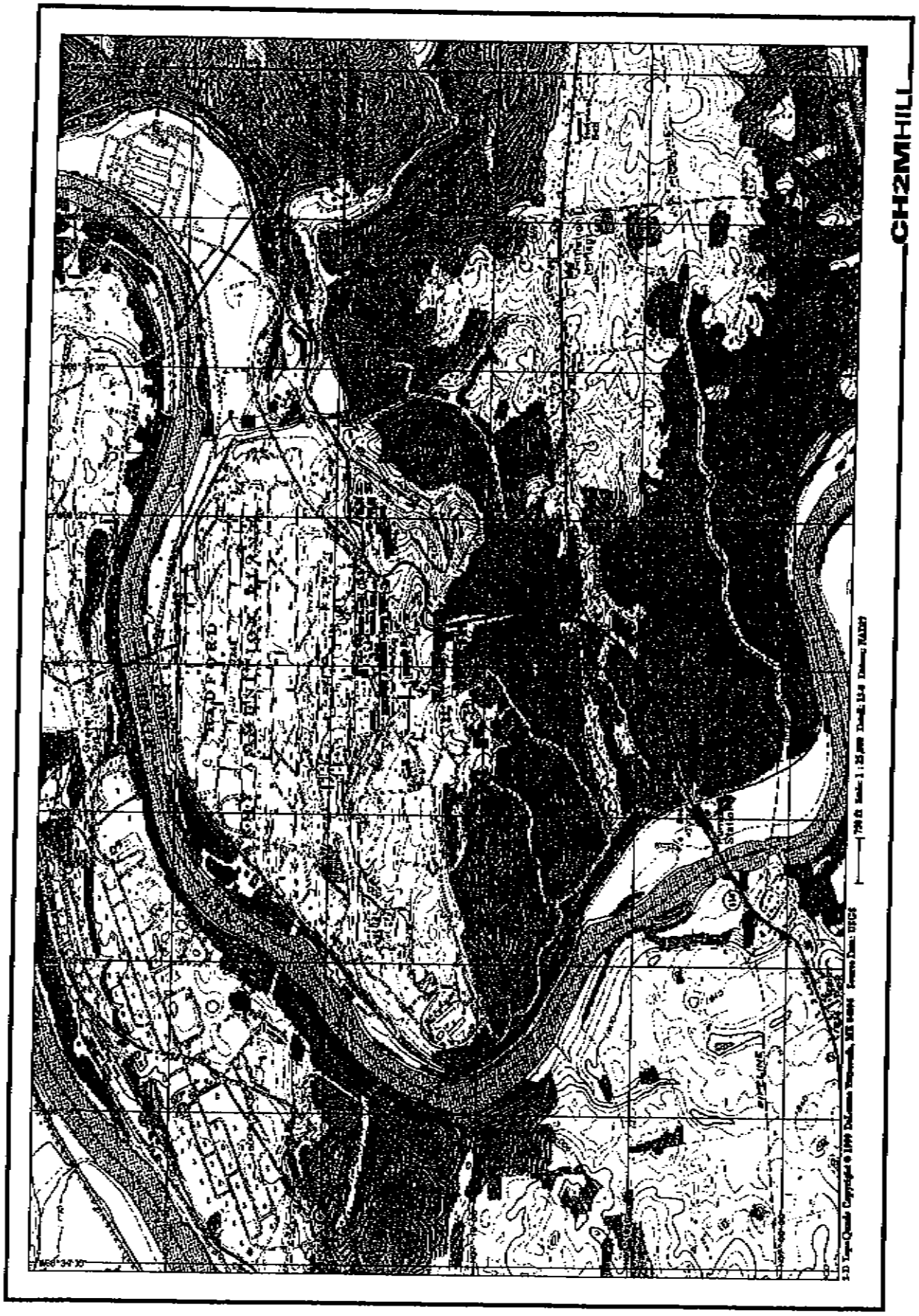


FIGURE II.A-2
APPROXIMATE BOUNDARY OF THE RADFORD ARMY AMMUNITION PLANT HAZARDOUS WASTE MANAGEMENT FACILITY



CH2MHILL

Figure II.A-3
Site Vicinity Map
Open Burning Ground
Radford Army Ammunition Plant, Radford, VA

FIGURE II.A-3

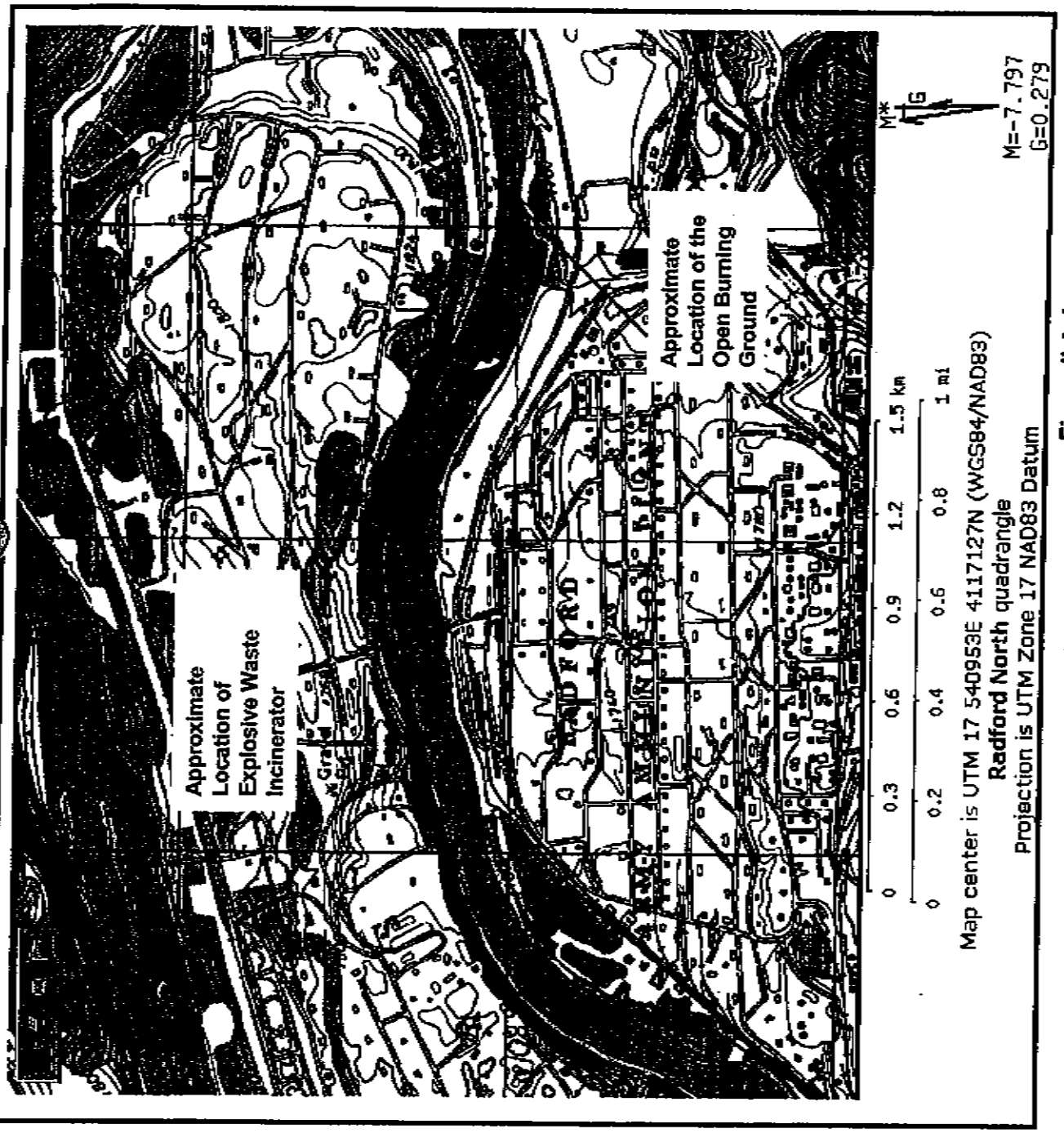


Figure II.A-4
Open Burning Ground Schematic
Open Burning Ground
Radford Army Ammunition Plant, Radford, VA

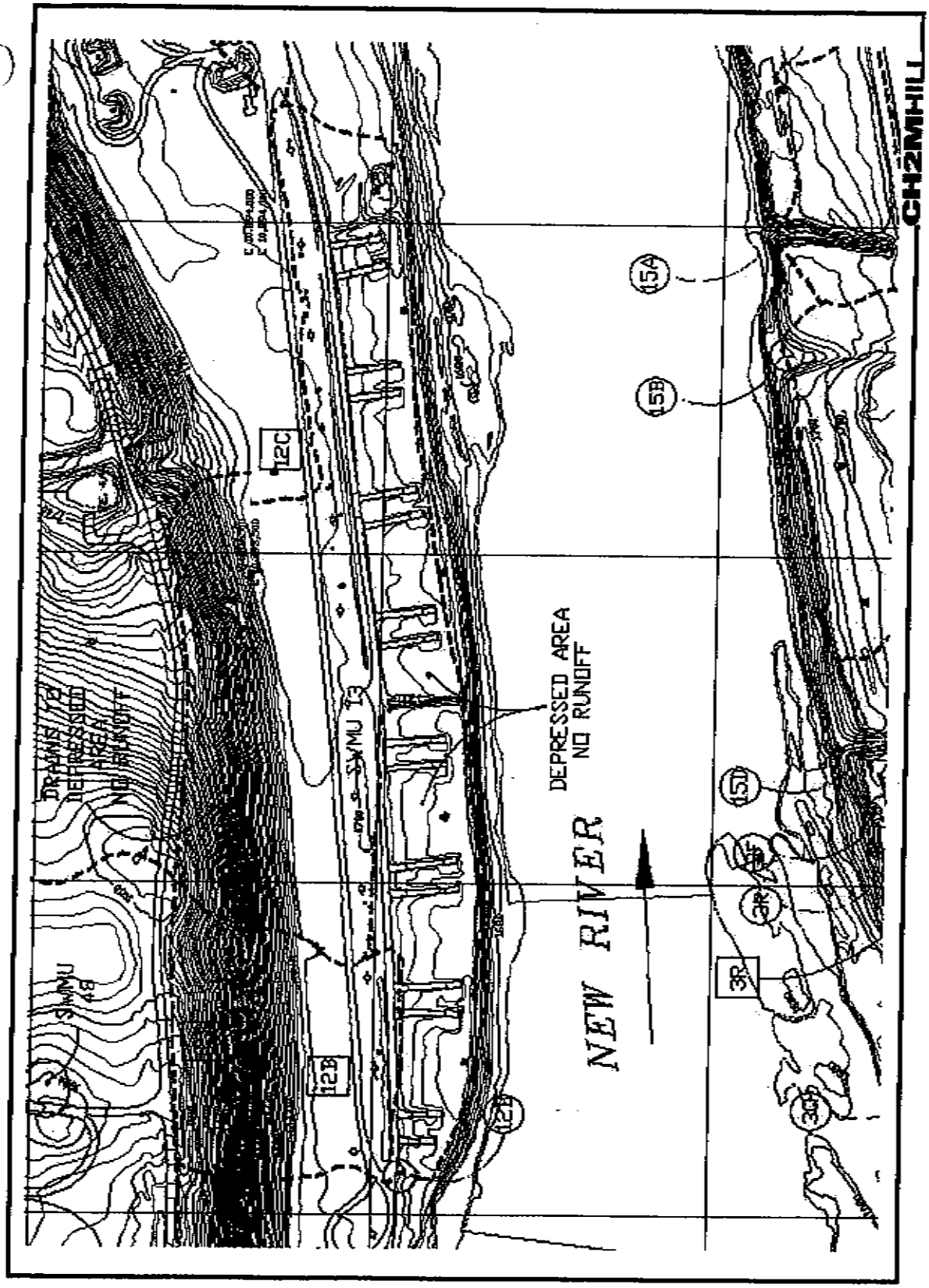


Figure II.A-5
Open Burning Ground Details
Open Burning Ground, Radford Army Ammunition Plant, VA

FIGURE II.A-5 OB GROUND DETAIL.DOC

AUER LAND USE CLASSIFICATION LEGEND

- I1 - HEAVY INDUSTRIAL
- I2 – LIGHT-MODERATE INDUSTRIAL
- CT – COMMERICAL
- R1 – COMMON RESIDENTIAL
- R2 – COMPACT RESIDENTIAL
- R3 – COMPACT RESIDENTIAL
- R4 – ESTATE RESIDENTIAL
- A1 – METROPOLITAN NATURAL
- A2 – AGRICULTURAL RURAL
- A3 – UNDEVELOPED
- A4 – UNDEVELOPED RURAL
- A5 – WATER SURFACES
- (P) POINT SOURCE

FIGURE II.A-6
AUER LAND USE CLASSIFICATION

AUER LAND USE CLASSIFICATION LEGEND

- I1 - HEAVY INDUSTRIAL
- I2 – LIGHT-MODERATE INDUSTRIAL
- CT – COMMERICAL
- R1 – COMMON RESIDENTIAL
- R2 – COMPACT RESIDENTIAL
- R3 – COMPACT RESIDENTIAL
- R4 – ESTATE RESIDENTIAL
- A1 – METROPOLITAN NATURAL
- A2 – AGRICULTURAL RURAL
- A3 – UNDEVELOPED
- A4 – UNDEVELOPED RURAL
- A5 – WATER SURFACES
- (P) POINT SOURCE

FIGURE II.A-7
AUER LAND USE CLASSIFICATIONS WITH RECEPTOR GRIP OVERLAY

ATTACHMENT II.B

WASTE ANALYSIS PLAN

ATTACHMENT II.B – WASTE ANALYSIS PLAN

II.B.1. Waste Characteristics

Hazardous wastes that may be managed at the permitted open burning grounds are waste propellants and spill "clean-up" residues generated at Radford Army Ammunition Plant (RFAAP) which are hazardous due to their ignitability (D001) or reactivity (D003). Only hazardous wastes, which are consistent with the requirements of the facility's RCRA Permit and this Waste Analysis Plan will be open burned. No wastes generated outside of RFAAP will be received, stored, or treated at the open burning ground. Only wastes generated at RFAAP by the Permittees may be treated at the permitted treatment area.

Wastes managed in accordance with the facility's RCRA Permit will be limited to the following:

a. Wastes which exhibit only the following hazardous characteristic(s);

   i. Reactivity (hazardous waste number D003) as specified in 9 VAC 20-60-261, incorporating 40 CFR 261.23 by reference; or

   ii. Reactivity (hazardous waste number D003) as specified in 9 VAC 20-60-261, incorporating 40 CFR 261.23 by reference, and the characteristic of toxicity, as specified in 9 VAC 20-60-261, incorporating 40 CFR 261.24 by reference, for one or more of the following contaminants;

      a) Lead (hazardous waste number D008);
      b) 2,4-Dinitrotoluene (hazardous waste number D030).
      c) Barium (hazardous waste number D005)

   iii. Ignitability (hazardous waste number D001) as specified in 9 VAC 20-60-261, incorporating 40 CFR 261.21 by reference. Ignitable wastes are limited to clean up residue of propellant ingredients. If mixtures of sawdust and cleanup residue are not D001 or D003, then they are not allowed to be open burned.

b. Wastes which are not listed pursuant in 9 VAC 20-60-261, incorporating 40 CFR 261.31, 32, and 33 by reference; and

c. Wastes which are one of the following:

   i. Off-specification propellants and propellant intermediates, generated at RFAAP;

ii. Load, assemble and pack waste, consisting of energetic materials from assembling cartridges

iii. Specialty product wastes containing propellant with nitrocellulose, nitrate esters, nitroguanidine, solid explosives, and one of the following combinations of additional materials:
   a) 40 CFR 261, Appendix VIII constituents (D003)
   b) 40 CFR 261, Appendix VIII constituents, chlorides and/or perchlorates (D003)
   c) 40 CFR 261, Appendix VIII constituents and/or metals (D003, D004-D010)

iv. Other miscellaneous waste, described in Table I, as one of the following:
   a) Ignitable and reactive liquids in sawdust (D001, D003)
   b) Off-specification dinitrotoluene, trinitrotoluene, and Isotriol

The wastes identified above are described in more detail in Section II.B.2 and in Tables 1 and 2. Tables 1 and 2 delineate twenty waste Groups. The Group numbers were assigned as the information on the waste Groups was collected and there is no significance to the order of the discussion.

Radioactive wastes, mixed radioactive and hazardous wastes, and listed wastes will not be stored or treated at the permitted OB Ground.

II.B.2. Waste Composition and Characterization

The composition of the waste propellant mixtures generated and sent to the Open Burning Grounds varies due to changes in the production schedule. Off-specification propellants and propellant intermediates, dinitrotoluene (including production intermediates), load, assemble and pack waste, specialty product waste, and other miscellaneous wastes, as presented in Table 1, are the categories of wastes which may be stored or treated.

Table 1 provides 20 Groups of wastes. Wastes that are treated fit into one of these Groups. Wastes from all groups except Groups 2, 3, 5, and 6 may be treated by open burning when:

i. Material cannot be safely put through the grinder. Such material may be contaminated with tramp metal objects, rocks, and similar debris that will damage the grinder.

ii. The material cannot be safely treated at the incinerator. Certain propellants, intermediate products, and essential materials cannot be

ground or mixed with water due to their reactive nature, geometry, or specific hazard. If the waste is not in slurry form it is not safe to treat in the incinerator.

iii. The incinerators are down for maintenance or are inoperable because of mechanical failure and the reactive waste accumulation areas are not capable of handling any additional material in accordance with Army and Alliant policy on building capacity.

In these circumstances, a hazards analysis will be performed and the results of that analysis placed in the operating record. The material will not be treated in the RFAAP hazardous waste incinerator system because of an undue risk of an incident but will be treated by open burning. Examples of material typically open burned include:

i. Waste generated from floor cleaning (excluding listed wastes) in operating which contains more than one reactive waste group.

ii. Primers, flashtubes, and projectiles from Group 15 that have been tested and proven not to detonate when burned but contain metal that render them not suitable for treatment in the incinerator. At no point, will listed wastes be open burned.

iii. Items such as press heels and rocket grains are too long or large to fit into the grinder.

Table 2, List of Propellant Ingredients, presents the constituents and the percentage range of waste constituents that may be in the 20 Groups.

If the Permittees wish to manage waste whose formulation is not consistent with one of the Groups identified in Table 1 of this Waste Analysis Plan, the Permittees will submit a request for permit modification.

II.B.2a. Off-Specification Propellant and Propellant Production Intermediates

Table 1 identifies three categories of propellant that differ in their primary constituents, as follows:

Primary Category	Primary Constituent(s)
Single Base	Nitrocellulose
Double Base	Nitrocellulose, nitroglycerine
Triple Base	Nitrocellulose, nitroglycerine, nitroguanidine

The categories have been further divided into a total of nine waste Groups, based on other waste constituents that distinguish them from each other. The nine Groups are:

- Group 7 - Single base propellants with nitrocellulose and lead (D003, D008)
- Group 8 - Single base, propellants with nitrocellulose (D003)
- Group 9 - Single base propellants with nitrocellulose and dinitrotoluene (D003, D030)
- Group 10 - Double base propellants with nitrocellulose and nitrate esters (D003)
- Group 11 - Double base propellants with nitrocellulose, nitrate esters, and perchlorate salts (D003)
- Group 12 -Double base propellants with nitrocellulose, lead, and nitrate esters (D003, D008)
- Group 13 - Double base propellant with nitrocellulose, nitrate esters, and solid explosives (D003)
- Group 14 - Triple base propellant with nitrocellulose, nitrate esters and nitroguanidine (D003)
- Group 16 - Single base propellant with nitrocellulose, dinitrotoluene and lead (D003, D008, D030)

II.B.2b. Load, Assemble, and Pack Waste

Energetic waste is generated when cartridges are assembled. The waste consists of materials that are placed in the cartridges such as HMX, RDX, and propellants. These wastes are identified in Table 1 as Group 15.

II.B.2c. Specialty Products Waste

The specialty products waste Groups contain propellant with nitrocellulose, nitrate esters, nitroguanidine, solid explosives, and 40 CFR 261, Appendix VIII constituents. The specialty products wastes identified as Group 18 on Table 1 also contain chlorides or perchlorates. The specialty products wastes identified as Group 19 on Table 1 contain metals in addition to the other materials contained in specialty product wastes. The volume of specialty product waste is less than 5,000 pounds per year.

II.B.2d. Miscellaneous Wastes

The miscellaneous wastes listed in Table I include:

a) Ignitable and reactive liquids in sawdust
b) Off-specification Dinitrotoluene, Trinitrotoluene, and Isotriol

The term ignitable and reactive liquids in sawdust refers to a waste containing a nitrate ester (any liquid explosive, i.e., nitroglycerine, diethylene glycol dinitrate), triacetin, acetone, alcohol, or ether, and sawdust. The ignitable or reactive liquids with sawdust typically originate from cleaning operations or spills in the production area. Triacetin is used to desensitize the reactive liquids.

Off-specification dinitrotoluene may result from the manufacture of commercial Dinitrotoluene, Trinitrotoluene, and Isotriol at the facility.

II.B.2e. Screening and Floor Wastes

The screening and floor waste group does not consist of specific constituents included in Table 2 and is therefore, not represented on Table 2. Waste Group 20 is a combination of materials from Waste Groups 1 through 19, excluding 2, 3, 5, and 6. It doe not include any listed wastes nor does it exceed any of the limitations on specific constituents set forth in Module III of this permit.

II.B.3. Waste Storage and Handling

Waste materials from the 20 waste Groups that are to be treated at the OB Ground burned are stored in less than 90-day storage/accumulation buildings throughout RFAAP in 20 gallon tubs. These tubs of waste are retrieved by operators and transported to the Open Burning Grounds, where they are prepared for open burning. The frequency of pickup varies according to production schedules, occurring as often as daily, however in most cases weekly. All hazardous waste is retrieved or burned before the 90-day accumulation period expires.

II.B.4. Waste Sampling

Alliant Ammunition and Powder Company, LLC, the permitted operator of the treatment and storage facilities, has prepared a waste sampling plan to help ensure collection of representative samples for analysis. The intent of the sampling plan is to provide representative data to maintain compliance with solid and hazardous waste regulations. All sampling will be conducted in accordance with the facility's sampling and analysis plan and maintained as part of the Facility Operating Record.

Grab samples are collected daily into separate sample bags or jars for each Group received at the OB Ground. The daily grab samples are composited into one sample for each Group for each month. Each sample bag or jar is labeled with the date, the propellant type, the "composite" notation for sample type, the sample number, and the sampler's initials.

The daily grab and monthly composite samples are collected throughout the month for each of the 20 Groups and are stored in the Grinder Building in an area

designated for samples. At the end of the month, the operator splits the composite sample for one of the waste Groups. Both of these samples are sent to the laboratory with the other waste Group composite samples to be analyzed for the month. This duplicate sample provides quality assurance/quality control information on the analysis technologies. The composite samples are analyzed as described in Section II.B.5, Waste Analysis Requirements. All samples will be stored in the Grinder Building.

II.B.5. Waste Analysis Requirements

All hazardous wastes managed in accordance with the facility's Permit will be subjected to waste analysis pursuant to the Permit and this Waste Analysis Plan prior to being stored or treated at the permitted treatment and storage areas.

For each solid or hazardous waste which may be used as a slurry component (see Section II.B.2.) for open burning, a hazardous waste determination will be made in accordance with 9 VAC 20-60-262, adopting 40 CFR 262.11 by reference. At a minimum, the determination will identify:

i. Whether the waste is radioactive,
ii. Whether the waste is listed under 9 VAC 20-60-261, adopting 40 CFR 261 Subpart D by reference; and
iii. Whether the waste is a characteristic hazardous waste in accordance with 9 VAC-20-60-261, adopting 40 CFR 261.20 through 261.24 by reference.

The results of all hazardous waste determinations will be maintained in the Facility Operating Record.

In addition to the hazardous determination for each waste Group, all wastes stored or treated at the facility are tested for compatibility with nitroglycerin (NG) and nitratability when they are first generated. Compatibility on a daily basis is not of concern, as compatibility with other materials is addressed upon generation of the material.

Compatibility testing is performed utilizing a multi-test apparatus methodology, which, when completed, provides the data necessary to determine the compatibility of waste Groups. Compatibility is based on the amount of gas produced by the mixture of explosive and contact material that is in excess of the amount of gas produced by the materials themselves. Test criteria establishes "incompatible" as a mixed sample which generates a specific volume of gas more than the sum of the associated unmixed specimens. Compatibility tests are performed by the on site laboratory.

II.B.5a. Analysis of Waste Groups

All waste Groups are analyzed to determine a profile for the Group, to determine compliance with feed rate limits for the OB Ground. These two types of analyses are described in more detail below.

Waste Profiling Analysis

At all times an accurate profile of every hazardous waste open burned at the permitted treatment and storage areas will be maintained in the Facility Operating Record. A hazardous waste profile will identify the hazardous constituents and characteristics necessary for proper designation and management of the waste stream. The profile will also include concentrations of all 40 CFR 261 Appendix VIII (adopted by reference in 9 VAC 20-60-261) constituents in that waste.

Each hazardous waste profile will include or consist of:

a. Existing published or documented data on the hazardous waste or on waste generated from similar processes. The use of existing published or documented data will include confirmation by the generator that the process generating the hazardous waste has not significantly changed; or

b. Laboratory analysis of the waste stream consisting of chemical, physical, and/or biological analyses using appropriate tests from the EPA document SW-846 Test Methods for Evaluating Solid Waste, 3rd Edition, 1986, as updated, or by facility standard operating methods that achieve the performance specifications specified in the equivalent SW-846 method.

Every waste profile will be reviewed at least annually in order to confirm that it still accurately represents the waste stream. A waste stream will be reprofiled whenever the Permittees have reason to believe that the process or operation generating the hazardous waste has changed.

Analysis for Compliance with Open Burning Permit Conditions

In order to assure compliance with the waste feed requirements of the facility's RCRA Permit, the composition of each waste Group to be open burned will be determined from 1) the generators knowledge of waste compositions provided in Appendix II.B-1, Table 2 and 2) samples collected daily and composited monthly at the Grinder Building by OB Ground personnel. The concentration of the constituents listed below will be determined through analysis:

- Aluminum
- Barium
- Chromium
- Chloride (total)
- Lead

The concentration of the constituents will be determined by the analytical methods specified below:

i. The ash concentration will be determined using the method specified in Appendix II.B-1.

ii. The concentration of metal compounds will be determined using SW-846 Method 7000A or the most current version of the method for each analyte. Alternatively, metal compound concentrations may be determined using the RFAAP Laboratory test methods as specified in Table 3. Note: Not all of the constituents listed in Table 3 are required to be sampled.

iii. Samples shall be prepared using RFAAP Laboratory nitric acid reflux method digestion method as described in Table 4.

Analytical results below the method detection limit (MDL) will be considered analytical non-detects and recorded at one-half the method detection limit.

II.B.5b. Analysis of Waste Residues and Other Materials

After each burn, the ash is placed in a 20-cubic yard roll-off container located ath the OB Ground. If the ash exhibits a characteristic reactivity it will be removed from the container and place back on the pans at the Open Burning Ground for treatment... If the ash does not exhibit a characteristic for reactivity but is a hazardous waste according to 9 VAC 20-60-261.24, then it will be managed as a hazardous waste in accordance with all applicable requirements of 9 VAC 20-60. If the ash does not exhibit a characteristic of a hazardous waste it will be managed as a solid waste in accordance with all applicable requirements of 9 VAC 20-80-10 *et seq*.

II.B.5c. Quality Assurance and Quality Control

All sampling and analyses performed in accordance with this Waste Analysis Plan will, at a minimum, achieve all performance specifications specified in the equivalent SW-846 methods and Tables 4-7, as appropriate. Records of specific analytical methods utilized from SW-846 or standard facility operating methods and procedures and appropriate QA/QC documentation will be maintained at RFAAP with the results of all analyses.

II.B.7 Chemical and Physical Analyses [40 CFR 270.14(b)(2) and 264.13(a)]

Chemical and Physical Analyses for wastes treated at the OB Ground are discussed in Section II.B.5.

II.B.7(a) Containerized Waste [40 CFR 270.15(b)(1)]

Containerized waste associated with the OB Ground is discussed in Section II.B.3.

II.B.7(b) Waste in Piles [40 CFR 264.250(c)(1) and (4)]

There are no RCRA waste piles associated with the RFAAP OB Ground.

II.B.7(c) Landfilled Wastes [40 CFR 264.314]

There are no RCRA landfilled wastes associated with the OB Ground. Ash determined hazardous from the treatment of waste at the miscellaneous units is sent to a permitted RCRA disposal facility.

II.B.7(d) Wastes to be Land Treated [40 CFR 270.20(b)(4), and (2)]

There are no RCRA wastes to be land treated in association with RFAAP's OB Ground.

II.B.7(e) Miscellaneous Thermal Treatment of Wastes [40 CFR 270.23]

The OB Ground has analyzed each shipment of residue for many years. Originally each shipment was tested using the Gap Test as described in Appendix II.B-2. The residue never was reactive. In the past 2 years the residue has been analyzed by the on site laboratory for propellant. Hazards Analysis then reviews the data and by knowing that less than 10% propellant in the residue will not result in a reactive waste the waste is deemed not reactive. The residue comes back at less than 1% propellant. This demonstrates the effectiveness of the OB Ground operations.

The waste streams include the same raw material as the usable items but do not meet some performance specification. When this is the case, the same conclusions can be drawn regarding the appropriate treatment based on published data. This information is reviewed and if there is a question as to the suitability of a particular waste for OB, other data is gathered to resolve the issue. A small test burn of this material, if possible, may provide adequate information on the applicability of OB for this waste. A test burn may also be appropriate to determine acceptability of OB on materials for which little or no historical data exists. It is not feasible in the aforementioned cases to do a complete chemical analysis of the material in question because of its presumed hazardous nature.

Information to ensure safe handling of materials to be thermally treated is available in historical data and ordnance publications. In the case of materials that have no such information, chemical and physical analyses are performed to determine its reactivity, stability, and ignitability characteristics. These guidelines are provided in the waste analysis plan contained in this permit application. No waste materials are stored at the OB site. They are transported to the site directly from the production plant or from established <90-day accumulation areas.

Under no circumstances is any material contaminated with or suspected of being contaminated with military warfare agents accepted for thermal treatment at the OB unit. Examples of such chemical warfare agents are:

Choking agents
Nerve agents
Blood agents
Blister agents
Incapacitating agents
Vomiting compounds
Tear producing compounds
Herbicides

Another class of compounds that will not be treated at the OB Ground are smoke and incendiary devices. These compounds either will not be successfully treated by this process or are violently reactive to the point of being a severe health hazard.

All of the waste accepted for thermal treatment is considered hazardous prior to treatment because of its explosive, reactive, or flammable nature. Full hazard characteristics analyses are not performed prior to open burning to avoid danger associated with excess handling of such materials and to eliminate costly and potentially dangerous time delays. The waste is visually inspected prior to treatment to ensure that only appropriate wastes are subjected to thermal treatment. Non-explosive wastes are returned to the main plant.

The primary hazard characteristic of the waste residue after thermal treatment will originate from heavy metals and possible traces of the waste material. All of the waste residues from burning, cleaning of the burn pans and collection of precipitation that collects in the burn pans are containerized and handled as hazardous waste. They are stored onsite, sampled and analyzed in accordance with the hazardous waste analysis plan contained in this document and in accordance with 40 CFR 264. Wastes that are verified as being hazardous are then disposed of in a permitted hazardous waste disposal facility. After treatment, the immediate area surrounding the unit is inspected and unburned explosives are collected and held until the next scheduled burn. This procedure ensures that any waste treatment residues collected for analysis and disposal are not of an

explosive nature. Scrap metal fragments are collected and disposed of in accordance with applicable DOD and environmental regulations.

II.B.8 Waste Analysis Plan [40 CFR 270.14(b)(3), 264.13(b)(c)]

The Waste Analysis Plan for the OB Ground was presented at the begininig of this section.

II.B.8(a) Parameters and Rationale [40 CFR 264.13(b)(1)]

The parameters and rationale of the Waste Analysis Plan are described in Section II.B.1.

II.B.8(b) Test Methods [40 CFR 264.13(b)(2)]

Test procedures of the Waste Analysis Plan are described in Section II.B.5.

II.B.8(c) Sampling Methods [40 CFR 264.13(b)(3) and Part 261, App. I]

Sampling Methods of the Waste Analysis Plan are discussed in Section II.B.4.

II.B.8(d) Frequency of Analysis [40 CFR 264.13(b)(4)]

Sampling Methods of the Waste Analysis Plan are discussed in Section II.B.4.

II.B.8(e) Additional Requirements for Ignitable, Reactive or Incompatible Wastes [40 CFR 264.13(b)(6), 264.17]

Additional requirements for ignitable, reactive or incompatible wastes are described in Section II.B.5 of the Waste Analysis Plan.

TABLE 1

WASTE GENERATED AT RFAAP ALLOWED FOR TREATMENT AT OPEN BURNING GROUND

Group No.	Category	Defining Characteristics	
1	Miscellaneous Waste	Ignitable and reactive Liquids and Sawdust D001, D003	Propellant wastes, Nitrate ester wastes only. No solvents unless more than 50% Propellant
2	Miscellaneous Waste	Propellant Laboratory Waste D003, D008, D030, D004	Not allowed at OBG
3	Miscellaneous Waste:	Pit Cotton Solid Waste	Not allowed at OBG
4	Miscellaneous Waste	Off specification Dinitrotoluene, Trinitrotoluene, Isotrioil D030	
5	Liquid Waste	Water Containing Triethlyene Glycol Solid Waste	Not allowed at OBG
6	Liquid Waste	Water Containing Diethylene Glycol Solid Waste	Not allowed at OBG
7	Single Base Propellants	Propellant with Nitrocellulose or lead D003, D008	
8	Single Base Propellants	Propellant with Nitrocellulose D003	
9	Single Base propellant	Propellant with Nitrocellulose and Dinitrotoluene D003, D030	
10	Double Base Propellants	Propellant with Nitrocellulose or Nitrate Esters D003	
11	Double Base Propellant	Propellant with Nitrocellulose, Nitrate Esters or a Non toxic metal COC D003	
12	Single or Double Base propellant	Propellant with Nitrocellulose, Lead, or Nitrate Esters D003, D008	

TABLE 1

WASTE GENERATED AT RFAAP ALLOWED FOR TREATMENT AT OPEN BURNING GROUND

13	Double base propellant	Propellant with Nitrocellulose, Nitrate Esters or Solid Explosives D003,	
14	Triple base propellant	Propellant with Nitrocellulose, Nitrate Esters or Nitroguanidine D003	
15	Load, Assemble, & Pack Waste	Energetic materials from manufacturing cartridges D003	
16	Single Base Propellants	Propellant with Nitrocellulose, Dinitrotoluene or Lead D003, D008, D030	
17	Specialty Products Waste Group A	Propellant with Nitrocellulose, Nitrate Esters, Nitroguanidine, Solid Explosives , or 40 CFR Part 261, App VIII Constituents D003	
18	Specialty Products Waste Group B	Propellant with Nitrocellulose, Nitrate Esters, Nitroguanidine, Solid Explosives, or 40 CFR Part 261, App VIII Constituents, Chlorides or Perchlorates D003	
19	Specialty Products Waste Group C	Propellant with Nitrocellulose, Nitrate Esters, Nitroguanidine, Solid Explosives, or 40 CFR Part 261, App VIII Constituents, or Metals D003, D004-D010	
20	Screening and floor wastes	Items that require extra fuel for burning but otherwise are D003.	

TABLE

LIST OF PROPELLANT INGREDIENTS

CONSTITUENT	GRP 1	GRP 4	GRP 7	GRP 8	GRP 9	GRP 10	GRP 11	GRP 12	GRP 13	GRP 14	GRP 15	GRP 16	GRP 17	GRP 18	GRP 19
D001															
Acetone	<20					< 5				0 7	< 5	< 5			
Alcohol	<20			0 26	0 17	< 5				0 11	< 5	< 5			
Ethanol												< 5			
Ether	<20			0 74	0 25										
Isopropanol	<20											< 5			
Methanol	<20											< 5			
1-Methoxy-2-propanol	<20											< 5			
1-Methoxy-2-propanol-acetate	<20											< 5			
Methylene Chloride	<20													< 5	
D003															
2 – Nitratoethyl-nitramine (NENA)														0 100	
2-Hydroxy methyl-2-methyl-1,3-propanediol trinitrate (TMETN)	<20					0 45	0 45	0 45	0 45	0 45			0 45	0 45	0 45
Ammonium Perchlorate									0 100		0 100			0 100	

TABL

LIST OF PROPELLANT INGREDIENTS

CONSTITUENT	GRP 1	GRP 4	GRP 7	GRP 8	GRP 9	GRP 10	GRP 11	GRP 12	GRP 13	GRP 14	GRP 15	GRP 16	GRP 17	GRP 18	GRP 19
Black powder											< 5	0 100	0 100		
Butanol	<20					0 45	0 45	0 45	0 45	0 45			0 45	0 45	0 45
Butyl tri nitrate (BTTN)	<20					0 45	0 45	0 45	0 45	0 45			0 45	0 45	0 45
Cyclohexanone												0 100			
Cyclortrimethylenenitramine (RDX)									0 45		0 45	0 45	0 45	0 45	0 45
Cyclotetramethylenete-tranitramine (HMX)									57 60		0 45	0 45	0 45	0 45	0 45
Diethylene glycol dinitrate (DEGDN)	<20					0 45							0 45	0 45	0 45
Metriol Trinitrate	<20					0 45							0 45	0 45	0 45
N – propanol	<20														
Nitroglycerin (NG)	<20					14 45	32 35	34.9 40.6	15 17	17.0 23.5	42.5 45.5		0 45	0 45	0 45
Nitroguanidine (NQ)										47 56			< 5	< 5	< 5
Triethylene glycol dinitrate (TEGDN)	<20					14 45	32 35	34.9 40.6	15 17	21.5 23.5	42.5 45.5		0 45	0 45	0 45
Trinitrotoluene, Isotrioil (TNT)		0 100													
D004 - D011															
Arsenic															< 5

Attachment II.B

TABL

LIST OF PROPELLANT INGREDIENTS

CONSTITUENT	GRP 1	GRP 4	GRP 7	GRP 8	GRP 9	GRP 10	GRP 11	GRP 12	GRP 13	GRP 14	GRP 15	GRP 16	GRP 17	GRP 18	GRP 19
Barium N.O.S			ND									< 5			< 5
Lead compounds N.O.S			ND		0.8 1.2	4		0.8 5.4							< 5
Mercury															<5
Silver															
Appendix 3.6															
2,4 Dinitrotoluene		< 5		3 10	6 12								< 5	< 5	< 5
2-Nitrodiphenylamine			ND			1.5 2.5		1.5 2.5	0.8 1.2				< 5	< 5	< 5
Antimony Sulfide												< 5	< 5	< 5	< 5
Barium N.O.S			ND									< 5			< 5
Chlorobenzene			ND										< 5	< 5	< 5
Chromium nitrate			ND										< 5	< 5	< 5
Diethylene glycol dinitrate (DEGDN)	<20					0 45							0 45	0 45	0 45
Dibutyl phthalate			ND	1 3	1 3			8 9		2.7 3.3	1 3		< 5	< 5	< 5
Diethylphthalate						1 3		10.5					< 5	< 5	< 5

TAB

LIST OF PROPELLANT INGREDIENTS

CONSTITUENT	GRP 1	GRP 4	GRP 7	GRP 8	GRP 9	GRP 10	GRP 11	GRP 12	GRP 13	GRP 14	GRP 15	GRP 16	GRP 17	GRP 18	GRP 19
Diphphenylamine			ND	0.4 1.5	0.5 1.3								< 5	< 5	< 5
Hexachloroethane												< 5	< 5	< 5	< 5
Lead compounds N.O.S			ND		0.8 1.2	4		3.3 5.4					< 5	< 5	< 5
Mercuric chloride			ND										< 5	< 5	< 5
Methylene chloride						23 25						< 5	< 5	< 5	< 5
Metriol trinitrate													< 5	< 5	< 5
Nitroglycerin (NG)	<20					14 45	32 35	34.9 40.6	15 17	17.0 23.5	42.5 45.5		0 45	0 45	0 45
Nitroguanidine (NQ)										47 56			< 5	< 5	< 5
Potassium Perchlorate							7.8 8.05					< 5	< 5	< 5	< 5
Toluene	<20											< 5	< 5	< 5	< 5
Triethylene glycol dinitrate (TEGDN)	<20					14 45	32 35	34.9 40.6	15 17	21.5 23.5	42.5 45.5		0 45	0 45	0 45
OTHERS															
Akardit II						0 1									
Aluminum			ND					1.5				< 5			
Aluminum Magnesium Alloy												< 5			

Attachment II.B

TABL

LIST OF PROPELLANT INGREDIENTS

CONSTITUENT	GRP 1	GRP 4	GRP 7	GRP 8	GRP 9	GRP 10	GRP 11	GRP 12	GRP 13	GRP 14	GRP 15	GRP 16	GRP 17	GRP 18	GRP 19
Antioxidant												<5			
Benzene Carboxylic Acid												< 5			
Black Copper Oxide (cupric oxide, CuO)												< 5			
Boric Acid												< 5			
Butanol												< 5			
Butyl Stearate					< 5										
Candella Wax						0.1 0.2		0.1 0.2			0 0.2				
Carbolac			ND												
Carbon Black			ND			0.1 0.5	1.2	0.05		.05 0.1	0.1 0.3				
Cellulose Acetate						< 5									
Charcoal			ND	9 10								< 5			
Chlorowax												< 5			
Clorowax 70												< 5			
Copper Carbonate												< 5			
Copper Chromite															0 1

TABL

LIST OF PROPELLANT INGREDIENTS

CONSTITUENT	GRP 1	GRP 4	GRP 7	GRP 8	GRP 9	GRP 10	GRP 11	GRP 12	GRP 13	GRP 14	GRP 15	GRP 16	GRP 17	GRP 18	GRP 19
Copper Oxide (cuprous oxide, Cu_2O)												< 5			
Copper Oxychloride												< 5			
Copper Saliylate								2.5							
Cryolite			ND							0.2 0.4					
Dextroamphetamine sulfate (dextrine)												< 5			
Dihydrate, Tetrasodium Pyrphasate												< 5			
Di-N-propyl-adipate								1.6 3.3							
Diphenylamine				1.3 1.7		< 5									
1, 3-Diphenylguanidine			ND												
Ethyl Centralite				0.4 0.6	1.0 1.4	0.5 1.2	0.8	1.7 2.3		1.4 1.6	1.7 2.3	< 5			
Ethyl Cellulose			ND			< 5									
Ethylene-Vinyl Acetate Polymer											<5				
Ferrous Ammonium Sulfate			ND												
Graphite				0 0.4	0 0.4	0.2 0.4		0.5		0.2	< 5				

TABLE

LIST OF PROPELLANT INGREDIENTS

CONSTITUENT	GRP 1	GRP 4	GRP 7	GRP 8	GRP 9	GRP 10	GRP 11	GRP 12	GRP 13	GRP 14	GRP 15	GRP 16	GRP 17	GRP 18	GRP 19
Herkote						< 5									
Hydrocarbon resin												< 5			
Iron												< 5			
Isopropyl Acetate												< 5			
Lactoge Shellac												< 5			
Laxtose												< 5			
Magnesium												< 5			
Magnesium Carbonate												< 5			
Magnesium Oxide			ND												
Methyl Centralite				0.5 1.5											
Morpholine			ND									< 5			
N-butyl acetate												< 5			
N-Butyl Stearate					2.7 3.3										
Nitrocellulose				39 80	13.0 90	58 80	0 54	48.5 53	18 22	20.5 29.5	50 54		0 80	0 80	0 80

TABL

LIST OF PROPELLANT INGREDIENTS

CONSTITUENT	GRP 1	GRP 4	GRP 7	GRP 8	GRP 9	GRP 10	GRP 11	GRP 12	GRP 13	GRP 14	GRP 15	GRP 16	GRP 17	GRP 18	GRP 19
Orasol Blue						< 5									
Orasol Yellow						< 5									
Oxamide									4.5 5.5						
Phenolic resin												< 5			
Polyvinyl chloride												< 5			
Potassium benzoate												< 5			
Potassium Chlorate												< 5			
Potassium Hydrogen Phthalate												< 5			
Potassium Nitrate			ND	45 43		0.5 1						< 5			
Potassium Salts				0.7 1.3											
Potassium Sulfate			ND		0.1 1.5	< 5		1.0 1.5		0.7 1.5	< 5				
Red Gum - N.F.V.												< 5			
Remix						< 5									
Rosin												< 5			
Shellac												< 5			

TABLE

LIST OF PROPELLANT INGREDIENTS

CONSTITUENT	GRP 1	GRP 4	GRP 7	GRP 8	GRP 9	GRP 10	GRP 11	GRP 12	GRP 13	GRP 14	GRP 15	GRP 16	GRP 17	GRP 18	GRP 19
Silicon												< 5			
Sodium Alkyl Benzene Sulfonates												< 5			
Sodium Bicarbonate												< 5			
Sodium Carbonate												< 5			
Sodium dichloro-3-triazinetrione												< 5			
Sodium Oxalate												< 5			
Sodium Sacicylate												< 5			
Stearic Acid												< 5			
Strontium Carbonate												< 5			
Strontium Nitrate												< 5			
Sulfur			ND	6 7								< 5			
Titanium												< 5			
Titanium Dioxide						< 5									
Triacetin								1.7 3.25							

TABL

LIST OF PROPELLANT INGREDIENTS

CONSTITUENT	GRP 1	GRP 4	GRP 7	GRP 8	GRP 9	GRP 10	GRP 11	GRP 12	GRP 13	GRP 14	GRP 15	GRP 16	GRP 17	GRP 18	GRP 19
Vinsol						< 5									
Ethyl Lactate								0 69.8							
Di-normal-propyl-adipate								0 2.0							
Sawdust	57 79	0 95													
Ash	0 57	0.2 45	0.9 2.4	0.2 75.2	0 5.3	0 4.1	0.1 3.1	0.2 9.3		0 1.1	0.2 8.3	0.4 2.5			0.9 1.6
Maximum Theoretical Heat of Explosion – (BTU/pound)	110	270	1350	1800	1440	2340	1980	1800	2340	1530	2340	1130	2340	1980	1980

Note: Waste Group 20 is not included on this Table because it can be a mixture of any of the Groups and their constituents listed above. Waste Group 20 will not include any Listed Wastes and will not exceed any limitations set forth within the permit on specific constituents.

TABLE 3

SUMMARY OF ANALYTICAL METHODS

Analyte	SW-846 Method Number
Sample preparation	RFAAP Laboratory Nitric Acid Reflux Digestion Method[1]
Antimony	7040
Thallium	7840
Lead	7420
Cadmium	7130
Nickel	7520
Silver	7760A
Chromium	7190
Beryllium	7090
Barium	7080A
Selenium	7742
Mercury	7470A/7471A or RFAAP Laboratory Varian Cold Vapor AA[2]
Arsenic	7062
Ash	RFAAP Laboratory Gravimetric Method[3]
Chloride	RFAAP Laboratory Anion Chromatography Method[4]
Perchlorate	RFAAP Laboratory Anion Chromatography Method[5]

[1] Method description provided in Table 4
[2] Method description and QA criteria provided in Table 5
[3] Method description provided Appendix II.B-1
[4] Method description and QA criteria provided in Table 6
[5] Method description and QA criteria provided in Table 7

TABLE 4

METHOD DESCRIPTION FOR SAMPLE DIGESTION

Method for Digestion of waste propellants prior to metals analyses

SW-846 Method 3050B shall be followed with the exception of the variations noted below:

- Weigh 20 g of sample
- Add 160 ml nitric acid
- Bring to reflux slowly
- Reflux overnight
- Add nitric acid to make 200 ml total volume
- Filter

TABLE 5

METHOD DESCRIPTION AND QA CRITERIA FOR MERCURY

Method for determining mercury in waste propellants via Varian cold vapor AA
SW-846 Method 7470A/7471A shall be followed with the exception of the variations noted below:

- Weigh 10 g of sample into ST Erlenmeyer flask (typically 24/40 250 ml)
- Add 80 ml nitric acid
- Bring to reflux slowly under ST Friedrich condenser
- Reflux overnight
- Cool
- Transfer with nitric acid washing to make 100ml total volume in volumetric flask.
- Filter through Whatman #41 paper.
- Dilute 1 to 10 with 5% nitric acid containing 0.01% potassium dichromate.

Conditions for Varian AA: Cold vapor

INSTRUMENT	Varian
WAVELENGHT NM	253.7
SLIT NM	0.5
MILIAMPS	10
BC (ON/OFF)	OFF
STANDARDS	5,10,15,20 ppb mercury
BLANK MATRIX	5% NITRIC ACID, 0.01% $K_2Cr_2O_7$
STD MATRIX	5% NITRIC ACID, 0.01% $K_2Cr_2O_7$

Method QA shall be conducted as specified below.

QA Provision	Definition	Criterion
Calibration Curve Correlation	Correlation to least squares fit	0.995 minimum
Continuing Calibration Verification	Recovery of independent source of standard at midrange of curve performed every 20 samples	75% to 125%
Spiked Samples	Recovery of known concentration of analyte is determined every 20 samples	75% to 125%
Duplicate Sample	Reproducibility of duplicate samples is determined every 20 samples	No formal criteria for rejection because of inhomogeneity of samples
Blanks	Spectrophotometric absorbance of reagents without analyte is determined	Used to determine MDL and MQL and deducted from the sample absorbances to compensate for drift
Minimum Detection Limit (MDL)	3 times the standard deviation of the blank divided by the slope of the calibration curve	Consistent with literature and previous performance of instrument
Minimum Quantitation Limit (MQL)	5 times the standard deviation of the blank divided by the slope of the calibration curve	Consistent with literature and previous performance of instrument

TABLE 6

QA CRITERIA FOR ASH*

QA Provision	Definition	Criterion
Duplicate Sample	Reproducibility of duplicate samples is determined every 20 samples	No formal criteria for rejection because of inhomogeneity of samples
Blanks	Weight change of empty crucible is determined	Used to determine MDL and MQL
Minimum Detection Limit (MDL)	3 times the standard deviation of the blank determined during method development	Consistent previous performance and balance capabilities
Minimum Quantitation Limit (MQL)	5 times the standard deviation of the blank determined during method development	Consistent previous performance and balance capabilities

* See Appendix II.B-1 for description of method.

TABLE 7

METHOD DESCRIPTIONS AND QA CRITERIA FOR CHLORIDE AND PERCHLORATE

Anion Chromatographic method for determining chloride in waste propellants
SW-846 Method 9057 shall be followed with the exception of the variations noted below:

- Dissolve 1g of waste in 50 ml acetonitrile. (Typically in volumetric flask 250 ml using magnetic stirring over night)
- Add DI water for total volume of 250 ml. Mix thoroughly with shaking and flask inversions.
- Centrifuge a portion (about 20 ml) to remove precipitated organics (polymers) (note: allowing mixture to settle overnight and decanting makes this step easier.)
- Prepare 3M Empore 2240 47mm SDB-XC extraction disk with sequential 10 ml acetone, isopropanol, methanol, and water rinses.
- Filter decanted sample through Extraction disk.
- Dionex IonPac guard and analytical columns (AG16 4X50 and AS16 4X250 mm, respectively).
- Eluent 12 mM KOH or minimum concentration needed for desired separation.
- Eluent flow nominally 1 ml/min.
- Retention time of chloride anion 6-7 minutes is typical.
- Standards nominally 5,10,20,30,40,50 ppm Cl.

Anion Chromatographic method for determining perchlorate in waste propellants (very similar to chloride method above)
SW-846 Method 9058 shall be followed with the exception of the variations noted below:

- Dissolve 1g of waste in 50 ml acetonitrile.
- Add DI water for total volume of 250 ml.
- Centrifuge.
- Prepare 3M Empore 2240 47mm SDB-XC extraction disk with sequential 10 ml acetone, isopropanol, methanol, and water rinses.
- Filter decanted sample through Extraction disk.
- Dionex IonPac guard and analytical columns (AG16 4X50 and AS16 4X250 mm, respectively).
- Eluent 45mM KOH, or minimum concentration required for desired separation.
- Eluent flow nominally 0.9 ml/min.
- Perchlorate retention time 12 to 13 min.
- Standards nominally 10, 50, 150, 200, 250, 500 ppm ClO_4
- Calculate and report data as chlorine concentration

TABLE 7 (cont.)

Method QA shall be conducted as specified below.

QA Provision	Definition	Criterion
Calibration Curve Correlation	Correlation to least squares fit	0.995 minimum
Continuing Calibration Verification	Recovery of independent source of standard at midrange of curve performed every 20 samples	75% to 125%
Spiked Samples	Recovery of known concentration of analyte is determined every 20 samples	75% to 125%
Duplicate Sample	Reproducibility of duplicate samples is determined every 20 samples	No formal criteria for rejection because of inhomogeneity of samples
Blanks	Concentration of reagents without analyte is determined	Used to determine that contamination has not occurred
Minimum Detection Limit (MDL)	1 ppm chloride in prepared sample	Consistent with literature and previous performance of instrument
Minimum Quantitation Limit (MQL)	3 ppm chloride in prepared sample	Consistent with literature and previous performance of instrument

Appendix II.B-1

Ash Determination Method

Ash Determination Method

6. OPERATION

6.1 With gentle stirring, dampen the sample with alcohol.

6.2 Treat the sample with sufficient acetone-castor oil solution to thoroughly gelatinize the nitrocellulose.

6.3 Turn on the forced-air hood. Place the crucible on a tripod and ignite.

6.4 Allow the sample to burn without applying any further heat until a charred residue remains. Turn off the forced-air hood.

6.5 Using tongs, transfer the sample to the muffle oven and burn until all carbon is consumed.

6.6 With the aid of tongs, remove the crucible from muffle oven and cool in a desiccator.

6.7 Weigh the crucible with ash; wipe the ash residue out of the crucible and reweigh.

6.8 The difference in weight is the amount of ash in the sample.

6.9 Calculate.

$$\% \text{ Ash} = \frac{A - B}{C} \times 100$$

Where: A = weight of crucible with ash
B = weight of crucible
C = weight of sample

Appendix II.B-2

Reactivity Test Methods

Three methods are used to determine reactivity of residue from thermal treatment of reactive wastes.

The first method is performed by the on site laboratory. A composite sample of the residue is analyzed for the presence of propellant. This method provides results to within a detection limit of less than 1%. Hazards Analysis has a propriety report that tested explosives in soil. If there is less than 10% explosives in a soil matrix the soil will not be reactive for the Gap test or DOT test. Hazards Analysis uses the data from the on site laboratory to make the determination whether the residue is reactive or not reactive.

The second method is to analysis the composite sample using SW 846 Method 8330. Again using the proprietary report Hazards Analysis uses the data to make the determination whether the residue is reactive or not reactive.

The third method is the is to use the GAP test or DOT test. These tests are described on the next three pages.

The first method is used for waste characterization residue. This testing is Quality checked by using the second method every 4 ash samples. The third method is done annually to confirm the Hazard Analysis report.

REACTIVITY TEST PROCEDURES

DESCRIPTION OF TESTS

TEST FOR SOLID MATERIALS

The experimental arrangement used for the gap test is shown in Figure 2. The test sample is contained in a cylinder consisting of a 40.64-cm (16-inch) length of cold-drawn seamless carbon steel "mechanical" tubing 4.76 cm (1.875 inches) in outside diameter with a wall thickness of 0.56 cm (0.219 inch) and an inside diameter of 3.65 cm (1.438 inches). The sample in this test is normally either a gel or a granular solid at room temperature that is loaded to the density attained by tapping the cylinder until further settling becomes imperceptible. The bottom of the cylinder is closed with two layers of 0.0076-cm (0.003-inch) thick polyethylene sheet tied on with gum rubber bands and polyvinyl chloride electrical insulating tape. The sample is subjected to the shock wave generated by the detonation of a cast pentolite density 1.65 g/cm³ (50/50 pentaerythritol tetranitrate PETN/TNT) pellet 5.08 cm (2 inches) in diameter and 5.08 cm (2 inches) thick. The pellet may be either in direct contact with the bottom of the sample tube ("zero gap"), or separated from it by a cylinder of material that provides shock attenuation (see below). As applied in Test Series 1, this test uses the zero-gap code. The pentolite pellet is initiated by a U.S. Army Engineers special detonator having a base charge of 0.935 gram (14.4 grains) of PETN and a primary charge of 0.35 gram (5.4 grains) of diazo dinitrophenol which is butted against the bottom surface of the pentolite pellet and held in place by a cylinder of cork. Instrumentation consists of a continuous rate probe made of a thin aluminum tube with an inner diameter of 0.051 cm (0.02 inch) and a wall thickness of 0.0038 cm (0.0015 inch) with an axial enamel-coated resistance wire of 0.0079-cm (0.0031-inch) diameter, having a resistance of 3.0 ohms/cm (7.62 ohms/inch) [1]. The outer tubing is crimped against the inner wire at the lower end, forming a resistor. When this assembly is inserted in a medium that transmits a shock wave, the outer wall crushes against the inner wire as the wave moves up the tubing, shortening the effective length and changing the resistance. If a constant current (usually 0.06 ampere) is made to flow between the outer and inner conductors, the voltage between them is proportional to the effective length and can be recorded as a function of time using an oscilloscope. The slope of the oscilloscope trace is thus proportional to the velocity of the shock wave.

Criteria Results of this test are considered to be positive if a stable propagation velocity greater than 1.5 km/sec is observed. Additional diagnostic information is provided by a mild steel witness plate 15.24 cm (6 inches) square and 0.3175 cm (0.125 inch) thick, mounted at the upper end the sample tubing and separated from it by spacers 0.16 cm (0.063 inch) thick. In the original sion of this test, the witness plate was 0.952 cm (0.375 inch) thick, but in the application of his test to low-density, low-energy materials, i.e., marginally explosive granular solids, it was found that detonation in many of these materials could not punch a hole through the plate (the desired indication of a positive result). With some materials, even the thinner plate is not punched through (benzoyl peroxide is an example), but the above thickness represents the best compromise that could be found. (If the plate is made too thin, even a non-reactive shock wave generated by the pentolite booster in the sample material can punch the plate, generating false positive results.)

A third source of diagnostic information is the fragmentation of the sample tube. The results of the test are considered to be positive only if the tube is fragmented along its entire length. The fragments range, depending on the material tested, from a few long strips to nearly a hundred small fragments; bulging, cracking, or "banana-peeling" of the acceptor is not considered a positive result.

In most cases, the results of the above three diagnostic methods agree. In some they do not, particularly with low-energy, low-density materials, e.g., benzoyl peroxide, in which the witness plate is not punched through, but the tube is fragmented; also with certain propellants, the witness plate is punched, but little damage is done to the tube, evidently indicating a localized explosion at the upper end of the tube. In such cases, since there are essentially three criteria (witness plate, tube fragmentation, and rate probe), the result is assessed on the basis of the two criteria that agree; i.e., if any two criteria indicate a detonation, the result is considered positive, but not so if only one indicates a detonation. Some cases of doubtful propagation can also be resolved by using a longer sample tube.

DOT TEST

The experimental arrangement for the DOT Test is shown in Figure 4. The sample of material to be tested is contained in a 45.7-cm (18-inch) length of 3-inch-diameter schedule 80 carbon steel pipe with inside diameter of 7.37 cm (2.9 inches) and wall thickness of 0.76 cm (0.30 inch), capped at both ends with "3000 pound" forged steel pipe caps.

The sample is subjected to the thermal and pressure stimulus generated by an igniter consisting of a mixture of 50 percent RDX and 50 percent grade FFF_g black powder located at the center of the sample vessel. The igniter assembly consists of a cylindrical container 2.06 cm (0.81 inch) in diameter and of variable length, which is made from 0.0254-cm (0.01-inch) thick cellulose acetate held together by two layers of nylon-filament-reinforced cellulose acetate tape. The length of the igniter capsule is 0.32 cm (0.125 inch) for each gram of igniter material. The igniter capsule contains a small loop formed from a 2.54-cm (1-inch) length of nickel-chromium alloy resistance wire 0.03 cm (0.012 inch) in diameter having a resistance of 0.343 ohm. This loop is attached to two insulating copper tinned lead wires 0.066 cm (0.026 inch) in diameter; the overall wire diameter including insulation is 0.127 cm (0.05 inch). These lead wires are fed through small holes in a brass disc approximately 1 cm (0.4 inch) in diameter and 0.08 cm (0.03 inch) thick, which is soldered to the end of a 23-cm (9-inch) length of "1/8-inch" steel pipe having a diameter of 1.03 cm (0.405 inch); this pipe is threaded at the other end and screwed into a threaded hole on the inside of one of the pipe caps. This pipe supports the igniter capsule and serves as a channel for the igniter wires. The igniter is fired by a current of 15 amperes obtained from a 20-volt transformer.

Criteria The criterion currently used in the interpretation of this test is that for a positive result either the pipe or at least one of the end caps be fragmented into at least two distinct pieces, i.e., results in which the pipe is merely split or laid open or in which the pipe or caps are distorted to the point at which the caps are blown off are considered to be negative results. Although it may be argued that a small number of fragments does not indicate the development of a detonation, it at least indicates a very rapidly rising pressure which in a larger sample could lead to development of detonation.

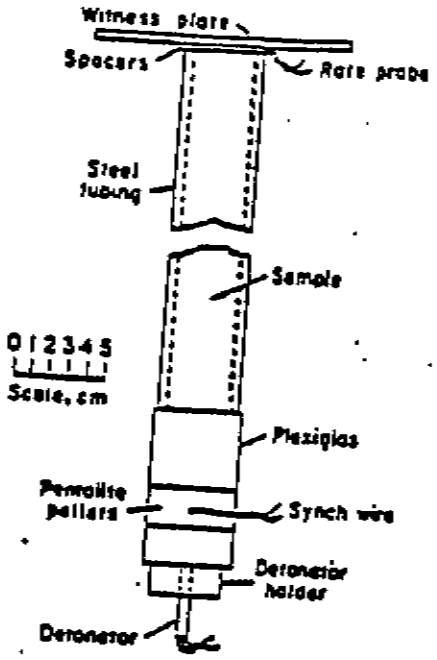


Figure 2. Experimental arrangement for gap test.

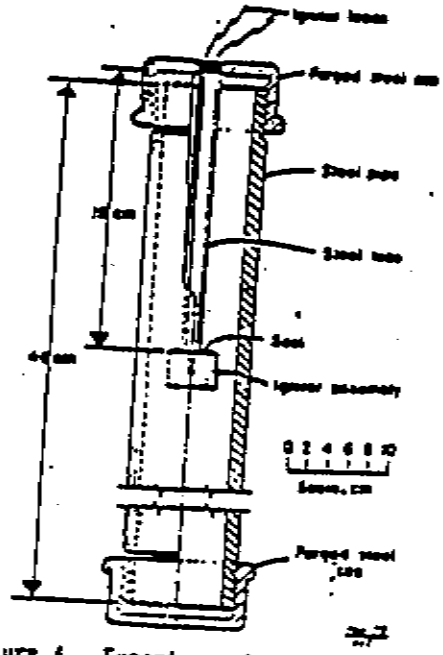


Figure 4. Experimental arrangement for deflagration-detonation transition test.

SOIL MONITORING PROGRAM
FOR THE
OPEN BURNING GROUND
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

Submitted to:

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EEE Job No. 04-702

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Appendix A Example Chain-of-Custody Form

CERTIFICATION SHEET

Virginia Professional Certification:

I certify that I have supervised preparation of the attached report, that it has been prepared in general accordance with industry standards and practices, and that the information contained herein is truthful and accurate to the best of my knowledge.

Name: Andrew E. Kassoff, PG

Signature: _____

Virginia Professional Certification Type and Number: Professional Geologist # 873

Company: EEE Consulting, Inc.

Address: 307 Church Street

City/State/Zip: Blacksburg, Virginia 24060

1.0 INTRODUCTION

This Soil Monitoring Program (SMP) has been developed to monitor for potential impacts to surface soils resulting from the operation of the Open Burning Ground (OB Ground) at the Radford Army Ammunition Plant (Radford AAP) in Radford, Virginia. The duration of the program will be over the lifetime of the RCRA Operating Permit. The OB Ground is also designated as Solid Waste Management Unit 13 (SWMU-13) in the EPA Corrective Action Permit for the facility. Historical and ongoing groundwater monitoring at the site has indicated that no statistically significant evidence of a release of hazardous constituents as defined under 40 CFR 264.93 has been detected in the groundwater at the OB Ground. The SMP outlines the procedures and techniques that for sample collection, sample preservation and shipment, chain-of-custody control, and laboratory analyses that will be utilized during groundwater monitoring for the Unit. The results of the SMP will be used to detect the presence of a release of hazardous constituents from the OB Ground to the surface soils comprising the Unit.

The purpose of this SMP is to evaluate the potential for surface soil impacts from the operation of the OB Ground by providing an accurate representation of surface soils. This will be accomplished by collecting an adequate number of representative samples, QA/QC samples, and background samples. To this end, this program will outline the methods and procedures to be used to establish representative background concentrations of explosives and other compounds of potential concern (COPC), identify the protocols for sampling, sample handling, preservation, chain of custody and shipping, and decontamination procedures of sampling equipment.

In addition, this program description will address the procedures to be taken for the evaluation of hotspots, should they be detected, and the protocol for interim measures that may be required to remediate any hotspots.

As the facility is within the 100-year floodplain, a major consideration in the design of this program was to comply with the requirements set forth in 40 CFR 264.18 (b) pertaining to floodplains, as follows:

> (b) *Floodplains.* (1) A facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout or any hazardous waste by a 100-year flood, *unless* the owner or operator can demonstrate to the Regional Administrator's satisfaction that:
>
> > (i) Procedures are in effect which will cause the waste to be removed safely, before flood waters can reach the facility, to a location where the wastes will not be vulnerable to flood waters;

The analysis of soil samples and subsequent provisions for remediation will, in effect, serve as the *procedures which will cause the waste to be removed safely, before flood waters can reach the facility, to a location where the wastes will not be vulnerable to flood waters.*

This work will be in accordance with the following documents that are incorporated in part into this program by reference. They are:

- *Draft Final Open Burning Ground/Open Detonation Permitting Guidelines, VDEQ, February 2002*
- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Chapters 1 and 9, US EPA, Revision 5, April 1998,*
- *Draft Guidance Manual for Closure Plans and Post-Closure Plans September 28, 2001*
- *Superfund Program Representative Sampling Guidance, Volume 1: Soil, Interim Final, OSWER Directive 9360. 4-10, EPA 540/R-95/141, PB96-963207, December 1995*
- *ASTM Standard Guide for Soil Sampling in the Vadose Zone, Designation D 4700-91, July 15, 1991 (re-approved 1998)*
- *Draft Human Health Risk Assessment for the Open Burning Ground, Radford Army Ammunition Plant, CH2M Hill, June 2004.*
- *Facility-Wide Background Study Report, IT Corporation, January 2001*

1.1 SITE DESCRIPTION

The Radford AAP is located in the mountains of southwestern Virginia within Pulaski and Montgomery Counties. A Site Location Maps are presented as **Figure 1 and Figure 2**. The facility is situated in one of a series of narrow valleys typical of the Valley and Ridge physiographic province of the Appalachian Highland Region of North America. Oriented in a northeast-southwest direction, the valley is approximately 25 miles long. The valley has a width of approximately eight miles at the southwest end and narrows to approximately two miles at the northeast end. Radford AAP lies along the New River in the relatively narrow northeast corner of the valley. The maximum elevation at Radford AAP is 2,225 feet above mean sea level (MSL) in the southeast corner and the minimum elevation is approximately 1,675 feet above MSL along the New River at the northern property boundary. Radford AAP is divided by the New River into two sections. The southern section, which comprises approximately two-thirds of Radford AAP, is called the "Main Plant." The remaining northern one-third section is called the "Horseshoe Area." The OB Ground is located in the Horseshoe Area.

The OB Ground is the waste propellant burning ground. A Site Plan for the Unit is included as **Figure 3**. Material that cannot be burned in the Explosive Waste Incinerators is open burned at this Unit. As shown on the Site Location Map (**Figure 2**), the OB Ground is located within the 100-year flood plain of the New River at the southeastern end of the Horseshoe Area. The Unit is located approximately 70 to 150 feet north of the river at an approximate elevation of 1,695 feet MSL (Site Plan, **Figure 3**). The topography across the Unit is relatively flat; however, approximately 75 to 100 feet north of the Unit the ground surface slopes steeply upward. The elevation of the New River at the western end of the OB Ground is approximately 1,690 feet MSL; the elevation of the New River at the eastern end of the Unit is approximately 1,686 feet MSL.

1.2 DEFINITIONS

The following definitions apply to this document:

Hazardous Constituents. Constituents specified in a facility's permit for which the surface soils must be monitored. Hazardous constituents are constituents identified in Appendix VIII of 40 CFR Part 261 that are reasonably expected to be in or derived from waste contained in a regulated unit.

2.0 GEOLOGIC SETTING

The Valley and Ridge physiographic province consists of folded and thrust-faulted Paleozoic sedimentary rocks ranging in age from Cambrian to Mississippian. Post-deformation weathering of these thrust-faulted and overturned Paleozoic rocks has resulted in the formation of resistant sandstone and dolomite ridges separated by valleys underlain by more easily eroded shale and limestone. Well developed karst features such as sinkholes and caves are common in the Valley and Ridge.

The general geology at Radford AAP consists of limestone/dolomite bedrock covered by weathered residual deposits and/or alluvial deposits. The alluvial deposits consist of typical fluvial deposits of interbedded clay, silt, and sand/gravel deposits with cobble lenses. The thickness of the alluvial deposits ranges from a few feet to approximately 50 feet, with an average thickness of 20 feet. The residual deposits consist of clay, silt, and clasts resulting from the physical and chemical weathering of the parent bedrock. The residual deposits typically underlie the alluvium, except in locations where the residuum has been eroded to bedrock and replaced by alluvium. The thickness of the residual deposits ranges from a few feet to approximately 40 feet. Underlying the alluvium and residuum throughout most of Radford AAP is a series of dolomite, limestone and shale strata known as the Cambrian-aged Elbrook Formation. The Elbrook Formation is the major outcropping formation as well as the predominant karstic formation below the facility. Sinkholes, solution channels, pinnacled surfaces, and springs are common to the Elbrook Formation.

The OB Ground is underlain by an approximately 13-20 feet thick alluvial deposit. Based on a review of boring logs for monitoring wells that were installed (by others) around the OB Ground, the alluvial deposit consists of clay and silt overlying sand and gravel. The alluvium appears to be laterally continuous across most of the site, although the thickness, composition, and texture vary between monitoring well locations. The alluvium is underlain by Middle Cambrian Age carbonate bedrock of the Elbrook Formation. The Elbrook Formation is comprised of dolomite and limestone with lesser shale and siltstone.

In 1992, the USEPA reviewed and compared historical aerial photography to assess sinkhole presence and development, and to analyze apparent photo-lineaments. A fracture trace/sinkhole location map of Radford AAP was prepared (USEPA, 1992). The fracture trace map illustrates a northwest-trending lineament passing through the OB Ground to the east of monitoring well 13MW2. Furthermore, a geologic map of the area illustrates a splay of the Pulaski Thrust Fault trending to the northwest through the western portion of the Unit (Schultz, VDMR open file in preparation).

2.1 SOILS OCCURRENCE AND PROPERTIES

According to the *Facility-Wide Background Report (Section 1.0)* the OB Ground is underlain by Wheeling Sandy Loam (see **Figure 4**). The Wheeling Sandy comprises about 11% of the soils at the Radford Plant site. The Wheeling is characterized by low slopes (0-2%). The unit is described as a surface layer of 10-inches of dark brown sandy loam underlain by 50-inches of dark brown gravely sandy loam subsoil. At depths greater than 60-inches below ground surface the soil is predominately a mixture of silt and sand with minor amounts of clay. Depth to bedrock is at least 60-inches.

The permeability and water capacity of the Wheeling is moderate. Surface runoff is slow. The organic matter content is moderately low, and the soil is moderately to strongly acidic. The hazard of erosion from the Wheeling soil unit is characterized as slight.

2.2 HYDROGEOLOGY

The general hydrogeologic setting for Radford AAP is characterized by porous alluvial sediments overlying weathered and unweathered dolomite and limestone. In areas where the porous alluvial sediments are the uppermost water-bearing zone, ground water flow is generally from topographically high areas to topographically low areas. In some areas of Radford AAP, the uppermost water-bearing zone is within the limestone and dolomite bedrock. The karst features within the bedrock aquifer can provide conduits for rapid transport of ground water to the New River, which is the discharge area for regional ground water flow.

Seasonal variations in precipitation can affect the direction of ground water flow within the bedrock aquifer at Radford AAP. During wet seasons (high flow conditions), ground water flow may occur in higher elevation conduits that are not normally saturated during dry seasons (low flow conditions). As a result, flow directions may change significantly as different conduits are accessed. Additionally, flow may short-circuit the predominant flow paths and be redirected, discharging in unexpected areas.

In addition to seasonal variations, ground water levels within the bedrock aquifer may fluctuate dramatically during heavy precipitation events. Ground water levels in the karst bedrock aquifer generally respond to heavy precipitation within approximately 14 hours, and may rise several feet in a short time. This condition exists throughout Radford AAP, especially in areas where surface water infiltrates through sinkholes. Stormwater that flows into the sinkholes travels downward rapidly through conduits into the bedrock aquifer. Because ground water may flow very quickly through these conduits, stormwater which infiltrates in the uplands of the facility may discharge to the New River in a matter of a few days following a storm event. The turbulent flow created by these conditions aerates the infiltrating water. The increased dissolved oxygen content can significantly affect the chemistry of the ground water, increasing the concentration of many commonly occurring inorganic analytes. It is this direct connection between surface water and ground water and the rapid movement of ground water through the aquifer that is vital to interpreting the migration of both naturally occurring and released constituents in the ground water at Radford AAP.

3.0 SOIL MONITORING PROGRAM

The SMP will be used to monitor for the presence of a release of hazardous constituents from the operation of the OB Ground to the surface soils of the Unit. The zone of monitoring is defined as the uppermost surface soils (zero to six-inches below ground surface) at selected locations located within the operating unit. The objective of the SMP is to evaluate for potential impacts to the surface soils over time. Samples will be collected and compared to specific regulatory limits and background values which will function as action levels. If specific action levels are exceeded, interim measures will be implemented.

3.1 SAMPLE LOCATIONS

The sample locations proposed for SMP are based on a judgment and knowledge of the site. **Figure 3** presents the proposed location of the samples. Sample matrices will be limited to the uppermost soil horizon. The sampling of surface water runoff from the site is addressed by the site Virginia Pollution Discharge Elimination System (VPDES) permit. Outfall 017 is included in the plant-wide permit. Groundwater samples are collected quarterly as part of the existing RCRA Operational Permit for the Unit. As the objective of the SMP is to evaluate if potential for contamination to leave the site via airborne deposition to the soils, the uppermost soil horizon has been targeted. Vertical delineation of the soil is not proposed as impacts to soils below the uppermost horizon are not subject to site erosion and vertical migration is addressed by the groundwater monitoring program.

The proposed sample locations are based on a highly biased observation that the "worse case" impacts will be within the immediate vicinity of the burn pans and within the overlapping ejecta zone of the pans. These locations were selected to represent the areas of greatest potential for impacts. The rationale that supports the selection of the sample locations is that soils will be transported by erosion and the worst case areas of deposition serve as the primary source area for the migration of impacted soils.

In addition to the samples adjacent to the burn pans, two discreet grab samples will be collected randomly along the southern border boundary of the OB Grounds and two samples will be randomly collected along the northern portion of the burn pads. Also, one grab sample will be collected at the southeast corner of the OB Ground inside the proposed berm and one sample from the center-bottom of the sediment basin. These samples will be collected during the first two semi-annual sampling events. If no constituents are detected above their respective action levels (Table 1), Alliant may petition the DEQ to cease the sampling at these locations.

The sample locations presented in **Figure 3** are functionally in between the burn pans of each burn pad locations. Each *pad* in defined as the area of raised topography that houses the location of two individual burn *pans*. Burn *pans* are the ceramic or clay lined vessels that hold the waste propellant before and during the process of open burning. The sample locations represent an area that will be subject to overlapping zones of ejecta from each pan. The ejecta zone for each pan is conservatively defined as 20-feet in all directions. This ejecta zone delineation is based on repeated observation of the open burning operations by plant personnel and evaluation of slow motion videos of the operation by graduate researchers from Virginia Tech. As presented in **Figure 3** there will be a total of 8 samples collected from designated sample locations during each sampling event. The location of the random samples, the sample

before the berm and the center of the pond are not depicted, as those locations may vary between events. In an effort to accurately measure the temporal variation (change over time) of constituent concentrations at the designated sample locations, it is proposed to collect samples within a zone of ten-feet in diameter at each location during each subsequent sampling event. In practice this would entail recording a triangulated location each event that could be reproduced each subsequent sampling event. The actual sampling location will correspond to an area of low topography between each pan that functions as the runoff conduit for the pad. These areas are erosion channels that flow towards the river-side berm and ultimately to the pond that precedes Outfall 017. These channels are not vegetated and are comprised of open soils. **Figure 5** presents photographs of a typical sample location.

Background samples will be collected at a location on the far side of the Horseshoe area of the plant in a the same soils group, the Wheeling Unit, as the soil at the OB Ground. Samples will be collected for SW 846 Methods 8260B and 8270C. **Figure 4** presents the proposed background sample location. Four replicate samples will be collected from two sample locations for future statistical evaluation. Upper confidence levels (UCLs) for constituents detected above their respective Reporting Limits will be calculated. Samples for Methods 8330 and 8332 for energetics and nitroglycerin, respectively, will not be collected due to the high degree of false positives associated with those methods. Inorganics will not be collected as those values have already be determined in the Facility wide Background Study.

3.2 SOIL MONITORING ANALYTE LIST AND DETECTION DETERMINATION

The hazardous constituents for which the OB Ground will be monitored are listed in **Table 1**. This list is derived from the significant amount of analysis applied to selecting Compounds of Potential Concern (COPC) that was conducted in the *Detection Groundwater Monitoring Program – Open Burning Ground, Draper Aden Associates*, the *Human Health Risk Assessment for the Open Burning Ground, Radford Army Ammunition Plant, CH2M Hill, June 2004* and the associated Master Constituent List (MCL) that was compiled for the Risk Assessment. The constituents presented in **Table 1** are derived from the (MCL); therefore, they are constituents that are reasonably expected to be in, or derived from, the wastes treated at the OB Ground and represent a reliable indication of the presence of hazardous constituents in the soil. The compounds listed in the Master Constituent List were compared to the list of hazardous constituents presented in Appendix VIII of 40 CFR Part 261. In addition, the comparison process included an evaluation of the Material Safety Data Sheets for the proprietary compounds and other generic substances listed in the Master Constituent List in order to determine the specific chemical constituents of those substances. Those constituents that comprise the substances listed in the MCL that are also listed in Appendix VIII of 40 CFR Part 261 are presented in **Table 1**. Also included in **Table 1** are those energetic compounds that are typically reported in SW 846 Method 8330 for energetics, as well as Total petroleum Hydrocarbons-Diesel Range Organics (TPH-DRO). TPH-DRO analyses will be collected and conducted at Pads 1, 4 and 7 as diesel and kerosene is occasionally used as an accelerant at those locations.

The analytes listed in **Table 1** will serve as the parameter list for the Soil Monitoring Program. Detection will be defined as an analytical result above the laboratory Reporting Limit (RL). The RL is analogous o the Limit of Quantitation (LOQ) for each parameter. RLs for each constituent are presented in **Table 1**. Constituents not detected above the RL will be reported as

Not Detected (ND). Radford AAP will list each constituent detected in soil. Also listed on the table will be the laboratory specific Method Detection Limit (MDL) for each constituent. If a concentration is recorded between the MDL and the RL, that concentration will be J-flagged on the table. It is important to note; however, that the definition of a detection for this program will be an exceedance of the RL, not the MDL. Therefore, the subsequent actions associated with constituent confirmation, delineation and interim measures will only be triggered by an exceedance of the RL. As shown on **Table 1**, the RLs for each of the constituents are well below the respective designated action levels (benchmarks). Therefore the RLs are deemed to be sufficiently conservative to serve as appropriate screening values for this program.

The Program Action levels (primarily the Region 3 RBCs) will be updated on a bi-annual basis (every two years). This will be done in the form of a Class I Permit modification. The rationale for this approach is due to the fact that the SMP will be part of a RCRA Operating Permit; therefore, effectively changing the Action Levels on a non-routine basis could result violations that are out of the control of both the permittee and the DEQ.

Chloromethane and 4-Nitrophenol have no Region III RBC values. Accordingly Radford AAP proposes the following:

- Chloromenthane: 1.6+02 mg/kg (source – most recent Region 9 PRG for industrial soil).
- 4-Nitrophenol: Currently there are no published Risk Based Concentrations for this compound. Accordingly, Radford AAP will analyze for this compound, and if detected above the Reporting Limit, a site specific risk evaluation will be conducted. The risk evaluation will entail comparing the result to a June 23, 2000 EPA memorandum Entitled *Amended Guidance on Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Activities, and Inclusion of Stakeholders*. This document recommends 7.0E+00 mg/kg as an ecological screening level for 4-Nitrophenol in soil. The memorandum can be reviewed in it's entirety at: http://www.epa.gov/region4/waste/fedfac/ecoproc2.pdf

If ten or more non-carcinogenic COPCs are detected during a single sampling event, the concentrations will be compared to 1/10 of the RBC of those constituents. This comparison is a qualitative evaluation and will have no bearing on the risk evaluation of the site, and will not trigger corrective actions or interim measures at the site.

Table 2 presents the dioxin/furan (D/F) "action level". This benchmark will be the Region IX PRG for 2,3,7,8 TCDD equivalent. That value for industrial soils is 1.6×10^{-5} mg/kg or 16 nanograms per kilogram (ng/kg). The way that equivalent will be calculated is to multiply all detections of those compounds listed in **Table 2** by their respective toxicity equivalent factors (TEFs). The multiplication products will be summed and the resulting total sum will be compared to the Region III PRG for 2,3,7,8 TCDD. This is the recommended methodology for all regions according to the US EPA Office of Solid Waste and Emergency Response (OSWER) guidance.

3.3 MONITORING FREQUENCY

The SMP will be carried out will be sampled on a semi-annual basis (every six months). Analysis will be conducted for the constituents listed in **Table 1**. If at the end the initial year (2

events) there are limited instances of concentrations exceeding the action levels, then Radford AAP may propose an alternative sampling plan where semi-annual samples will only be collected in areas where samples have exceeded action levels. The remainder of the site would be sampled annually. Additionally, as mentioned previously, Radford AAP may petition to cease collection of the random samples, along with the samples at the southeast corner of the site and the center of the pond if no action levels are exceeded at those locations. Also, **Table 1** lists 8 constituents that were requested for inclusion on the COPC list by the VDEQ in February 2005. Those constituents will be included in the first 2 semi annual events. If there are no detections of those constituents above there respective action levels, Radford AAP may petition the VDEQ to cease monitoring for those constituents.

4.0 SAMPLING AND ANALYSIS PLAN

The Sampling and Analysis Plan (SAP) for Soil Monitoring Program is based on the following reference documents:

- *Draft Final Open Burning Ground/Open Detonation Permitting Guidelines, VDEQ, February 2002*
- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Chapters 1 and 9, US EPA, Revision 5, April 1998,*
- *Draft Guidance Manual for Closure Plans and Post-Closure Plans September 28, 2001*
- *Superfund Program Representative Sampling Guidance, Volume 1: Soil, Interim Final, OSWER Directive 9360. 4-10, EPA 540/R-95/141, PB96-963207, December 1995*
- ASTM Standard Guide for Soil Sampling in the Vadose Zone, Designation D 4700-91, July 15, 1991 (re-approved 1998)

Procedures and techniques for sample collection, sample preservation and handling (shipment), chain-of-custody control, analytical procedures, and field and laboratory quality assurance/quality control (QA/QC) are included in the SAP. Soil sample collection shall be conducted in accordance with the protocols described in this section.

4.1 SAMPLE COLLECTION ORDER

During the initial sampling event the soil samples will be collected sequentially, beginning at sample location 1 and progressing through sample location 8. In future events, in order to minimize the potential for cross-contamination, samples will be collected in the order from least contaminated location to the most contaminated.

4.2 FIELD LOG BOOK/LABORATORY LOGBOOK

A Field Logbook is used to record field information and activities for each well. The Field Log Book will include the following information:

- Sample Location Designation Identification
- Weather conditions and relative moisture of soil
- sampling date, time, and equipment used
- sample identifications (by constituents)
- preservatives used, if any
- constituents to be analyzed
- samplers' and sample preparers' names

The contract laboratory will keep a logbook to document the processing steps that are applied to the sample. All sample preparation techniques and instrumental methods must be identified in this logbook. The results of the analysis of all quality control samples should be identified specific to each batch of groundwater samples analyzed. The logbook should also include the time, date, and name of person (and company affiliation if subcontracted) who performed each processing step.

4.3 SOIL SAMPLE COLLECTION PROCEDURES

Soils will be collected from the uppermost six inches of soil using dedicated stainless steel tulip bulb samplers as described in *ASTM Standard Guide for Soil Sampling in the Vadose Zone, Designation D 4700-91, July 15, 1991 (re-approved 1998).* Each sampler will be marked with a permanent marker on the wooden handle with the sample location as presented in **Figure 3.** The sample location will be located using a method of triangulation as described below:

- At each sampling pad, two pieces of steel reinforcing bar (rebar) cut to a length of 24-inches will be driven into the soil directly adjacent to the concrete block retaining system that surrounds each pad. The rebar will be driven into the soil to a depth that is just below the height of the immediately adjacent concrete block. A horizontal distance of approximately 20 feet will separate the two pieces of rebar. Using a plastic measuring tape, a sample location will be triangulated from the two pieces of rebar and recorded in the field logbook. This triangulation process will be repeated during each subsequent sampling event. A horizontal separation of approximately 2-feet will be established for each subsequent future sampling point.

The procedures to be used at each location are as follows:

1. Samplers will wear a fresh pair of Latex Gloves at each location. Level D Personal Protective Equipment (PPE) will be worn (steel toed boots, eye protection and gloves).
2. The sample location will be triangulated and recorded in field logbook.
3. A sheet of plastic sheeting will be laid out to accommodate sample vessels and equipment.
4. Using the dedicated tulip bulb sampler, samplers will advance a boring in native soils to a depth of six-inches below ground surface. Samples will be placed in the respective laboratory provided sample vessels and placed on ice in designated coolers for transport. Should additional soil material be required, borings directly adjacent to the first boring can be advanced.
5. Soil material directly adjacent to the sampling location will be manually re-graded to fill in any borings.
6. Decontaminate the tulip bulb sampler in a designated location as described in **Section 4.3.1.** Once the sampler is completely dry, place the sampler in a one-gallon zip-lock plastic bag for storage until the next sampling event.
7. Remove plastic sheeting and proceed to the next sampling location.

4.3.1 Equipment Decontamination

The dedicated sampling equipment will be decontaminated prior to use at the site, and after use at each sampling location. Decontamination will be performed in a manner such that the decontamination solutions may be captured. The dedicated sampling equipment will be decontaminated as follows:

- Wash equipment with phosphate-free detergent.
- Rinse equipment with deionized water.
- Rinse equipment with isopropanol.
- Rinse equipment with deionized water.

Following decontamination, the equipment will be allowed to air dry or dried using clean disposable wipes.

4.4 SAMPLE PRESERVATION AND HANDLING

Samples will be preserved with the proper preservatives in accordance with USEPA SW-846 (Test Methods for Evaluating Solid Waste, latest edition). Prior to sample collection, sample vessels will be prepared by the analyzing laboratory. Preservatives (as required by analytical methods) will be added to samples immediately after they are collected if the sample containers are not pre-preserved by the laboratory. More detailed preservation information is provided in **Table 3**.

All sample containers shall be packed in a cooler with ice as soon as they are collected. Upon the completion of activities at the Unit, the coolers will be packed with additional ice for transport to the contract laboratory. The samples will be relinquished directly from the samplers to representatives from the contract analytical laboratory for transport to the laboratory, or the samples will be shipped to the laboratory by common carrier.

In the event that final receipt by the laboratory of any shipping container or sample bottle indicates evidence of compromised sample integrity, the laboratory QA/QC officer or his/her representative shall notify the operator within 24 hours of receipt. Subsequent to notification, sample integrity will be evaluated and appropriate actions will be taken to assure representative samples. Sample integrity determinations and needs for additional actions will be conducted according to QA/QC guidance from USEPA SW-846 (Test Methods for Evaluating Solid Waste, latest edition). Resampling will be conducted if determined necessary.

4.5 CHAIN-OF-CUSTODY DOCUMENTATION

The soil monitoring program incorporates a chain-of-custody program to track the route and handlers of the soil samples. The monitoring of sample possession from field sampling to laboratory analysis is important in the event that unexpected lab results occur and the security of transportation is evaluated. This documentation contains several records and logs that assist in the quality control of the program.

Sample labels are used to prevent misidentification of samples. The labels are completed and affixed to the sample containers prior to field sampling. The labels contain the following information:

- Sample identification number
- Name of sampler (initials)
- Date and time of sample collection
- Sampling location
- Constituents to be analyzed

Sample seals should be used when a common carrier transports the sample shipment to the laboratory. These seals ensure that the samples have not been disturbed during transportation. The sample identification and date will be included on the sample seal.

The chain-of-custody record is filled out for each Unit and accompanies the samples to the contract laboratory. The completed form is returned to Radford AAP with the analyses for each Unit. An example chain-of-custody form is included in **Appendix A**. The sample possession is established from time of collection to the time of analysis. This record contains the following information:

- sample identification and location
- signature of sampler
- date and time of sampling
- sample type
- identification
- number of containers
- required analysis
- signatures of person(s) involved in possession
- times and dates of possession
- method of transportation
- tracking number from transporter
- statement for packing on ice
- temperature during shipment (min & max)
- internal temperature upon arrival at laboratory

A sample analysis request sheet can further clarify the samples for each requested constituent. This additional check sheet will be utilized when necessary (i.e., beginning of a new contract with a new laboratory). This sheet sent along with the samples will contain the following information:

- name of person receiving samples
- laboratory sample number
- date of sample receipt
- analysis to be performed
- internal temperature during shipping

4.6 DISPOSITION OF DECONTAMINATION WASTE WATER/INVESTIGATION DERIVED WASTES

All decontamination water that is generated during sampling activities will be collected in containers and subsequently emptied into the Biological Wastewater Treatment Plant at Radford AAP.

The investigation derived sampling materials will be drummed onsite. When the drum is deemed full the contents will be analyzed for hazardous characteristics by Radford AAP. The materials will be disposed of as hazardous waste if the results indicate that characteristic criteria

are met, or as a solid waste if the data indicate that the wastes are not hazardous. The appropriately licensed and permitted disposal contractor will be selected by Radford AAP. The location where hazardous wastes are transported will be a facility permitted by EPA under 40 CFR Part 270.

5.0 ANALYTICAL PROCEDURES

The analytical methods set forth in USEPA SW-846 (Test Methods for Evaluating Solid Waste, latest edition) will be used to analyze all constituents. Recommended analytical methods and associated quantitation limits are listed in **Table 1**.

All records of analysis will be distributed to the VDEQ as specified in **Section 7.4**, as well as maintained on site.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

6.1 FIELD QA/QC PROGRAM

The field QA/QC program is designed to ensure the reliability and validity of the field data gathered as part of the overall soil monitoring program. The field QA/QC program consists of regular inspection and decontamination of field instruments, and routine collection and analysis of trip and equipment blanks and blind duplicates.

For each sampling event, one trip blank shall be filled with laboratory-grade reagent water in the laboratory that has been selected to conduct the soil analyses. The trip blank shall be analyzed only for the same volatile organic compounds for which the samples will be analyzed. The trip blank shall accompany the sampling kit, in the transport cooler, at all times.

Equipment blanks will be collected to monitor the decontamination of randomly selected equipment that may be used in the sampling process. The equipment blank shall be prepared by rinsing the decontaminated sampling device with laboratory-grade reagent water and transferring the water from the sampling device to the sample containers. The equipment blank will be returned to the laboratory for analysis for the maximum number of constituents being analyzed in soil. One equipment blank will be collected during each sampling event at the OB Ground if required. The equipment blank will be analyzed for site-specific constituents.

One blind field duplicate sample also will be collected during each sampling event at the OB Ground. The blind field duplicate will be analyzed for the site-specific constituents. The monitoring well from which the blind duplicate is collected will be noted on the Field Log for that well.

The occurrence of constituents in blank samples may serve to invalidate the analytical results of the affected constituents. Additional blanks or duplicate samples may be prepared and analyzed to address specific, unanticipated conditions.

6.2 LABORATORY QA/QC PROGRAM

The contract laboratory is to provide a QA/QC plan for laboratory analysis according to USEPA SW-846 (Test Methods for Evaluating Solid Waste). This plan utilizes standards, laboratory blanks, duplicates, batch spikes, and matrix spikes for calibration and identification of potential matrix interferences. This data is on file at the laboratory and is routinely reviewed by Radford AAP personnel. This data is a measure of performance as well as an indicator of potential sources of cross contamination. This control data is for performance review and not for correction of soil analysis data.

The contract laboratory will keep a logbook to document the processing steps that are applied to the sample. All sample preparation techniques and instrumental methods must be identified in this logbook. The results of the analysis of all quality control samples should be identified specific to each batch of groundwater samples analyzed. The logbook should also include the time, date, and name of person who performed each processing step.

Dilution during analyses has a major impact on the overall quality and usability of the soil monitoring data. Large dilution factors may mask hazardous constituents that are present at low concentrations, which may result in constituent concentrations not being identified. Therefore, when multiple analyses using sequential dilutions are required, the results from these multiple analyses will be reported.

In addition to the trip and equipment blanks and blind duplicates collected for the field QA/QC program, the laboratory shall prepare and analyze at least one matrix spike for each sampling batch or every 20 samples. The laboratory shall also prepare and analyze either one matrix duplicate or matrix spike duplicate for each analytical method employed. Sufficient sample volume shall be collected in the field so that the laboratory can prepare the matrix spike and matrix spike duplicate.

7.0 SOIL DATA EVALUATION

7.1 LABORATORY ANALYTICAL DATA VALIDATION

Laboratory analytical data will be validated based on guidelines outlined in SW-846, "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review" (USEPA, 1994a), and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (USEPA, 1994b). Additionally, the analytical laboratory QA/QC will be evaluated for conformance with and adherence to prescribed data quality objectives.

The evaluation of the analytical laboratory's compliance with the analytical methods and validation of the results will be based on a limited review of the following items: QC deliverables package, QC history documentation, technical holding times, preservation requirements, instrument performance (tune) check, instrument calibrations, blank sample analyses, surrogate spike recoveries, laboratory control samples, matrix spike, matrix spike duplicate, or sample duplicate analyses, interference check sample results, and internal standard requirements where appropriate. The review will be limited mainly to summary sheets provided by the laboratory, unless a notable discrepancy in the data package requires review of the raw data.

7.2 EVALUATION OF LABORATORY ANALYTICAL DATA AND DATA MANAGEMENT

The analytical results of each sampling event conducted at the OB Ground must be assessed on a case-specific basis. The probability of elevated constituent concentrations must be weighed against the evidence of natural geochemical variations, and field or laboratory error. A review of the analytical data obtained from each sampling event will be conducted.

In general the evaluation of the analytical data for this program involves the direct comparison of validated results to the Action Levels presented on **Table 1**. If a result is in excess of the proposed action level for a given constituent, Radford AAP may chose to verify the result in accordance with the procedure outlined in this section. Should the process of verification confirm impacts greater than the Action Levels, and an alternative source demonstration is not pursued, then Interim Measure Corrective Actions will be proposed in accordance with **Section 8.0** of this document.

7.2.1 Data Management

Chemical analytical data will be managed as both non-qualified data and interpreted data. Non-qualified data refers to concentration values as they appear on the laboratory Certificate of Analysis. Interpretation of the non-qualified data may include, but is not necessarily limited to, the treatment of low and zero values, missing data, and outliers. Each report shall identify interpreted data.

7.2.2 Treatment of Missing Data Values

If a sampling event results in a missing data value, an attempt to resample for the missing value shall be made within two weeks.

7.2.3 Treatment of Data Outliers

All data will be investigated to verify outliers. An outlier refers to a data point which is an inconsistently large or small value. An outlier can be observed due to sampling, laboratory, transportation, or transcription errors. To remove the possibility of including data with this type of error, the historical data should be screened for each sample and constituent for the existence of outliers (USEPA 1992 section 6.2) using the method described by Dixon (1953).

Radford AAP may correct outliers of any data set under circumstances where such correction can be justified. Any elimination of an outlier must have prior approval from the VDEQ.

7.2.4 Evaluation of Data Above Reporting Limits

Data that meets or exceeds the proposed Reporting Limits (RLs) presented in **Table 1** will be considered a detected constituent. Data results below the RL will be reported as non-detected. Event specific RLs and Action Levels (ALs) for dioxin and furan constituents will be calculated and presented in a format similar to the example presented in **Table 3.**

7.2.5 Selection of Statistical Method

Radford AAP shall use direct comparison of the analytical results to the proposed Action Levels on **Table 1** as the only method statistical evaluation.

7.3.6 Verification Sampling

The verification sample is considered as a part of the evaluation to confirm an exceedance of the proposed Action Levels. All verification samples must be collected at the earliest time possible (prior to the next scheduled sampling event) or as approved by the VDEQ. The VDEQ will be informed in advance of any planned verification re-sampling. Please see the description for the verification sampling procedure in **Section 7.4.**

7.4 REPORTING REQUIREMENTS

The analytical results for each semi-annual sampling event will be compiled, evaluated, and interpreted upon receipt from the analyzing laboratory to determine whether any soil contamination exists at the OB Ground above the designated Action Levels. The results of the data evaluation will be summarized annually and kept in the operating record for the facility. The data will be submitted to the VDEQ annually in an Annual Soil Monitoring Report for the Unit.

If it is determined during the course of the SMP that there is evidence of soil contamination in excess of the designated Action Levels at any sampling point, Radford AAP

may demonstrate that a source other than the OB Ground is the cause of the contamination, or that the detection is an artifact caused by error in sampling, analysis or evaluation. To make such a demonstration, Radford AAP shall:

- Notify the VDEQ in writing within seven days that they intend to make a demonstration.
- Within 90 days, submit a report to the VDEQ demonstrating that a source other than the OB Ground caused the contamination or that the contamination resulted from error in sampling, analysis, or evaluation.
- Within 90 days, submit a permit modification application to the VDEQ to make any appropriate changes to the SMP.
- Continue to monitor in accordance with SMP.

If evidence contamination in excess of the designated action levels is detected at any sampling point, and Radford AAP does *not* make a demonstration that a source other than the OB Ground is the cause of the contamination, Radford AAP shall:

- Notify the VDEQ in writing within seven days. The notification must indicate which chemical parameters or hazardous constituents have shown evidence of contamination.
- At the discretion of Radford AAP, immediately sample at those sampling points for the constituents detected and confirm which constituents are present and at what concentration. Sampling will also include a determination of horizontal extent by trending out in all four compass directions (north, south, east and west) at a distance as close as practicable to 20 feet in each direction from the point of original detection. **Figure 3** presents a typical array of confirmation samples to determine horizontal extent of impacts.
- Within 90 days, if the contamination is confirmed, Radford AAP will submit a proposed interim measure corrective action work plan in accordance with **Section 8.0** of this plan.

If Radford AAP or the Director determines during the course of the SMP that the program no longer satisfies the requirements of the facility operating permit, Radford AAP must submit a permit modification application to make appropriate changes to the program within 90 days.

8.0 INTERIM MEASURES

Should the data indicate that an exceedance of the proposed Action Level of a constituent listed in **Table** 1, an interim measure corrective action work plan will be submitted to the VDEQ within 90 days of the notice to VDEQ. Notification will be in accordance with **Section 7.4** of this plan. Interim Measures that may be conducted at the OB Ground are described in the following sections.

8.1 Hot-Spot Evaluation And Soil Removal

If a constituent is detected above the proposed Action Level, a hot spot determination will be conducted. If contamination is detected at concentrations that exceed the designated action levels, Radford AAP will collect a total of four samples as close as practicable to 20 feet in all directions (north, south, east and west) of the original detection. The samples will be analyzed for those constituents that have exceeded the action levels. This action will ensure that the nature and extent of the exceedance will be delineated in all horizontal directions.

In addition to the sampling described above, a sampling grid will be established in a five-feet radius of the sample collection point. Four randomly selected sample points will be selected within the diameter of the grid. Each sample point will be sampled to a terminal depth of 24-inches below ground surface by advancing a pre-cleaned stainless steel auger. Samples will be collected every six-inches to the terminal depth of 24-inches. The auger will be decontaminated in accordance with **Section 4.3.1** between every six-inch interval. The aliquots from each six-inch interval will be composited with the same corresponding interval from each of the four borings. The aliquots will be homogenized in a pre-cleaned stainless steel bowl using a pre-cleaned stainless steel spoon or trowel. The analyses from each six-inch interval will be evaluated by comparing the results to the Action Levels for the constituent.

If the Action Levels are exceeded in any given layer, a soil removal work plan will be prepared. The work plan will define the volume of soils to be removed by designating the horizontal and vertical extent of removal. The work plan will be submitted to the VDEQ for review and approval. Upon approval of the work plan, the soils will be excavated with a mechanical backhoe under the supervision of designated representative of Radford AAP. Soils will be placed in a DOT approved covered roll-off container and transported offsite for disposal at an approved facility for disposal and/or treatment. Upon completion of the excavation confirmatory samples will be collected to confirm complete removal of the contaminated media. Confirmatory samples will include four randomly selected aliquots from the base of the excavation and two from the sidewalls of the excavation to be composited for a single analysis.

The excavation will be immediately backfilled with soils to be collected from a designated borrow area within the Radford AAP facility, or prewashed and graded gravel. Soils or gravel will be re-graded to match existing contours. Soils will be seeded with natural vegetation that matches the existing ground cover of the site. The process of immediately backfilling that excavation will allow for normal operations to resume at the OB Ground. Should the confirmatory samples indicate that there are contaminated media in excess of the Action Levels beneath the backfilled material, the backfilled material will be removed and an additional volume of soils will be removed. Confirmatory samples will be collected from the secondary excavation as well. The secondary excavation will be backfilled immediately. The process of

excavation and confirmation will proceed until the Action Levels are no longer exceeded or bedrock or groundwater is encountered. A complete report of the removal actions will be prepared and submitted to the VDEQ within 30-days of completion of the Interim Measures.

8.2 Other In Situ/Ex-Situ Physical and Chemical Remediation Strategies

Radford AAP reserves the opportunity to submit to the DEQ adequate documentation (pilot test results or bench studies) demonstrating the effectiveness of a remedial technology for the onsite treatment of a specific compound or suite of compounds that have been detected at concentrations that exceed the designated action levels for those compounds. The data submitted will provide a time frame for remediation as well as estimated costs. The remedial endpoint goal will be the designated action level. Radford AAP agrees that the proposed timeframe for remediation must be equivalent to the hot-spot removal option.

TABLES

Attachment II.C-22

Table 1[redacted]1 of 2
Identifi[redacted] Constituents of Potential Concern
Open Bu[redacted]ground Soil Monitoring Program
Radford Army Ammunition Plant

Constituent	CASRN	Type of Constituent	In Waste?	Reported in Bang Box Database?	On GW List	To be Sampled?	SW-846 Method	Proposed RL mg/kg	Action Level mg/kg	Updated Action Level mg/kg	Source of Updated A.L.
1,2-Dichloroethane	107-06-2	PIC		Yes		Yes	8260B	0.005	31	2.2	R3 RBC Ind
1,3,5-Trinitrobenzene	99-35-4	PIC		Yes		Yes	8330	0.25	31000	27000	R3 RBC Ind
2,4,6-Trinitrotoluene	118-96-7	ENER				Yes	8330	0.25	95	79	R3 RBC Ind
2-amino-4,6-dinitrotoluene	35572-78-2	ENER				Yes	8330	0.25	2000	2000	R3 RBC Ind
4-amino-2,6-dinitrotoluene	19406-51-0	ENER				Yes	8330	0.25	2000	1900	R3 RBC Ind
2,4-Dichlorophenol	120-83-2	PIC		Yes		Yes	8270C	0.33	3100	1800	R3 RBC Ind
1,3-Dinitrobenzene	99-65-0	ENER				Yes	8330	0.25	100	62	R3 RBC Ind
2,4-Dinitrotoluene	121-14-2	Both	Yes		Yes	Yes	8330	0.25	2000	1200	R3 RBC Ind
2,6-Dinitrotoluene	606-20-2	PIC		Yes	Yes	Yes	8330	0.25	1000	820	R3 RBC Ind
2-Chlorophenol	95-57-8	PIC		Yes		Yes	8270C	0.33	5100	5100	R3 RBC Ind
3-Methylphenol	108-39-4	PIC		Yes		Yes	8270C	0.33	61000	31000	R3 RBC Ind
4-Methylphenol	106-44-5	PIC		Yes		Yes	8270C	0.33	5100	3100	R3 RBC Ind
2-Nitrotoluene (ortho)	88-72-2	ENER				Yes	8330	0.25	12	13	R3 RBC Ind
3-Nitrotoluene (meta)	99-08-1	ENER				Yes	8330	0.25	20000	12000	R3 RBC Ind
4-Nitrotoluene (para)	99-99-0	ENER				Yes	8330	0.25	170	110	R3 RBC Ind
3,3-Dimethylbenzidine	119-93-7	PIC		Yes		Yes	8270C	[redacted]	—	[redacted]	R3 RBC Ind
4-Nitrophenol	100-02-7	PIC		Yes		Yes	8270C	1.6	7	7	ECO Risk
Acetophenone	98-86-2	PIC		Yes		Yes	8270C	0.33	100000	100000	R3 RBC Ind
Arsenic	7440-38-2	Propellant Ingredient	Yes		Yes	Yes	6010B	1	15.8	15.8	FWB
Barium	7440-39-3	Propellant Ingredient	Yes	Yes	Yes	Yes	6010B	20	72000	190000	R3 RBC Ind
Benz(a)anthracene	56-55-3	PIC		Yes		Yes	8270C	0.33	3.9	2.1	R3 RBC Ind
Benzene	71-43-2	Propellant Ingredient	Yes		Yes	Yes	8260B	0.005	52	5.6	R3 RBC Ind
Benzo(a)pyrene	50-32-8	PIC		Yes		Yes	8270C	[redacted]	0.39	0.21	R3 RBC Ind
Benzo(b)fluoranthene	205-99-2	PIC		Yes		Yes	8270C	0.33	3.9	2.1	R3 RBC Ind
Benzo(k)fluoranthene	207-08-9	PIC		Yes		Yes	8270C	0.33	39	21	R3 RBC Ind
Benzyl chloride	100-44-7	PIC		Yes		Yes	8260B	0.005	—	17	R3 RBC Ind
bis(2-Ethylhexyl)phthalate	117-81-7	PIC		Yes		Yes	8270C	0.33	200	120	R3 RBC Ind
Butylbenzylphthalate	85-68-7	PIC		Yes		Yes	8270C	0.33	200000	910	R3 RBC Ind
Cadmium	7440-43-9	PIC		Yes		Yes	6010B	0.5	510	810	R3 RBC Ind
Carbon tetrachloride	56-23-5	PIC		Yes	Yes	Yes	8260B	0.005	22	1.3	R3 RBC Ind
Chlorobenzene	108-90-7	Both	Yes	Yes	Yes	Yes	8260B	0.005	20000	1500	R3 RBC Ind
Chloroform	67-66-3	PIC		Yes		Yes	8260B	0.005	10000	1.5	R3 RBC Ind
Chromium	7440-47-3	PIC		Yes	Yes	Yes	6010B	1	3100	1400	R3 RBC Ind
Dibenz(a,h)anthracene	53-70-3	PIC		Yes		Yes	8270C	[redacted]	0.39	0.21	R3 RBC Ind
Diethylphthalate	84-66-2	Propellant Ingredient	Yes			Yes	8270C	0.33	820000	490000	R3 RBC Ind
Dimethyl phthalate	131-11-3	PIC		Yes		Yes	8270C	0.33	10000000	10000000	R3 RBC Ind
Di-n-butyl phthalate	84-74-2	PIC		Yes	Yes	Yes	8270C	0.33	100000	62000	R3 RBC Ind
Diphenylamine	122-39-4	Both	Yes	Yes	Yes	Yes	8270C	1.6	28000	15000	R3 RBC Ind
Ethanol	64-17-5	Propellant Ingredient	Yes				NCA				
Fluoranthene	206-44-0	PIC		Yes		Yes	8270C	0.33	41000	22000	R3 RBC Ind
Hexachloroethane	67-72-1	Propellant Ingredient	Yes		Yes	Yes	8260B	0.005	200	120	R3 RBC Ind
HMX	2691-41-0	ENER				Yes	8330	2.2	51000	49000	R3 RBC Ind
Indeno(1,2,3-cd)pyrene	193-39-5	PIC		Yes		Yes	8270C	0.33	3.9	2.1	R3 RBC Ind
Lead	7439-92-1	PIC		Yes	Yes	Yes	6010B	0.3	800	800	ALM
Mercury	7439-97-6	Propellant Ingredient	Yes		Yes	Yes	6010B	0.1	0.13	28	R3 RBC Ind
Methyl bromide (Bromomethane)	74-83-9	PIC		Yes		Yes	8260B	0.005	15	35	R3 RBC Ind
Methyl chloride (Chloromethane)	74-87-3	Both	Yes	Yes	Yes	Yes	8260B	0.005	6	8.4	R3 RBC Ind
Methylene chloride	75-09-2	Both	Yes	Yes	Yes	Yes	8260B	0.005	380	54	R3 RBC Ind
Naphthalene	91-20-3	PIC		Yes		Yes	8270C	0.33	20000	20	R3 RBC Ind
Nitrobenzene	98-95-3	ENER				Yes	8330	0.25	510	280	R3 RBC Ind
Nitrogen dioxide (peroxide)	10102-44-0	PIC		Yes			NCA				
Phenol	108-95-2	PIC		Yes		Yes	8270C	0.33	310000	180000	R3 RBC Ind
RDX	121-82-4	ENER				Yes	8330	1	26	24	R3 RBC Ind
Silver	7440-22-4	Propellant Ingredient	Yes		Yes	Yes	6010B	1	5100	5100	R3 RBC Ind
Selenium	7782-49-2	Background				Yes	6010B	0.5	5100	5100	R3 RBC Ind

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Table 1: [redacted] of 2
Identifica[redacted] Constituents of Potential Concern
Open Burning Ground Soil Monitoring Program
Radford Army Ammunition Plant

Constituent	CASRN	Type of Constituent	In Waste?	Reported in Bang	On GW List	To be Sampled?	Method SW-846	Proposed RL mg/kg	Action Level mg/kg	Source of A.L.
1,2-Dichloroethane	107-06-2	PIC		Yes		Yes	8260B	5.00E-03	3.10E+01	R3 RBC Ind
1,3,5-Trinitrobenzene	99-35-4	PIC		Yes		Yes	8330	2.50E-01	3.10E+04	R3 RBC Ind
2,4,6 - Trinotrotoluene	118-96-7	ENER				Yes	8330	2.50E-01	9.50E+01	R3 RBC Ind
2-amino-4,6-dinitrotoluene	35572-78-2	ENER				Yes	8330	2.50E-01	2.00E+03	R3 RBC Ind
4-amino-2,6-dinitrotoluene	19406-51-0	ENER				Yes	8330	2.50E-01	2.00E+03	R3 RBC Ind
2,4-Dichlorophenol	120-83-2	PIC		Yes		Yes	8270C	3.30E-01	3.10E+03	R3 RBC Ind
1,3 Dinitrobenzene	99-65-0	ENER				Yes	8330	2.50E-01	1.00E+02	R3 RBC Ind
2,4 Dinitrotolbeng	121-14-2	Both	Yes		Yes	Yes	8330	2.50E-01	2.00E+03	R3 RBC Ind
2,6-Dinitrotoluene	606-20-2	PIC		Yes	Yes	Yes	8330	2.50E-01	1.00E+03	R3 RBC Ind
2-Chlorophenol	95-57-8	PIC		Yes		Yes	8270C	3.30E-01	5.10E+03	R3 RBC Ind
3 -Methylphenol	108-39-4	PIC		Yes		Yes	8270C	3.30E-01	5.10E+04	R3 RBC Ind
4-Methylphenol	106-44-5	PIC		Yes		Yes	8270C	3.30E-01	5.10E+03	R3 RBC Ind
2- Nitrotoluene (ortho)	88-72-2	ENER				Yes	8330	2.50E-01	1.20E+01	R3 RBC Ind
3- Nitrotoluene (meta)	99-08-1	ENER				Yes	8330	2.50E-01	2.00E+04	R3 RBC Ind
4- Nitrotoluene (para)	99-99-0	ENER				Yes	8330	2.50E-01	1.70E+02	R3 RBC Ind
3,3-Dimethylbenzidine	119-93-7	PIC		Yes			NCA			
4-Nitrophenol	100-02-7	PIC		Yes		Yes	8270C	1.60E+00	7.00E+00	ECO Risk
Acetophenone	98-86-2	PIC		Yes		Yes	8270C	3.30E-01	1.00E+05	R3 RBC Ind
Arsenic	7440-38-2	Propellant Ingredient	Yes		Yes	Yes	6010B	1.00E+00	1.58E+01	FWB
Barium	7440-39-3	Propellant Ingredient	Yes	Yes	Yes	Yes	6010B	2.00E+01	7.20E+04	R3 RBC Ind
Benz(a)anthracene	56-55-3	PIC		Yes		Yes	8270C	3.30E-01	3.90E+00	R3 RBC Ind
Benzene	71-43-2	Propellant Ingredient	Yes		Yes	Yes	8260B	5.00E-03	5.20E+01	R3 RBC Ind
Benzo(a)pyrene	50-32-8	PIC		Yes		Yes	8270C	3.30E-01	3.90E-01	R3 RBC Ind
Benzo(b)fluoranthene	205-99-2	PIC		Yes		Yes	8270C	3.30E-01	3.90E+00	R3 RBC Ind
Benzo(k)fluoranthene	207-08-9	PIC		Yes		Yes	8270C	3.30E-01	3.90E+01	R3 RBC Ind
Benzyl chloride	100-44-7	PIC		Yes		Yes	8270C	3.30E-01	2.00E+02	R3 RBC Ind
bis (2-Ethylhexyl)phthalate	117-81-7	PIC		Yes			NCA			
Butylbenzyl phthalate	85-68-7	PIC		Yes		Yes	8270C	3.30E-01	2.00E+05	R3 RBC Ind
Cadmium	7440-43-9	PIC		Yes		Yes	8270C	3.30E-01	5.10E+02	R3 RBC Ind
Carbon Tetrachloride	56-23-5	PIC		Yes		Yes	6010B	5.00E-01	2.20E+01	R3 RBC Ind
Chlorobenzene	108-90-7	Both	Yes	Yes	Yes	Yes	6010B	5.00E-03	2.00E+04	R3 RBC Ind
Chloroform	67-66-3	PIC		Yes	Yes	Yes	8260B	5.00E-03	1.00E+04	R3 RBC Ind
Chromium	7740-47-3	PIC		Yes		Yes	8260B	5.00E-03	3.10E+03	R3 RBC Ind
Dibenz(a,h)anthracene	53-70-3	PIC		Yes	Yes	Yes	6010B	1.00E+00	3.90E-01	R3 RBC Ind
Dibutyl phthalate	84-74-2	Propellant Ingredient	Yes	Yes		Yes	8270C	3.30E-01	1.00E+05	R3 RBC Ind
Diethylphthalate	84-66-2	Propellant Ingredient	Yes		Yes	Yes	8270C	3.30E-01	8.20E+05	R3 RBC Ind
Dimethyl phthalate	131-11-3	PIC		Yes		Yes	8270C	3.30E-01	1.00E+07	R3 RBC Ind
Di-n-butyl phthalate	131-11-3	PIC		Yes		Yes	8270C	3.30E-01	1.00E+06	R3 RBC Ind
Diphenylamine	122-39-4	Both	Yes	Yes	Yes	Yes	8270C	1.60E+00	2.60E+04	R3 RBC Ind
Ethanol	67-56-1	Propellant Ingredient	Yes				NCA			
Fluoranthene	206-44-0	PIC		Yes		Yes	8270C	3.30E-01	4.10E+04	R3 RBC Ind
Hexachloroethane	67-72-1	Propellant Ingredient	Yes		Yes	Yes	8260B	5.00E-03	2.00E+02	R3 RBC Ind
HMX	2691-41-0	ENER				Yes	8330	2.20E+00	5.10E+04	R3 RBC Ind
Indeno(1,2,3-cd)pyrene	193-39-5	PIC		Yes		Yes	8270C	3.30E-01	3.90E+00	R3 RBC Ind
Lead	7439-92-1	PIC		Yes	Yes	Yes	6010B	3.00E-01	8.00E+02	AL,M
Mercury	7439-97-6	Propellant Ingredient	Yes		Yes	Yes	6010B	1.00E-01	1.30E-01	FWB
Methyl Bromide (bromomethane)	74-83-9	PIC		Yes		Yes	8260B	5.00E-03	1.50E+01	R3 RBC Ind
Methyl Chloride (Chloromethane)	74-87-3	Both	Yes	Yes	Yes	Yes	8260B	5.00E-03	6.00E+00	R9 PRG Ind
Methylene chloride	75-09-2	Both	Yes	Yes	Yes	Yes	8260B	5.00E-03	3.80E+02	R3 RBC Ind
Naphthalene	91-20-3	PIC		Yes		Yes	8270C	3.30E-01	2.00E+04	R3 RBC Ind
Nitrobenzene	98-95-3	ENER				Yes	8330	2.50E-01	5.10E+02	R3 RBC Ind
Nitrogen Dioxide (peroxide)	10102-44-0	PIC		Yes			NCA			

Revised letter dated 12/18/08 e-mail 11/9/09

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Table 2
Example of Data Presentation for Dioxin Results
Radford AAP, OB Ground Soil Monitoring Program

Sample Location ID			OBG Pad 1		OBG Pad 2		OBG Pad 3		OBG Pad 4	
Depth			0-6 Inches		0-6 Inches		0-6 Inches		0-6 Inches	
		LOQ								
Constituent	TEF		Result	TEQ	Result	TEQ	Result	TEQ	Result	TEQ
1,2,3,4,5,7,8,9-Octachlorodibenzo(p)dioxin (OCDD)	0.0001									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	0.0001									
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin (HpCDD)	0.01									
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	0.01									
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	0.01									
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin (HxCDD)	0.1									
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.1									
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin (HxCDD)	0.1									
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.1									
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin (HxCDD)	0.1									
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	0.1									
1,2,3,7,8-Pentachlorodibenzo(p)dioxin (PeCDD)	1									
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	0.05									
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.1									
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.5									
2,3,7,8-Tetrachlorodibenzo(p)dioxin (TCDD)	1									
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.1									
2,3,7,8 Toxicity Equivilent (TEQ) (ng/kg)										

Sample Location ID			OBG Pad 5		OBG Pad 6		OBG Pad 7		OBG Pad 8	
Depth			0-6 Inches		0-6 Inches		0-6 Inches		0-6 Inches	
		LOQ								
Constituent	TEF		Result	TEQ	Result	TEQ	Result	TEQ	Result	TEQ
1,2,3,4,5,7,8,9-Octachlorodibenzo(p)dioxin (OCDD)	0.0001									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	0.0001									
1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin (HpCDD)	0.01									
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	0.01									
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	0.01									
1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin (HxCDD)	0.1									
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.1									
1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin (HxCDD)	0.1									
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.1									
1,2,3,7,8,9-Hexachlorodibenzo(p)dioxin (HxCDD)	0.1									
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	0.1									
1,2,3,7,8-Pentachlorodibenzo(p)dioxin (PeCDD)	1									
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	0.05									
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	0.1									
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.5									
2,3,7,8-Tetrachlorodibenzo(p)dioxin (TCDD)	1									
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.1									
2,3,7,8 Toxicity Equivilent (TEQ) (ng/kg)										

NOTE: 2,3,7,8 TCDD TEQ = 16 ng/kg

Attachment II,C-25

TABLE 3

SAMPLING AND PRESERVATION PROCEDURES

Parameter (Method)	Recommended Container[a]	Preservative	Maximum Holding Time	Min. Volume Required for Analysis
Metals (6010B, 6020, 7470A)	G, 4-ounce. clear	Cool 4°C	6 months (28 days for mercury)	250 ml
Volatile Organics (8260B)	(3) 5 gram Encores	Cool 4°C	48 hours	15 grams
Semi-volatile Organics (8270C, 8091)	G, 4-ounce clear	Cool 4°C	14 days until extraction; 28 days after extraction	250 ml
Nitroglycerine (8332)	G, 4-ounce clear	Cool 4°C	14 days until extraction; 28 days after extraction	250 ml
Explosives (8330)	G, 4-ounce clear	Cool 4°C	14 days until extraction; 28 days after extraction	250 ml
Dioxins and Furans (8290)	G, 4-ounce clear	Cool 4°C	30 days	250 ml
TPH – DRO (8015B)	G, 4-ounce clear	Cool 4°C	14 days until extraction; 28 days after extraction	250 ml

Notes:

[a] Container Types:

G: Glass

[b] Do not allow any headspace in the container.

Attachment II.C-26

FIGURES

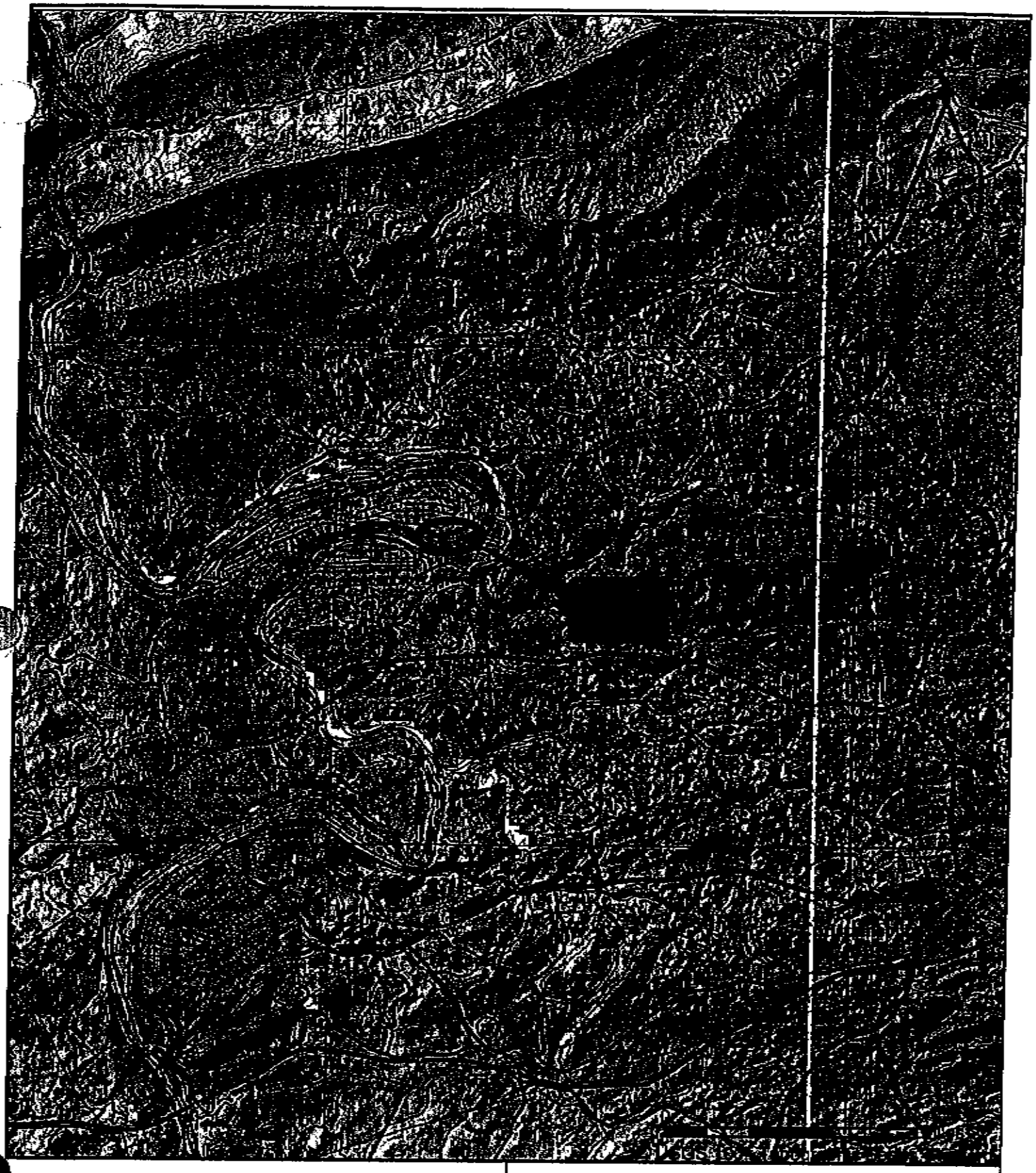

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FIGURE1
Regional Site Location
OB Ground SAP; RAAP; Radford, Virginia
EEE Job Number: 04-702 November 24, 2004

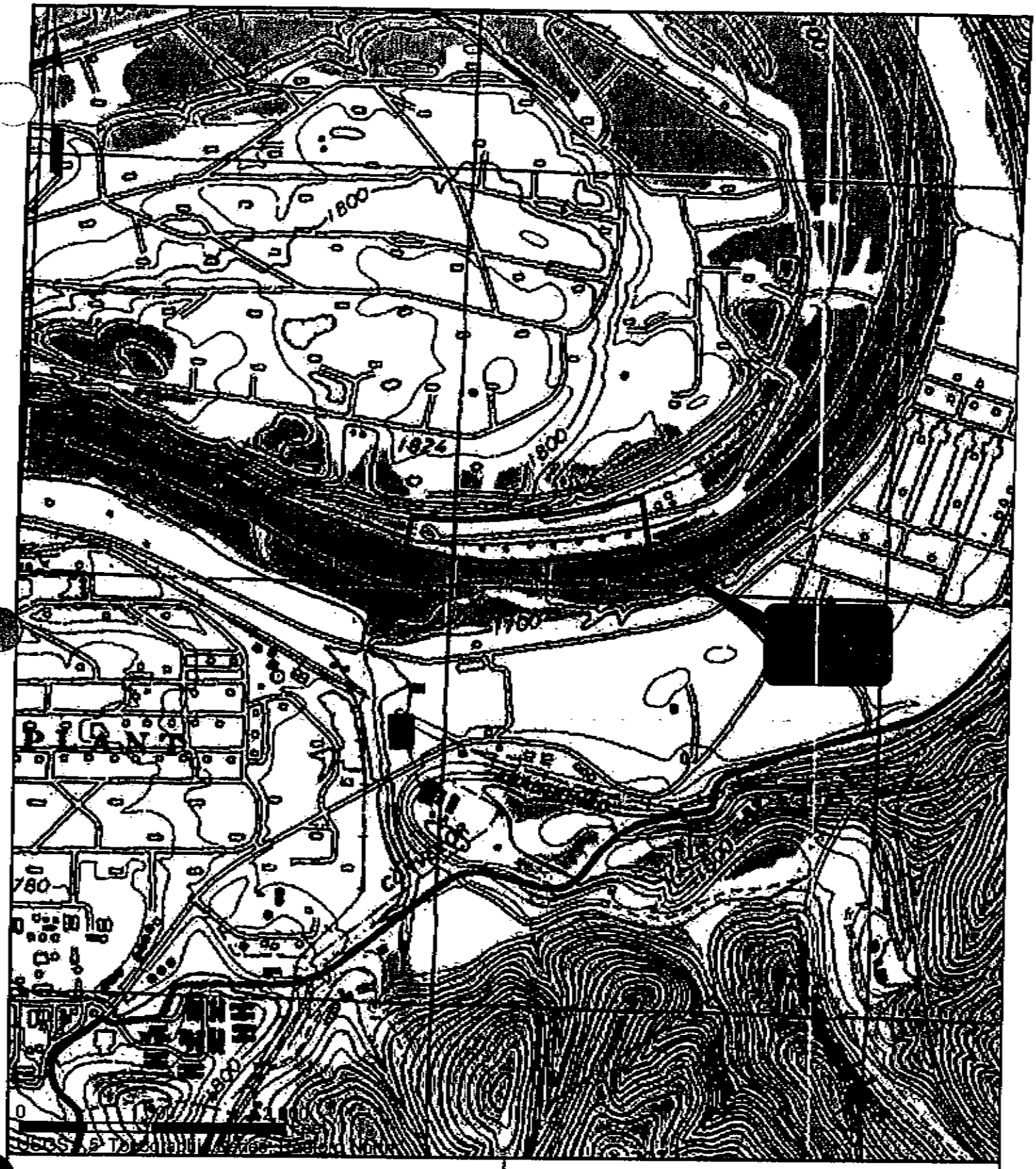

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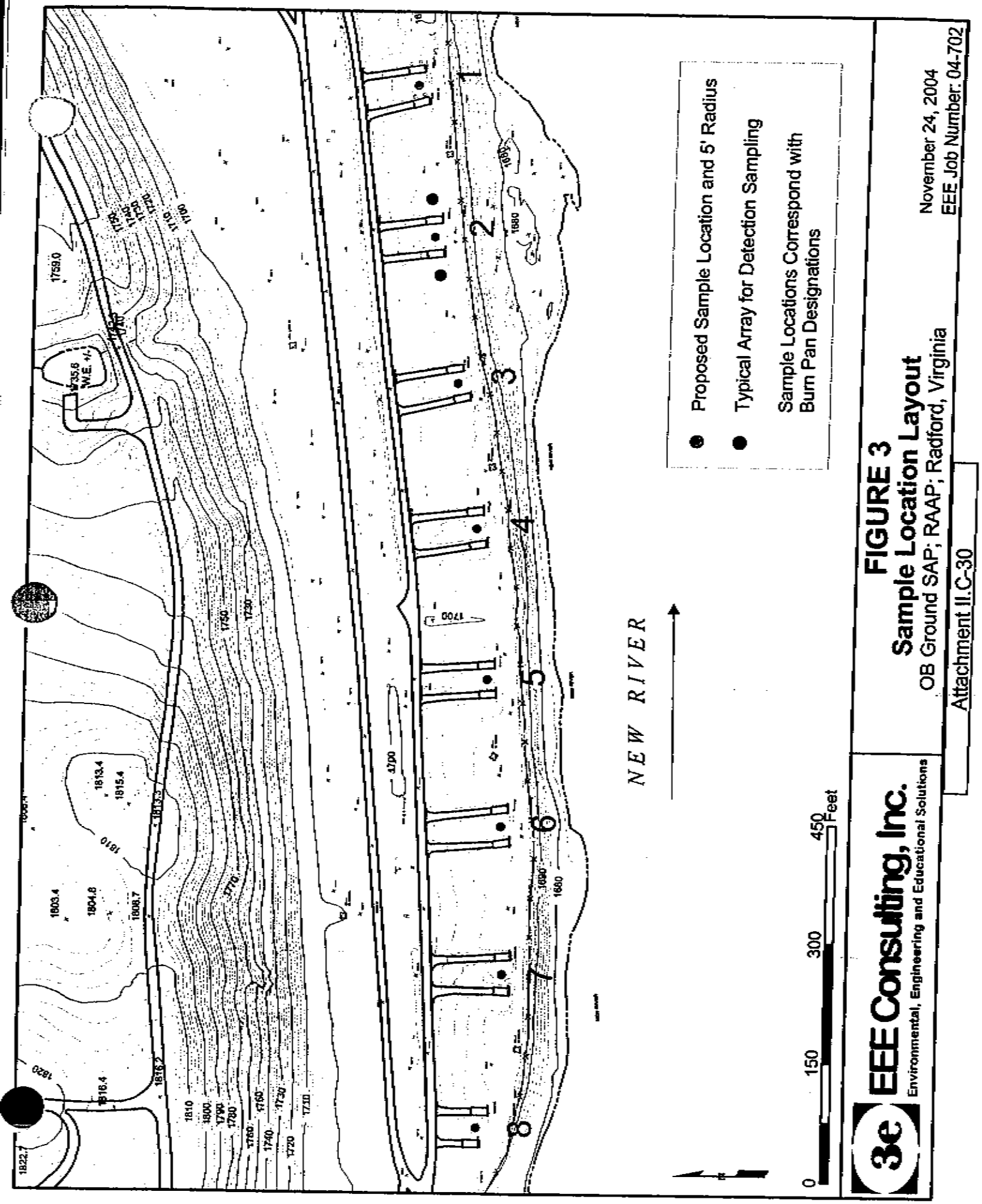
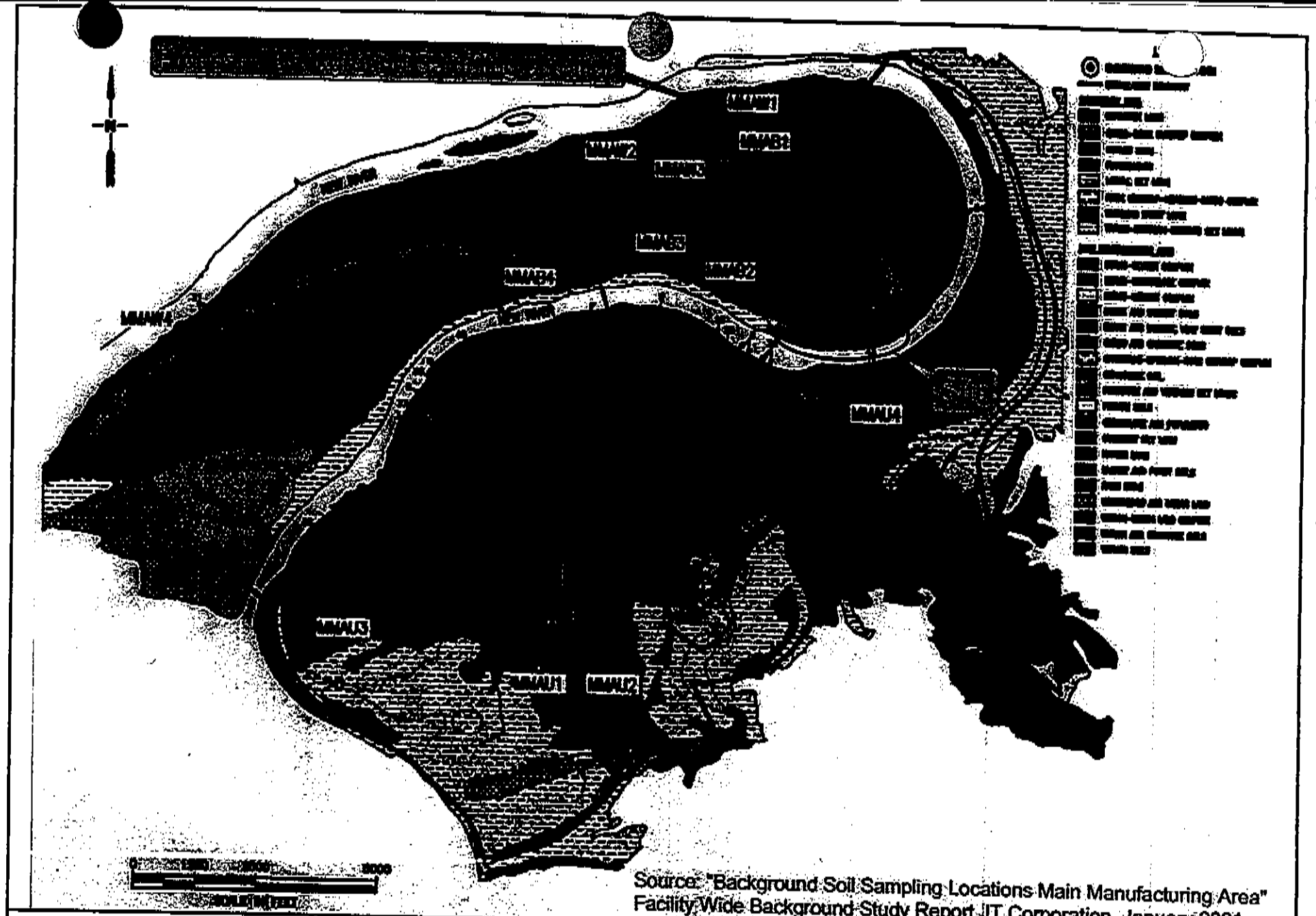
FIGURE 2
OBG Site Topography
OB Ground SAP; RAAP; Radford, Virginia
EEE Job Number: 04-702 November 24, 2004


Proposed Sample Location and 5' Radius
Typical Array for Detection Sampling
Sample Locations Correspond with Burn Pan Designations
NEW RIVER
0
150
300
450
Feet
1
2
3
4
5
6
7
8
1680
1700
1720
1740
1760
1780
1800
1810
1820
1822.7
1816.4
1816.2
1803.4
1804.8
1808.7
1813.4
1815.4
1759.0
1735.6
W.E. +/-
EEE Consulting, Inc.
Environmental, Engineering and Educational Solutions
FIGURE 3
Sample Location Layout
OB Ground SAP; RAAP; Radford, Virginia
November 24, 2004
EEE Job Number: 04-702
Attachment II.C-30



Source: "Background Soil Sampling Locations Main Manufacturing Area"
Facility Wide Background Study Report, IT Corporation, January 2001

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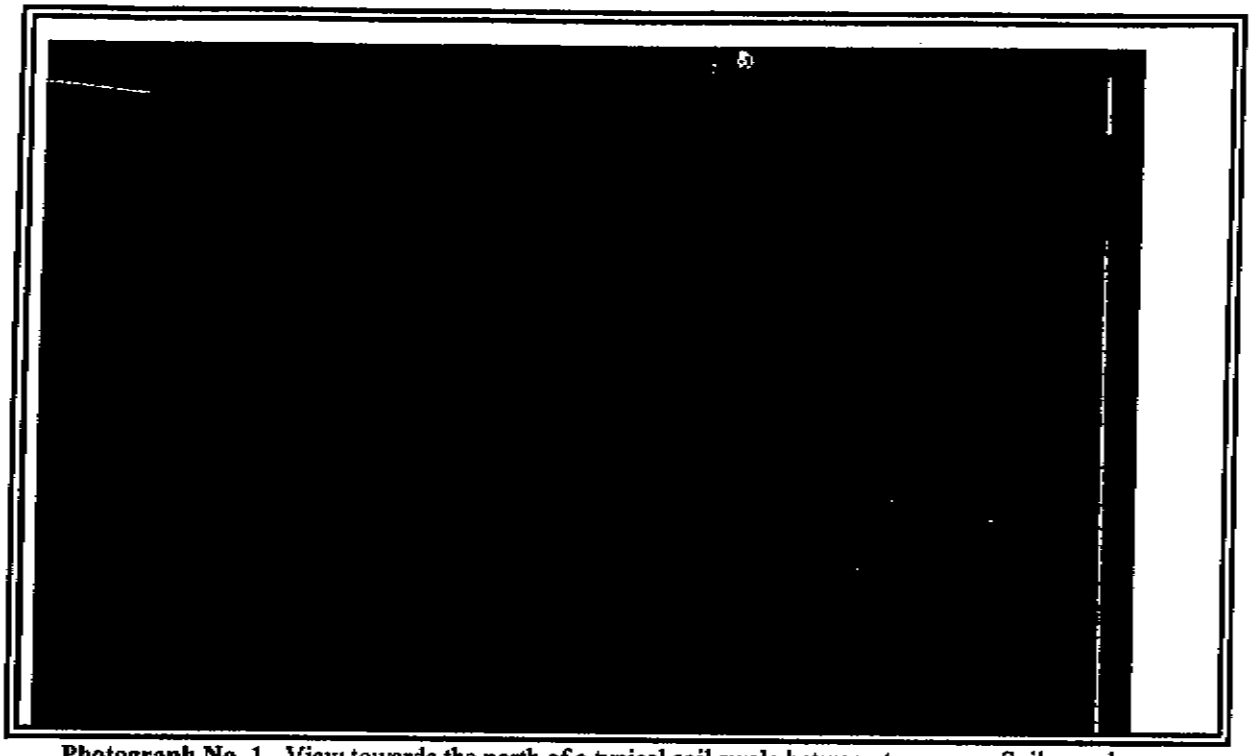
Environmental, Engineering and Educational Solutions

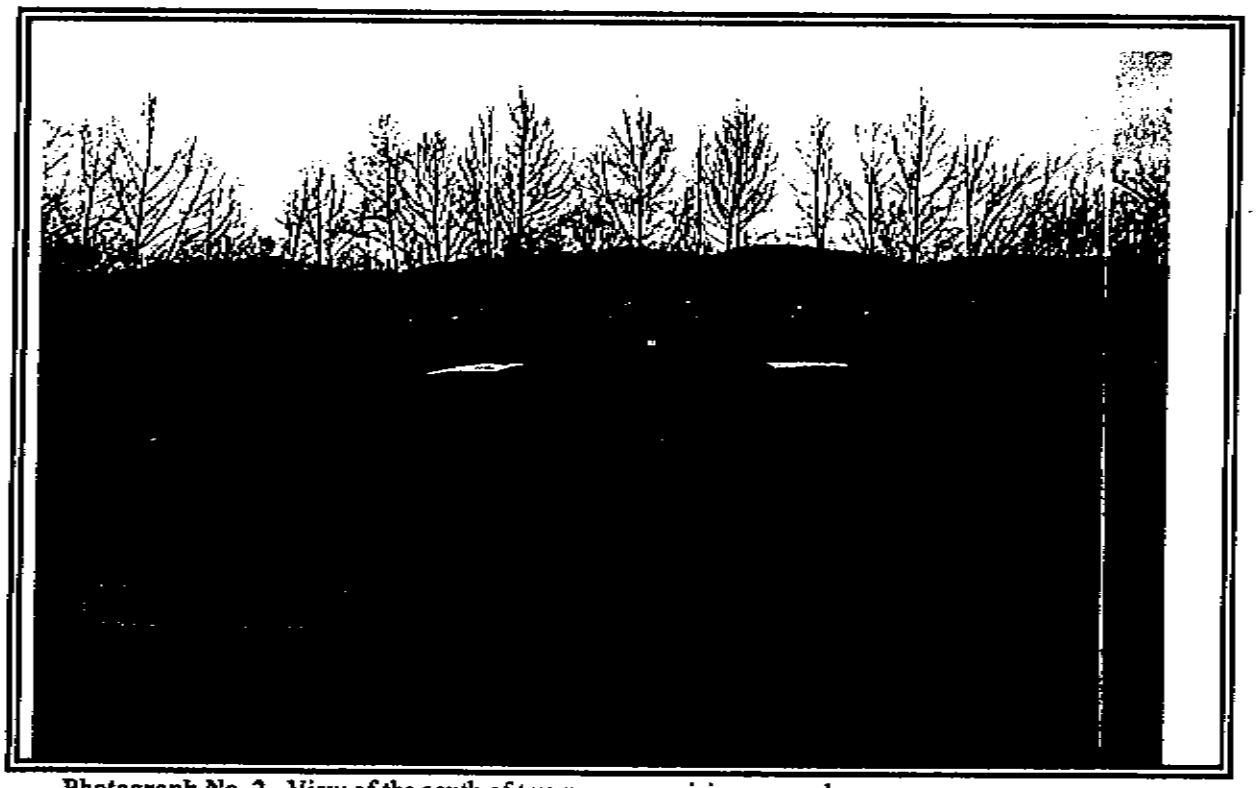
FIGURE 4
Soil Map
OB Ground SAP; RAAP; Radford, Virginia

November 24, 2004
EEE Job Number: 04-702

Attachment II.C-31



Photograph No. 1. View towards the north of a typical soil swale between two pans. Soil samples will be collected within the swale. Note the edge of the pan track in upper left hand corner. Rebar for triangulation measurements will be installed along outer edge of track.



Photograph No. 2. View of the south of two pans comprising one pad.

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Attachment II.C-32

FIGURE -5

Radford Army Ammunition Plant
Radford, Virginia

APPENDIX A

EXAMPLE CHAIN-OF-CUSTODY FORM

Attachment II.C-33

CHAIN OF CUSTODY - EXAMPLE

Sampler Name:		**Signature:**		8260B Volatiles	8270C Semi-Volatiles	8330 Explosives	8332 Nitroglycerin	6010/7471A RCRA 8 Metals	8290 – Dioxins/Furans	8015B TPH-DRO		Transporters Tacking #: _____
Site Name: Open Burning Ground		**Special Request:**										
Site Location: Radford AAP, Radford, Virginia		**Event Name:** Semi-annual Soil Monitor										
SAMPLE ID	MATRIX	DATE	TIME									Comments
Pad 1	Soil											
Pad 2	Soil											
Pad 3	Soil											
Pad 4	Soil											
Pad 5	Soil											
Pad 6	Soil											
Pad 7	Soil											
Pad 8	Soil											

	Relinquished By	Company	Date	Time	Received By	Comp-any	Date	Time	Comments
1.									
2.									
3.									

Attachment II.C-34

ATTACHMENT II.D

INSPECTION SCHEDULE

ATTACHMENT II.D – INSPECTION SCHEDULE

II.D.1. General Inspection Requirements

Inspections function as a preventative measure to help ensure safe operations and to identify potential problems before they can become serious problems. The permitted treatment and storage area will be inspected as specified in this Inspection Schedule.

No inspections are required pursuant to this schedule on days when waste is not being open burned in the permitted treatment and storage area. In such instances, rationale for lack of inspection must be indicated in inspection records.

All inspection results will be recorded on an inspection form by the individual who performs the inspection at the time that the inspection is performed. The individual performing the inspection will sign and date each completed inspection form. An example of a daily log inspection form is included as Figures II.C-1 described below:

a. Figure II.C-1 – Waste Propellant Area, Foreman's Daily Log
The foreman completes this form. The log documents general issues that concern both the Explosive Waste Incinerator (EWI) and the Open Burning Ground (OBG). The log provides a quick view of the daily operations at both units.

II.D.2. Open Burning Grounds

Inspections function as a preventive measure to help ensure safe operations and to identify potential problems before they can become serious problems. The permitted OBG will be inspected as specified in this Inspection Schedule.

No inspections are required pursuant to this schedule on days when waste is not being treated at the permitted OBG. In such instances, rationale for lack of inspection must be indicated in inspection records.

All inspection results will be recorded on an inspection form by the individual who performs the inspection at the time that the inspection is performed. The individual performing the inspection will sign and date each completed inspection form. The OBG foreman records each inspection in an inspection log and maintains these records for at least three years from the date of inspection. These records include date and time of the inspection, the name of the inspector, a notation of the observations made, and the data and nature of any repairs or other remedial action.

Examples of inspection forms are included at the end of this section as "example inspection forms" and follow Figure II.C-1. These example inspection forms are:

a. Weather Conditions
This form provides documentation that the operators have contacted the local weather service in Blacksburg, VA to collect the information. Internet sources may also be referenced for gathering weather information. The form also is the documentation as the amount of waste treated at each pan.

b. Environmental Management, Powder Burn Ground
This daily inspection covers the basic inspections required at the OBG. The operator checks for waste out of place, and cleans it up immediately if it is noted. Prior to loading the pans the pans are checked to insure that the steel is still in good condition and that there are no holes in the pan. This example form also covers the less than 90 accumulation area for the residue from the burning ground.

c. Burning Ground Area Checklist
This inspection is performed daily when the OBG is in operation. It covers the inspection of the equipment prior to loading the pans. It also requires that the firing circuit is inspected as are all the safety items are in place and in operating order.

Only personnel who have completed appropriate training and are approved for the task shall conduct inspections pursuant to this Inspection Schedule.

II.D.3. Types of Problems

The types of problems are listed on the example inspection forms above. Any problem that is noted should also be noted on the Waste Propellant Area, Foreman's Daily Log. If the foreman or operator believes that the inspection warrant action to correct any item they are to stop the process and get the item repaired.

II.D.4. Inspection Schedule

All inspections will be performed daily at the open burning grounds when in operation. If the burning grounds can not operate due to weather or equipment malfunctions, such as holes in the burning pans, it must be noted on the daily inspections logs.

See also 40 CFR 264.15(b)(4) which states: The frequency of inspection may vary for the items on the schedule. However, the frequency should be based on the rate of deterioration of the equipment and the probability of an environmental or human health incident if the deterioration, malfunction, or any operator error

Attachment II.D-2

goes undetected between inspections. Areas subject to spills, such as loading and unloading areas, must be inspected daily when in use.

II.D.5. Remedial Action

Should any problems or deficiencies be observed during an inspection, that observation will be recorded on the appropriate inspection form. Any necessary remedial actions will also be noted on the form and the problem or deficiency will be brought to the attention of the appropriate supervisor. When repairs or remedial actions have been completed, the date and nature of the repairs will be also recorded on the inspection form on which the problem or deficiency was originally noted.

Should any problems or deficiencies be observed that could lead to a release of hazardous waste or which could threaten personnel safety, operations will cease until the problem or deficiency is rectified. In no case will operations resume until all spill and emergency response equipment is operable and adequately stocked.

II.D.6. Inspection Recordkeeping

The operators involved with waste propellant treatment will record each inspection on an inspection form or in the computer-based program for inspections, if appropriate. These forms will be maintained as a part of the facility operating record for at least three years from the date of inspection. These records will include the date and time of inspection, the name of the inspector (including full signature), a notation of the observations made, and the date and nature of any repairs or remedial actions.

II.D.5. Emergency Equipment

The open burning grounds treat only solid propellants or reactive waste and sawdust. In accordance with site operating procedures, any liquid wastes picked up for treatment are returned to that portion of the plant, which produced the waste to be mixed with sawdust. Consequently, any propellant inadvertently spilled on the ground during loading of the pans, as well as waste ejected during burning, can be picked up with a shovel or broom.

Three 2 ½- gallon pressurized water fire extinguishers are located at the iginition bunker next to the site office trailer, one at the trailer itself and one at the nearby storage building to be used in the event of fire on the facility because of waste ejection during burning or other causes. When the possibility of brush fires is increased because of environmental conditions (windy and/or dry) fire trucks are requested to stand by on site during the burning operation. Other available emergency equipment at the plant is listed in the Contingency Plan (Attachment II.E).

The Hazardous communications systems, fire protection equipment, and spill control equipment are tested and maintained according to standard procedures to assure proper operation during an emergency situation.

II.D.6 Water for Fire Control

The New River is the source of water used for fire fighting in the hazardous waste facility areas. The filter plant has a capacity of one million gallons per day. To supplement the above as necessary, there are two water storage tanks available with a 700,000-gallon total capacity.

Attachment II.D-4

TABLE II.D-1

INSPECTION SCHEDULE – SAFETY AND EMERGENCY EQUIPMENT AND SECURITY DEVICES

Inspection Item	Types of Problems	Frequency of Inspection
Absorbent material, booms	Out of stock	Weekly or as used
Fire extinguishers	Seal, hose, pressure, and condition	Monthly or as used
Protective clothing - flameproof coveralls - conductive safety shoes - rubber gloves - hard hat with protective neck flap - safety glasses and goggles - hearing protection	Condition	As used
Respirators	Condition, operational	Weekly
Air compressors	Operational	Weekly
Portable pumps	Operational	Weekly
Facility barricade	Condition	Daily
Flashing red lights	Operational	Daily
Facility signs	Condition, visible	Daily
Internal alarm system (horn)	Operational	Daily
Communication systems	Operational	Daily

Attachment II.D-5

Figure II.D-1

DUP 7824 (REV 12/98)

DATE _____

WASTE PROPELLANT AREA
FOREMAN'S DAILY LOG

REMARKS:

SHIFT & LETTER _____ **FOREMAN** _____

_____ **5 min safety mtg/** _____ **wage attendees/given by** _____

_____ **reg safety mtg/** _____ **wage attendees/** _____ **quality mtg/** _____ **wage attendees**

MINOR INJURY _____

QUALITY FAILURE _____

INCIDENTS _____

GENERAL INFORMATION _____

OPERATIONS DOWNTIME _____

DUP 7714 (REV 3/88)

a

WEATHER CONDITIONS

AWAS - Call 231-4837, Blacksburg, VA

INSTALLATION: Radford Army Ammunition Plant, Alliant Techsystems, Inc., Radford, VA

OFFICE OF RESPONSIBILITY: Propellant Burn Ground, Building Number T-806

PROPELLANT BURN GROUND LOCATION: Magazine Area, Building 428

DAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
DATE	/ /	/ /	/ /	/ /	/ /	/ /	/ /
TIME							
FORECAST							
Probability of Precipitation, Electrical or Thunderstorm							
Wind Speed							
Wind Direction							
Cloud Cover							
Cloud Ceiling Height							
Air Pollution Advisory / Alert							
Viability							
Other (i.e., Closing Index)							
Conditions at Time of Burn							
SKY CONDITION (Use Codes) - AWAS							
VISIBILITY - AWAS							
TEMPERATURE (DEG. F)							
WIND SPEED							
WIND DIRECTION							
AREA OPERATIONAL (yes / no / NMTB*)							
CLOUD CEILING HEIGHT							
TYPE OF MATERIAL DESTROYED							
Pan 1E							
Pan 1W							
Pan 2E							
Pan 2W							
Pan 3E							
Pan 3W							
Pan 4E							
Pan 4W							
Pan 5E							
Pan 5W							
Pan 6E							
Pan 6W							
Pan 7E							
Pan 7W							
Pan 8E							
Pan 8W							
AMOUNT OF MATERIAL DESTROYED	LB.	LB.	LB.	LB.	LB.	LB.	LB.

REMARKS:

UP 6057-D (REV 1/98)

ENVIRONMENTAL MANAGEMENT — POWDER BURN GROUND

MONTH & YEAR _____

INSPECTION FREQUENCY - ONCE PER DAY

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
AREA IN OPERATION ON THIS DATE?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y
WASTE PROPELLANT OR ASH DISPERSED BY THE WIND?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y
ARE THERE HOLES IN THE BURN PAN?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y
S PROPELLANT OR ASH ON THE GROUND AROUND THE BURN PAN?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y
S THE ASH FROM BURNED PROPELLANT PLACED IN COVERED CONTAINER?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y
S THE PAN COVERED WHEN NOT BEING LOADED?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y
AFTER A BURN AND THE PAN IS COOLED IS IT COVERED?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y
ROLL OFF BOX INSPECTION																
A. "HAZARDOUS WASTE" LABEL ON ROLL OFF BOX?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y
B. WHAT IS THE ACCUMULATION START DATE?																
C. IS STORAGE TIME LESS THAN 90 DAYS?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y
D. IS THE COVER IN PLACE?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y
E. IS ROLL OFF BOX DETERIORATING OR DAMAGED?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y
INSPECTED BY																
TIME OF DAY																
NUMBER OF BOATS ON THE RIVER AT 1430 HOURS																

REMARKS:

DATE	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
IS AREA IN OPERATION ON THIS DATE?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
IS WASTE PROPELLANT OR ASH DISPERSED BY THE WIND?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
ARE THERE HOLES IN THE BURN PAN?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
IS PROPELLANT OR ASH ON THE GROUND AROUND THE BURN PAN?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
IS THE ASH FROM BURNED PROPELLANT PLACED IN COVERED CONTAINER?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
IS THE PAN COVERED WHEN NOT BEING LOADED?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
AFTER A BURN AND THE PAN IS COOLED IS IT COVERED?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
ROLL OFF BOX INSPECTION															
A. "HAZARDOUS WASTE" LABEL ON ROLL OFF BOX?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
B. WHAT IS THE ACCUMULATION START DATE?															
C. IS STORAGE TIME LESS THAN 90 DAYS?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
D. IS THE COVER IN PLACE?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
E. IS ROLL OFF BOX DETERIORATING OR DAMAGED?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
INSPECTED BY															
TIME OF DAY															
NUMBER OF BOATS ON THE RIVER AT 1430 HOURS															

REMARKS:

FOIA EXEMPT
DO NOT RELEASE

DUP 7571 (REV. 7/96)

BURNING GROUND AREA CHECKLIST

Week of _____

The following items shall be checked during each operating shift to assure proper operating conditions. All needed repairs will be authorized and/or accomplished as indicated in the CONDITION column using the legend: Approved ✓, Defective, Work Authority Issued X, Repairs Completed (X). Cite difficulties experienced in the "REMARKS" column. "DO NOT OPERATE DEFECTIVE, UNSAFE EQUIPMENT".

ITEM	CONDITION							REMARKS
	S	M	T	W	T	F	S	
I. PROCEDURES:								
In Place								
Pages in Place								
II. SAFETY:								
Explosive/Personnel Limits Posted								
Area Entrance Cables in Place								
No Fire in Pans								
Pan Ground Wires - Secured								
Housekeeping (area)								
Fire Blankets								
III. EQUIPMENT:								
P.A. System								
Siren								
Red Warning Lights								
Galvanometer Calibration Date								
Ignition Wires								
Shovels								
Rakes								
Pans (not damaged, pan lining ok)								
Firing System Control Panel								
Wind Scope								
Pan Covers								
Fire Extinguishers								
IV. HAZARDOUS WASTE MANAGEMENT:								
Area Around Pans Free of Ash & Propellant								
(a) Roll Off Box Covers								
(b) Stenciling								

ATTACHMENT II.E

PERSONNEL TRAINING

ATTACHMENT II.E – PERSONNEL TRAINING

II.E.1. Personnel Training

The purpose of the introductory and continuing hazardous waste training program is to educate the employees who are responsible for handling hazardous wastes. The program makes known to the employee the hazards of those wastes being handled, the regulatory requirements for handling those wastes, and the proper procedures to follow in the event of an emergency. Employee training has been and will be completed through formal classes and through on-the-job training given by Alliant Ammunition and Powder Company, LLC.

II.E.2. Outline of the Training Program

Radford has an established group of personnel responsible for the employee training program. The training program at RFAAP consists of a general orientation, instruction for area-specific procedures, on-the-job training, and a general and continued training program. Table II.D-1 summarizes the current training program at RFAAP.

II.E.3. Job Title/Job Description

Job titles, job descriptions, and the names of those individuals involved with hazardous wastes at RFAAP are summarized in Table II.D-2. These job titles and the name of the individual filling it are maintained and kept on file at RFAAP.

II.E.4. Training Content, Frequency and Techniques

Introductory training for all plant employees consists of general orientation, which is provided by the facility training department. Training in operating procedures is given on-the-job by the area foreman. The operating procedures cover subjects such as cleaning equipment and materials, operating equipment and materials, safety rules and precautions and a step-by-step description of the designated task. Table II.D-3 is a sample employee training record.

Facility personnel have or will successfully complete the required training program within six (6) months after the effective date of their employment or assignment to the permitted treatment and storage area, or to a new position at the permitted treatment and storage area, whichever is later. Employees will not work in unsupervised positions until they have completed the training requirements described in this section. Facility personnel will also participate in an annual review of the facility operating procedures. The plant has courses on subjects that range from Alliant and RFAAP regulations, technical updates, supervisory training, and personal development. The methods of instruction for these courses include stand-up instruction, films, slide-sound presentations, video-

taped programs, worksheets, and hands-on practice. The form of media is conducive to the content of the course.

II.E.5. Training Director

Area training is the responsibility of the Area Manager, Richard Labrie.

Mr. Jerry Redder conducts or oversees all hazardous waste management training and maintenance of personnel training records. Mr. Redder is a registered professional engineer.

Mr. Redder is presently serving as Lead Compliance Engineer for Solid and Hazardous Waste. The responsibilities for this position include compiling the hazardous waste annual report; notifying health, Safety, Security, Operations, and Fire Departments of changes in facility status; implementing the emergency response actions required for any spills, tank ruptures or unusual pollution conditions, Supervisor and foreman training, and reviewing operating procedures. Supervisor training includes security regulations, inspection requirements, personnel training, operating records and emergency plan measures. Appropriate changes in facility operating procedures are implemented as a result of training.

Operating personnel receive on-the-job training based on these operating procedures. At least annually, Mr. Redder conducts a course to review the permit conditions and any changes in the regulations. If a permit modification is approved, Mr. Redder will conduct a seminar on the modification within 30 days of the modification. In this way, the training of the operating personnel in facility procedures is accomplished. The Training Department Manager, Tom Lawley, maintains the records of all training at RFAAP. The Training Department keeps the records on a computer-based file that documents when training has occurred and when it is required again. A log is maintained by the Environmental Department to supplement the Training Department's records.

II.E.6. Relevance of Training to Job Description

All employees receive general plant orientation and training in area-specific procedures. Employees then receive on-the-job training in all of the procedures, which specifically pertain to their area of employment.

Table II.D-3 is a sample employee training record. The employee training records are kept for all RFAAP employees. This system of maintaining employee training records at RFAAP (Section II.D.8.) ensures appropriate and relevant training is coordinated with employee job functions.

II.E.7. Standing Operating Procedures

Standing Operating Procedures (SOPs) are developed and used for open burning of waste at RFAAP. The SOPs specify the procedures involved at the burn pads to minimize the possibility of fire, explosion, or any unplanned release of hazardous waste constituents. The SOPs for the burn area are listed under SOP No. RD-0000-H-0001. The supervisor for open burning operations is responsible for reviewing and updating SOPs annually for operating and training personnel in the safe, efficient, and environmentally acceptable thermal treatment of waste propellant received at the OB Ground. The SOPs are directed to the following operations:

- Waste Collection, Identification, and Storage — Operation No. 1
- Burning Ground Preparation — Operation No. 2
- Sampling Burned Residue — Operation No. 3
- Loading Pans — Operation No. 4
- Loading Pans with Acid Wet Nitrocellulose — Operation No. 5
- Loading Pans with Liquid Explosive Waste — Operation No. 6
- Arming and Ignition — Operation No. 7
- Handling Misfires — Operation No. 8
- Disposal of Reject or Unstable Igniters — Operation No. 9

II.E.8. Training for Emergency Response

The training program at RFAAP includes on-the-job training to cover effective response to emergencies which involves knowledge of emergency procedures, emergency equipment, emergency systems, communications or alarm systems, and shutdown of operations. The operating procedures, which pertain to these topics are taught to the employee by the foreman. This training is equivalent to the training required by 29 CFR 1910.120(e) in accordance with 29 CFR 1910.120(e)(9). Due to the reactive wastes at RFAAP, it is imperative that adequate fire prevention and protection is provided. Response to fires is provided by RFAAP's fire department. The Fire Prevention and Protection Training Program includes drills, exercises, and hands-on training sessions. Each fireman receives a minimum of four hours training each week. A training schedule is prepared, and a training record is maintained on each fireman and retained in the fire station. New firemen receive formal and on-the-job training, and respond with the fire company to all fires. The basic training period usually covers at least

18 months depending on the prior qualification and experience of the new fireman. Training of other employees is conducted during drills and safety meetings. Fire department personnel are available to other RFAAP employees on request to conduct classes, demonstrations, and drills.

II.E.9. Implementation of Training Program

There exists at Radford an extensive system to ensure that required on-the-job training has been conducted with each employee. When an employee performs a job, he submits a job card which has a code number that indicates the department he works in, his employee number and the operation number for the job he performed. When the cards are processed for payroll accounting through the computer, the computer also searches the employee's training history to determine if the employee was trained in the jobs he performed. If the computer search finds that the employee was not properly trained, it prints out a notice of the training deficiency. This notice is then routed to the foreman so the deficiency may be corrected.

Training records and computer based training (CBT) is maintained by the Training Department. The system notifies supervision when training is required. Non CBT is recorded when supervisors submit the information to the Training Department for update. Training of area procedures is recorded in the CBT system.

Current training records of employees involved with hazardous waste management will be kept until closure of the hazardous waste facilities. Training records on former employees will be kept for at least three years from the date the employee last worked at the facility.

Current OBG employee training records will be kept at Radford until closure of these hazardous waste facilities. Training records on former employees are kept for at least three years from the date the employee last worked at the facility. All of the training records are kept in a computer bank. An example of an employee training record maintained at RFAAP is shown in Table

TABLE II.E-1

OUTLINE OF RFAAP TRAINING PROGRAM

Type of Training	Training Content	Training Technique
General Plant Orientation	Layout of plant, security procedures, general job requirements, propellant safety requirements	Area training Coordinator at an onsite location.
Area Specific Procedures	Emergency response, safety training, and accident prevention	Area Training Coordinator at an onsite location
On-the-Job Operating Procedures	Operating the waste propellant incinerator, grinding and slurry operation, draining slurry tanks, propellant handling and transport, inspecting the surface impoundment, operating the open burning grounds	Area Foreman with on-the-job training.
General and Continuing Training	Alliant and RFAAP regulations, technical updates, supervisory training, personnel development practice.	Various instructors with stand-up instruction, films, slide-sound presentation, video-taped programs, and hands-on

TABLE II.E-2

PERSONNEL TRAINING SUMMARY OF RFAAP HAZARDOUS WASTE PROGRAM

Title	Responsibilities and Training Required	Current Assigned Personnel
RCRA Coordinator	Responsible for overall administration of hazardous waste management program as directed by the Army under the terms of the operating contract for the installation. Trained in all aspects of hazardous waste management. Involved in pollution abatement and hazardous waste management. Responsible for Waste Analysis Plan. Coordinates hazardous waste management supervisory training.	Mr. J. J. Redder
ACO Safety Risk Manager	Oversight of operating contractor in safety management.	Mr. Douglas Day
ACO Environmental Engineer	Oversight of operating contractor in solid/hazardous waste management.	Mr. Jim McKenna
Safety Manager	Assist in preparation and presentation of training program, provide health and safety data on handling hazardous wastes. Occasional outside training program to keep current. Trained in all aspects of hazardous waste emergency response.	D. Hall
Training Coordinator	Conducts general and continuing training programs.	Mr. Thomas Lawley
Plant Protection Manager	Overall monitoring of radio transmissions and HWM facility security. Trained in all aspects of hazardous waste emergency response.	Mr. Thomas Lawley
Fire Department Coordinator	Assist in preparation and presentation of training program, maintain prefire plan for HWM facility, respond to fire alarms. Trained in hazardous waste emergency procedures.	Mr. Thomas Lawley
Medical Nurse	Responds to all health emergencies. Responsible for all aspects of hazardous waste emergency health responses.	
Toxicologist Board	Review handling and management of an new materials to be used at RFAAP. Responsible for safety procedures.	Mr. Robert Kelly Mr. Mike Lee
Foreman	Conduct weekly inside building inspections, supervise hazardous waste handling operations at HWM facility, minor spill cleanup supervision. Responsible for on-the-job training of employees.	Ms. Wanda Jones
Waste Propellant Facility Operators	Responsible for operating the burning ground, placing waste on the pans, inspections, and residues. Trained in hazardous waste handling procedures, including chemical hazards, personnel protection, and explosive reactions.	Randal Hamm, Joe Ray
Firemen	Responds to hazardous waste emergencies. Trained in all aspects of hazardous waste emergency response. Training conducted with regular fire training and not hazardous waste program.	All firemen
Environmental Manager	Functions as alternate to RCRA Coordinator. Responsible for overall plant management. Trained in all aspects of manufacturing and hazardous waste disposal operations.	(acting Manager) Paige Hold

TABLE II.E-3

SAMPLE EMPLOYEE TRAINING RECORD

Training History Summary Report

Employee Name: Jones, Wanda

Company ID: 14237

Curriculum Name	Status	Assigned On	Closed On
001 Asbestos Awareness	Open	30 Aug 2000	
001 Asbestos Awareness	Completed	19 Aug 2000	25 Aug 2000 15:05
001 Asbestos Awareness	Completed	07 Feb 2000	16 Feb 2000 13:40
001 Asbestos Awareness	Completed	05 Aug 1999	05 Aug 1999 23:54
001 Asbestos Awareness	Completed	04 Aug 1999	04 Aug 1999 23:49
001 Asbestos Awareness	Completed	03 Aug 1999	03 Aug 1999 23:56
001 Asbestos Awareness	Completed	02 Aug 1999	03 Aug 1999 00:10
001 Asbestos Awareness	Completed	01 Aug 1999	02 Aug 1999 00:15
001 Asbestos Awareness	Completed	31 Jul 1999	01 Aug 1999 00:11
001 Asbestos Awareness	Completed	25 Jan 1999	27 Jan 1999 08:30
001 Hazard Communication	Open	30 Aug 2000	
001 Hazard Communication	Completed	17 Feb 2000	29 Aug 2000 11:08
001 Hazard Communication	Completed	16 Aug 1999	16 Aug 1999 23:51
001 Hazard Communication	Completed	03 Feb 1999	09 Feb 1999 12:17
001 Hazardous Waste Management	Open	30 Aug 2000	
001 Hazardous Waste Management	Completed	17 Feb 2000	29 Aug 2000 11:02
001 Hazardous Waste Management	Completed	16 Aug 1999	16 Aug 1999 23:51
001 Hazardous Waste Management	Completed	03 Feb 1999	09 Feb 1999 12:17
001 Hearing Conservation	Open	30 Aug 2000	
001 Hearing Conservation	Completed	17 Feb 2000	29 Aug 2000 10:57
001 Hearing Conservation	Completed	16 Aug 1999	16 Aug 1999 23:52
001 Hearing Conservation	Completed	03 Feb 1999	09 Feb 1999 12:17
001 Personal Protective Equipment	Open	30 Aug 2000	
001 Personal Protective Equipment	Completed	19 Aug 2000	25 Aug 2000 14:51
001 Personal Protective Equipment	Completed	07 Feb 2000	16 Feb 2000 13:43
001 Personal Protective Equipment	Completed	05 Aug 1999	05 Aug 1999 23:54
001 Personal Protective Equipment	Completed	04 Aug 1999	04 Aug 1999 23:48
001 Personal Protective Equipment	Completed	03 Aug 1999	03 Aug 1999 23:56
001 Personal Protective Equipment	Completed	02 Aug 1999	03 Aug 1999 00:10
001 Personal Protective Equipment	Completed	01 Aug 1999	02 Aug 1999 00:15
001 Personal Protective Equipment	Completed	31 Jul 1999	01 Aug 1999 00:11
001 Personal Protective Equipment	Completed	25 Jan 1999	27 Jan 1999 08:30
002 Team Building	Open	22 Nov 1999	24 Aug 2000 00:59
3-1.1 Reporting Pollution Incidents Rev 14	Completed	17 May 2000	13 Jul 2000 12:29
4-A-007 Change Revision 18	Open	11 May 1999	
4-A-007 Corrective Action for ISO Audit	Expired	01 Mar 1999	19 Mar 1999 13:34
4-A-036, Revision 7 - CHANGE	Completed	23 Aug 2000	23 Aug 2000 03:39
4-A-066 Revision 12 Change	Completed	19 Jul 2000	25 Jul 2000 12:33
752 BGFO-03	Open	18 Feb 2000	
752 BGFO-06	Open	18 May 1999	
752 BGFO-06	Open	30 Aug 2000	
752 BGFO-06	Completed	17 May 2000	29 Aug 2000 10:26

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NEICVP1068E02

Training History Summary Report

Employee Name: Jones, Wanda

Company ID: 14237

Curriculum Name	Status	Assigned On	Closed On
752 BGFO-09	Open	30 Aug 2000	
752 BGFO-09	Open	16 Aug 1999	
752 BGFO-09	Completed	15 Aug 2000	29 Aug 2000 10:51
752 BGFO-12	Open	16 Nov 1999	
Asbestos Awareness	Completed	14 Nov 1999	25 Aug 2000 15:05
CC 45 Issue 0 Change	Completed	30 Mar 2000	04 Apr 2000 14:28
Disaster Control Plan	Completed	28 Feb 2000	04 Apr 2000 15:01
Hazard Communication	Completed	14 Nov 1999	29 Aug 2000 11:16
Hazardous Waste Management	Completed	14 Nov 1999	16 Feb 2000 13:55
Hearing Conservation	Completed	14 Nov 1999	16 Feb 2000 13:50
Managing Diversity 2000	Open	26 Apr 2000	
MM 2-1.05, Issue 12 Change	Completed	23 Aug 2000	24 Aug 2000 09:17
MM 2-1.07, Issue 5 Change	Completed	23 Aug 2000	23 Aug 2000 11:04
MM 3-1.15 Isssue 2 Change	Completed	02 Dec 1999	16 Feb 2000 13:45
MM 3-1.16 Issue 2 Change	Completed	02 Dec 1999	16 Feb 2000 13:29
MM 3-1.17 Issue 2 Change	Completed	02 Dec 1999	16 Feb 2000 13:31
MM 3-1.18 Issue 2 Change	Completed	02 Dec 1999	23 Dec 1999 13:17
MM 5-1.10, Issue 13 Change	Completed	19 Jul 2000	25 Jul 2000 12:17
MM 5-1.2 Revision 6 Change	Completed	09 Nov 1999	16 Feb 2000 13:17
MM 5-1.3, Issue 13 Change	Completed	14 Jul 2000	25 Jul 2000 12:34
MM 5-1.3, Issue 13 Change	Completed	14 Jul 2000	25 Jul 2000 12:34
MM 5-1.8, Revision 12 Change	Completed	01 Nov 1999	16 Feb 2000 13:03
MM 5-2.2, Revision 5 Change	Completed	29 Oct 1999	16 Feb 2000 13:07
MM 5-4.10 Issue 9 Change	Completed	25 Mar 2000	04 Apr 2000 14:39
MM 5-4.7 Issue 3 Change	Completed	25 Mar 2000	04 Apr 2000 14:29
MM 5-4.9, Issue 7 Change	Completed	28 Jul 2000	03 Aug 2000 14:33
MM 5-6.7, Issue 3 Change	Completed	11 Aug 2000	29 Aug 2000 10:53
MM 5-7.1, Issue 0 New	Completed	28 Jul 2000	03 Aug 2000 14:28
MM 5-7.2, Issue 0 New	Completed	28 Jul 2000	03 Aug 2000 14:27
MM 7-2.2, Revision 10 Change	Completed	01 Nov 1999	16 Feb 2000 13:24
MM 8-2.6 Issue 6 Change	Completed	22 Mar 2000	04 Apr 2000 14:51
MM 9-1.06, Issue 4 Change	Completed	08 Aug 2000	29 Aug 2000 10:55
MM 9-3.7, Issue 1 New	Completed	28 Jul 2000	03 Aug 2000 14:31
Personal Protective Equipment	Completed	14 Nov 1999	01 Mar 2000 10:48
PSM	Completed	14 Nov 1999	16 Feb 2000 14:11
RD-0000-H-001 Change 01 07-07-00	Completed	12 Jul 2000	13 Jul 2000 08:50
RD-0000-K-002 Revision 10 Change	Completed	12 Jul 2000	13 Jul 2000 12:26

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ATTACHMENT II.F

CONTINGENCY PLAN

ATTACHMENT II.F – CONTINGENCY PLAN

The following text was excerpted from RFAAP's January 12, 2001 submittal excluding the incinerator. The original formatting and numbering scheme is retained in order to simplify

1.0 INTRODUCTION AND GENERAL INFORMATION

This Contingency Plan (Plan) has been prepared for the Open Burning Ground units, at the Radford Army Ammunition Plant (RFAAP). This Plan has been compiled as a stand-alone document for the permitted treatment and storage area and has been structured to be consistent with other plans and procedures in use at the RFAAP.

1.1 Purpose

In accordance with Subpart D of 40 CFR Part 264, this document describes the Contingency Plan that will be activated in the event of a fire, explosion, or release of hazardous waste or hazardous waste constituents, which could threaten human health or the environment. A current copy of the Plan will be maintained in the RFAAP Facility Operating Record as well as in the Environmental Manager's files.

This Plan is designed to address the requirements of Subpart D of 40 CFR Part 264. Management plans, Army installation procedures, and plant operating procedures exist outside the text of this Plan. The purpose of these other documents is to handle emergency situations that might occur at the RFAAP, but that may or may not be directly associated with hazardous waste management. Although these documents are not required under Subpart D of 40 CFR Part 264, and are not part of this Plan, a brief description of the contents of these documents and a listing of the established operating procedures applicable to RFAAP emergency and disaster situations are included in Table 1. Appendix A contains a copy of the table of contents for the RFAAP Disaster Control Plan (RFAAP-DCP) and the Plant Protection Plan.

1.2 Plan Contents

This Contingency Plan contains pertinent information to be used during an emergency situation. The various sections and content of the plan are listed below.

- Section 2 describes facility operations and the types of hazardous wastes managed at the Open Burning Grounds.
- Section 3 identifies the RFAAP Emergency Coordinator and alternates.
- Section 4 discusses Contingency Plan implementation.
- Section 5 presents a description of release prevention measures.
- Section 6 describes emergency response procedures.
- Section 7 describes coordination agreements between RFAAP and surrounding communities.
- Section 8 presents the permitted treatment and storage area evacuation plan.
- Section 9 outlines release-reporting requirements.
- Section 10 includes requirements for Contingency Plan modifications.

2.0 FACILITY LOCATION, OPERATIONS, AND WASTES MANAGED

This section provides background information that may be useful as part of an emergency situation. This information includes the location of the facility, operations performed at the facility, types of wastes managed, and potential emergency situations that could be encountered.

2.1 Facility Location

The RFAAP is located in southwest Virginia within Pulaski and Montgomery Counties as shown in Figure 1. The RFAAP is located approximately 5 miles northeast of the City of Radford, 10 miles west of Blacksburg, and 47 miles southwest of Roanoke. The main entrance to the RFAAP is located on Virginia Route 114 between the Towns of Christiansburg and Radford. The RFAAP address is as follows:

Radford Army Ammunition Plant
Route 114
P.O. Box 1
Radford, Virginia 24141-0100

The RFAAP encompasses approximately 4,104 acres. The New River separates Pulaski and Montgomery counties and also divides the RFAAP into two portions commonly known as the Horseshoe Area and Main Manufacturing Area. These two areas and the approximate boundary of the RFAAP are shown on Figure 1.

The OB Ground is located in the southeast section of the Horseshoe Area on the northern bank of the New River as shown in Figure 1 and is used for the open burning of waste propellant. Propellant wastes that cannot be safely treated in the Incinerator (metal particles, rocks, and similar debris in the waste may damage the grinder system) are treated at the OB Ground. Figure 2 shows the OB Ground boundary and the locations of the actual structures.

2.2 Facility Operations

General operations performed at the RFAAP and at the permitted treatment and storage area are described in the following sections.

2.2.1 RFAAP Operations

RFAAP is a government-owned, contractor-operated (GOCO) industrial installation responsible to the U.S. Army Joint Munitions Command at Rock Island Arsenal whose mission is to manufacture propellants, explosives, and chemical materials as assigned. The Alliant Ammunition and Powder Company, L.L.C. (Alliant) currently is the operator of the facility under a Facility Use contract. As a GOCO operation, RFAAP has both Government and Contractor organizations. For the purpose of this permit application, the facility consists of all contiguous portions of the RFAAP under the control of the either the U.S. Army or Alliant (Permittees). The facility specifically includes both the Horseshoe Area and the Main Manufacturing area.

The facility was first constructed in 1940 and began operations producing smokeless powder (single base, double base, and triple base propellants) in 1941. Since that time various processes/products have been added to the facility including production of cast propellants, trinitrotoluene (TNT), commercial propellants, and load, assemble and pack facilities. Specific operations vary based upon contracted capacity and products from the Department of Defense and U.S. allies.

2.2.2 OB Ground Operations

Operations included as part of the OB Ground include propellat waste transfer and treatment, and equipment as follows:

- Burning Pans and Covers
- Remote Ignition System

Specific operations that are performed at the OB Ground are listed below.

1. Waste materials are transported from production areas in <20 gallon containers to the OB Ground. The waste is then loaded into the burning pans.

2. The burning pans are prepared for ignition by spreading the waste out and adding diesel fuel if necessary.

3. The burning pans are remotely ignited.

4. Ash from the burning pans is collected and staged on-site pending sample analysis and disposal in a properly permitted disposal facility.

2.3 Wastes Managed

The hazardous wastes that are managed (treated and stored) at the permitted facility include waste propellants and spill "cleanup" residues generated at the facility which are hazardous due to their ingnitability (D001) or reactivity (D003). Only hazardous wastes identified in this Permit's Waste Analysis Plan will be treated the OB Ground. These wastes include the following:

1. Wastes which exhibit only the following hazardous characteristic(s):

   a. Reactivity (hazardous waste number D003) as specified in 9 VAC 20-60-261; 40 CFR Part 261.23;
   b. Reactivity (hazardous waste number D003) as specified in 9 VAC 20-60-261; 40 CFR 261.23 and the characteristic of toxicity, as specified in 9 VAC 20-60-261; 40 CFR 261.24, for one of the following constituents:

      i. Lead (hazardous waste number D008);

ii. 2,4-Dinitrotoluene (hazardous waste number D030); and/or

iii. Barium (hazardous waste number D005)

c. Ignitability (hazardous waste number D001) as specified in 9 VAC 20-60-261; 40 CFR 261.21. Ignitable wastes are limited to clean up residue of propellant ingredients. Ignitable wastes are mixed with sawdust and are not a liquid when brought to the permitted treatment and storage area.

2. Wastes which are not listed pursuant to 9 VAC 20-60-261; 40 CFR 261.31, 32, and 33; and

3. Wastes which are one of the following (as identified in the Waste Analysis Plan):

a. Off-specification propellants and propellant intermediates, generated at the facility;
b. Load, assemble and pack waste, consisting of energetic materials from assembling cartridges;
c. Specialty product wastes containing propellant with nitrocellulose, nitrate esters, nitroguanidine, solid explosives, and one of the following combinations of additional materials:
   i. 40 CFR 261 Appendix VIII constituents (D003)
   ii. 40 CFR 261 Appendix VIII constituents, chlorides and/or perchlorates (D003)
   iii. 40 CFR 261 Appendix VIII constituents and/or metals (D003, D004-D010)
d. Other miscellaneous waste, described in Module II, Attachment II.B, Appendix II.B-1, Table I, as one of the following:
   i. Ignitable and reactive liquids in sawdust (D001, D003)
   ii. Off-specification dinitrotoluene, trinitrotoluene, or Isotriol

2.3.1 Composition of Waste

The composition of the waste propellant mixtures fed to OB Ground varies over time due to changes in the production schedule at the RFAAP. Off-specification propellants and propellant intermediates, dinitrotoluene (including production intermediates), trinitrotoluene, isotriol, load, assemble and pack waste, specialty product waste and other miscellaneous wastes are the categories of wastes which may be treated at the OB Ground. These categories are segregated into 20 distinct waste groups, as listed in Table 2; all wastes with the exception of Groups 2,3, and the two liquid waste groups (Groups 5 and 6) containing triethylene glycol and diethylene glycol, may be treated at the OB Ground. No liquid wastes are treated at the OB Ground.

These waste streams are processed as described in Sections 2.2.2 and 2.2.3 and are handled in accordance with the Waste Analysis Plan. There are no wastes managed in the facility that are incompatible with the waste propellants (reactive waste).

2.3.2 Identification and Quantity of Waste

Hazardous wastes treated at the OB Ground consist primarily of off-specification/waste propellants as described above. The specific identification of wastes to be stored and treated at the permitted storage and treatment area(s) is recorded on an internal manifest form that accompanies the waste from the generation area. Consequently, the identity of any released material can be identified.

Wastes brought to the OB Ground are treated (burned) the same day as received. The resulting ash from the burning pans is collected and staged on-site pending sample analysis and disposal in a properly permitted disposal facility.

2.4 Potential Emergency Situations

Situations at the OB Ground that would require implementation of the Contingency Plan include releases from a fire or an explosion of reactive wastes during processing or handling.

The most serious situation at OB Ground would be an explosion, as such an incident would pose an immediate danger to facility personnel and could allow for the release of a significant quantity of material.

3.0 EMERGENCY COORDINATORS

The primary Emergency Coordinator/Incident Site Commander (EC/ISC) at the facility is the Plant Protection Specialist on duty. The EC/ISC has the authority to determine and implement the Disaster Control Plan, RFAAP Hazardous Material Emergency Response Plan, and Plant Protection Plan as well as this Contingency Plan if deemed necessary. The facility has an on-site Fire Department and Hazardous Materials Emergency Response Team. Environmental emergencies are primarily communicated to and handled by the Environmental Manager and the Environmental Engineering Staff in accordance with applicable regulations. The Environmental Manager coordinates all pollution control and remediation activities including monitoring, containment, control, countermeasures, clean-up, and disposal activities. The Environmental Manager and the EC/ISC also have the authority to commit all necessary resources to carry out emergency response under this plan.

Other facility employees are designated as alternate EC/ICSs and are qualified to act as EC in event the primary EC is unavailable. A (primary or alternate) emergency coordinator (EC) will be available or on call at all times. The facility personnel who are designated as ECs are listed in Table 3 (the Notification Action Summary sheet). The alternate ECs are called on in the order listed to act as the EC in the event of an emergency.

Table 3 also lists the names, addresses, and phone numbers (office and home) of the emergency coordinators and alternate ECs. All of these persons are qualified by experience and training to act as Emergency Coordinator. All of these persons hold management positions at the facility and have been trained to respond to emergencies dealing with hazardous waste management and have extensive experience in the propellant manufacturing environment.

4.0 IMPLEMENTATION

The Contingency Plan will be implemented whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents, which could threaten human health or the environment. The EC will be responsible for evaluation of any situation to determine if the Contingency Plan will be implemented.

It shall be the duty of all facility personnel to follow the direction of the EC when the decision has been made to implement the Contingency Plan.

4.1 Implementation at the OB Ground

The person observing an emergency situation at the OB Ground will most likely be someone other than the EC. That person is to take the following actions to involve the EC as soon as possible:

1. Ensure his/her personal safety.

2. Telephone, radio, or otherwise notify the Security Dispatcher and the Foreman of any observed releases (e.g., spills, fires, or explosions) at the OB Ground and report: his/her name, location, and nature and extent of the release. The alarms (radio and telephone) are located on-site at the trailer and bunker (Figure 2). The Security Dispatcher will immediately notify the EC.

3. Remain available to assist the EC with information about initial observations of the incident.

4. The EC will determine whether the Contingency Plan should be implemented.

5.0 RELEASE PREVENTION MEASURES AND CONTROL PROCEDURES

RFAAP has general facility-wide control procedures to minimize the potential for fires, explosions, and chemical releases as part of overall facility operations. Additional measures have been implemented at the OB Ground to prevent and/or control the propagation of such incidents.

5.1 RFAAP Control Procedures

The RFAAP is designed so that process, raw material storage and product storage facilities present a minimal threat of fire, explosion or material release. These process and storage operations are not subject to RCRA regulation. However, in the course of normal operation and maintenance, hazardous wastes are generated. Because safeguards exist for the non-RCRA regulated processing operations, this also protects against hazards once the waste is generated in the plant.

The facility has provisions for response to fires, explosions or spills involving hazardous waste as follows: The EC will notify the on-site supervisor to direct personnel to contain, absorb, package, or redirect spilled materials as deemed necessary to protect human health or the environment. For this purpose, the plant maintains an adequate supply of hand and motorized tools and clean, empty containers for recovering waste propellants and other hazardous wastes.

The EC has the authority to direct, through the on-site plant fire chief, trained fire crews to contain and control fires and cool affected areas to prevent spread of further hazard.

5.2 Prevention of Recurrence or Spread of Fires, Explosions or Releases

Numerous precautions are taken at the OB Ground in order to reduce the likelihood that fires, explosions, and releases occur. These precautions include general response to fires at the OB Ground.

Should there be a fire, explosion, or release of hazardous materials at the OB Ground, the EC and other environmental and operational personnel will review the incident after response and clean-up activities are completed. Based on this review, the cause will be determined, if possible, facility operating procedures or design will be revised as necessary and other corrective actions will be taken in order to help prevent a reoccurrence. The Contingency Plan will also be revised as necessary in order to improve facility response to future incidents.

6.0 EMERGENCY RESPONSE PROCEDURES

This section outlines procedures to be followed during an emergency situation including the following information:

- The responsibilities of the EC;
- Notification procedures for facility personnel and regulatory agencies; and
- Various procedures for responding to and controlling an emergency situation.

6.1 Emergency Coordinator's Responsibilities

When the decision has been made to implement the Contingency Plan, the Emergency Coordinator's responsibilities will include, but not be limited to, the following:

1. Accounting of facility personnel;
2. Implementation of internal notification;
3. Coordination of first-aid activities;
4. Activation of the Evacuation Plan, if required; and
5. Notification of appropriate State and local authorities (coordinate notification requirements with Environmental).

6.2 Notification

Procedures for the notification of RFAAP personnel and appropriate federal, state and local agencies are included in this section. The Notification Action Summary is provided in Table 3 of this Contingency Plan

6.2.1 Internal RFAAP Notifications

Internal communication systems (telephone or two-way radios) will be used to notify RFAAP personnel. The appropriate alarms will be activated and the EC will be notified in an effort to implement the Contingency Plan as outlined in Section 4.0.

6.2.2 Notification of Federal, State, and Local Agencies

The Environmental Manager (or a designated alternate) will notify appropriate state and local agencies as outlined in this plan and as listed below.

Release Greater Than Reportable Quantity: State and federal regulations require immediate notification whenever there is a release of a hazardous substance greater than a reportable quantity as listed in 40 CFR 302.4. The list on the following page are the substances that are at RFAAP that have an RQ. Not all of the substances listed are at the open burning ground but are on site.

CHEMICALS AND SUBSTANCES			
Chemical	**Reportable Quantity (lbs.)**	**Chemical**	**Reportable Quantity (lbs.)**
Acetone	5,000 lbs (755 gal)	**Nitric acid (any percentage)**	**1,000 lbs (80 gal @ 100% conc.)**
Ammonia (anhydrous)	**100 lbs**	Nitroglycerin (NG)	10 lbs (<1 gal)
Chlorine	**10 lbs**	Petroleum products (oils, fuels, used or waste products)	150 lbs (25 gallons to land)
Dibutyl phthalate (DBP)	10 lbs (1 gal)	Petroleum products (oils, fuels, used or waste products)	Visible sheen on outfall or river
Diethyl phthalate (DEP)	1,000 lbs (100 gal)	Phosphoric acid	5,000 lbs (329 gal @100% conc.)
Ethyl ether	100 lbs (17 gal)	Sodium hydrosulfide	5,000 lbs
2,4-dinitrotoluene (DNT)	10 lbs	Sodium hydroxide (any solution)	1,000 lbs (100 gal @20% caustic)
Lead	10 lbs	**Sulfur dioxide**	**500 lbs**
Mercury	1 lb (1.3 ounces)	**Sulfuric acid (any percentage)**	**1,000 lbs (66 gal @ 100% conc.)**
Mixed acids (any percentage)	**1,000 lbs (80 gal)**	Toluene	1,000 lbs (138 gal)
OTHER HAZARDOUS SUBSTANCES, WASTES, OR AIR EMISSIONS			
Sludge from Bioplant	10 lbs	Wastewater with a pH of ≤ 2.0 or pH ≥ 12.5	100 lbs (12 gal)
Sludge from NG Pre-Treatment Plants	10 lbs	DNT Contaminated Wastewater	225 lbs (27 gallons)
Waste propellant	100 lbs	Visible air emissions for > 1 hour	---
Ash from Propellant and Contaminated Waste Burning Grounds and Incinerator	10 lbs	Any other material identified as hazardous waste	---

Note: Chemicals in bold print are "OSHA Extremely Hazardous Substances" and require special consideration of health effects in emergency response efforts.

1. The National Response Center (800-424-8802) must be notified of any release greater than a reportable quantity in accordance with Section 103 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and as listed in 40 CFR Part 302.

2. The Director of the Virginia Department of Environmental Quality must be notified within 24 hours of any release of hazardous waste in a quantity greater than the Reportable Quantity.

Release That Threatens Off-Site Impacts: Pursuant to 40 CFR 264.56(d), if the Emergency Coordinator determines that the facility has had a release, fire, or explosion, which could threaten human health or the environment outside the facility, he shall report his findings as follows:

1. If his assessment indicates that evacuation of local areas may be advisable, he shall immediately notify appropriate local authorities. He shall be available to help appropriate officials decide whether local areas should be evacuated; and

2. He shall immediately notify the local government official designated as the on-scene coordinator for that area, and the State Emergency Response Team of the Virginia Department of Emergency Management at 800/468-8892.

3. A release that poses an immediate or imminent threat to public health and requires notification of the National Response Center must also be reported to the Department of Environmental Quality, Department of Emergency Management, and the Local Emergency Planning Committee's Office.

In the event that an emergency situation occurs that requires notification of outside agencies, the following information shall be reported:

1. Name and telephone number of notifier;
2. Name and address of facility;
3. Time and type of incident;
4. Name and quantity of material(s) involved to the extent known;
5. The extent of injuries, if any; and
6. The possible hazards to human health or the environment outside the facility.

6.3 Emergency Equipment Available

The emergency equipment available and "on-call" for use at the unit is listed in MOP 4-27-2. This MOP list, and information obtained from the safety manager and the fire chief at RFAAP, is summarized in Table 6 and Figure 3. The numbers (1-12) in Table 6 indicate the different physical locations and Figure 3 shows these locations within the facility.

In addition to the equipment listed in Table 6, other fire, personnel protection, and cleaning equipment is available as follows. Fire protection equipment includes portable fire extinguishers, a mobile carbon dioxide extinguishing system, and fire hydrants near the

hazardous waste facilities and at various locations within the plant. Additional spill cleanup equipment is located in the Roads and Grounds Building.

6.4 Containment, Countermeasures, Clean-Up and Disposal

General response measures that will be implemented during an emergency situation at the OG Ground are presented below.

1. ***Ensure Personal Safety, Sound Alarm and Notify Emergency Coordinator*:** Upon identification of a fire, explosion, or other release personnel shall enusre their personal safety and then activate the alarm system and notify the EC. The alarm system consists of radio and telephone. Both forms of alarm are accessible at the OB Ground. The alarms will be used to contact the Security Dispatcher, which is staffed 24 hours a day, 7 days a week.

2. ***Evacuation*:** Personnel will evacuate the area as outlined in the Evacuation Plan in Section 8.0.

3. ***Identify the Material(s) Involved*:** The specific identification of wastes will be determined from the internal manifest forms, which identify the materials that are sent to the Incinerator and to the OB Ground. Copies of the manifests are carried in the transport vehicles carrying the waste. Upon delivery to the treatment facility, the manifests are transferred from the transport vehicles and kept at the Incinerator Control Room or at the OB Ground Trailer, depending on the waste destination. In addition, copies of the manifests are kept at the operational office for each accumulation area from which the waste is generated.

   Each waste transport vehicle also utilizes a hazard classification placard system to allow firefighting forces to quickly and easily determine the methods by which any emergency situations involving the waste materials should be handled. A description of the hazard classification placard system is included in Appendix B.

4. ***Assessment*:** Upon arrival at the scene the EC (or the designated alternate) will take control of the affected area including all resources necessary to deal with the emergency. The EC will maintain this authority and control until the emergency has been eliminated and cleanup is complete.

   After taking control of the affected area, the EC will determine the source, extent and nature of the involved hazardous waste and assess any primary and secondary hazards. Waste generation, source and analytical data are to be used to make this determination. These records shall be kept on-site. The evaluation criteria used by the EC to determine if the Contingency Plan is to be implemented are presented in Table 4. A logic diagram representing the evaluation process is shown as Figure 4.

5. ***Alert Local Authorities for Assistance***: Should the situation require resources beyond those available at the RFAAP, local fire, police, and/or medical support will be requested as described in Section 7.0.

6. ***Implement Spill Response Measures***: Spill response measures will be implemented as outlined in Table 5 using spill response equipment available at the facility as listed in Table 6 and materials provided by supporting communities as needed. Response measures include evaluation of safety issues, containment of the release, regulatory notifications, waste treatment, and monitoring. Response measure will be performed by the RFAAP Fire Department and Emergency Response Team under the direction of the EC with assistance from other local agencies as needed.

7. ***Storage and Treatment of Released Material***: If a spill or leak occurs in the grinder building, the released material (an aqueous waste propellant slurry) will be contained in the secondary containment system. The slurry will drain to a sump from which it is pumped to the catch tank. If waste propellant slurry is released to the ground such as may occur due to a failure in the slurry feed line, applicable spill response measures outlined in Table 5 will be followed. Recovered waste propellant will be treated at the open burning ground, if appropriate.

   Ash from fires will be treated similar to incinerator ash. The ash will be analyzed for reactivity, TCLP toxicity, and other constituents as specified in the Waste Analysis Plan. If the ash fails for either or both characteristics, or is a listed hazardous waste it will be taken to a RCRA permitted facility. If it does not fail, it will be disposed in a permitted solid waste landfill, if such disposal is in accordance with that permit.

8. ***Incompatible Wastes***: There are no wastes managed in the facility that are incompatible with the waste propellants (reactive waste).

6.5 Disposal of Miscellaneous Waste and Debris

Wastes generated as part of a response action will be collected and contained. Those materials that cannot be treated in the incinerator or the open burning area will be characterized and disposed of off-site in accordance with state and federal laws. Such wastes may include but is not limited to the following:

- Personal protective equipment;
- Plastic sheeting used for decontamination or containment;
- Absorbent materials; and
- Soil and/or water.

6.6 Post-Emergency Equipment Maintenance

Post-emergency provisions are designed to prevent recurrence, to clean up and dispose of residuals, to decontaminate equipment, and to provide for personnel debriefing.

The Emergency Coordinator will take all necessary steps to ensure that a secondary release, fire or explosion does not occur after the initial incident. Procedures that will be carried out in the affected area include:

1. Inspection for any leaks or cracks in pipes, valves, tanks, and incinerators;
2. Inspection for excess heat generation at the incident area; and
3. Isolation of residual waste materials.

All waste propellant and other cleanup residues will be tested for RCRA characteristics and other parameters as necessary to meet waste profiling requirements. The material will then be transported to a RCRA permitted facility should they be determined to be a hazardous waste. If the residues are determined to be non-hazardous, they will be disposed in a permitted solid waste landfill.

All equipment used during the cleanup will be decontaminated on-site and readied for future use. Site personnel will remove and properly dispose of contaminated clothing as necessary. Fire extinguishers will be recharged, personnel protective equipment replaced and tools restocked. Before operations are resumed, all safety equipment will be inspected.

7.0 COORDINATION AGREEMENTS

Mutual assistance agreements have been made with the following communities: Dublin, Fairlawn, Radford, Christiansburg, Riner, Longshop/McCoy, and Blacksburg located near the facility. Copies of the Mutual Assistance Agreements and Supplemental Agreements are included in Appendix C. These mutual assistance agreements pertain to the local fire departments. Furthermore, there is close cooperation between local county law enforcement officials and RFAAP Security personnel for traffic control in the plant area if a significant disaster should occur.

Facility staff will contact selected local and regional entities and authorities that may be involved in an emergency situation according to the anticipated needs at the plant. Personnel from these organizations may be asked to support RFAAP personnel in response to fires, explosions, or chemical releases if RFAAP personnel cannot adequately address the situation internally. Personnel from these agencies will act under the direction of the EC and will be directed and escorted by plant personnel.

Arrangements with local hospitals have also been made through verbal agreements between RFAAP and surrounding medical facilities. Immediate support is available at New River Valley Medical Center (15 minutes traveling time) and the Montgomery County Community Hospital in Blacksburg (12 minutes traveling time). Helicopter service is available upon request from the New River Valley Medical Center. RFAAP staff nurses are familiar with the properties of the hazardous wastes handled at the facility and the types of injuries or illnesses which could result from fires, explosions or releases at the facility. There is a reference book, Medical Directives for Occupational Health Nurses, for the local nurses to follow in addition to their experience in anticipation of the RFAAP doctor's arrival or aid from a local hospital. To supplement the aforementioned resources, RFAAP firemen are state-certified emergency medical technicians.

Due to RFAAP's in-house fire department, medical staff, and security force, and the unique wastes to be dealt with, the facility EC will act as the primary authority during emergency situations. RFAAP security personnel are responsible for escorting local fire department and emergency response teams to any emergency site within the plant. Emergency units from off-plant will not be allowed to respond inside RFAAP without an escort. For incidents in the horseshoe area, units from Dublin, Fairlawn, Blacksburg, Riner, Longshop/McCoy, or Radford will be asked to assemble at Gate 10. For incidents in the Main Plant Area and larger incidents in the horseshoe area, units from Radford, Christiansburg and Blacksburg will be asked to assemble at the Main Gate on Route 114. Entry to the manufacturing area will usually be through Gate 1.

8.0 EVACUATION PLANS

8.1 OB Ground Evacuation Plan

The OB Ground is located in the southeast section of the Horseshoe Area on the northern bank of the New River. This area is an isolated location as shown on Figure 1. The New River acts as a protective barrier on the southern exposure of this area. Approximately 75 to 100 feet north of the OB Ground, the ground surface slopes steeply upward, with an elevation change of approximately 50 to 100 feet. Thus, if an emergency situation should develop at this area, evacuation of the entire facility is not likely to be necessary. The OB Ground operating personnel should be the only persons immediately endangered during an emergency situation at the facility.

Evacuation of any personnel in the immediate area of the OB Ground will occur in the event of the fires or explosions. The evacuation routes from the OB Ground are shown in Figure 5.

9.0 REQUIRED REPORTS

Reporting requirements for emergency situations to regulatory agencies and to the U.S. Army are presented in this section.

9.1 Incident Reports

Pursuant to 9 VAC 20-60-264; 40 CFR 264.56(j), the time, date, and details of any incident, which requires implementation of the Contingency Plan, will be noted in the facility operating record. In addition, within 15 days after the incident, a written report will be submitted to the Director of the Virginia Department of Environmental Quality. The report will include:

1. Name, address and telephone number of the owner or operator;
2. Name, address and telephone number of the facility;
3. Date, time and type of incident;
4. Name and quantity of material(s) involved;
5. The extent of injuries, if any;
6. An assessment of actual or potential hazards to human health or the environment, where this is applicable;
7. Estimated quantity and disposition of recovered material that resulted from the incident; and,
8. Such other information specifically requested by the Director, which is reasonably necessary and relevant to the purpose of an operating record.

Pursuant to 9 VAC 20-60-264; 40 CFR 264.196.d, for any tank system or secondary containment, any release to the environment, except as provided in item 1 below, will be reported to the Department within 24 hours of its detection. If the release has been reported pursuant to 40 CFR Part 302 (see Section 6.2 of this Contingency Plan), that report will satisfy this requirement.

1. A leak or spill of hazardous waste is exempted from the reporting requirements of section 9.0 of this Contingency Plan, if it is:

   a. Less than or equal to a quantity of one pound, and
   b. Immediately contained and clean-up.

2. Within 30 days of detection of a release to the environment, a report containing the following information shall be submitted to the Department:

   a. Likely route of migration of the release;
   b. Characteristics of the surrounding soil (soil composition, geology, hydrogeology, climate);
   c. Results of any monitoring or sampling conducted in connection with the release (if available). If sampling or monitoring data relating to the release are not available within 30 days, this data shall be submitted to the Department as soon as they become available;

d. Proximity to downgradient drinking water, surface water, and populated areas; and
e. Description of response actions taken or planned.

9.2 U.S. Army Material Command Notification

RFAAP also follows U.S. Army Joint Munitions Command at Rock Island Arsenal notification procedures. If a release occurs, a report similar to the one required by Federal and State agencies is submitted to the U.S. Army Material Command. The reported information required by 40 CFR 264.56(j) and delineated above shall also be incorporated into the facility's permanent operating record.

RFAAP will notify the Director and other appropriate Commonwealth and local authorities that:

1. Cleanup procedures have been completed; and
2. All emergency equipment listed in the Contingency Plan is cleaned and fit for its intended use prior to resuming operations in the affected area(s) of the facility.

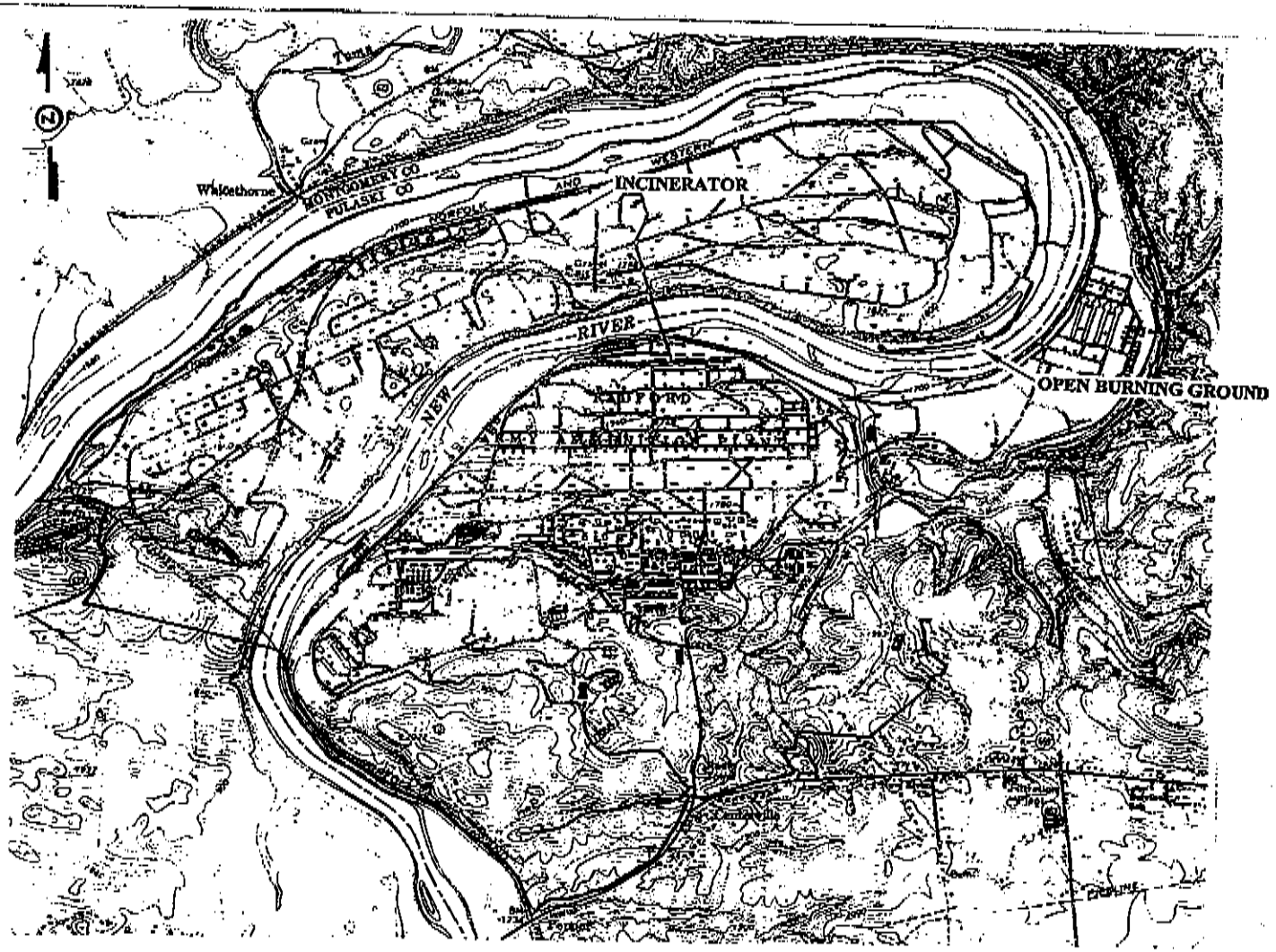
10.0 MODIFICATION OF PLAN

Pursuant to 9 VAC 20-60-264; 40 CFR 264.54, this Contingency Plan is subject to review and amendment, if:

a. The plan fails in an emergency;
b. The facility permit is revised;
c. The facility changes in design, construction, operation, maintenance, or other circumstances; in a way that materially increases the potential for fires, explosions, or releases of hazardous waste constituents; or changes the response necessary in any emergency;
d. The list of emergency coordinators changes; or
e. The list of emergency equipment changes.

When the contingency plan is amended for any reason the Permittees will request a permit modification pursuant to 40 CFR 270.42.

FIGURES



LEGEND

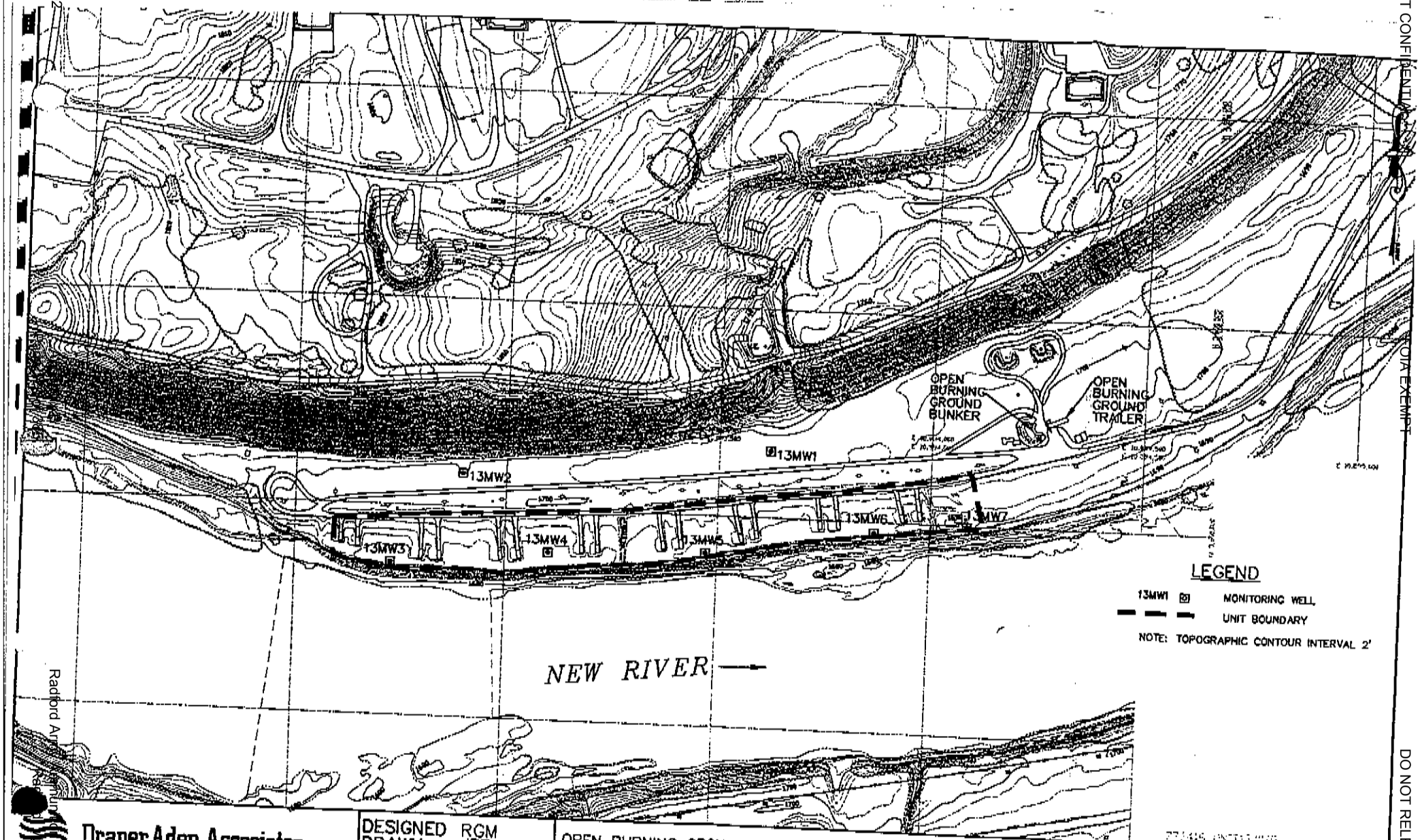
PROPERTY LINE

APPEND.DWG

Draper Aden Associates CONSULTING ENGINEERS Blacksburg, Virginia – Richmond, Virginia – Nashville, Tennessee	DESIGNED RGM DRAWN JFF CHECKED AEK DATE 6-11-97	SITE LOCATION MAP RADFORD ARMY AMMUNITION PLANT MONTGOMERY COUNTY, VIRGINIA	SCALE: 1" = 2000' PLAN NO.
			FIGURE 1

NEICVP1068E02

ENFORCEMENT CONFIDENTIAL - FOIA EXEMPT



Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, Virginia – Richmond, Virginia

DESIGNED	RGM
DRAWN	JFF
CHECKED	AEK
DATE	9-5-00

OPEN BURNING GROUND SITE PLAN
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

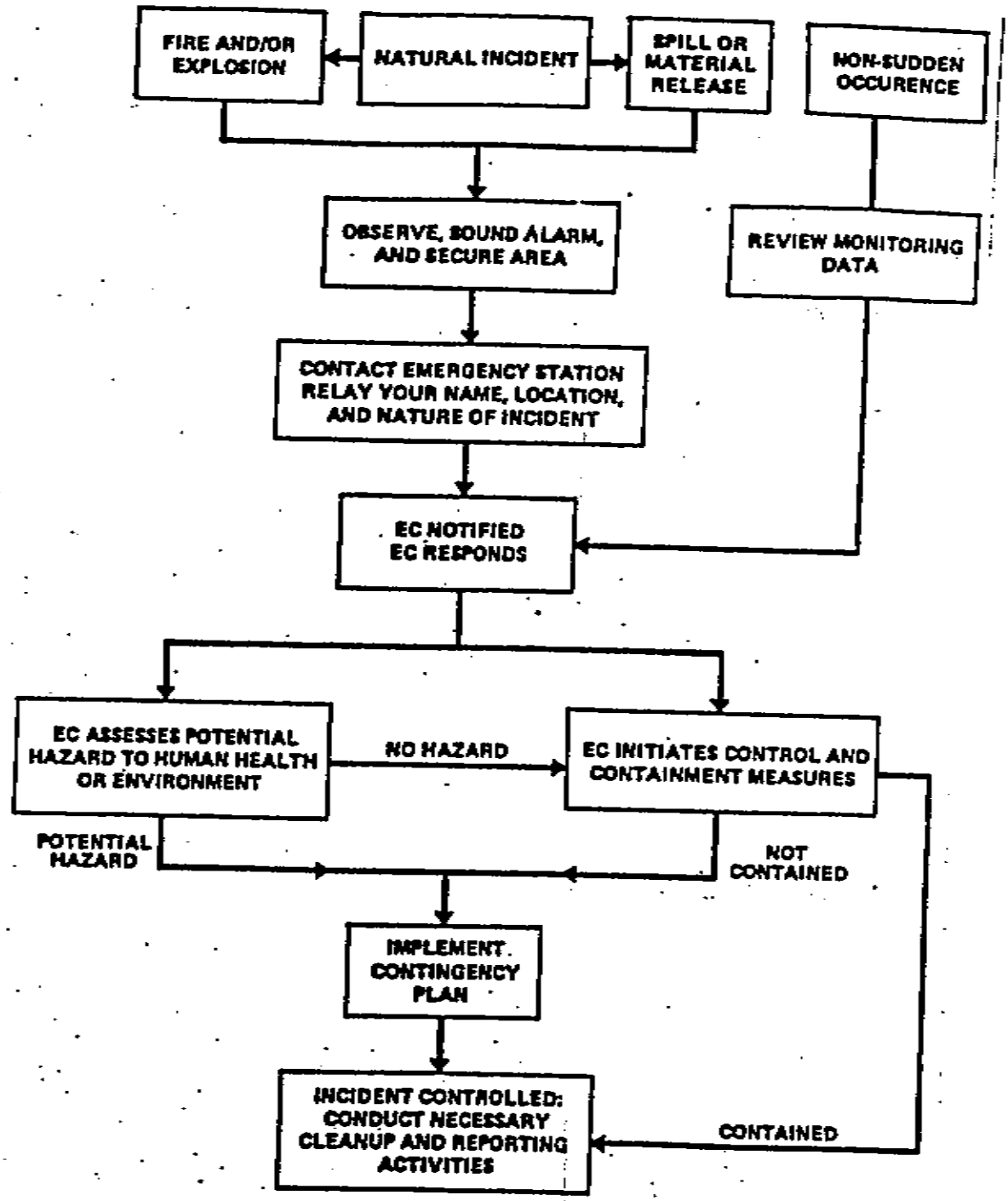
SCALE: 1" = 200'

PLAN NO. 7774-16

FIGURE Z

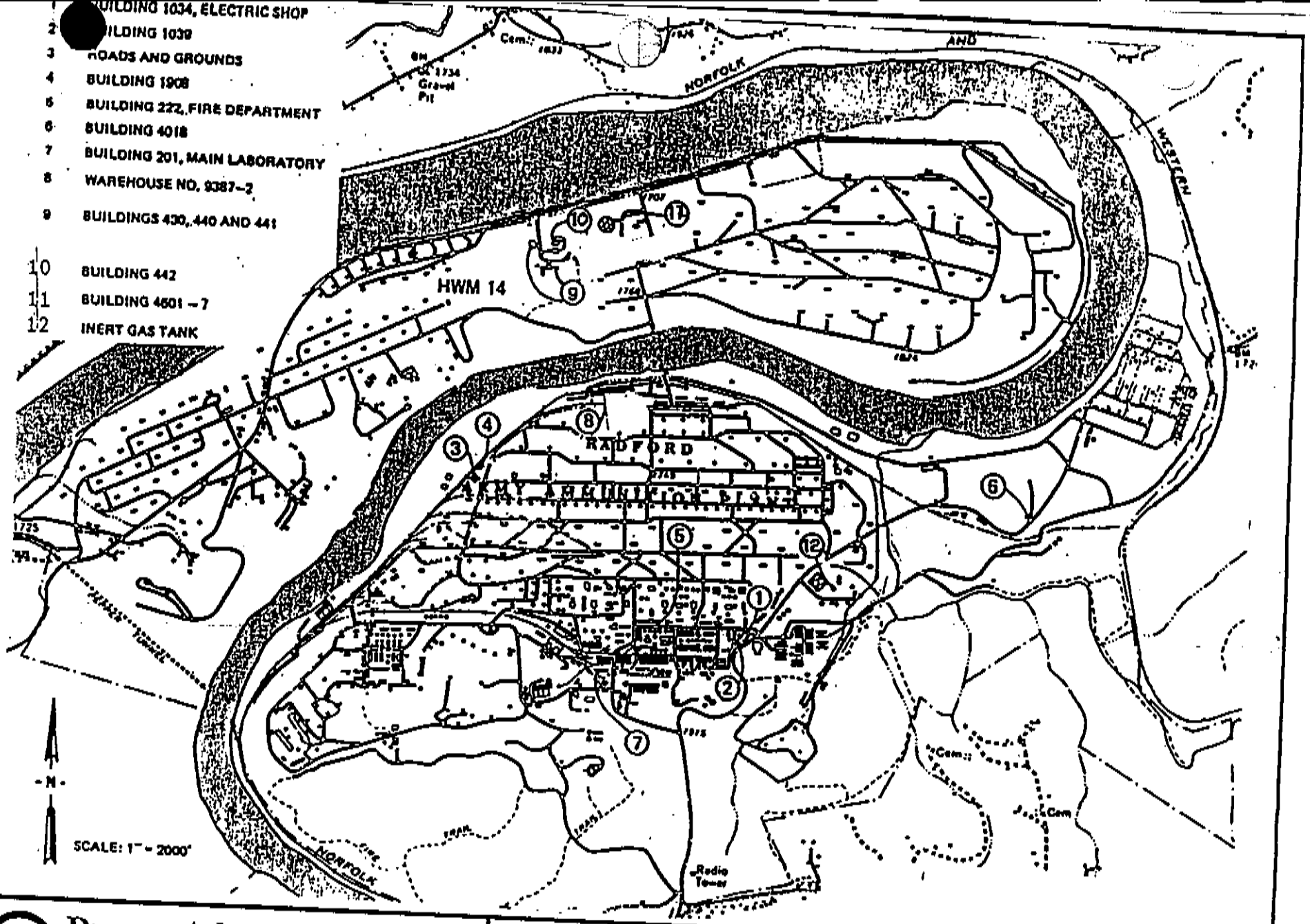
DO NOT RELEASE

Radford Ammunition Plant
Radford, Virginia



EC = EMERGENCY COORDINATOR

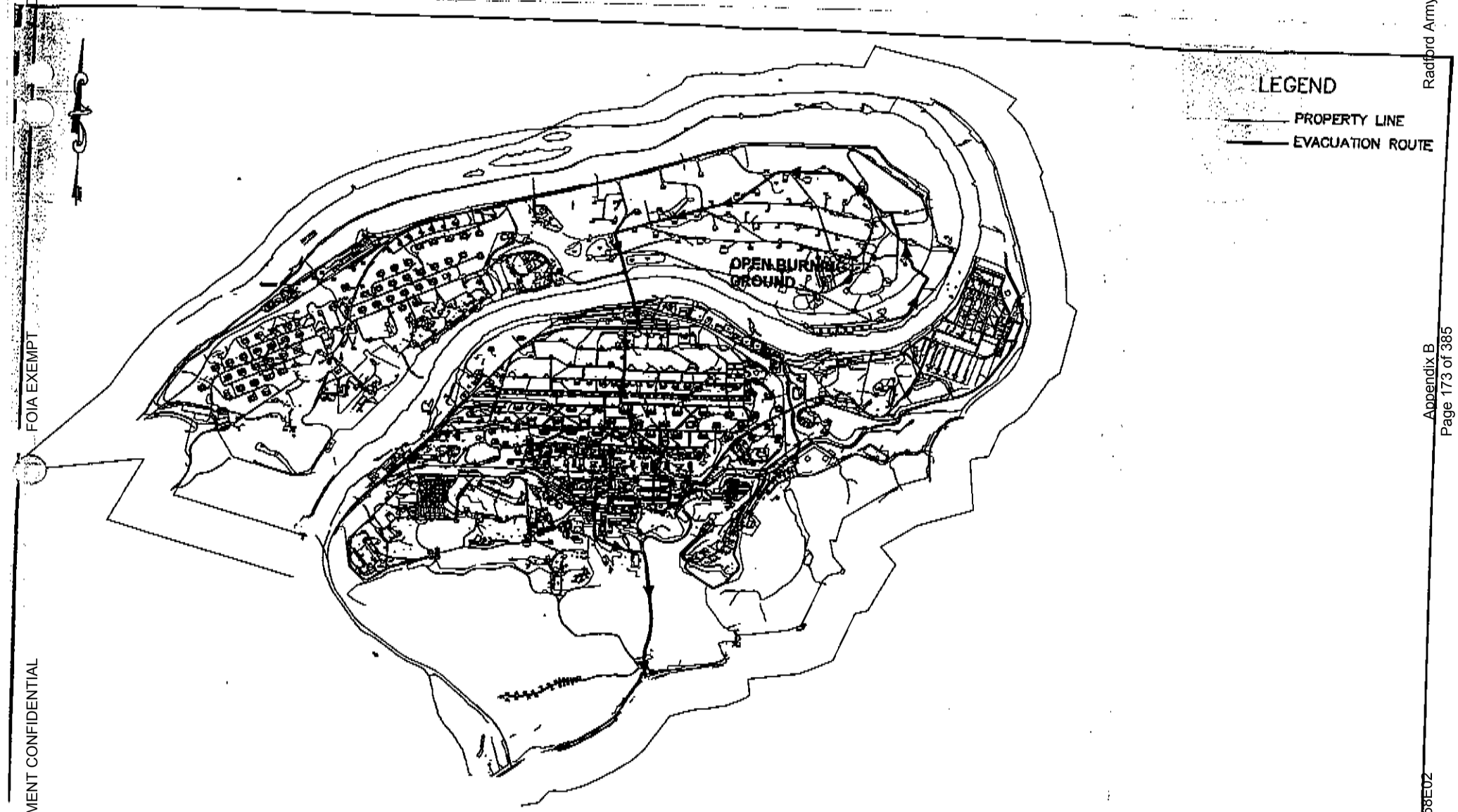
CONTINGENCY PLAN IMPLEMENTATION LOGIC DIAGRAM	RADFORD ARMY AMMUNITION PLANT			
Draper Aden Associates Blacksburg • Richmond, Virginia Engineering • Surveying • Environmental Services	JOB No. 7774-16	DATE: 09-07-00	SCALE: NA	FIGURE 4



Draper Aden Associates
Blacksburg • Richmond, Virginia
Engineering • Surveying • Environmental Services

EMERGENCY EQUIPMENT LOCATIONS RADFORD ARMY AMMUNITION PLANT	JOB No. 7774-16	DATE 09-07-00	FIGURE 3

FOIA EXEMPT
DO NOT RELEASE



CEMENT CONFIDENTIAL

Draper Aden Associates
Blacksburg • Richmond, Virginia
Engineering • Surveying • Environmental Services

DESIGNED	RGM
DRAWN	JFF
CHECKED	AEK
DATE	9-7-00

OPEN BURNING GROUND EVACUATION ROUTES
RADFORD ARMY AMMUNITION PLANT
MONTGOMERY COUNTY, VIRGINIA

7774-16_SITEMAP.DWG

SCALE: 1" = 2000'

PLAN NO. 7774-16

FIGURE 5

TABLES

TABLE 1
EMERGENCY PROCEDURES

RFAAP Disaster Control Plan (RFAAP-DCP) provides plans for:

1) Equipment and/or facility damage
2) Oil and hazardous substance control
3) Chemical, nuclear or radiological accidents
4) Emergency situation reporting
5) Search and rescue operations
6) Crisis emergency/relocation plan
7) Communications-electronics

Spill Prevention, Control and Countermeasure (SPCC) Plan and Installation Spill Contingency Plan (ISCP) for spills other than hazardous waste described in the Part B permit.

SPCC provides:

1) The location and capacity of tanks containing process materials and wastes
2) A description of equipment and/or operation
3) Spill potential information (types of failure, description of flow, maximum loss anticipated, detection methods, time to reach river)

ISCP is concerned with the recognition, reporting, containment and notification procedures in the event of leaks and spills.

Fire Prevention and Protection Program Describes:

1) Employee and Fire Department personnel responsibilities for fire prevention and protection
2) Inspection and use of equipment and supplies
3) Fire Department training program
4) Building evacuation procedures
5) Annual Fire Prevention and Protection Program
6) Prefire plan and other fire plans

RFAAP Hazardous Material Emergency Response Plan provides:

1) Emergency response notification requirements
2) Training requirements
3) Medical surveillance
4) HAZCOM MSDS information
5) List of hazardous materials at RFAAP
6) PPE selection criteria
7) Available material and equipment
8) Emergency response procedure
9) Incident command structure and response
10) Emergency response guidelines (per chemical basis)

TABLE 1
EMERGENCY PROCEDURES (Continued)

Oil Discharge Contingency Plan provides:

1) Regulated petroleum tank information
2) Emergency notification requirements
3) Worst case discharge information
4) Disaster plan strategies
5) I.D. of natural responses at risk or facilities
6) Oil discharge drills
7) Facility staffing, equipment and material levels and inventories
8) Training requirements
9) Inspection procedures
10) Facility security

Plant Protection Plan (PPP)

Outlines plant protection/security procedures including the security of explosives, intrusion detection systems, protective communications and key and lock control.

Procedures

4-27-2: Maintenance Responsibilities During Disaster and Major Emergencies

Applicable Plant Operating Procedure: Protective Clothing and Equipment

Attachment II.H of this Permit: Flood Proofing/Protection Plans and Specifications and 100-Year Response Procedures

4-15-53: Clean-up and Decontamination of NG/Nitrate Ester and Other Hazardous Spills

4-3-2: Area General Waste Propellant Incinerator Facility

TABLE 2

WASTE GENERATED AT RFAAP ALLOWED FOR TREATMENT AT OPEN BURNING GROUND

Group No.	Category	Defining Characteristics	
1	Miscellaneous Waste	Ignitable and reactive Liquids and Sawdust D001, D003	Propellant wastes, Nitrate ester wastes only. No solvents unless more than 50% Propellant
2	Miscellaneous Waste	Propellant Laboratory Waste D003, D008, D030, D004	Not allowed at OBG
3	Miscellaneous Waste:	Pit Cotton Solid Waste	Not allowed at OBG
4	Miscellaneous Waste	Off specification Dinitrotoluene, Trinitrotoluene, Isotrioil D030	
5	Liquid Waste	Water Containing Triethlyene Glycol Solid Waste	Not allowed at OBG
6	Liquid Waste	Water Containing Diethylene Glycol Solid Waste	Not allowed at OBG
7	Single Base Propellants	Propellant with Nitrocellulose or lead D003, D008	
8	Single Base Propellants	Propellant with Nitrocellulose D003	
9	Single Base propellant	Propellant with Nitrocellulose and Dinitrotoluene D003, D030	
10	Double Base Propellants	Propellant with Nitrocellulose or Nitrate Esters D003	
11	Double Base Propellant	Propellant with Nitrocellulose, Nitrate Esters or a Non toxic metal COC D003	
12	Single or Double Base propellant	Propellant with Nitrocellulose, Lead, or Nitrate Esters D003, D008	

TABLE 1

WASTE GENERATED AT RFAAP ALLOWED FOR TREATMENT AT OPEN BURNING GROUND

13	Double base propellant	Propellant with Nitrocellulose, Nitrate Esters or Solid Explosives D003,	
14	Triple base propellant	Propellant with Nitrocellulose, Nitrate Esters or Nitroguanidine D003	
15	Load, Assemble, & Pack Waste	Energetic materials from manufacturing cartridges D003	
16	Single Base Propellants	Propellant with Nitrocellulose, Dinitrotoluene or Lead D003, D008, D030	
17	Specialty Products Waste Group A	Propellant with Nitrocellulose, Nitrate Esters, Nitroguanidine, Solid Explosives , or 40 CFR Part 261, App VIII Constituents D003	
18	Specialty Products Waste Group B	Propellant with Nitrocellulose, Nitrate Esters, Nitroguanidine, Solid Explosives, or 40 CFR Part 261, App VIII Constituents, Chlorides or Perchlorates D003	
19	Specialty Products Waste Group C	Propellant with Nitrocellulose, Nitrate Esters, Nitroguanidine, Solid Explosives, or 40 CFR Part 261, App VIII Constituents, or Metals D003, D004-D010	
20	Screening and floor wastes	Items that require extra fuel for burning but otherwise are D003.	

TABLE 3
NOTIFICATION ACTION SUMMARY

ON-SITE Emergency Contacts
Contacts to be made in accordance with Management Manual 3-1.1

Emergency Coordinator	Office Phone	Home Phone	Home Address
Plant Security	Ext 7323	NA	NA
Plant Fire	Ext 16	NA	NA
Environmental Emergency Contact	Cell Phone 230-8970	NA	NA
Safety On-Call Representative	Security will Contact	NA	NA
Environmental Manager – Paige Holt	Ext 8658 Cell 540-257-3752	540-961-0907	4815 Nature's Way Blacksburg, VA 24060
Environmental Lead Engineer – Hazardous Waste – Jeremy Flint	Ext 7668 Pager 540-953-6781	540-381-6207	1850 Playground Court Riner, VA 24149
Safety Manager – Donal Hall	Ext 8103 Cell 540-239-6567	Use cell phone	265 Cheverly Rd Christiansburg, VA 24073

ON-SITE Notifications
The following managers should be notified in the event of major emergencies:

Title	Name	Contact Number
Vice President of Safety, Mission Assurance, Environmental, and Security	Anthony Miano	Cell (540) 239-6378
Vice President of Operations	Mark Matusevich	Cell 540-230-6601

OFF-SITE Notifications
To be made by the Environmental Manager or a designated representative as needed:

1. Army Administrative Contracting Officer – Operations Division Chief Cell (540) 239-4475
2. Virginia Department of Environmental Quality Blue Ridge Regional Office 540-562-6700
3. National Response Center (for releases above an RQ) 1-800-424-8802
4. Virginia Department of Emergency Management 1-800-468-8892
5. U.S. Environmental Protection Agency Region 3 (215) 814-5000
6. Montgomery County Local Emergency Planning Committee (LEPC) (540) 382-2951
7. Pulaski County Local Emergency Planning Committee (LEPC) (540) 980-7705
8. Emergency Service Resources (Fire, Ambulance, Police) 911
9. Chemtrec 1-800-424-9300

TABLE 3
NOTIFICATION ACTION SUMMARY

ON-SITE NOTIFICATION:

Emergency Coordination	Office Phone #	Home Phone #	Home Address
Administrative Contracting Officer	540-639-8647		
J. M. Slaughter Safety Specialist	540-639-8731	540-980-4621	Rt. 1, Box 393 Pulaski, VA 24301
D. M. Hurley Safety Specialist	540-639-8313	540-382-3698	350 Pepper Street, Crestview #305G Christiansburg, VA 24073
P. K. McMillian Safety Specialist	540-639-8671	540-755-3577	Box 388 Cana, VA 24317
T. E. Lawley Security Manager	540-639-7119	540-552-7995	2804 Farmview Dr. Blacksburg, VA 24060
J. J. Redder Environmental Engineer	540-639-7536	540-951-3064	P. O. Box 10925 Blacksburg, VA 24060
C. A. Williams Hazard Analysis Supervisor	540-639-7225	540-726-2835	304 W. Westview Narrows, VA 24124
R. A. Bond Acid Area Manager	540-639-7393	540-639-7488	1234 Shady Grove Road Indian Valley, VA 24105-3047

Move Retired

Add Security

Dan Hall for New Specialist

Revised letter dated 12/18/08

TABLE 4
EVALUATION CRITERIA FOR IMPLEMENTATION OF CONTINGENCY PLAN

Fire and/or Explosion

- Fires causes the release of toxic fumes
- The fire could spread, thereby, possibly igniting materials in other locations on-site or off-site, or could cause heat-induced leaks or explosions
- The use of fire suppressant could result in contaminated runoff
- Explosion has or could:
  - Result in danger from flying fragments or shock waves
  - Ignite other hazardous waste at the facility
  - Release toxic materials
- Fire or explosion endangers human health or the environment for any other reason

Spills or Material Releases

- A spill could release toxic or explosive liquids, thus causing a fire or explosion hazard
- A spill could result in off-site or on-site soil contamination and/or ground or surface water contamination
- A spill constitutes a release of a "reportable quantity" of a hazardous substance under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)
- A spill endangers human health or the environment for any other reason

TABLE 5
SPILL RESPONSE MEASURES

The spill response program will be coordinated by the Emergency Coordinator. Guidelines are provided concerning safety, containment, evaluation, notification, treatment and monitoring as related to each spill incident.

1. Safety

   a. Evaluate the hazard of the spilled chemical to personnel which may be involved in clean up, treatment and monitoring operations.

   b. Assure proper clothing and protective equipment is available and used by personnel involved in the spill response.

2. Containment

   a. Establish the expected flow path of the spilled material.

   b. Locate the nearest proposed damming site.

   c. Erect a dam – notify Roads and Grounds regarding construction of dam.

3. Evaluation of Spill Extent

   a. Obtain pH meter readings at site if chemical spilled was an acid or base.

   b. Confirm stoppage of leak at source.

4. Initial Notification

   a. Delegated to the Emergency Coordinator

   b. Notify appropriate agencies (see Notification Action Summary).

5. Treatment

   a. Straw or other absorbent materials will be supplied to entrap hazardous wastes which are spilled. Sites/locations within the plant containing straw and other entrapment materials are controlled by Roads and Grounds.

TABLE 5
SPILL RESPONSE MEASURES (Continued)

6. Monitoring Program

Upon receiving notification of an accidental loss to the industrial sewer or surface streams, personnel will obtain grab samples at intervals and from the points described by the Emergency Coordinator.

a. In-Plant Sites

1. Suggested sampling sites will be determined based on the location of the spill

2. Samples will be collected at intervals/.locations designated.

b. New River Sites

Sampling at the New River sites will be performed on a staggered basis since the river flow approximates one mile per hour. Sampling will be performed.

7. Final Treatment

a. Determine disposition of impounded material depending on type and quantity of spill. Ensure EPA and DEQ concur with disposition.

b. Provide monitoring for duration of disposition.

Explosion fragments and materials and possible propellant-contaminated materials and soils will be analyzed using SW846 Method 8332 for explosives and 8330 for nitroglycerine. If the analyses indicate that the materials are reactive, they will be handled as hazardous waste. Hazardous soils and residual reactive wastes will be treated at the OB Ground or sent off-site for disposal. If the analyses indicate that the materials are non-reactive, they will be disposed of as solid waste.

TABLE 6
EMERGENCY EQUIPMENT LOCATIONS AT RFAAP

Location No. on Figure 5	Location Description	Equipment Available
1	Bldg. 1034, Electric Shop	Raincoats, rubber gloves, respirators
2	Bldg. 1039	Self-contained breathing apparatus (2)
3	Roads and grounds	Respirators, goggles, air fed respirators, safety belts, shoe cleats, air compressors (250 and 700 CFM ratings), portable pumps (50, 100 and 700 GPM capacities), cranes, bulldozers, movers, graders, tow tractors, portable electric generators, backhoes, front-end loaders, portable tankers, absorbent pads, booms, cloths
5	Bldg. 1908	Absorbent material / booms
6	Bldg. 1999	Farm wagon with spill control materials
7	Bldg. 222, Fire Department	1 ladder truck, 1 engine, 1 utility truck, 1 tanker, 1 brush truck, 1 HAZMAT trailer with response gear, 3 boats with trailers
8	Bldg. 4018	Boats, motors, hoses, nozzles and other supply equipment

TABLE 6
EMERGENCY EQUIPMENT AT RFAAP (Continued)

9	Bldg. 201, Main Laboratory	nitroglycerine remover
10	Bldgs. 440 and 441 (incinerators)	Halon 1211 Model 1300 Hal, type ABC fire extinguishers
11	Bldg. 442	Telephone access
12	Bldg. 4601-7	Telephone access and spill cleanup equipment

APPENDIX A

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RFAAP DISASTER CONTROL PLAN AND
RFAAP PLANT PROTECTION PLAN

RFAAP DISASTER CONTROL PLAN
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APPENDIX B

HAZARD CLASSIFICATION PLACARD SYSTEM

12-13. Hazards of Fires Involving Explosives. a. General. In order to provide a guide for firefighting forces, ammunition and explosives are divided into hazard classes in accordance with the relative danger encountered in fighting fires in which they are present. The hazard classes are identified by the numerals "1, 2, 3, and 4," each displayed on a distinctively shaped placard (symbol) to improve visibility at long range.

b. Description of fire symbols.

(1) Fire symbols numbered "1" through "4" are synonymous with the hazard classes 1.1 through 1.4 described in chapter 19.

(2) Fire symbol 1 indicates the greatest hazard. The hazard decreased with ascending fire division numbers as follows:

Fire Division	Hazard Involved
1	Mass detonation
2	Fragment hazard
3	Mass fire hazard
4	Moderate fire hazard

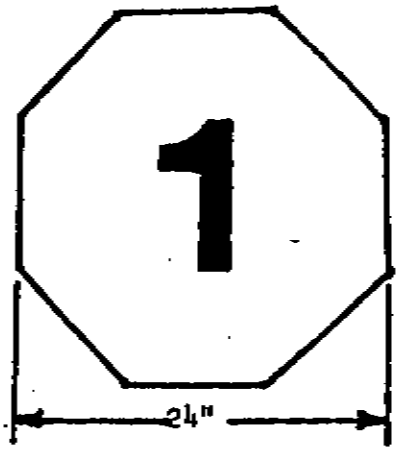
(3) Each of the four hazard classes are indicated by a distinctive symbol in order to be recognized by firefighting personnel approaching the scene of a fire. The applicable hazard class number is shown on each symbol. For the purpose of identifying these symbols from long range, the symbols differ in shape as follows:

Octagon shape	Fire division symbol 1
Cross shape	Fire division symbol 2
Inverted triangle shape	Fire division symbol 3
Diamond shape	Fire division symbol 4

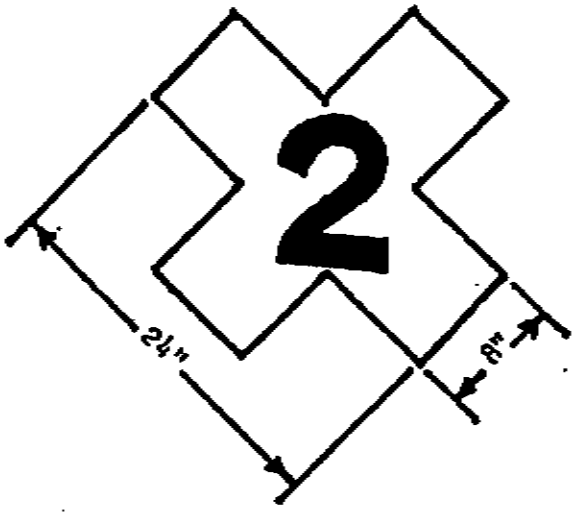
(4) The background color of the fire symbols is orange. The color of each number identifying the applicable fire division is black. The color of the symbols is in accordance with the color on NATO, UNO, and IMCO labels for class 1 material (explosives) and with DOT labels for explosive A, explosive B, and explosive C items. Symbols made from reflectorized or luminous materials are preferred.

(5) Shape and size of the four fire division symbols and numbers are shown in figure 12-1. For application on doors or lockers inside building or motor vehicles and railroad cars, half-sized symbols may be used.

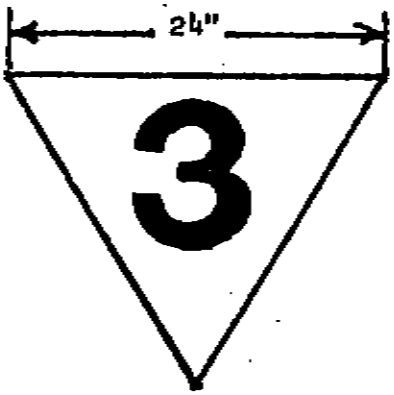
(6) Symbols to indicate special hazards such as those of toxic chemicals shall be used in addition to the firefighting symbols herein specified. (See chapter 11, figure 11-1.)



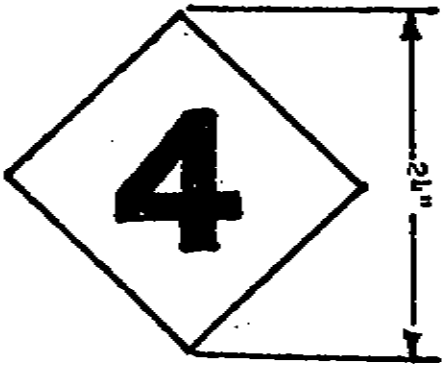
Fire Division 1
(Hazard Class 1.1)



Fire Division 2
(Hazard Class 1.2)



Fire Division 3
(Hazard Class 1.3)



Fire Division 4
(Hazard Class 1.4)

Background: Orange #12246 (See Fed Std. 595A or GSA Catalog)
Numbers: 10" high and 2" thick; Black #17038 (See Fed Std. 595A or GSA Catalog)

Figure 12-1. Fire symbols

c. Display of fire symbols.

(1) Appropriate fire symbols shall be displayed on buildings and storage sites containing explosives or ammunition in such a manner as to make them easily visible to approaching firefighting forces from the maximum practicable distance. Installation commanders may, in lieu of posting every storage structure, designate blocks or a single row of storage sites, aboveground magazines, or earth-covered magazines, as areas requiring posting of only the appropriate fire symbol for the most hazardous material stored in the area or row at each entrance to the block or row.

(2) Where fire symbols are not displayed on individual structures, as permitted by this regulation, or where topography and/or vegetation would prevent seeing a fire symbol until arrival at a storage site, a master list and/or map shall be maintained which indicates storage site locations, fire symbols, chemical symbols, and empty sites, as applicable. This list and/or map shall be kept current and should be available at all normal access road entrances, control stations, or control points servicing the storage location. This list and/or map shall also be furnished to emergency forces (e.g., fire department, guard forces). This provision does not apply to chemical agent and chemical munition storage/operating facilities which are addressed in paragraph 11-6.

(3) Fire symbols may be placed directly on the exterior of a building, but removal placards bearing the symbol may be preferable for buildings or storage sites in which the explosive content is subject to frequent change. For buildings of long dimensions or when access to the building is from several directions, more than one symbol to a side may be necessary.

(4) The fire symbol displayed on a building or storage site shall reflect the most hazardous material stored in a building or at the site.

(5) Warehouses and other facilities used for storage of containers from which explosives have been removed, but the containers have not been decontaminated to remove explosive residue, shall be placarded with a fire symbol consistent with the degree of hazard.

(6) All railroad cars and motor vehicles containing ammunition or explosives, while on AMC installations, must be provided with a means for quick identification of hazard. Installation railroad cars and motor vehicles which are not destined for off-post movement shall display at least two AMC fire symbols. Installation transport vehicles destined for off-post shipment and commercial railroad cars and motor vehicles will have DOT placards displayed, in accordance with 49 CFR 172.504, when containing ammunition or explosives. Fire symbols or DOT placards shall be placed on all transport vehicles immediately prior to loading and shall be removed from transport vehicles immediately upon completion of unloading.

(7) Where dependence for identification of the hazards is placed on DOT placards, "explosive A" placarded transport vehicles (rail cars, motor vehicles, and freight containers) shall be treated as fire symbol 1 hazards and "explosive B" shall be treated as fire symbol 2. "Explosives C" should be treated as fire symbol 3. Transport vehicles containing small arms ammunition are not required by the DOT to be placarded; therefore, these vehicles will be treated as fire symbol 4 and will display either a fire symbol "4" or a DOT "dangerous" placard while on the installation.

(8) Chemical agents and chemical munitions storage, operating facilities, and nonpost vehicles will be identified with appropriate chemical agent fire symbols, as outlined in paragraph 11-6.

(9) Buildings where radioactive materials are present shall be clearly identified by means of the standard radiation symbol, in accordance with 10 CFR 20.203(b) and (e) and AR 385-30.

(10) The "+" sign may be used to identify locations of flammable and combustible liquids for fire fighting personnel. If used, their usage will be included in fire department training.

d. Firefighting procedures.

(1) General. At no time will auxiliary or mutual aid firefighters be exposed to any building fire which may contain ammunition, explosives, or chemical warfare weapons.

(a) All fires starting in the vicinity of ammunition or explosives shall be reported and fought immediately with all available means without awaiting specific instructions. However, if the fire involves explosive materials or is supplying heat to it, or if the fire is so large that it cannot be extinguished with the equipment at hand, the personnel involved shall evacuate. Operational personnel will be instructed on the specific characteristics of explosive materials and their reactions to heat/fire. This training will also include the technical aspects of the fire symbol system and actions to be taken in the event of a fire.

(b) Firefighters of ammunition and explosives fires shall have a thorough knowledge of the specific reactions of ammunition and explosives exposed to heat or fire.

(c) The firefighter forces should be briefed before approaching the scene of the fire. They are to be informed of the known hazards and conditions existing at the scene of the fire before proceeding to the location of the fire.

(d) The minimum public withdrawal distances for an accident depends on whether the event involves no fire or fire or whether the contents/quantities are unknown or known. If no fire is involved, on-site emergency authorities should determine the minimum withdrawal distances.

(e) The minimum public withdrawal distances for an accident involving fire of explosive laden tractor trailers and rail cars of unknown and known contents/quantities are addressed below.

(f) The minimum public withdrawal distances for an accident involving fire of explosive laden facilities, tractor trailers/trucks, and rail cars of known contents/quantities are--

Facility and tractor trailer/truck	3/4 mile
Rail car	1 mile

(g) The minimum public withdrawal distance for an accident, involving fire of "explosive A" (class/division 1.1. and 1.2) laden tractor trailers/trucks and rail cars of known contents/quantities are given by--

Range (feet) = 105 $W(lb)^{1/3}$, but not less than 1250 feet for nonfragmenting explosives materials. If known, maximum debris throw ranges, with an appropriate safety factor may be used to replace the 1250 feet minimum range.

Range (feet) = 328 $W(lb)^{1/3}$, but not less than 2500 feet for fragmenting explosives materials out to a maximum range of 4000 feet (3/4 miles). For bombs and projectiles with caliber 5-inch or greater use a minimum distance of 4000 feet. If known, the maximum fragment throw range (including the interaction effects for stacks of items), excluding lugs/strongbacks and nose/tail plates, may be used.

(h) The minimum public withdrawal distance for an accident involving fire of "explosive B" (class/division 1.3) and "explosive C" (class/division 1.4) laden tractor trailers/trucks and rail cars is 600 feet and 300 feet, respectively.

(i) The minimum withdrawal distances for an accident involving fire in an explosive facility of known contents/quantities are given by--

Fire Symbol	Public Withdrawal Distance (feet)	Special Requirements
1	105 $W(lb)^{1/3}$	Not less than 1250 feet for bulk explosives or not less than 4000 feet for fragmenting ammunition.
2	2500	
3	600	Use Inhabited Building Distance (IBD) for quantities greater than 500,000 pounds.
4	300	

APPENDIX C

EXAMPLE MUTUAL ASSISTANCE AGREEMENT

Annex II

MUTUAL ASSISTANCE AGREEMENT

This Mutual Assistance Agreement, entered into this 20th day of June 1967, between the Town of Christiansburg, Virginia, hereinafter referred to as the Town and the United States of America, hereinafter referred to as the Government, represented by the Commanding Officer executing this agreement.

WITNESSETH:

WHEREAS, the Government owns and operates Radford Army Ammunition Plant, Radford, Virginia, hereinafter referred to as the Plant, a facility of the Department of the Army; and

WHEREAS, the Town maintains an equipped Fire Department, including personnel, trucks, and fire-fighting equipment; and

WHEREAS, the Government also maintains a Fire Department at the Plant, which Plant is located approximately nine miles from the Town, and

WHEREAS, the personnel of the Fire Departments maintained by the parties hereto have become familiar with the special fire-fighting problems in the territories served by both Departments; and

WHEREAS, it is to the best interests of the parties hereto to cooperate in fire-fighting problems which may occur within the Town and at the Plant:

NOW, THEREFORE, the parties hereto do hereby agree to render mutual assistance, one to the other, on the terms, conditions, and provisions hereinafter set forth:

1. The Town and the Government shall render mutual fire-fighting assistance, one to the other, on all extra alarm fires in the Town and at the Plant; Provided, however, that conditions existing at the time when assistance is needed permit; and, provided further that the Commanding Officer of the Plant shall be the sole judge as to when such conditions permit assistance to the Town by the Government, and, provided further that the Fire Chief or Mayor of the Town shall be the sole judge as to when such conditions permit assistance to the Plant by the Town.

2. The costs of operation, including by way of description and not limitation, salaries, compensation, repairs, and upkeep, shall be borne by each Party as to its own equipment and personnel.

3. The liability of each Party hereto shall be limited and confined to responsibility for its own actions performed under the terms of this Agreement, and each Party shall be responsible to its governing authority for compliance with all applicable laws, rules and regulations governing it.

4. Each Party shall be solely liable for any damage it may do to property or persons and shall hold the other Party harmless for any such damage done; the intention of the Parties hereto being that this Agreement shall in no way be construed to make either Party responsible for any acts, conduct or consequences of the act or acts of the other Party or its agents.

5. When the combined fire department or parts thereof are engaged in fire-fighting at the Plant they shall be subject to the authority of the Fire Chief of the Plant and/or the Commanding Officer thereof. When the combined forces or parts thereof are engaged in fire-fighting in the Town they shall be under the authority of the Fire Chief of the Town .

6. It is understood that both Parties should have on hand and available for instant use sufficient adapters for equipment connections used by the cooperating fire departments. It is further understood that the Town Fire Department shall not be permitted to fight fires involving explosives.

7. The Town hereby grants to the Government the right to require a formal loyalty investigation of any of the employees of the Town which the Government deems necessary at any time in the future.

8. The rights of Government firemen to compensation, if any, for injuries arising out of and during the course of duties performed under the terms of the Agreement, shall not be considered abrogated; provided, however, that nothing herein contained shall be construed to make the Town liable therefor.

9. In the event the combined departments or parts thereof are engaged in fighting a fire, the department lending assistance may, in order to attend any alarm at its regular station, withdraw on notice to the Fire Chief in charge.

10. This Agreement may be terminated at any time by either Party: provided, however, that such termination shall not be effective until 60 days after the terminating party gives notice of its intention to terminate and such notice is received by the other Party. Until such termination is effected, the terms, provisions, and conditions of this Agreement shall remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have executed this Mutual Assistance Agreement as of the day and year first above written.

BY

ATTEST:

UNITED STATES OF AMERICA

BY
DEWEY J. WEEKS
Major, OrdC
Commanding

SUPPLEMENTAL AGREEMENT NO. 1

TO

MUTUAL ASSISTANCE AGREEMENT

This Supplement Agreement No. 1, entered into this 8th day of October, 1976, between the Town of Christiansburg, Virginia, hereinafter referred to as the Town and the United States of America, hereinafter referred to as the Government, represented by the Commanding Officer at Radford Army Ammunition Plant.

WITNESSETH THAT:

WHEREAS, there is in full force and effect a Mutual Assistance Agreement dated June 20, 1967, between the parties for the purposes and under the conditions therein set forth; and

WHEREAS, the parties wish to modify the said Mutual Assistance Agreement in accordance with the provisions of Army Regulation 420-90, Chapter 6, Paragraph 6-6.

NOW, THEREFORE, the parties hereto do hereby agree as follows:

The said Mutual Assistance Agreement shall be and is hereby modified and amended to include an additional paragraph designated as Paragraph 1A:

> 1A. In accordance with Army Regulation 420-90, Chapter 6, Paragraph 6-6, it is understood and agreed that fire-fighting equipment of the Radford Army Ammunition Plant is not to be used for riot control; and the Town of Christiansburg will be responsible for the protection of Radford Army Ammunition Plant's fire-fighting equipment under disorder or unrest conditions during the performance of the Government's obligations under this Mutual Assistance Agreement.

In all other respects, the said Mutual Assistance Agreement shall continue in full force.

IN WITNESS WHEREOF, the parties hereto have executed this Supplemental Agreement No. 1 to the Mutual Assistance Agreement as of the day, month, and year first above written.

TOWN OF CHRISTIANSBURG, VIRGINIA

BY _____
Mayor

ATTEST:

_____
Clerk

UNITED STATES OF AMERICA

BY _____
JOHN R. C. ROOP
Colonel, CmlC
Commanding

Annex II

CONTACT LETTER

Dear Sir or Madam:

Enclosed is a copy of the Revised Hazardous Waste Contingency Plan that has been prepared for the Radford Army Ammunition Plant. This plan addresses responsibilities and activities for emergency response at the plant in the event that an incident takes place involving hazardous or dangerous waste materials.

The plan has been prepared in response to U.S. Environmental Protection Agency regulations 40 CFR 270 and 264 and Virginia State Regulations. As such, this plan will become effective upon issuance of a permit to the facility (at an as yet undetermined time). Until such time the existing Contingency Plan in effect will remain in force.

The regulatory agencies have asked the Radford Army Ammunition Plant to distribute the new plan to regional and local authorities and re-confirm your agreement to respond if requested to do so in an emergency. By this letter, we are requesting a renewal of that agreement. If your organization will provide support upon request, in an emergency, please sign the enclosed copy of this letter and return it to RAAP.

Your prompt response and continued support are appreciated.

Sincerely,

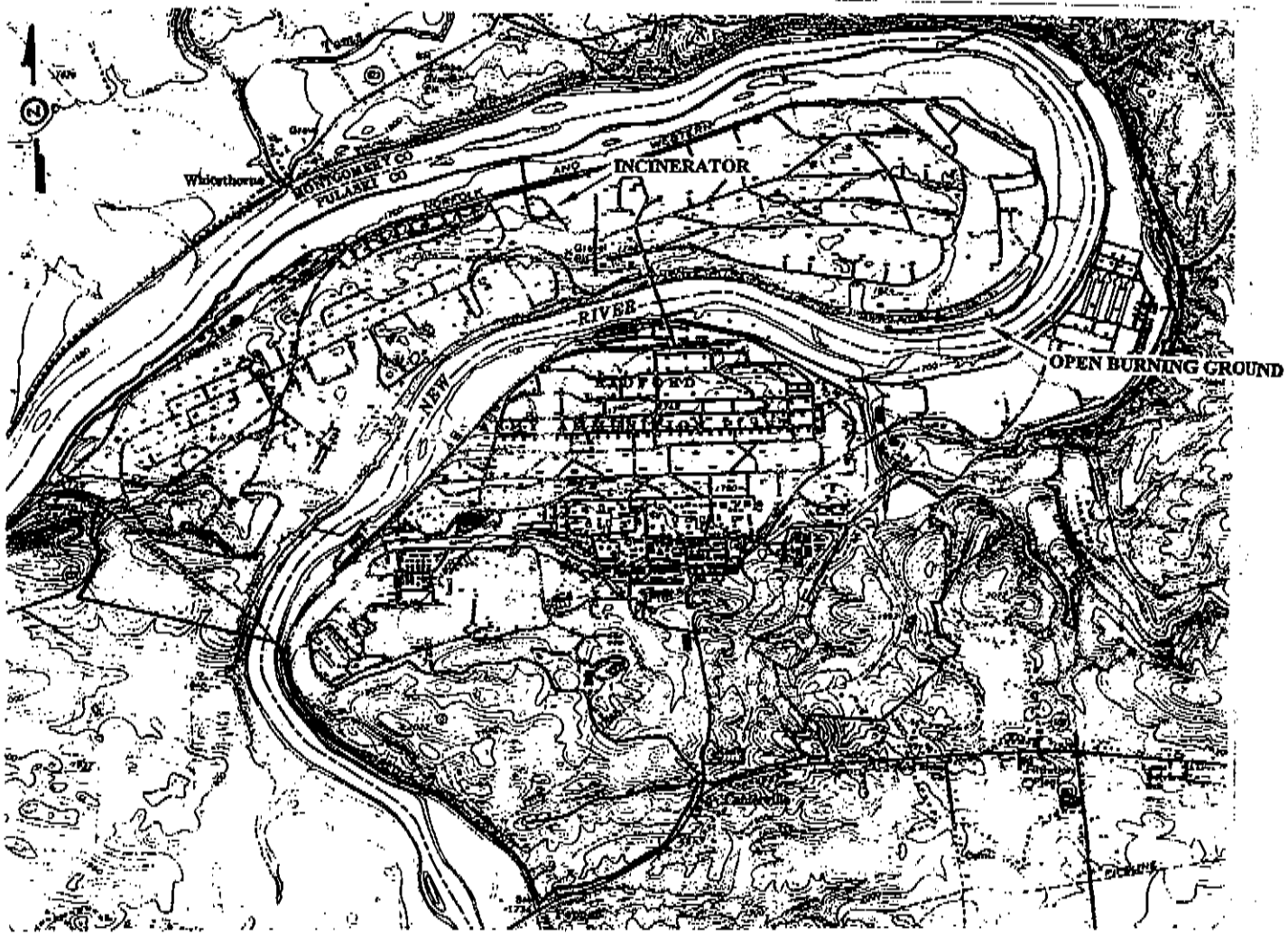
Plant Manager

_____
Signature and Date

_____
Printed Name and Title

_____
Agency or Organization Name

WDR85/12



LEGEND

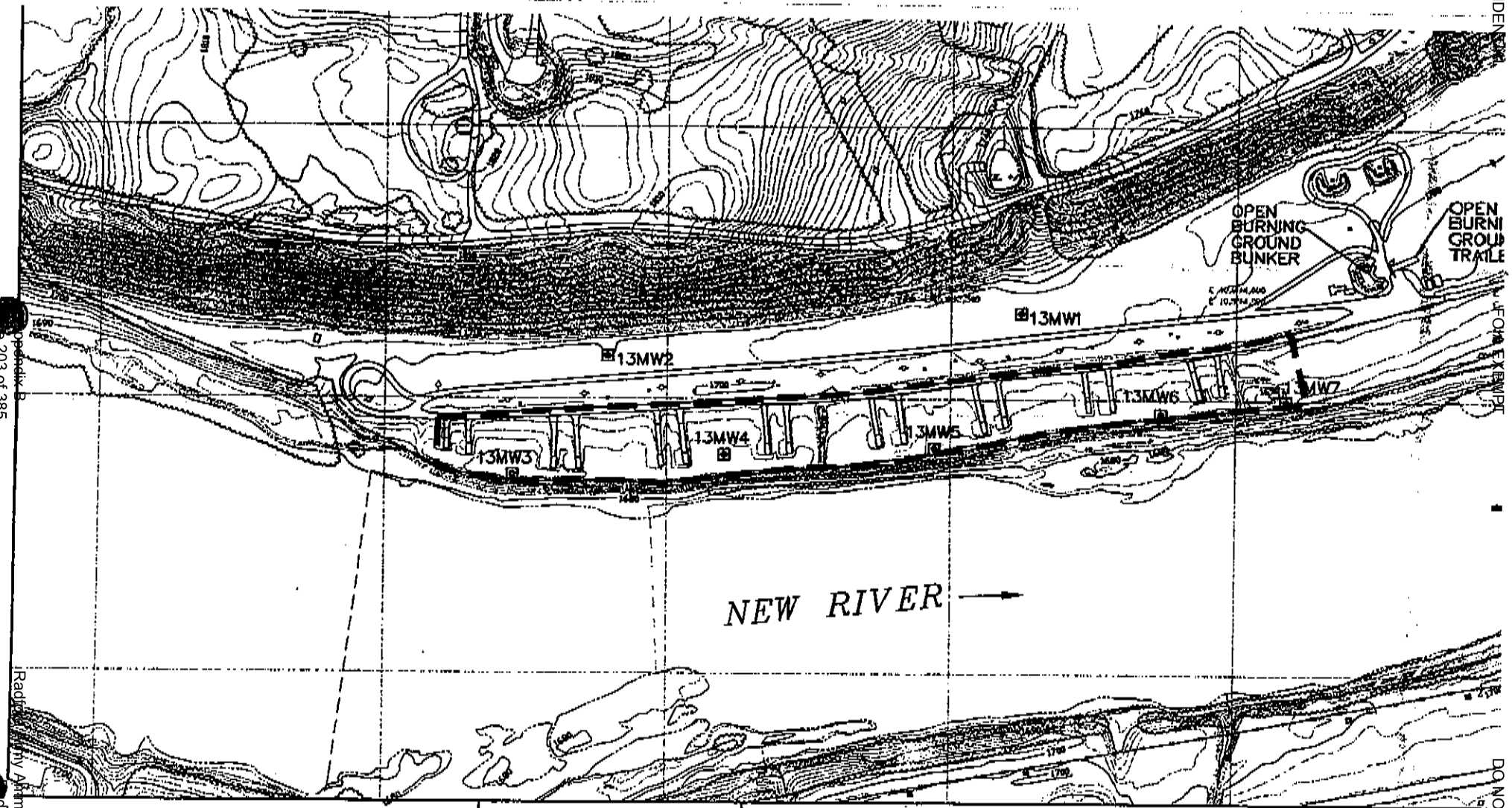
PROPERTY LINE

APPEND.DWG

Draper Aden Associates CONSULTING ENGINEERS Blacksburg, Virginia – Richmond, Virginia – Nashville, Tennessee	DESIGNED RGM DRAWN JFF CHECKED AEK DATE 6-11-97	SITE LOCATION MAP RADFORD ARMY AMMUNITION PLANT MONTGOMERY COUNTY, VIRGINIA	SCALE: 1" = 2000' PLAN NO.

FIGURE 1

ENFORCEMENT CONFIDENTIAL



Draper Aden Associates
CONSULTING ENGINEERS
Blacksburg, Virginia - Richmond, Virginia

DESIGNED	RGM
DRAWN	JFF
CHECKED	AEK
DATE	9-5-00

OPEN BURNING GROUND SITE PLAN
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

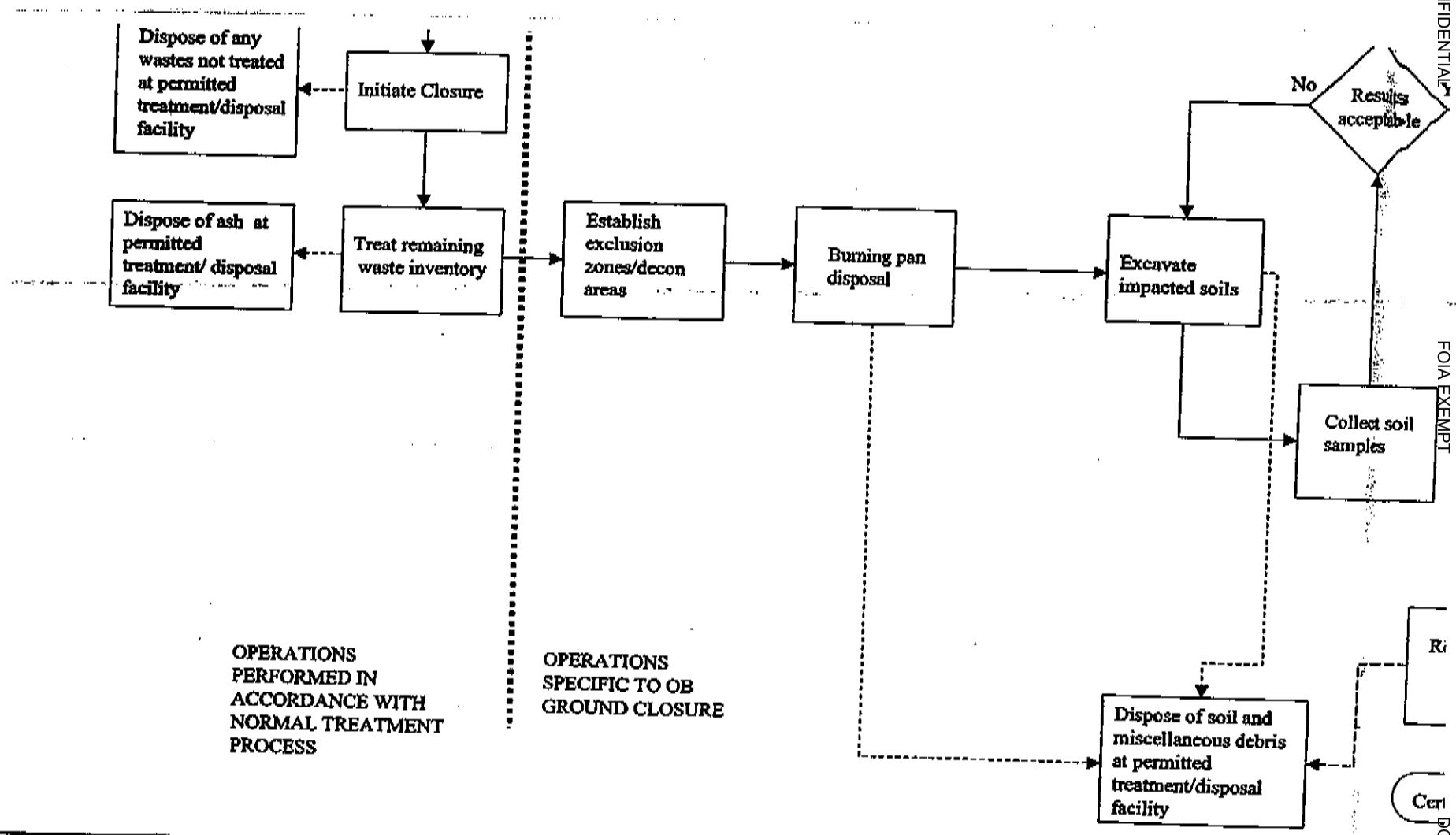
S
P

II G-22

DO NOT RELEASE FOIA EXEMPT

ENFORCEMENT CONFIDENTIAL

FOIA EXEMPT



DO NOT RELEASE

Draper Aden Associates
Engineering • Surveying • Environmental Services

CLOSURE FLOW CHART

Radford Army Ammunition Plant
OB Ground

JOB No.
7774-16

TT.6-23

Tables

TABLE 1

HAZARDOUS CONSTITUENTS CONTAINED IN WASTES TREATED AT THE OPEN BURNING GROUND

Radford Army Ammunition Plant

Parameter	CAS #	Analytical Method (SW-846)	Estimated Quantitation Limits(µg/L)
Antimony sulfide (Antimony Compounds N.O.S.)	(Antimony) 7440-36-0	6020	1
Arsenic	7440-38-2	6020	5
Barium N.O.S.	(Barium) 7440-39-3	6020	10
Benzene (possibly in alkylbenzene sulfonic acid)	71-43-2	8260B	5
Chlorobenzene	108-90-7	8260B	5
Carbon tetrachloride (1.5 % of Chlorowax 70)	56-23-5	8260B	5
Chromium nitrate (Chromium compounds N.O.S.)	(Chromium) 7440-47-3	6020	5
Dibutyl phthalate (Di-n-butyl phthalate)	84-74-2	8270C	10
Diethyl phthalate	117-81-7	8270C	10
2,4-Dinitrotoluene	121-14-2	8091	0.08
Diphenylamine	122-39-4	8270C	10
Formaldehyde (found in phenolic resin)	50-00-0	8315A	25
Hexachloroethane	67-72-1	8270C	50
Lead N.O.S.	(Lead) 7439-92-1	6020	1
Mercury	7439-97-6	7470A	2
Mercuric chloride (CAS# 7487-94-7) (Mercuric Compounds N.O.S)	(Mercury) 7439-97-6	7470A	2
Methyl chloride	74-87-3	8260B	5
Methylene chloride	75-09-2	8260B	5
Nitroglygerine	55-63-0	8332	10 mg/L
Total Phenols (found in phenolic resin)	108-95-2	9066	5
Silver	7440-22-4	6020	2
Toluene	108-88-3	8260B	5

N.O.S: Not Otherwise Specified, signifies those members of the general class not specifically listed by name in Appendix VIII of 40 CFR Part 261.

TABLE 2

PROPOSED CLOSURE SCHEDULE
OB Ground
Radford Army Ammunition Plant

Days From Beginning of Closure	Event
- 45	Notification of Department
0	Receive last volume of waste
0-2	Treat final volume of waste
2-5	Remove residuals from burning pans
5-15	Select tentative locations for background sampling, seek approval from Department
15-20	Inspect for cracks in secondary containment
20-30	Clean and decontaminate burning pans
30-75	Sampling –wash water
55-100	Sample analysis
55-75	Soil Sampling
100-125	Soil Removal (if necessary)
90-125	Repeat sampling and analysis (if necessary)
110-140	Additional soil removal (if necessary)
90-150	Repeat sampling and analysis (if necessary)
180	Completion of closure activities
240	Submit signed closure certification to the Department
240	Submit signed closure certification to the Department

Times, in days, are from the date upon which closure begins.

ATTACHMENT II.H

SECURITY PROVISIONS

ATTACHMENT II.H – SECURITY PROVISIONS AND MAINTENANCE

II.H.1. Introduction

Plant security at Radford Army Ammunition Plant is provided by the Alliant Techsystems, Inc. in accordance with U.S. Army Operations Support Command standards. Plant security is assured by security procedures and security equipment, a 24-hour security system, a gated fence system with controlled entry, and posted warning signs.

II.H.2. Security Procedures and Equipment

Security Areas and Control Measures are documented in Chapter 2 of the "*Plant Protection Plan*" manual. The Captain of WSI Security Guard Force and the Plant Protection Manager have a copies of this manual in their offices. The Security Guard Standing Operating Procedures (SOPs) are also listed in this manual. There are 45 SOPs with information on subjects ranging from employee and visitor identification procedures, the movement of property through the totally encircling fence (security gates), visitor control, vehicle control, and general security police orders. Physical security at Radford Army Ammunition Plant includes perimeter patrols, a badge ID system, pre-employment investigations, building and lock inspections, lock rotation, and key registration. At storage sites, tank inlets and disbursing valves are secured with security locks.

II.H.3. 24-Hour Security System

Radford Army Ammunition Plant's 24-hour security force is divided into three shifts. The day shift security force consists manned posts and roving patrols; the evening shift has manned posts and roving patrols; and the midnight shift has manned posts and roving patrols. The 24-hour roving patrol checks on all explosives buildings and road-visible fencing every eight-hour shift.

II.H.4. Barrier and Means to Control Entry

Entry to the Radford Army Ammunition Plant is limited to one point. This access is manned 24 hours/7 days a week The outer perimeter of the installation is enclosed with a FE-1 five-strand barbed wire fence. Security personnel at installation entrances record the name and other pertinent data of each person not possessing a Radford Army Ammunition Plant personnel identification badge. If the person has valid official business at the plant or is accompanying a person who does have such business, posted area visitor badges are issued and the time and date of entry are recorded.

Seventy-two percent of Radford Army Ammunition Plant's acreage is enclosed in three limited areas. All propellant manufacturing, storage, testing and support

activities except administration are included in limited areas. There is a six-foot high cyclone fence (FE-6 or FE-7) with two feet of barbed wire on top that surrounds limited areas.

The six active entrances into the limited area are controlled by armed Security Guards. Entering persons must first be authorized by the Plant Manager, Commander, or their designated representatives and then processed by the security personnel.

Each person entering the limited areas is required to have an appropriately coded personnel identification badge as checked or issued by the Security Guard. Entry into any of the hazardous waste facilities by anyone other than an operator or foreman must be approved by the Area Manager, Chief Operator, or Control Room Operator. A log book is kept of visitors to the hazardous waste facilities for people not generally doing business at the hazardous waste facilities.

II.H.5. Warning Signs

At all plant entrances and in areas designated as posted, the following "Condition to Entry" have been erected:

CONDITION TO ENTRY
TO
RADFORD ARMY AMMUNITION PLANT

All persons, their possessions and vehicles are liable to search upon entering, during their stay, or upon their leaving this installation. Entry of persons and/or vehicles constitutes consent to search by proper authorities at any time. The following articles are prohibited within this installation:

Firearms, ammunition and weapons
Explosives and explosive devices
Cameras
Intoxicants and drugs
Gambling Services
Chemical Emission devices
Stolen property and obscene literature

By order of the Commanding Officer.

Signs reading "US Government Property - No Trespassing" are located approximately every 500 feet on the installation boundary, except where designated limited area fences are not located on or reasonably adjacent to the property boundary.

Every 500 feet on limited area fences and at other highly visible locations, such as corners and gates, the following signs are located on the fence facing outward:

US ARMY
RESTRICTED AREA
WARNING

This area has been declared a Restricted Area by authority of the Commanding Officer, in accordance with provisions of the Directive issued by the Secretary of Defense on 20 August 1954, pursuant to the provisions of Section 21, Internal Security Act of 1950. Unauthorized entry is prohibited. All persons and vehicles entering hereon are liable to search. Photographing, making notes, drawings, maps, or graphic representations of this area or test activities, are prohibited unless specifically authorized by the Commanding Officer. Any such material found in the possession of unauthorized persons will be confiscated.

In addition, information signs warning against smoking and the introduction of matches and other flame-producing devices are displayed at all normally used gates.

All warning signs posted around the regulated units can be read from a distance of at least 25 feet.

II.H.6. Entry to Regulated Units

Reactive waste is not stored at the open burning grounds. It is delivered in the powder vans, placed directly in the burning pans and ignited that day. Prior to igniting any material in the burning pans, a barricade is placed across the access road to prevent entry. Three loud speakers directed toward the river broadcast a warning message and siren signal. Flashing red lights at both ends of the site are activated. There is a sign posted at the entrance of the open burning grounds with the approved legen "DANGER UNAUTHORIZED PERSONNEL KEEP OUT."

ATTACHMENT II.I

100-YEAR FLOODPLAIN PROTECTION PLAN

ATTACHMENT II.I – 100-YEAR FLOODPLAIN PROTECTION PLAN

II.I.1. Floodplain Standard

The OB Ground is located within the 100-year floodplain. The source of data for this determination is the National Flood Insurance Program, Flood Insurance Rate Map, Community Panel Number 510099 0025 A, October 17, 1978. As the facility is within the 100-year floodplain, a major consideration in the design of this program was to comply with the requirements set forth in 40 CFR 264.18 (b) pertaining to floodplains, as follows:

> *Floodplains.* (1) A facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood, *unless* the owner or operator can demonstrate to the Regional Administrator's satisfaction that:
>
> *(i) For Waste:* Procedures are in effect which will cause the waste to be removed safely, before flood waters can reach the facility, to a location where the wastes will not be vulnerable to flood waters;
>
> (ii) For Soil: The analysis of soil samples and subsequent provisions for remediation will, in effect, serve as the *procedures which will cause the contaminated soil to be removed safely, before flood waters can reach the facility, to a location where the wastes will not be vulnerable to flood waters.*

II.I.2 In addition to the above measures the following procedures will be conducted routinely at RFAAP in accordance with the Soil Monitoring Plan (SMP) provided in Module II Attachment II.C.

If a constituent is detected above the proposed Action Level, a hot spot determination will be conducted. If contamination is detected at concentrations that exceed the designated action levels, RFAAP will collect a total of four samples as close as practicable to 20 feet in all directions (north, south, east and west) of the original detection. The samples will be analyzed for those constituents that have exceeded the action levels. This action will ensure that the nature and extent of the exceedance will be delineated in all horizontal directions.

In addition to the sampling described above, a sampling grid will be established in a five-feet radius of the sample collection point. Four randomly selected sample points will be selected within the diameter of the grid. Each sample point will be sampled to a terminal depth of 24-inches below ground surface by advancing a pre-cleaned stainless steel auger. Samples will be collected every six-inches to the terminal depth of 24-inches. The auger will be decontaminated in accordance

with **Section 4.3.1 of the SMP** between every six-inch interval. The aliquots from each six-inch interval will be composited with the same corresponding interval from each of the four borings. The aliquots will be homogenized in a pre-cleaned stainless steel bowl using a pre-cleaned stainless steel spoon or trowel. The analyses from each six-inch interval will be evaluated by comparing the results to the Action Levels for the constituent.

If the Action Levels are exceeded in any given layer, a soil removal work plan will be prepared. The work plan will define the volume of soils to be removed by designating the horizontal and vertical extent of removal. The work plan will be submitted to the VDEQ for review and approval. Upon approval of the work plan, the soils will be excavated with a mechanical backhoe under the supervision of designated representative of RFAAP. Soils will be placed in a DOT approved covered roll-off container and transported offsite for disposal at an approved facility for disposal and/or treatment. Upon completion of the excavation confirmatory samples will be collected to confirm complete removal of the contaminated media. Confirmatory samples will include four randomly selected aliquots from the base of the excavation and two from the sidewalls of the excavation to be composited for a single analysis.

The excavation will be immediately backfilled with soils to be collected from a designated borrow area within the Radford AAP facility, or prewashed and graded gravel. Soils or gravel will be re-graded to match existing contours. Soils will be seeded with natural vegetation that matches the existing ground cover of the site. The process of immediately backfilling that excavation will allow for normal operations to resume at the OB Ground. Should the confirmatory samples indicate that there are contaminated media in excess of the Action Levels beneath the backfilled material, the backfilled material will be removed and an additional volume of soils will be removed. Confirmatory samples will be collected from the secondary excavation as well. The secondary excavation will be backfilled immediately. The process of excavation and confirmation will proceed until the Action Levels are no longer exceeded or bedrock or groundwater is encountered. A complete report of the removal actions will be prepared and submitted to the VDEQ within 30-days of completion of the Interim Measures.

MODULE III – OPERATING CONDITIONS

III.A. GENERAL

This Module is organized with separate Parts to identify the operational and performance requirements that are specific to the OB Grounds.

The OB Ground is located along the banks of the New River in the southeastern portion of the horseshoe area bounded by the river. The OB operations are conducted in an area approximately 100 feet by 1,500 feet (see Figure III-1). The actual burning of explosive waste is performed in six foot by 18 foot burning pans on raised pads about 250 feet square. There are eight pads in the area, each consisting of two raised pans for a total of 16 pans.

III.B. PERMITTED AND PROHIBITED WASTE IDENTIFICATION

III.B.1 Hazardous wastes that may be managed at the permitted open burning grounds are waste propellants and spill "clean-up" residues generated at Radford Army Ammunition Plant (RFAAP) which are hazardous due to their ignitability (D001) or reactivity (D003). Only hazardous wastes, which are consistent with the requirements of the facility's RCRA Permit and specified in Module II, Attachment II.B Waste Analysis Plan (WAP) will be open burned. Only wastes generated at RFAAP by the Permittees may be treated at the OB Ground. At NO TIME will any of the following wastes be open burned at RFAAP:

- Listed Wastes
- Wastes generated outside of RFAAP
- Wastes in Group 2 – Miscellaneous Waste – Propellant Laboratory Waste
- Wastes in Group 3 – Miscellaneous Waste – Pit Cotton (Waste Nitrocellulose) – Solid Waste
- Wastes in Group 5 & 6 – Liquid Wastes – Waster Containing Triethylene Glycol or Diethylene Glycol – Solid Waste
- Small arms ammunition up to 50 caliber, Chemical agent munitions, Riot-control munitions, White/red phosphorous, Incendiaries (e.g., napalm), Colored smokes, Depleted uranium (DU) munitions

III.B.2 Some of the materials treated at the OB Ground are the same wastes that would be treated at the incinerator except that they may contain rocks, tramp metal, and other debris that will damage the incinerator grinder. Propellant wastes that will not feed into the grinder due to its physical shape and material that through Hazard Analysis is determined that it cannot be safely incinerated but can be open burned are also treated at the OB Ground.

III.B.3 Table III-1 represents performance standards set forth by the Human Health and Ecological Risk Assessments. At no time should the feed limits or constituent concentrations presented in this table be exceeded. In addition to Table III-1, Table 2 of Attachment II.B, presents the composition limitations for all of the constituents treated at the OB Ground. The following feed limits have been set with regards to specific constituents treated at the OB Ground and supersedes the concentrations mentioned in the above-referenced Table 2.

A. No greater then 88 ppm of barium will be burned at the OB Ground
B No greater then 12 ppm of chromium will be burned at the OB Ground
C No greater then 1 wt% of aluminum will be burned at the OB Ground

III.C OB GROUND OPERATIONS

III.C.1 The lowest elevation of the OB Ground nearest the New River is girded by a 4-6 feet high, crushed-rock berm. The rear portion of each burn pad, at a distance of 10 feet from the rock berm is raised to provide a flat surface on the sloping topography (see Figure III-2). The elevated pads on which the pans are placed prevent surface water run-on, but do not prevent surface water run-off from the pad. Stormwater run-on and run-off at the OB Ground will comply with 40 CFR 264.273. Stormwater Management Improvements for the RFAAP OB Grounds to control run-on and run-off have been included in Attachment III-A.

III.C.2 The Open Burning Ground is composed of 16 burn pans. For those wastes that require an aid to burning, a skid consisting of 5 wooden pallets are treated with 12.5 gallons of on-road diesel fuel and ignited. It is assumed that a maximum of two pans per day would require a skid; the facility refers to the non-energetic burns as "Skid Burns". The facility used the currently reviewed human health and ecological risk assessments to support the following limits for the RCRA Subpart X operating permit:

- Propellant Burns of 8,000 pounds / day for 365 days / year
- Skid Burns of 2,000 pounds / day for 365 days / year

These two burn scenarios correspond to 2,920,000 pounds / year and 730,000 pounds / year respectively and, assuming two skid burns per day, 9125 gallons of diesel fuel. The facility has indicated in the Human Health Risk Assessment (HHRA) that the Open Burning Ground typically operates approximately 260 days / year.

III.C.3 Figure III-3 provides construction and material details of the burn pans, supports, and pads. Figure III-4 provides details of the pan covers, which are mounted on wheels and can be rolled manually over the pans to prevent rain from collecting in the pans and overflowing onto the ground. OB Ground Schematic's are

presented in Figures III-5 through III-8. The burning pans are lined with six inches of clay or ceramic mastic to insulate the metal from the intense heat of burning. There are no liners or leak containment systems below the burning pans. The pans are inspected daily prior to loading to ensure that they are no leaking.

III.C.4 Each morning that the OB Ground plans to operate the Area Manager checks the local weather forecast. It is the decision of the Area Manager to begin loading the pans. Factors that the Area Manager considers is the precipitation forecast, wind speed, river level, Pond level of Claytor Lake, excessive rainfall in the headwaters of the New River in North Carolina. If the precipitation forecast is greater than 50% chance of precipitation or the winds are >20 miles per hour the area manger will not allow open burning to commence. If the winds are below 20 miles per hour and there is no precipitation at the time of ignition the operations will commence. Also, if a precipitation forecast of greater than 50% is predicted by the weather service providers within 3 hours of the start of a burn then the area manager will not allow open burning to commence. Once the pan is loaded with waste the waste cannot be removed safely from the pan. If precipitation occurs after the pans have already been loaded, then the pans will be covered prior to ignition and no open burning will occur. The burning ground will not operate during precipitation nor will operators be working during a thunderstorm in the local vicinity of the burning ground. Also refer to III.E.

III.C.5 The pans and the surrounding area from the previous day's operations are visually inspected for material that may not have been consumed in the previous burn. If the operator sees any unburned material the residue is collected and is placed on another burning pan for treatment. Refer to III.E. On a routine daily basis, the pans on alternate pads are loaded during the morning hours. The waste to be open burned is selected from the plants less than 90 day accumulation areas. The criteria for selection are the accumulation start date and the theoretical burn rate of the material. The theoretical burn rate is used to ensure that fast burning material is not covered by slower burning material. The materials contained in covered plastic 20-gallon tubs or DOT approved fiber drums are unloaded at the appropriate pan. The waste is kept at a critical height to prevent detonation. The waste capacity of each pan is 1000 pounds. To prevent untreated material from landing on the soil the operator may burn considerably less material.

III.C.6 Skid Burns at the OB Ground require an aid to burning. These wastes are placed on wood pallets to allow air under the waste. The pallets are covered with a cloth material that is soaked with diesel fuel. The waste is spread onto the cloth and soaked with diesel fuel. The fuel aids in combustion of the waste.

III.C.7 The arming circuit is checked for continually and the squib is placed in the pan and covered with dry propellant.

presented in Figures III-5 through III-8. The burning pans are lined with six inches of clay or ceramic mastic to insulate the metal from the intense heat of burning. There are no liners or leak containment systems below the burning pans. The pans are inspected daily prior to loading to ensure that they are no leaking.

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III.C.7 The arming circuit is checked for continually and the squib is placed in the pan and covered with dry propellant.

The operators then proceed as follows:
Assure that all personnel are away from the burning pan area.

Hook cables across upper roadway.
Record the following information on DUP-7714 just before firing:

(1) Sky condition (Use Codes) – AWAS
(2) Visibility – AWAS
(3) Temperature (Deg. F)
(4) Wind Speed (Should not be > 20 mph)
(5) Wind Direction
(6) Area Operational (Yes/No/NMTB*)
(7) Cloud Ceiling Height
(8) Type of material Destroyed
(9) Remarks (Chance of Precipitation should not be >50%)

Turn DUP-782, "Burning Ground Report" or DUP-782A, Burning Ground Report – For Use with Material Control Work Orders Only, into area office to file.

III.C.8 The burning ground pans have a waste capacity of 1000 pounds each, for material that will produce a mass fire, not an explosion or a detonation. To ensure the safety of the few boaters that use the river in front of the OB ground, Radford posts a person across the river approximately 200 feet upstream from pad number 8 and 200 feet downstream from pad number 1 as well. This distance provides more than double the Army's recommend distance for mass fire from public traffic route. The Waste will not be ignited if a person is observed on the river shoreline between these 2 observation posts. The observers and the burning ground operators turn on rotating red lights that are placed along the river in front of the burning ground to advise boaters that the burning ground is about to begin operations. A siren is sounded for about 10 seconds, followed by the operator making the following announcement twice:

"Warning, the Burning Ground of the Radford Army Ammunition Plant is about to begin Burning Operations. Evacuate the River Area immediately."

The burning pans are not ignited until assurance is received from both observers that the area between them is clear. If anyone is observed within these locations, they shall be verbally warned to move from the area. Burning shall not be performed until the area is clear.

The wastes are ignited only after the operator is sure that no one is on the river and that all of the procedures for ignition have been followed. Operators wait at least one-half hour after a burn before approaching a pan to examine the residue.

III.D ASH/RESIDUE MANAGEMENT

The morning following the burning operations the operator inspects the pans that were used the previous day. Any untreated waste is collected and placed on a pan for re-treatment. The remaining residue is collected and placed in a container at the OB ground less than 90 day accumulation area.

Prior to placing the residue into the accumulation container a one half cup grab sample of residue is obtained and placed in a separate small container. Each day that residue is added, a sample is collected. At approximately day 60 of accumulation, the samples are composited and sent off site for toxic characteristics. For the following waste streams, D004 – D011, the facility will do TCLP analysis. Also, all underlying constituents must be analyzed to make sure that the waste meets Land Disposal Restrictions. At least once per year the residue is analyzed in accordance with 40 CFR 268.48 for underlying constituents of concern.

A split sample is sent to the on site laboratory for propellant analysis. The residue is considered not reactive if less than 10% of the residue is propellant. Historically less than 0.5% of the residue is propellant.

The same reactivity test conducted on incinerator residue is conducted for the OB Ground annually. If the waste is not reactive, it still must pass for all underlying constituents before land disposal. Annually the ash is analyzed for explosive compounds using SW 846 Method 8330.

Upon receiving the analysis the waste is shipped to a permitted landfill for disposal in accordance with all Virginia and federal laws and regulations

III.E INSPECTION SCHEDULE AND PROCEDURES

The Permittee shall inspect the OB Ground in accordance with the inspection schedule set out in Attachment II.D

III.F MONITORING REQUIREMENTS

The Permittee shall conduct ground-water monitoring at the OB Ground in accordance with Permit Module IV.

The Permittee shall conduct soil monitoring at the OB Ground in accordance with the Soil Monitoring Program provided in Attachment II.C.

III.G FACILITY MODIFICATION AND EXPANSION

Permit Modification

Virginia DEQ reserves the right to modify this Permit in accordance with 40 CFR 270.41.

Permit Modification at the Request of the Permittee Modifications or expansions of the facility shall be accomplished in accordance with 40 CFR 270.42.

III.H RECORDKEEPING AND REPORTING

The Permittee shall comply with all applicable procedures for recordkeeping and reporting requirements provided in 40 CFR 264.73 (b) and 268.7, along with, the Inspection Schedule presented in Attachment II.D. Also refer to III.C.7 and Section II.I.

III.H.1 WASTE MINIMIZATION PLAN

The Waste Minimization Plan is included in Attachment III.B. The plan was designed to address RFAAP continued efforts to reduce the amount of hazardous waste sent to the OB Ground.

MODULE III – LIST OF ATTACHMENTS

The following Attachments are incorporated, in their entirety, by reference into this Permit. These incorporated attachments are enforceable conditions of this Permit. Some of the documents contain excerpts from the Permittees' Hazardous Waste Permit Application. The Department has, as deemed necessary, modified specific language excerpted from the permit application. Additional modifications are prescribed in the Permit Conditions (Modules I through IX), and thereby supersede the language of the attachments. Facility operations shall be in accordance with the contents of the Attachments and this Permit.

Attachment III.A – *Stormwater Management Improvements for the Radford Army Ammunitions Plant Open Burning Ground*

Attachment III.B – Waste Minimization Plan

FIGURES

TA[illegible]-1

Performance Standards Based on Human Health and Ecological Risks

Radford Army Ammunition Plant, Radford, Virginia

Type of Risk	Type of Burn Scenario	Exposure Scenario	Risk Driver (Constituent)	Applicable Waste Groups	Limit (lbs/day)	Notes
Human Health Risk	Propellant Burn	Residential		All	8,000	
		Subsistence Fisher		All	8,000	
		Subsistence Farmer	Dioxins	Groups 11 and 18 with total chloride > 1%	2,800	Groups 11 and 18 waste stream will be tested for total chloride; limit will be 8,000 lbs/day for lots with total chloride < 1%
	Skid Burn	Residential		All	2,000	
		Subsistence Fisher		All	2,000	
		Subsistence Farmer	Dioxins	Group 20 with total chloride > 1%	see note	Group 20 waste stream will be tested for total chloride limit will be 2,000 lbs/day for lots with total chloride < 1%. RAAP will develop a testing program for this waste stream to evaluate total chloride content in batches prior to burning. Chloride contents will be adjusted to achieve a 1% limit for total chloride prior to burning. RAAP will survey potential impact area to verify that land uses corresponding to this exposure scenario are not present.
	Skid Burn (mitigated)	Residential		All	2,000	
		Subsistence Fisher		All	2,000	
		Subsistence Farmer		All	2,000	RAAP will survey potential impact area to verify that land uses corresponding to this exposure scenario are not present.
Ecological Risk	Propellant Burn	Terrestrial			8,000	
		Aquatic (surface water)	Lead	Groups 7 and 12 waste streams with lead > 870 ppm	3,400	Groups 7 and 12 waste stream will be tested for total lead; limit will be 8,000 lbs/day for lots with total lead < 870 ppm.
	Skid Burn	Terrestrial (fauna)	Chromium	Group 20 with > 7 ppm chromium	1,100	Group 20 waste stream will be tested for chromium Limit will be 2,000 lbs/day for lots with chromium < 7 ppm. Waste feeds will be adjusted to achieve a 7 ppm limit for chromium prior to burning.
		Terrestrial (foodweb)	Dioxins	Group 20 with total chloride > 1%	see note	Group 20 waste stream will be tested for total chloride. Limit will be 2,000 lbs/day for lots with total chloride < 1%. Waste feeds will be adjusted to achieve a 1% limit for total chloride prior to burning.
			Lead	Group 20 with lead > 520 ppm	500	Group 20 waste stream will be tested for lead. Limit will be 2,000 lbs/day for lots with lead < 520 ppm. Waste feeds will be adjusted to achieve a 520 ppm limit for lead prior to burning.
		Aquatic		All	2,000	
	Skid Burn (mitigated)	Terrestrial (foodweb)	Lead	Group 20 with lead > 520 ppm	500	Group 20 waste stream will be tested for lead. Limit will be 2,000 lbs/day for lots with lead < 520 ppm. Waste feeds will be adjusted to achieve a 520 ppm limit for lead prior to burning.
		Aquatic (surface water)		All	2,000	

Notes:

Subsistence farmer scenario is a land use unlikely to be present within the study area. Value is provided only for comparison purposes.

The Skid Burn (mitigated) scenario involves a burn pan that uses a supply of propane or natural gas as the donor fuel and a remotely actuated spark ignitor as the ignition source. With this approach, the donor fuel is delivered and combusted as needed and higher combustion temperatures are maintained throughout the burn.

Total chloride limit is based on studies indicating that 1% total chloride is a threshold for forming excess dioxins and furans during combustion (U.S. EPA, 2003).

At no time will the Risk Drivers (Constituents) exceed the composition % set forth in Table 2 of Appendix II.B-1.

FIGURES

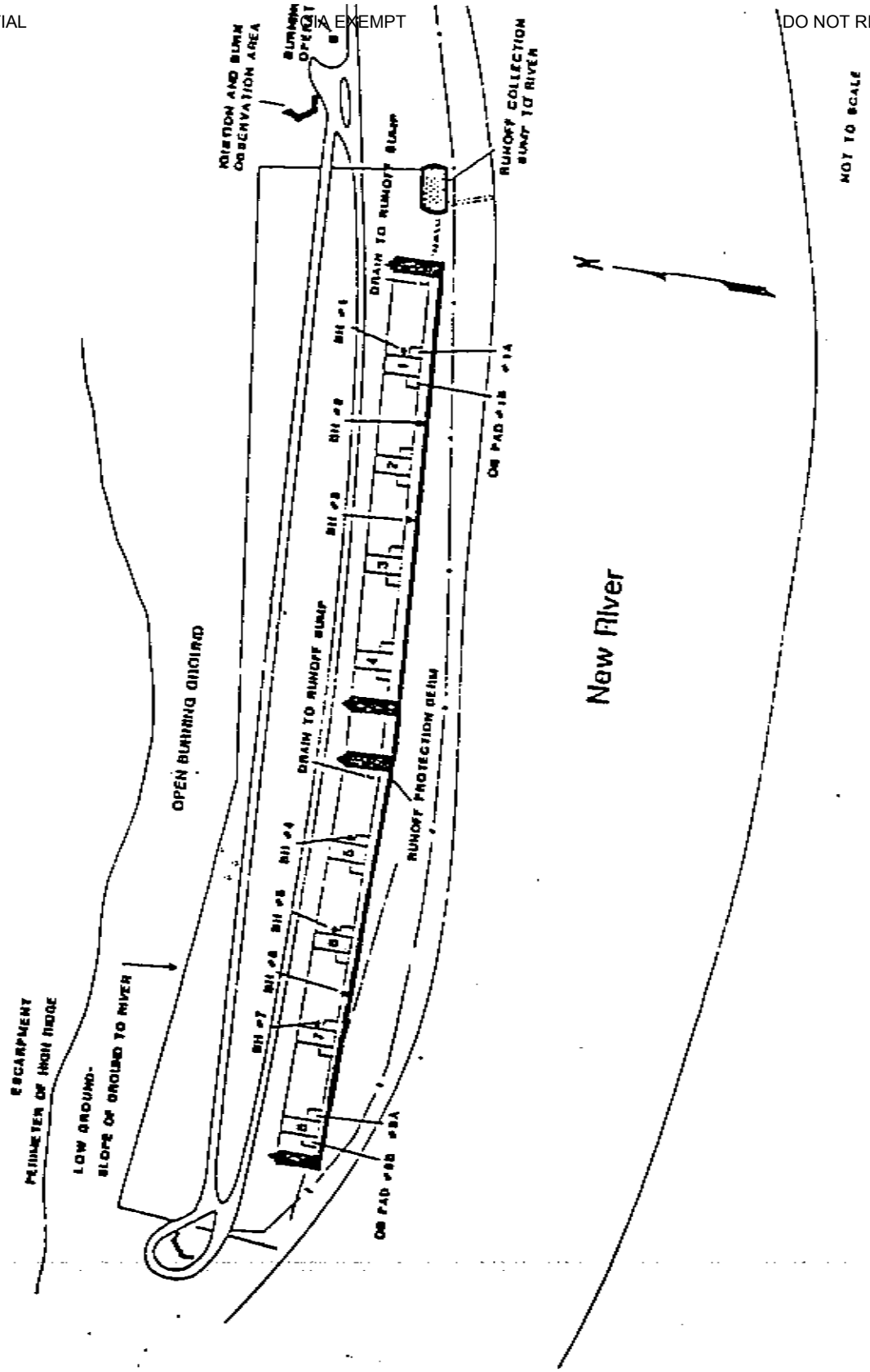


Figure III-1
Open Burning Ground Area

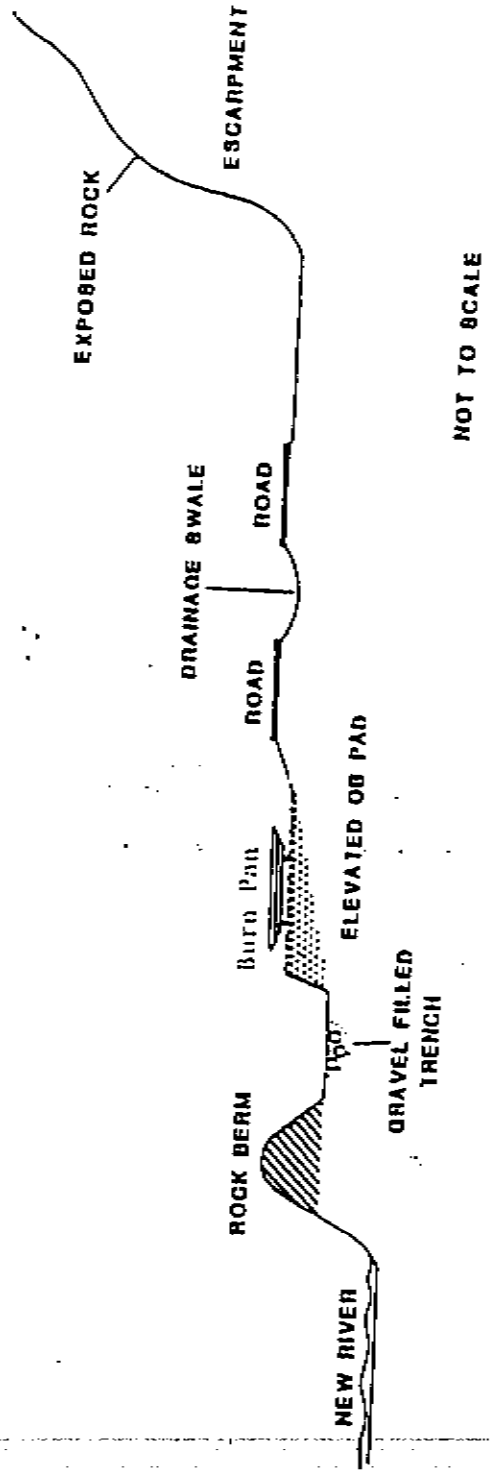
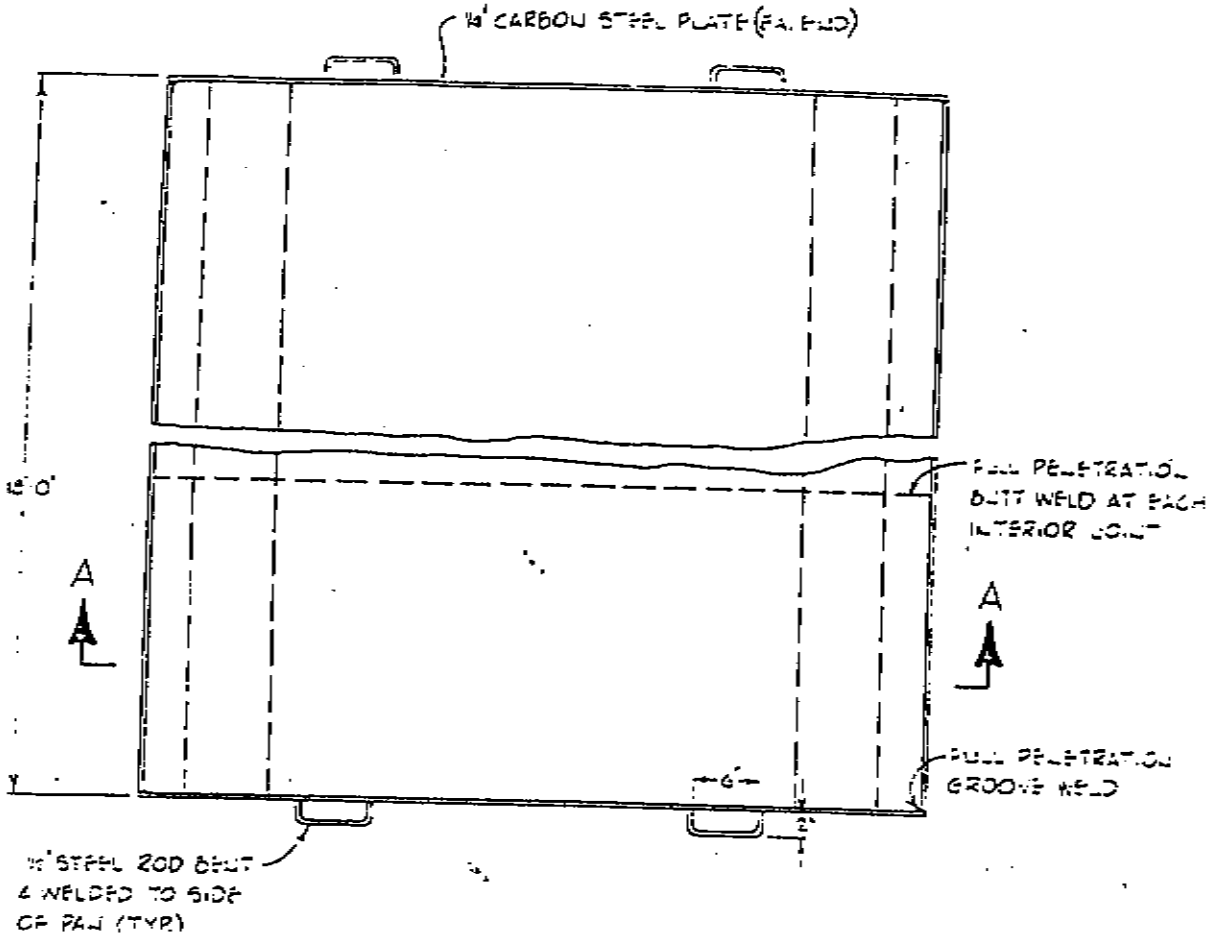
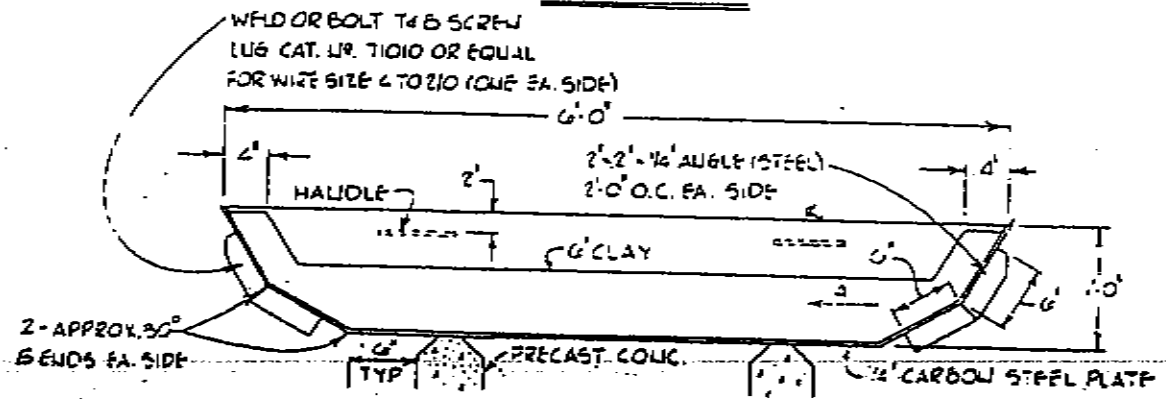


Figure III-2
Burn Pad Cross Section



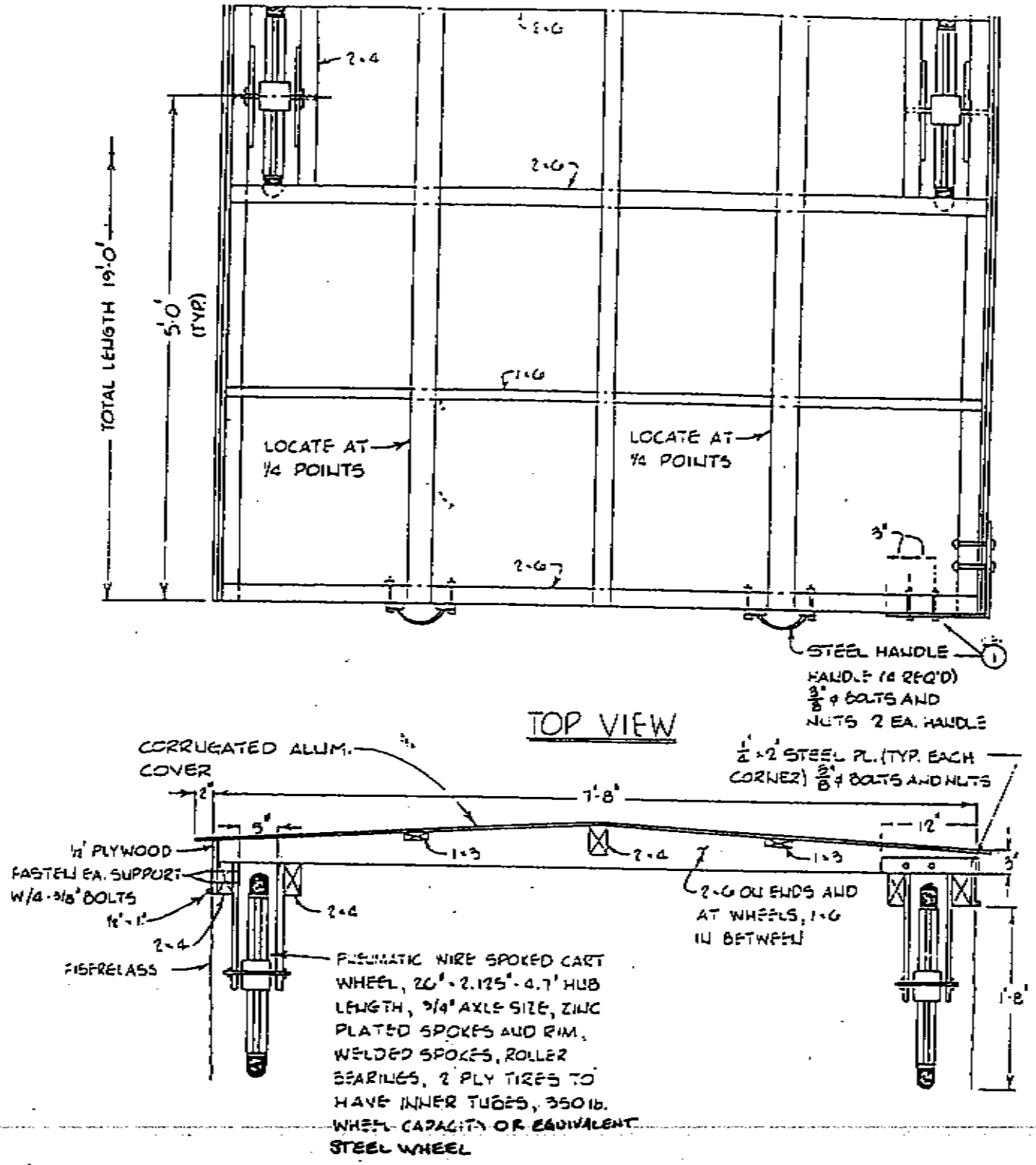
TOP VIEW



SECTION A-A

REFERENCE: RAAP Pan and cover for Powder Burning Ground, Serial No. 34586, Rev. No. 1, May 4, 1987.

Figure III-3
Burn Pan Plan View



REFERENCE: RAAP Pan and cover for Powder ning Ground, Serial 34586, Rev. No. 1, 4, 1987.

Figure III-4
Burn Pan Cover Plan

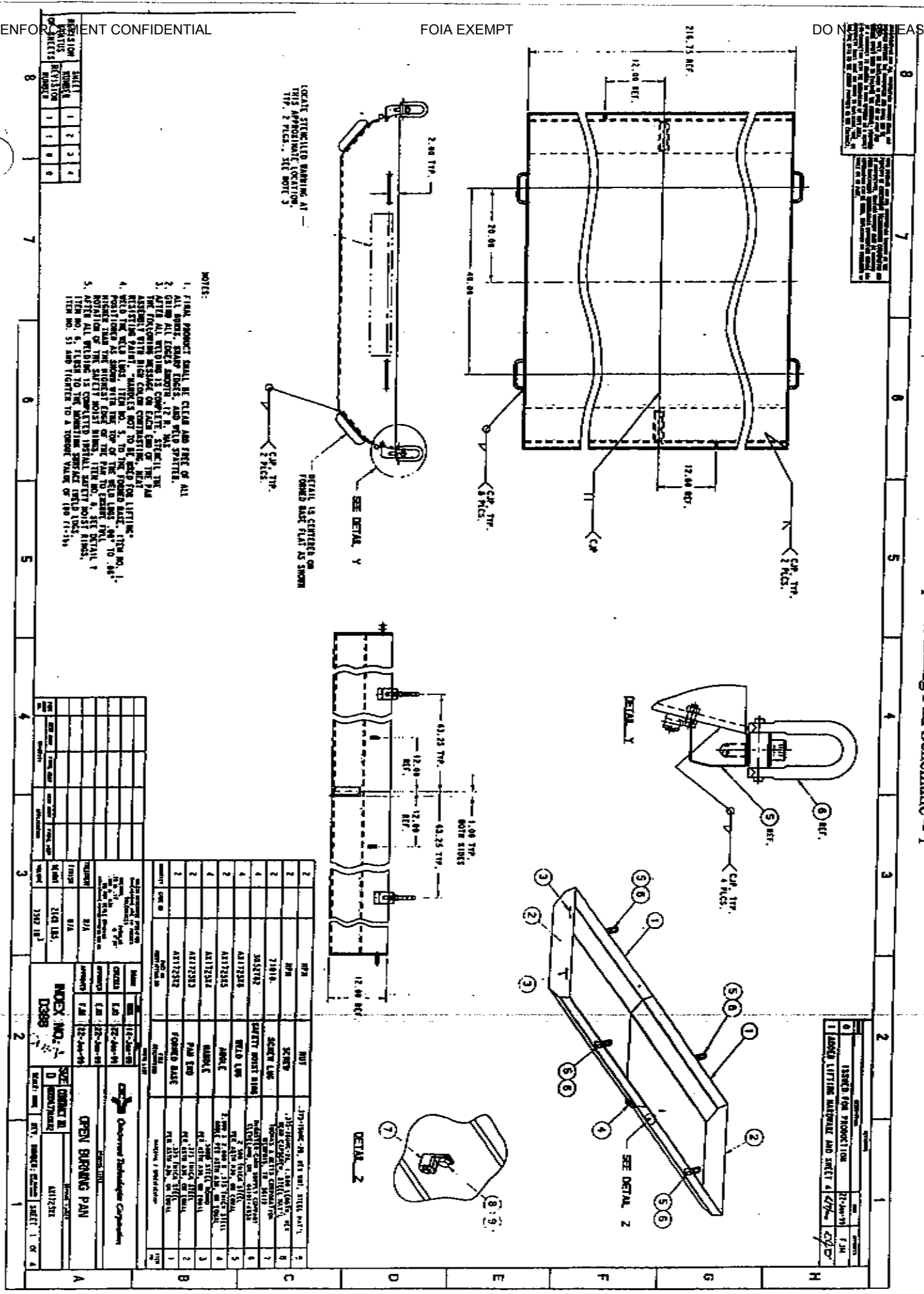
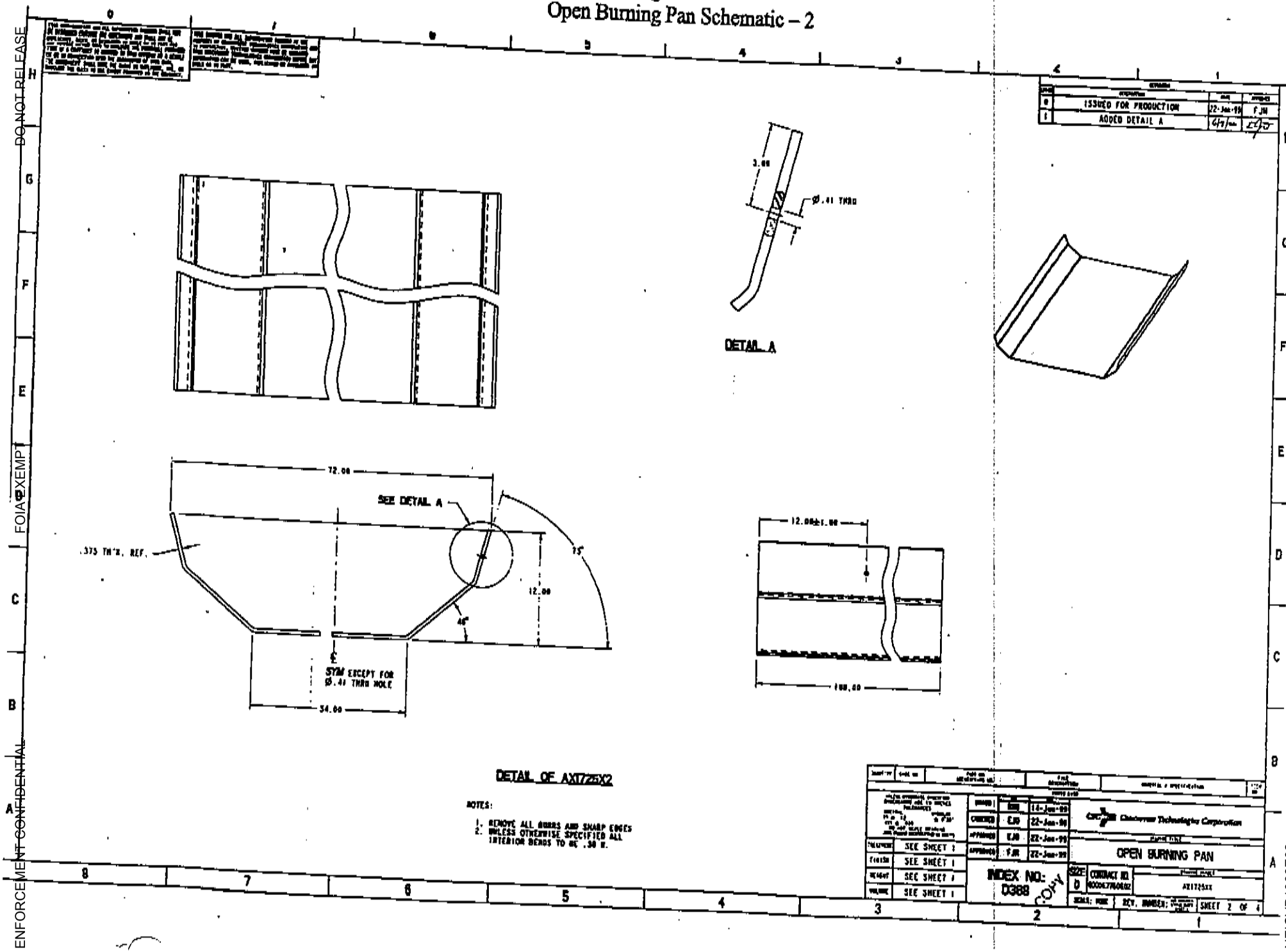


Figure III-5
Open Burning Pan Schematic – 1

Figure III-6
Open Burning Pan Schematic – 2



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ENFORCEMENT CONFIDENTIAL

Figure III-7

Open Burning Pan Schematic – 3

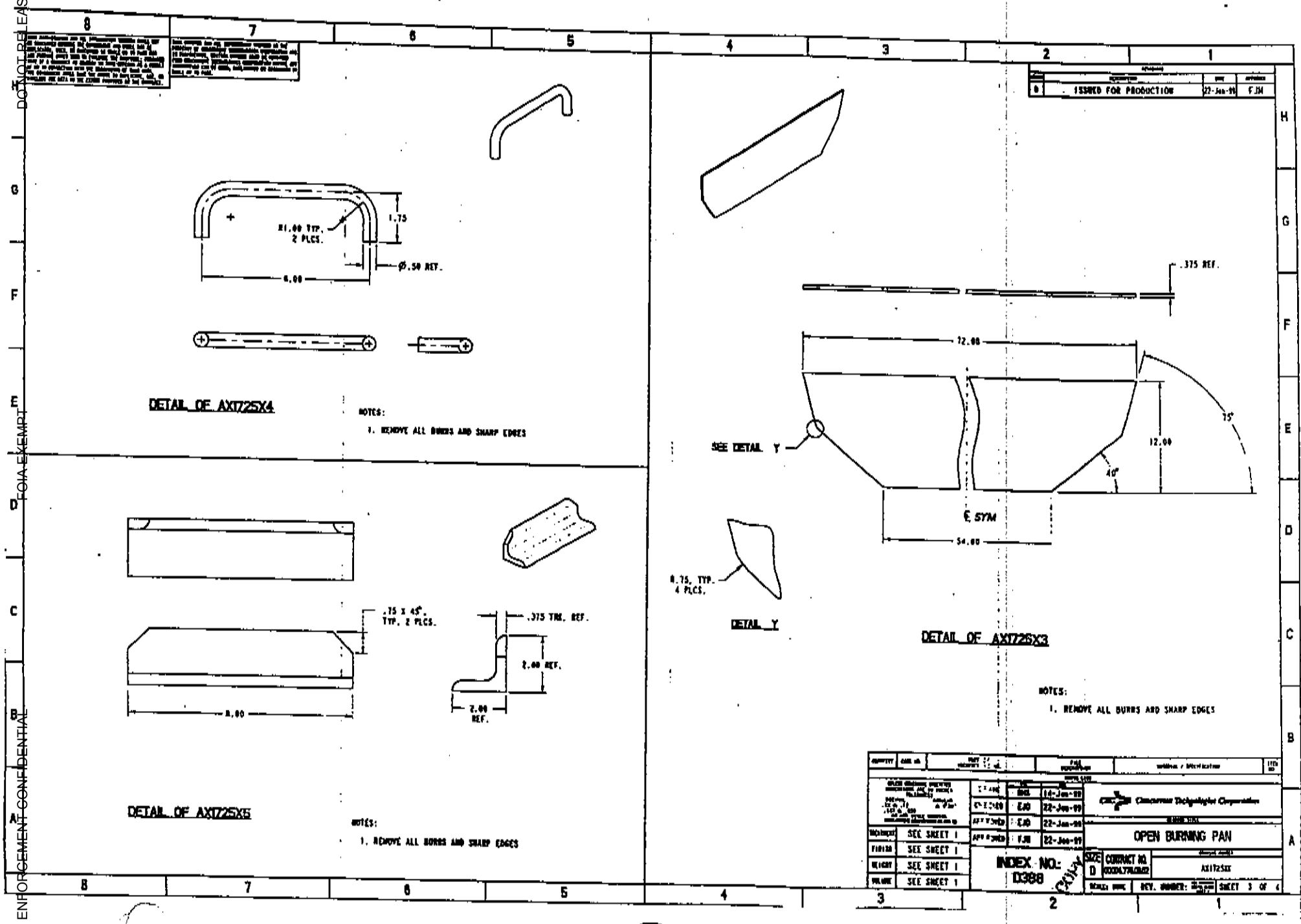

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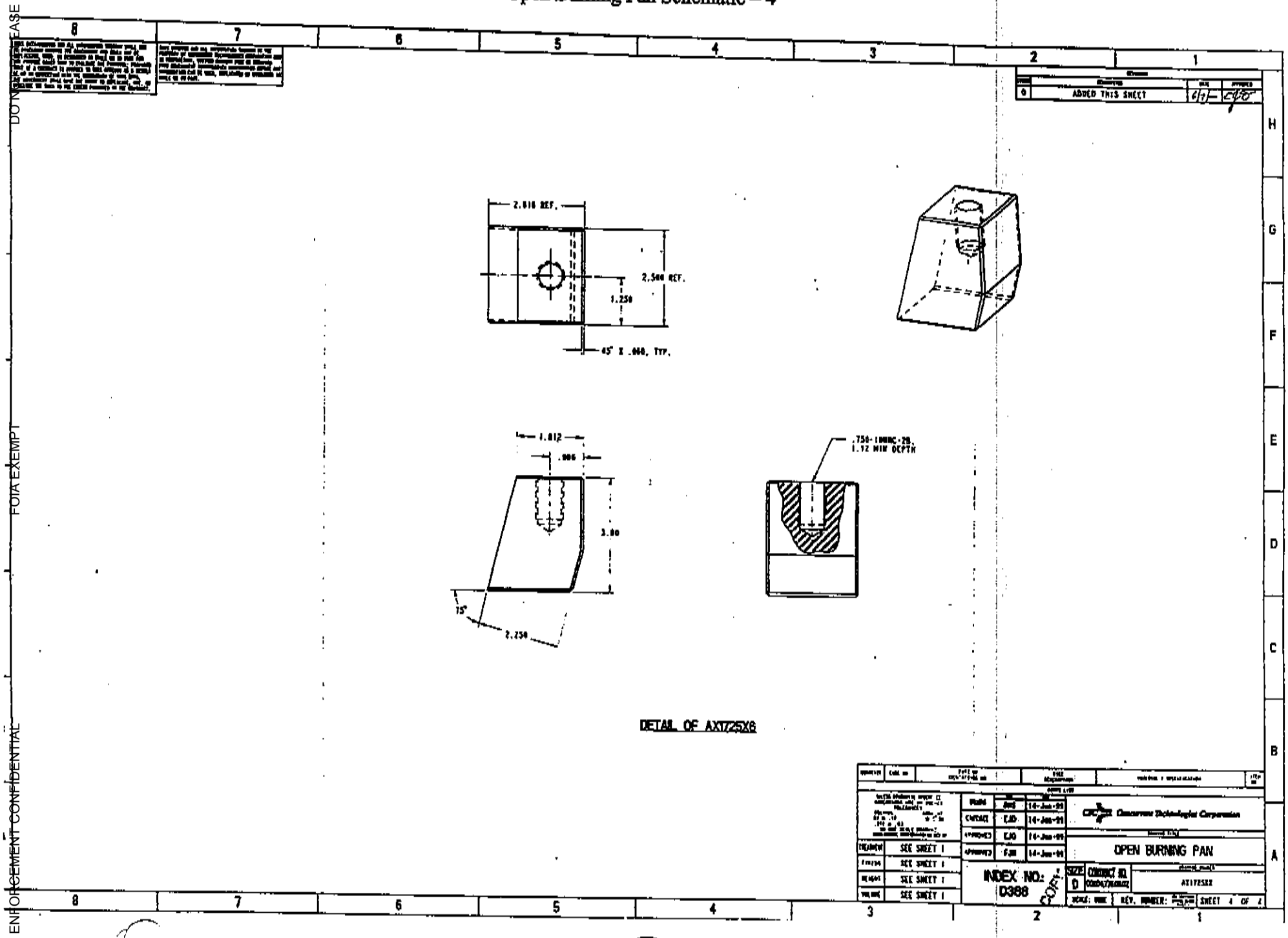
Figure III-8
Open Burning Pan Schematic – 4



ATTACHMENT III.A
Stormwater Management Improvements for the Radford Army Ammunitions Plant Open Burning Ground

Notice:

Radford Army Ammunitions Plant (RFAAP) must comply with the design of the Stormwater Management Improvements provided in this attachment. If RFAAP wishes to change the design that has already been approved by the Department of Environmental Quality (Department) then they will need to submit a written document to the Department summarizing the changes in which they intend to make. The Department will have the right to approve or disapprove any changes. Construction design drawings will be submitted to the Department before (if changed from original) the project begins and as-built drawings will be submitted to the Department after completion of the project. A change in materials of construction will not need Department pre-approval unless the changes affect the design.

THOMPSON & LITTON

STORMWATER MANAGEMENT IMPROVEMENTS FOR THE RADFORD ARMY AMMUNITIONS PLANT OPEN BURNING GROUND

PREPARED FOR

RADFORD ARMY AMMUNITIONS PLANT

This document, including the ideas and designs incorporated herein, as an instrument of professional service, is the property of Thompson & Litton and is not to be used in whole or in part for any other project without the written authorization of Thompson & Litton.

THOMPSON & LITTON

WISE, VIRGINIA 24293

For Review Only
Not to be used for Construction

COMMISSION NO. 7998-00

MAY 2005

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SECTION I

TECHNICAL SPECIFICATIONS

SECTION 02100 - SITE CLEARING

1. GENERAL

1.1 THE CONTRACT DOCUMENTS APPLY TO THIS SECTION.

1.2 RELATED WORK SPECIFIED ELSEWHERE INCLUDES THE FOLLOWING:

A. SECTION 02200 - EARTHWORK

B. SECTION 02485 – SEEDING

C. SECTION 02501 – PAVING & SURFACING

1.3 BURNING WILL NOT BE PERMITTED.

1.4 JOB CONDITIONS

PROTECTION OF EXISTING IMPROVEMENTS:

A. PROVIDE BARRICADES, COVERINGS, OR OTHER TYPES OF PROTECTION NECESSARY TO PREVENT DAMAGE TO EXISTING IMPROVEMENTS INDICATED TO REMAIN IN PLACE.

B. PROTECT IMPROVEMENTS ON ADJOINING PROPERTIES AS WELL AS THOSE ON THE OWNER'S PROPERTY.

C. RESTORE ANY IMPROVEMENTS DAMAGED BY THIS WORK TO THEIR ORIGINAL CONDITION, AS ACCEPTABLE TO THE OWNERS OR OTHER PARTIES OR AUTHORITIES HAVING JURISDICTION.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 CLEARING

A. REMOVE FROM THE SITE TREES, BRUSH, SHRUBS, DOWN TIMBER, ROTTEN WOOD, RUBBISH, OTHER VEGETATION AS WELL AS FENCES, AND INCIDENTAL STRUCTURES NECESSARY TO ALLOW FOR NEW CONSTRUCTION.

B. CLEARING WORK SHALL BE RESTRICTED TO AREA WITHIN

RIGHTS-OF-WAY OR EASEMENTS OR WITHIN 'CONSTRUCTION LIMITS' INDICATED ON DRAWING.

1. THE 'CONSTRUCTION LIMITS' SHALL BE DEFINED BY THE NEW CONTOURS AND IMPROVEMENTS SHOWN ON THE DRAWINGS.

2. THE CONTRACTOR SHALL EXERCISE CARE TO MINIMIZE DISTURBANCES WITHIN THE 'CONSTRUCTION LIMITS'.

C. UNDISTURBED STUMPS AND ROOTS, WHICH WILL BE A MINIMUM OF 5 FEET BELOW FINISHED GRADE AND WILL NOT BE LOCATED UNDER OR WITHIN 10 FEET OF ANY STRUCTURE, MAY BE LEFT IN PLACE. TOPS OF STUMPS LEFT IN PLACE SHALL NOT BE MORE THAN 6 INCHES ABOVE ORIGINAL GRADE.

3.2 EXISTING TREES AND SHRUBS

A. TREES AND SHRUBS THAT ARE TO REMAIN WITHIN 'CONSTRUCTION LIMITS' WILL BE INDICATED ON DRAWINGS OR CONSPICUOUSLY MARKED ON SITE.

B. UNLESS OTHERWISE NOTED, TREES WITHIN THE 'CONSTRUCTION LIMITS' SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE.

C. TREES WITHIN THE 'CONSTRUCTION LIMITS' GREATER THAN 4 INCHES IN DIAMETER AND NOT INDICATED TO REMAIN SHALL BE CUT TO LENGTH AND STORED IN PILES AS REQUIRED BY OWNER.

D. PROVIDE PROTECTION FOR ROOTS AND BRANCHES OVER 1-1/2 INCHES DIAMETER THAT ARE CUT DURING CONSTRUCTION OPERATIONS. COAT THE CUT FACES WITH AN EMULSIFIED ASPHALT OR OTHER COATING ESPECIALLY FORMULATED FOR HORTICULTURAL USE ON CUT OR DAMAGED PLANT TISSUES. TEMPORARILY COVER ALL EXPOSED ROOTS WITH WET BURLAP TO PREVENT ROOTS FROM DRYING OUT. PROVIDE EARTH COVER AS SOON AS POSSIBLE.

3.3 GRUBBING

A. GRUB AREAS WITHIN AND TO A POINT 10 FEET OUTSIDE OF ALL STRUCTURES, AREAS TO RECEIVE FILL WHERE FINISHED GRADE WILL BE LESS THAN 3 FEET ABOVE EXISTING GRADE, CUT AREAS WHERE FINISHED GRADE WILL BE LESS THAN 2 FEET BELOW EXISTING GRADE, TRANSITIONAL AREAS BETWEEN CUT AND FILL, AND ANY AREA TO RECEIVE CONTROL FILL.

B. REMOVE FROM THE GROUND TO A DEPTH OF 18 INCHES, ALL STUMPS, ROOTS ½ INCH AND LARGER, ORGANIC MATERIAL, AND DEBRIS.

C. USE ONLY HAND METHODS FOR GRUBBING INSIDE THE DRIP LINES OF TREES WHICH ARE TO REMAIN.

3.4 DEMOLITION

A. REMOVE ABOVE-GRADE IMPROVEMENTS SUCH AS POSTS, POLES, FENCES, AND OTHER WORK AS SPECIFICALLY INDICATED OR NECESSARY TO PERMIT NEW CONSTRUCTION.

B. MASONRY AND OTHER CONSTRUCTION MATERIAL THAT WILL RESULT IN DUST SHALL BE WET DOWN DURING DEMOLITION AND REMOVAL.

3.5 CLEAN UP DEBRIS RESULTING FROM SITE CLEARING OPERATIONS CONTINUOUSLY WITH THE PROGRESS OF THE WORK.

3.6 REMOVE PROMPTLY ALL SALVAGE THAT BECOMES PROPERTY OF THE CONTRACTOR AND IS NOT TO BE REUSED IN CONSTRUCTION. SALE OF MATERIAL ON THE SITE IS PROHIBITED.

3.7 REMOVE ALL WASTE MATERIAL FROM THE OWNER'S PROPERTY.

3.8 REMOVE DEBRIS FROM SITE IN SUCH A MANNER AS TO PREVENT SPILLAGE. KEEP PAVEMENT AND AREA ADJACENT TO SITE CLEAN AND FREE FROM MUD, DIRT, AND DEBRIS AT ALL TIMES.

END OF SECTION

SECTION 02200 - EARTHWORK

1. GENERAL

1.1 THE CONTRACT DOCUMENTS APPLY TO THIS SECTION.

1.2 RELATED WORK SPECIFIED ELSEWHERE INCLUDES THE FOLLOWING:

A. SECTION 02100 - SITE CLEARING

B. SECTION 02400 - SITE DRAINAGE

C. SECTION 02485 - SEEDING

D. SECTION 02501 - PAVING & SURFACING

1.3 REFERENCE SPECIFICATIONS WHERE APPLICABLE TO WORK UNDER THIS SECTION ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS ---------- ASTM

B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS ---------- AASHTO

1.4 CONTRACTOR WILL PROVIDE COMPACTION TESTING.

ENGAGE AN INDEPENDENT, QUALIFIED TESTING LABORATORY TO PROVIDE TESTING IN THIS SECTION. RESULTS SHALL BE SUBMITTED TO THE ENGINEER. TEST LOCATIONS SHALL BE APPROVED BY ENGINEER.

1.5 TESTING: MOISTURE AND DENSITY TESTING SHALL BE PERFORMED ON ALL FILLS IN ACCORDANCE WITH APPROVED METHODS. TESTS SHALL BE PERFORMED ON EACH LIFT OF FILL PLACED, AT THE RATE OF ONE SET OF TESTS PER 10,000 SQ. FEET OF FILL AREA, BUT NOT LESS THAN TWO SETS OF TESTS PER LIFT, REGARDLESS OF SIZE OF FILL.

1.6 LOCATE EXISTING UTILITIES, CULVERTS, AND STRUCTURES, ABOVE OR BELOW GROUND, BEFORE ANY EXCAVATION STARTS. PROTECT, MAINTAIN IN SERVICE, AND PREVENT DAMAGE TO UTILITIES NOT DESIGNATED TO BE REMOVED. WHEN UTILITIES ARE ENCOUNTERED AND ARE NOT SHOWN ON DRAWINGS OR WHEN LOCATIONS DIFFER

FROM THOSE SHOWN ON DRAWINGS, NOTIFY ENGINEER FOR INSTRUCTIONS BEFORE PROCEEDING.

1.7 ALL EXCAVATION SHALL BE UNCLASSIFIED REGARDLESS OF MATERIAL ENCOUNTERED.

1.8 UNAUTHORIZED EXCAVATION CONSISTS OF REMOVAL OF MATERIALS BEYOND INDICATED SUBGRADE ELEVATIONS OR SIDE DIMENSIONS, WITHOUT SPECIFIC APPROVAL OF ENGINEER. UNAUTHORIZED EXCAVATION SHALL BE REPLACED AT CONTRACTOR'S EXPENSE.

2. PRODUCTS

2.1 FILL MATERIALS

A. STRUCTURAL FILL SHALL BE 95% FREE FROM STONES LARGER THAN 4 INCHES IN ANY DIMENSION OR OTHER HARMFUL MATTER.

2.2 TOPSOIL SHALL BE SANDY LOAM, CLAY LOAM, LOAM, SILT LOAM, SANDY CLAY LOAM, OR SOIL FROM THE SITE WHICH HAS SUFFICIENT ORGANIC MATERIAL TO PROMOTE THE GROWTH OF TURF GRASS. IT SHALL NOT HAVE A MIXTURE OF SUBSOIL AND CONTAIN NO SLAG, CINDERS, STONES, LUMPS OF SOIL, STICKS, ROOTS, WEEDS, TRASH, OR OTHER EXTRANEOUS MATERIALS LARGER THAN 1-1/2 INCHES IN ANY DIMENSION.

3. EXECUTION

3.1 STRIP EXISTING TOPSOIL, LEAF MOLD, AND ORGANIC MATERIALS, MEETING TOPSOIL REQUIREMENTS OF SECTION 02485 - SEEDING. DEPOSIT IN STORAGE PILES SEPARATE FROM OTHER EXCAVATED MATERIAL.

3.2 WHERE UNAUTHORIZED EXCAVATIONS HAVE BEEN CARRIED BELOW OR BEYOND POINTS REQUIRED, RESTORE THESE AREAS TO THE ELEVATIONS AND DIMENSIONS SHOWN ON THE DRAWINGS WITH MATERIAL APPROVED BY ENGINEER AND COMPACT AS SPECIFIED. THIS WORK SHALL BE PERFORMED AT NO ADDITIONAL COST TO THE OWNER.

3.3 WHERE REMOVAL OF UNSATISFACTORY MATERIAL IS DUE TO FAULT OR NEGLIGENCE OF THE CONTRACTOR, BY INADEQUATE SHORING OR BRACING, DEWATERING, MATERIAL STORAGE OR OTHER FAILURE TO

MEET SPECIFIED REQUIREMENTS, WORK SHALL BE PERFORMED AT NO ADDITIONAL COST TO THE OWNER.

3.4 EXCAVATION

A. AREAS THAT RECEIVE SEEDING SHALL BE GRADED BELOW FINISHED GRADES SHOWN, LEAVING SPACE FOR TOPSOILING.

B. STOCKPILE EXCAVATED SOIL MATERIAL SATISFACTORY FOR BACKFILL OR FILL UNTIL REQUIRED. PLACE, GRADE, AND SHAPE STOCKPILES FOR PROPER DRAINAGE.

C. REMOVE FROM PROJECT SITE AND DISPOSE OF MATERIAL UNSATISFACTORY FOR BACKFILL OR FILL, TRASH AND DEBRIS, AND ALL EXCESS MATERIAL CONTINUOUSLY WITH THE PROGRESS OF THE WORK.

D. KEEP EXCAVATIONS FREE OF WATER WHILE WORK IS BEING PERFORMED.

E. WHERE UNDERGROUND STREAMS OR SPRINGS ARE FOUND, PROVIDE TEMPORARY DRAINAGE AND NOTIFY ENGINEER.

F. EXCAVATE SO THAT BANKS OF EXCAVATION WILL NOT BE UNDERCUT AND STRATUM FOR FOUNDATIONS WILL NOT BE DISTURBED.

G. EXCAVATE UNSATISFACTORY SOIL MATERIALS ENCOUNTERED THAT EXTEND BELOW REQUIRED ELEVATIONS TO THE ADDITIONAL DEPTH AS DIRECTED BY ENGINEER.

H. REMOVE SHORING AND ALL FORM MATERIALS.

I. CUT SLOPES SHALL BE SHAPED AND CLEANED OF LOOSE ROCK AS THE WORK PROGRESSES IN ACCORDANCE WITH THE FOLLOWING SEQUENCE:

1. SLOPE WHOSE VERTICAL HEIGHT IS 20 FEET OR GREATER SHALL BE SHAPED, CLEANED, AND SEEDED (WHERE REQUIRED) IN THREE APPROXIMATELY EQUAL INCREMENTS OF HEIGHT. SLOPES WHOSE VERTICAL HEIGHT IS 75 FEET SHALL BE SHAPED, CLEANED, AND SEEDED (WHERE REQUIRED) IN APPROXIMATELY 25 FOOT INCREMENTS OF

HEIGHT.

2. SLOPES WHOSE VERTICAL HEIGHT IS LESS THAN 20 FEET, BUT MORE THAN 5 FEET, SHALL BE SHAPED, CLEANED, AND SEEDED (WHERE REQUIRED) IN TWO APPROXIMATELY EQUAL INCREMENTS OF HEIGHT.

3. SLOPES WHOSE VERTICAL HEIGHT IS LESS THAN 5 FEET SHALL BE SHAPED, CLEANED, AND SEEDED (WHERE REQUIRED) IN ONE OPERATION.

3.5 EXCAVATION FOR STRUCTURES

A. CONFORM TO ELEVATIONS AND DIMENSIONS SHOWN ON THE DRAWINGS. EXTEND EXCAVATION SUFFICIENT DISTANCE FROM FOOTINGS AND FOUNDATIONS TO PERMIT PLACING AND REMOVAL OF CONCRETE FORMWORK, INSTALLATION OF SERVICES, AND FOR OTHER CONSTRUCTION REQUIRED. FOUNDATION CONCRETE SHALL NOT BE PLACED UNTIL THE BEARING STRATUM HAS BEEN EXAMINED AND FOUND SATISFACTORY FOR THE DESIGN BEARING CAPACITY.

B. WHERE ROCK IS ENCOUNTERED, NOTIFY ENGINEER. WHEN THE ENTIRE STRUCTURE WILL BEAR ON ROCK, IT SHALL BE USED TO SUPPORT THE FOUNDATION. WHERE ONLY A PART OF THE FOUNDATION WILL BEAR ON ROCK, EXCAVATE 8 INCHES BELOW SUBGRADE OF FLOOR OR FOOTINGS AND BACKFILL WITH AGGREGATE FILL AND THOROUGHLY COMPACT.

3.6 COMPACTION

A. PERCENTAGE OF MAXIMUM DENSITY REQUIREMENTS.

1. COMPACT EACH LAYER OF FILL OR BACKFILL TO NOT LESS THAN THE FOLLOWING PERCENTAGES OF THE MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D 698 OR AASHTO T-99:

100 PERCENT BENEATH AND WITHIN 25 FT. OF BUILDINGS AND STRUCTURES, INCLUDING THOSE SHOWN FOR FUTURE CONSTRUCTION.

95 PERCENT BENEATH PAVEMENTS, WALKS, AND ROAD SHOULDERS, INCLUDING THOSE SHOWN FOR FUTURE CONSTRUCTION.

95 PERCENT IN OTHER UNPAVED AREAS.

2. IF THE DENSITY OF THE ADJACENT SOIL IS MORE THAN THE DENSITY SPECIFIED, COMPACT TO A DENSITY NOT LESS THAN THE DENSITY OF THE ADJACENT SOIL.

B. COMPACT SOIL MATERIALS USING EQUIPMENT SUITABLE FOR MATERIALS TO BE COMPACTED AND WORK AREA LOCATIONS. USE POWER-DRIVEN HAND TAMPERS FOR COMPACTING MATERIALS ADJACENT TO STRUCTURES.

C. PROVIDE EQUIPMENT CAPABLE OF ADDING MOISTURE TO THE SOIL MATERIAL AS DETERMINED BY MOISTURE-DENSITY TESTS.

D. WHERE REQUIRED, UNIFORMLY APPLY WATER TO THE SURFACE OF SUBGRADE OR LAYER OF SOIL MATERIAL IN SUCH MANNER AS TO PREVENT FREE WATER APPEARING ON THE SURFACE, EITHER DURING OR SUBSEQUENT TO COMPACTION OPERATIONS.

3.7 FILL AND BACKFILL

A. REMOVE VEGETATION, DEBRIS, UNSATISFACTORY MATERIALS AND HARMFUL MATERIALS PRIOR TO PLACEMENT OF FILL. PLOW, STRIP, OR BREAK UP SLOPED SURFACES STEEPER THAN 4 TO 1 SO THAT FILL MATERIAL WILL BOND WITH EXISTING SURFACE.

B. OBTAIN FILL FROM EXCAVATION OR OTHER APPROVED SOURCES. THE MATERIAL SHALL BE SUCH THAT IT CAN BE COMPACTED IN ACCORDANCE WITH THESE SPECIFICATIONS. MAXIMUM ROCK SIZE SHALL BE 75 PCT. OF COMPACTED LAYER THICKNESS OR MAXIMUM OF 6 INCHES DIAMETER. PREVENT NESTING OF LARGE ROCKS AND COMPACT FILL TO PREVENT VOIDS. MAXIMUM ROCK SIZE WITHIN 12 INCHES OF FOOTING ELEVATIONS SHALL BE 2 INCH DIAMETER.

C. REMOVE AND REPLACE, OR SCARIFY AND AIR DRY, SOIL MATERIAL THAT IS TOO WET TO PERMIT COMPACTION TO SPECIFIED PERCENTAGE OF MAXIMUM DENSITY.

D. DO NOT COMPACT MATERIAL THAT IS FROZEN.

E. STRUCTURAL FILL MATERIAL THAT HAS BEEN REMOVED AS TOO WET TO PERMIT COMPACTION MAY BE STOCKPILED OR SPREAD TO DRY. WHEN MOISTURE CONTENT IS REDUCED TO A SATISFACTORY VALUE, THE MATERIAL MAY BE USED AS FILL OR BACKFILL.

F. PLACE FILL TO OBTAIN ELEVATIONS SHOWN ON THE DRAWINGS. DO NOT PLACE FILL ON MUDDY OR FROZEN AREAS.

G. EXCAVATE DEPRESSIONS CAUSED BY REMOVAL OF STUMPS OR OTHER CLEARING OPERATIONS TO FIRM SUBGRADE, FILL WITH CLEAN EARTHFILL, AND COMPACT AS SPECIFIED.

H. WHEN THE EXISTING GROUND SURFACE HAS BEEN DISTURBED AND HAS A DENSITY OF LESS THAN THAT SPECIFIED FOR THE PARTICULAR AREA CLASSIFICATION, SCARIFY THE GROUND SURFACE, PULVERIZE, ADJUST MOISTURE CONDITION TO OPTIMUM MOISTURE CONTENT, AND COMPACT TO REQUIRED DEPTH AND PERCENTAGE OF MAXIMUM DENSITY.

I. PLACE STRUCTURAL FILL MATERIALS IN LAYERS NOT MORE THAN 8 IN. IN LOOSE DEPTH. BEFORE COMPACTION, MOISTEN OR AERATE EACH LAYER AS NECESSARY TO PROVIDE OPTIMUM MOISTURE CONTENT. COMPACT EACH LAYER TO THE REQUIRED DENSITY.

J. PLACE BACKFILL AND FILL MATERIALS EVENLY ADJACENT TO STRUCTURES. PREVENT WEDGING ACTION OF THE BACKFILL AGAINST STRUCTURES BY CARRYING THE MATERIAL UNIFORMLY AROUND THE STRUCTURE TO APPROXIMATELY THE SAME ELEVATION IN EACH LIFT.

3.8 GRADING

A. UNIFORMLY GRADE ALL AREAS WITHIN THE LIMITS DESIGNATED ON THE DRAWINGS, INCLUDING ADJACENT TRANSITION AREAS. FINISH SURFACES WITHIN SPECIFIED TOLERANCES WITH UNIFORM LEVELS OR SLOPES BETWEEN POINTS WHERE ELEVATIONS ARE SHOWN AND WITH EXISTING GRADES.

B. FINISH ALL SURFACES FREE FROM IRREGULAR CHANGES.

C. FINISH AREAS TO RECEIVE TOPSOIL TO WITHIN 0.10 FOOT OF

REQUIRED SUBGRADE ELEVATIONS.

D. SHAPE SUBGRADE UNDER PAVEMENT TO LINE, GRADE, AND CROSS-SECTION TO WITHIN 1/2 INCH OF REQUIRED SUBGRADE ELEVATIONS.

E. PROTECT NEWLY GRADED AREAS FROM TRAFFIC AND EROSION. REPAIR AND RE-ESTABLISH GRADE IN SETTLED, ERODED, OR RUTTED AREAS TO THE SPECIFIED TOLERANCES.

F. WHERE COMPACTED AREAS ARE DISTURBED BY SUBSEQUENT CONSTRUCTION OR ADVERSE WEATHER, SCARIFY THE SURFACE, RESHAPE, AND COMPACT TO THE REQUIRED DENSITY. USE HAND TAMPER FOR RECOMPACTION OVER UNDERGROUND UTILITIES AND UNDERFLOOR SUBDRAINS.

G. PLACE TOPSOIL IN AREAS TO BE SEEDED.

3.9 EROSION CONTROL

A. NO MORE THAN 500 FEET OF TRENCH SHALL BE OPEN AT ANY ONE TIME.

B. NO DISTURBED AREA SHALL BE DENUDED FOR MORE THAN 30 CALENDAR DAYS.

C. COMPLY WITH ALL LOCAL REQUIREMENTS AND WITH THE LATEST EDITION OF THE *VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK* BY THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION TO CONTROL EROSION AND SEDIMENTATION.

D. INSTALL SILT FENCE AROUND AREAS TO BE GRADED BEFORE BEGINNING.

E. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING AN APPROVED EROSION AND SEDIMENT CONTROL PLAN.

3.10 PROTECT GRADED AREAS FROM THE ACTION OF THE ELEMENTS. SETTLEMENT OR OTHER DAMAGE THAT OCCURS PRIOR TO ACCEPTANCE OF THE WORK SHALL BE REPAIRED AND GRADES SATISFACTORILY RE-ESTABLISHED.

3.11 REPAIR AFTER CLEAN-UP. UPON COMPLETION OF CONSTRUCTION WORK AND AFTER SPOIL AND DEBRIS HAVE BEEN REMOVED, REGRADE ANY AREAS DISTURBED BY THE OPERATIONS.

END OF SECTION

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SECTION 02400 - SITE DRAINAGE

1. GENERAL

1.1 THE CONTRACT DOCUMENTS APPLY TO THIS SECTION.

1.2 RELATED WORK SPECIFIED ELSEWHERE INCLUDES THE FOLLOWING:

A. SECTION 02200 - EARTHWORK

1.3 SPECIFICATIONS ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS ---------- AASHTO

B. AMERICAN SOCIETY OF TESTING AND MATERIALS ---------- ASTM

C. VIRGINIA DEPARTMENT OF TRANSPORTATION ---------- VDOT

1.4 REFERENCED SPECIFICATIONS ARE IN ACCORDANCE WITH THE LATEST EDITION OF VDOT *ROAD AND BRIDGE SPECIFICATIONS* AND *ROAD AND BRIDGE STANDARDS*.

1.5 WORK IN THIS SECTION INCLUDES ALL STORM SEWER WORK ON THIS PROJECT.

2. PRODUCTS

2.1 REINFORCED CONCRETE PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ASTM C 76, 'REINFORCED CONCRETE CULVERT, STORM DRAIN AND SEWER PIPE' OR AASHTO M 170 FOR CLASS OF PIPE AS INDICATED ON THE DRAWINGS.

2.2 CONCRETE PIPE AND FITTINGS SHALL MEET REQUIREMENTS OF ASTM C 14, 'CONCRETE SEWER, STORM DRAIN AND CULVERT PIPE', FOR CLASS OF PIPE AS INDICATED ON DRAWINGS.

2.3 RUBBER GASKETS FOR CONCRETE PIPE JOINTS SHALL MEET REQUIREMENTS OF ASTM C 443, 'JOINTS FOR CIRCULAR CONCRETE AND CULVERT PIPE', USING FLEXIBLE, WATERTIGHT, RUBBER GASKET.

2.4 SMOOTH INTERIOR HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS FOR CULVERTS SHALL BE N-12 AS MANUFACTURED BY ADVANCED DRAINAGE SYSTEMS, INC. OR APPROVED EQUAL.

2.5 POLYVINYLCHLORIDE (PVC) PIPE SHALL MEET REQUIREMENTS OF ASTM D 2729.

2.6 AGGREGATE FOR USE IN TRENCH DRAINS SHALL MEET THE VDOT REQUIREMENTS FOR NO. 5 COARSE AGGREGATE.

2.7 FILTER FABRIC FOR USE IN TRENCH DRAINS SHALL BE MIRAFI 140 NL AS MANUFACTURED BY MIRAFI, INC. OR APPROVED EQUAL.

2.8 ENDWALLS SHALL BE AS SPECIFIED IN THE LATEST EDITIONS OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION VDOT *ROAD AND BRIDGE STANDARDS AND ROAD AND BRIDGE SPECIFICATIONS* FOR THE TYPES SHOWN ON THE DRAWINGS.

2.9 TRASH RACK AND ANTI-VORTEX DEVICE SHALL BE MANUFACTURED FROM GALVANIZED SHEETS MEETING REQUIREMENTS OF ASTM A 444.

3. EXECUTION

3.1 MAINTAIN DRAINAGE ON SITE TO PREVENT EROSION, DAMAGING WATER, AND STANDING WATER DURING ALL PHASES OF CONSTRUCTION.

3.2 KEEP EXCAVATIONS CLEAR OF WATER WHILE WORK IS BEING INSTALLED. CONTROL SUB-SURFACE WATER ENCOUNTERED AND REPORT TO ENGINEER.

3.3 LAY PIPE TRUE TO LINE AND GRADE. DO NOT LAY PIPE WHEN TRENCH CONDITIONS OR WEATHER ARE UNSUITABLE FOR SUCH WORK. KEEP PIPE INTERIOR CLEAN AND FREE FROM DIRT OR WASTE MATERIALS.

3.4 LAY PIPE UPGRADE WITH BELL OR GROOVE ENDS UPSTREAM.

3.5 CONSTRUCT INLETS, ENDWALLS, AND OTHER STORM DRAINAGE ITEMS AS DETAILED IN THE LATEST EDITION OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION *ROAD AND BRIDGE STANDARDS* OR ON DRAWINGS, AS APPLICABLE.

3.6 CONSTRUCT SEDIMENT BASIN AND ASSOCIATED ITEMS AS DETAILED IN THE LATEST EDITION OF THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION EROSION AND *SEDIMENT CONTROL HANDBOOK* OR ON THE DRAWINGS, AS APPLICABLE.

3.7 JOIN CONCRETE PIPE IN ACCORDANCE WITH ASTM C 443, "JOINTS FOR CIRCULAR CONCRETE SEWER AND CULVERT PIPE USING RUBBER GASKETS."

3.8 JOIN PVC PIPE IN ACCORDANCE WITH ASTM C 2855, "MAKING SOLVENT-CEMENTED JOINTS WITH PVC PIPE AND FITTINGS."

3.9 AS EACH JOINT IS LAID, VISUALLY INSPECT TO BE CERTAIN THAT NO JOINTING COMPOUND, GASKET, OR TRASH IS PROTRUDING FROM THE JOINT OR LYING INSIDE THE PIPE.

3.10 PIPE BEDDING

A. BED CONCRETE PIPE AS SPECIFIED IN THE LATEST EDITION OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION *ROAD AND BRIDGE SPECIFICATIONS.*

B. BED PVC AND SMOOTH INTERIOR HIGH DENSITY POLYETHYLENE PIPE AS RECOMMENDED BY THE MANUFACTURER.

3.11 PIPE BACKFILL

C. BACKFILL CONCRETE PIPE AS SPECIFIED IN THE LATEST EDITION OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION *ROAD AND BRIDGE SPECIFICATIONS.*

D. BACKFILL PVC AND SMOOTH INTERIOR HIGH DENSITY POLYETHYLENE PIPE AS RECOMMENDED BY THE MANUFACTURER.

END OF SECTION

SECTION 02485 - SEEDING

1. GENERAL

1.1 THE CONTRACT DOCUMENTS APPLY TO THIS SECTION.

1.2 RELATED WORK SPECIFIED ELSEWHERE INCLUDES THE FOLLOWING:

A. SECTION 02200 - EARTHWORK

1.3 REFERENCE SPECIFICATIONS ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS ---------- ASTM

B. AMERICAN ASSOC. OF NURSERYMEN, INC. ---------- AAN

C. AMERICAN NATIONAL STANDARDS INSTITUTE ---------- ANSI

D. VIRGINIA DEPARTMENT OF TRANSPORTATION ---------- VDOT

1.4 MATERIALS SHALL BE DELIVERED IN UNBROKEN CONTAINERS, CLEARLY MARKED BY THE MANUFACTURER AS TO CONTENTS. SEED, LIMESTONE, AND FERTILIZER SHALL BE LABELED AS TO PROPORTIONS, ANALYSIS, AND QUALITY. STORE ALL MATERIALS IN A MANNER AFFORDING PROTECTION FROM DAMAGE BY WEATHER OR VANDALISM.

1.5 SEED ONLY WHEN WIND VELOCITY IS LESS THAN 15 MILES PER HOUR.

2. PRODUCTS

2.1 TOPSOIL SHALL BE OBTAINED FROM ON-SITE OR OFF-SITE SOURCES, AS APPLICABLE. TOPSOIL SHALL BE FERTILE, FRIABLE LOAM, CONTAINING NOT LESS THAN 2 PERCENT BY WEIGHT OF FINELY DIVIDED, DECOMPOSED VEGETABLE MATTER. TOPSOIL SHALL BE FREE OF SUBSOIL, CLAY LUMPS, BRUSH, WEEDS, ROOTS LARGER THAN 1/2 INCH DIAMETER, STONES LARGER THAN 1/2 INCH DIAMETER, AND OTHER MATERIAL TOXIC OR HARMFUL TO GROWTH.

2.2 FERTILIZER SHALL MEET REQUIREMENTS OF FEDERAL SPECIFICATION 0-F-241. PROVIDE FERTILIZER THAT IS COMPLETE, INORGANIC,

UNIFORM IN COMPOSITION, AND SUITABLE FOR APPLICATION WITH APPROVED EQUIPMENT. PROPORTIONS OF FERTILIZER NUTRIENTS SHALL BE THE FOLLOWING:

10 LBS. OF ACTUAL NITROGEN
10 LBS. OF ACTUAL PHOSPHATE
10 LBS. OF ACTUAL POTASH

2.3 GRASS SEED, TESTED WITHIN 6 MONTHS OF SOWING, SHALL HAVE THE FOLLOWING CHARACTERISTICS:

A. PERMANENT SEEDING

SPECIES	PERCENTAGES (MINIMUM)			SEEDING RATE
	WGT.	PURITY	GERM.	LBS. PER ACRE
KENTUCKY 31 TALL FESCUE	90	98	90	150
KENBLUE KENTUCKY BLUEGRASS	10	85	75	24

B. TEMPORARY SEEDING

SEEDING DATE	SPECIES	PERCENTAGES (MINIMUM)			SEEDING RATE
		WGT.	PURITY	GERM.	LBS. PER ACRE
02/15 - 03/30	OATS	100	98	85	96
05/01 - 08/31	MILLET	100	98	80	40
09/01 - 11/15	RYE	100	96	85	140

2.4 LIME SHALL BE GROUND AGRICULTURAL GRADE LIMESTONE CONTAINING NOT LESS THAN 85 PERCENT CALCIUM AND MAGNESIUM CARBONATES. FINENESS SHALL BE SUCH THAT 100 PERCENT WILL PASS A NO. 20 SIEVE, AND NOT LESS THAN 50 PERCENT WILL PASS A NO. 100 SIEVE. BURNT LIME OR HYDRATED LIME MAY BE SUBSTITUTED IN EQUIVALENT CARBONATES, IF REQUESTED.

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2.5 TYPE I MULCH SHALL BE CURLEX BLANKET EROSION CONTROL FABRIC MANUFACTURED BY AMERICAN EXCELSIOR COMPANY, 415 W. SEYMOUR AVENUE, CINCINNATI, OHIO 45216-1897. THE FABRIC SHALL BE MANUFACTURED OF MATERIALS WHICH DEGRADE IN 6 TO 8 MONTHS UNDER OUTDOOR EXPOSURE.

2.6 TYPE II MULCH COMPOSED OF THRESHED STRAW OF CEREAL GRAIN, PINE NEEDLES, OR WOOD FIBER SHALL BE FREE OF OBJECTIONABLE WEED SEEDS OR OTHER HARMFUL MATERIAL.

2.7 ASPHALT ADHESIVE FOR USE WITH TYPE II MULCH SHALL BE EMULSIFIED ASPHALT MEETING REQUIREMENTS OF ASTM D 977, GRADE SS-1.

2.8 SYNTHETIC MULCH BINDER FOR USE WITH TYPE II MULCH: CURASOL, DCA-70, PETROSET, OR TERRA TACK.

3. EXECUTION

3.1 PLACE 6-INCHES OF TOPSOIL IN AREAS TO BE SEEDED.

3.2 TEMPORARY SEEDING

A. USE IN AREAS WHEN FINAL GRADING HAS NOT BEEN COMPLETED OR WHEN PERMANENT SEEDING CANNOT BE DONE DUE TO THE SPECIFIED PERMANENT SEEDING DATES.

B. APPLY FERTILIZER AT A RATE OF 15 LBS. OF 10-20-10 PER 1000 SQ. FT. (600 LBS. PER ACRE) OR EQUIVALENT.

C. FOR LOOSE SOIL, WORK FERTILIZER INTO SOIL AND THEN SEED. FOR PACKED OR HARD SOIL, LOOSEN TOP LAYER WHILE WORKING FERTILIZER INTO SOIL AND THEN SEED AT THE RATE REQUIRED FOR THE TEMPORARY SEEDING SPECIES.

D. SEED ONLY BETWEEN FEBRUARY 15 AND NOVEMBER 15. USE MULCHING OR SODDING BETWEEN NOVEMBER 15 AND FEBRUARY 15.

3.3 PERMANENT SEEDING

A. PREPARE SOIL FOR PERMANENT SEEDING BY TILLAGE OF TOPSOIL IN PLACE TO LOOSEN THOROUGHLY AND BREAK UP ALL CLODS TO

A DEPTH OF 6 INCHES. REMOVE ALL STUMPS AND ROOTS, COARSE VEGETATION, STONES LARGER THAN 1-1/2 INCHES, AND ALL CONSTRUCTION DEBRIS. SOIL SHALL BE WORKED BY SUITABLE AGRICULTURAL EQUIPMENT TO A DEPTH OF NOT LESS THAN 4 INCHES. RAKE TO A UNIFORM, SMOOTH, AND DRAINABLE SURFACE.

B. APPLY LIME AND FERTILIZER UNIFORMLY AND MIX WELL INTO TOP 4 INCHES OF SEED BED. APPLY LIME AT THE RATE OF 100 LBS. PER 1000 SQ. FT. APPLY FERTILIZER AT THE RATE OF 50 LBS. OF 10-10-10 PER 1000 SQ. FT. OR 25 LBS. OF 10-20-10 PER 1000 SQ. FT. RATES SHOULD BE ADJUSTED FOR OTHER GRADES OF FERTILIZER.

3.4 SOW PERMANENT GRASS SEED BETWEEN DATES OF MARCH 15 AND APRIL 15 OR AUGUST 15 AND SEPTEMBER 15.

3.5 SOW SEED BY MECHANICAL SEEDER AS FOLLOWS:

A. MIX SEED THOROUGHLY WITH CLEAN DRY SAWDUST AND BROADCAST AT RATE OF 6 LBS. PER 1000 SQ. FT. IN CROSS DIRECTIONS TO ENSURE UNIFORM DISTRIBUTION. RAKE SURFACE LIGHTLY AND ROLL WITH APPROPRIATE TYPE OF LAWN ROLLER WEIGHING MAXIMUM OF 150 LBS. PER FOOT OF WIDTH.

B. APPLY EITHER TYPE I OR TYPE II MULCH.

1. TYPE I MULCH: APPLY IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

2. TYPE II MULCH: APPLY UNIFORMLY TO DEPTH OF APPROXIMATELY 1-1/4 INCHES. ANCHOR MULCH BY THE FOLLOWING METHODS:

a. APPLY LIGHT TACK COAT OF ASPHALT EMULSION.

b. IN RESIDENTIAL AREAS, APPLY SYNTHETIC MULCH BINDER AT RATE RECOMMENDED BY MANUFACTURER.

c. ON SLOPES STEEPER THAN 4 HORIZONTAL TO 1 VERTICAL, FASTEN HEAVY JUTE MESH TO WOODEN STAKES.

3.6 SOW SEED BY HYDRAULIC SEEDER AS FOLLOWS:

A. PREPARE HOMOGENEOUS SLURRY OF THE FOLLOWING:

1. WATER - 20 GAL.

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2. SEED - 6 LBS.

3. FERTILIZER – 30 LBS.

4. WOOD CELLULOSE FIBER - 30 LBS.

B. DISTRIBUTE SLURRY UNIFORMLY AT RATE OF 10 GAL. PER 1000 SQ. FT.

C. APPLY EITHER TYPE I OR TYPE II MULCH ON SLOPES 4:1 OR STEEPER.

1. TYPE I MULCH: APPLY IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

2. TYPE II MULCH: APPLY UNIFORMLY TO DEPTH OF APPROXIMATELY 1-1/4 INCHES. ANCHOR MULCH BY HEAVY JUTE MESH FASTENED TO WOODEN STAKES.

3.7 REMOVE ALL SOILING OR STAINING OF FINISHED WALKS, DRIVES, AND PARKING AREAS RESULTING FROM SEEDING WORK. MAINTAIN PAVED AREAS IN CLEAN CONDITION.

3.8 TURFGRASS MAINTENANCE

A. WATER AS REQUIRED TO KEEP SOIL MOIST DURING GERMINATION PERIOD.

B. RESEED AND MULCH SPOTS LARGER THAN 1 SQ. FT. WITHOUT UNIFORM STAND OF GRASS.

C. MOW AND MAINTAIN ALL SEEDED AREAS UNTIL UNIFORM STAND OF GRASS IS ACCEPTABLE TO THE ENGINEER.

D. IN THE EVENT THAT GROWTH IS NOT ESTABLISHED BY FINAL PROJECT INSPECTION, CONTINUE THE SPECIFIED ATTENTION UNTIL STAND IS ACCEPTED BY ENGINEER.

E. CORRECT OR REPAIR ALL UNDUE SETTLING AS EVIDENCED BY COMPLAINTS RECEIVED WITHIN ONE YEAR AFTER FINAL INSPECTION.

END OF SECTION

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SECTION 02501 - PAVING & SURFACING

1. GENERAL

1.1 THE CONTRACT DOCUMENTS APPLY TO THIS SECTION

1.2 WORK SPECIFIED ELSEWHERE INCLUDES THE FOLLOWING:

A. SECTION 02100 - SITE CLEARING

B. SECTION 02200 - EARTHWORK

1.3 REFERENCE SPECIFICATIONS WHERE APPLICABLE TO WORK UNDER THIS SECTION ARE REFERRED TO BY ABBREVIATION AS FOLLOWS:

A. AMERICAN ASSOC. OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS ---------- AASHTO

B. VIRGINIA DEPARTMENT OF TRANSPORTATION ---------- VDOT

1.4 REFERENCED SPECIFICATIONS ARE IN ACCORDANCE WITH THE LATEST EDITIONS OF VDOT *ROAD AND BRIDGE SPECIFICATIONS AND ROAD AND BRIDGE STANDARDS.*

1.5 ESTABLISH AND MAINTAIN REQUIRED LINES AND ELEVATIONS.

2. PRODUCTS

2.1 AGGREGATE BASE COURSE SHALL BE TYPE 1, GRADED AGGREGATE BASE COURSE AS DEFINED IN VDOT, *ROAD AND BRIDGE SPECIFICATIONS.*

3. EXECUTION

3.1 SUBGRADE PREPARATION. SUBGRADE PREPARATION SHALL CONSIST OF THE FINAL MACHINING OF THE SUBGRADE IMMEDIATELY PRIOR TO PLACING THE AGGREGATE BASE COURSE. THE SURFACE SHALL BE TRUE TO LINE AND GRADE. CONSTRUCTION METHODS AND EQUIPMENT SHALL CONFORM TO APPLICABLE PORTIONS OF VDOT *ROAD AND BRIDGE SPECIFICATIONS.*

3.2 AGGREGATE BASE COURSE. CONSTRUCTION METHODS AND

EQUIPMENT SHALL CONFORM TO REQUIREMENTS OF VDOT *ROAD AND BRIDGE SPECIFICATIONS.*

END OF SECTION

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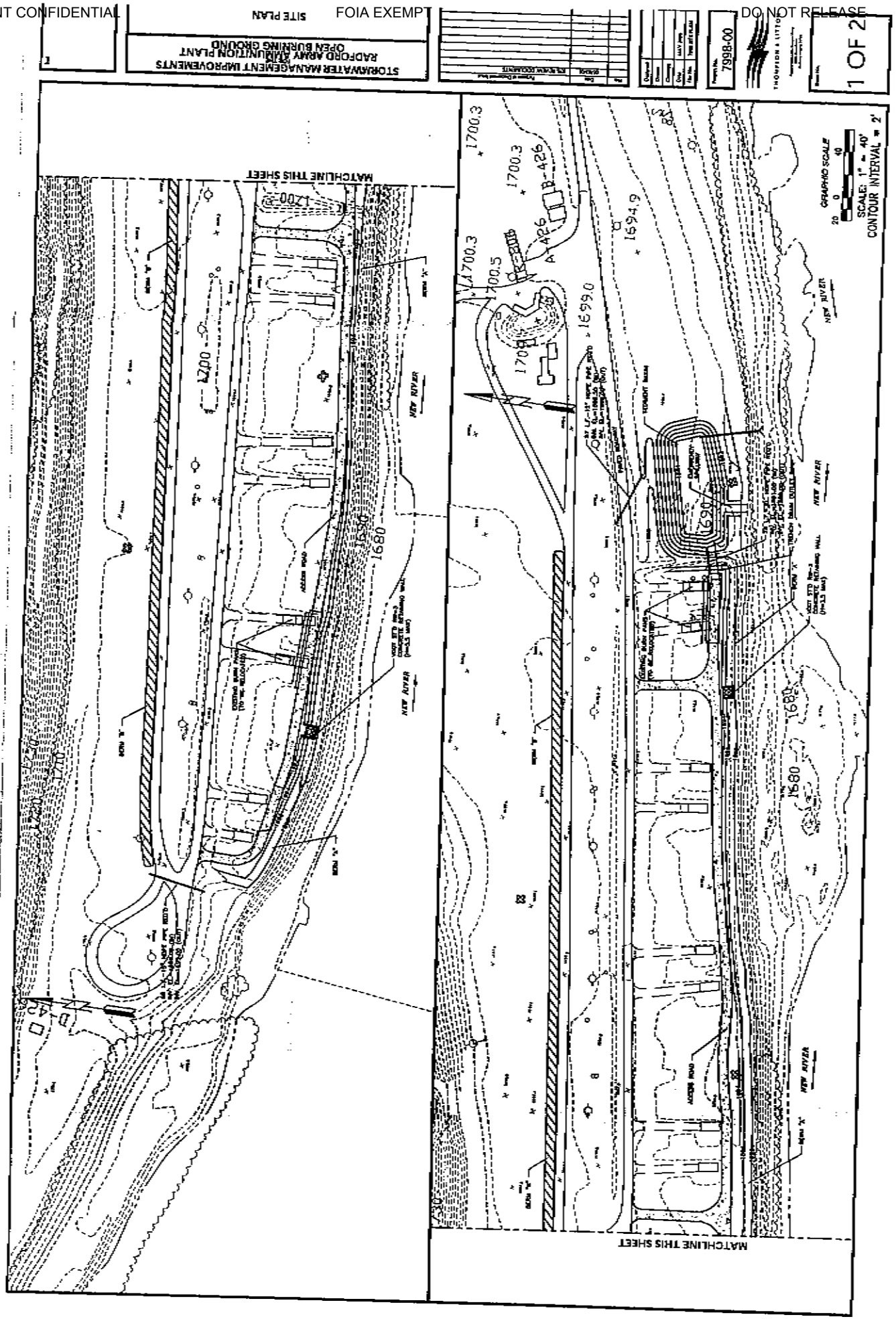
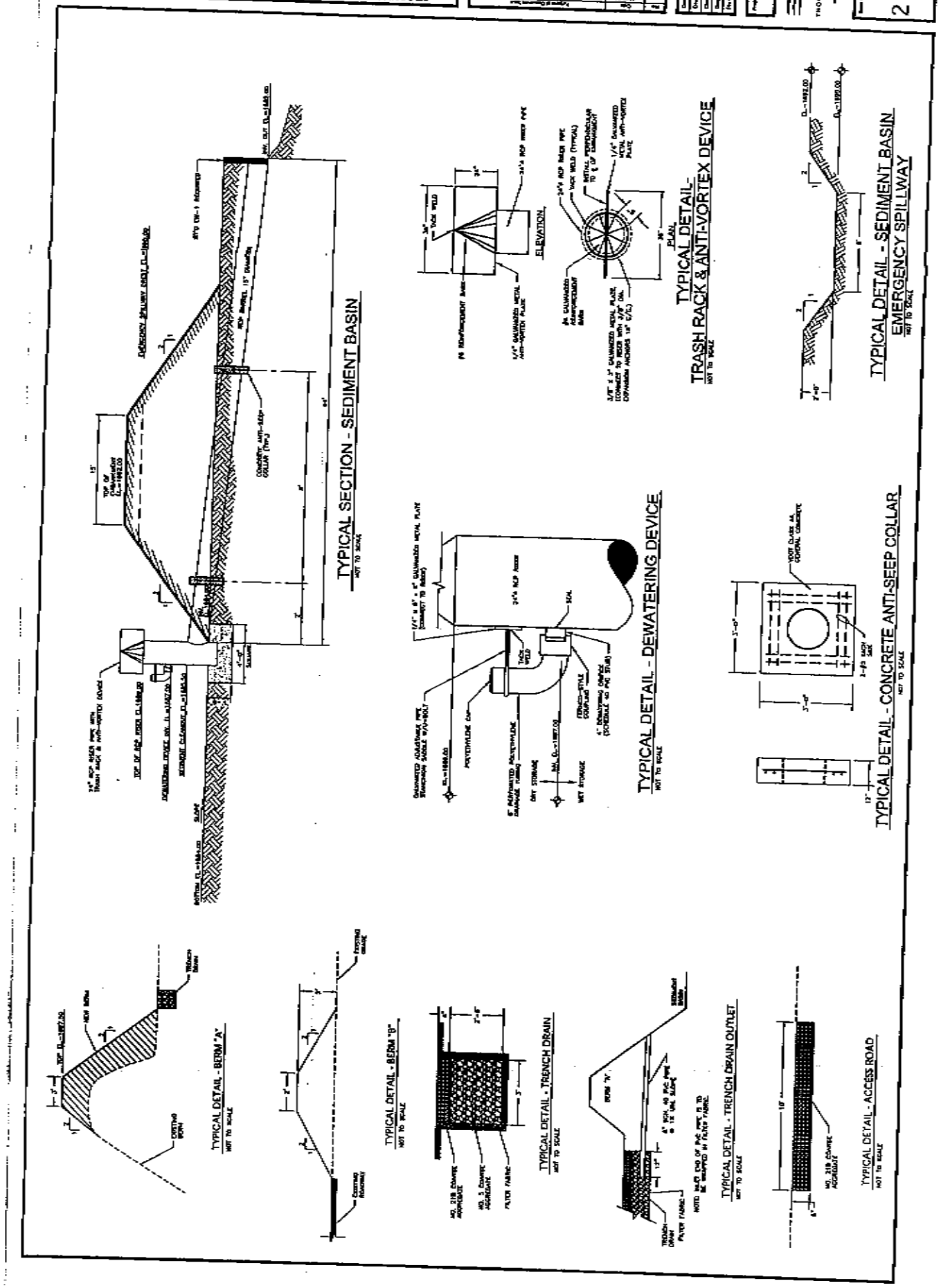
SECTION II

CONSTRUCTION DRAWINGS


STORMWATER MANAGEMENT IMPROVEMENTS
RADFORD ARMY AMMUNITION PLANT
OPEN BURNING GROUND
SITE PLAN
7998-00
1 OF 2
SCALE: 1" = 40'
CONTOUR INTERVAL = 2'
GRAPHIC SCALE
MATCHLINE THIS SHEET
NEW RIVER
ACCESS ROAD
1700.3
1694.9
1699.0
1690
1680
B-426
A-426


STORMWATER MANAGEMENT IMPROVEMENTS
RADFORD ARMY AMMUNITION PLANT
OPEN BURNING GROUND
MISCELLANEOUS DETAILS
7998-00
2 OF 2
TYPICAL SECTION - SEDIMENT BASIN
NOT TO SCALE
TYPICAL DETAIL - TRASH RACK & ANTI-VORTEX DEVICE
NOT TO SCALE
TYPICAL DETAIL - SEDIMENT BASIN EMERGENCY SPILLWAY
NOT TO SCALE
TYPICAL DETAIL - DEWATERING DEVICE
NOT TO SCALE
TYPICAL DETAIL - CONCRETE ANTI-SEEP COLLAR
NOT TO SCALE
TYPICAL DETAIL - BERM "A"
NOT TO SCALE
TYPICAL DETAIL - BERM "B"
NOT TO SCALE
TYPICAL DETAIL - TRENCH DRAIN
NOT TO SCALE
TYPICAL DETAIL - TRENCH DRAIN OUTLET
NOT TO SCALE
TYPICAL DETAIL - ACCESS ROAD
NOT TO SCALE

SECTION III

COST ESTIMATE

Engineer's Estimate of Probable Construction Cost
RAAP - OBG Stormwater Manangement Improvements
90% Plans - 5/3/05

Item No.	Item Description	Quantity	Unit	Unit Price	Total
1	Berm 'A', complete, in place.	1	LS	$14,000.00	$14,000.00
2	Berm 'B', complete, in place.	1	LS	$4,500.00	$4,500.00
3	Concrete Retaining Wall (VDOT St'd RW-3), complete, in place.	1	LS	$13,000.00	$13,000.00
4	30-inch storm drain, complete, in place.	28	LF	$45.00	$1,260.00
5	15-inch storm drain, complete, in place.	60	LF	$30.00	$1,800.00
6	12-inch storm drain, complete, in place.	57	LF	$25.00	$1,425.00
7	Sediment Pond, complete, in place.	1	LS	$12,000.00	$12,000.00
8	Trench Drain, including stone & fabric, complete, in place.	1	LS	$29,500.00	$29,500.00
9	Aggregate for Access Road (W=10'), complete, in place.	675	Ton	$15.00	$10,125.00
10	Miscellaneous site grading, seeding, complete, in place.	1	LS	$5,000.00	$5,000.00
11	Mobilization, bonds, taxes, & etc....	1	LS	$5,556.60	$5,556.60
				Sub-Total	**$98,166.60**
				Construction Contingency (10%)	$9,816.66
				Total Construction	**$107,983.26**

SECTION IV

DESIGN CALCULATIONS

Stormwater Management Improvements for the Open Burning Ground at the Radford Army Ammunition Plant Radford, Virginia

Design Narrative / Calculations – 90% Review Document

The purpose of the stormwater management improvements for the Open Burning Ground (OBG) at the Radford Army Ammunition Plant (RAAP) are as follows:

1. develop a run-on control system capable of preventing flow onto the OBG during peak discharge from the 24-hour, 25-year storm; and
2. develop a run-off control system to collect and control the water volume resulting from a 24-hour, 25-year storm within the limits of the OBG.

It should be noted that the proposed run-on / run-off control system will not be constructed to prevent flooding of the OBG site due to the 25-year flood elevation of the New River, which is approximately 1702 feet. It is our understanding that flooding events along this stretch of the river are not considered "flash" floods and that the Claytor Lake Dam, which is located upstream of the OBG site, provides an additional buffer with respect to how quickly the various flood stages are reached at the OBG site. Furthermore, AEP – the operator of the Claytor Lake Dam- provides advance notice to the RAAP during flooding events which require significant increases in water releases from the dam. The aforementioned method of operation in concert with the soil sampling program and the standard operating procedures for the OBG site will provide a means by which to ensure that waste will be removed prior to flood waters reaching the site.

The overall run-on / run-off control system for the OBG site will consist of the following design facilities: diversion / containment berms, culverts, a trench drain and a sediment pond. These facilities are depicted in Exhibit I.

As presented in Exhibit I, four (4) drainage areas were identified for consideration in the design of the run-on / run-off control system for the OBG site. The 24-hour, 25-year peak discharge associated with each drainage area is summarized as follows:

1. Drainage Area 1 (DA1)= 3.61 cfs
2. Drainage Area 2 (DA2)= 37.50 cfs
3. Drainage Area 3 (DA3)= 24.48 cfs
4. Drainage Area 4 (DA4)= 21.95 cfs

The peak discharge computations for the aforementioned were based on the Rational Method and are presented in Attachment 1. It should be noted that the OBG site is situated within Drainage Area 3.

In order to prevent flow from DA's 1 and 2 from running onto the OBG site (DA3) a diversion berm (Berm B) will be constructed along the northern boundary. A 15-inch culvert will be installed to the west of the OBG site to carry the discharge associated with the 24-hour, 25-year flow from DA1 to an existing RAAP outfall. As presented in Attachment 2 the15-inch culvert has been designed to carry the aforementioned flow without surcharging (i.e., HW/D = 1) or encroaching upon the northern toe of Berm B. The discharge from DA2 will follow its existing drainage path to the northeast of the OBG site to its discharge at the RAAP's existing Outfall 12. The existing drainage path is comprised of the following facilities: drainage swale, 18-inch CMP culvert (crushed to a 16-inch opening at the inlet) and a drainage ditch. The calculations presented in Attachment 3 illustrate that the existing drainage swale can accommodate the 24-hour, 25-year flow from DA2 without encroaching upon the toe of Berm B. The existing culvert will surcharge due to the 24-hour, 25-year peak discharge flow attributable to DA's 2 and 4. However, the roadway in the vicinity of the existing culvert will be overtopped at an elevation of approximately 1694.5 feet causing the flow to concentrate at the existing drainage ditch downstream of the culvert. The capacity of the downstream ditch (Outfall 12) will accommodate the aforementioned flows, thereby, preventing the flow from backing up to an elevation (i.e., 1699.7 feet) which would overtop the diversion berm (Berm B) at the OBG site (see Attachment 4).

The run-off control system for the OBG site (DA3) will collect and control the volume of water associated with the 24-hour, 25-year flow from DA3 via the construction of the following: containment berm (Berm A), a trench drain, a 30-inch culvert and a sediment basin. In order to contain the water within the OBG site, Berm A will be constructed along the southern boundary between the site and the New River. The berm will be constructed to maintain an elevation of 1697.50 feet, which matches the highest elevation along the existing berm and permits the maintenance of a 10 foot wide travel way between the toe of Berm A and the burning pans. The water collected within the OBG site will discharge from the site via a 30-inch culvert located in the southeast corner. Water within the site will flow to the inlet of the 30-inch culvert through a combination of sheet flow and a trench drain located at the northern toe of Berm A. The calculations presented in Attachments 2 and 5 illustrate the capability of the 30-inch culvert to convey the flow from DA3 without surcharging (i.e., HW/D = 1) and the flow capacity / velocity associated with the channel created between the northern face of Berm A and the burning pan embankment.

Flow discharging from the OBG site via the 30-culvert will be detained in a sediment basin located outside of Berm A to the northeast of the site. Stormwater releases from the sediment basin will be controlled via a principal spillway which will discharge to the New River through the RAAP's existing Outfall 17. The sediment basin will be designed / constructed in accordance with the latest edition of the "Virginia Erosion & Sediment Control Handbook," by the Department of Conservation and Recreation (Std & Spec

3.14 – Temporary Sediment Basin). The design calculations for the sediment basin are presented in Attachment 6.

The design calculations associated with flows along the northern embankments of both Berm A and B indicate velocities less than 2 feet per second (fps), therefore the berms will be constructed with compacted soil and stabilized via the application / maintenance of a vegetative cover. The earthen berms shall be constructed of off-site soils with a Unified Soil Classification of SC, GC and/or CL. Each layer of fill material shall be compacted to not less than 95 percent of the maximum dry density at optimum moisture content as determined by ASTM D 698, Standard Proctor Method.

Attachments:
Exhibit I
Attachment 1 - Drainage Area Calculations
Attachment 2 – Culvert Sizing
Attachment 3 – Existing Swale Evaluation
Attachment 4 – Existing Culvert & Ditch Evaluation
Attachment 5 – Berm A Velocity Calculation
Attachment 6 – Sediment Basin Design Calculations

EXHIBIT

ENFORCEMENT CONFIDENTIAL

FOIA EXEMPT

DO NOT RELEASE

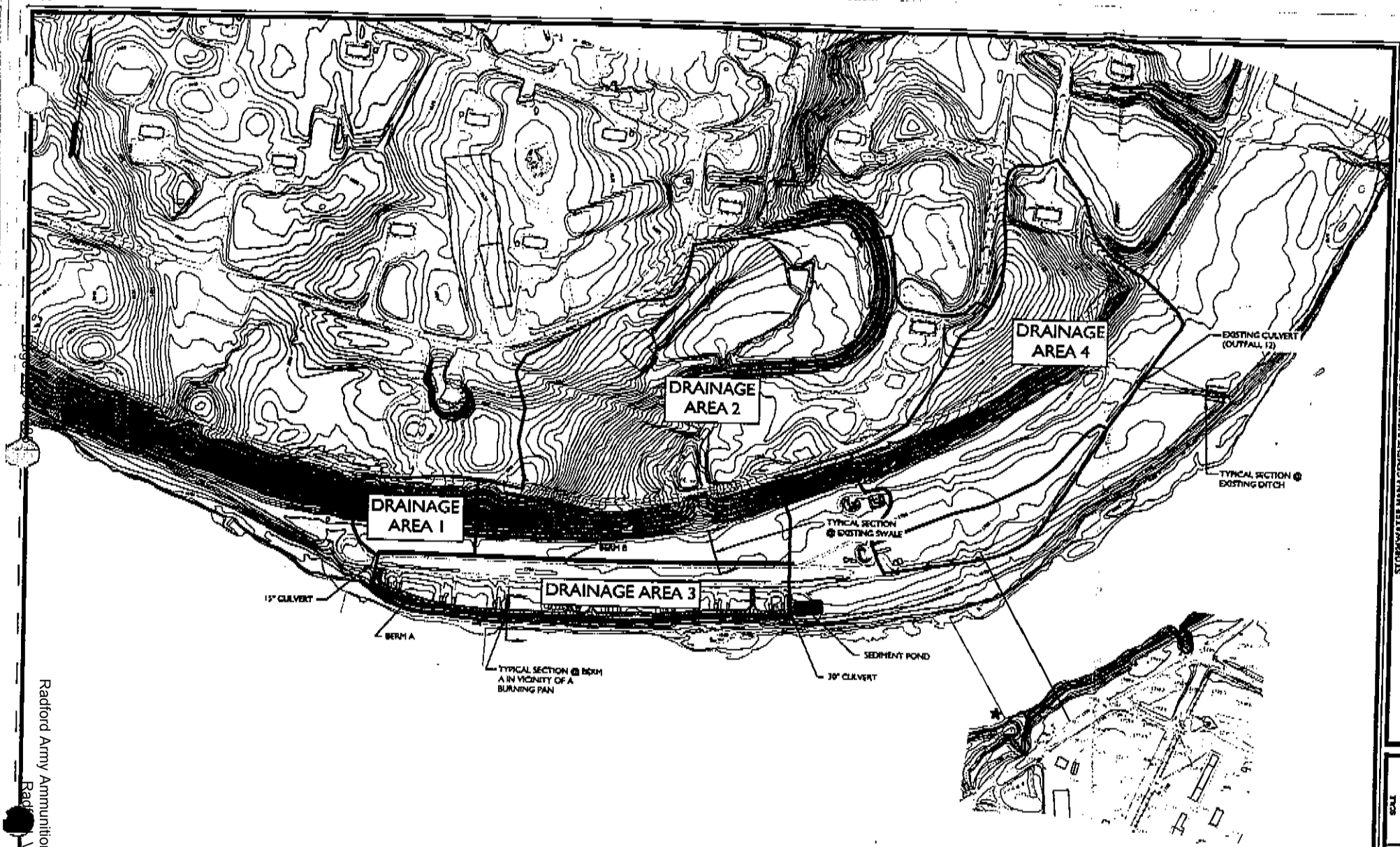


EXHIBIT 1
DRAINAGE AREA/PROPOSED FACILITY MAP

ATTACHMENT NO. 1

RAAP - OBG Stormwater Manangement Improvements
DA 1

Find Q-25
Rational Method Q=CiA

DA 1 = 2.53 acres

Travel Time, Tc
200 ft overland flow, dense vegetation, 57.5% slope
Plate 5-1 To = 12.3 min (based on 20% slope)
260 ft shallow concentrated, dense vegetation, 5% slope
Plate 5-2 v = 3.6 fps
Tsc = L/60V = 1.2 min

Time of Concentration, Tc
Tc = To + Tsc = 13.5 min

Rainfall Intensity, I25
Plate 5-14 I25 = 5.7 in per hr

Runoff Coefficient, C

Unimproved	0.1 to	0.3 from Table 5-2		
Woodlands	0.05 to	0.25	USE C=	0.25

Q-25 = 3.61 cfs

RAAP - OBG Stormwater Manangement Improvements
DA 2

Find Q-25
Rational Method Q=CiA

DA 2 = 29.41 acres

Travel Time, Tt
200 ft overland flow, dense vegetation, 20% slope
Plate 5-1 To = 12.3 min (based on 20% slope)
1000 ft shallow concentrated, dense vegetation, 5% slope
Plate 5-2 v = 3.6 fps
Tsc = L/60V = 4.6 min

Time of Concentration, Tc
Tc = To + Tsc = 16.9 min

Rainfall Intensity, I25
Plate 5-14 I25 = 5.1 in per hr

Runoff Coefficient, C

Unimproved	0.1 to	0.3 from Table 5-2	
Woodlands	0.05 to	0.25	USE C= 0.25

Q-25 = 37.50 cfs

RAAP - OBG Stormwater Manangement Improvements
DA 3

Find Q-25
Rational Method Q=CiA

DA 3 = 6.26 acres

Travel Time, Tt
200 ft overland flow, improved & graveled, 3% slope
Plate 5-1 To = 9.3 min
1000 ft channel flow, improved & graveled, 0.5% slope
Plate 5-3 Tch = 12 min

Time of Concentration, Tc
Tc = To + Tch = 21.3 min

Rainfall Intensity, I25
Plate 5-14 I25 = 4.6 in per hr

Runoff Coefficient, C
Drive and Walks 0.75 to 0.85 from Table 5-2
USE C= 0.85

Q-25 = 24.48 cfs

RAAP - OBG Stormwater Manangement Improvements
DA 4

Find Q-25
Rational Method Q=CiA

DA 1 = 15.4 acres

Travel Time, Tt
200 ft overland flow, dense vegetation, 57.5% slope
Plate 5-1 To = 12.3 min (based on 20% slope)
1000 ft shallow concentrated, dense vegetation, 5% slope
Plate 5-2 v = 3.6 fps
Tsc = L/60V = 4.6 min

Time of Concentration, Tc
Tc = To + Tsc = 16.9 min

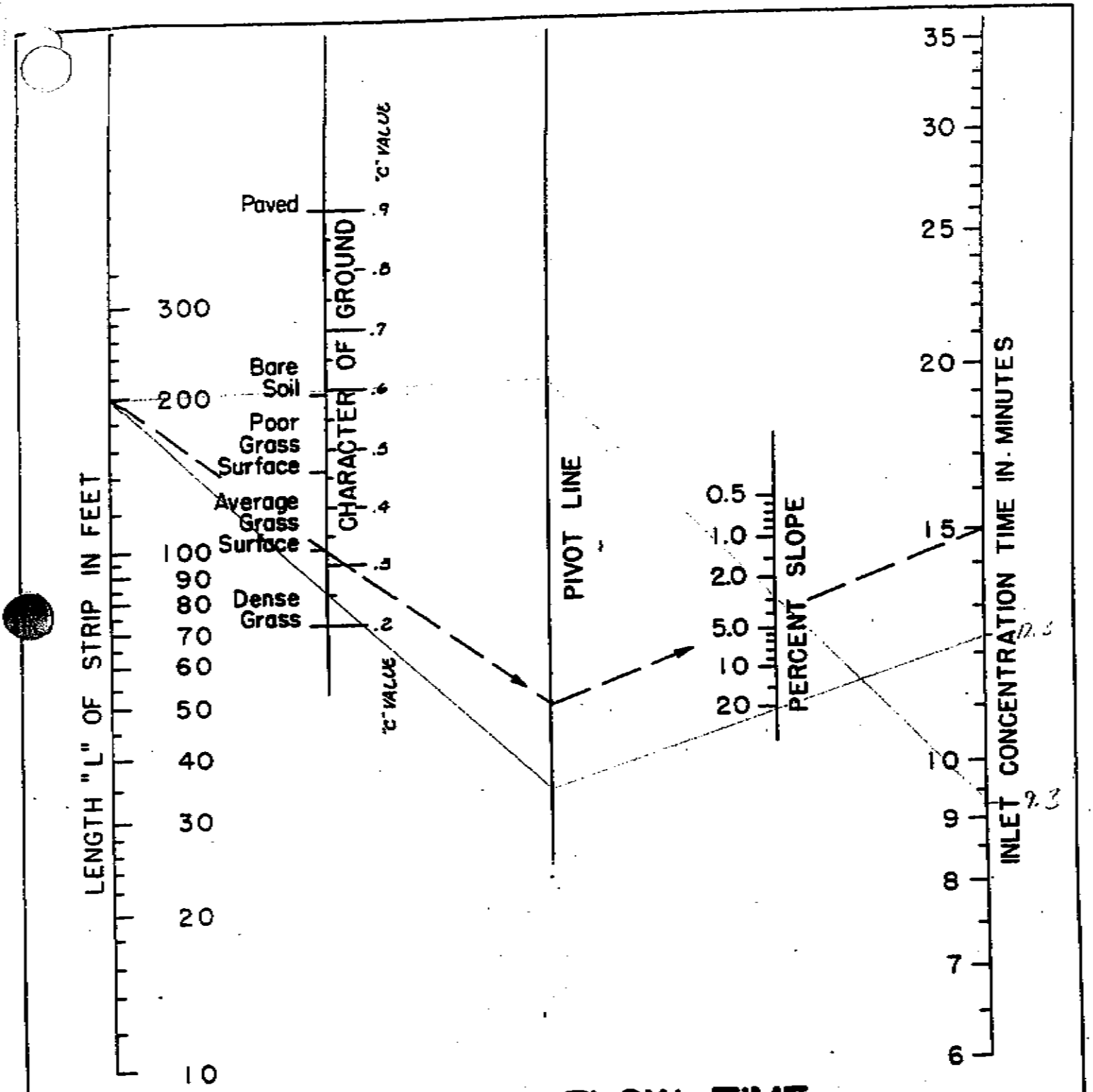
Rainfall Intensity, I25
Plate 5-14 I25 = 3.57 in per hr

Runoff Coefficient, C

Unimproved	0.1 to	0.3 from Table 5-2		
Woodlands	0.05 to	0.25	USE C=	0.25

Q-25 = 21.95 cfs

1992



OVERLAND FLOW TIME

(Seelye Chart)

Source: Data Book for Civil Engineers, E.E. Seelye

Plate 5-1

AVERAGE VELOCITIES FOR ESTIMATING TRAVEL TIME FOR SHALLOW CONCENTRATED FLOW

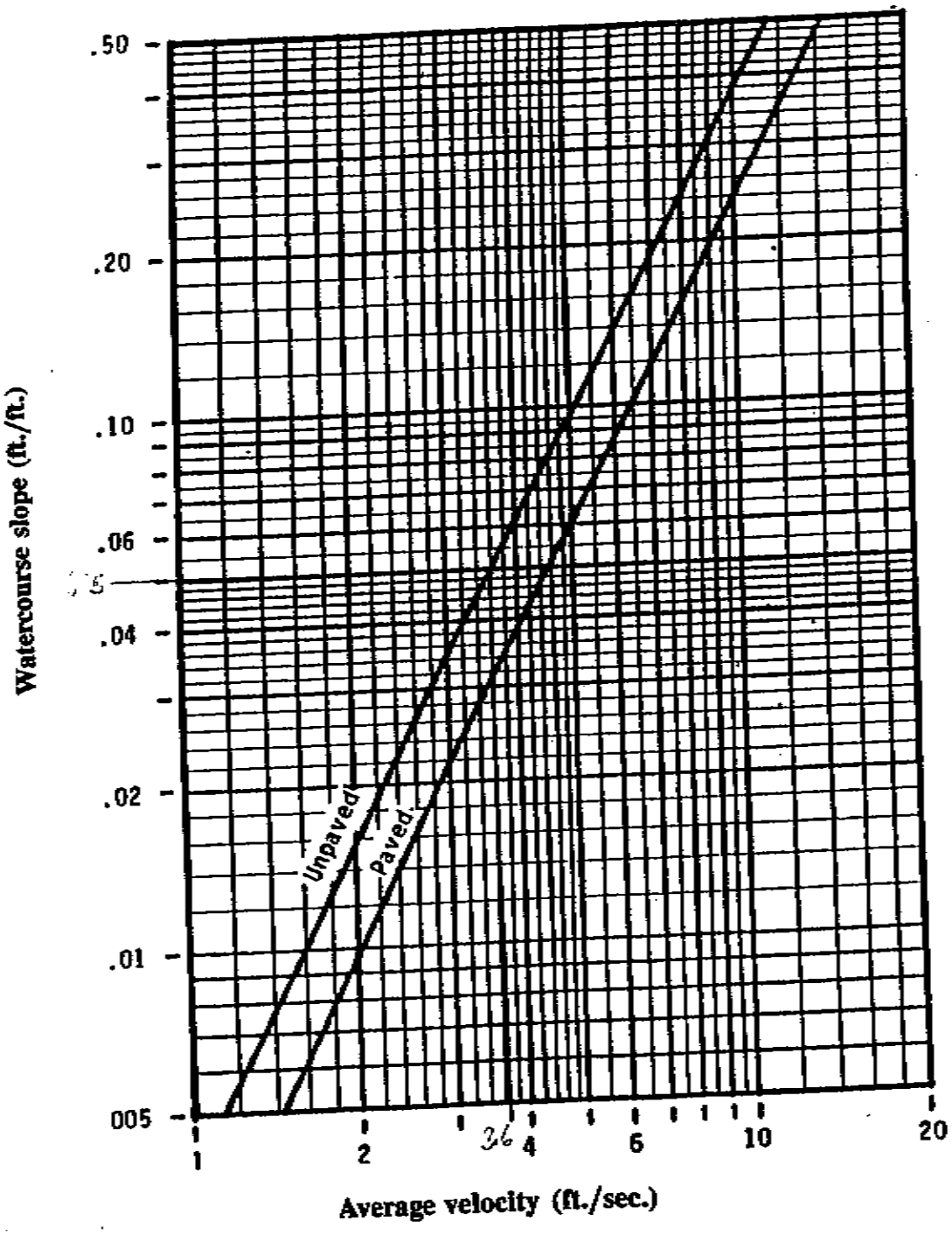
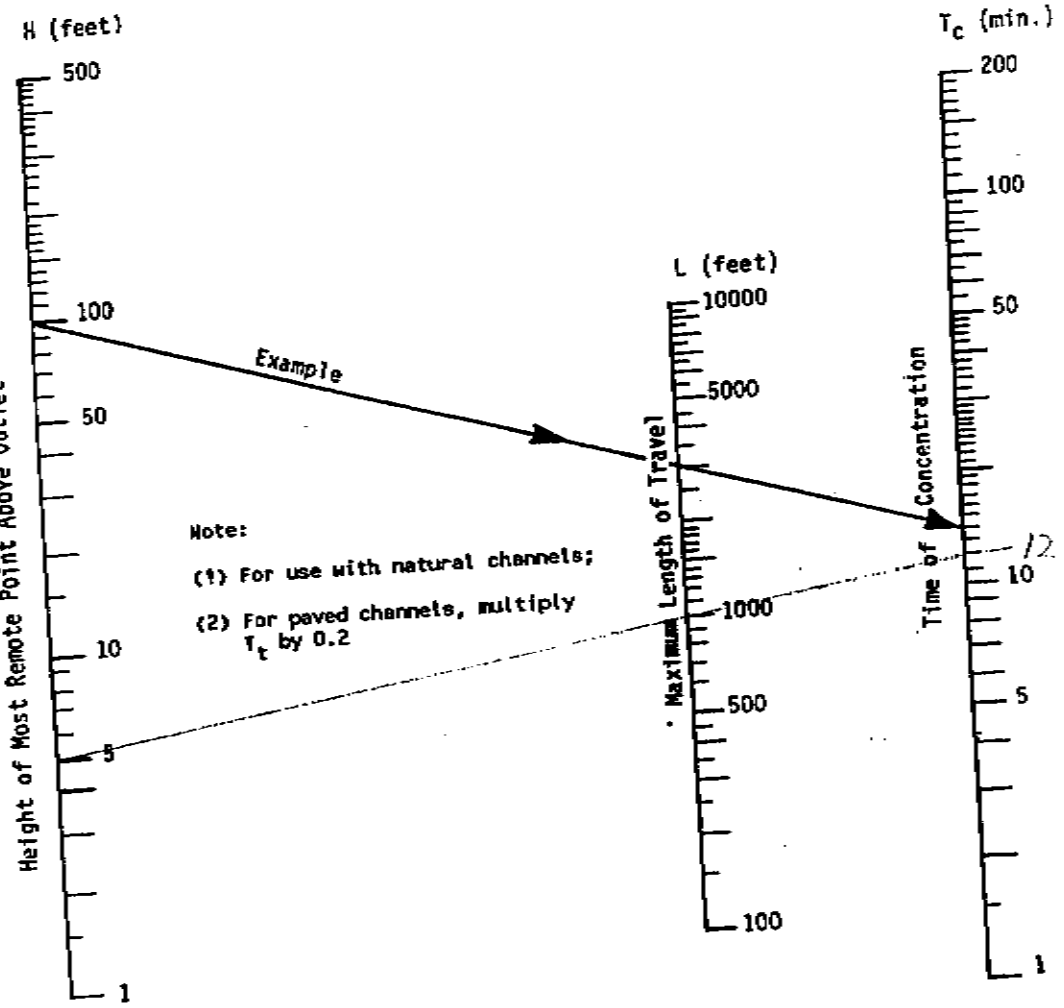


Plate 5-2

Source: USDA-SCS

TRAVEL TIME FOR CHANNEL FLOW
(Kirpich Chart)

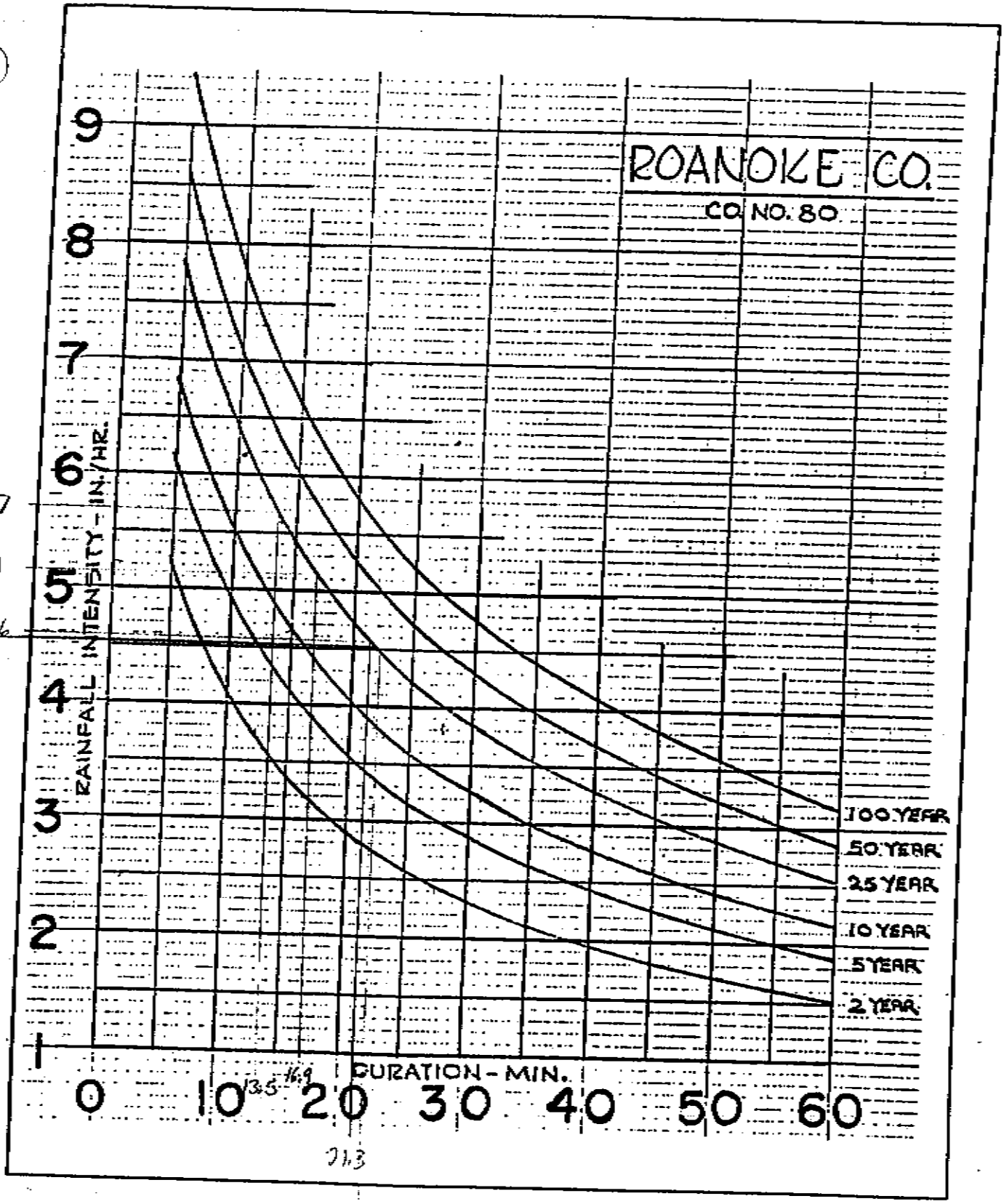


TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

Plate 5-3

Source: VDOT

1992



Source: VDOT

Plate 5-14

ATTACHMENT NO. 2

New Culvert Sizing

DA 1

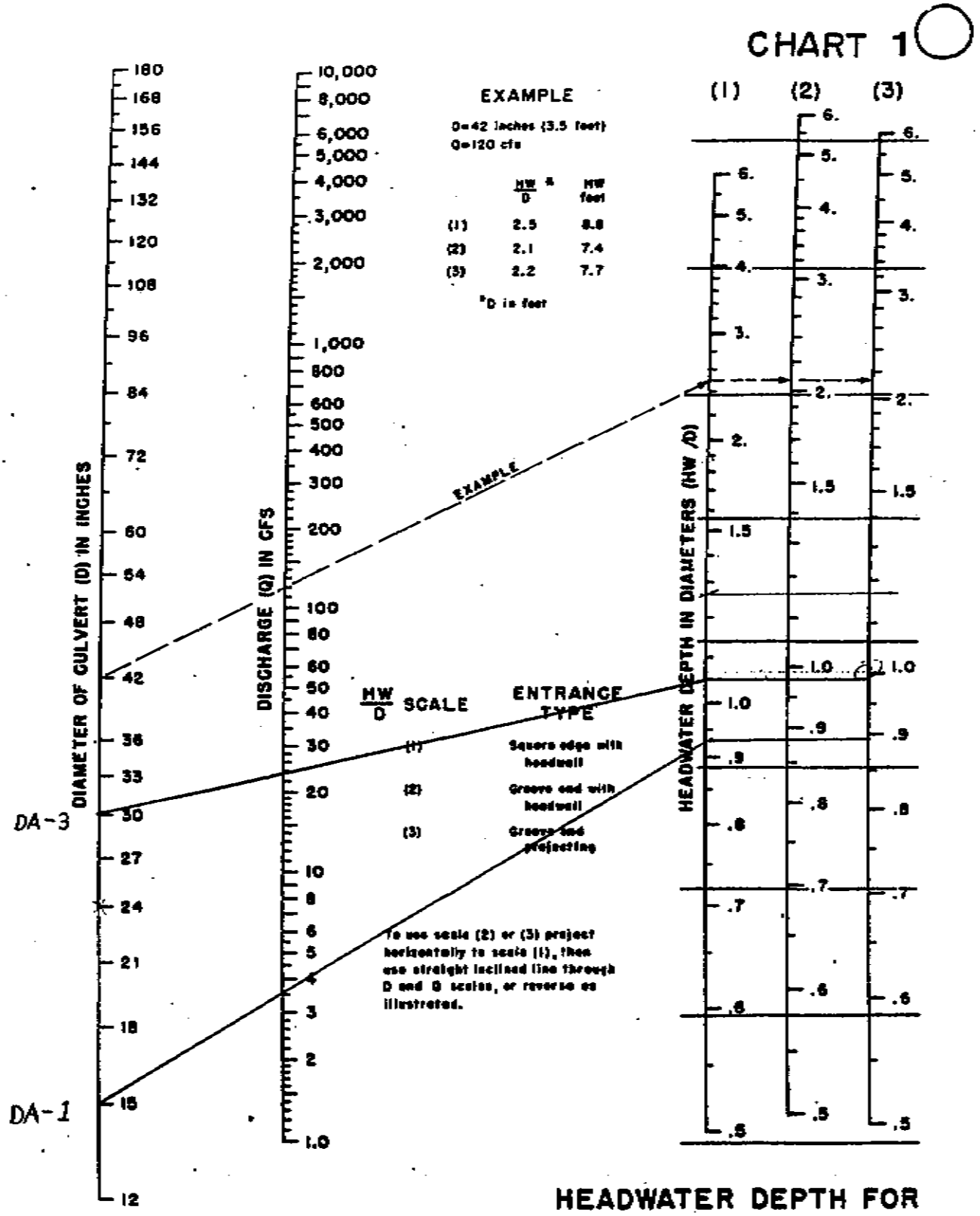
Q25 = 3.61 cfs
n = 0.013
Assume inlet control
Groove end projecting entrance type
Maintain HW/D less than or equal to 1

Chart 1 pipe diameter = 15 inch
HW/D = 0.88

DA 3

Q25 = 24.48 cfs
n = 0.013
Assume inlet control
Groove end projecting entrance type
Maintain HW/D less than or equal to 1

Chart 1 pipe diameter = 30 inch
HW/D = 0.97



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

181

ATTACHMENT NO. 3

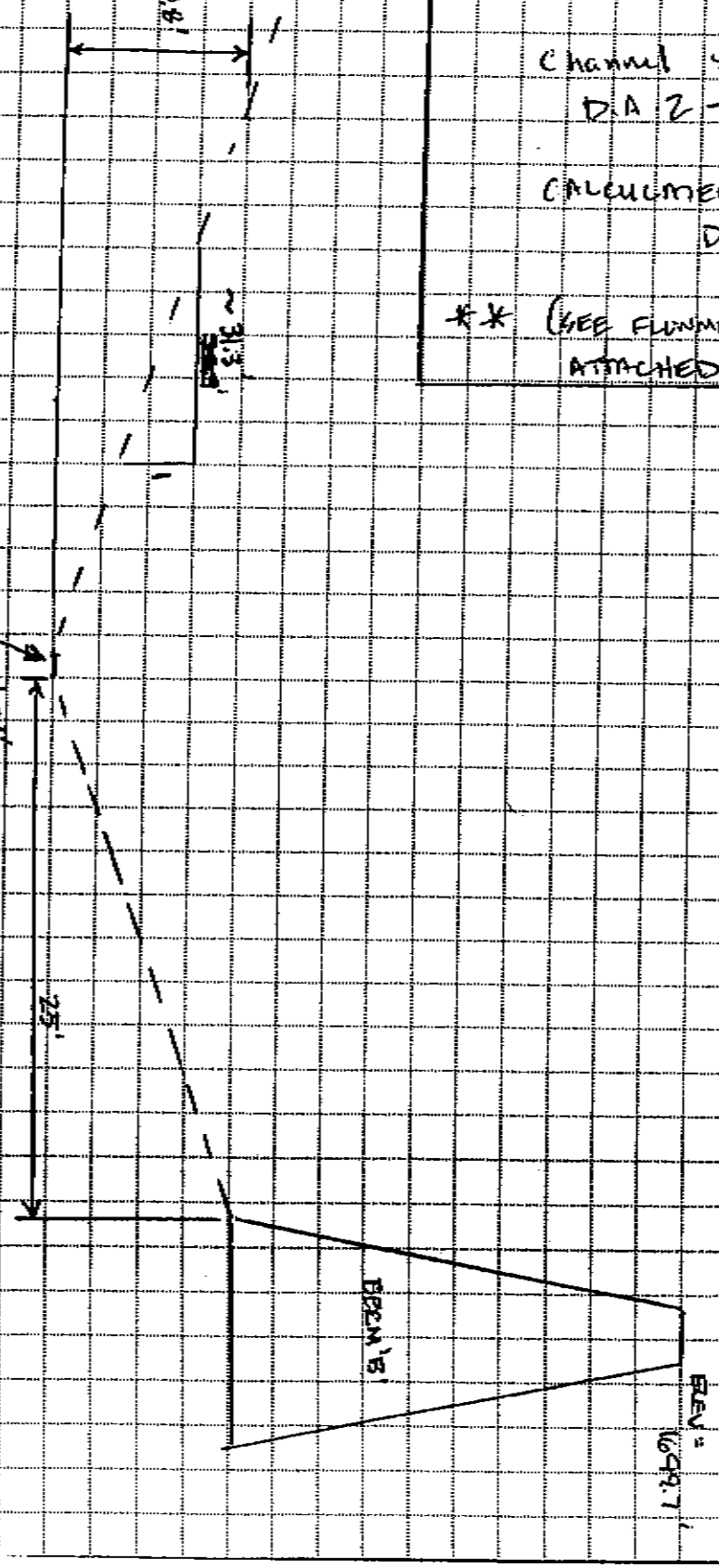
THOMPSON & LITTON
103 East Main Street • P.O. Box 1307
Wise, Virginia 24293
Telephone (276) 328-2161 • FAX (276) 328-1738

JOB RAAP - OBG SWM
PROJ. NO. 7990-00 SHEET NO. 1 OF 2
CALCULATED BY GHH DATE 1/31/05
CHECKED BY DATE
DESCRIPTION CHANNEL EVALUATION

n = 0.03
Channel SLOPE = 0.45%
D.A 2 - Q_{25} = 37.5 cfs

CALCULATED FLOW DEPTH = 0.80'

** (SEE FLOWMASTER PRINTOUT ATTACHED)



TYPICAL SECTION @ EXISTING SWALE
(NOTE - ANALYZE AS A TRAPEZOIDAL CHANNEL)

10

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: RAAP BERM B CHANNEL

Comment: CHANNEL EVALUATION FOR DA-2 AT Q25

Solve For Depth

Given Input Data:

Bottom Width.....	1.00 ft
Left Side Slope..	31.30:1 (H:V)
Right Side Slope.	31.30:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0045 ft/ft
Discharge.....	37.50 cfs

Computed Results:

Depth.....	0.80 ft
Velocity.....	1.82 fps
Flow Area.....	20.60 sf
Flow Top Width...	50.80 ft
Wetted Perimeter.	50.82 ft
Critical Depth...	0.60 ft
Critical Slope...	0.0194 ft/ft
Froude Number....	0.50 (flow is Subcritical)

Open Channel Flow Module, Version 3.43 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

ATTACHMENT NO. 4

Q_{25} Headwater Depth for Existing Culvert

DA 4 + DA 2

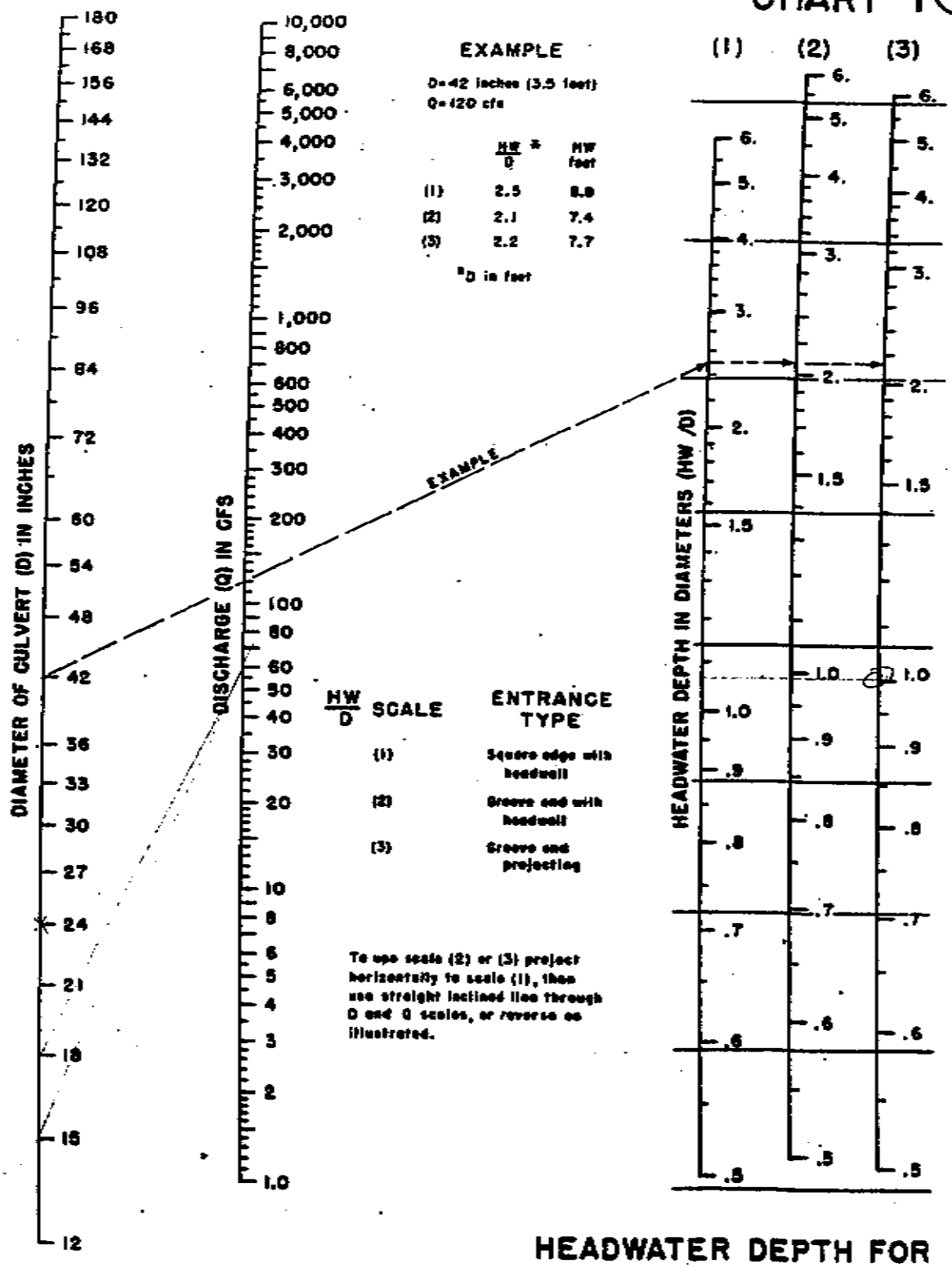
1) Q25 = 59.44 cfs
n = 0.013
Assume inlet control
Groove end projecting entrance type
Maintain HW/D less than or equal to 1

Chart 1 pipe diameter = 18 inch
HW/D = >6

2) Q25 = 59.44 cfs
n = 0.013
Assume inlet control
Groove end projecting entrance type
Maintain HW/D less than or equal to 1

Chart 1 pipe diameter = 15 inch
HW/D = >6

CHART 1



HEADWATER SCALES 2&3
REVISED MAY 1964

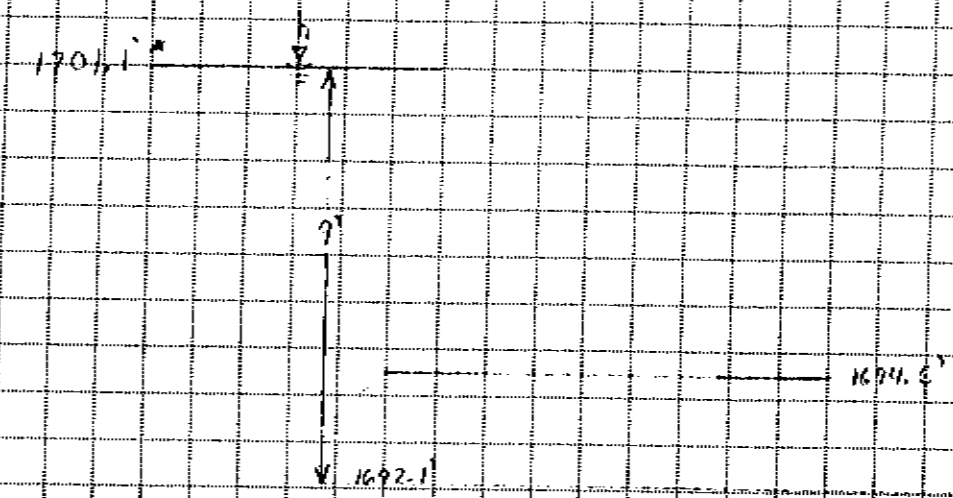
BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

181

THOMPSON & LITTON
103 East Main Street • P.O. Box 1307
Wise, Virginia 24293
Telephone (276) 328-2161 • FAX (276) 328-1738

JOB
PROJ. NO. SHEET NO. OF
CALCULATED BY DATE
CHECKED BY DATE
DESCRIPTION

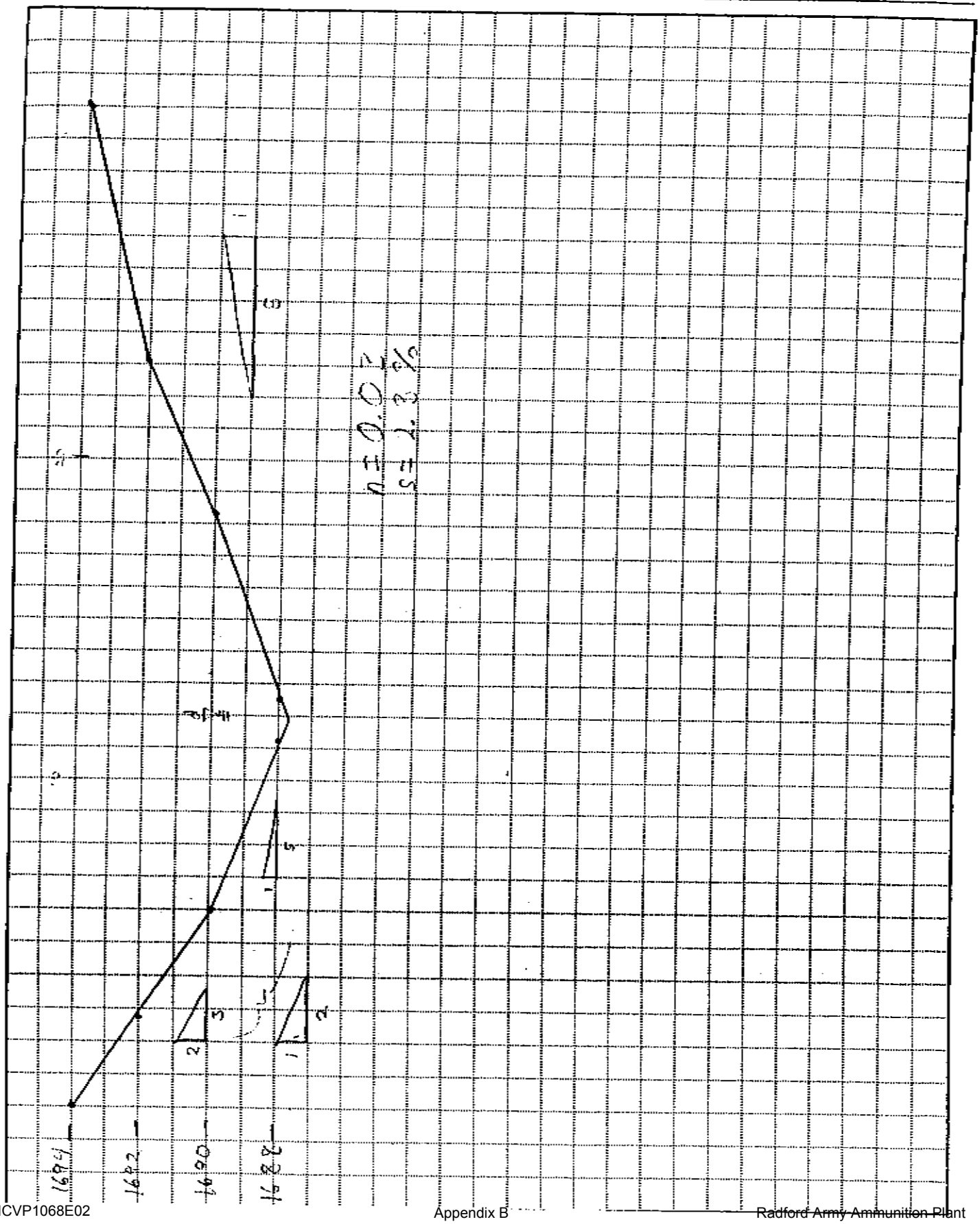


HW/D ⇒ 6 × 18" HW = 9'

* note: WATER WILL OVERFLOW ROAD PRIOR TO OBTAINING THE SURCHARGE ELEVATION OF 1701.1 FT.

THOMPSON & LITTON
103 East Main Street • P.O. Box 1307
Wise, Virginia 24293
Telephone (276) 328-2161 • FAX (276) 328-1738

JOB BAAP OBG SWMA
PROJ. NO. 7998-00 SHEET NO. ____ OF ____
CALCULATED BY ____ DATE ____
CHECKED BY ____ DATE ____
DESCRIPTION DA 4 [illegible]



Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: RAAP OBG SWM

Comment: DA-4 Exit Channel

Solve For Depth

Given Input Data:

Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	5.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0230 ft/ft
Discharge.....	59.44 cfs

Computed Results:

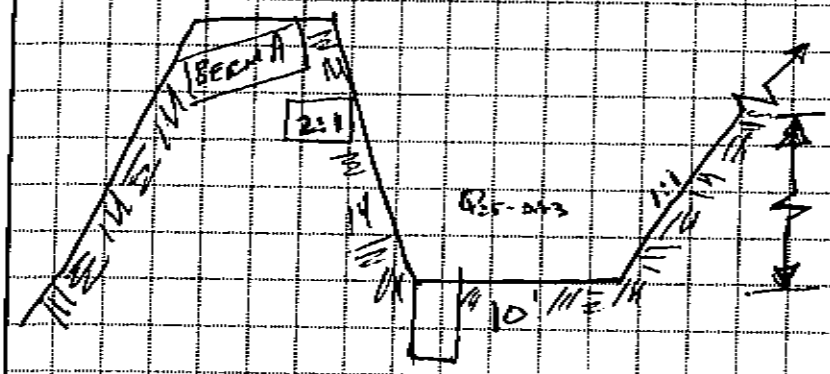
Depth.....	1.63 ft
Velocity.....	6.36 fps
Flow Area.....	9.34 sf
Flow Top Width...	11.44 ft
Wetted Perimeter.	11.98 ft
Critical Depth...	1.78 ft
Critical Slope...	0.0145 ft/ft
Froude Number....	1.24 (flow is Supercritical)

Open Channel Flow Module, Version 3.43 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

ATTACHMENT NO. 5

THOMPSON & LITTON
103 East Main Street • P.O. Box 1307
Wise, Virginia 24293
Telephone (276) 328-2161 • FAX (276) 328-1738

JOB
PROJ. NO. 7448-00 SHEET NO. 1 OF 1
CALCULATED BY DATE 3/1/05
CHECKED BY DATE
DESCRIPTION



Slope = 0.0645%
(0.0006)
n = 0.025
Q_{25-DA3} = 24.48 cfs

TYPICAL SECTION @ BERM A IN THE VICINITY OF A BURNING PAN

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BERM A SCOUR

Comment: Interior velocity/depth at Q25

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	1.00:1 (H:V)
Manning's n.....	0.025
Channel Slope....	0.0006 ft/ft
Discharge.....	24.48 cfs

Computed Results:

Depth.....	1.33 ft
Velocity.....	1.53 fps
Flow Area.....	16.01 sf
Flow Top Width...	14.00 ft
Wetted Perimeter.	14.87 ft
Critical Depth...	0.55 ft
Critical Slope...	0.0118 ft/ft
Froude Number....	0.25 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: BERM A SCOUR

Comment: Interior velocity/depth at Q25

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	1.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0006 ft/ft
Discharge.....	24.48 cfs

Computed Results:

Depth.....	1.48 ft
Velocity.....	1.35 fps
Flow Area.....	18.11 sf
Flow Top Width...	14.45 ft
Wetted Perimeter.	15.41 ft
Critical Depth...	0.55 ft
Critical Slope...	0.0170 ft/ft
Froude Number....	0.21 (flow is Subcritical)

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ATTACHMENT NO. 6

SEDIMENT BASIN DESIGN CALCULATIONS

1992

3.14

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project RADFORD ARMY AMMUNITIONS PLANT

Basin # N/A Location SEE SITE PLAN

Total area draining to basin: 6.3 acres.

Basin Volume Design

Wet Storage:

1. Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).

   67 cu. yds. x 6.3 acres = 422.1 cu. yds.

2. Available basin volume = 442.35 cu. yds. at elevation 1687. (From storage - elevation curve)

3. Excavate _____ cu. yds. to obtain required volume*.

   * Elevation corresponding to required volume = invert of the dewatering orifice.

4. Available volume before cleanout required.

   33 cu. yds. x 6.3 acres = 207.9 cu. yds.

5. Elevation corresponding to cleanout level = 1685.5.

   (From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 1.5 ft. (Min. = 1.0 ft.)

Dry Storage:

7. Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).

   67 cu. yds. x 6.3 acres = 422.1 cu. yds.

8. Total available basin volume at crest of riser* = 844.83 cu. yds. at elevation 1689. (From Storage - Elevation Curve)

* Minimum = 134 cu. yds./acre of total drainage area.

9. Diameter of dewatering orifice = 4 in.

10. Diameter of flexible tubing = 6 in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 1689

Top of Dam = 1692

Design High Water = 1690

Upstream Toe of Dam = 1684

Basin Shape

12. Length of Flow / Effective Width $\frac{L}{We}$ = 2.9

If > 2, baffles are not required ✓

If < 2, baffles are required _____

Runoff

13. Q_2 = 10.52 cfs (From Chapter 5)

14. Q_{25} = 17.28 cfs (From Chapter 5)

Principal Spillway Design

15. With emergency spillway, required spillway capacity $Q_p = Q_2$ = 10.52 cfs. (riser and barrel)

Without emergency spillway, required spillway capacity $Q_p = Q_{25}$ = N/A cfs. (riser and barrel)

16. With emergency spillway:

Assumed available head (h) = 1.0 ft. (Using Q_2)

h = Crest of Emergency Spillway Elevation - Crest of Riser Elevation

Without emergency spillway:

Assumed available head (h) = N/A ft. (Using Q_{25})

h = Design High Water Elevation - Crest of Riser Elevation

17. Riser diameter (D_r) = 24 in. Actual head (h) = 0.75 ft.

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

18. Barrel length (l) = 64 ft.

Head (H) on barrel through embankment = 8 ft.

(From Plate 3.14-7).

19. Barrel diameter = 15 in.

(From Plate 3.14-B [concrete pipe] or Plate 3.14-A [corrugated pipe]).

20. Trash rack and anti-vortex device

Diameter = 36 inches.

Height = 13 inches.

(From Table 3.14-D).

Emergency Spillway Design

21. Required spillway capacity $Q_e = Q_{25} - Q_p$ = 6.76 cfs.

22. Bottom width (b) = 8 ft.; the slope of the exit channel (s) = 3.7 ft./foot; and the minimum length of the exit channel (x) = 36 ft.
(From Table 3.14-C).

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = 5 ft.

Slope of upstream face of embankment (Z) = 2 :1.

Slope of principal spillway barrel (S_b) = 3.03 %

Length of barrel in saturated zone (L_s) = 34 ft.

24. Number of collars required = 2 dimensions = 3'x3'

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 1692

Design High Water = 1689.75

Emergency Spillway Crest = 1690

Principal Spillway Crest = 1689

Dewatering Orifice Invert = 1687

Cleanout Elevation = 1685.5

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = 1684

SEDIMENT BASIN VOLUMES

ELEVATION	AREA(SF)	VOLUME(CY)	CUMULATIVE VOLUME(CY)
1684	3165.49		
		127.20	127.20
1685	3703.51		
		147.13	274.33
1686	4241.53		
		168.01	442.35
1687	4831.155		
		189.85	632.20
1688	5420.78		
		212.63	844.83
1689	6061.125		
		236.34	1081.17
1690	6701.47		
		261.66	1342.83
1691	7428.305		
		288.58	1631.41
1692	8155.14		

SIZING OF DEWATERING ORIFICE:

Calculate diameter of dewatering orifice, where:

A = flow area of orifice, in square feet
d = diameter of orifice, in feet
h = average driving head, in feet
Q = volumetric flow rate through orifice needed to achieve approximate 6-hour drawdown, in cubic feet per second
S = total storage available in dry storage area, in cubic feet
Q = S/21,600 seconds

S = (422.1 cy)(27 cf/cy) = 11,397 cf

Q = S/21,600sec
Q = 11,397 cf/21,600 sec = 0.53 cfs

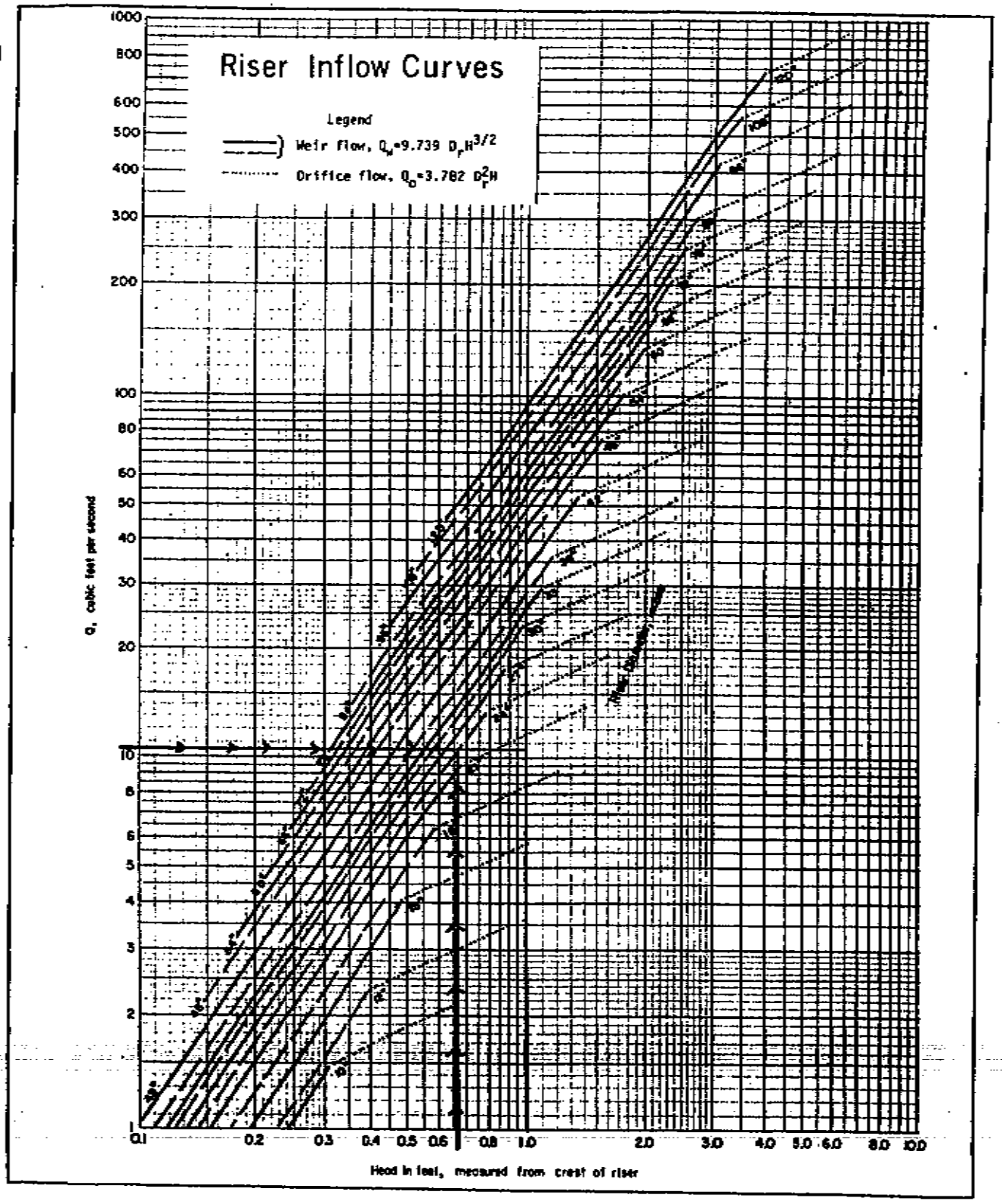
$A = Q/(64.32 \times h)^{0.5} (0.6)$
$A = 0.53 \text{ cfs}/(64.32 \times 1)^{0.5} (0.6) = 0.11 \text{ sf}$

$d = 2 \times (A/3.14)^{0.5}$
$d = 2 \times (0.11/3.14)^{0.5} = 0.37 \text{ ft} = 4.5 \text{ inches}$

USE – 4 inch diameter orifice

1992

3.14



Source: USDA-SCS

Plate 3.14-8

TABLE 3.14-B
PIPE FLOW CHART, n = 0.013

FOR REINFORCED CONCRETE PIPE INLET $K_e = K_e + K_b = 0.65$ AND 70 FEET OF REINFORCED CONCRETE PIPE CONDUIT (full flow assumed)

Note correction factors for pipe lengths other than 70 feet

diameter of pipe in inches

H, in feet	12"	15"	18"	21"	24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"
1	3.22	5.44	8.29	11.8	15.9	26.0	38.6	53.8	71.4	91.5	114	139	167	197	229	264	302	342
2	4.55	7.69	11.7	16.7	22.5	36.8	54.6	76.0	101	129	161	197	236	278	324	374	427	483
3	5.57	9.42	14.4	20.4	27.5	45.0	66.9	93.1	124	159	198	241	289	341	397	458	523	592
4	6.43	10.9	16.6	23.5	31.8	52.0	77.3	108	143	183	228	278	334	394	459	529	604	683
5	7.19	12.2	18.5	26.3	35.5	58.1	86.4	120	160	205	255	311	373	440	513	591	675	764
6	7.88	13.3	20.3	28.8	38.9	63.7	94.6	132	175	224	280	341	409	482	562	647	739	837
7	8.51	14.4	21.9	31.1	42.0	68.8	102	142	189	242	302	368	441	521	607	699	798	904
8	9.10	15.4	23.5	33.3	44.9	73.5	109	152	202	259	323	394	472	557	685	748	854	966
9	9.65	16.3	24.9	35.3	47.7	78.0	116	161	214	275	342	418	500	590	688	793	905	1025
10	10.2	17.2	26.2	37.2	50.2	82.2	122	170	226	289	361	440	527	622	725	836	954	1080
11	10.7	18.0	27.5	39.0	52.7	86.2	128	178	237	304	379	462	553	653	761	877	1001	1133
12	11.1	18.9	28.7	40.8	55.0	90.1	134	186	247	317	395	482	578	682	794	916	1045	1184
13	11.6	19.6	29.9	42.4	57.3	93.7	139	194	257	330	411	502	601	710	827	953	1088	1232
14	12.0	20.4	31.0	44.1	59.4	97.1	145	201	267	342	427	521	624	736	858	989	1129	1278
15	12.5	21.1	32.1	45.6	61.5	101	150	208	277	354	442	539	646	762	888	1024	1169	1323
16	12.9	21.8	33.2	47.1	63.5	104	155	215	286	366	457	557	667	787	917	1057	1207	1367
17	13.3	22.4	34.2	48.5	65.5	107	159	222	294	377	471	574	688	812	946	1090	1244	1409
18	13.7	23.1	35.2	49.9	67.4	110	164	228	303	388	484	591	708	835	973	1121	1280	1450
19	14.0	23.7	36.1	51.3	69.2	113	168	234	311	399	497	607	727	858	1000	1152	1315	1489
20	14.4	24.3	37.1	52.6	71.0	116	173	240	319	409	510	623	746	880	1026	1182	1350	1528
21	14.7	24.9	38.0	53.9	72.8	119	177	246	327	419	523	638	764	902	1051	1211	1383	1566
22	15.1	25.5	38.9	55.2	74.5	122	181	252	335	429	535	653	782	923	1076	1240	1415	1603
23	15.4	26.1	39.8	56.5	76.2	125	186	258	342	439	547	668	800	944	1100	1268	1447	1639
24	15.8	26.7	40.6	57.7	77.8	127	189	263	350	448	559	682	817	964	1123	1295	1478	1674
25	16.1	27.2	41.5	58.9	79.4	130	193	269	357	458	571	696	834	984	1147	1322	1509	1708
26	16.4	27.7	42.3	60.0	81.0	133	197	274	364	467	582	710	850	1004	1169	1348	1539	1742
27	16.7	28.3	43.1	61.2	82.5	135	201	279	371	476	593	723	867	1023	1192	1373	1568	1775
28	17.0	28.8	43.9	62.3	84.1	138	204	285	378	484	604	737	883	1041	1214	1399	1597	1808
29	17.3	29.3	44.7	63.4	85.5	140	208	290	384	493	615	750	898	1060	1235	1423	1625	1840
30	17.6	29.8	45.4	64.5	87.0	142	212	294	391	501	625	763	913	1078	1256	1448	1653	1871
L, in feet	Correction Factors For Other Pipe Lengths																	
20	1.30	1.24	1.21	1.18	1.15	1.12	1.10	1.08	1.07	1.06	1.05	1.05	1.04	1.04	1.03	1.03	1.03	1.03
30	1.22	1.18	1.15	1.13	1.12	1.09	1.08	1.06	1.05	1.05	1.04	1.04	1.03	1.03	1.03	1.02	1.02	1.02
40	1.15	1.13	1.11	1.10	1.08	1.07	1.05	1.05	1.04	1.03	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02
50	1.09	1.08	1.07	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.02	1.02	1.02	1.01	1.01	1.01	1.01	1.01
60	1.04	1.04	1.03	1.03	1.03	1.02	1.02	1.02	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
70	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
80	.96	.97	.97	.97	.98	.98	.98	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99
90	.93	.94	.94	.95	.95	.96	.97	.97	.98	.98	.98	.98	.98	.99	.99	.99	.99	.99
100	.90	.91	.92	.93	.93	.95	.95	.96	.97	.97	.97	.98	.98	.98	.98	.98	.98	.99
120	.84	.86	.87	.89	.90	.91	.93	.94	.94	.95	.96	.96	.96	.97	.97	.97	.97	.98
140	.80	.82	.83	.85	.86	.88	.90	.91	.92	.93	.94	.94	.95	.95	.96	.96	.96	.97
160	.76	.78	.80	.82	.83	.86	.88	.89	.90	.91	.92	.93	.94	.94	.95	.95	.95	.96

Source: USDA-SCS

TABLE 3.14-D

CONCENTRIC TRASH RACK AND ANTI-VORTEX DEVICE DESIGN TABLE

Riser Diam., in.	Cylinder		Height, inches	Minimum Size Support Bar	Minimum Top	
	Diameter, inches	Thickness, gage			Thickness	Stiffener
12	18	16	6	#6 Rebar or 1½ x 1½ x 3/16 angle	16 ga. (F&C)	-
15	21	16	7	" "	" "	-
18	27	16	8	" "	" "	-
21	30	16	11	" "	16 ga.(C), 14 ga.(F)	-
24	36	16	13	" "	" "	-
27	42	16	15	" "	" "	-
36	54	14	17	#8 Rebar	14 ga.(C), 12 ga.(F)	-
42	60	16	19	" "	" "	-
48	72	16	21	1¼" pipe or 1¼ x 1¼ x ¼ angle	14 ga.(C), 10 ga.(F)	-
54	78	16	25	" "	" "	-
60	90	14	29	1½" pipe or 1½ x 1½ x ¼ angle	12 ga.(C), 8 ga.(F)	-
66	96	14	33	2" pipe or 2 x 2 x 3/16 angle	12 ga.(C); 8 ga.(F) w/stiffener	2 x 2 x ¼ angle
72	102	14	36	" "	" "	2½ x 2½ x ¼ angle
78	114	14	39	2½" pipe or 2 x 2 x ¼ angle	" "	" "
84	120	12	42	2½" pipe or 2½ x 2½ x ¼ angle	" "	2½ x 2½ x 5/16 angle

Note$_1$: The criterion for sizing the cylinder is that the area between the inside of the cylinder and the outside of the riser is equal to or greater than the area inside the riser. Therefore, the above table is invalid for use with concrete pipe risers.

Note$_2$: Corrugation for 12"-36" pipe measures 2⅔" x ½"; for 42" -84" the corrugation measures 5" x 1" or 8" x 1".

Note$_3$: C = corrugated; F = flat.

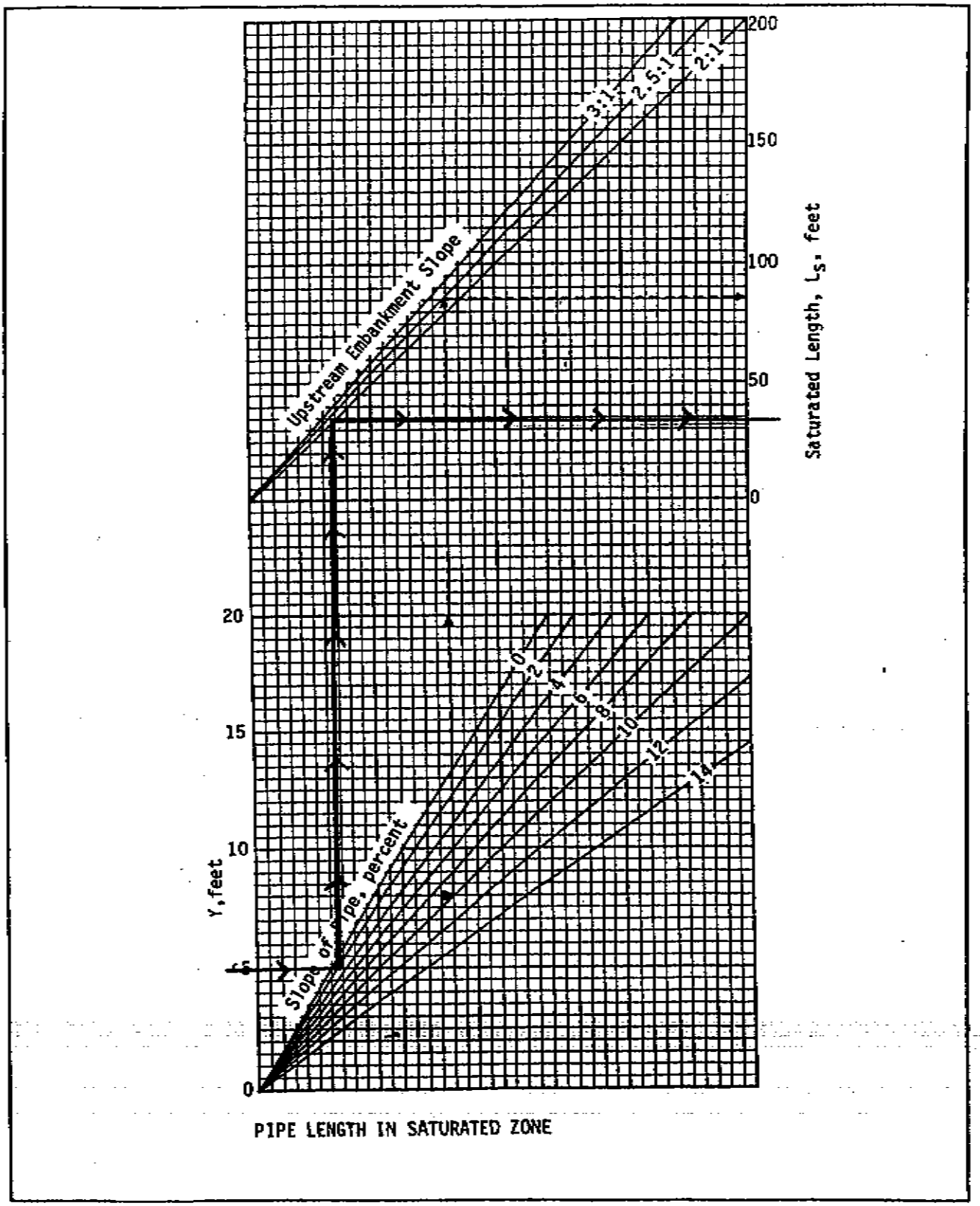
Source: Adapted from USDA-SCS and Carl M. Henshaw Drainage Products Information.

TABLE 3.14-C

DESIGN DATA FOR EARTH SPILLWAYS

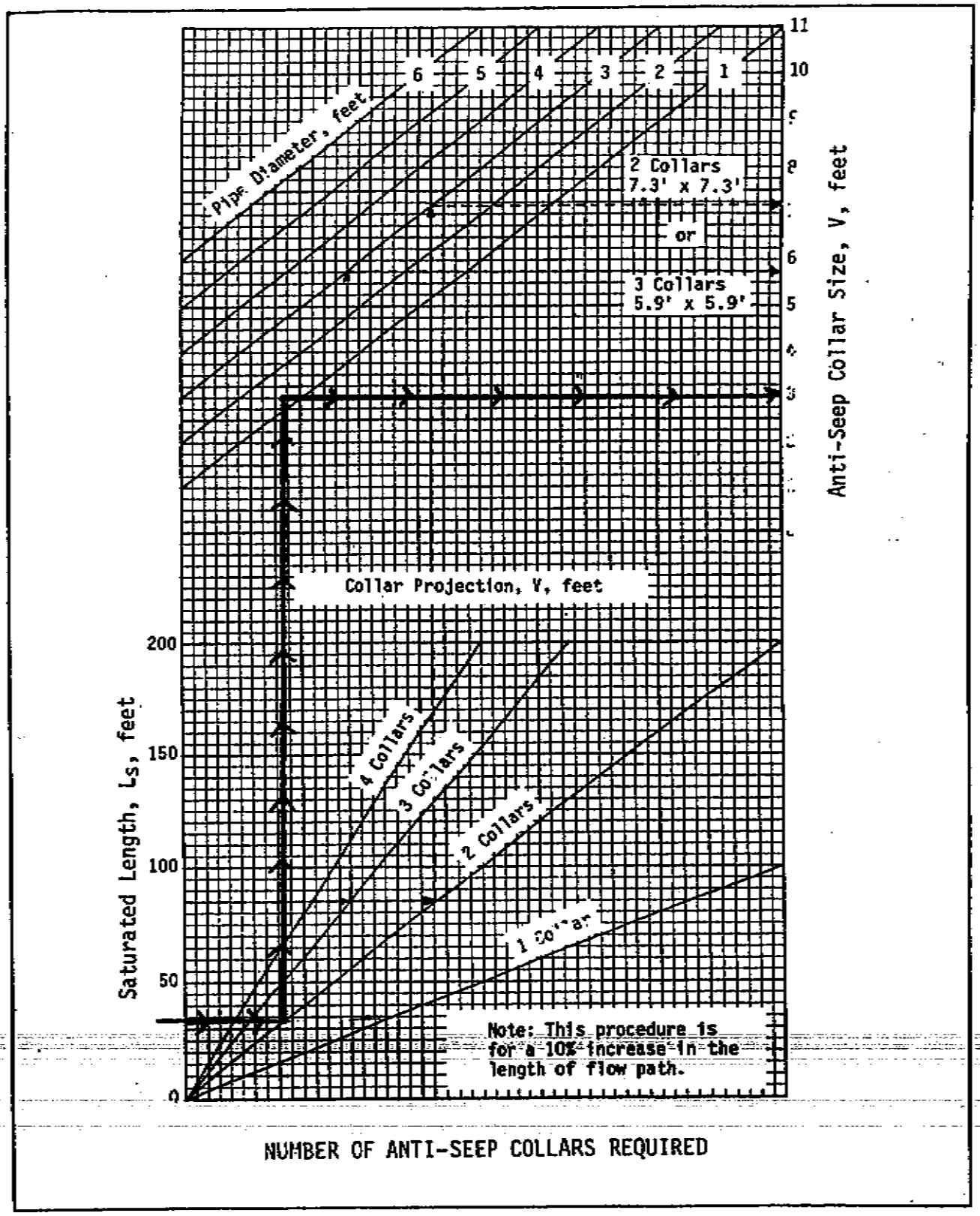
STAGE (H) IN FEET	SPILLWAY VARIABLES	BOTTOM WIDTH (b) IN FEET																
		0	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
0.5	Q	6	7	8	10	11	13	14	15	17	18	20	21	22	24	25	27	28
	V	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
	S	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
	X	32	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
0.6	Q	[illegible]	10	12	14	16	18	20	22	24	26	28	30	32	34	35	37	39
	V	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	S	3.7	3.7	3.7	3.7	3.6	3.7	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
	X	36	36	36	36	36	36	37	37	37	37	37	37	37	37	37	37	37
0.7	Q	11	13	16	18	20	23	25	28	30	33	35	38	41	43	44	46	49
	V	3.2	3.2	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
	S	3.5	3.5	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
	X	39	40	40	40	41	41	41	41	41	41	41	41	41	41	41	41	41
0.8	Q	13	16	19	22	26	29	32	35	38	42	45	48	48	51	54	57	60
	V	3.5	3.5	3.5	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
	S	3.3	3.3	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
	X	44	44	44	44	45	45	45	45	45	45	45	45	45	45	45	45	45
0.9	Q	17	20	24	28	32	35	39	43	47	51	55	57	60	64	68	71	75
	V	3.7	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
	S	3.2	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
	X	47	47	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
1.0	Q	20	24	29	33	38	42	47	51	56	61	65	68	72	77	81	86	90
	V	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	S	3.1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	X	51	51	51	51	52	52	52	52	52	52	52	52	52	52	52	52	52
1.1	Q	23	28	34	39	44	49	54	60	65	70	74	79	84	89	95	100	105
	V	4.2	4.2	4.2	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
	S	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
	X	55	55	55	55	55	55	55	56	56	56	56	56	56	56	56	56	56
1.2	Q	26	32	40	45	51	58	64	69	74	80	86	92	98	104	110	116	122
	V	4.4	4.4	4.4	4.4	4.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
	S	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
	X	58	58	59	59	59	59	59	59	60	60	60	60	60	60	60	60	60
1.3	Q	32	38	46	53	59	65	73	80	86	91	99	106	112	119	125	133	140
	V	4.6	4.6	4.6	4.6	4.6	4.6	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7
	S	2.8	2.8	2.8	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
	X	62	62	62	63	63	63	63	63	63	63	63	64	64	64	64	64	64
1.4	Q	37	44	51	59	66	74	82	90	98	105	111	119	127	134	142	150	158
	V	4.7	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
	S	2.8	2.7	2.7	2.7	2.7	2.7	2.7	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
	X	65	66	66	66	66	67	67	67	67	67	67	68	68	68	68	68	68
1.5	Q	41	50	58	66	75	85	92	101	109	116	125	133	142	150	160	169	178
	V	4.8	4.9	4.9	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.1	5.1	5.1
	S	2.7	2.7	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.5	2.5	2.5
	X	69	69	70	70	71	71	71	71	71	71	71	72	72	72	72	72	72
1.6	Q	46	56	65	75	84	94	104	112	122	132	142	149	159	169	179	187	197
	V	5.0	5.1	5.1	5.1	5.1	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
	S	2.6	2.6	2.6	2.6	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	X	73	74	74	75	76	76	76	76	76	76	76	76	76	76	76	76	76
1.7	Q	52	62	73	83	94	105	116	126	135	145	156	167	178	187	198	208	217
	V	5.2	5.2	5.2	5.3	5.3	5.3	5.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
	S	2.6	2.6	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	X	78	78	79	80	80	80	80	80	80	80	80	80	80	80	80	80	80
1.8	Q	58	69	81	93	104	116	127	139	150	160	171	182	194	204	214	226	237
	V	5.3	5.4	5.4	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.6	5.6	5.6	5.6	5.6	5.6
	S	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
	X	80	82	83	84	84	84	84	84	84	84	84	84	84	84	84	84	84
1.9	Q	64	76	89	102	114	127	140	152	164	176	188	201	213	225	235	248	260
	V	5.5	5.6	5.6	5.6	5.6	5.6	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
	S	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
	X	84	85	86	87	88	88	88	88	88	88	88	88	88	88	88	88	88
2.0	Q	71	83	97	111	125	138	153	164	178	193	204	218	232	245	256	269	283
	V	5.6	5.7	5.7	5.7	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.9	5.9	5.9	5.9	5.9	5.9
	S	2.5	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
	X	89	90	91	91	91	91	92	92	92	92	92	92	92	92	92	92	92
2.1	Q	77	91	107	122	135	149	162	177	192	207	220	234	250	267	276	291	305
	V	5.7	5.8	5.9	5.9	5.9	5.9	5.9	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
	S	2.4	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
	X	93	93	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96
2.2	Q	84	100	116	131	146	163	177	194	210	224	239	255	269	288	301	314	330
	V	5.9	5.9	6.0	6.0	6.0	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2
	S	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
	X	98	98	99	99	99	99	99	100	100	100	100	100	100	100	100	100	100
2.3	Q	90	106	124	140	158	175	193	208	226	243	259	276	292	306	323	341	354
	V	6.0	6.1	6.1	6.1	6.2	6.2	6.2	6.2	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
	S	2.4	2.4	2.3	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
	X	100	102	102	103	103	103	104	104	104	105	105	105	105	105	105	105	105
2.4	Q	99	116	135	152	170	189	206	224	241	260	273	294	312	327	346	364	378
	V	6.1	6.2	6.2	6.3	6.3	6.3	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4
	S	2.3	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
	X	105	105	106	107	107	108	108	108	108	109	109	109	109	109	109	109	109

Source: USDA-SCS



Source: USDA-SCS

Plate 3.14-11



Source: USDA-SCS

Plate 3.14-12

ATTACHMENT III.B – WASTE MINIMIZATION PAN

Radford Army Ammunition Plant (RFAAP) has multiple waste minimization plans. Following the ISO 14000 format RFAAP has an Objective and Target for energetic waste implementation. Discussed below are some of the initiatives RFAAP has taken to reduce the amount of energetic waste burned at the OB Grounds and the amount of waste generated at the facility as a whole. In addition, RFAAP has multiple Pollution Prevention initiatives which restricts much of the how waste is disposed of at the facility..

In 2003 RFAAP developed a method for reusing the spent caustic and scrap nitrocellulose generated at the facility. Both were sent to the Biological Wastewater Treatment Plant where they acted as nutrients for the Bio Mass at the plant. This process enabled RFAAP to divert over 63,000 pounds of scrap nitrocellulose from the incinerators and OB Grounds in 2003 and reuse approximately 189,000 pounds of sodium hydroxide.

In previous years scraps from the ballistics range along with Medium Ammunition Caliber (MAC) lot overruns and rounds with minor defects were sent to either the incinerator or OB Ground for disposal. Primed cases from the MAC overruns which were previously sent to the OB Grounds are now being shipped to an off-site permitted Treatment Storage & Disposal Facility (TSDF). Additionally, RFAAP intends to activate a machine which would be able to recycle the aluminum and steel cases from the primers. This will reduce the amount of waste generated, as only the primer and flashtube would require thermal treatment.

One of RFAAP largest waste minimization programs is known as MK 90. Through MK 90 the United States (US) Army and RFAAP have been able to reuse a large portion of the scrap waste generated during the manufacturing process. This scrap waste would have been otherwise treated as a hazardous waste either at the incinerators or OB Ground. RFAAP has reused 347,309 pounds of scrap waste in 2001, 280,740 pounds in 2002 and 269,857 pounds in 2003. What was once a hazardous waste at RFAAP and was treated as one is now being utilized as a product.

Also, the United States (US) Army has developed a new training propellant that will reduce the toxicity of single base propellants. This is accomplished by removing the DNT from the propellant composition thus reducing the amount of hazardous waste generated. In addition, the US Army and Alliant Techsystems (ATK) are working injunction to investigate other methods of biodegradation of energetics as opposed to thermal treatment.

ATK through the use of the Six Sigma process and other quality programs are always looking for opportunities to increase the yield of the products it manufactures. The greater the yield would result in less hazardous waste generated.

The table below is a indicator that RFAAP has been reducing the amount of hazardous waste burned at the Open Burning Ground over the past couple years. This is a gross

weight. For safety reasons all of the energetic wastes are water wet, hence RFAAP does not have a Net Explosive Weight (NEW) for its hazardous waste.

POUNDS ENERGETIC TREATED

	2001	2002	2003	2004
Open Burning Ground	1,048,457	761,941	473,915	688752
Incinerator	1,055,985	881,493	700,732	795527
TOTAL	2,104,442	1,643,434	1,174,647	1,484,279
Per Cent Open Burned	49.82%	46.36%	40.35%	46.40%

WASTE MINIMIZATION GOALS

1. During the course of the OB Ground permit RFAAP will strive to maintain that no more than 40% of its generated energetic waste will be open burned. Energetic waste includes all reactive wastes and flammable solids.
2. During the course of this OB Ground permit RFAAP will strive to send more energetic waste that is toxic for lead to the incinerator than to the OB Ground on a quarterly basis.
3. RFAAP will continue to strive to increase yield of all of its products and to search for alternate technologies to reduce the amount of hazardous waste sent to the OB Ground.

MODULE IV
DETECTION MONITORING

IV.A. HIGHLIGHTS

The Open Burn/Open Detonation (OB/OD) area at the Radford Army Ammunition Plant (RAAP) is located on the southeastern end of of the Horseshoe Area on the flood plain of the New River and consists of eight above ground burning assemblies. Groundwater monitoring at the OB/OD site is to be conducted under a Detection Monitoring Program until such time that hazardous constituents related to the site are detected at statistically significant concentrations above background concentrations. At that time a permit modification is necessary that requires RAAP to enter into a Compliance Monitoring Program.

IV.B. DETECTION MONITORING REQUIREMENTS

IV.B.1. The Detection Monitoring Program requires semiannual monitoring of a background well and at downgradient point of compliance wells. Static groundwater elevation will be measured at all wells specified in **Permit Section IV.B.1.a**.during each sampling event.

a. Groundwater beneath the OB/OD shall be monitored with two background groundwater monitoring well and five downgradient point of compliance wells located as specified on the map presented in **Figure IV-1**. Monitoring wells 13MW-1 and 13MW-2 are the background wells for the OB/OD and monitoring wells 13MW-3, 13MW-4, 13MW-5, 13MW-6, and 13MW-7 are the point of compliance wells.

IV.B.2. The compliance point wells and background wells will be sampled in accordance with the Sampling and Analysis Plan **(Attachment IV.A)** and the following schedule:

a. **The background wells and downgradient point of compliance wells specified in Permit Section IV.B.1. will be sampled at least semiannually for the constituents listed in Attachment IV.B. Samples for each constituent will be collected using the methods specified in Attachment IV.A and analyses shall be obtained using the EPA SW-846 Methods specified in Attachment IV.B.**

b. Alternate SW-846 methods may be approved by the Director, provided the request is in writing and submitted 30 days prior to the sampling event. Proposed alternate methods must achieve the same Limit of Quanititation (or lower) as the specified method and meet the requirement of **Attachment IV.A Section III.C.**

IV.C. **WELL LOCATION, INSTALLATION AND CONSTRUCTION**

The Permittee shall maintain the groundwater monitoring system as specified below:

IV.C.1. The Permittee shall maintain groundwater monitoring wells 13MW-1, 13MW-2, 13MW-3, 13MW-4, 13MW-5, 13MW-6, and 13MW-7 at the locations specified on the map presented in **Figure IV-1**. If additional monitoring wells are required they shall be installed and sampled in accordance with the requirements of 40 CFR 264.97.

a. Boring logs for monitoring wells 13MW-1, 13MW-2, 13MW-3, 13MW-4, 13MW-5, 13MW-6, and 13MW-7 are included as **Attachment IV.A, Appendix 8.**

b. Monitoring well design and construction details for monitoring wells 13MW-1, 13MW-2, 13MW-3, 13MW-4, 13MW-5, 13MW-6, and 13MW-7 are included as **Attachment IV.A, Appendix 8.**

IV.C.2. All groundwater monitoring wells required by this permit shall be maintained in conformance with the following:

a. The groundwater monitoring system must yield samples in the background well that represent the quality of the background groundwater unaffected by leakage from any regulated unit, and from downgradient wells that yield samples representative of the quality of groundwater passing the compliance point.

b. The number and location of monitoring wells must be sufficient to identify and define all logical release pathways from the regulated unit to the uppermost aquifer based on site specific hydrogeologic characterization.

IV.C.3. The Permittee shall maintain the monitoring wells identified in **Permit Section IV.C.1.** of the Permit in accordance with the plans and specifications presented in **Attachment IV.A, Appendix 8.**

IV.C.4. **The Director must approve the addition or removal of all monitoring wells prior to installation or decommissioning.**

a. **All wells deleted from the monitoring program shall be plugged and** abandoned in accordance with **Attachment IV.A, Appendix 7.** Well plugging methods and abandonment certification shall be submitted to the Director within thirty (30) days from the date the wells are removed from the monitoring program.

b. All monitoring wells added to the existing groundwater monitoring system

described in **Permit Section IV.C.1.** must be constructed in accordance with the requirements of EPA's *RCRA Groundwater Monitoring Technical Enforcement Guidance Document* (TEGD) and approved by the Department **(Attachment IV.A, Appendix 5)**.

IV.D. **INDICATOR PARAMETERS AND MONITORING CONSTITUENTS**

IV.D.1. The Permittee shall monitor all wells as described in **Permit Section IV.C.1** for all parameters and constituents specified in **Attachment IV.B.**

IV.D.2. Background groundwater concentrations shall be established the first year subsequent to Permit issuance. Existing data may be used to establish background concentrations provided it is of sufficient quality. Established background values for parameters and constituents will be listed in **Attachment IV.C.**

IV.D.3. For those parameters and constituents in **Attachment IV.B** for which no accurate background values are established at the time the Permit is issued (or for constituents added to the monitoring program during the life of the Permit), the Permittee shall establish accurate background values in accordance with the procedures in **Attachment IV.A, Appendix 6.**

a. Background groundwater quality for a monitoring parameter or constituent shall be based on data from quarterly sampling of 13MW-1 and 13MW-2 for one year.

IV.E. **SAMPLING AND ANALYSIS PROCEDURES**

The Permittee shall use the following techniques and procedures when obtaining and analyzing samples from the groundwater monitoring wells described in **Permit Sections IV.C.**:

IV.E.1. Groundwater monitoring samples shall be collected using the techniques described in **Attachment IV.A.**

IV.E.2. Samples shall be preserved, packed, and shipped off-site for analysis in accordance with the procedures specified in **Attachment IV.A.**

IV.E.3. Samples shall be analyzed in accordance with the procedures specified in **Attachment IV.A** using the methods prescribed in **Attachment IV.B.**

IV.E.4. Samples shall be tracked and controlled using the chain-of-custody procedures specified in **Attachment IV.A.**

IV.E.5. The Permittee must determine the concentration of hazardous constituents and parameters listed in **Attachment IV.B** in the groundwater at the compliance point

at least semiannually.

IV.F. **ELEVATION OF THE GROUNDWATER SURFACE**

IV.F.1. The Permittee shall determine the groundwater surface elevation at each monitoring well (13MW-1, 13MW-2, 13MW-3, 13MW-4, 13MW-5, 13MW-6, and 13MW-7) each time groundwater is sampled in accordance with **Atachment IV.A**.

IV.F.2. The Permittee shall report the surveyed elevation of any additional or replacement monitoring well(s) when installed with as-built drawings. The total depth of wells and the elevation of the following shall be recorded: top of the casing, ground surface and/or apron elevation, and the top of the protective casing.

IV.G. **STATISTICAL PROCEDURES**

IV.G.1. When evaluating the monitoring results in accordance with **Permit Section IV.H.**, the Permittee shall use the procedures in **Attachment IV.A, Appendix 6**.

a. If the appropriate statistical test (specified in **Attachment IV.A, Appendix 6** and/or approved by the Director) indicates that the difference between the established background (or upgradient well concentration) and the downgradient well concentration is significant, the Permittee may resample within thirty (30) days of receipt of original laboratory data, not to exceed sixty days (60) from the date of original sample collection.

b. If the second round of analyses specified in **Permit Section IV.H.1.a.** indicates that the difference is significant, the Permittee shall conclude that a statistically significant change has occurred.

IV.H. **MONITORING PROGRAM AND DATA EVALUATION**

The Permittee shall determine groundwater quality as follows:

IV.H.1. The Permittee shall collect, preserve, and analyze groundwater samples pursuant to **Permit Section IV.E.**

IV.H.2. For each hazardous constituent identified in **Permit Section IV.D.**, the Permittee shall determine whether there is statistically significant evidence of increased contamination for any parameter or chemical constituent each time the concentration of hazardous constituents is monitored in groundwater at the compliance point. In determining whether such an increase has occurred, the Permittee shall compare the groundwater quality at each monitoring well specified in **Permit Section IV.B.** of the Permit, to the background concentration for that constituent, in accordance with the procedures specified in **Attachment IV.A,**

Appendix 6, if appropriate. These determinations shall be made each time groundwater monitoring occurs.

IV.H.3. The Permittee shall determine the groundwater flow rate and direction in the uppermost aquifer at least annually.

IV.H.4. The Permittee shall perform the statistical evaluation required by **Permit Section IV. G.** within 30 days from the date the analytical results are available from the laboratory performing the analyses.

IV.H.5. Pursuant to **Permit Section IV.G.,** if the Permittee determines there is a statistically significant evidence of increased contamination above the concentration limits specified in **Attachment IV.C** for the constituents specified in **Permit Section IV.D.** (indicating that the background concentration is being exceeded), at any monitoring well at the point of compliance, the Permittee shall:

a. Notify the Department in writing within seven (7) days of the determination. The notification must include what parameters or constituents have shown statistically significant evidence of contamination;

b. Immediately sample the groundwater in all monitoring wells for the constituents listed in Appendix IX of CFR 40 Part 264.

c. For any Appendix IX constituents detected, the Permittee may resample within thirty (30) days from the date of the laboratory report and repeat the analysis for those constituents detected. If the results of the second analysis confirm the initial results, the detected Appendix IX constituents will form the basis for Compliance Monitoring.

d. If the second analysis **(Permit Section IV.H.5.c.)** confirms the presence of constituents not included in the Detection Monitoring program or if the Permittee chooses not to resample, the Permittee shall establish the background values for each additional Appendix IX to 40 CFR Part 264 constituent found in the groundwater pursuant to **Permit Sections IV.D.2 and IV.D.3.**

e. **Within ninety (90) days, submit to the Director a Permit modification request to establish a Compliance Monitoring Program [40 CFR 264.98(h)]. The application must include the following:**

i. An identification of the concentration of each Appendix IX to CFR 40 Part 264 constituent found in the groundwater at each monitoring well at the compliance point.

ii. Proposed changes to the groundwater monitoring system necessary to meet

the requirements of compliance monitoring as described in 40 CFR 264.99.

iii. Proposed changes to the monitoring frequency, sampling and analysis procedures, or methods or statistical procedures used at the facility necessary to meet the requirements of compliance monitoring as described in 40 CFR 264.99.

iv. For each hazardous constituent found at the compliance point, a proposed concentration limit, or a notice of intent to seek an alternate concentration limit for a hazardous constituent.

IV.H.6. If the Permittee determines, pursuant to **Permit Condition IV.H.5.**, that there is a statistically significant increase above the background concentration for the constituents specified in **Attachment IV.B**, the Permittee may make a demonstration that the exceedence was due to sources other than a regulated unit or errors in sampling, analysis, evaluation, or natural variation in the groundwater.

a. The Permittee must notify the Director in writing, within seven (7) days, that a demonstration will be made.

b. The Permittee must submit a report to the Director within ninety (90) days that demonstrates that a source other than a regulated unit caused the exceedence or that the exceedence was a result of an error in sampling, analysis, or evaluation.

c. The Permittee must submit to the Director within 90 days an application for a permit modification to make any appropriate changes in the Detection Monitoring Program at the facility.

d. The Permittee must continue to monitor in accordance with the Detection Monitoring Program established under 40 CFR 264.98.

IV.I. REPORTING AND RECORDKEEPING

IV.I.1. The Permittee shall enter all monitoring, testing, and analytical data obtained pursuant to **Permit Section IV.H.** in the operating record. The data must include all computations, calculated means, variances, and results of statistical tests and must be submitted to the Director, at least annually, no later than March 1 of each year.

IV.I.2. The Permittee shall submit the analytical results **(Permit Section IV.H.)**, whenever there is a change in flow rate or direction, or statistically significant evidence of increased contamination in one or more of the hazardous constituents being monitored, or at least annually with the annual groundwater report.

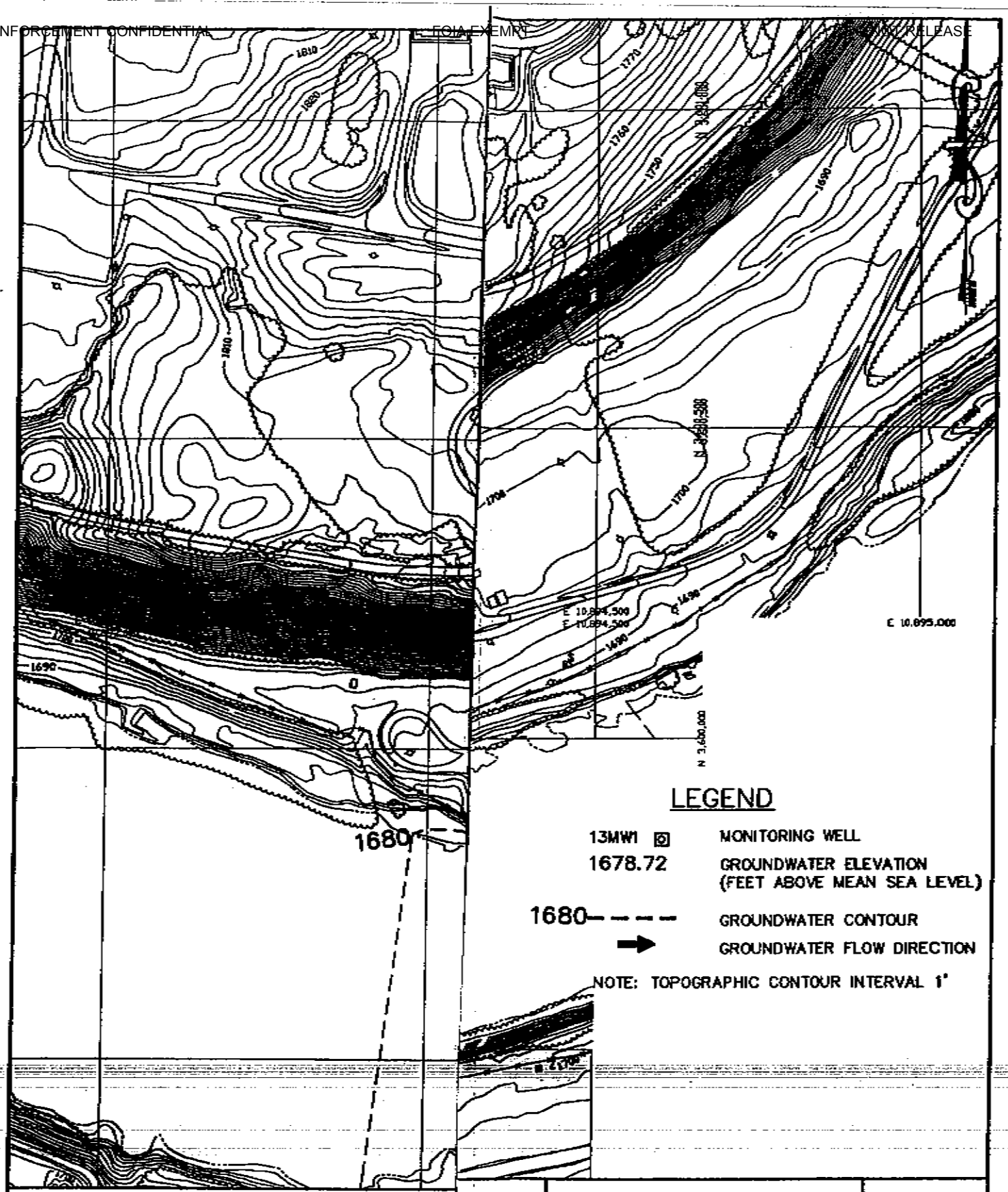
IV.I.3. The Permittee shall annually submit potentiometric contour maps depicting groundwater flow paths and the supporting groundwater elevation data to determine whether the requirements for locating the monitoring network continue to be satisfied. If the evaluation determines the existing monitoring wells no longer satisfy the requirements of 40 CFR 264.97(a), the Permittee shall immediately submit a permit modification request to the Director to bring the monitoring system back into compliance.

IV.J. **ASSURANCE OF DETECTION**

The Permittee shall demonstrate to the Director that groundwater monitoring measures necessary to achieve compliance with the monitoring requirements under 40 CFR 264.92 are taken during the term of the Permit.

IV.K. **REQUESTS FOR PERMIT MODIFICATION**

IV.K.1. If the Permittee or the Director determines the Groundwater Detection Monitoring Program no longer satisfies the requirements of 40 CFR 264.98, then the Permittee shall submit to the Director an application for a permit modification to make any appropriate changes to the program in accordance with 40 CFR 264.98(h).



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SCALE: 1"=200'

PLAN NO. B03131-01

FIGURE IV-1

B03131-01_HWMU-13.dwg

ATTACHMENT IV.A

GROUNDWATER MONITORING PROGRAM SAMPLING AND ANALYSIS PLAN

ATTACHMENT IV.A

GROUNDWATER MONITORING PROGRAM
SAMPLING AND ANALYSIS PLAN

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RADFORD ARMY AMMUNITION PLANT OB/OD, SAMPLING AND ANALYSIS PLAN

I.A. INTRODUCTION

Federal regulations at 40 CFR§270.14(c)(5), 270.14(c)(6)(iv), and 270.14(c)(7)(vi) require a description of the sampling, analysis, and statistical comparison procedures proposed for evaluating groundwater monitoring data. In addition, §§264.97(d) and 264.97(e) outline minimum procedures and techniques for groundwater monitoring programs implemented pursuant to 40 CFR Part 264 Subpart F. These regulations require that groundwater monitoring programs include measurement, sampling, and analytical methods that accurately assess groundwater quality, and that provide early detection of hazardous constituents released to groundwater.

Groundwater beneath the OB/OD unit will be monitored with two background monitoring wells and six downgradient compliance point monitoring wells located as specified on the map presented in **Figure IV-1**. Monitoring well 13MW-1 and 13MW-2 are the background wells. Monitoring wells 13MW-3, 13MW-4, 13MW-5, 13MW-6, and 13MW-7 are the point of compliance wells for the unit.

The Radford Army Ammunition Plant Sampling and Analysis Plan (S&AP) is an essential part of the Detection Monitoring Program in that it stipulates the field sampling, laboratory analysis, and annual reporting methods to be utilized throughout the post-closure period. The S&AP addresses the Detection Monitoring Program requirements prescribed in the VHWMR, 9 VAC 20-60 § 264.98 and as described in the Operating Permit.

I.B. SAMPLING FREQUENCY

Groundwater samples will be collected and analyzed semiannually at each point of compliance well for all the constituents listed in **Attachment IV.B. Attachment IV.B** lists the parameters, constituents, and test methods required for the Detection Monitoring Program. The Permittee may resample for any statistically significant detection within 30 days to confirm or refute the detection.

I.C. FIELD METHODS

The following activities should be performed prior to collecting ground-water samples for analysis:

- Measurement of static water level elevation;
- Detection and sampling of immiscible layers; and
- Well purging.

I.C.1. Measurement of Static Water Level Elevations:

Prior to purging each well, both the static water level (SWL) and the depth to the bottom of the well shall be measured to ±0.01 foot. Well measurements will be made using an electronic water level probe, referenced to a predetermined mark at the top of the well casing. The elevation of the top of the well casing (with locking cap removed) will be established to an elevation ±0.01 foot, in relation to the existing landfill datum, which will be established from a National Geodetic Vertical Datum.

The static ground water surface elevations obtained prior to each sampling event shall be used to create potentiometric maps to determine whether the requirements for locating the monitoring wells continues to be satisfied. If the potentiometric maps reveal that the depths, location, or number of wells is insufficient to monitor hazardous waste constituents migrating from the waste management area, new well locations and depths will be submitted to the Department for their approval and subsequent installation and monitoring. Any new wells will be installed prior to the next regularly scheduled groundwater sampling event.

Background wells and wells where constituents have not historically been noted will be measured first, followed by wells where constituents have been noted. All measurements for each well will be recorded in the Groundwater Log. Measurements that do not correlate with the previous trends will be verified in the field with different measurement technology, if necessary.

I.C.2. Calculation of Static Water Volume:

The static water level and total depth will be used to calculate the volume of stagnant water in the well and provide a check on the integrity of the well (e.g., identify siltation problems), as well as characterize changes in hydraulic conditions that may occur over time. The static water level measuring device used will be constructed of inert materials and thoroughly decontaminated prior to each use to prevent cross contamination from one well to another. The meter will be decontaminated by washing with non-phosphate detergent and rinsing three times with deionized water prior to air-drying. Decontamination fluid will be containerized and disposed of in an on-site wastewater treatment system if available or a publicly owned treatment facility with approval. Sampling members will wear clean gloves during sampling and shall change gloves between sampling each well at a minimum.

I.C.3. Immiscible Layers:

Each well shall be tested for the presence of immiscible fluids prior to well evacuation and sample collection. The procedures for testing for immiscible fluid layers are as follows:

1. Air in the wellhead will be screened for organic vapors using a photo ionization detector or other appropriate device.

2. An electronic interface probe or other appropriate device capable of detecting light and dense immiscible fluids will be lowered into the well to determine the existence of any immiscible layers.

3. If immiscible layers are detected, immiscible phases will be collected prior to any purging activities.

I.C.4. Well Purging

The volume of stagnant water in each well will be determined prior to well evacuation based on the static water level, well depth, well diameter, filter pack length, and borehole diameter. Three volumes of the pore space of the screen filter pack and three volumes of the well casing will be purged prior to sampling if possible. The volume of stagnant water to be purged shall be calculated according to the formulae presented in Appendix 2 of this Attachment or the volume purged shall be sufficient when pH, temperature, and conductivity have stabilized. Purge volume calculations will be recorded in the Groundwater Log shown in Appendix 1 of this Attachment.

a. If the wells prove to be low yield, wells will be evacuated to dryness once and will be purged at a rate which will not cause recharge water to be excessively agitated. Dry and low recharge rates will be noted in the field observations.

b. All purge water will be containerized and disposed of in an on-site wastewater treatment system if available or a publicly owned treatment facility with approval.

When micropurging techniques are utilized, EPA guidance shall be followed (EPA/540/S-95/504). Dedicated bladder pumps shall be placed with their input at the midway point of the screened interval. Flow rates should be low enough to minimize drawdown to the system. Water quality indicator parameters are used to determine purging needs. In-line flow cells are used to continuously monitor pH, specific conductance, temperature, etc. Purging is considered complete when indicator parameters have stabilized. Water levels and pumping rates will be monitored and recorded in addition to any adjustments.

Stabilization parameters pH, temperature, and conductivity will be measured at the start and end of sampling as a check on the stability of the water samples over time. A minimum of four (4) replicate measurements of pH and specific conductivity will be recorded in the Groundwater Log shown in Attachment 1 for each groundwater sample. In addition to the start and end measurements, additional measurements will be taken every three minutes. All purging equipment that has been or will be in contact with ground water should be

decontaminated prior to use (See Section I.C.6.). Decontamination water should be stored in appropriate containers and disposed of per I.C.4.b.

I.C.5. Groundwater Sampling Equipment:

The Department prefers that all sampling equipment be dedicated to a particular well. The following recommendations apply to the selection of sampling equipment:

- Sampling equipment should be chosen based on the analytes of interest and the characteristics and depth of the saturated zone from which the sample is withdrawn. For example, the choice of sampling equipment should reflect consideration of the potential for LNAPLs and DNAPLs.
- Sampling equipment should be constructed of inert material. Sample collection equipment should not alter analyte concentrations, cause loss of analytes via sorption, or cause gain of analytes via desorption, degradation, or corrosion.
- Sampling equipment should be designed such that Viton®, Tygon®, silicone, or neoprene components do not come into contact with the groundwater sample.
- Sampling equipment should cause minimal sample agitation and should be selected to reduce/eliminate sample contact with the atmosphere during sample transfer. Sampling equipment should not allow volatilization or aeration of samples to the extent that analyte concentrations are altered.
- Dedicated bladder pumps should be placed with the pump-intake located in the middle or slightly above the middle of the screened interval.

I.C.6. Decontamination:

When dedicated equipment is not used for sampling (or well purging) or when dedicated equipment is stored outside of the well, it will be thoroughly decontaminated between wells by disassembling and washing with (non-phosphate) detergent, thoroughly rinsed with de-ionized water, and air dryed. All equipment coming in contact with media suspected of being contaminated will be decontaminated before it contacts a media which is likely to be less contaminated or uncontaminated.

All non-dedicated ground water sampling equipment will be cleaned over a decontamination pad after each use in the following manner:

- Rinse with tap water.
- Wash with a non-phosphate laboratory detergent and tap water.

- Rinse with distilled water
- Wash with laboratory-grade methanol or isopropanol
- Triple rinse with de-ionized, distilled water
- Allow to air dry.

If the equipment is not to be used again immediately, it should be packaged and properly stored to protect it from dust and dirt. Equipment may be wrapped in aluminum foil (shiny side on the outside) and placed in a plastic bag. A label should be affixed to the outside wrapping summarizing the decontamination procedure and stating the date of decontamination. Decontaminated sampling equipment should not be placed on the ground or on other contaminated surfaces prior to insertion in the well.

The decontamination pad will be lined with polyethylene sheeting and sloped to promote drainage towards one corner into an in-ground container. This will facilitate removal of any potentially contaminated decontamination fluids. All decontamination water that is generated during sampling activities will be collected in containers and subsequently emptied into the Biological Wastewater Treatment Plant at Radford AAP. Disposable items will be disposed of as solid waste in an approved, permitted landfill.

I.C.7. Groundwater Sample Collection

Monitoring well sampling should always progress from a well that is the least contaminated to the well that is the most contaminated, to minimize the potential for cross-contamination of samples that may result from inadequate decontamination of sampling equipment. Samples should be collected and containerized according to the volatility of the target analytes. The preferred collection order for some of the more common groundwater analytes is as follows:

- Volatile organics and total organic halogens
- Dissolved gases and total organic carbon
- Semi-Volatile Organics
- Pesticides/herbicides
- PCBs
- Metals and cyanide
- Total Phenols
- Major water quality cations and anions (sulfate, chloride, etc.)
- Nitrate

A sample collecting bottle kit should be prepared from the sample parameter list in accordance with approved sample analysis methods (see Appendix 4). The sample kit should be stored in clean coolers for transport to the site. To preserve sample intergrity, all samples should be collected in precleaned containers, preserved when required, and stored at the appropriate temperature. The containers shall be shipped with caps that are securely fastened. Samples shall be

transferred directly from the sampling device to the sample containers.

The following recommendations apply to the use and operation of groundwater sampling equipment:

- Check valves should be designed and inspected to ensure that fouling problems do not reduce delivery capabilities or result in aeration of samples.
- Sampling equipment should never be dropped into the well, as this will cause degassing of the water upon impact.
- Contents of the sampling device should be transferred to sample containers in a controlled manner that will minimize sample agitation and aeration.
- Decontaminated sampling equipment should not be allowed to come into contact with the ground or other contaminated surfaces prior to insertion into the well.
- Groundwater samples should be collected as soon as possible after the well is purged. Water that has remained in the well casing for more than about 2 hours has had the opportunity to exchange gases with the atmosphere and to interact with the well casing material.
- The rate at which a well is sampled should not exceed the rate at which the well was purged. Low sampling rates, approximately 0.1 L/min, are suggested. Pumps should be operated at rates less than 0.1 L/min when collecting samples for volatile organics analysis.
- Pump lines should be cleared at a rate of 0.1 L/min or less before collecting samples for volatiles analysis so that the samples collected will not be from the period of time when the pump was operating more rapidly.
- Pumps should be operated in a continuous, non-pulsating manner so that they do not produce samples that are aerated in the return tube or upon discharge.
- When sampling wells that contain LNAPLs, a stilling tube should be inserted in the well. Groundwater samples should be collected from the screened interval of the well below the base of the tube.
- Groundwater samples collected for analysis for organic constituents or parameters should not be filtered in the field.

- Sample collection must be accomplished prior to a flow-through cell, and subsequent to stabilization of indicator field parameters.

I.D. **FIELD AND LABORATORY QA/QC PROGRAM**

Field Quality Assurance/Quality Control (QA/QC) requires the routine collection and analysis of blanks to verify that the sample collection and handling process has not affected the quality of the samples. Both field and laboratory QC samples should be prepared during the sampling event. It is recommended that the following samples be analyzed with each batch of samples (a batch may not exceed 20 samples):

- One field duplicate;
- One equipment rinsate (required only when non-disposable and non-dedicated equipment is being used);
- One matrix spike (when appropriate for the method); and
- One duplicate sample (either a matrix duplicate or a matrix spike duplicate).

A trip blank should be prepared and analyzed when samples are being analyzed for volatile organic analytes. A trip blank should be submitted with samples each day that samples are collected.

I.D.1. All field QC samples should be prepared exactly as regular investigation samples with regard to sample volume, containers, and preservation. The concentrations of any contaminants found in blank samples should not be used to correct the groundwater data. The contaminant concentrations in blanks should be documented, and if the concentrations are more than an order of magnitude greater than the field sample results, the Permittee should resample the ground water. Other QA/QC practices such as sampling equipment calibration, equipment decontamination procedures, and chain-of-custody procedures are discussed in other sections of this Attachment.

I.D.2. Laboratory QA/QC Program

The permitte's laboratory should provide for the use of control samples. The Permittee should use appropriate statistical procedures to monitor and document performance and to implement an effective program to resolve testing problems (e.g., instrument maintenance, operator training). Data from control samples (e.g., spiked samples, duplicates, and blanks) should be used as a measure of performance or as an indicator of potential sources of cross-contamination. All QC data should be submitted to the Department with the groundwater monitoring sample results.

I.D.3. At a minimum, all field instruments should be calibrated at the beginning of each use and in accordance with the frequency suggested by the manufacturer. Field

instruments should be calibrated using at least two calibration standards spanning the range of results anticipated during the sampling event. For example, if groundwater pH is expected to be near pH 7, the two standards used to calibrate the pH meter should be pH 4 and pH 10, respectively.

I.E. SAMPLE HANDLING AND CHAIN-OF-CUSTODY

Sample handling will be strictly controlled to prevent sample contamination. Chain-of-Custody control for all samples will consist of the following:

1. Labels will be placed on individual sample containers while sampling indicating the sampler's name, date and time of sample collection, place of collection, and preservation method used for the sample.

2. A custody seal should be placed on the shipping container or on the individual sample bottles. Custody seals provide prevention or easy detection of sample tampering. The custody seal should bear the signature of the collector and the date signed. The custody seal can be placed on the front and back of a cooler, around the opening of a polyethylene overpack bag or on the lid of each sample container.

3. No sample should be brought back to the laboratory for preservation. It is recommended that two polyethylene overpack bags be used in shipping. The first will contain the sample bottles, the second the ice needed to keep the samples at 4° C. A temperature history of the samples should be maintained as a quality control measure. Upon receipt of the shipment, the laboratory should record the temperature on the chain-of-custody record. Holding time refers to the period that begins when the sample is collected from the well and ends with its extraction or analysis.

4. A chain-of-custody record should be completed and should accompany every sample shipment. The chain-of-custody record should contain enough copies so that each person possessing the shipment receives his/her own and should be designed to allow the Permittee to reconstruct how and under what circumstances a sample was collected, including any problems encountered. An example of a chain-of-custody form that includes the necessary information is included as Appendix 3.

4. Samples will be packaged and labeled for shipment in compliance with current U.S. Department of Transportation regulations. All samples will be shipped priority/overnight via commercial carrier or hand delivered to the lab.

5. Samples will arrive at the laboratory via the overnight delivery service or hand delivery. Upon delivery to the laboratory, the ice chests will be checked for intact custody seals and the samples will be unpacked and the information on the accompanying chain of custody records will be examined. If the

samples shipped match those described on the chain-of-custody form, the laboratory sample coordinator will sign the form and assume responsibility for the samples. If problems are found with the sample shipment, the laboratory sample custodian will sign the form and record the problems in the "remarks" section.

6. Any missing samples, missing sample tags, broken sample bottles, or unpreserved samples will be noted on the chain-of-custody record. If there are problems with individual samples, the sample custodian will inform the laboratory coordinator of such problems. The laboratory custodian will then contact the Permittee to determine a viable solution to the problem.

7. All information relevant to the sample will be secured at the end of each business day. All samples will be stored in a designated sample storage refrigerator, access to which will be limited to laboratory employees.

I.F. FIELD LOGBOOK

Field technician(s) will keep an up-to-date field logbook documenting information pertaining to field activities. Appendix 1 of this Attachment provides an example of a Groundwater Log that includes the necessary information that must be completed for each monitoring well sampled.

II. LABORATORY ANALYSIS

II.A. INTRODUCTION

The groundwater parameters and constituents to be analyzed include organic and inorganic constituents which have been used at the facility or have been detected in the facility's waste, sludge, and/or groundwater (**Attachment IV.B**). **Attachment IV.B** also lists analytical methods that must be used in the analysis of groundwater samples.

II.B. LABORATORY QA/QC

QA/QC procedures will be used at all times. The laboratory shall assure the accuracy and precision of all analytical determinations.

II.B.1. Internal quality control:

Internal quality control checks shall be undertaken regularly to assess the precision and accuracy of analytical procedures. Internal quality control checks shall include use of calibration standards, standard references, duplicates and spiked/fortified samples.

II.B.2. Calibration:

Calibration standards shall be verified against standard reference from an outside source. Calibration curves shall be comprised of a minimum of one blank and

three standards. Samples shall be diluted if necessary to ensure analytical measurements fall on the linear portion of the calibration curve.

II.B.3. Duplicate samples:
Duplicate samples shall be processed at an average frequency of ten percent to assess the precision of testing methods, and standard references shall be processed monthly to assess accuracy of analytical procedures. Spiked/fortified samples shall be carried through all stages of sample preparation and measurement to validate the accuracy of analysis. During the course of analysis, quality control data and sample data shall be reviewed to identify questionable data.

III. DATA EVALUATION

III.A. ANALYTICAL DATA REVIEW

The Permittee and/or its representative will review and validate the analytical data to ensure that the laboratory followed proper analytical protocols. The data review will be performed in general accordance with the following United States EPA guidance documents:

- *Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses*, April 1993, and
- *Region III Modifications to National Functional Guidelines for Organic Data Review Multi-Media, Multi-Concentration*, September 1994.

III.B. STATISTICAL EVALUATION

Statistical evaluations will be performed in general accordance with Appendix 6 to **Attachment IV.A.**

III.C. DATA QUALITY OBJECTIVE

High-quality data collection implies data of sufficient accuracy, precision, and completeness (i.e., ratio of valid analytical results to the minimum sample number called for in the permit) to meet the program objectives. It is the Permittee's responsibility to report sufficient valid analytical results for each monitoring event. Reported data will, at a minimum, be of such quality to immediately detect a release from the regulated unit. Laboratory methods will be selected to yield reporting limits (Limit of quantitation, or LOQ) values that are equal to or below human health-based standards for the target analytes. The human health-based standards are established as: Maximum Contaminant Levels (MCLs) under the Safe Drinking Water Act; Alternate Concentration Limits (ACLs) whenever MCLs are not available; or as EPA Region III Tap Water Risk Based Concentrations (RBC) when MCLs or ACLs are not available. ACLs are

calculated by the Risk Exposure and Analysis Modeling System (REAMS) using a residential ground water ingestion-modeling scenario by VADEQ. If an ACL or EPA Region III Tap Water RBC for a specific constituent is less than the lowest LOQ listed in SW-846 for that constituent, then an appropriate, DEQ approved, LOQ should be used.

IV. RECORD KEEPING AND REPORTING

IV.A. INTRODUCTION

Copies of all groundwater analytical results, groundwater semiannual reports, groundwater annual reports, groundwater level elevations, Groundwater Sampling and Analysis Plan, Facility Operating Permit, etc. shall be maintained at the RAAP throughout the active life of the facility and post-closure care period. The Permittee shall report the groundwater monitoring information to the Director described in Sections IV.B and IV.C below.

IV.B. GROUNDWATER MONITORING RESULTS

The Permittee shall report concentrations or values of the parameters and constituents listed in **Attachment IV.B** for each required groundwater monitoring well within 30 days after completing each analysis.

IV.C. ANNUAL REPORT

The Permittee shall submit an Annual Groundwater Monitoring Report to the Virginia Department of Environmental Quality by March 1st of the following year for the year beginning January 1st and ending December 31st containing:

1. Static groundwater level elevations;

2. Potentiometric surface maps reflecting each sampling event;

3. Groundwater flow rate and direction in the uppermost aquifer calculated after each sampling event;

4. Statistical evaluations of the concentrations or values of the parameters and constituents listed in **Attachment IV.B;**

5. The calculated or measured rate of migration of hazardous waste or hazardous waste constituents in the groundwater; and

6. Results of the evaluations of groundwater surface evaluations to determine whether the requirements for locating the monitoring wells continue to meet the criteria set forth in 40 CFR § 264.97.

Appendix 1

GROUNDWATER LOG EXAMPLE

SAMPLING EVENT _____
LOCATION _____
WELL NO. _____ DATE: _____
WEATHER _____ TEMPERATURE: _____

MEASUREMENT TEAM _____
TIME WELL CASING UNLOCKED _____
DEPTH TO WATER FROM TOP OF OUTER CASING _____FT
DEPTH OF WELL FROM TOP OUTER CASING _____FT
STATIC WASTER LEVEL _____FT

MEASUREMENT TECHNIQUE: [ ] WATER LEVEL INDICATOR
[ ] OTHER/EXPLAIN _____

FORMULAS FOR DETERMINING PURGE VOLUME TWD =

Water Level above Sand Pack: [ ]

$3 \times [(\pi r_b^2 h_s - \pi r_c^2 h_s) \times 0.3 + (\pi r_c^2 h_w)]$

Water Level below Sand Pack: [ ]

$3 \times [\pi r_b^2 h_w - \pi r_c^2 h_w) \times 0.3 + (\pi r_c^2 h_w)]$

where:
r_b = radius of boring =
r_c = radius of casing =
h_s = height of sand =
h_w = height of water =

IMMISCIBLE LAYERS: [ ] YES [ ]NO
DETECTION METHOD: [ ] VISUAL [ ] OTHER_____
COLLECTION METHOD: [ ] BEAKER [ ]OTHER_____

SAMPLE IDENTIFICATION _____

PURGE TEAM _____

PURGE PROCEDURE/EQUIPMENT: [ ]TEFLON BAILER
[ ]WELL PUMP

PURGE TIME _____ PURGE VOLUME _____

PURGE APPEARANCE _____
COMMENTS _____
_____
_____

Attachment IV.A-13

Appendix IV.A (cont'd)

SAMPLING EVENT: _____
LOCATION: _____
WELL: _____ DATE _____

SAMPLING PROCEDURE/EQUIPMENT: [ ]TEFLON BAILER
[ ]WELL PUMP

SAMPLING TIME: _____

pH METER CALIBRATED WITH BUFFERS: [ ]4 [ ]7 [ ]10
pH METER CALIBRATED BY: _____
CONDUCTIVITY METER CALIBRATED WITH STANDARD SOLUTION OF _____
CONDUCTIVITY METER CALIBRATED BY: _____

pH(S.U.) _____, _____, _____,

TEMP (°C) _____, _____, _____,

COND (μS) _____, _____, _____,

SAMPLE COLLECTION TIME: CONTAINER*/PRESERVATIVE

(1)_____	VOC(G/NONE)	(2)_____	TOX(A/HNO_3)
(3)_____	TOC(A/H_2SO_4)	(4)_____	COD(A/H_2SO_4)
(5)_____	O&G/TPH(A/HCL)	(6)_____	PHEN(A/H_2SO_4)
(7)_____	N(/)	(8)_____	PHOS(A/H_2SO_2)
(9)_____	SO(/)	(10)_____	TMET(P/HNO_3)
(11)_____	DMET(P/NONE)	(12)_____	pH,COND(P/NONE)
(13)_____	CHLORIDE(P/NONE)	(14)_____	SMLL TST(P/NONE)
(15)_____	CN^- (P/NONE)	(16)_____	(P/NONE)

FINAL pH (S.U.) _____ FINAL TEMPERATURE (°C)_____
FINAL CONDUCTIVITY (μS) _____

LOCKED WELL AT _____

COMMENTS _____

NOTES:

1. G = GLASS, A=AMBER GLASS BOTTLE, P=PLASTIC(POLYETHYLENE)
2. Shipping containers (cooling chest with ice or ice pack) should be certified as to the 4° C

Attachment IV.A-14

temperature at time of sample placement into these containers. Preservation of samples requires that the temperature of collected samples be adjusted to the 4° C immediately after collection. Shipping coolers must be at 4° C and maintained at 4° C upon placement of sample and during shipment. Chain-of-custody forms will have Shipping/Receiving (max/min) temperature boxes for recording data and verification.

3. IDW: Collect all used decontamination solutions and rinses; store in a labeled 55 gallon drum for no more than 90 days in accordance with DEQ's IDW Policy.

4. SILTATION: If the level of siltation is higher than 1 foot above the base of the screen, the well will need to be redeveloped. Note whether the level of siltation is greater than 1 foot in the comments section.

5. DEDICATED TEFLON TUBING: replace if older than one year; note in comments the date the tubing was installed.

Attachment IV.A-15

Appendix 2

CALCULATIONS OF PURGE VOLUME

Determine purge volume as follows:

Water Level above sand pack:

$$3 \times [(\Pi r_b^2 h_s - \Pi r_c^2 h_s) \times 0.3 + (\Pi r_c^2 h_w)]$$

Water Level below sand pack

$$3 \times [(\Pi r_b^2 h_w - \Pi r_c^2 h_w) \times 0.3 + (\Pi r_c^2 h_w)]$$

where:

r_b = radius of boring
r_c = radius of casing
h_s = height of sand
h_w = height of water

This calculation must be based upon 30% filter pack volume. Once the volume to be purged is known, purging can begin. The purge water will be collected, containerized and disposed of in accordance with local, state and federal regulations and laws.

Appendix 3

EXAMPLE CHAIN OF CUSTODY

Attachment IV.A-17

CHAIN OF CUSTODY RECORD

Laboratory:

Client:
Attn:
Address:

Phone:
Fax:
Fax:

Consultant:
Attn:
Address:

Phone:
Fax:

Sample Site: RAAP, Radford, Virginia
Location: Open Buring Ground (HWMU-13)

Event:
DAA JN:
Lab JN:

Project Specific (PS) QC: ☑ YES ☐ NO
Sample Collection for Project Complete? ☑ YES ☐ NO

Carrier:
Tracking Number:

Box 1: Matrix
- SW Surface Water
- GW Groundwater
- L Leachate
- S Soil
- T Trip Blank
- E Equipment Blank
- P Product
- O Other

Box 2: Preservative
- A HCL
- B HNO_3
- C H_2SO_4
- D $Na_2S_2O_3$
- E NaOH
- F ZnAc
- G Other (Specify)
- H None

Box 3: Filtered/Unfiltered
- F Filtered
- U Unfiltered

Box 4: Sample Type
- G Grab
- C Composite

Box 5: Sample Container Type
- P Plastic
- V VOA
- AG Amber Glass
- CG Clear Glass

Invoice
Copy to Consultant: ☐ YES ☐ NO
Bill: ☐ Client ☐ Consultant
Preserved and shipped on ice: ☑ YES ☐ NO

GENERAL NOTES:

Sample ID	Date: 2003	Time	Box 1: Matrix	Number of Bottles	Volatiles 8260B	Semi-Volatiles 8270C	Total Metals	Nitroglycerine 8332	Perchlorate 314.0	Total Phenols 9065	TOC 9060	TOX 9020B	Formaldehyde 8315A
Box 4 - Sample Type					G	G	G	G	G	G	G	G	G
Box 3 - Filtered/Unfiltered					U	U	U	U	U	U	U	U	U
Required pH of Sample					<2	-	<2	-	-	<2	<2	<2	-
Box 2 - Preservative					A	H	B	H	H	C	A	C	H
Box 5 - Sample Container Type					V	AG	P	V	P	P	AG	AG	AG
13MW1			GW		x	x	x	x	x	x	x	x	x
13MW2			GW		x	x	x	x	x	x	x	x	x
13MW3			GW		x	x	x	x	x	x	x	x	x
13MW4			GW		x	x	x	x	x	x	x	x	x
13MW5			GW		x	x	x	x	x	x	x	x	x
13MW6			GW		x	x	x	x	x	x	x	x	x
13MW7			GW		x	x	x	x	x	x	x	x	x
Trip Blank 1			TB		x								

Clients Special Instructions: level 4 with edd. See attached target analyte list.

Received by lab in Good Condition ____ Yes ____ No Custody Seal Intact ____ Yes ____ No Temperature upon arrival ____ Received on Ice ____ Yes ____ No
Describe problems, if any:

Sampler Name (Print):	Date:	#1 Relinquished by (Signature):	Date:	#2 Relinquished by (Signature):	Date:	Sample Storage Time Requested:
Sampler Signature:	Time:	Company Name:	Time:	Company Name:	Time:	
Sampler Name (Print):	Date:	#1 Received by (Signature):	Date:	#2 Received by (Signature):	Date:	30 DYS ORG/6 MTHS INORG
Sampler Signature:	Time:	Company Name:	Time:	Company Name:	Time:	

ENFORCEMENT CONFIDENTIAL
FOIA EXEMPT
DO NOT RELEASE

Appendix 4

SAMPLE CONTAINERS AND PRESERVATIVES

Analyte	SW-846 Analysis Numbers	Container	Preservative	Holding Time (days)
Metals except mercury	6010B, 6020A	HDPE	HNO_3 to pH<2	6 months
Mercury	7470A	HDPE	HNO_3 to pH<2	28
Energetics and PETN	8330	Amber glass	4° C	7/40
Nitroglycerin	8332	Amber glass	4° C	7/40
Cyanide	9010B	HDPE	NaOH to pH>12	14
Nitrate/nitrite	353.2	Amber Glass	4° C	48 hours
Perchlorate	314.0	HDPE or Glass	None	28
Appendix IX Volatile Organics	8260B	40 ml Glass VOA	4° C, H_2SO_4 to pH<2,	14
Appendix IX Semi-volatile Organics	8270C	Amber glass	4° C	7/40
Appendix IX Organochlorines	8081A	Amber glass	4° C	7/40
Appendix IX Herbicides	8151A	Amber glass	4° C	7/40
Appendix IX Organophosphates	8141A	Amber glass	4° C	7/40

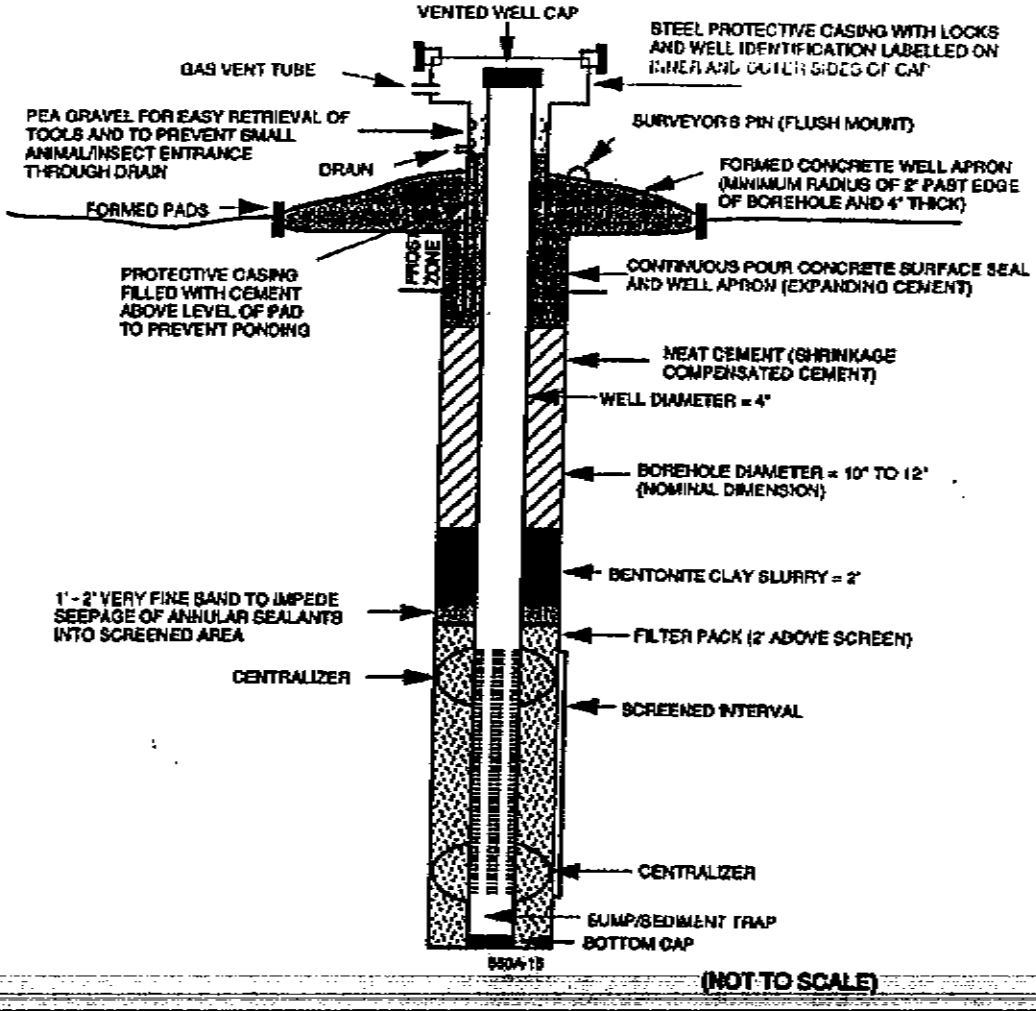
NOTES:

1. References:
   Test Methods for Evaluating Solid Waste - Physical/Chemical Methods, SW-846 (2nd edition, 1982).
   Methods for Chemical analysis of Water and Wastes, EPA-600/4-79-020.
   Standard Methods for the Examination of Water and Wastewater, 16th edition (1985).

2. Container Types:
   HDPE = Plastic (polyethylene)
   T = Fluorocarbon resins (PTFE, Teflon. FEP, PFA, etc.)

Appendix 5

MONITORING WELL CONSTRUCTION DIAGRAM
(from *EPA Technical Enforcement Guidance Document, 1986*)



CROSS-SECTION OF TYPICAL MONITORING WELL

Attachment IV.A-19

Appendix 6

STATISTICAL PROCEDURES

A. HIGHLIGHTS

In accordance with 40 CFR 264.97(g), the permittee will collect an appropriate number of samples from upgradient well(s) and an appropriate number of samples from each of the point of compliance wells specified in Permit Section IV.C.1. Appropriate background sample sizes for the preferred method of statistical analysis will be collected prior to the scheduled date of the statistical analysis.

Statistical analysis of the groundwater data will include the following:

1. Outliers
2. Testing of normality
3. Missing data
4. Evaluation of data below detection limits or quantitation limits
5. Selection of statistical method
6. Verification sampling strategy (optional)

B. OUTLIERS

An outlier refers to a data point which is an inconsistently large or small value. An outlier can be observed due to sampling, laboratory, transportation, or transcription errors. To remove the possibility of including data with this type of error, the historical data should be screened for each well and constituent for the existence of outliers (USEPA 1992 section 6.2) using the method described by Dixon (1953) or another method approved by the VADEQ. Background observations, which are considered to be outliers, should not be included in the statistical analysis. If an extreme value occurs in a point-of-compliance well or during a Detection sampling event, the facility should collect a re-sample during the Detection period of the initial sample. Any elimination of an outlier must be approved by the Department.

C. TESTING NORMALITY OF DATA DISTRIBUTION

The Permittee shall verify that the distribution of monitoring data for the Hazardous Constituents is consistent with the assumptions of the selected statistical test method. A multiple group version of the Shapiro-Wilk test shall be applied to determine if the distribution of the data is normal or lognormal. To test for log normality, the natural

logarithms of original data are taken and if the distribution of the transformed concentrations is normal then the data are considered to be log-normally distributed. The permittee may use any other appropriate method for testing the distributional assumptions (see Gibbons 1994a for a review, also see USEPA 1992). However, the permittee shall demonstrate that the alternative method can detect deviations from normality with similar power as the Shapiro-Wilk and Shapiro-Francia methods. No testing of normality is required when the percentage of non-detects or non-quantified values is greater than 50%. Once the distribution of the data is determined, the permittee should apply statistical tests as follows:

When the detection frequency is less than 50% and/or transformation fails to bring about normality, a non-parametric method should be used.

When the detection frequency is between 50%-75%, a parametric test can be performed with an adjustment for non-detects. Aitcheson's or Cohen's adjustments are recommended. Determination of the appropriate adjustment to be applied should be based on the properties of the data set (USEPA, 1992, section 2.2).

When the detection frequency is 75% or greater, an appropriate parametric test may be applied without adjusting for non-detects. Non-detects should be analyzed using one half the laboratory limit of detection or quantitation.

D. MISSING DATA

If a sampling event results in a missing data value, an attempt to resample for the missing value shall be made within two weeks.

E. DATA BELOW DETECTION LIMITS

For data where the non-detects or non-quantified values are less than 25 percent, the Permittee shall replace the non-detects or non-quantified values with one half the laboratory limit of detection or quantitation. However, when the percentage of non-detects or non-quantified values is greater than 25 percent and less than 50 percent the mean and standard deviation should be adjusted using Atchison's method (USEPA 1992 section 2.2.2 and Aitchison, 1955). An acceptable alternative to Aitchison's method is Cohen's maximum likelihood estimator (Cohen, 1961). Extensive tables and computational details are also provided in Gibbons, 1994a. The approach for selection between the two methods is described in USEPA (1992) section 2.2.1.

F. SELECTION OF STATISTICAL METHOD

The Permittee shall use an appropriate statistical method consistent with the Virginia Hazardous Waste Management Regulations. As specified in these regulations, the level of significance for individual well comparison shall be no less than 0.01 and no less than 0.05 for multiple comparisons. However, these performance standards do not apply for

prediction intervals, tolerance intervals and control charts. The false positive rate for these interval methods or control charts can depend on the number of data points available from the background wells at the time of statistical comparison. A larger number of background data points can decrease the false positive rate for these tests. In the event the Permittee has decided to use an interval or other statistical method, and if the selected method requires additional samples, the Permittee shall collect the additional samples prior to the date specified in this permit for conducting appropriate statistical analysis. The statistical comparison shall not be delayed due to collection of an inadequate number of samples. The false positive rate for a single constituent/well comparison shall not be lower than .01 unless the Permittee can demonstrate that an alternative false positive rate will provide at least 50% power to detect a 3 standard deviation increase above background levels and 80% power to detect a 4 standard deviation increase above background levels.

1. Interval Method

If the Permittee uses an interval method and the percentage of detects is greater than 50%, the Permittee shall test the data from the background wells for normality. If the background well data are normally or log-normally distributed the permittee shall use a parametric interval method. Table 1 provides the suggested minimum number of samples for calculation of parametric interval methods that are acceptable to VADEQ. In the event the background data are not normally or log-normally distributed the permittee shall use a non-parametric interval method . Suggested test methods and recommended minimum sample size requirements are provided in Table 1. However, a statistical analysis can be conducted with a smaller dataset than the suggested size at any time. Please note that these methods can lead to higher false positive or false negative rates with smaller samples sizes. For each sampling event, the permittee shall calculate the appropriate interval for the background data set based on the method selected, and compare each data point from the compliance well to the upper limit. If the Compliance well data exceeds the upper limit, the permittee shall report that there has been a statistical increase of contaminants in the groundwater.

2. Other Methods

In the event the Permittee has selected any other method listed in the Virginia Hazardous Waste Management Regulations, the Permittee shall collect the appropriate number of samples and shall maintain the appropriate level of significance specified above.

G. VERIFICATION SAMPLING (OPTIONAL)

Verification resampling can be an integral part of the statistical methodology (USEPA, 1992 section 5); however, it should be considered as a part of the statistical test and based

on the site-specific condition. Since the probability of an initial exceedance is very high for the site as a whole (considering only test wise false positive rates), the verification sample is considered as a part of the evaluation to conclude a statistically significant exceedance. A pre-planned verification sample can be incorporated into the calculation of the statistical limits to calculate an upper limit using a smaller false positive rate. Without verification resampling, an attempt to minimize the false positive rates will lead to very large prediction limits. This will increase the false negative rates and decrease the power of the test to detect a release from the facility. All verification samples must be collected at the earliest time possible (prior to next scheduled sampling event) or as approved by the DEQ or as specified in this permit. Note that the Department must be informed of any planned verification resampling in advance

Verification resampling can involve one or two samples. DEQ's preferred strategy includes passing one verification resample or passing one of two verification resamples. Statistical analyses which incorporate verification samples must provide at least 50% power to detect a 3 standard deviation increase above background levels and 80% power to detect a 4 standard deviation increase above background levels.

H. COMPARISON OF POINT OF COMPLIANCE WELL DATA TO A STANDARD DURING COMPLIANCE OR CORRECTIVE ACTION MONITORING

In accordance with the Virginia Hazardous Waste Management Regulations the point of compliance data shall be compared to the GWPS. If a maximum contaminant level (MCL) is promulgated or alternate concentration limit (ACL) is established for a constituent, and the ACL or MCL is greater than the background limit (or statistically determined background level), the ACL or MCL is the groundwater protection standard. All new concentrations in the point of compliance wells should be compared to the standard (i.e., ACL or MCL) using the lower 95% confidence limit computed from the last four sampling values (collected during the last 12 months).

If an upper limit based on a tolerance or prediction limit calculated from naturally occurring background data exceeds the MCL or ACL, then the background limit will be the groundwater protection standard. If the groundwater protection standard is based on a tolerance or prediction limit, the point of compliance samples shall be compared to the GWPS using a point comparison. If the point of compliance sample exceeds the background based GWPS, a statistical exceedence above the GWPS shall be reported to the Department.

However, for all constituents analyzed, if the established groundwater protection standard is less than the Department accepted Limit of Quantitation (LOQ) then the LOQ becomes the standard, and the new point of compliance well data will be compared to the LOQ.

Comparisons of point of compliance well data to a groundwater protection standard based on a MCL or ACL should be performed by a parametric or non-parametric confidence interval. If data are normally or log-normally distributed a 95% lower confidence limit on

the last four samples (collected during the last 12 months) can be calculated for comparison to the MCL or ACL. If data are not normally or log-normally distributed the minimum concentration from the last four samples (collected during the last 12 months) should be compared to the groundwater protection standard (based on a MCL or ACL). Alternative statistical methods for comparing lower limits of Compliance well data to a groundwater protection standard based on a MCL or ACL should be approved by the Department prior to implementation. If the lower confidence limit or minimum concentration exceeds the groundwater protection standard based on a MCL or ACL then the permittee has shown a statistical exceedence above the ground water protection standard.

Please note that a point comparison (non-statistical) to the GWPS (based on a MCL or ACL) may be performed if only one data point exists for a sampling event. If the point comparison indicates that the given data point is above the groundwater protection standard, and the GWPS is based on a MCL or ACL, and the facility chooses not to use data from the previous three sampling events, then additional samples (at least three additional samples will be required to calculate a confidence interval) may be collected within the next 3 months and a statistical comparison to the GWPS (based on a MCL or ACL) may be performed.

I. REFERENCES

1. Aitchison, J. On the distribution of a positive random variable having discrete probability mass at the origin, Journal of American Statistical Association, 50(272), 901-908 (1955).

2. Cohen, A.C. Tables for maximum likelihood estimates: Singly truncated and singly censored samples, Technometrics, 3, 535-541 (1961).

3. Gibbons, R.D. Statistical Methods for Groundwater Monitoring, John Wiley and Sons, Inc., 1994.

4. Gibbons, R.D. Some conceptual and statistical issues in analysis of groundwater monitoring data, Environmetrics, 7, 185-199 (1996).

5. ~~USEPA, Statistical analysis of groundwater monitoring data at RCRA facilities, Addendum to Interim Final Guidance. Office of Solid Waste, July 1992.~~

6. USEPA, Statistical analysis of groundwater monitoring data at RCRA facilities - Interim Final guidance (April 1989).

Table 1

Suggested Minimum Samples*			
	Parametric	Non-Parametric	Non-Parametric Interval %Confidence
CABF T-test	4	NA	NA
Wilcoxon Rank Sum	NA	5	NA
Confidence Interval	4	NA	NA
Tolerance Interval	8	19	95%
Prediction Interval	8	13	99%#
Shewhart CUSUM Chart+	8	NA	NA

* The above tests can be used with fewer samples; however it will increase the false positive rate.

Includes one verification re-sample, use 19 samples for a 95% Prediction Interval with no verification re-samples.

+ For Intra-well testing only.

NA Not Applicable.

Attachment IV.A-25

Appendix 7

MONITORING WELL ABANDONMENT PROCEDURES

NOTE: Approval from the Director must be granted before any monitoring well may be abandoned.

A. Monitoring wells and/or piezometers will be abandoned by pressure grouting methods. Surface installations (protective covers or manholes) will be removed and an attempt to pull the casing string with the rig will be made. Once this has either been accomplished or has failed, grouting operations will commence as described below.

A.1. Monitoring well abandonment will be accomplished by lowering a tremie pipe to the bottom of the borehole.

A.2. Portland cement/bentonite grout will then be pumped down the tremie pipe until an even flow of consistent grout returns at the surface.

A.3. The tremie pipe will be removed from the borehole on completion of grouting operations and a minimum four inch thick and six foot diameter concrete cap will be constructed over the grouted borehole.

B. Removed casings will be steam cleaned, cut up into manageable sections, and disposed of as refuse.

C. All tremie rods and other downhole equipment will be steam cleaned prior to introduction into the hole or well.

D. All decontamination fluid will be containerized and handled pursuant to decontamination fluid handling procedures contained in Appendix 9.

Appendix 8

BORING LOGS AND WELL CONSTRUCTION DIAGRAMS

Boring logs and well construction diagrams for groundwater monitoring wells are included as appendices to this Attachment.

Well 13MW-1
Well 13MW-2
Well 13MW-3
Well 13MW-4
Well 13MW-5
Well 13MW-6
Well 13MW-7

BORING LOG AND WELL CONSTRUCTION DIAGRAM FOR 13MW-1

Attachment IV.A-28

BORING 13MW1

Location: Radford AAP, Virginia
Surface Elevation: 1698.7 Feet, MSL
Start: 08:14 on 8-20-91
Finish: 12:40 on 8-20-91

Depth (Meters)	Depth (Feet)	Sampling Method	Sample No.	Blows/Foot	Core Run No.	% Recovery	Sample Interval	RQD %	Symbols	Description
0	0	SPT	1	11					ML	REDDISH BROWN (2.5YR 3/3) SILT WITH TRACE FINE SAND, MICACEOUS, MOIST
1										
	5	SPT	2	9						GRADING TO DUSKY RED (2.5YR 3/2) WITH TRACE CLAY
2										
3	10	SPT	3	10						
4									CL	DUSKY RED (2.5YR 3/2) SILTY CLAY, MICACEOUS, MOIST
	15	SPT	4	7					SM	REDDISH BROWN (5YR 4/4) SILTY SAND, VERY MOIST
5									CH	REDDISH BROWN (5YR 4/4) CLAY, PLASTIC, WITH FINE SAND SEAMS, GRADES TO SANDY CLAY AT BASE
									SM	STRONG BROWN (7.5YR 5/6) SILTY SAND, MICACEOUS
6	20	NX			1	100		68	LS	DARK GRAY LIMESTONE, BRECIATED, PERMEABLE, PITTED, POORLY CEMENTED, MOIST BETTER CEMENTED BELOW 20.0 FEET, HIGHLY PITTED WITH VUGS, DRY, TRACE PYRITE CHANGE TO THINLY BEDDED WITH 20° DIP THIN, VERY WEATHERED SEAM, DRY DRY CALCITE FILLED FRACTURES MORE COMMON BELOW 24.0 FEET
7										
	25	NX			2	86		56		NO APPARENT BEDDING 25.1 TO 25.5 FEET DRY FRACTURED LIMESTONE WITH CALCITE VEINS DRY
8										
9	30									AIR ROTARY DRILL WITHOUT CORING BELOW 29.0 FEET WATER ENCOUNTERED AT 31.0 FEET, HIGH FLOW THROUGH FRACTURE PROBABLE
10										
	35									BOREHOLE TERMINATED AT A DEPTH OF 35.0 FEET
11										
12	40									

LOG OF BORING

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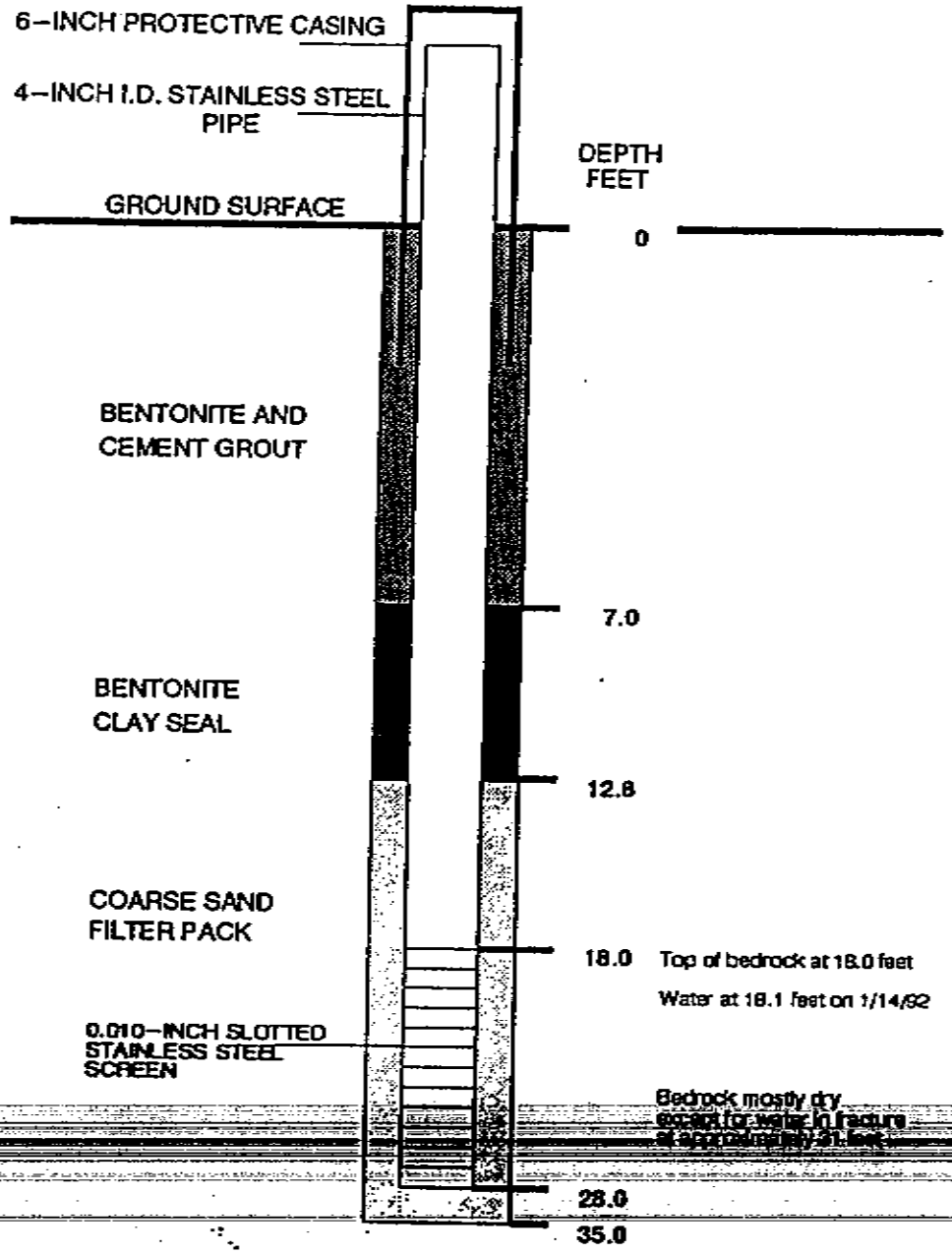
WELL INSTALLATION DIAGRAM FOR RCRA FACILITY INVESTIGATION RADFORD AAP, VIRGINIA

Location: 13MW1
Installation Date: 8/20/91
Surface Elevation: 1698.7 Feet
Top of SS Elevation: 1701.44 Feet



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BORING LOG AND WELL CONSTRUCTION DIAGRAM FOR 13MW-2

Attachment IV.A-29

BORING 13MW2

Location: Radford AAP, Virginia
Surface Elevation: 1701.2 Feet, MSL
Start: 07:44 on 8-26-91
Finish: 12:00 on 8-26-91

Depth (Meters)	Depth (Feet)	Sampling Method	Sample No.	Blows/Foot	Core Run No.	% Recovery	Sample Interval	RQD %	Symbols	Description
0	0	SPT	1	9					ML	DUSKY RED (2.5YR 3/2) SILT, MICACEOUS, MOIST
										GRADED CONTACT
1	5	SPT	2	6					SC/CL	DARK BROWN (7.5YR 4/4) SANDY CLAY WITH CLAY SEAMS
										GRADES TO DARK REDDISH BROWN (5YR 3/3) SILTY CLAY, MICACEOUS
										GRADED CONTACT
2	10	SPT	3	13					ML	REDDISH BROWN (5YR 4/3) CLAYEY SILT WITH FINE SAND, MICACEOUS, MOIST
										GRADED CONTACT
3	15	SPT	4	11					SM	DARK YELLOWISH BROWN (10YR 4/4) SILTY FINE SAND, MICACEOUS
										THIN LIMESTONE SEAM AT 16.8 FEET
										WEATHERED BEDROCK CONTACT AT 19.0 FEET
4	20	SPT	5	100/6"					LS	DARK GRAY LIMESTONE WITH HORIZONTAL FRACTURES
										VERY FRACTURED SEAM
5	25	NX			1	52		0		NO RECOVERY 23.0 TO 25.6 FEET, MAYBE CLAY SEAM, LOST CORING WATER, POSSIBLE WATER TABLE
										DARK GRAY THINLY BEDDED LIMESTONE WITH ORANGE OXIDIZED SEAMS
										BECOMING RECEMENTED BRECIATED LIMESTONE
6	30	NX			2	94		60		WITH THIN CLAY SEAM
										OXIDIZED SEAMS LESS FREQUENT
										AIR ROTARY DRILL WITHOUT CORING BELOW 31.0 FEET
7	35									
8	40									BOREHOLE TERMINATED AT A DEPTH OF 38.0 FEET

LOG OF BORING

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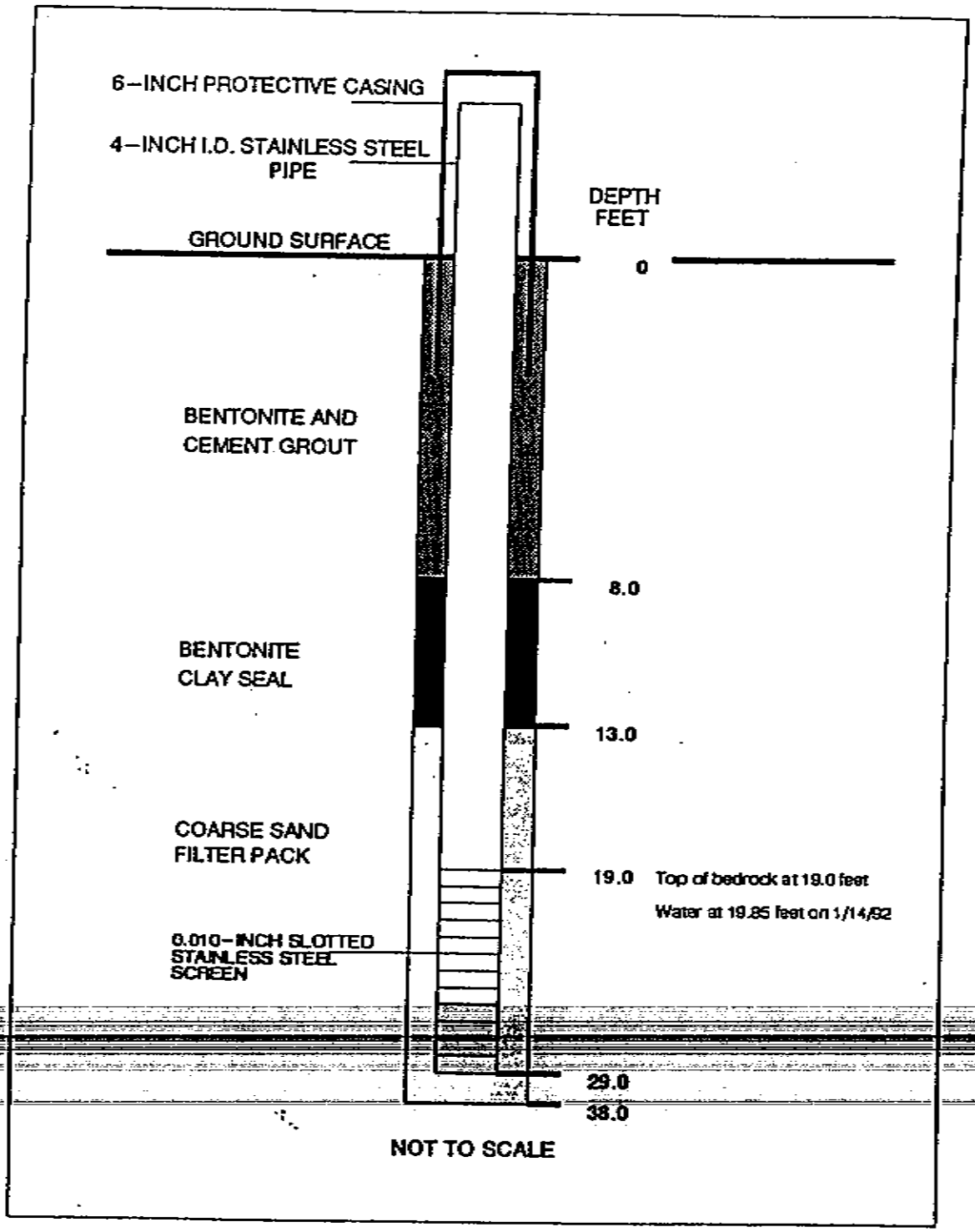
WELL INSTALLATION DIAGRAM FOR RCRA FACILITY INVESTIGATION RADFORD AAP, VIRGINIA

Location: 13MW2
Installation Date: 8/29/91
Surface Elevation: 1701.2 Feet
Top of SS Elevation: 1702.62 Feet



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BORING LOG AND WELL CONSTRUCTION DIAGRAM FOR 13MW-3

Attachment IV.A-30

BORING 13MW3

Location: Radford AAP, Virginia
Surface Elevation: 1693.4 Feet, MSL
Start: 07:58 on 8-27-91
Finish: 11:27 on 8-27-91

Depth (Meters)	Depth (Feet)	Sampling Method	Sample No.	Blows/Foot	Core Run No.	% Recovery	Sample Interval	RQD %	Symbols	Description
0	0	SPT	1	10					ML	DARK GRAYISH BROWN (10YR 3/2) SILT
1									SM	DARK GRAYISH BROWN (10YR 3/2) SILTY FINE SAND WITH SAND SEAMS, MOIST
	5	SPT	2	11						GRADES TO DARK BROWN (7.5YR 3/4) FINE SAND
2									SP	DARK BROWN (7.5YR 3/4) MEDIUM TO COARSE SAND WITH SOME GRAVEL AND TRACE SILT, MOIST
3	10	SPT	3	13						
4									GP	GRAVELS AND COBBLES, MOIST TO WET WEATHERED BEDROCK AT 13.0 FEET, WET
	15	NX			1	73		44	LS	LIGHT GRAY AND GRAY SHALY LIMESTONE WITH BRECIATED SEAMS, WITH CALCITE VEINS
5										GRADES TO HARD LIMESTONE WITH CALCITE AIR ROTARY DRILL WITHOUT CORING BELOW 18.0 FEET
6	20									
7										BOREHOLE TERMINATED AT A DEPTH OF 22.0 FEET
	25									
8										
9	30									
10										
	35									
11										
12	40									

LOG OF BORING

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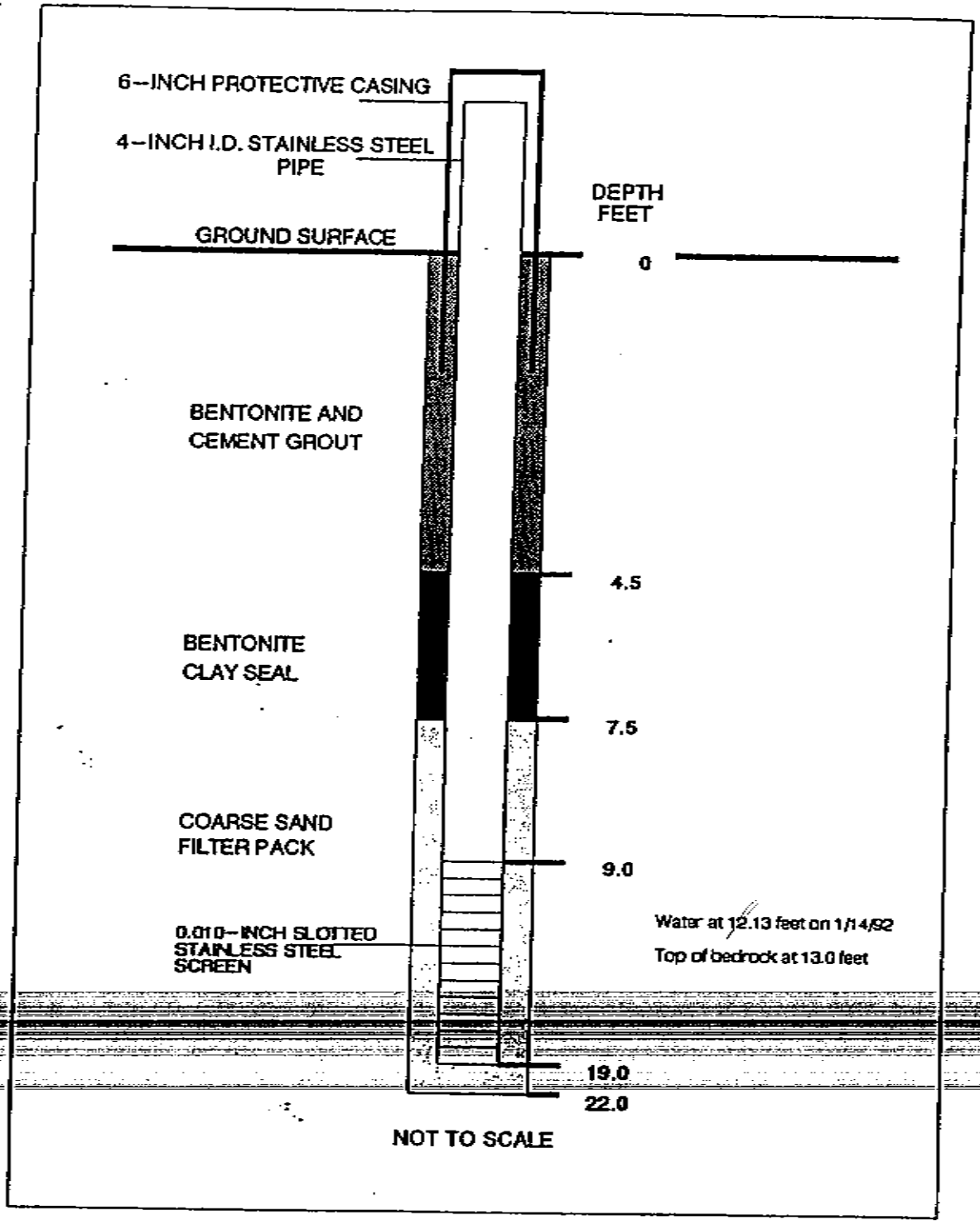
WELL INSTALLATION DIAGRAM FOR RCRA FACILITY INVESTIGATION RADFORD AAP, VIRGINIA

Location: 13MW3
Installation Date: 8/27/91
Surface Elevation: 1693.4 Feet
Top of SS Elevation: 1694.47 Feet



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BORING LOG AND WELL CONSTRUCTION DIAGRAM FOR 13MW-4

Attachment IV.A-31

BORING 13MW4

Location: Radford AAP, Virginia
Surface Elevation: 1695.2 Feet, MSL
Start: 07:25 on 8-28-91
Finish: 11:09 on 8-28-91

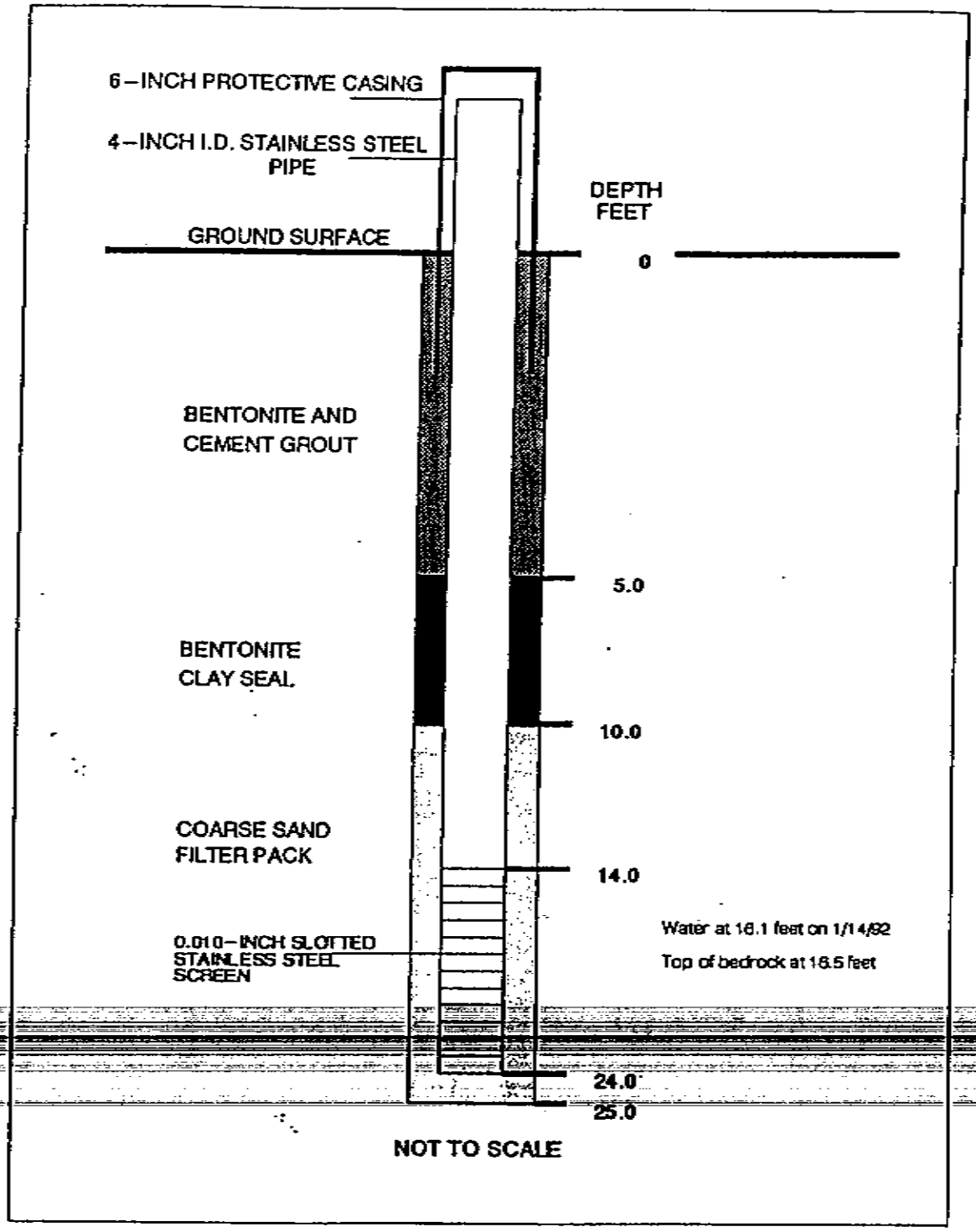
Depth (Meters)	Depth (Feet)	Sampling Method	Sample No.	Blows/Foot	Core Run No.	% Recovery	Sample Interval	RQD %	Symbols	Description
0	0	SPT	1	15					SM	VERY DARK GRAYISH BROWN (10YR 3/2) VERY SANDY SILT, DRY, MICACEOUS
1	5	SPT	2	5						GRADES TO DARK YELLOWISH BROWN (10YR 3/4), MOIST
2										GRADES TO FINE SAND WITH SOME SILT
3	10	SPT	3	9						FINE SAND SEAM AT BASE
4									ML	DARK YELLOWISH BROWN (10.5YR 4/4) CLAYEY SILT, MOIST, MICACEOUS
	15								GM	DARK YELLOWISH BROWN (10YR 4/4) SILTY SANDY GRAVEL
5		SPT	4	62						WATER AT 16.2 FEET
										GRAY VERY WEATHERED LIMESTONE (CLAYSTONE) WITH WEATHERED BRECIATED LIMESTONE SEAMS
6	20	NX			1	40		16		
7										AIR ROTARY DRILL WITHOUT CORING BELOW 22.0 FEET
8	25									BOREHOLE TERMINATED AT A DEPTH OF 25.0 FEET
9	30									
10										
11	35									
12	40									

LOG OF BORING

Dames & Moore

WELL INSTALLATION DIAGRAM FOR RCRA FACILITY INVESTIGATION RADFORD AAP, VIRGINIA

Location: 13MW4
Installation Date: 8/28/91
Surface Elevation: 1695.2 Feet
Top of SS Elevation: 1696.40 Feet



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BORING LOG AND WELL CONSTRUCTION DIAGRAM FOR 13MW-5

Attachment IV.A-32

BORING 13MW5

Location: Radford AAP, Virginia
Surface Elevation: 1695.3 Feet, MSL
Start: 07:44 on 8-23-91
Finish: 10:53 on 8-23-91

Depth (Meters)	Depth (Feet)	Sampling Method	Sample No.	Blows/Foot	Core Run No.	% Recovery	Sample Interval	RQD %	Symbols	Description
0	0	SPT	1	18					ML	DARK REDDISH BROWN (5YR 2.5/2) FINE SANDY SILT
1	5	SPT	2	7						GRADES TO DARK BROWN SILT WITH SOME SAND
2										
3	10	SPT	3	11					SM	DARK BROWN (7.5YR 4/4) SILTY FINE SAND, LOOSE, MICACEOUS
4										
	15									GRADES CLAYEY SAND
5		SPT	4	23					SP	BROWN (10YR 5/3) SAND WITH GRAVEL
										DARK GRAYISH BROWN VERY WEATHERED LIMESTONE WITH CALCITE VEINS
6	20								LS	
		NX			1	82		72		
7										
	25									AIR ROTARY DRILL WITHOUT CORING BELOW 24.0 FEET
										BOREHOLE TERMINATED AT A DEPTH OF 25.0 FEET
8										
9	30									
10										
	35									
11										
12	40									

LOG OF BORING

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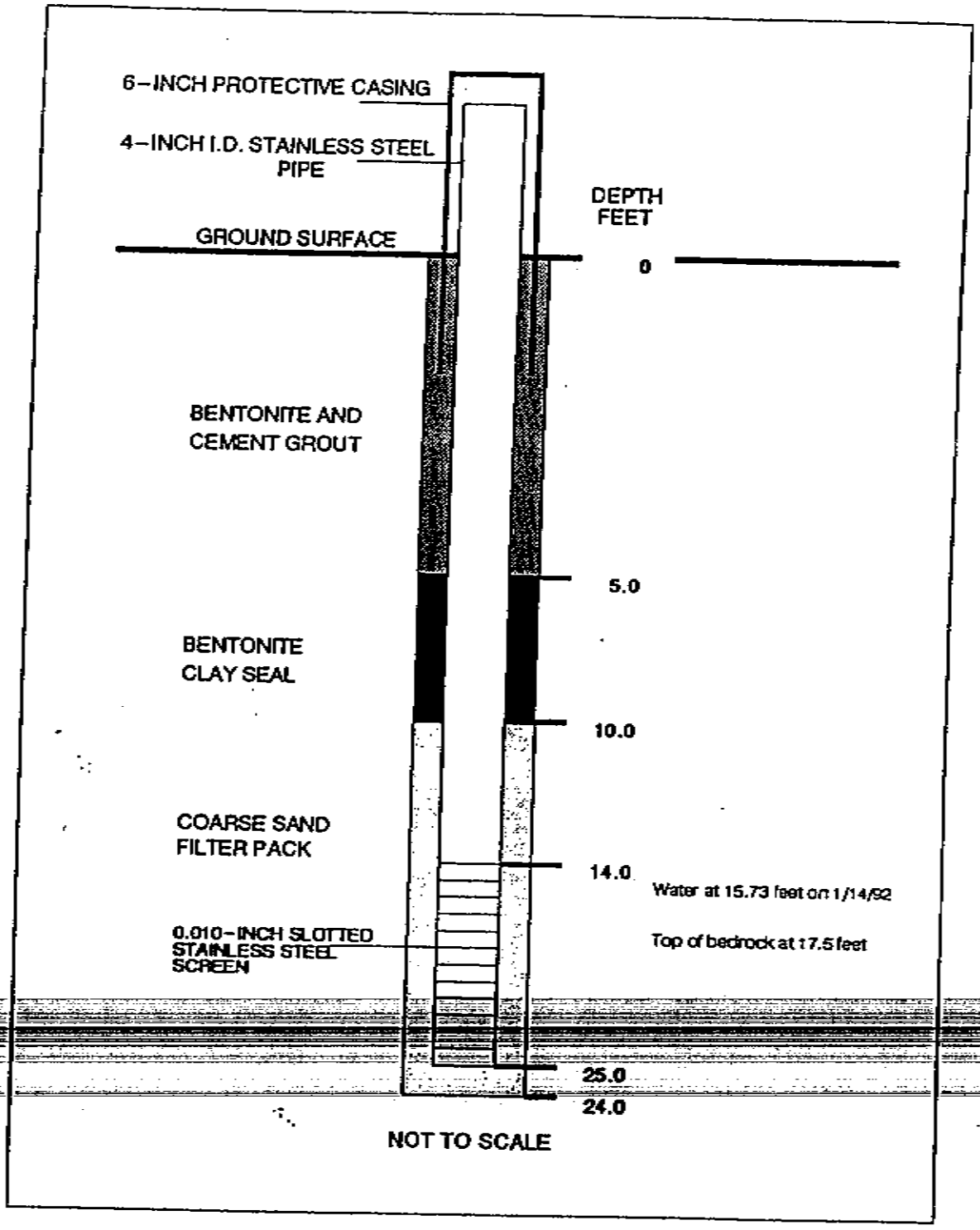
WELL INSTALLATION DIAGRAM FOR RCRA FACILITY INVESTIGATION RADFORD AAP, VIRGINIA

Location: 13MW5
Installation Date: 8/23/91
Surface Elevation: 1695.3 Feet
Top of SS Elevation: 1696.40 Feet



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BORING LOG AND WELL CONSTRUCTION DIAGRAM FOR 13MW-6

Attachment IV.A-33

BORING 13MW6

Location: Radford AAP, Virginia
Surface Elevation: 1693.8 Feet, MSL
Start: 07:45 on 8-21-91
Finish: 13:30 on 8-21-91

Depth (Meters)	Depth (Feet)	Sampling Method	Sample No.	Blows/Foot	Core Run No.	% Recovery	Sample Interval	RQD %	Symbols	Description
0	0	SPT	1	19					GW	FILL MATERIAL (SAND AND GRAVEL)
1									SM	DARK BROWN (10YR 3/3) SILTY FINE SAND, MICACEOUS
	5	SPT	2	7						GRADES TO DARK REDDISH BROWN FINE SAND WITH SILT
2										
3	10	SPT	3	9					ML	DARK BROWN (7.5YR 3/3) SILT WITH FINE SAND, MOIST
4										
5	15	SPT	4	105					GP	DARK YELLOWISH BROWN (10YR 4/4) SANDY GRAVEL, WET
6	20	NX			1	100		0	LS Shale	ALTERNATING DARK GRAY LIMESTONE AND SHALE LAYERS, WITH CALCITE VEINS, TRACE PYRITE
7										AIR ROTARY DRILL, WITHOUT CORING BELOW 21.0 FEET
8	25									BOREHOLE TERMINED AT A DEPTH OF 24.0 FEET
9	30									
10										
11	35									
12	40									

LOG OF BORING

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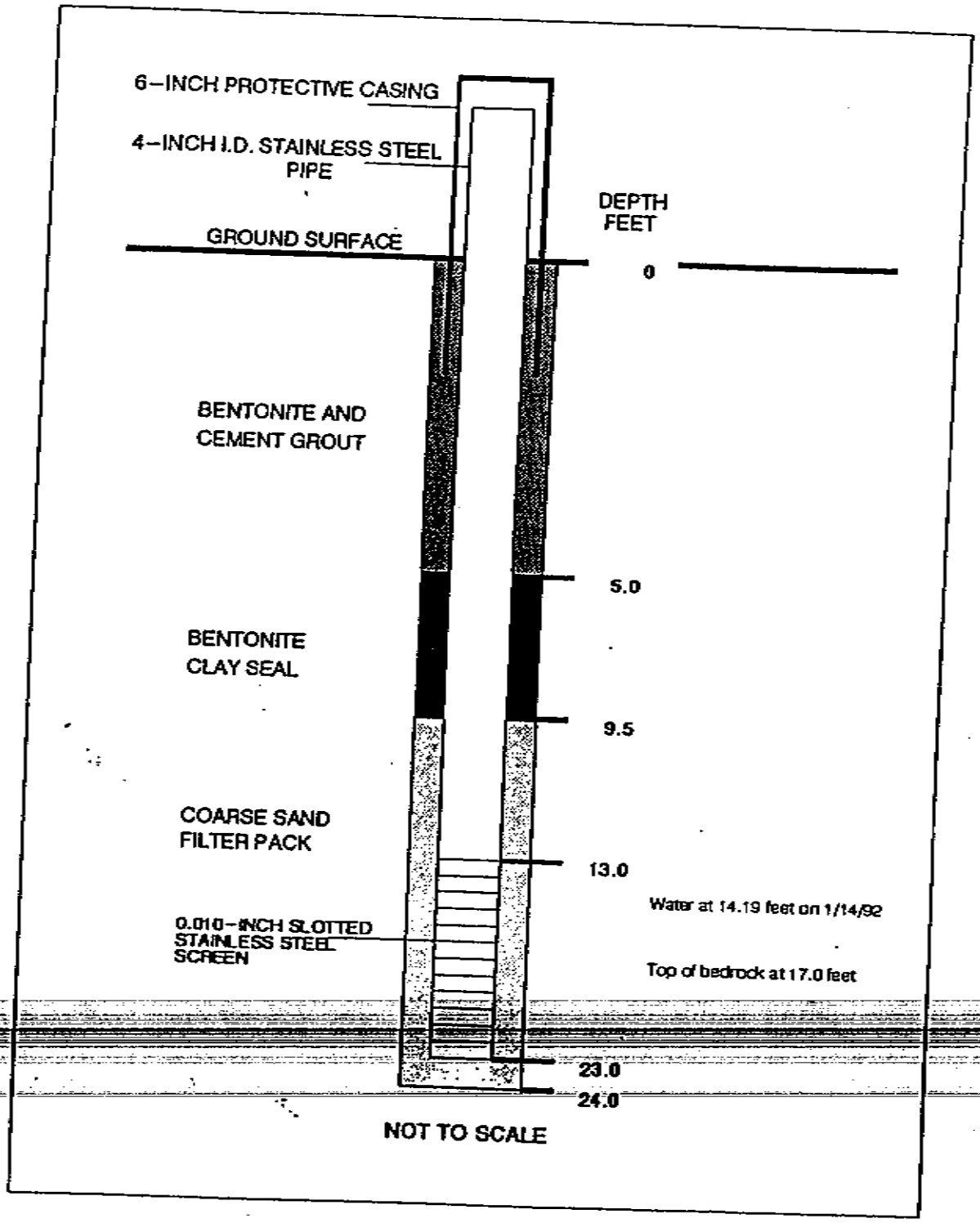
WELL INSTALLATION DIAGRAM FOR RCRA FACILITY INVESTIGATION RADFORD AAP, VIRGINIA

Location: 13MW6
Installation Date: 8/21/91
Surface Elevation: 1693.8 Feet
Top of SS Elevation: 1696.05 Feet



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BORING LOG AND WELL CONSTRUCTION DIAGRAM FOR 13MW-7

Attachment IV.A-34

BORING 13MW7

Location: Radford AAP, Virginia
Surface Elevation: 1693.8 Feet, MSL
Start: 15:41 on 8-21-91
Finish: 16:45 on 8-21-91

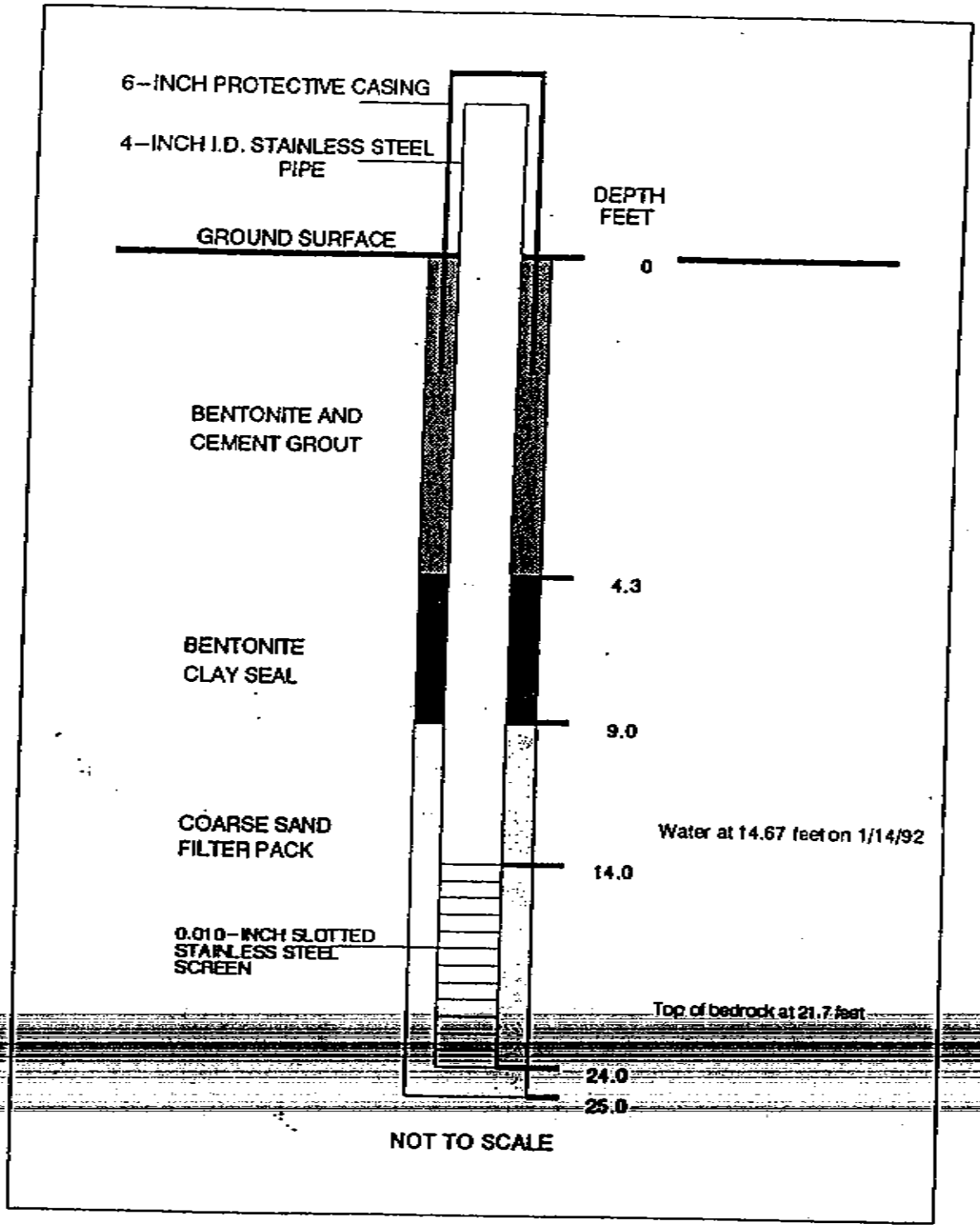
Depth (Meters)	Depth (Feet)	Sampling Method	Sample No.	Blows/Foot	Core Run No.	% Recovery	Sample Interval	RQD %	Symbols	Description
0	0	SPT	1	11					SM/ML	DARK REDDISH BROWN (5YR 3/4) SILTY FINE SAND
1										
	5	SPT	2	9						GRADES MOSTLY SILT, MICACEOUS
2										
3	10	SPT	3	9						GRADES TO SILTY FINE SAND
4										
	15	SPT	4	30						WATER AT 16.0 FEET
5									SP/GP	COARSE SAND AND GRAVEL, WET
6	20	SPT	5	35						
									CL	DARK BROWN (7.5YR 4/3) CLAY WITH TRACE SAND
7									LS	VERY WEATHERED, FRACTURED LIMESTONE
	25									BOREHOLE TERMINATED AT A DEPTH OF 25.0 FEET
8										
9	30									
10										
	35									
11										
12	40									

LOG OF BORING

Dames & Moore

WELL INSTALLATION DIAGRAM FOR RCRA FACILITY INVESTIGATION RADFORD AAP, VIRGINIA

Location: 13MW7
Installation Date: 8/22/92
Surface Elevation: 1693.8 Feet
Top of SS Elevation: 1695.21 Feet



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Appendix 9

INVESTIGATIVE DERIVED WASTE POLICY

Department of Environmental Quality
Waste Operations
Policy for the Handling of
Investigation Derived Waste (IDW)

The Department of Environmental Quality (DEQ), Waste Operations has received a request for guidance from the regulated community concerning the Commonwealth of Virginia's requirements regarding the management and disposal of investigation derived waste (IDW). Because Virginia administers an authorized state RCRA program, the Virginia Solid Waste Management Regulations (VSWMR) and the Virginia Hazardous Waste Management Regulations (VHWMR) will serve as the governing requirements in lieu of Federal RCRA regulations contained in the Code of Federal Regulations (40 CFR 260 - 270) except for the Land Disposal Restrictions of 40 CFR 268. For reference, please see the Virginia Waste Management Act, Code of Virginia §10.1-1400 et seq.; the Virginia Hazardous Waste Management Regulations (VHWMR) (VR 672-10-1); the Virginia Solid Waste Management Regulations (VSWMR) (VR 672-20-10); Federal: the Resource Conservation and Recovery Act (RCRA), 42 USC 6901; and the U. S. Department of Transportation Rules for the Transportation of Hazardous Materials, 49 CFR Part 107, 171.1 - 172.558.

With regard to IDW, it is the site manager's responsibility to determine whether the wastes generated during an investigation meet the definition of a solid or hazardous waste. The site manager will be either the on-scene coordinator (i.e., either the federal official predesignated by the Environmental Protection Agency (EPA) or the U.S. Coast Guard to coordinate and direct federal responses under subpart D or the official designated by the lead agency to coordinate and direct removal actions under subpart E of the National Contingency Plan (NCP)), or the remedial project manager (i.e., the official designated by the lead agency to coordinate, monitor, or direct remedial or other response actions under subpart E of the NCP).

If there is a possibility that either the ground water or the soil at the location where a monitoring well is installed is contaminated, the site manager must determine whether or not the well cuttings, purge water, and/or other IDW are contaminated (i.e., whether they are solid or hazardous wastes). In these cases, the site manager may use knowledge of the contaminated media to declare that the IDW is solid or hazardous waste. If analysis shows that no contamination is present in the soil or the ground water at the location where the monitoring well is installed, neither the well cuttings, nor the purge water would be regulated as a solid waste. An example of a situation where the site manager might use knowledge to determine proper disposition (i.e., testing would not be required) would involve materials generated at locations where wells are installed for the purpose of ascertaining naturally occurring levels of

inorganic constituents and there is no basis to expect contamination, i.e., there is no past history of hazardous waste management activities or releases in these areas. If this is the case, the soils, cuttings, purge water, etc. would not be regulated as solid wastes. Test results or knowledge of the waste should be used to screen the well cuttings, purge water and other IDW to demonstrate that concentrations of contaminants are below or equal to background levels.

Purge water, well cuttings from monitoring wells, and other IDW, if tested, must be done so in accordance with EPA SW-846, Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, 3rd edition, 1986, as updated. If contaminant levels are found to be above background levels, the IDW would be considered a solid waste. Should test results further indicate that the IDW contains a listed hazardous waste, or if the IDW exhibits a characteristic of hazardous waste, the IDW is a hazardous waste and must be managed and disposed in accordance with the VHWMR. Alternatively, contaminated IDW that contains a listed hazardous waste must be managed as a hazardous waste until it no longer "contains" the hazardous waste, i.e., until the constituent levels are below site specific risk based levels. This is consistent with EPA's Contained In Policy. The DEQ should be contacted directly to determine the site specific risk based levels that would apply to IDW that contains listed hazardous waste.

If the IDW is not a hazardous waste, but contains levels of contaminants above background levels, the IDW must be managed in accordance with the VSWMR. Solid waste generated from cleanup or investigation activities is considered a special waste under Part VIII of the VSWMR. Prior to acceptance of a special waste for disposal at a solid waste management facility, the operator must obtain prior authorization from the Department. Purge water, on the other hand, must be disposed at a publicly owned treatment works (POTW) or other wastewater treatment system operating in accordance with its Virginia Pollutant Discharge Elimination System (VPDES) permit, provided that all other pertinent criteria are satisfied.

The on-site treatment, storage, or disposal of IDW must be authorized by a permit from the DEQ. A generator of hazardous IDW may accumulate such wastes in tanks or containers in accordance with VHWMR §6.4.E. Treatment of hazardous waste in tanks or containers within the 90 day accumulation period may only occur upon prior written approval from the appropriate DEQ Regional Office.

This policy may be revised or rescinded at any time as Federal and/or State regulations change.

Signed:

Hassan Vakili

Hassan Vakili, Director
Waste Operations

6-28-95
Date

ADDENDUM

Department of Environmental Quality
Waste Operations
Policy for the Handling of
Investigation Derived Waste (IDW)

This Addendum is being provided to clarify the distinction between the disposal requirements for Investigation Derived Waste (IDW) that is generated from an undefined area, and the requirements for soil and sediment IDW when soil and sediment is generated from an area of known contamination subject to further response measures with oversight from DEQ and/or EPA.

"DEQ Policy for the Handling of Investigation Derived Waste" dated July 5, 1995, specifies that IDW contaminated above background levels is considered a solid waste and must be managed in accordance with the Virginia Solid Waste Management Regulations. If the IDW contains a listed hazardous waste or exhibits a characteristic of hazardous waste, it must be managed as hazardous waste in accordance with the Virginia Hazardous Waste Management Regulations. Under this policy, returning contaminated IDW to the location from which it is generated is prohibited.

However, this policy was not intended to address the requirements associated with soil and sediment IDW generated from an area of known contamination when this area is subject to future response activities with oversight from DEQ or EPA. In such a case, the management and disposal of the IDW should be in accordance with the pertinent EPA guidance governing the applicability of RCRA land disposal restrictions. ("Management of IDW During SI's", EPA/540/G-91/009).

Under the EPA guidance, replacement of soil and sediment IDW into the area of contamination from which it is generated is permissible provided that the waste is not treated prior to placement. Therefore, the above-referenced DEQ IDW policy now recognizes that if soil and sediment IDW is generated from an area of known contamination, and this area is subject to further response measures with oversight from DEQ and/or EPA, the IDW may be placed back into the area from which it is taken provided there is no treatment of this waste prior to placement.

Signed Hassan Vakili Date 9/24/96

Hassan Vakili, Director
Division of Waste Operations

PERMIT ATTACHMENT IV.B

GROUND WATER MONITORING LIST

Attachment IV.B-1

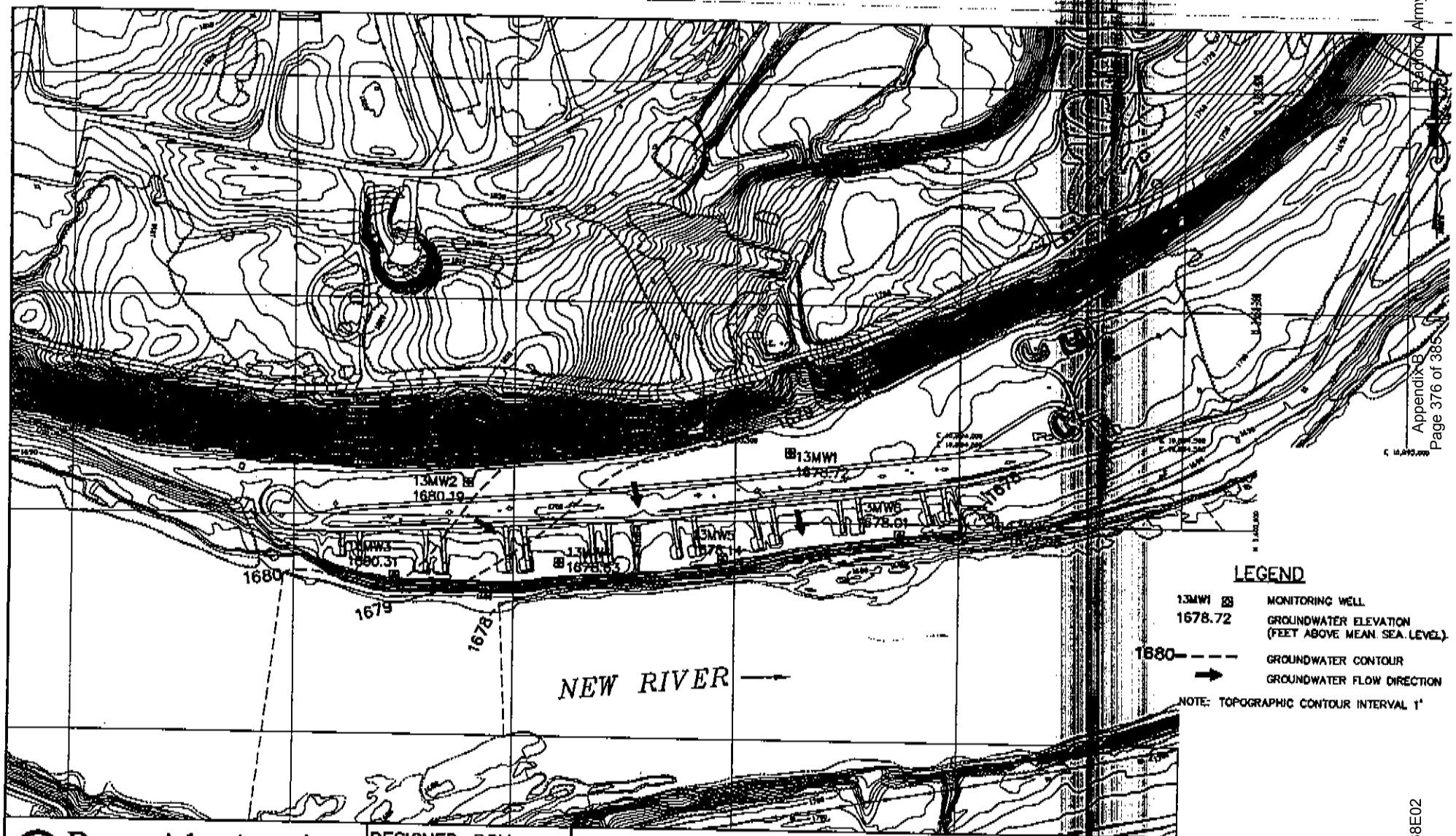
PERMIT ATTACHMENT IV.B

GROUND WATER MONITORING LIST

Constituents	CASRN	Analytical Method
Energetics		
1,3,5-trinitrobenzene	99354	8330
1,3-dinitrobenzene	99650	8330
2,4-dinitrotoluene	121142	8330
2,6-dinitrotoluene	606202	8330
Nitroglycerin	55630	8332
Semivolatiles		
2,4-dichlorophenol	120832	8270C
3,3'-dimethylbenzidine	119937	8270D
2-chlorophenol	95578	8270C
3-methylphenol	108394	8270C
4-methylphenol	106445	8270C
4-nitrophenol	100027	8270C
Acetophenone	98862	8270C
Benzo(a)anthracene	56553	8270C
Benzo(a)pyrene	50328	8270C
Benzo(b)fluoranthene	205992	8270C
Benzo(k)fluoranthene	207089	8270C
Bis(2-ethylhexyl)phthalate	117817	8270C
Butyl benzyl phthalate	85687	8270C
Dibenzo(a,h)anthracene	53703	8270C
Dibenzofuran	132649	8270C
Dibutyl phthalate	84742	8270C
Diethyl phthalate	84662	8270C
Dimethyl phthalate	131113	8270C
Di-n-butyl phthalate	84742	8151A
Di-n-octyl phthalate	117840	8270C
Diphenylamine	122394	8270C
Fluoranthene	206440	8270C
Hexachloroethane	67721	8260B
Indeno(1,2,3-cd)pyrene	193395	8270C
Naphthalene	91203	8260B
Nitrobenzene	98953	8270C

Attachment IV.B-2

DO NOT RELEASE
FOIA EXEMPT
ENFORCEMENT CONFIDENTIAL



Draper Aden Associates
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DESIGNED	RGM
DRAWN	JFF/DRW
CHECKED	AEK
DATE	02/13/02

OPEN BURNING GROUND POTENTIOMETRIC SURFACE MAP (4TH QUARTER 2001)
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

SCALE: 1"=200'
PLAN NO. B03131-01
FIGURE IV-1

B03131-01_HWMU-13.dwg

Constituents	CASRN	Analytical Method
Phenol	108952	8270C
Pyrene	129000	8270C
Volatiles		
1,2-dichloroethane	107062	8260B
1,1-dichloroethene	75354	8260B
Benzene	71432	8260B
Benzyl chloride	100447	8260B
Carbon tetrachloride	56235	8260B
Chlorobenzene	108907	8260B
Chloroform	67663	8260B
Methyl bromide	74839	8260B
Methyl chloride	74873	8260B
Methylene chloride	75092	8260B
Tetrachloroethene	127184	8260B
Toluene	108883	8260B
Trichloroethene	79016	8260B
Vinyl chloride	75014	8260B
Total Metals		
Antimony	7440360	6010B
Arsenic	7440382	6010B
Barium	7440393	6010B
Cadmium	7440439	6010B
Chromium	7440473	6010B
Lead	7439921	6010B
Mercury	7439976	7470A
Nickel	7440020	6010B
Selenium	7782492	6010B
Silver	7440224	6010B
Zinc	7440666	6010B
Miscellaneous		
Perchlorate	14797730	314.0

Note:

1. Alternate SW-846 Methods may be approved by the Department if the request is in writing and submitted at least 30 days prior to the sample collection event. Proposed alternative methods must achieve the appropriate Data Quality Objective (i.e. at least a Department approved health-based concentration limit).

Attachment IV.B-3

PERMIT ATTACHMENT IV.C

INITIAL BACKGROUND CONCENTRATIONS

Attachment IV.C-1

PERMIT ATTACHMENT IV.C

INITIAL BACKGROUND CONCENTRATIONS

Constituents	CASRN	Initial Background Concentration
Energetics		
1,3,5-trinitrobenzene	99354	
1,3-dinitrobenzene	99650	
2,4-dinitrotoluene	121142	
2,6-dinitrotoluene	606202	
Nitroglycerin	55630	
Semivolatiles		
2,4-dichlorophenol	120832	
3,3'-dimethylbenzidine	119937	
2-chlorophenol	95578	
3-methylphenol	108394	
4-methylphenol	106445	
4-nitrophenol	100027	
Acetophenone	98862	
Benzo(a)anthracene	56553	
Benzo(a)pyrene	50328	
Benzo(b)fluoranthene	205992	
Benzo(k)fluoranthene	207089	
Bis(2-ethylhexyl)phthalate	117817	
Butyl benzyl phthalate	85687	
Dibenzo(a,h)anthracene	53703	
Dibenzofuran	132649	
Dibutyl phthalate	84742	
Diethyl phthalate	84662	
Dimethyl phthalate	131113	
Di-n-butyl phthalate	84742	
Di-n-octyl phthalate	117840	
Diphenylamine	122394	
Fluoranthene	206440	
Hexachloroethane	67721	
Indeno(1,2,3-cd)pyrene	193395	

Attachment IV.C-2

Constituents	CASRN	Initial Background Concentration
Naphthalene	91203	
Nitrobenzene	98953	
Phenol	108952	
Pyrene	129000	
Volatiles		
1,2-dichloroethane	107062	
1,1-dichloroethene	75354	
Benzene	71432	
Benzyl chloride	100447	
Carbon tetrachloride	56235	
Chlorobenzene	108907	
Chloroform	67663	
Methyl bromide	74839	
Methyl chloride	74873	
Methylene chloride	75092	
Tetrachloroethene	127184	
Toluene	108883	
Trichloroethene	79016	
Vinyl chloride	75014	
Total Metals		
Antimony	7440360	
Arsenic	7440382	
Barium	7440393	
Cadmium	7440439	
Chromium	7440473	
Lead	7439921	
Mercury	7439976	
Nickel	7440020	
Selenium	7782492	
Silver	7440224	
Zinc	7440666	
Miscellaneous		
Perchlorate	14797730	

Attachment IV.C-3

MODULE V – GROUNDWATER COMPLIANCE MONITORING

RESERVED

MODULE VI – POST-CLOSURE CARE

RESERVED

MODULE VII – REGULATED CORRECTIVE ACTION

RESERVED

MODULE VIII – SITE-WIDE CORRECTIVE ACTION

VIII.A. CORRECTIVE ACTION FOR CONTINUING RELEASES; PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The requirements of 40 CFR 264.101 are addressed by the Corrective Action Permit issued to the Permittees by EPA Region III which became effective on October 31, 2000 and shall remain in effect until October 31, 2010. The terms and conditions of the Corrective Action Permit issued by EPA are adequate to fulfill the Department's requirements for facility-wide corrective action as specified in 40 CFR 264.101 as made applicable by 9 VAC 20-60-264.

VIII.B REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE DEPARTMENT

Copies of all notifications, report, and submissions made in compliance with the EPA permit shall be provided to the Director in accordance with Permit Condition I.I. (see Module I).

MODULE IX – SCHEDULE OF COMPLIANCE

PART IX.1 -

[RESERVED]