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RCRA PART B HAZARDOUS WASTE FACILITY OPERATION PERMIT APPLICATION FOR DEMOLITION NAS KEY WEST FL

2/17/1989

ENVIRONMENTAL AND SAFETY DESIGNS INCORPORATED

RCRA PART B
HAZARDOUS WASTE FACILITY
OPERATION PERMIT APPLICATION

for

DEMOLITION KEY
NAVAL AIR STATION KEY WEST, FLORIDA

prepared for

NAVAL FACILITIES ENGINEERING COMMAND
SOUTHERN DIVISION
CHARLESTON, SOUTH CAROLINA

prepared by

ENVIRONMENTAL AND SAFETY DESIGNS
MEMPHIS, TENNESSEE

17 FEBRUARY 1989

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APPLICATION FOR A HAZARDOUS WASTE FACILITY PERMIT
PART I - GENERAL
TO BE COMPLETED BY ALL APPLICANTS

Please Type or Print

A. GENERAL INFORMATION

1. TYPE OF FACILITY:
   DISPOSAL [ ]
   LANDFILL [ ] LAND TREATMENT [ ] SURFACE IMPOUNDMENT [ ]
   STORAGE [ ]
   CONTAINERS [ ] TANKS [ ] PILES [ ] SURFACE IMPOUNDMENT [ ]
   TREATMENT [X]
   TANKS [ ] PILES [ ] INCINERATION [ ] SURFACE IMPOUNDMENT [ ]
   * THERMAL [X] CHEMICAL [ ] PHYSICAL [ ] BIOLOGICAL [ ]

2. TYPE OF APPLICATION: [ ] TOP [ ] CONSTRUCTION [X] OPERATION [ ] CLOSURE [ ] RD&D

3. DATE CURRENT OPERATION BEGAN (OR IS EXPECTED TO BEGIN): 1960's

4. FACILITY NAME: Naval Air Station Key West - Demolition Key

5. FL EPA/DER I.D. NO.: FL 3170500000

6. FACILITY LOCATION OR STREET ADDRESS: Demolition Key

7. FACILITY MAILING ADDRESS: NAS Key West (STREET OR P.O. BOX) Key West (CITY) FL (STATE) 33040-5000 (ZIP)

8. CONTACT PERSON: Steve Covell TELEPHONE: (305) 292-2151
   TITLE: Environmental Protection Specialist
   MAILING ADDRESS: Public Works Office (STREET OR P.O. BOX) NASKW Key West (CITY) FL (STATE) 33040-5000 (ZIP)

9. OPERATOR'S NAME: EOD NAS Key West TELEPHONE: (305) 292-5321

10. OPERATOR'S ADDRESS: EOD, NAS Key West (STREET OR P.O. BOX) Key West (CITY) FL (STATE) 33040-5000 (ZIP)

11. FACILITY OWNER'S NAME: NAS Key West

12. FACILITY OWNER'S ADDRESS: NAS Key West (STREET OR P.O. BOX) Key West (CITY) FL (STATE) 33040-5000 (ZIP)

13. LEGAL STRUCTURE: [ ] CORPORATION [ ] NON-PROFIT CORPORATION [ ] PARTNERSHIP
    [ ] INDIVIDUAL [ ] LOCAL GOVERNMENT [ ] STATE GOVERNMENT [X] FEDERAL GOVERNMENT
    OTHER

14. IF AN INDIVIDUAL, PARTNERSHIP, OR BUSINESS IS PERFORMED UNDER AN ASSUMED NAME, SPECIFY COUNTY AND STATE WHERE NAME IS REGISTERED. COUNTY: N/A STATE ___

15. IF A CORPORATION, INDICATE STATE OF INCORPORATION N/A .

* Miscellaneous Unit

16. IF AN INDIVIDUAL OR PARTNERSHIP, LIST OWNERS: N/A

NAME: _____

ADDRESS: _____
STREET OR P.O. BOX CITY STATE ZIP

NAME: _____

ADDRESS: _____
STREET OR P.O. BOX CITY STATE ZIP

NAME: _____

ADDRESS: _____
STREET OR P.O. BOX CITY STATE ZIP

NAME: _____

ADDRESS: _____
STREET OR P.O. BOX CITY STATE ZIP

17. SITE OWNERSHIP STATUS: [X] OWNED [ ] TO BE PURCHASED [ ] TO BE LEASED _____ YEARS
[ ] PRESENTLY LEASED: EXPIRATION DATE _____ IF LEASED, GIVE:

LAND OWNER'S NAME N/A

LAND OWNER'S ADDRESS _____
STREET OR P.O. BOX CITY STATE ZIP

18. ENGINEER: Joseph L. McCauley REGISTRATION NO.: 7636 (SC) (1)

ADDRESS: P.O. Box 10068, Code 1142, Charleston, SC 29411
STREET OR P.O. BOX CITY STATE ZIP

ASSOCIATED WITH: U.S. Navy

19. FACILITY LOCATED ON INDIAN LAND: [ ] YES [X] NO

20. EXISTING OR PENDING ENVIRONMENTAL PERMITS: (ATTACH A SEPARATE SHEET IF NECESSARY)

NAME OF PERMIT	AGENCY	PERMIT NUMBER	DATE ISSUED	EXPIRATION DATE
There are no other environmental permits at this time.				

B. SITE INFORMATION

1. FACILITY LOCATION: COUNTY: Monroe NEAREST COMMUNITY: Key West
   LATITUDE: 24° 35' 48" N LONGITUDE: 81°, 47', 45" W
2. AREA OF FACILITY SITE (ACRES): 24
3. ATTACH A SCALE DRAWING AND PHOTOGRAPHS OF THE FACILITY SHOWING THE LOCATION OF ALL PAST, PRESENT, AND FUTURE TREATMENT, STORAGE AND DISPOSAL AREAS. ALSO SHOW THE HAZARDOUS WASTES TRAFFIC PATTERN INCLUDING ESTIMATED VOLUME AND CONTROL.
   See Figures A-1 and A-2, Attachment A
4. ATTACH TOPOGRAPHIC MAP WHICH SHOW ALL THE FEATURES INDICATED IN THE INSTRUCTION SHEET FOR THIS PART.
   See Figure A-3, Attachment A
5. IS THE SITE LOCATED IN A 100-YEAR FLOOD PLAIN? [X] YES [ ] NO

C. LAND USE INFORMATION

1. PRESENT ZONING OF THE SITE? None-Military Reservation
2. IF A ZONING CHANGE IS NEEDED, WHAT SHOULD NEW ZONING BE? N/A
3. PRESENT LAND USE OF SITE Military Reservation

D. OPERATING INFORMATION

1. IS WASTE GENERATED ON SITE? [X] YES [ ] NO LIST THE SIC CODES (4-DIGIT)
   9711
2. ATTACH A BRIEF DESCRIPTION OF THE FACILITY OPERATION, NATURE OF THE BUSINESS, AND ACTIVITIES THAT GENERATE OR OTHERWISE INVOLVE HAZARDOUS WASTE.
   See Attachment B
3. USING THE FOLLOWING TABLE AND CODES PROVIDED, SPECIFY, (1) EACH PROCESS USED FOR TREATING, STORING, OR DISPOSING OF HAZARDOUS WASTE (INCLUDING DESIGN CAPACITIES)) AT THE FACILITY, AND (2) THE HAZARDOUS WASTE (OR WASTES) LISTED OR DESIGNATED IN 40 CFR PART 261, INCLUDING THE ANNUAL QUANTITIES, TO BE TREATED, STORED, OR DISPOSED BY EACH PROCESS AT THE FACILITY. (SEE INSTRUCTIONS FOR LIST OF PROCESS CODES AND UNITS).

PROCESS CODE	PROCESS DESIGN CAPACITY AND UNITS OF MEASURE	HAZARDOUS WASTE CODE	ANNUAL QUANTITY OF HAZARDOUS WASTE AND UNITS OF MEASURE
T04	100 lb/Burn	D003,5, 6, 7	2,000 lb./Yr.
T04	100 lb./Detonation	D003,8, 9	3,000 lb./Yr.

Note: 200#/Yr. of ash, D005, 6, 8 will be generated.

APPLICATION FOR A HAZARDOUS WASTE FACILITY PERMIT
PART II

A. - GENERAL

A) ATTACH A TOPOGRAPHIC MAP SHOWING A DISTANCE OF 1000 FEET AROUND THE HAZARDOUS WASTE MANAGEMENT AREA AT A SCALE OF 1 INCH TO 200 FEET. CONTOURS MUST BE SHOWN ON THE MAP WITH INTERVALS SUFFICIENT TO CLEARLY SHOW THE PATTERN OF SURFACE WATER FLOW IN THE VICINITY OF AND FROM EACH OPERATIONAL UNIT OF THE FACILITY (E.G., CONTOUR INTERVALS OF 5 FEET IF RELIEF IS GREATER THAN 20 FEET OR AN INTERVAL OF 2 FEET IF RELIEF IS LESS THAN 20 FEET). THE MAP SHOULD CLEARLY SHOW THE FOLLOWING:

1) MAP SCALE AND DATE
2) 100-YEAR FLOODPLAIN AREA
3) ORIENTATION OF THE MAP
4) ACCESS CONTROL (FENCES, GATES)
5) INJECTION AND WITHDRAWAL WELLS BOTH ON-SITE AND OFF-SITE
6) BUILDING AND OTHER STRUCTURES (RECREATIONAL AREAS, ACCESS AND INTERNAL ROADS, STORM, SANITARY, AND PROCESS SEWERAGE SYSTEMS, FIRE CONTROL FACILITIES, ETC.)
7) CONTOURS SUFFICIENT TO SHOW SURFACE WATER FLOW
8) LOADING AND UNLOADING AREAS
9) DRAINAGE OR FLOOD CONTROL BARRIERS
10) HAZARDOUS WASTE UNITS INCLUDING CLEAN UP AREAS
11) RUNOFF CONTROL SYSTEM

See Figure A-4, Attachment A

B) A WIND ROSE SHOULD BE INCLUDED WITH THE MAPS, OR AS A SEPARATE ITEM, INDICATING THE LOCAL PREVAILING WIND SPEED AND DIRECTION, LEGEND, AND DATE.

See Figure A-5, Attachment A

TOPOGRAPHIC MAPS MAY BE OBTAINED AT THE FOLLOWING ADDRESS:

BRANCH OF DISTRIBUTION
U.S.G.S.
1200 SOUTH EADS
ARLINGTON, VIRGINIA 22202
PHONE NO. (703) 557-2751

INFORMATION ON LATITUDES AND LONGITUDES MAY BE OBTAINED FROM THE U.S.G.S. NATIONAL CARTOGRAPHIC INFORMATION CENTER AT (703) 860-6336.

C) TRAFFIC INFORMATION

See Figure A-1, Attachment A

2. FINANCIAL RESPONSIBILITY INFORMATION Federal Facility - Not Applicable

a) ATTACH THE MOST RECENT CLOSURE COST ESTIMATES FOR THE FACILITY (§264.142) AND A COPY OF THE FINANCIAL MECHANISM USED TO ESTABLISH FINANCIAL ASSURANCE FOR CLOSURE OF THE FACILITY [§264.143 AND §270.14(b) (15)]. USE DER FORM NUMBERS 17-30.900(4) (a,b,c,d,e,f,g,h,i or j) ONLY. RETYPED DOCUMENTS ARE NOT ACCEPTABLE. SEND THE ORIGINALLY SIGNED DOCUMENTS TO: HAZARDOUS WASTE FINANCIAL RESPONSIBILITY COORDINATOR, DEPARTMENT OF ENVIRONMENTAL REGULATION, DIVISION OF WASTE MANAGEMENT, 2600 BLAIR STONE ROAD, TALLAHASSEE, FLORIDA, 32399-2400.

b) IF APPLICABLE, ATTACH THE MOST RECENT POST-CLOSURE CARE COST ESTIMATE FOR THE FACILITY (§264.144) AND A COPY OF THE FINANCIAL MECHANISM USED TO ESTABLISH FINANCIAL ASSURANCE FOR POST-CLOSURE CARE OF THE FACILITY [§264.145, §264.146 AND §270.14(b)(16)]. USE DER FORM NUMBERS 17-30.900(4) (a,b,c,d,e,f,g,h,i or j) ONLY. RETYPED DOCUMENTS ARE NOT ACCEPTABLE. SEND THE ORIGINALLY SIGNED DOCUMENTS TO THE ADDRESS IN a. ABOVE.

c) ATTACH A COPY OF THE DOCUMENTS USED TO DEMONSTRATE LIABILITY COVERAGE (§264.147). USE DER FORM NUMBERS 17-30.900(4) (b,d,k,l,m OR n) ONLY. RETYPED DOCUMENTS ARE ARE NOT ACCEPTABLE. SEND THE ORIGINALLY SIGNED DOCUMENTS TO THE ADDRESS IN a. ABOVE. IF FORMS 17-30.900(2) (k,l,m OR n) ARE USED, ALSO SEND A SIGNED DUPLICATE ORIGINAL OF THE INSURANCE POLICY WITH THE ORIGINALLY SIGNED DOCUMENTS TO THE ADDRESS IN a. ABOVE [§264.147(a)(1)(i) AND (§270.14(b)(17)].

3. ATTACH A FLOOD MAP. INFORMATION ON FLOOD AREAS MAY BE OBTAINED FROM A FLOOD MAP PRODUCED BY THE FEDERAL INSURANCE ADMINISTRATION (FIA) OF THE FEDERAL EMERGENCY MANAGEMENT AGENCY. IF A FIA FLOOD MAP IS NOT AVAILABLE FOR AN AREA, AN EQUIVALENT MAPPING TECHNIQUE MAY BE USED TO DETERMINE WHETHER THE FACILITY IS WITHIN THE 100-YEAR FLOODPLAIN, AND IF SO, WHAT THE 100-YEAR FLOOD ELEVATION WOULD BE. INFORMATION REQUESTED IN THIS SECTION MAY BE OBTAINED FROM THE U.S. GEOLOGICAL SURVEY, THE SOIL CONSERVATION SERVICE, THE WATER MANAGEMENT DISTRICTS, OR THE REGIONAL PLANNING COUNCILS. See Figuire A-3, Attachment A

IF THE SITE IS LOCATED IN THE 100-YEAR FLOODPLAIN, IDENTIFY THE 100-YEAR FLOOD LEVEL AND ANY OTHER SPECIAL FLOODING FACTORS (E.G., WAVE ACTION) WHICH MUST BE CONSIDERED IN DESIGNING, CONSTRUCTION, OPERATING, OR MAINTAINING THE FACILITY TO WITHSTAND WASHOUT FROM A 100-YEAR FLOOD. ADDITIONALLY, PROVIDE THE FOLLOWING INFORMATION:

a) ENGINEERING ANALYSIS TO INDICATE THE VARIOUS HYDRODYNAMIC AND HYDROSTATIC FORCES EXPECTED TO RESULT AT THE SITE AS A CONSEQUENCE OF A 100-YEAR FLOOD.
N/A

b) STRUCTURAL OF OTHER ENGINEERING STUDIES SHOWING THE DESIGN OF OPERATIONAL UNITS (I.E., TANKS, INCINERATORS) AND FLOOD PROTECTION DEVICES (I E., FLOODWALLS, DIKES) AT THE FACILITY AND HOW THESE WILL PREVENT WASHOUT.
N/A

c) IF APPLICABLE, AND IN LIEU OF PARAGRAPHS (1) AND (2) ABOVE, A DETAILED DESCRIPTION OF PROCEDURES TO BE FOLLOWED TO REMOVE HAZARDOUS WASTE TO SAFETY BEFORE THE FACILITY IS FLOODED, INCLUDING:
See Attachment C

(1) TIMING OF SUCH MOVEMENT RELATIVE TO FLOOD LEVELS, INCLUDING THE ESTIMATED TIME TO MOVE THE WASTE TO SHOW THAT SUCH MOVEMENT CAN BE

COMPLETED BEFORE FLOODWATERS REACH THE FACILITY;

(2) A DESCRIPTION OF THE LOCATION(S) TO WHICH THE WASTE WILL BE MOVED AND A DEMONSTRATION THAT THOSE FACILITIES WILL BE ELIGIBLE TO RECEIVE HAZARDOUS WASTE IN ACCORDANCE WITH THE REGULATIONS UNDER 40 CFR PARTS 264 AND 265;

(3) THE PLANNED PROCEDURES, EQUIPMENT, AND PERSONNEL TO BE USED AND THE MEANS TO ENSURE THAT SUCH RESOURCES WILL BE AVAILABLE IN TIME FOR USE; AND

(4) THE POTENTIAL FOR ACCIDENTAL DISCHARGES OF THE WASTE DURING MOVEMENT.

IF THE SITE IS NOT LOCATED IN THE 100-YEAR FLOODPLAIN, PROVIDE THE SOURCE OF DATA FOR SUCH A DETERMINATION AND INCLUDE A COPY OF THE RELEVANT FIA FLOOD MAP OR THE CALCULATIONS AND MAPS USED WHERE A FIA MAP IS NOT AVAILABLE. N/A

4. FACILITY SECURITY INFORMATION

a) ATTACH A DESCRIPTION OF THE SECURITY PROCEDURES AND EQUIPMENT REQUIRED BY §264.14 [270.14(b)(4)]. See Attachment D

b) ATTACH A COPY OF THE CONTINGENCY PLAN REQUIRED BY 40 CFR PART 264, SUBPART D. [270.14(b)(7)]. See Attachment E

c) ATTACH A DESCRIPTION OF PROCEDURES, STRUCTURES, OR EQUIPMENT USED AT THE FACILITY TO: See Attachment F

(1) MITIGATE EFFECTS OF EQUIPMENT FAILURE AND POWER OUTAGES;

(2) PREVENT HAZARDS IN UNLOADING OPERATIONS (i.e., RAMPS, SPECIAL FORKLIFTS);

(3) PREVENT UNDUE EXPOSURE OF PERSONNEL TO HAZARDOUS WASTE (i.e., PROTECTIVE CLOTHING);

(4) PREVENT CONTAMINATION OF WATER SUPPLIES;

(5) PREVENT RUN-OFF FROM HAZARDOUS WASTE HANDLING AREAS TO OTHER AREAS OF THE FACILITY OR ENVIRONMENT, OR TO PREVENT FLOODING (i.e., BERMS, DIKES, TRENCHES);

(6) PREVENT ACCIDENTAL IGNITION OR REACTION OF IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTES. [270.14(9)]

d) ATTACH A DESCRIPTION OF THE PREPAREDNESS AND PREVENTION PROCEDURES REQUIRED BY 40 CFR PART 264, SUBPART C, INCLUDING DESIGN AND OPERATION OF THE FACILITY, REQUIRED EQUIPMENT, TESTING AND MAINTENANCE OF EQUIPMENT, ACCESS TO COMMUNICATIONS OR ALARM SYSTEM, REQUIRED AISLE SPACE, AND ARRANGEMENTS WITH LOCAL AUTHORITIES [270.14(b)(6)]. See Attachment G

e) ATTACH AN OUTLINE OF BOTH THE INTRODUCTORY AND CONTINUING TRAINING PROGRAMS USED TO PREPARE PERSONS TO OPERATE OR MAINTAIN THE HAZARDOUS WASTE MANAGEMENT FACILITY IN A SAFE MANNER AS REQUIRED TO DEMONSTRATE COMPLIANCE WITH §264.16 [270.14(b)(12)]. See Attachment H

5. ATTACH A COPY OF THE REPORTS OF THE CHEMICAL AND PHYSICAL ANALYSES OF THE HAZARDOUS WASTES HANDLED AT THE FACILITY, INCLUDING ALL INFORMATION WHICH MUST BE KNOWN TO TREAT, STORE, OR DISPOSE OF THE WASTES IN ACCORDANCE WITH §264.13 [270.14.b(3)].
See Attachment I

6. ATTACH A COPY OF THE WASTE ANALYSIS PLAN REQUIRED BY §264.13 [270.14.b(2)]. SUCH INFORMATION SHOULD INCLUDE THE FOLLOWING: See Attachment J

   a) PARAMETERS FOR WHICH EACH HAZARDOUS WASTE WILL BE ANALYZED AND THE RATIONALE FOR THE SELECTION OF THESE PARAMETERS;

   b) TEST METHODS USED;

   c) SAMPLING METHODS USED;

   d) FREQUENCY OF ANALYSIS TO ENSURE ACCURACY;

   e) WASTE ANALYSES THAT GENERATORS SUPPLY;

   f) METHODS USED TO MEET ADDITIONAL WASTE ANALYSIS REQUIREMENTS; AND, IF APPLICABLE,

   g) FOR OFF-SITE FACILITIES, THE PROCEDURES USED TO INSPECT AND ENSURE THAT THE WASTES RECEIVED MATCH THE ACCOMPANYING MANIFEST.

7. ATTACH A COPY OF THE PROCEDURES USED TO COMPLY WITH §264.12 AND 40 CFR PART 264, SUBPART E (MANIFEST SYSTEM, RECORD KEEPING, AND REPORTING).
See Attachment K

I. - MISCELLANEOUS UNITS

THE APPLICANT MUST PROVIDE THE FOLLOWING INFORMATION IN ACCORDANCE WITH 40 CFR 264 SUBPART X (§270.23)

1. ATTACH A DETAILED DESCRIPTION OF THE UNIT BEING USED OR PROPOSED FOR USE, INCLUDING THE FOLLOWING: See Attachment L

    a) PHYSICAL CHARACTERISTICS, MATERIALS OF CONSTRUCTION, AND DIMENSIONS OF THE UNIT;

    b) DETAILED PLANS AND ENGINEERING REPORTS DESCRIBING HOW THE UNIT WILL BE LOCATED, DESIGNED, CONSTRUCTED, OPERATED, (§264.73) MAINTAINED, (§264.33) MONITORED, INSPECTED (§264.15) AND CLOSED (§264.112) TO COMPLY WITH THE REQUIREMENTS OF §§264.601 AND 264.602;

    c) FOR DISPOSAL UNITS, A DETAILED DESCRIPTION OF THE PLANS TO COMPLY WITH THE POST-CLOSURE REQUIREMENTS OF §§264.603 AND 264.118. N/A

2. ATTACH DETAILED HYDROLOGIC, GEOLOGIC, AND METEROLOGIC ASSESSMENTS AND LAND-USE MAPS FOR THE REGION SURROUNDING THE SITE THAT ADDRESS AND ENSURE COMPLIANCE OF THE UNIT WITH EACH FACTOR IN THE ENVIRONMENTAL PERFORMANCE STANDARDS §264.601.
   See Attachment M
3. ATTACH INFORMATION ON THE POTENTIAL PATHWAYS OF EXPOSURE OF HUMANS OR ENVIRONMENTAL RECEPTORS TO HAZARDOUS WASTE OR HAZARDOUS CONSTITUENTS AND ON THE POTENTIAL MAGNITUDE AND NATURE OF SUCH EXPOSURES.
   See Attachment N
4. ATTACH FOR ANY TREATMENT UNIT, A REPORT ON A DEMONSTRATION OF THE EFFECTIVENESS OF THE TREATMENT BASED ON LABORATORY OR FIELD DATA.
   See Attachment O
5. IF IGNITABLE, REACTIVE OR INCOMPATIBLE WASTES ARE TO BE PLACED IN THE MISCELLANEOUS UNIT, ATTACH AN EXPLANATION OF HOW THE REQUIREMENTS OF §264.17 WILL BE COMPLIED WITH.
   See Attachment P
6. SUBMITTAL OF 17-30.900(2) PART II - K - CLOSURE See Following

7. SUBMITTAL OF 17-30.900(2) PART II - M - GROUNDWATER PROTECTION. (IF APPLICABLE) N/A

8. SUBMITTAL OF 17-30.900(2) PART II - O - EXPOSURE INFORMATION. See Following

K. - CLOSURE

THE APPLICANT MUST PROVIDE THE FOLLOWING INFORMATION IN ACCORDANCE WITH 40 CFR 264 SUBPART G (§270.14(b)(13)).

1. ATTACH THE FOLLOWING INFORMATION TO MEET THE CLOSURE PERFORMANCE STANDARD OF 40 CFR 264.111, WHICH REQUIRES CONTROLLING, MINIMIZING OR ELIMINATING TO THE EXTENT NECESSARY TO PROTECT HUMAN HEALTH AND THE ENVIRONMENT, POST-CLOSURE ESCAPE OF HAZARDOUS WASTE, HAZARDOUS CONSTITUENTS, LEACHATE, CONTAMINATED RUN-OFF, OR HAZARDOUS WASTE DECOMPOSITION PRODUCTS TO THE GROUNDWATER, SURFACE WATERS OR TO THE ATMOSPHERE (THIS PLAN MUST INCLUDE ALL OF THE INFORMATION REQUIRED UNDER PART II SECTIONS A THROUGH I OF THIS APPLICATION) (270.14(b)(13)): See Attachment Q

   a) A DESCRIPTION OF HOW EACH HAZARDOUS WASTE MANAGEMENT UNIT AT THE FACILITY WILL BE CLOSED IN ACCORDANCE WITH 40 CFR 264.111;

   b) A DESCRIPTION OF HOW FINAL CLOSURE OF THE FACILITY WILL BE CONDUCTED IN ACCORDANCE WITH 40 CFR 264.111. THE DESCRIPTION MUST IDENTIFY THE MAXIMUM EXTENT OF THE OPERATIONS WHICH WILL BE UNCLOSED DURING THE ACTIVE LIFE OF THE FACILITY;

   c) AN ESTIMATE OF THE MAXIMUM INVENTORY OF WASTES EVER ON SITE OVER THE ACTIVE LIFE OF THE FACILITY AND A DETAILED DESCRIPTION OF THE METHODS TO BE USED DURING PARTIAL CLOSURES AND FINAL CLOSURE, INCLUDING, BUT NOT LIMITED TO, METHODS FOR REMOVING, TRANSPORTING, TREATING, STORING, OR DISPOSING OF ALL HAZARDOUS WASTES, AND IDENTIFICATION OF THE TYPE(S) OF THE OFFSITE HAZARDOUS WASTE MANAGEMENT UNITS TO BE USED, IF APPLICABLE;

   d) A DETAILED DESCRIPTION OF THE STEPS NEEDED TO REMOVE OR DECONTAMINATE ALL HAZARDOUS WASTE RESIDUES AND CONTAMINATED CONTAINMENT SYSTEM COMPONENTS, EQUIPMENT, STRUCTURES, AND SOILS DURING PARTIAL AND FINAL CLOSURE, INCLUDING, BUT NOT LIMITED TO, PROCEDURES FOR CLEANING EQUIPMENT AND REMOVING CONTAMINATED SOILS, METHODS FOR SAMPLING AND TESTING SURROUNDING SOILS, AND CRITERIA FOR DETERMINING THE EXTENT OF DECONTAMINATION REQUIRED TO SATISFY THE CLOSURE PERFORMANCE STANDARD;

   e) A DETAILED DESCRIPTION OF OTHER ACTIVITIES NECESSARY DURING THE CLOSURE PERIOD TO ENSURE THAT ALL PARTIAL CLOSURES AND FINAL CLOSURE SATISFY THE CLOSURE PERFORMANCE STANDARDS, INCLUDING, BUT NOT LIMITED TO, GROUNDWATER MONITORING, LEACHATE COLLECTION, AND RUN-ON AND RUN-OFF CONTROL;

   f) A SCHEDULE FOR CLOSURE OF EACH HAZARDOUS WASTE MANAGEMENT UNIT AND FOR FINAL CLOSURE OF THE FACILITY. THE SCHEDULE MUST INCLUDE, AT A MINIMUM, THE TOTAL TIME REQUIRED TO CLOSE EACH HAZARDOUS WASTE MANAGEMENT UNIT AND THE TIME REQUIRED FOR INTERVENING CLOSURE ACTIVITIES WHICH WILL ALLOW TRACKING OF THE PROGRESS OF PARTIAL AND FINAL CLOSURE.

g) FOR FACILITIES THAT USE TRUST FUNDS TO ESTABLISH FINANCIAL ASSURANCE UNDER 264.143 OR 264.145 AND THAT ARE EXPECTED TO CLOSE PRIOR TO THE EXPIRATION OF THE PERMIT, AN ESTIMATE OF THE EXPECTED YEAR OF FINAL CLOSURE.

2. ATTACH, IF REQUIRED, A POST-CLOSURE PLAN IN ACCORDANCE WITH 264.118 AND 264.197 WHICH MUST CONTAIN THE FOLLOWING INFORMATION FOR EACH HAZARDOUS WASTE MANAGEMENT UNIT AT THE FACILITY SUBJECT TO THE REQUIREMENTS OF PART 264 (THIS PLAN MUST INCLUDE ALL INFORMATION REQUIRED BY PART II SECTIONS A THROUGH I OF THIS APPLICATION) (270.14(b)13):

   a) THE ACTIVITIES WHICH WILL BE CARRIED ON AFTER CLOSURE FOR EACH DISPOSAL UNIT AND THE FREQUENCY OF THESE ACTIVITIES;

   b) A DESCRIPTION OF THE PLANNED MONITORING ACTIVITIES AND FREQUENCIES AT WHICH THEY WILL BE PERFORMED TO COMPLY WITH SUBPARTS F, J, K, L, M, AND N OF PART 264 DURING THE POST-CLOSURE CARE PERIOD;

   c) A DESCRIPTION OF THE PLANNED MAINTENANCE ACTIVITIES, AND FREQUENCIES AT WHICH THEY WILL BE PERFORMED TO ENSURE THE INTEGRITY OF THE CAP AND FINAL COVER OR OTHER CONTAINMENT SYSTEMS IN ACCORDANCE WITH THE REQUIREMENTS OF SUBPARTS J, K, L, M AND N OF PART 264 AND TO ENSURE THE FUNCTION OF THE MONITORING EQUIPMENT IN ACCORDANCE WITH THE REQUIREMENTS OF SUBPARTS F, J, K, L, M, AND N OF PART 264; AND

   d) THE NAME, ADDRESS, AND PHONE NUMBER OF THE PERSON OR OFFICE TO CONTACT ABOUT THE HAZARDOUS WASTE DISPOSAL UNIT OR FACILITY DURING THE POST-CLOSURE CARE PERIOD.

3. IF CLOSURE OR POST-CLOSURE PLANS HAVE BEEN APPROVED BY THE DEPARTMENT AS PART OF A TOP, CONSTRUCTION, OR OPERATION PERMIT APPLICATION, ATTACH A COPY OF A CLOSURE AND POST-CLOSURE PLAN AS REQUIRED BY 264.112 AND 264.118. ALSO, EITHER;

   N/A

   a) ATTACH A CERTIFICATION STATING THAT NO CHANGES HAVE BEEN MADE TO THE PLANS WHICH HAVE BEEN PROVIDED TO THE DEPARTMENT; OR

   b) PROVIDE AN AMENDED PLAN SHOWING ALL THE CHANGES WHICH HAVE BEEN MADE, OR ARE PROPOSED TO BE MADE, TO THE PLANS WHICH HAVE BEEN PROVIDED TO THE DEPARTMENT.

M. - GROUND WATER PROTECTION

THE APPLICANT MUST PROVIDE THE FOLLOWING INFORMATION IN ACCORDANCE WITH 40 CFR 264 SUBPART F ($270.14(c)).

THE FOLLOWING ADDITIONAL INFORMATION REGARDING PROTECTION OF GROUND WATER IS REQUIRED FROM OWNERS OR OPERATORS OF HAZARDOUS WASTE SURFACE IMPOUNDMENTS, PILES, LAND TREATMENT UNITS, AND LANDFILLS EXCEPT AS OTHERWISE PROVIDED IN §264.90(b) OR SECTION 17-30.180(7), FAC: N/A See Attachment R

1. A SUMMARY OF THE GROUND WATER MONITORING DATA OBTAINED DURING THE INTERIM STATUS PERIOD UNDER §§265.90 THROUGH 265.94, WHERE APPLICABLE.

2. IDENTIFICATION OF THE UPPERMOST AQUIFER AND AQUIFERS HYDRAULICALLY INTERCONNECTED BENEATH THE FACILITY PROPERTY, INCLUDING GROUND WATER FLOW DIRECTION AND RATE, AND THE BASIS FOR SUCH IDENTIFICAION (i.e., THE INFORMATION OBTAINED FROM HYDROGEOLOGIC INVESTIGATIONS OF THE FACILITY AREA INCLUDING GROUNDWATER CONTOUR MAPS).

3. ON THE TOPOGRAPHIC MAP REQUIRED UNDER PART II-A-1, A DELINEATION OF THE WASTE MANAGEMENT AREA, THE PROPERTY BOUNDARY, THE PROPOSED "POINT OF COMPLIANCE" AS DEFINED UNDER §264.95, THE PROPOSED LOCATION OF GROUND WATER MONITORING WELLS AS REQUIRED UNDER §264.97 AND, TO THE EXTENT POSSIBLE, THE INFORMATION REQUIRED IN (2) ABOVE.

4. A DESCRIPTION OF ANY PLUME OF CONTAMINATION THAT HAS ENTERED THE GROUND WATER FROM A REGULATED UNIT AT THE TIME THAT THE APPLICATION IS SUBMITTED THAT:

    a) DELINEATES THE VERTICAL AND HORIZONTAL EXTENT OF THE PLUME ON THE TOPOGRAPHIC MAP REQUIRED UNDER PART II-A-1;

    b) IDENTIFIES THE CONCENTRATION OF EACH APPENDIX VIII OF PART 261 CONSTITUENT OR DEPARTMENT APPROVED EQUIVALENT THROUGHOUT THE PLUME OR IDENTIFIES THE MAXIMUM CONCENTRATIONS OF EACH APPENDIX VIII CONSTITUENT OR DEPARTMENT APPROVED EQUIVALENT IN THE PLUME.

5. DETAILED PLANS AND AN ENGINEERING REPORT DESCRIBING THE PROPOSED GROUND WATER MONITORING PROGRAM TO BE IMPLEMENTED TO MEET THE REQUIREMENTS OF §264.97.

6. IF THE PRESENCE OF HAZARDOUS CONSTITUENTS HAS NOT BEEN DETECTED IN THE GROUND WATER AT THE TIME OF PERMIT APPLICATION, THE OWNER OR OPERATOR MUST SUBMIT SUFFICIENT INFORMATION, SUPPORTING DATA, AND ANALYSES TO ESTABLISH A DETECTION MONITORING PROGRAM WHICH MEETS THE REQUIREMENTS OF §264.98. THIS SUBMISSION MUST ADDRESS THE FOLLOWING ITEMS AS SPECIFIED UNDER §264.98:

    a) A PROPOSED LIST OF INDICATOR PARAMETERS, WASTE CONSTITUENTS, OR REACTION PRODUCTS THAT CAN PROVIDE A RELIABLE INDICATION OF THE PRESENCE OF HAZARDOUS CONSTITUENTS IN THE GROUND WATER;

    b) A PROPOSED GROUND WATER MONITORING SYSTEM;

    c) BACKGROUND VALUES FOR EACH PROPOSED MONITORING PARAMETER OR CONSTITUENT, OR PROCEDURES TO CALCULATE SUCH VALUES;

    d) A DESCRIPTION OF PROPOSED SAMPLING, ANALYSIS AND STATISTICAL COMPARISON PROCEDURES TO BE UTILIZED IN EVALUATING GROUND WATER MONITORING DATA.

7. IF THE PRESENCE OF HAZARDOUS CONSTITUENTS HAS BEEN DETECTED IN THE GROUND WATER AT THE POINT OF COMPLIANCE AT THE TIME OF PERMIT APPLICATION, THE OWNER OR OPERATOR MUST SUBMIT SUFFICIENT INFORMATION, SUPPORTING DATA, AND ANALYSES TO ESTABLISH A COMPLIANCE MONITORING PROGRAM WHICH MEETS THE REQUIREMENTS OF §264.99. THE OWNER OR OPERATOR MUST ALSO SUBMIT AN ENGINEERING FEASIBILITY PLAN FOR A CORRECTIVE ACTION PROGRAM NECESSARY TO MEET THE REQUIREMENTS OF §264.100, AND CHAPTER 17-30.180(4) EXCEPT AS PROVIDED IN §264.98(h)(5). TO DEMONSTRATE COMPLIANCE WITH §264.99, THE OWNER OR OPERATOR MUST ADDRESS THE FOLLOWING ITEMS:

   a) A DESCRIPTION OF THE WASTES PREVIOUSLY HANDLED AT THE FACILITY;

   b) A CHARACTERIZATION OF THE CONTAMINATED GROUND WATER, INCLUDING CONCENTRATIONS OF HAZARDOUS CONSTITUENTS;

   c) A LIST OF HAZARDOUS CONSTITUENTS FOR WHICH COMPLIANCE MONITORING WILL BE UNDERTAKEN IN ACCORDANCE WITH §§264.97 AND 264.99;

   d) PROPOSED CONCENTRATION LIMITS FOR EACH HAZARDOUS CONSTITUENT, BASED ON THE CRITERIA SET FORTH IN §264.94(a), INCLUDING A JUSTIFICATION FOR ESTABLISHING ANY ALTERNATE CONCENTRATION LIMITS;

   e) DETAILED PLANS AND AN ENGINEERING REPORT DESCRIBING THE PROPOSED GROUND WATER MONITORING SYSTEM, IN ACCORDANCE WITH THE REQUIREMENTS OF §264.97;

   f) A DESCRIPTION OF PROPOSED SAMPLING, ANALYSIS AND STATISTICAL COMPARISON PROCEDURES TO BE UTILIZED IN EVALUATING GROUND WATER MONITORING DATA.

8. IF HAZARDOUS CONSTITUENTS HAVE BEEN MEASURED IN THE GROUND WATER WHICH EXCEED THE CONCENTRATION LIMITS ESTABLISHED UNDER §264.94 TABLE 1, OR IF GROUND WATER MONITORING CONDUCTED AT THE TIME OF PERMIT APPLICATION UNDER §§265.90-265.94 AT THE WASTE BOUNDARY INDICATES THE PRESENCE OF HAZARDOUS CONSTITUENTS FROM THE FACILITY IN GROUND WATER OVER BACKGROUND CONCENTRATIONS, THE OWNER OR OPERATOR MUST SUBMIT SUFFICIENT INFORMATION, SUPPORTING DATA, AND ANALYSES TO ESTABLISH A CORRECTIVE ACTION PROGRAM WHICH MEETS THE REQUIREMENTS OF §§264.100 AND 264.101, AND CHAPTER 17-30.180(4). HOWEVER, AN OWNER OR OPERATOR IS NOT REQUIRED TO SUBMIT INFORMATION TO ESTABLISH A CORRECTIVE ACTION PROGRAM IF HE DEMONSTRATES TO THE DEPARTMENT THAT ALTERNATE CONCENTRATION LIMITS WILL PROTECT HUMAN HEALTH AND THE ENVIRONMENT AFTER CONSIDERING THE CRITERIA LISTED IN §264.94(b). AN OWNER OR OPERATOR WHO IS NOT REQUIRED TO ESTABLISH A CORRECTIVE ACTION PROGRAM FOR THIS REASON MUST INSTEAD SUBMIT SUFFICIENT INFORMATION TO ESTABLISH A COMPLIANCE MONITORING PROGRAM WHICH MEETS THE REQUIREMENTS OF §264.99 AND (6) ABOVE. TO DEMONSTRATE COMPLIANCE WITH §§264.100 AND 264.101 AND CHAPTER 17-30.180(4), THE OWNER OR OPERATOR MUST ADDRESS, AT A MINIMUM, THE FOLLOWING ITEMS:

a) A CHARACTERIZATION OF THE CONTAMINATED GROUND WATER, INCLUDING CONCENTRATIONS OF HAZARDOUS CONSTITUENTS;

b) THE CONCENTRATION LIMIT FOR EACH HAZARDOUS CONSTITUENT FOUND IN THE GROUND WATER AS SET FORTH IN §264.94;

c) DETAILED PLANS AND AN ENGINEERING REPORT DESCRIBING THE CORRECTIVE ACTION TO BE TAKEN;

d) A DESCRIPTION OF HOW THE GROUND WATER MONITORING PROGRAM WILL ASSESS THE ADEQUACY OF THE CORRECTIVE ACTION.

e) A DESCRIPTION OF THE WASTES PREVIOUSLY HANDLED AT THE FACILITY.

9. CHAPTERS 17-3 and 17-4, FAC, REQUIREMENTS

IN ACCORDANCE WITH SECTION 17-30.180(4)(c) HAZARDOUS WASTE FACILITIES WHICH MAY IMPACT THE GROUND WATER MUST ALSO COMPLY WITH THE GROUND WATER PROVISIONS OF CHAPTERS 17-3 AND 17-4. THE DEPARTMENT'S SUPPLEMENTAL GROUND WATER MONITORING FORM (DER FORM 17-1.216(3)), MUST BE COMPLETED AS PART OF THE HAZARDOUS WASTE PERMIT APPLICATION UNLESS THE DEPARTMENT MAKES THE DETERMINATION THAT THE FACILITY'S EXISTING HAZARDOUS WASTE GROUND WATER MONITORING PROGRAM IS IN SUBSTANTIAL COMPLIANCE WITH SECTION 17-4.245(6).

O. - EXPOSURE INFORMATION (§270.10(j))

THE APPLICANT MUST PROVIDE THE FOLLOWING INFORMATION, IF THE FACILITY HAS A SURFACE IMPOUNDMENT OR A LANDFILL: See Attachment S .

1. REASONABLY FORESEEABLE POTENTIAL RELEASES FROM BOTH NORMAL OPERATIONS AND ACCIDENTS AT THE UNIT, INCLUDING RELEASES ASSOCIATED WITH TRANSPORTATION TO OR FROM THE UNIT.

2. THE POTENTIAL PATHWAYS OF HUMAN EXPOSURE TO HAZARDOUS WASTES OR CONSTITUENTS RESULTING FROM THE RELEASE DESCRIBED UNDER PARAGRAPH (1).

3. THE POTENTIAL MAGNITUDE AND NATURE OF THE HUMAN EXPOSURE RESULTING FROM SUCH RELEASES.

P. - INFORMATION REGARDING POTENTIAL RELEASES FROM SOLID WASTE MANAGEMENT UNITS

FACILITY NAME: NAS Key West - Demolition Key

EPA I.D. NUMBER: FL6170022952

LOCATION: City Demolition Key

State FL

1. Are there any of the following solid waste management units (existing or closed) at your facility? NOTE - DO NOT INCLUDE HAZARDOUS WASTES UNITS CURRENTLY SHOWN IN YOUR PART B APPLICATION

	YES	NO
• Landfill	____	X
• Surface Impoundment	____	X
• Land Farm	____	X
• Waste Pile	____	X
• Incinerator	____	X
• Storage Tank (Above Ground)	____	X
• Storage Tank (Underground)	____	X
• Container Storage Area	____	X
• Injection Wells	____	X
• Wastewater Treatment Units	____	X
• Transfer Stations	____	X
• Waste Recycling Operations	____	X
• Land Treatment Facility	____	X

2. If there are "Yes" answers to any of the items in Number 1 above, please provide a description of the wastes that were stored, treated or disposed of in each unit. In particular please focus on whether or not the wastes would be considered as hazardous wastes or hazardous constituents under RCRA. Also include any available data on quantities or volumes of wastes disposed of and the dates of disposal. Please also provide a description of each unit and include capacity, dimensions, location at facility, provide a site plan if available.

N/A

NOTE: Hazardous waste are those identified in 40 CFR Part 261. Hazardous constituents are those listed in Appendix VIII of 40 CFR Part 261.

3. For the units noted in Number 1 above and also those hazardous waste units in your Part B application, please describe for each unit any data available on any prior or current releases of hazardous wastes or constituents to the environment that may have occurred in the past or still be occurring.

   Please provide the following information:

   a. Date of release
   b. Type of waste released
   c. Quantity or volume of waste released
   d. Describe nature of release (i.e., spill, overflow, ruptured pipe or tank, etc)

   N/A

4. In regard to the prior releases described in Number 3 above, please provide (for each unit) any analytical data that may be available which would describe the nature and extent of environmental contamination that exists as a result of such releases. Please focus on concentrations of hazardous wastes or constituents present in contaminated soil or groundwater.

   N/A

Signature and Certification

As with reports in RCRA Permit Applications, submittal of this information must contain the following certification and signature by a principal executive officer of at least the level of Vice President or by a duly authorized representative of that person:

> I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Signature

Name and Title (Typed)

APPLICATION FOR A HAZARDOUS WASTE FACILITY PERMIT
CERTIFICATION
TO BE COMPLETED BY ALL APPLICANTS

1. OPERATOR

I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS. FURTHER, I AGREE TO COMPLY WITH THE PROVISIONS OF CHAPTER 403, FLORIDA STATUTES, AND ALL RULES AND REGULATIONS OF THE DEPARTMENT OF ENVIRONMENTAL REGULATION. IT IS UNDERSTOOD THAT THE PERMIT IS ONLY TRANSFERABLE IN ACCORDANCE WITH SECTION 17-30, FAC, AND, IF GRANTED A PERMIT, THE DEPARTMENT OF ENVIRONMENTAL REGULATION WILL BE NOTIFIED PRIOR TO THE SALE OR LEGAL TRANSFER OF THE PERMITTED FACILITY.

_____
SIGNATURE OF THE OPERATOR OR AUTHORIZED REPRESENTATIVE*

_____
NAME AND TITLE (PLEASE TYPE OR PRINT)

DATE: _____ TELEPHONE NO. ( ) _____

*ATTACH A LETTER OF AUTHORIZATION

2. FACILITY OWNER

THIS IS TO CERTIFY THAT I UNDERSTAND THIS APPLICATION IS SUBMITTED FOR THE PURPOSE OF OBTAINING A PERMIT TO CONSTRUCT, OPERATE, OR CLOSE A HAZARDOUS WASTE MANAGEMENT FACILITY ON THE PROPERTY AS DESCRIBED. AS OWNER OF THE FACILITY, I UNDERSTAND FULLY THAT THE FACILITY OPERATOR AND I ARE JOINTLY RESPONSIBLE FOR COMPLIANCE WITH THE PROVISIONS OF CHAPTER 403, FLORIDA STATUTES, AND ALL RULES AND REGULATIONS OF THE DEPARTMENT OF ENVIRONMENTAL REGULATION.

_____
SIGNATURE OF THE FACILITY OWNER OR AUTHORIZED REPRESENTATIVE*

_____
NAME AND TITLE (PLEASE TYPE OR PRINT)

DATE: _____ TELEPHONE NO. ( ) _____

*ATTACH A LETTER OF AUTHORIZATION

3 LAND OWNER

THIS IS TO CERTIFY THAT I, AS LAND OWNER, UNDERSTAND THAT THIS APPLICATION IS SUBMITTED FOR THE PURPOSE OF OBTAINING A PERMIT TO CONSTRUCT, OPERATE, OR CLOSE A HAZARDOUS WASTE MANAGEMENT FACILITY ON THE PROPERTY AS DESCRIBED. FOR HAZARDOUS WASTE DISPOSAL FACILITIES, I FURTHER UNDERSTAND THAT I AM RESPONSIBLE FOR PROVIDING THE NOTICE IN THE DEED TO THE PROPERTY REQUIRED BY 40 CFR §264.119 AND §265.119, AS ADOPTED BY REFERENCE IN CHAPTER 17-30, FAC.

SIGNATURE OF THE FACILITY OWNER OR AUTHORIZED REPRESENTATIVE*

NAME AND TITLE (PLEASE TYPE OR PRINT)

DATE: _____ TELEPHONE NO. ( )

*ATTACH A LETTER OF AUTHORIZATION

4. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (WHERE REQUIRED BY CHAPTER 471, F.S.)

THIS IS TO CERTIFY THAT THE ENGINEERING FEATURES OF THIS HAZARDOUS WASTE MANAGEMENT FACILITY HAVE BEEN DESIGNED/EXAMINED BY ME AND FOUND TO CONFORM TO ENGINEERING PRINCIPLES APPLICABLE TO SUCH FACILITIES. IN MY PROFESSIONAL JUDGMENT, THIS FACILITY, WHEN PROPERLY CONSTRUCTED, MAINTAINED AND OPERATED, OR CLOSED, WILL COMPLY WITH ALL APPLICABLE STATUTES OF THE STATE OF FLORIDA AND RULES OF THE DEPARTMENT OF ENVIRONMENTAL REGULATION.

SIGNATURE _____ MAILING ADDRESS _____

NAME _____ _____
(PLEASE TYPE) STREET OR P.O. BOX

_____
CITY STATE ZIP

( ) _____
TELEPHONE NO. DATE

FLORIDA REGISTRATION NUMBER: _____

(Please Affix Seal)

ATTACHMENT A

MAPS AND DRAWINGS

ATTACHMENT A

MAPS AND DRAWINGS

REFERENCE: FDER PART I, SECTION B; PART II, SECTION A
EPA 40 CFR 270.13

A-1 VICINITY MAP

Figure A-1 is the vicinity map for Demolition Key. All past, present and future treatment, storage and disposal areas are shown. All pertinent traffic information, including evacuation routes, are shown.

A-2 AERIAL PHOTOGRAPH OF THE FACILITY

Figure A-2 contains an aerial photograph of Demolition Key.

A-3 TOPOGRAPHIC MAP OF AREA

Figure A-3 is a US Geological Survey quad sheet of the area which serves as the topographic map of the area. It is at a scale of one inch = 2,000 feet. The map shows Demolition Key and the area one mile past its boundary including surface water bodies. Note that the entire facility is assumed to be in the 100-year floodplain although no flood map produced by the Federal Insurance Administration is known to exist. No injection wells or drinking water wells are located on Demolition Key or within one-quarter mile of its border. No intake or discharge structures are within one mile of the facility.

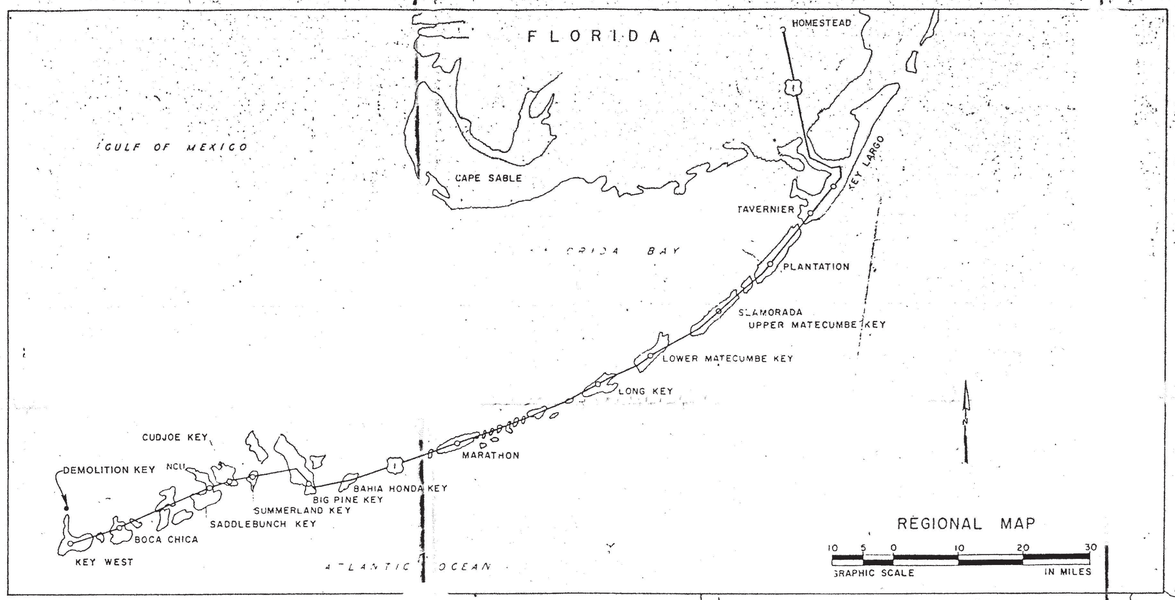
A-4 TOPOGRAPHIC MAP OF HAZARDOUS WASTE MANAGEMENT AREA

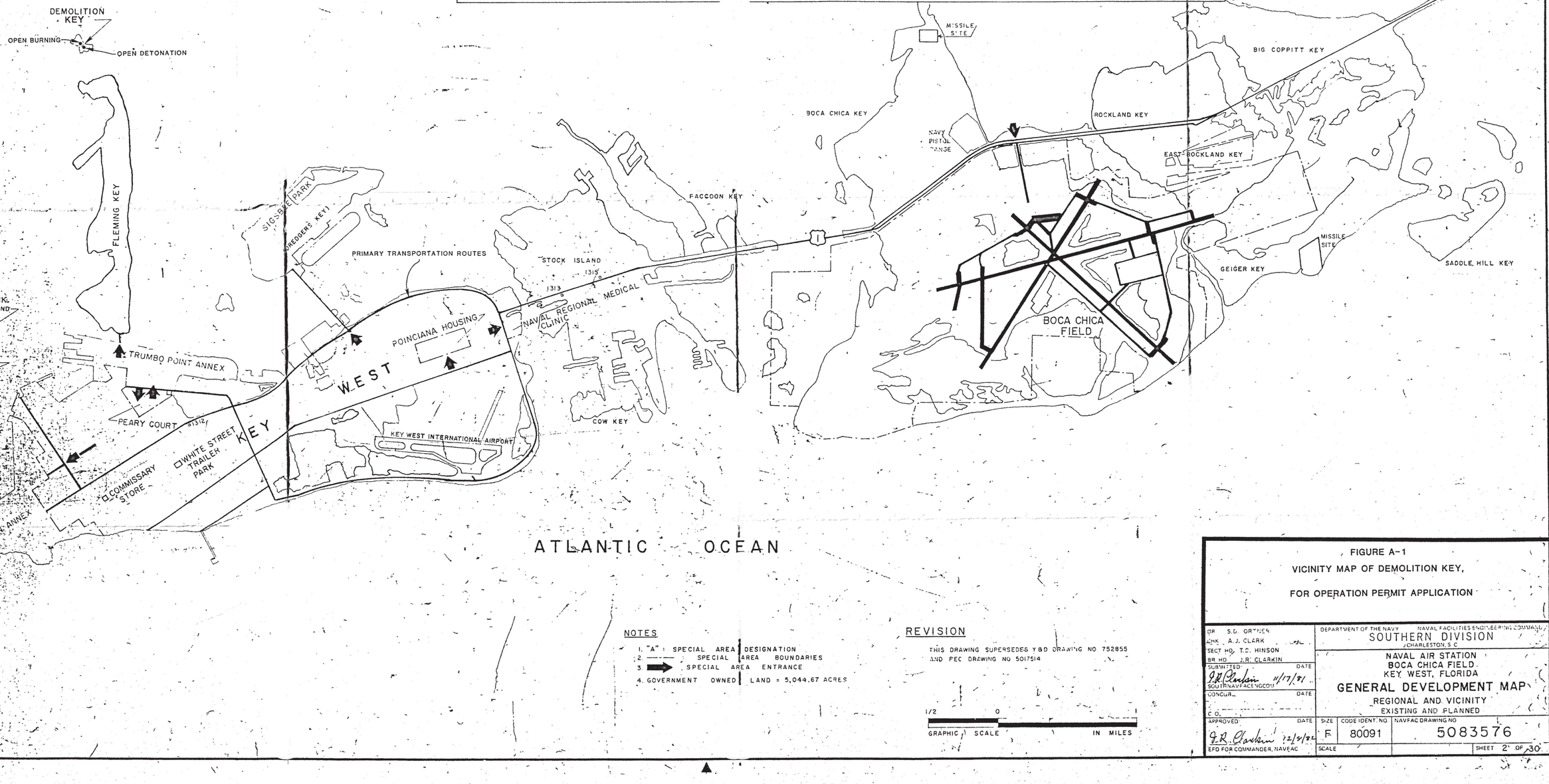
Figure A-4 is a topographic map of Demolition Key showing a distance of 1,000 feet around the hazardous waste management area. It is at a scale of one inch = 200 feet. The contours are at five feet intervals although the total relief is less than twenty feet because no other topographic source exists. However, the contours clearly show that all surface water drainage would be to the adjacent ocean and gulf waters. The entire key is assumed

to be in the 100-year floodplain. There are no man-made access control structures, although access is limited to water transportation. There is only one building, the personnel protection bunker. There are no injection wells, withdrawal wells, flood control barriers or other hazardous waste units besides the open burning and open detonation units. The drainage control device is the open detonation pit. The only other structure is the open burning tray. All loading and unloading is at the shore near the two units.

A-5 WIND ROSE

Figure A-5 is the 1971 wind rose for Naval Air Station Key West which eight miles away on nearby Boca Chica Key. The wind patterns should be essentially the same.





NOTES

1. "A" : SPECIAL AREA DESIGNATION
2. ——— : SPECIAL AREA BOUNDARIES
3. ➡ : SPECIAL AREA ENTRANCE
4. GOVERNMENT OWNED LAND = 5,044.67 ACRES

REVISION

THIS DRAWING SUPERSEDES Y&D DRAWING NO 752855 AND FEC DRAWING NO 5017514

1/2 0 1
GRAPHIC SCALE
IN MILES

FIGURE A-1

VICINITY MAP OF DEMOLITION KEY,

FOR OPERATION PERMIT APPLICATION

OR S.D. ORTNER	DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
CHK A.J. CLARK	SOUTHERN DIVISION
SECT HD T.C. HINSON	CHARLESTON, S.C.
BR HD J.R. CLARKIN	NAVAL AIR STATION
SUBMITTED DATE	BOCA CHICA FIELD
J.R. Clarkin 11/17/81	KEY WEST, FLORIDA
SOUTHNAVFACENGCOM	GENERAL DEVELOPMENT MAP
CONCUR DATE	REGIONAL AND VICINITY
C.O.	EXISTING AND PLANNED
APPROVED DATE	SIZE: F — CODE IDENT. NO: 80091 — NAVFAC DRAWING NO: 5083576
J.R. Clarkin 12/2/81	SCALE — SHEET 2 OF 30
EFD FOR COMMANDER, NAVFAC	

FIGURE A-2
AERIAL PHOTOGRAPH
OF DEMOLITION KEY

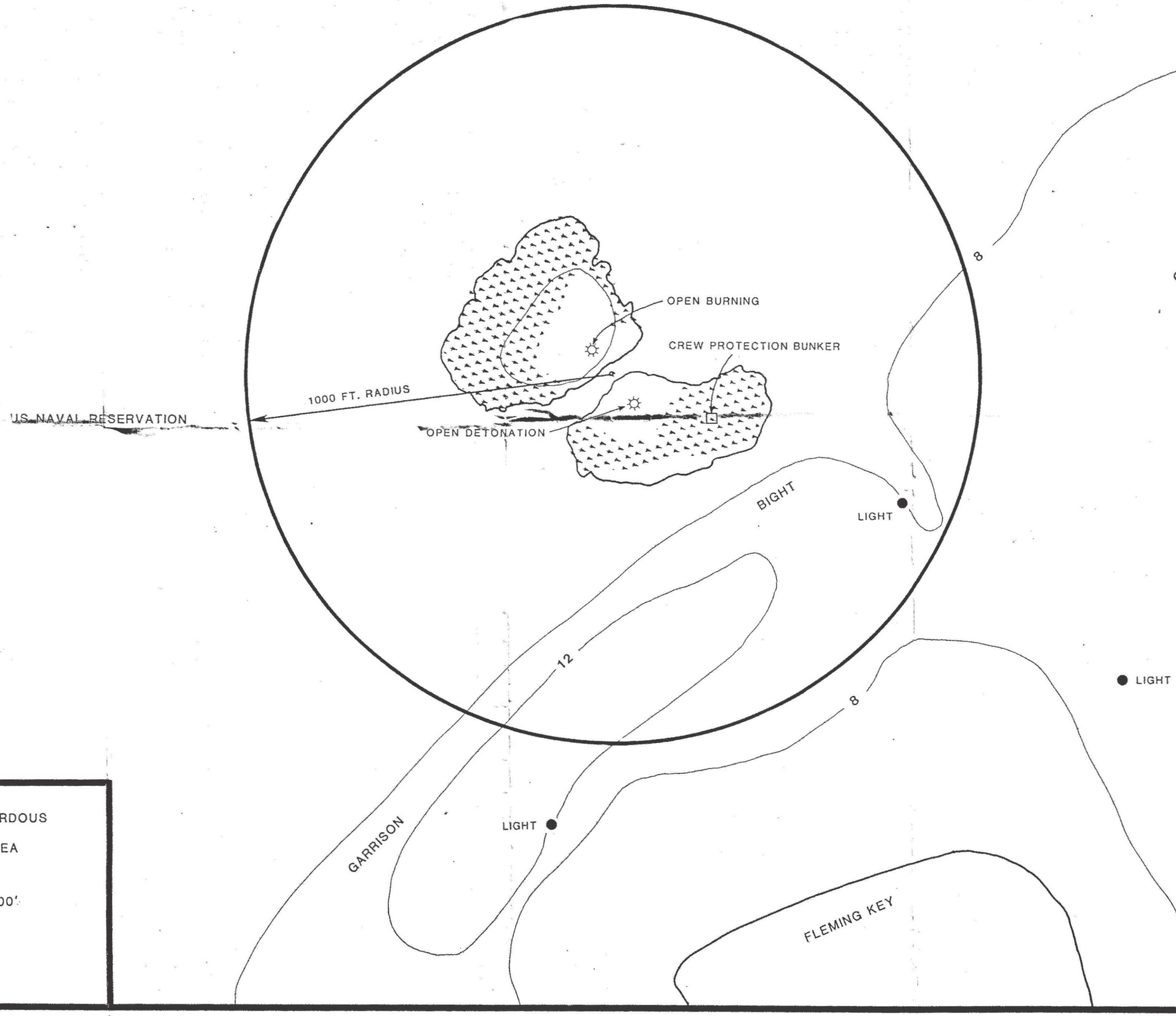


FIGURE A-4
TOPOGRAPHIC MAP OF HAZARDOUS
WASTE MANAGEMENT AREA

SCALE OF 1" EQUALS 200'
5FT. CONTOURS

DATE: 10/20/88
REVISION NO. 0
ATTACHMENT A

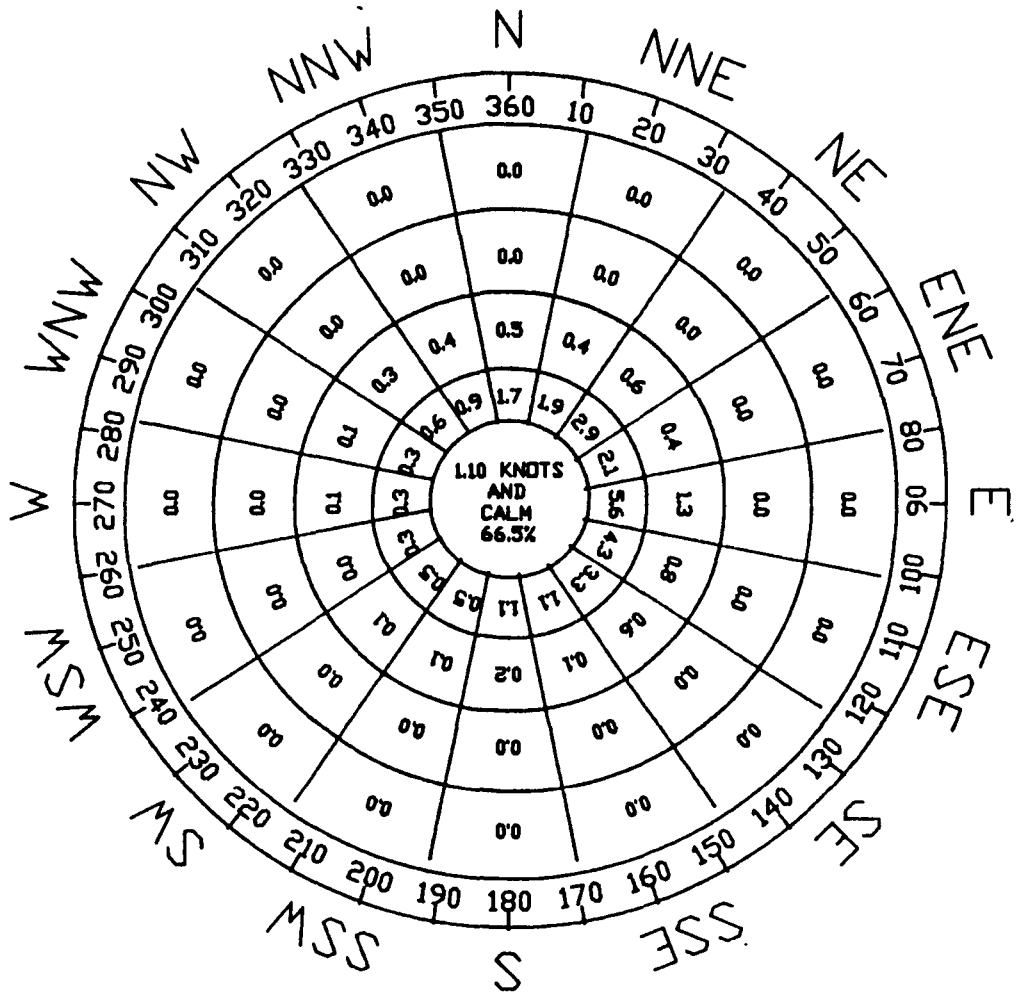


FIGURE A-5
WIND ROSE
NAS KEY WEST, 1971

ATTACHMENT B

BRIEF DESCRIPTION OF FACILITY OPERATION

ATTACHMENT B

BRIEF DESCRIPTION OF FACILITY OPERATION

REFERENCE: FDER PART I, SECTION D.2
EPA 40 CFR 270.13

B-1 NATURE OF BUSINESS

Demolition Key is a military reservation which owned and operated by the United States Navy. It is under the command of the commanding officer of Naval Air Station Key West on nearby Boca Chica Key. Other missions associated with NAS Key West are Trumbo Point and Truman Annex on Key West and Fleming Key.

B-2 FACILITY OPERATION

The facility is used to thermally treat explosive hazardous wastes in either an open detonation pit or in an open burning tray. The ordnance is brought to Demolition Key by boat from NAS Key West on Boca Chica Key only on the day of treatment. All treatment is performed by the Explosive Ordnance Detachment (EOD) who has sole authority for conducting all such activities on the facility. Any resultant ash is collected into 55-gallon drums at the facility. The drum will be transported to the hazardous waste container storage facility on Boca Chica Key between treatment operations. The drum will serve as a satellite collection area until the drum is filled. At that time, the ash is properly sampled and analyzed to determine if it is hazardous. If it is, the drum will assigned to the hazardous waste container storage facility at NAS Key West for management.

In addition to the hazardous waste treatment activity, other similar operations are conducted by the Navy at Demolition Key. The Naval Air Development Center conducts tests of developmental ordnances there, and the EOD uses it as a training facility. The EOD also conducts emergency actions for such diverse groups as the Coast Guard, the Drug Enforcement Agency, the Federal Bureau of Investigation, state and local law enforcement agencies and NAS Key West. However, these actions are not required to receive a RCRA permit as stated under 40 CFR 270.1(c)(3)(i).

B-3 HAZARDOUS WASTE GENERATION

By using strict Naval procedures, Naval ordnance may be determined to be unusable. Once a determination has been made to demilitarize the ordnance, the material is tracked using form number 1348-1. Through an agreement reached between the Department of Defense and the Environmental Protection Agency, the ordnance to be demilitarized is not considered to be hazardous waste until it is delivered to the treatment site and form 1348-1 has been signed by the receiving party. By this definition, the hazardous waste treatment facility is also the generator of the hazardous waste. Therefore, the scope of RCRA regulations are not applicable until that point. However, the only source of this material is the US Navy activities at NAS Key West.

ATTACHMENT C

FLOODPLAIN EVALUATION

ATTACHMENT C

FLOODPLAIN EVALUATION

REFERENCE: FDER PART II, SECTION A.3
EPA 40 CFR 270.14(b)(11)

C-1 FLOODPLAIN LOCATION

All of Demolition Key is assumed to be in the 100-year floodplain. During a flood, the open detonation pit and the open burning tray would be immersed in water.

C-2 REMOVAL PROCEDURES

Normal rains are not the cause of flooding on Demolition Key. Flooding will be caused only by tropical storms and hurricanes. Given the ability to track such storms with modern technology, lead times of days would be available to remove any hazardous waste. More importantly, due to safety concerns, Navy operating procedures preclude demilitarization during any time when precipitation or lightning is possible. It is standard operating procedure for the EOD to confirm with the Navy weather station to confirm such situations will not occur before scheduling and before conducting these operation. Further, hazardous waste is at the facility only on the day of treatment. Given these safeguards, there is no chance for flood waters to reach hazardous waste at this facility.

SECTION D

SECURITY PROCEDURES AND EQUIPMENT

SECTION D

SECURITY PROCEDURES AND EQUIPMENT

REFERENCE: FDER PART II, SECTION A.4(a)
EPA 40 CFR 264.14

D-1 PROCEDURES

Because of the intermittent nature of hazardous waste activities, and because hazardous waste is present only at those times, direct security procedures are taken only at those times. Prior to conducting open burning or open detonation, Garrison Bight Channel (see Figure A-3) is blockaded on both sides of the key which prevents access to Demolition Key during treatment.

The simple nature of the units, a pit and a tray renders them easily inspected for deficiencies which may have occurred between treatments. Such inspections will always be made.

D-2 EQUIPMENT

A minimum of two boats will be used to prevent traffic through the channel during treatment. Personnel on each boat will be equipped with binoculars and two-way radios to facilitate observations and communications. A minimum of two-way radio will be used by the operating personnel on the key. All EOD personnel are trained in the proper usage of the radios. Between operations, the radios will be stored at the EOD facilities at Truman Annex, Key West.

Signs reading "Danger-Unauthorized Personnel Keep Out" (or the equivalent) will be posted on the boundary of the facility. Similar signs written in Spanish will also be posted. These signs will legible from a distance of twenty-five feet.

ATTACHMENT E

CONTINGENCY PLAN

CONTINGENCY PLAN
DEMOLITION KEY, FLORIDA

OWNER/OPERATOR
NAVAL AIR STATION KEY WEST, FLORIDA

REFERENCE: FDER PART II, SECTION A.4(b)
EPA 40 CFR 264 SUBPART D

E-1 GENERAL INFORMATION

The following is the contingency plan for the hazardous waste open burning open detonation facility on Demolition Key. A base wide contingency plan has been prepared and is under review. This contingency plan is in agreement with the proposed base wide contingency plan.

Demolition Key is a military reservation which is owned and operated by the United States Navy. It is under the command of the commanding officer of Naval Air Station Key West on nearby Boca Chica Key. Other missions associated with NAS Key West are Trumbo Point and Truman Annex on Key West and Fleming Key.

The facility is used to thermally treat reactive hazardous wastes in either an open detonation pit or in an open burning tray. The wastes are brought to Demolition Key by boat from NAS Key West on Boca Chica Key only on the day of treatment. All treatment is performed by the Explosive Ordnance Detachment (EOD) who has sole authority for conducting all such activities on the facility. Any resultant ash is collected into 55-gallon drums at the facility in a satellite collection area until the drum is filled. At that time, the ash is properly sampled and analyzed to determine if it is hazardous. If it is, the drum is transported to the permitted hazardous waste container storage facility at NAS Key West.

In addition to the hazardous waste treatment activity, other similar operations are conducted by the Navy at Demolition Key. The Naval Air Development Center conducts tests of developmental ordnances there, and the EOD uses it as a training facility. The EOD also conducts emergency actions for such diverse groups as the Coast Guard, the Drug Enforcement Agency, the Federal Bureau of Investigation, state and local law enforcement agencies and NAS Key West.

As a miscellaneous unit hazardous waste facility, Demolition Key is quite different in nature from other, more typical facilities. First, the hazardous wastes at this facility are solids. Therefore, spills are much easier contain and evaporation during spills is negligible. Secondly, these wastes are hazardous due to reactivity, specifically explosivity, which creates the immediately dangerous to life and health situation. While some people can become sensitized to some explosives after prolonged exposure, the effect of the toxic properties of these materials to emergency response personnel are not of primary concern during emergency procedures. However, the contingency plan does provide appropriate procedures consistent with both the reactive and toxic properties of the wastes. Finally, explosive hazardous wastes are brought to and temporarily stored at the facility only on the day they are to be treated. So, hazardous waste is present at the facility only in small quantities and only at intermittent times.

Naval Air Station (NAS) Key West is composed of several noncontiguous areas on several of the Florida Keys. The vicinity around NAS Key West is shown in Figure E-1. Demolition Key is an uninhabited, man-made island just across Garrison Bight Channel from the northern end of Fleming Key. The open burning unit and the open detonation unit are located in the interior of key on opposite shores of the inlet to the center of the key. Access to the key and to the units is by boat, only.

E-2 EMERGENCY COORDINATORS

Primary:
Commander J. T. Corbett
Public Works Officer
1030 Mitscher Drive
Key West, FL 33040
Office: (305) 292-2900
Home: (305) 294-8323

Figure E-1

FIGURE E-2

Alternate:
Martin T. Bushman
Hazardous Waste Manager
Building A-629
Public Works Department
Naval Air Station Boca Chica
Key West, FL 33040
Office: (305) 292-2583
Home: (305) 296-4734
After Hours: OOD (305) 292-2268/2971

By delegation from the commanding officer of Key West, the Emergency Coordinators shown above are authorized to commit the resources of the Station in response to an emergency which requires implementation of this contingency plan.

E-3 IMPLEMENTATION CRITERIA

The Contingency Plan must be implemented under the following circumstances which may occur at Demolition Key:

1. Fire/Explosion

   a. Fire causes release of toxic fume;
   b. Fire-fighting agents result in contaminated runoff;
   c. Imminent threat of explosion.

2. Spills/Leaks

   a. Fire hazard exists due to spilled materials;
   b. Toxic fume hazard exists;
   c. Groundwater may be threatened;
   d. Spill threatens off-site property;
   e. Spill threatens navigable water.

E-4 EMERGENCY RESPONSE PROCEDURES

Notification

In the event of an emergency at the open burning/open detonation facility, the discoverer must notify the Emergency Coordinator or the Alternate Emergency Coordinator using a two-way radio system in contact with NAS Key West which can make further contacts via the telephone system. In addition, the NAS Fire Department must also be immediately notified. The Emergency Coordinator will initiate notifications to Navy authorities (according to Navy

procedures) and to federal and state agencies as may be required by law. Telephone numbers of emergency organizations who may provide assistance are shown in Table E-1.

Identify the Type of Waste

The only explosive hazardous waste stored at the site will be those wastes transported to the site on the day they are to be open burned or open detonated. The set of 1348-1 forms identify the ordnance by military specification and by description. Also, the ordnance has the military specification numbers printed on them. These methods can be used to identify the ordnance.

The Emergency Coordinator should immediately identify the location of the leak or fire and identify the chemical hazard, estimate the quantities released and the extent of the emergency posed by the release.

Assessment

The Emergency Coordinator, assisted by the Station Fire Department head, Chief Rainey, will assess possible hazards to human health or the environment that may result from a release, fire, or explosion. This assessment must consider both direct and indirect effects of the release, fire or explosion (e.g., the effects of any toxic, irritating or asphyxiating gases that are generated, or the effects of any hazardous surface water run-off from water or chemical agents used to control fire and heat-induced explosions). If the Emergency Coordinator concludes that there is a hazard to human health or the environment, then the contingency plan will be implemented.

Control Procedures

Potential emergency incidents may be classified under one of the following:

(1) fire/explosion,
(2) spills/leaks, or
(3) hurricane.

TABLE E-1

EMERGENCY ORGANIZATIONS

EMERGENCY	ORGANIZATION	TELEPHONE
Injury/Chemical Exposure	Station Dispensary	Ext. 2444
	Florida Keys Memorial Hospital	294-5531
	Key West Poison Control Center	294-5531
Fire/Explosion	Station Fire Department	Ext. 2776
	Explosive Ordnance Disposal Team	Ext. 2342
Hazardous Material Spill	Station Fire Department	Ext. 2776
	Hazardous Waste Coordinator	Ext. 2304
Spill in Waterway	National Response Center	800-424-8802
	EPA Region IV	404-881-4062
	Coast Guard Captain of the Port	294-4760
	Florida Department of Environmental Regulation	904-488-4809
Natural Disaster	Station Security	Ext. 2515
Hurricane Threat	National Hurricane Center	661-5065

Note: All area codes are 305 unless otherwise specified; and all extensions are for 296-3561, the main NAS Key West telephone number.

Fire/Explosion

Fighting uncontrolled fires near explosives is very dangerous and is to be avoided. In the event of small, localized fires, carbon dioxide fire extinguishers and shovels are available for fire fighting. However, in the event that the fire is not immediately contained, all personnel and loading/unloading vehicles are to evacuated from the island to prevent injury from explosions. Since the island is uninhabited and completed surrounded by water, the fire will be allowed to burn to its natural completion. An "all-clear" signal (voice command) will be given when the Fire Commander and the Emergency Coordinator agree that the emergency is over.

Spills/Leaks

The most probable emergencies involving spills or leaks of hazardous waste from containers are:

1. Spill or leak container while in storage;

2. Spills caused by accidents during loading of waste at generating units;

3. Spills as a result of a vehicular accident during movement of waste;

4. Spills caused by accidents during unloading operations at the storage building.

Because virtually all (except nitroglycerine) of the hazardous waste is in the form of solids, and because operations never occur during rainfall periods, spills are much more easily contained. All spilled hazardous waste (including contaminated soils) on land will be collected manually and treatment operations will continue as planned.

All loading, transfer and unloading operations are conducted under the close and direct supervision. Therefore, a trained qualified person will always be immediately available under the most probable spill scenarios.

In the event of a spill or leak from one or more containers into the surface waters, the Emergency Coordinator will make an immediate assessment of the degree of hazard posed by the spill. This assessment will include the type of material spilled, location of the spill, quantity spilled or likely to be spilled before containment is achieved, direction of

spill and associated vapors if any, potential for injury and the threat of fire or explosion. Based on this assessment, the Emergency Coordinator will direct EOD personnel to handle spill under his supervision.

The area impacted by the spill will be evacuated for a distance of one thousand feet in all directions. Navy boats used during normal operations will be used to prevent entrance into the evacuated area. Entrance is possible only by boat and only via a narrow, shallow channel. It is not probable that any spill or leak from a container will require greater evacuation.

The Emergency Coordinator will initiate all required notifications of a reportable quantity of hazardous substance (one-pound unless a higher quantity has been specified in 40 CFR 302) or hazardous waste.

Hazardous wastes at Demolition Key are present in relatively small quantities. Therefore, it is not likely that outside assistance in responding to a spill will be required.

The Emergency Coordinator will initiate all notifications required by that plan. These notifications include the reporting of a spill of reportable quantity of a hazardous material and reports to the appropriate Naval commands.

The procedures to be followed in the event of a spill include:

1. Locate injured personnel, if any, and notify the local hospital to mobilize ambulances and medical personnel.

2. Evacuate area within a one thousand feet radius.
3. Dispatch any necessary emergency personnel and associated response equipment to site of spill.

4. Monitor progress to determine whether additional assistance should be requested.
5. Ensure that cleanup personnel use appropriate personal protective equipment.
6. Remove leaking container recovery container.

7. Use absorbent material to contain and solidify liquid.

8. Place all solidified spill material and contaminated spill debris in drums using non-sparking tools.

After the immediate emergency, the Emergency Coordinator must assess whether unprotected soils have been contaminated and arrange for the removal and containerization of contaminated soils to protect groundwater supplies from contamination. It is unlikely that sufficient material can spill at one time to pose an immediate threat to groundwater. The Emergency Coordinator must also ensure that all emergency equipment and safety equipment cleaned, decontaminated and stored for immediate use. Stock of absorbent and recovery drums must be checked and replenished if necessary.

Hurricane

In the event of a hurricane, the hazardous waste facility will be secured in accordance with the NAS Disaster Response Plan. No hazardous waste shipments via public routes may be initiated during a hurricane emergency.

E-5 PREVENTION OF RECURRENCE OF FIRES, EXPLOSIONS OR RELEASES

The Emergency Coordinator may order the temporary removal of containers of waste from the facility after an emergency until the facility is safe and no recurrence can be expected.

E-6 STORAGE TREATMENT OF RELEASED MATERIAL

The Emergency Coordinator will order all spilled material, cleanup debris and contaminated soil to be containerized with non-sparking tools and stored for later disposal. All hazardous wastes on this site will be either bulk solids or munitions. Therefore, all spilled material will be collected either by use of shovels or by picking up by hand. The spilled materials will be collected into either a burning tray, a burning pit or the original container. If the materials are returned to their original container, the container will be sealed as is appropriate to that specific ordnance.

E-7 INCOMPATIBLE WASTE

None of the waste ordnance treated at the facility is incompatible with any other waste ordnance treated there. Waste ordnance storage at the facility is limited to amount to be treated during one open burn or one open detonation.

E-8 POST EMERGENCY EQUIPMENT MAINTENANCE

After an emergency operation, all emergency equipment will be cleaned by EOD personnel at either Demolition Key or at the EOD offices at Truman Annex, Key West so that it is fit for use or it will be replaced. Broken equipment (e.g., radios) or expended materials (e.g., fire extinguishers) will be restored to proper operating conditions or replaced. Before operations are resumed, an inspection of all safety equipment will be conducted by the Emergency Coordinator. State authorities will be notified that post-emergency equipment maintenance has been performed and operations will be resumed.

E-9 EMERGENCY EQUIPMENT

Materials and equipment stored and needed for safe emergency response at Demolition Key are discussed in this section.

Specific personal protection equipment provided to protect employees from hazardous waste exposure include Kevlar flight jackets and helmets. Spill control equipment consists of non-sparking shovels and a 55-gallon drum. Fire fighting equipment consists of two carbon dioxide fire extinguishers and shovels. Communications equipment consists of a minimum of two two-way radios. Fire extinguishers, shovels and radios will be aboard each boat and at the treatment site on Demolition Key during treatment operations and at EOD Offices at Truman Annex, Key West during other times. The first aid kit includes:

1. burn treatment
2. antiseptic adhesive bandages
3. tape
4. compresses for the treatment of minor cuts and scrapes.

All emergency response teams including the hospital are notified that open burning and open detonation operations will be conducted prior to leaving for Demolition Key. Marine band 81 is dedicated for exclusively for EOD personnel. A Medivac helicopter is available from the hospital for evacuation.

E-10 DISTRIBUTION AND COORDINATION

NAS has entered into two mutual fire fighting assistance agreements. A written mutual assistance agreement exist with Monroe County and a verbal agreement exists with the City of Key West. Upon approval of the contingency plan by the FDER, approved copies of the contingency plan will be sent to and coordinated with the Station Hospital, Station Fire Department, Station Safety Officer, the Station Security Officer and state and local emergency coordinators.

E-11 EVACUATION PLAN

The Emergency Coordinator and the Station Fire Chief are responsible for determining whether evacuation are necessary in the event of an emergency. Demolition Key is located in a remote area north of Fleming Key removed from all residential areas. If the Emergency Coordinator or the officer-in-charge determines that the evacuation of Demolition Key is necessary, all personnel will return to Truman Annex. The evacuation route is shown in Figure A-1. Reentry to the area will be allowed only when the Emergency Coordinator gives an "all-clear" instruction.

E-12 REQUIRED REPORTS

In addition to verbal notification to be initiated by the Emergency Coordinator, written follow-up reports will be prepared. All emergencies which require implementation of the Contingency Plan will be reported in writing within fifteen days to DER and the Regional Administrator, EPA Region IV. The report will detail the name of the facility, date, time and type of accident; type quantity of material involved; extent of injuries; and assessment of the impact on human health and environment; and quantity and disposition of material released.

In addition, reports must be filed with the Public Works Officer and other Navy officials. After an emergency, the Emergency Coordinator will the contingency Plan for effectiveness and make changes as are appropriate. The plan will also be reviewed when emergency coordinators, emergency equipment or the hazardous waste management plan are altered. All amendments to the Contingency Plan must be approved in writing by DER.

E-13 PLAN AMENDMENTS

In addition to the Contingency Plan, provisions for a Spill Prevention, Control and Countermeasure Plan are made in a separate Naval instruction. That plan was prepared and is maintained according to the provisions of 40 CFR 112. The plan is available upon request.

SECTION F

PROCEDURES, STRUCTURES AND EQUIPMENT

SECTION F

PROCEDURES, STRUCTURES AND EQUIPMENT

REFERENCE: FDER PART II, SECTION A.4(c)
EPA 40 CFR 270.14(9)

All Explosive Ordnance Detachment operations are covered in the Naval publication NAVSEA OP-5 which is frequently updated and is too voluminous to submit with this application. However, the applicable procedures from that publication are paraphrased in great detail in Attachment L of this application and are therefore not rewritten in this attachment. These procedures are supplemented with site-specific or ordnance-specific written operating procedures which are continually updated. Because these documents deal with the specific nature of military ordnances, they are closely held documents which are not for general publication. However, any authorized representative from FDER or the USEPA will be allowed to review them in detail at the EOD facilities at Truman Annex, Key West. The following guideline information is given in lieu those documents which are subject to continual change.

F-1 EQUIPMENT FAILURE AND POWER OUTAGES

The open detonation unit is an earthen pit about six feet in diameter. The open burning unit is a metal tray used with a removable cover. Detonation and burning is initiated using standard explosives equipment such as: primer cords, blasting caps, fuzes, blasting circuits, blasting machines, Blaster's Galvanometer, and DuPont Blaster's Mutimeter (Model 101). The tray is inspected for leaks, and the initiating devices are inspected for operability prior to treatment operations. The radios are battery operated. No outside power sources are required to operate the units. The crew shelter bunker does not use electrical power.

F-2 UNLOADING OPERATIONS

All unloading is done by hand and in accordance with Navy standing operating procedures found in NAVSEA OP-5. These procedures are given in great detail in Attachment L and are therefore not repeated. All procedures for unloading are centered on the explosive nature of the waste ordnance. Proper handling procedures of ordnance is one of the primary topics of the EOD training, NAVSEA OP-5 and the standing operating procedures.

F-3 PERSONAL PROTECTIVE EQUIPMENT

During normal operations the EOD technicians are protected by Kevlar flight jackets and helmets. Also, a crew shelter bunker is used during detonations which is resistant to metal fragmentations from the explosions. The bunker is equipped with a periscope system for indirect visual observation.

F-4 WATER SUPPLY CONTAMINATION

Waste reactives in ordnance are usually within military devices (e.g., rockets, flares, etc.). Bulk ordnance such as black powder are stored in specially designed packaging to minimize any potential for spills. Therefore, the ordnance are not susceptible to releases onto the ground or into the water.

F-5 RUN-OFF AND FLOODING

Normal, non-emergency open detonation and open burning operations are never conducted during conditions of precipitation. Further, reactive hazardous waste is only brought to the facility on the day it is to be treated. These materials are never stored past working hours. All ash from open burning is collected into a an appropriately sized container and transferred to a satellite collection drum at the NAS Key West hazardous waste container storage building after each burn.

F-6 IGNITION OR REACTION OF IGNITABLE, REACTIVE OR INCOMPATIBLE WASTES

All wastes are crated during transport and during on-site temporary storage. Again, these materials are brought to the facility only on the day they are to be treated. The primary reason that treatment is never scheduled during existent or anticipated inclement weather is to avoid accidental ignition by lightning. Also, ignition sources such as cigarette lighters are strictly prohibited from the site.

All waste ordnance treated at the facility is compatible with all waste ordnance treated the facility. Therefore, no incompatibility table is given.

ATTACHMENT G

PREPAREDNESS AND PREVENTION PROCEDURES

ATTACHMENT G

PREPAREDNESS AND PREVENTION PROCEDURES

REFERENCE: FDER PART II, SECTION A.4(d)
EPA 40 CFR 264 SUBPART C

G-1 REQUIRED EQUIPMENT

A minimum of three two-way radios will be present at all times during operations. There will be one on each of the two blockade/surveillance boats and one on the key. The radios have access to Channel 81 marine band which is dedicated exclusively to Explosive Ordnance Detachment operations. Contact is made to emergency groups prior to arriving at the key. A minimum of two carbon dioxide fire extinguishers will be present at all times. Since the strategy is to not attempt to fight a fire of the explosives, no water sources are needed.

G-2 TESTING AND MAINTENANCE OF EQUIPMENT

Prior to initiating treatment all communication, fire fighting, spill control and decontamination equipment will be inspected by the ranking EOD officer present prior to treatment operations. All malfunctioning equipment will be repaired or replaced before continuing treatment operations.

G-3 ACCESS TO COMMUNICATION AND ALARM SYSTEM

No telephones exist at the facility. However, all personnel have access to the previously mentioned two-way radio system. There is never just one person at the facility. Given the relatively small size of Demolition Key and the even smaller work area, all communications between personnel on the key can be made by either voice communication or using hand signals.

ATTACHMENT H

TRAINING

ATTACHMENT H

TRAINING

REFERENCE: FDER PART II, SECTION A.4(e)
EPA 40 CFR 264.16

H-1 OUTLINE OF TRAINING PROGRAM

All Demolition Key Explosive Ordnance Technicians must successfully complete the training for explosives handling personnel which is conducted at Eglin Air Force Base and is a joint effort by the U.S. Navy, Army, and Air Force. This training class is specifically designed to train personnel in all phases of explosives handling and destruction operations. The course is a year in length.

Continual training occurs in the field. Field training occurs at a minimum of once per month but usually more often.

H-2 JOB TITLES AND DESCRIPTION

Title: Commanding Officer, Explosive Ordnance Disposal Mobile Unit FOUR

Name: CDR Thomas M. Ligon

Responsibilities:

Ultimate responsibility for the safe and efficient conduct of demolition range operations at Demo Key

Qualifications:

Rank of Commander or higher

A four year college degree

Have knowledge of all appropriate local, federal and state environmental regulations

Successfully completed the above mentioned training courses

Title: Officer in Charge, Explosive Ordnance Disposal Mobile Unit FOUR Detachment TWO

Name: Lt. Carl Hurst

Responsibilities:

Order all necessary supplies and materials

Assure all appropriate training for personnel is accomplished

Assure that all appropriate recordkeeping is accomplished and is up-to-date

Assure system is in place to continually update all standing operating procedures and meet all appropriate criteria

Coordinate all activities with all parties outside the EOD

Qualifications:

Rank of Lieutenant or higher

A four year college degree

Have knowledge of all appropriate local, federal and state environmental regulations

Successfully completed the above mentioned training courses

Title: EOD Technician

Name: There are forty-two people on the EOD staff including nine officers. All EOD Technicians are Navy personnel and rotate in and out of this particular group frequently. This renders any such name list dated in a short period of time. A full list of names will be provided to appropriately authorized Florida DER or US EPA representative upon request. All such requests should be made to Lt. Hurst at (305) 292-5321.

Responsibilities:

Detection, identification, field evaluation

Render safe procedures and ultimate disposal of ordnance

Qualifications:

Complete above mentioned training courses

H-3 TRAINING CONTENT

Training course material for the one year course is such that all personnel involved in handling and treatment operations shall be fully capable of performing the following operations:

1. Be able to identify, assemble, disassemble, prepare, and successfully use all tool sets in each of their inherent modes.

2. Be able to identify, render safe, recover and dispose of all conventional ordnance.

3. Be able to perform the procedures to safely remove any aircraft ejection hazards (AEH's) involving ejection systems.

4. Know all the procedures to follow in establishing fragmentation ranges, and ordnance identification and exploitation.

5. Be familiar with all of the current trends and countermeasures for improvised explosive devices (IEDs).

6. Be able to identify, render safe and package components of all special weapons utilized by the United States Navy and be familiar with all special weapons utilized by other services.

In addition, the Naval Air Station Key West Explosive Ordnance Detachment is primarily a training mission. Virtually all aspects of their operations are centered toward developing expertise in the proper detonation of military ordnance. Formal, in-house, facility-specific training sessions which are conducted a minimum of once per month, although the actual frequency is much higher. These

training sessions include emergency procedures, emergency equipment and contingency planning.

H-4 TRAINING DIRECTOR

All training is conducted under the direct supervision of a person knowledgeable in all aspects of hazardous waste management activities pertinent to operations at the open burning/open detonation unit. The EOD training facility in Indian Head, MD is the premier facility of its type in the world as are its instructors.

H-5 IMPLEMENTATION OF TRAINING PROGRAM

All new personnel will complete this training program prior to assignment to the hazardous waste disposal area. Training records are currently kept in individual personal file. The EOD Commander shall be responsible for maintaining training records. In addition, training records shall be kept for a minimum of three years for all personnel involved in treatment operations at the OB/OD facility.

ATTACHMENT I

CHEMICAL AND PHYSICAL ANALYSES OF WASTES

ATTACHMENT I

CHEMICAL AND PHYSICAL ANALYSES OF WASTES

REFERENCE: FDER PART II, SECTION A.5
EPA 40 CFR 264.13

I-1 INTRODUCTION

One of the reasons this facility is considered a miscellaneous unit is the unique nature of the waste treated. Unlike drums of spent solvent, these wastes are packaged in devices such as bombs, grenades, rockets and flares. Further, these items have a long history (prior to RCRA regulations) of being tracked from cradle-to-grave for safety purposes.

Through their extensive training, EOD Technicians are capable of identifying ordnance through many means. First, all explosive ordnance is labeled with a specific military number. From this number, the ordnance can be identified. Once the ordnance has been identified, the type of explosives, propellants or pyrotechnics in the ordnance can be identified.

I-2 DESCRIPTION OF ORDNANCES

Explosives

Explosives fall into one of the following two categories:

1. Detonating or High Explosive materials:

   (a) Primary, or initiating explosives (detonators), such as lead azide, mercury fulminate, lead styphnate (lead trinitroresorcinate).
   (b) Secondary such as TNT-AN, Tetryl, PETN, RDX, TNT, ammonium picrate, picric acid, DNT (Dinitro-toluene).

2. Deflagration or low explosives such as smokeless powder (colloided cellulose nitrate), black powder, nitrocotton

Initiating, or primary, high explosives are quite sensitive materials which can be made to explode by the application of fire or by means of a blow. They are very dangerous to handle and are used in comparatively small quantities to start the explosion of larger quantities of less sensitive explosives.

Secondary high explosives are materials which are quite insensitive to both mechanical shock and flame but which explode with great violence when set off by explosive shock, such as that obtained by detonating a small amount of initiating explosive in contact with the high explosive. Decomposition proceeds by means of detonation, which is rapid chemical destruction progressing directly through the mass of the explosive. Detonation is thought to be a chain reaction and proceeds at rates frequently as high as 6,000 m/s. It is this high rate of energy release, rather than the total energy given off, that makes a product an explosive. Nitroglycerin has only one-eighth the energy of gasoline. On the other hand, most high explosives, when unconfined or unshocked, will merely burn if ignited.

Low explosives, or propellants, differ from high explosives in their mode of decomposition: they only burn. Burning is a phenomenon that proceeds not through the body of the material, but through layers parallel to the surface. It is quite slow in its action, comparatively speaking, rarely exceeding 0.25 m/s. The action of low explosive is, therefore, less shattering. Low explosives evolve large volumes of gas on combustion in a definite and controllable manner.

Possibly the most powerful nonatomic military explosives are cast aluminized mixtures such as Torpex and HBX (RDX, TNT, aluminum and wax). As military requirements are extremely strict, only a few explosives have survived competitive testing.

Projectiles

A high artillery shell is depicted in Figure I-1. Such a shell consists of thin brass or steel cartridge case holding the primer, igniter, and propellant charge. This case is designed to fit smoothly into the gun and, on explosion, to expand (obdurate), scaling the breech of the gun so that the escape of gases from the burning of the propellant charge is prevented, thus allowing the full effect of the propellant to be exerted on the projectile, or destructive half of the shell.

The primer contains a small amount of primary explosive or sensitive mixture (e.g., $KClO_3$ + $Pb(CNS)_2$ + Sb_2S_3 + TNT + ground glass). This mixture explodes under the impact of the firing pin and produces a flame which ignites the black powder charge in the igniter, in turn igniting the propellant charge of smokeless powder. The burning of the smokeless powder causes the rapid emission of heated gas, which ejects the propellant from the gun. At the target, upon impact or upon functioning of the time fuze mechanism, a small quantity of primer (detonator) is set off: this causes explosion of the booster - an explosive of intermediate sensitivity (between that of a primary explosive and the bursting charge) - which picks up the explosive wave from the primary explosive, amplifies it, and ensures complete detonation of the bursting charge. The bursting charge, or high explosive, is usually TNT alone or mixed with ammonium nitrate, RDX, PETN, and ammonium nitrate are also sometime used.

Smoke Producing Ordnances

Various chemicals have been used to produce smokes or fogs primarily designed to conceal the movements of troop or installations from enemy observations. Screening smokes are basically of two compositions: (1) dispersion of solid particles in air, which correspond to true smoke, and (2) dispersion of minute liquid droplets, which resemble natural fogs or mists. One of the important innovations of World War II was the use of smokes not dependent on waste but prepared by atomization of high boiling fractions of petroleum. Much of the hiding effect of all smokes is due to their ability to scatter light waves by reflection.

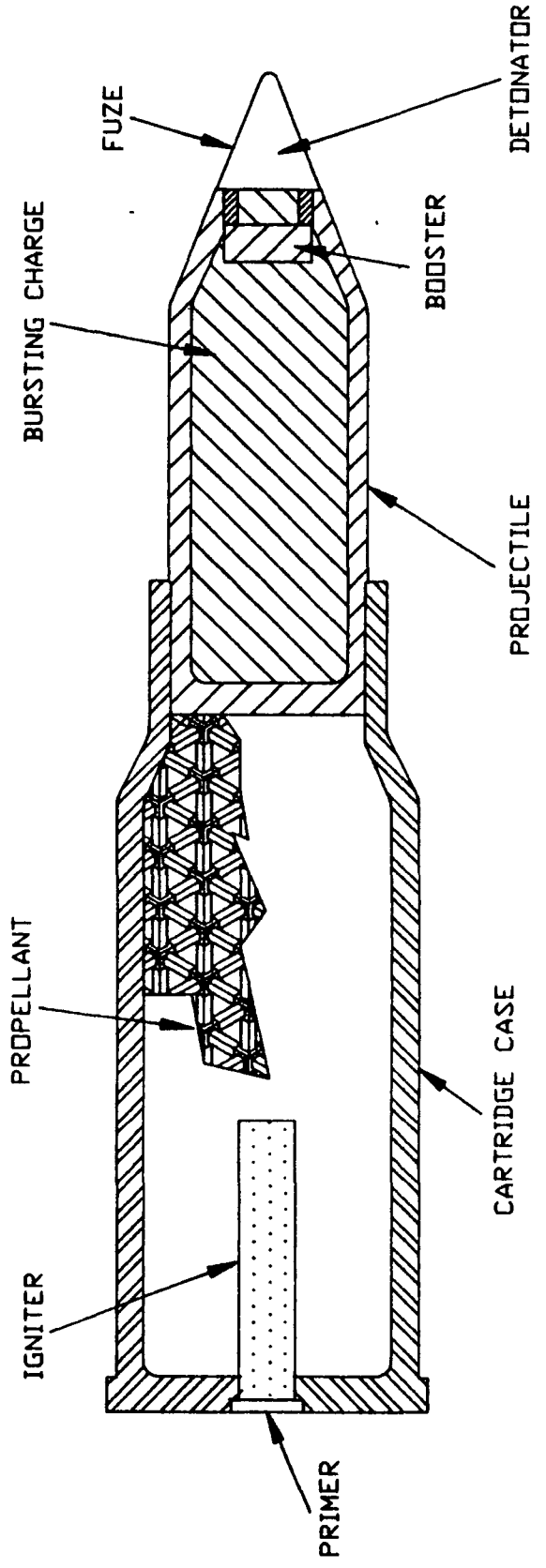


FIGURE I-1
TYPICAL HIGH EXPLOSIVE
ARTILLERY SHELL

This is more effective than obstructing. Smokes may be dispersed by various methods including mechanical, thermal, and chemical.

White phosphorus (WP) is loaded directly into shells, bombs, and grenades in the molten state. The material is dissipated by the force of the explosion and immediately burns to P_2O_5. In terms of pounds of smoke producing agent, this is the most efficient obscuring smoke. The smoke causes coughing and acid burns. These particles also have some incendiary effect. It has been improved by the development of plasticized white phosphorous (PWP).

Hexachlorethane (HC) is employed in mixtures with finely powdered aluminum and zinc oxide which are started by a fuse. The burning power here is that of phosphorous. The $ZnCl_2$, which is hygroscopic, attracts moisture to form a fog, the finely divided Al_2O_3 deflects the light rays and the carbon colors the cloud gray. These mixtures are issued in shells, grenades, and floating smoke pots and are known as volatile hygroscopic chloride.

A mixture of sulfuric trioxide and chlorosulfonic acid is used which hydrolyzes in air to produce an acidic mixture. This blend of chemicals is used by low flying airplanes equipped with spray tanks and replaces the more costly titanium tetrachloride. The resulting fumes are highly acidic and cannot be used by troops. The screening power of the smoke due to the hydroscopic action is not nearly so effective as that of phosphorous. This compound is also more difficult to store and handle.

Colored smokes are produced by burning a pyrotechnic mixture of fuel and various colored organic dyes. Anthraquinone dyes are superior and are dispersed into the air, where they act as aerosols of brilliant hue. They are for signaling purposes.

Pyrotechnics

Pyrotechnic compositions engage in oxidation-reduction reactions that resemble that of propellants and explosives, but generally produce little or no gas. They are heterogeneous mixtures of finely powdered metal, metal alloy, or organic fuel and inorganic oxidizers. Such compositions are commonly used for flares, signals,

tracers, incendiaries, delays, igniters, heating mixtures, and in devices where the formation of much gas is unacceptable either because the gas pressure causes unwanted changes in the reaction rate or the system is not designed to withstand the pressure without rupturing. Although pyrotechnic compositions are composed of inert ingredients their accidental initiation during the manufacturing process may be accomplished by the same catastrophic consequences that attend explosive detonations. Mixtures of finely divided oxidizers and metals are sensitive to initiation by friction or by spark.

Propellants

Rocket propulsion fuel systems derive their energy from chemical sources. Propellants are low explosives and carry their own oxidant or other reactant necessary to cause the planned reaction. The thrust of the escaping hot gases pushes the device forward, according to the principle that forces act equally in opposite direction. Propellant fuels are presented under liquid and solid, or castable. Actually there is a great variety of choices from which a combination of energy sources and conversion mechanisms for the design of efficient propulsion systems.

Solid propellants are simple in design and more easily handled than liquid propellants. Originally, solid propellants were classified in two groups: (1) heterogeneous or composite propellants (oxidizer and reducer present in two distinct phases), and (2) homogeneous, or double based (oxidizer and reducer present in a single distinct phase, e.g., nitrocellulose dissolved in nitroglycerin). Small percentages of additives are used to control the physical and chemical properties of the solid propellant. Composite propellants commonly use ammonium perchlorate to supply the oxygen required for the reaction. The most common gaseous products of the oxidation-reduction reactions are hydrogen, water, carbon monoxide, carbon dioxide, and nitrogen.

Propellants generally operate at low pressures up to about 2900 psi in rockets and up to about 100,000 psi in high performance guns. The process is characterized by a reaction front that moves in a direction normal to the exposed surface of the grain, proceeding from the outside to within in laminar layers. The rate of burning depends on the intrinsic rate of decomposition of the propellant information and the rate of heat transfer from the hot gases above the propellant surface.

A more comprehensive evaluation of all conventional military munitions and explosive and their compositions is provided in Appendix I-1. The information in Appendix I-1 demonstrates both the complexity of the composition of explosive ordnance and the completeness of knowledge of those ordnance by the military.

I-4 CHEMICAL AND PHYSICAL ANALYSES

Basis for Designation

All hazardous waste treated at Demolition Key is reactive (D003). Some primary explosives may also be EP toxic. Table I-1 lists these compounds and their hazardous waste ID number. Treatment should render all ash as non-reactive, but each filled drum will treated as though it is reactive and EP toxic until sampling and analysis can be completed.

Hazardous Constituents

In addition to being reactive and EP toxic, the waste ordnance may contain varying amounts of hazardous constituents as defined in 40 CFR 261 Appendix VII. Although EOD currently disposes only those items listed in Table I-2, they must have the permitted capability to treat the entire range of ordnance described in Appendix I-1. Therefore, a full list of potential hazardous constituents is given in Appendix I-2.

I-4 WASTE GENERATION

Cause

Navy ordnance may no longer be useful because of several reasons, such as:

1. The age of the item exceeds its shelf life.
2. The item appears to be damaged.
3. The item shows evidence of deterioration such as rust.
4. The item has been declared surplus.

TABLE I-1

EP TOXIC EXPLOSIVE ORDNANCE

NAME	HAZARDOUS WASTE NUMBER
1. Lead Azide	D008
2. Mercury Fulminate	D009
3. Lead Styphynate	D008
4. Lead Mononitroresorcinate	D008
5. Barium Nitrate	D005

TABLE I-2

REACTIVE WASTES CURRENTLY TREATED AT DEMOLITION KEY

EXPLOSIVE	METHOD OF TREATMENT
1. TNT	Open Detonation
2. RDX	Open Detonation
3. Amatol	Open Burning
4. PETN	Open Detonation
5. RDX Compositions: A-3, C-4	Open Detonation
6. HBX-3	Open Detonation
7. PBX	Open Detonation
8. Smokeless Powder	Open Burning/Open Detonation
9. Pyrotechnics	Open Burning
10. Tovex	Open Detonation
11. Phosphorus	Open Burning

Source

The Weapons group of Naval Air Station Key West is located on nearby Boca Chica Key. This group is in charge of procuring, storing and issuing all weapons to all military missions associated with NAS Key West. When an ordnance is no longer adequate for its intended purpose, Weapons will receive a Naval Ammunition Reclassification (NAR) form from either Ship Parts Control Center (SPCC) or from Naval Weapons Station Crane, Indiana advising them to inspect their inventory for any such ordnance. If Weapons finds any such ordnance in their inventory, they request disposition from SPCC.

Disposition

SPCC then determines whether to:

1. Return ordnance to SPCC for rework;
2. Return to Mechanicsville, PA for rework;
3. Send to NWS Yorktown for disposal; or
4. Dispose locally.

When a determination to dispose is made, Weapons prepares the initial paperwork as per form 1348-1. Then, Explosive Ordnance Detachment is notified. EOD then schedules a day for treatment in accordance with NAVSEA OP-5. The method of treatment, open burning versus open detonation, is also determined using this manual.

Generation Point

On the day that treatment is scheduled, EOD and Weapons transport the ordnance to Demolition Key. Upon receipt of the ordnance at the facility, form 1348-1 is signed by EOD. By an agreement reached between the Environmental Protection Agency and the Department of Defense, the ordnance becomes waste only at that point.

APPENDIX I-1

CONVENTIONAL MILITARY MUNITIONS

CONVENTIONAL MILITARY MUNITIONS

A. BLACK POWDER

A.1 General Description

Black powder is a low explosive, composed essentially of a mixture of potassium nitrate or sodium nitrate, charcoal, and sulphur. The proportions of ingredients are approximately 75 percent nitrate, 15 percent charcoal, and 10 percent sulphur. The Navy uses it in the form of grains or granules of varying sizes and degree of fineness, depending on its specific purpose or function. The grains are usually glazed and graphited to improve the powder's resistance to moisture and to give it a low coefficient of friction so that the grains will slide one upon the other for more compact loading. Black powder, originally called gun powder, is the oldest of the explosive and one of the most dangerous.

A.2 Classes and Uses

The various classes of black powder and the primary uses of each are described below.

A.2.a. Black Powder (Potassium Nitrate)

Black powder with a potassium nitrate base is divided into the following classes:

Class 1. Used in JATO and rocket igniters, artillery primers and igniter pads.

Class 2. Used in JATO and rocket igniters, primers, and propelling charges for line-throwing rockets and cartridges.

Class 3. Used in JATO and rocket igniters, expelling charges for base ejection shells, and pyrotechnic items.

Class 4 and 5. Used in JATO and rocket igniters, relay pellets, igniting charges for illuminating pyrotechnics, charges in target practice shells, expelling charges for base ejection shells, and igniter charges in primer detonators, fuze delay elements, and tracer igniters.

Classes 6 and 7. Used in JATO and rocket igniters, relay pellets, and delay and igniter charges in primer detonators, delay elements, practice hand grenade fuzes, and Navy squibs.

Class 8. Used in propellant charges for rocket signals.

A.2.b. Black Powder (Sodium Nitrate)

Black powder with a sodium nitrate base is divided into the following classes:

Class A. Used in saluting charges

Class B. Used in practice bombs

Class C. Used in torpedo impulse charges.

B. HIGH EXPLOSIVES

B.1 General Description

The various types of high explosives which are commonly used and stored by the Navy are described in the following paragraphs:

B.1.a. Trinitrotoluene (TNT)

TNT is a light brown or white colored material whose appearance varies with the degree of purity. It is insoluble in water but soluble in ether, acetone, alcohol, and similar solvents. Although TNT is less sensitive to friction and impact than many other explosives, it can be detonated by moderate force when confined between metal surfaces such as on threads of bolts. In thin, unconfined layers it usually burns without explosion. Burning or rapid heating under confinement may cause detonation. TNT is stable and does not form sensitive compounds with metals. It will, however, become very sensitive in the presence of alkalies. TNT exhibits well recognized toxic properties.

B.1.b. Cyclotrimethylenetrinitramine (RDX)

RDX is a white crystalline solid usually used in mixtures with other explosives, oils, or waxes and is rarely used alone. It has a high degree of stability in storage and is considered the most powerful and brisant of the military high explosives.

B.1.c. Amatol

Amatol is not a manufactured product but is a mixture of molten TNT and ammonium nitrate which is made at the time of loading. The most generally used amatol consists of 50% TNT and 50% ammonium nitrate. Amatols containing up to 80% ammonium nitrate have been used.

Ammonium nitrate is a crystalline powder varying from almost white to brown. It usually cannot be detonated by heat or friction but may be exploded by a sufficiently heavy initiation by booster explosives. It may be exploded by relatively light initiation if it has been sensitized by certain impurities, including many carbaceous materials. Ammonium nitrate is not flammable at normal temperatures. In fires involving large quantities of ammonium nitrate, the material becomes an explosive hazard which is accentuated by conditions of partial confinement and build up of a certain degree of pressure in the gases of decomposition. When ammonium nitrate is in contact with copper bearing metals, it may form sensitive compounds.

B.1.d Explosive D.

Explosive D (ammonium picrate) is a high explosive usually derived by nitration of phenol followed by ammonification of the picric acid which is produced. In bulk density, explosive D appears in the form of finely divided crystals. Explosive D stains human hair and skin yellow, due to the yellow dye content in the picric acid. If not entirely free of traces of unammoniated picric acid, explosive D will react with certain metals such as lead, potassium, copper, and iron to form sensitive compounds and must, therefore, be protected from direct contact with these metals.

B.1.e. Picratol.

Picratol is a castable mixture consisting of 52% explosive D and 48% TNT which is made by heating TNT to about 90° C in a steam-jacket melt kettle. The explosive D is added slowly, without preheating, and the mixture is agitated until it is uniform in composition.

B.1.f. Pentaerythritol (PETN)

PETN is more sensitive than either tetryl or RDX. In its pure form, PETN is a white crystalline material, but it may be light gray in color due to impurities. It must be shipped wet with not less than 40 percent by weight of water in metal barrels or drums or wooden barrels or kegs in which the material is packed in cloth or rubber bags. It is extremely sensitive to initiation and as such is considered an initiating agent.

B.1.g. Pentolite

Pentolite is a castable mixture of PETN and TNT usually in a 50/50 proportion. Pentolite may have a tendency to separate into its ingredients and, consequently, it should be handled as carefully as PETN.

B.1.h. N-tetranitro-N-methylaniline (Tetryl)

Tetryl is a fine yellow crystalline material which is insoluble in waster but soluble in acetone, benzene, and other similar solvents. It is toxic when taken internally or by skin contact and special precautions are necessary to protect personnel. It is stable at all temperatures normally encountered in storage.

B.1.i. Tetrytol

Tetrytol is a castable mixture of tetryl and TNT usually in the proportion of 70% tetryl and 30% TNT. It is used to obtain a tetryl mixture that may be cast for boosters and demolition charges.

B.1.j. Nitroguanidine

Nitroguanidine is a powerful high explosive which, when incorporated in propellants in appreciable quantities, results in a propellant that burns in a gun with temperatures so cool that little muzzle flash is produced.

B.1.k. RDX Composition

RDX compositions are mixtures of RDX, other explosive ingredients, and desensitizers or plasticizers. Three RDX compositions are described below:

(1) Composition A: During World War II the British introduced an explosive composition consisting of 91% RDX and 9% beeswax. This was designated as Composition A. When the United States standardized Composition A, the beeswax was replaced with wax derived from petroleum. Subsequent changes in the method of adding the desensitizer led to designation of the explosive as Composition A-2. More recently the composition has been designated as Composition A-3 because of later changes in the granulation of RDX and the method of manufacture. The wax is applied to coat the particles of RDX and act as a binding agent when the composition is pressed. Compositions A-4 and A-5 consisting of 97.0 and 98.5% RDX, respectively, with desensitizer added, have been developed but these explosives are not widely used.

(2) Composition B: This consists of castable mixtures of RDX and TNT; in some instances desensitizing agents are added to the mixture. The following are formulations of Composition B:

Composition B. 60% RDX and 40% TNT with 1% wax added.

Composition B-2. 60% RDX and 40% TNT

Composition B-3. Percentages of RDX and TNT vary but no desensitizer is added.

Composition B-4. 60% RDX, 39.5% TNT, and .5% Calcium Silicate.

Composition B, Desensitized. There are two formulations of desensitized Composition B--(1) 60% RDX and 40% TNT with 5% wax and 2% Vinylseal added, and (2) 55.2% RDX, 40% TNT, 1.2% Vistanex, and 3.6% Albacer Wax.

(3) Composition C. The Composition C explosives are plastic demolition explosives consisting of RDX, other explosives, plasticizers, and so forth. The following are formulations of Composition C: although C-3 and C-4 are the only formulations presently being used, C-1 and C-2 may still be encountered:

Composition C-1. 88.3% RDX and 11.7% nonexplosive oily plasticizer containing 0.6% lecithin.

Composition C-2. 78.7% RDX, 5.0% TNT, 12% DNT, 2.7% MNT, 0.6% NC, 1.0% Solvent.

Composition C-3. 77% RDX, 3% tetryl, 4% TNT, 10% DNT, 5% MNT, and 1% NC.

Composition C-4. 91% RDX, 2.1% Polyisobutylene, 1.6% Motor Oil, and 5.3% Sebacate.

B.1.1 Cyclotols.

The cyclotols were developed by the British between World Wars I and II and standardized in the United States early in World War II. Cyclotol is prepared by adding water-wet RDX to molten TNT in a steam-jacketed kettle at a temperature of 100° C. Some water is poured off and the heating and stirring are continued until all moisture is evaporated. The composition is cooled to a satisfactory pouring temperature. It is cast directly into ammunition components or in the form of chips when the cyclotol is to be stored for use later. There are three formulations of cyclotol being used, 75/25, 70/30, and 65/35 with the first number being the percent of RDX and the second number being the percent of TNT. Cyclotols used at NAVSEASYSCOM installations are procured commercially. Cyclotols are used for loading shaped-charge bombs, special fragmentation projectiles, and grenades.

B.1.m. Cyclotetramethylene tetranitromine (HMX)

HMX was discovered as an impurity in the nitration of hexamethylene tetramine to form RDX. Its sensitivity is about the same as RDX. Although it is almost as powerful as RDX, it is seldom used alone in military applications but is mixed with a compound such as TNT. NAVSEASYSCOM uses HMX as an ingredient in plastic bonded explosives.

B.1.n. Octols.

The Octols, which were developed by the United States, are prepared by slowly adding water-wet HMX to molten TNT in a steam-jacketed kettle at a temperature of 100° C. The mixture is heated and cooled to a satisfactory pouring temperature and cast directly into ammunition components or prepared in the form of chips when the octol is to be stored for use later. There are two formulations of octol being used, 75/25 and 70/30, with the first number being the percent of HMX and the second number the percent of TNT. Octols used at NAVSEASYSCOM installations for loading HE projectiles and bombs are procured commercially.

B.1.o. Aluminized Explosives.

Aluminum is added to explosives to increase its explosive power. Some recent studies to determine the optimum amount of aluminum for the TNT/aluminum mixture have shown that the blast effect reaches the maximum when the aluminum content is 30%. The brisance, as measured by the sand test, passes through a maximum of about 17% aluminum. The rate of detonation of cast charges is continuously decreased by addition of aluminum up to 40%. For all practical purposes, the addition of 18% to 20% of aluminum to TNT produces maximum performance of the TNT.

Six aluminized explosives are described in the following sections:

(1) HBX. HBX-1 and HBX-3 are binary explosives which were developed by the United States during World War II. The relatively insensitive mixtures were made by adding 5% desensitized to Torpex II for High Blast Explosive applications. They are castable mixtures of RDX, TNT,

powdered aluminum, D-2 wax, and calcium chloride. The exact formulations are:

	Percent HBX-1	Percent HBX-3
RDX	40	31
TNT	38	29
Powdered Aluminum	17	35
D-2 Wax	5	5
Calcium Chloride (added)	0.5	0.5
Loading Density	1.69	1.69

HBX can be made by adding the calculated amount of TNT to Composition B to obtain the desired proportion of RDX/TNT. After the TNT/Comp B is melted, the appropriate amounts of the other ingredients are added to complete the mixture. HBX is used in guided missile warheads and underwater ordnance.

(2) H6. This is a binary explosive developed by the United States. It is a castable mixture consisting of 45% RDX, 30% TNT, 20% Powdered Aluminum, and 5% D-2 Wax with 0.5% Calcium Chloride added. It is prepared by adding the powdered aluminum, D-2 Wax, and calcium chloride to previously melted Composition B. It is stable in storage, is more brisant that TNT, and is normally cast at a density of 1.74. H6 is used as a bursting charge in general purpose bombs, guided missile warheads, and underwater ordnance.

(3) Tritonal. This is a binary explosive developed by the United States during World War II. It is a castable mixture consisting of 80% TNT and 20% powdered aluminum. It is prepared by adding the TNT and aluminum separately to a steam-jacketed melt kettle equipped with an agitator. Heating is continued until the TNT is molten and the mixture is at the right viscosity for pouring (about 85° C). Tritonal is used as the bursting charge for general purpose bombs.

(4) Minol-2. This is also a binary explosive developed by the British during World War II. It is a castable mixture consisting of 40% TNT, 40% Ammonium Nitrate, and 20% Powdered Aluminum. It is prepared by adding ammonium nitrate and powdered aluminum to TNT that has been previously melted and which is maintained at a

temperature of 90° C. It is comparable to TNT and Tritonal in sensitivity to initiation but is more sensitive to shock and less brisant. It is unstable in the presence of moisture since the ammonium nitrate and aluminum react with each other. It is normally cast at a density of 1.68. Minol-2 is used as a bursting charge where TNT is in short supply.

(5) DBX. This is known as Depth Bomb Explosive. It is a binary explosive developed by the United States and Great Britain during World War II. It is a castable mixture consisting of 40% TNT, 21% RDX,21% ammonium nitrate, and 18% powdered aluminum. It can be prepared by adding 21% ammonium nitrate and 18% aluminum to 19% TNT which has been previously melted at about 100° C. It is normally cast at a density of between 1.61 and 1.69 and is used as a bursting charge in depth charges.

(6) Torpex. This is a binary explosive developed by the British during World War II. It is a castable mixture consisting of 42% RDX, 40% TNT, and 18% powdered aluminum. Waxed Torpex-2 and Torpex-3 with wax and calcium chloride were subsequently developed. Torpex mixtures have been declared obsolete and are no longer used due to their sensitivity.

B.1.p. Composition D-2.

This is a desensitizing wax used in many of the high explosive mixtures which have been discussed in this section. Composition D-2 contains 84% paraffin and other waxes, 14% nitrocellulose, and 2% lecithin.

B.1.q. Plastic Bonded Explosives.

Plastic bonded explosives are conventional high explosives which contain a plastic bonding agent such as nylon. They will stand higher temperatures than conventional high explosives and not be affected. They can be either press or cast-loaded depending on the type composition. Plastic bonded explosives used by the Navy are identified as PBX-N series.

B.1.r Picric Acid.

Picric acid is a nitrated product of phenol. With or without the addition of various materials intended to lower its melting point, it has been used as a military high explosive, to a greater or lesser extent, by almost all countries. The chemical name for picric acid is trinitrophenol.

C. INITIATING EXPLOSIVES

C.1 General Description

Complete detonation is accomplished by adding an initiating device to the explosive. Detonating substances used for this purpose are initiating mixtures consisting of an initiating explosive (also known as a primary explosive), such as lead azide or lead styphnate, thoroughly mixed with other materials. These mixtures will detonate by the application of impact, friction, heat or electrical current and will impart a percussion blow suitable to detonate a high explosive. Initiating explosives detonate, whether they are confined or not. They differ considerably in sensitivity to heat, and the amount of heat they give off, and in brisance.

C.2 Types of Initiating Explosives

Types of initiating explosives commonly stored and used by the Navy are described in the following sections.

C.2.a Lead Azide

Lead azide is a crystalline, cream-colored compound which is practically insoluble in water. When lead azide is stored in water, however, care must be taken to assure that the water is free of bacteria forming impurities which may react with the dextrinated lead azide to form a gas. Lead azide shall not be exposed to copper, zinc, or alloys containing such metals because of the possible formation of other azides which are more sensitive than the original lead azide.

C.2.b Lead Styphnate

There are two forms of lead styphnate--that which appears as six-sided monohydrate crystals and that which appears as small rectangular crystals. Its color varies from yellow to brown. Lead styphnate is particularly sensitive to fire and the discharge of static electricity and, when dry, can be readily detonated by static discharges from the human body. The longer and narrower the crystals, the more susceptible the material is to static electricity. Lead styphnate does not react with metals and it is less sensitive to shock and friction than mercury fulminate or lead azide. Lead styphnate is only slightly soluble in water and methyl alcohol and may be neutralized by a solution of sodium carbonate.

C.2.c Mercury Fulminate

Mercury fulminate is white when pure, but ordinarily it has a faint brownish yellow or grayish tint. It is a heavy, practically nonhygroscopic, crystalline solid. When dry it is very sensitive to heat, friction, spark, flame, and shock. Mercury fulminate either wet or dry should not come in contact with certain materials such as aluminum, magnesium, zinc, brass, or bronze.

C.2.d Tetracene

Tetracene is a colorless or pale yellow material. It is soluble in strong hydrochloric acid but practically insoluble in alcohol, water, benzene, ether, and carbon tetrachloride. It explodes readily from flame and produces a large volume of black smoke. It is lightly more sensitive to impact than mercury fulminate. Tetracene has the disadvantage of becoming easily dead-pressed.

C.2.e Diazodinitrophenol (DDNP)

DDNP is a yellowish brown powder which is soluble in acetic acid, and most of the solvents, but insoluble in water. A solution of cold sodium hydroxide may be used to destroy it. It is desensitized by immersion in water and does not react with water at normal temperatures. It is less sensitive to impact but more powerful than mercury fulminate or lead azide.

D. SMOKELESS POWDER

D.1 General Description

Smokeless powder is produced in many different types. Originally it was developed as a propellant for gun ammunition, and this remains a principle use today. In late years special types have developed as propellants for rockets and missiles. Smokeless powder is a hard, plastic substance, the color and appearance of which may vary from chalk white through pale yellow and translucent to black and completely opaque. Recently developed types are almost white and opaque.

D.2 Types by Characteristic of Base

Smokeless powder generally is considered to be of three types: single-base, double-base, and multibase. In single-base powder, nitrocellulose is the only explosive ingredient. Double-base powder contains both nitrocellulose and nitroglycerine as explosive ingredients. One multibase powder is cordite propellant which contains nitrocellulose, nitroglycerine, and nitroguanidine.

D.3 Types by Index Designation

Index numbers are given serially to powder that has been manufactured and proofed. The numbers aid in the identification of each index and also give an approximate indication as to the age of the powder. Each index of powder is assigned an index number consisting of a group of letters which designate the type of powder and a number which indicates the sequence of manufacture. Following are the index designation letters and their meanings. The letters SP refer to smokeless powder not containing stabilizers as distinguished from the earlier propellants, black powders, and brown powders (BP). SPR indicates a type of powder to which rosaniline dye was added to give it a violet color and to indicate that its stability was acceptable until the color changed to red by formation of decomposition acids within the grain. This procedure was not successful and the powder is no longer used. The letters D and C indicate the stabilizer diphenylamine and centralite, respectively.

D.3.a SPD

Smokeless powder stabilized by addition of diphenylamine. All powder since index 883 has been stabilized. This is standard "pyro" composition powder.

D.3.b SPDW

Reworked powder made from ground stabilized SPD smokeless powder and regranulated.

D.3.c SPDB

A blend of stabilized SPD smokeless powder. The blend was originally devised to provide an index of ample size for a ship's service allowance but the letters are now assigned to a lot made to utilize small remnants for service or target practice purposes. A blend of large-web and small-web powder may be made to produce an equivalent intermediate web to satisfy desired ballistics.

D.3.d SPDN

Nonhygroscopic powder stabilized with diphenylamine and with the further addition of certain nonvolatile solvents to reduce hygroscopicity and increase service life. This type of designation is also used for blends of nonhygroscopic stabilized smokeless powder.

D.3.e SPDF

Flashless powder; SPD powder made flashless by incorporation in the grains during manufacture of certain compounds which reduce muzzle flash.

D.3.f SPCG (CORDITE N)

A flashless, cool burning multibase powder of the Cordite (N) type, containing centralite as a stabilizer and plasticizer. SPCG contains nitrocellulose, nitroglycerine, and nitroguanidine. SPCG is opaque, chalk white in color and becomes slightly yellow with age.

D.3.g Ballisite

Ballisite is a double base smokeless powder which is used as the propelling charge for mortar ammunition and for some shotgun shells. It is used in greater measure as the propellant for rocket motors and as boosters and sustainers for guided missiles.

D.3.h Nitrocellulose

Nitrocellulose includes various types of nitrated cotton or wood pulp depending on the nitrogen content. Nitrocellulose when dry is extremely sensitive to shock and friction and readily accumulates static charges. It is highly flammable and explosive and burns rapidly but produces very little smoke and leaves no residue. When impure, it is subject to spontaneous ignition.

E. SOLID PROPELLANTS

E.1 General Description

Cast propellants are used normally in missiles and rockets of five-inch diameter and larger. Cast propellant grains are produced from both single-base and double-base casting powders. These casting powders are in granulation similar to small-arms powders but each has its own composition as follows:

E.1.a Single-Base Powder

In single-base powder, nitrocellulose forms the principal explosive ingredient. The nitrocellulose is transformed by a solvent into a colloid for granulation. Modifiers and stabilizers are included to obtain suitable form, desired burning characteristics, and stability. Single-base powder produces a larger volume of gas but less heat than double-base powder.

E.1.b Double-Base Powder

In characteristic double-base powder, nitroglycerine and nitrocellulose are the principal explosive ingredients. The nitrocellulose is transformed by the nitroglycerine and other added ingredients into a colloid for granulation.

F. GUN AMMUNITION

F.1 Projectiles

Projectiles are of various types and may be base fuzed, nose fuzed, or both. Commonly designated types are described in the following sections.

F.1.a Loaded Projectiles

These consist of all types of projectiles, 20-mm and larger caliber, which contain special materials or any of the following:

(1) Explosive in any form or quantity as a filler

(2) Pyrotechnic composition for illuminating, screening, signaling, or incendiary purposes.

(3) Smoke-making composition

(4) Chaff load with expelling charge

(5) Anti-personnel grenades with ejection charge

(6) Fuze containing explosives

F.1.b Blind Loaded and Plugged (BL&P) Projectiles

These are loaded with an inert filler and closed with plugs or dummy fuzes.

F.1.c Blind Loaded with Tracer (BL&T) Projectiles

These have an inert load, but a tracer is inserted in a hole in the base of the projectile.

F.1.d Solid Projectiles

These consist of solid metal without cavity.

F.1.e Empty Projectiles

These are projectiles having cavities which are capable of being closed and which do not contain explosive, inert, or other kinds of fillers. This type does not include slugs, proof-shot, or solid target projectiles or unfuzed illuminating projectiles which contain illuminating elements. The latter types of projectiles are regarded as loaded projectiles.

F.1.f Rocket Assisted Projectile (RAP)

The RAP projectile has been developed for 5"/38, 5"/54 and 155-mm guns to provide additional range without redesign of the existing weapons. The projectile consists of a solid-propellant rocket motor with a delayed ignition element, an explosive filled warhead, and either a controlled VT or a point detonation fuze.

F.2 Fixed Ammunition

Fixed ammunition includes all recoilless rifle and gun ammunition, larger than .60 caliber, in which the projectile and primer are firmly secured in a cartridge case containing the propelling charge so that the round is loaded into the gun as a unit in one operation. Examples of fixed ammunition are 20-mm, 30-mm, 40-mm, 76-mm, and 3"/50 cartridges.

F.3 Artillery Ammunition

Artillery ammunition is divided into four general types. They include fixed artillery ammunition, semifixed artillery

ammunition, separate loading artillery ammunition, and separated artillery ammunition. Each of the four types are discussed in the following sections.

F.3.a Fixed Artillery Ammunition

In this type the round is fixed, that is, not adjustable. It is loaded into the weapon in one operation and the primer is fitted into the base of the cartridge.

F.3.b Semifixed Artillery Ammunition

A round of semifixed artillery ammunition is characterized by the loose fir of the cartridge munition, it is loaded into the weapon in on operation. The propelling charge is divided into sections, each consisting of propellant powder in a bag. To adjust the propelling charge, the projectile is lifted from the cartridge case, and the projectile is reassembled in the cartridge case. As in fixed ammunition, the primer is assembled in the base of the cartridge case. In certain rounds for the 105-mm howitzer, even though the charge is fixed, the cartridge case is a free fit over the projectile to facilitate packing for shipment.

F.3.c Separate Loading Artillery Ammunition

Separate loading artillery ammunition requires two or more operations to be loaded into the weapon. The propellant, primer, and projectile are loaded in separate operations. The propellant is contained in cartridge bags and may be in one section but usually is divided into two or more sections with each section assembled in a bag.

F.3.d Separated Artillery Ammunition

In this type, the propelling charge is contained in a primed cartridge case, but the projectile can be fitted into the cartridge. The propelling charge and the projectile are loaded into the gun in one operation.

G. BOMB TYPE AMMUNITION

Typical bomb-type ammunition which may be treated at the open burning/open detonation unit include aircraft bombs, underwater mines (submarine, surface vessel, and aircraft launched), destructors, depth charges, torpedo warheads, and other thin walled containers which are loaded with relatively large bursting charges of cast explosives.

G.1 TNT Exudate

Bomb type ammunition containing cast TNT is known to exude, at times, a sticky, viscous liquid which varies from pale yellow to brown in color. This TNT exudate is found most frequently in old ammunition stocks whose TNT charges contain relatively large quantities of impurities as compared to stocks produced in late years. Its production is accelerated with increase temperature. TNT exudate mixed with a combustible material, such as wood chips, sawdust, or cotton waste, will form a low explosive which is highly flammable and ignites easily from a small flame. It can be exploded in a manner similar to a low grade of dynamite, but the main danger is its fire hazard.

H. ROCKET TYPE AMMUNITION

H.1 Guided Missiles

A guided missile is an unmanned self-propelled vehicle with or without a warhead, designed to move in a trajectory or flight path all or partially above the earth's surface, whose trajectory or course while in flight is capable of being controlled remotely by homing systems or by inertial or programmed guidance from within.

H.2 Rockets

A rocket consists essentially of an inert, chaff loaded, incendiary or explosive loaded warhead, a motor, and a flight stabilizer. The warhead usually contains an explosive filler and a fuze which produces the desired effect at the target. The motor contains the propellant.

The stabilizer for a fin-stabilized rocket consists of fins attached to the motor. For a spin-stabilized rocket, it consists of multiple canted nozzles.

H.3 Jet assisted takeoff (JATO) units

JATO units are cylindrical motors, similar to rocket motors. They use a propellant of the double-base type where in the individual grains are cast or extruded in a variety of configurations. They use electrically fired igniters. They vary in size from those designated to assist large multi-engine planes on takeoff to those designated to assist the launching of small target drones. In the large JATO units propellant weight may approximate 150 pounds, while the small units used to launch drones may have about 9.5 pounds.

I. MISCELLANEOUS EXPLOSIVES

Fuzes, primers, and detonators are included in the collective term, "explosive initiating devices." Explosive initiating devices, boosters, and tracers are components designed for assembly and use with larger ammunition components such as projectiles, bombs, and ammunition charges.

J. LANDING FORCE AMMUNITION

J.1 Grenades

Grenades are either explosive or chemical and are intended for use at relatively short range. They are very effective for augmenting primary weapons. They are also very effective in the form of smoke and tear gas grenades for dispersing crowds. There are two basic types of grenades: hand grenades designed to be thrown by hand, and rifle grenades designed to be projected by rifle or other launcher. Hand grenades are of four types: explosive (fragmentation and offensive) grenades, chemical grenades, practice grenades, and training grenades. Practice grenades contain a charge of black powder while the training grenades are inert. All hand grenades except training grenades are fitted with a delay action fuze.

J.2 Land mines

There are two main types of land mines: antitank (AT), for use against armored cars and tanks, and antipersonnel (AP), for use against personnel. They are further classified as service, practice, or dummy.

J.2.a Antitank (AT) mines

Antitank mines consist of a high explosive charge designed to be laid on, below, or planted flush with the ground. The mine is detonated by a mechanical or chemical device when actuated by the weight of the vehicle. Antitank mines may be of metallic construction or, to counteract the use of magnetic mine detectors, the material may be plastic, ceramic, hard paper, or other nonmetallic material.

J.2.b Antipersonnel (AP) mines

Antipersonnel mines consist of a high explosive charge designed to be used as booby traps, on or in-ground laying, or ambush. Types include bounding, bounding-fragmentation, blast and directional. A complete mine consists of the mine itself, the firing device, and any accessories such as trip wires.

J.3 Mortar ammunition

The types of mortar ammunition are: high explosive, smoke, illuminating, antipersonnel, practice, and training. The complete round is loaded into the mortar as a unit. It consists of a shell body, a fin assembly, an ignition cartridge, and a primer. The propellant charge is adjustable and consists of a number of propellant increments, usually sealed in individual bags. The propellant increments are attached to the fin shaft or within the fin blades. The ignition cartridge is inserted in the perforated base end of the fin shaft; the primer is screwed into the shaft after the ignition cartridge has been inserted.

J.4 Ground type rockets

Ground type rockets are procured by the Navy and Marine Corps chiefly from Army source for use by Naval landing forces ashore. They may be fitted with high explosives, chemical, practice, or target rocket warheads. High explosive is employed for antitank use. Both high explosive and chemical warheads are employed for barrage use.

K. PYROTECHNICS

Pyrotechnics are mixtures of oxidizing agents and combustibles to which materials such as agents for coloring flames or smokes, flame brighteners, deterrents, binders, stabilizers, and accelerators may be added for a particular purpose. Pyrotechnics consist of fireworks adapted to military purposes and are divided into signaling, simulators, smoke screening, incendiary and illuminating types.

L. INERTING MATERIALS

L.1 Inert ammunition components

Inert ammunition components are the essential materials which, when assembled together and loaded, comprise finished rounds. The proper functioning and, to a large extent, the safety in storage and use of ammunition is dependent upon the condition and suitability of the respective ammunition components.

L.2 Drill ammunition

Drill ammunition includes any type of ammunition or any component of any type of assembled without explosives or with inert materials, in simulation of regular ammunition. Drill ammunition is used for training an testing purposes only.

APPENDIX I-2

HAZARDOUS CONSTITUENTS OF MILITARY EXPLOSIVE ORDNANCE

Constituent	Cas No.	Method No.
Acetone	67-64-1	8270
*Acetyl Triethyl Citrate	- - - -	- - - -
*Aluminum Powder	- - - -	- - - -
*Ammonium Nitrate	- - - -	- - - -
Antimony	Total	6010/7040/7041
Barium	Total	6010/7080
*Boron	- - - -	- - - -
*Butyl Stearate	- - - -	- - - -
Cadmium	Total	6010/7130/7131
Chromium	Total	6010/7190/7191
*Diazodinitrophenol	- - - -	- - - -
Diethyl Phthalate	84-66-2	8060/8270
Dimethyl Phthalate	- - - -	8060/8270
Di-n-butyl phthalate	84-74-2	8060/8270
Di-n-octyl phthalate	117-84-0	8060/8270
*Dichromated Aluminum Powder	- - - -	- - - -
2,4-Dinitrotoluene	121-14-2	8090/8270
2,6-Dinitrotoluene	- - - -	8090/8270
Diphenylamine	122-39-4	8270
*Ethyl Centralite	- - - -	- - - -

HAZARDOUS WASTE CONSTITUENTS
(Cont.)

Constituents	Cas No.	Method No.
*HMX	- - - -	- - - -
Lead	Total	6010/7420/7421
*Magnesium Powder	- - - -	- - - -
*Magnesium Alloy Powder	- - - -	- - - -
Nickel Powder	Total	6010
*Nitrocellulose	- - - -	- - - -
*Nitroglycerin	- - - -	- - - -
*Nitroguanidine	- - - -	- - - -
*Nitrostarch	- - - -	- - - -
*Pentolite	- - - -	- - - -
*Pentaerythritol tetranitrate (PETN)	- - - -	- - - -
*Phosphorous	- - - -	- - - -
*Potassium Nitrate	- - - -	- - - -
*RDX (Cyclonite)	- - - -	- - - -
*Resorcinol	- - - -	- - - -
Selenium	Total	6010/7740/7741
*Sodium Nitrate	- - - -	- - - -
*Strontium Nitrate	- - - -	- - - -
*Tetracene	- - - -	- - - -
*Tetryl	- - - -	- - - -
*Titanium Powder	- - - -	- - - -

HAZARDOUS WASTE CONSTITUENTS
(Cont.)

Constituents	Cas No.	Method No.
*TNR (Trinitroresorcinol)	- - - -	- - - -
*TNT (Trinitotoluene)	- - - -	- - - -
*Tri Amino Guanidine Nitrate	- - - -	- - - -
Vinyl Acetate	108-05-4	8240/8240
Vinyl Chloride	75-01-4	8010/8240
Zinc	Total	6010/7950
*Zirconium Powder	- - - -	- - - -

* These constituents did not have a specified test method in "Summary of Appropriate Analytical Methods for Appendix 9". (USEPA, July 1987, PB87-230371)

ATTACHMENT J

WASTE ANALYSIS PLAN

ATTACHMENT J

WASTE ANALYSIS PLAN

REFERENCE: FDER PART II, SECTION A.6
EPA 40 CFR 264.13

J-1 INTRODUCTION

In Attachment I, a detailed description of military explosive ordnance is given. Attachment I also demonstrates that explosive composition of waste ordnance can be determined by use of military numbering systems. An ash by-product from treatment may be generated. This material will be sampled and analyzed to determine if it is a hazardous waste.

J-2 ANALYSIS PARAMETERS AND RATIONALE

Since there is a safety hazard posed by the handling and testing of wastes containing relatively high levels of explosives, and explosive contaminated wastes, sampling is not feasible. Therefore waste ordance are assumed to be reactive in lieu of testing. However, the ash resulting from the treatment of these hazardous wastes may require tests to determine other hazardous waste characteristics.

The possible characteristics of the ash resulting from the thermal treatment of open burning waste explosive materials are: (1) reactivity and (2) EP toxicity for barium, cadmium, chromium, lead and mercury.

The ash will be tested for reactivity and EP toxicity. The potential heavy metal contaminants will vary with the type and chemical composition of the burned explosives. Therefore, EP toxicity tests for barium, chromium, lead and mercury must be performed. Although the barium content of analyses is generally low, barium is a component of some explosives.

The chemical composition of waste munitions and munition components is known and the munitions are also known to be reactive. Therefore, no laboratory analyses are needed to determine physical or chemical characteristics.

J-3 TESTING METHODS

Two test methods have been developed by the U.S. Bureau of Mines for evaluating wastes for the characteristic of reactivity. They are the "Deflagration to Detonation Transition Test" and the "GAP Test". No EPA approved procedure for detonation reactivity exists at this time. Descriptions of the tests methods are given in Appendix J-1.

As mentioned before, waste explosive materials are not sampled or analyzed. Any residual ash that may be generated through treatment operations shall be tested for EP Toxicity, barium, chromium, lead and mercury according to the following EPA test methods: Method 1310, Method 7420/7421, Method 7190/7191, Method 7080/7081 and Method 7420/7421, respectively.

J-4 SAMPLING METHODS

Any residual ash remaining after burning operations shall be removed from the burning tray and placed in a 55 gallon drum to await sampling and analysis. The color of the ash usually ranges from white to black. In terms of texture, the ash residues appear in a variety of forms from light flakes to solid char and often will be seen in crumbly granular "cake". Metal parts may also be found in the residual ash.

A Thief Sampler shall be used to sample containers of ash. The procedures for the successful operation of the Thief Sampler and proper sample collection are described below.

1. Choose the stainless steel or brass Thief Sampler for the sampling of the residual ash.

2. Make sure that the sampler is working properly by rotating the end of the device and ensuring that all moving parts are free moving and operational.

3. Ensure that the sampler has been thoroughly cleaned and decontaminated.

4. Wear all applicable and appropriate protective clothing (including but not limited to Kevlar flight jackets, helmets and gloves) and observe required sampling precautions.

5. Ensure that the Thief Sampler is in the closed position before any sampling is performed.

6. Slowly lower the Thief Sampler into the barrel of waste ash until it reaches the bottom of the barrel.

7. Slowly rotate the top of the handle in a clockwise fashion to open the Thief Sampler. The sampler should be slightly shaken to allow the ash to fall into the sampler.

8. Close the Thief Sampler by rotating the top of the handle in a counter clockwise fashion to secure the sample.

9. Slowly retrieve the Thief Sampler from the barrel with one hand while wiping the sampler with a disposable cloth or rag with the other hand.

10. Carefully discharge all of the sample into a suitable sample container by slowly opening the sampler. This is done by again rotating the upper handle in a clockwise fashion.

11. Cap the sample container; attach and seal; record in field log book; and complete the sample analysis request sheet.

12. Disassemble the sampler, if appropriate, and perform decontamination operations with an appropriate cleaning solution, or store the contaminated parts in a plastic tube for subsequent cleaning. Store used rags in a plastic bag for subsequent disposal.

13. Only all-cargo aircraft, trucks, UPS, or other approved nonpassenger vehicles will be used to ship hazardous waste samples to laboratories. EPA procedures (SW-846) for sample preservation must be followed and EPA and DOT regulations for transportation hazardous materials / wastes must be met. Laboratories must certify that their procedures are EPA-approved and, in that certification, reference either 40 CFR 261 or Test Methods Manual SW-846.

    The Bureau of Mines test protocol for reactivity includes the "Gap Test" and the "Deflagration Detonation and Transition" test. These two tests, to be performed in three replicates for reproducibility, call for a total volume of approximately two gallons of residue. All samples taken from the drums will be mixed to form one composite sample.

J-5 FREQUENCY OF ANALYSIS

Ash shall be collected and containerized after each burning episode. Actual frequency varies with burning operations. However, analysis shall be performed initially to determine if the ash is hazardous. If it exhibits the characteristic of reactivity or EP Toxicity, then the ash shall be sampled upon generating a 55-gallon drum of waste or at least annually.

J-6 ADDITIONAL REQUIREMENTS FOR WASTE TO BE DISPOSED OF OFF-SITE

All hazardous wastes shipped to off-site landfills will meet the requirements of 40 CFR 268. This section outlines those hazardous wastes which are currently prohibited from land disposal (except in injection wells).

The following hazardous wastes are currently forbidden from land disposal except as described above, or except that an extract of the waste or of the treatment residue of the waste developed using the test method in Appendix I of 40 CFR 268 does not exceed the value of the Constituent Concentration Waste Extract (CCWE) of 40 CFR 268.41 for any hazardous waste constituent listed in the Table CCWE for that waste.

1. Liquid hazardous wastes having a pH of less than two (D002).

2. Liquid hazardous wastes containing polychlorinated biphenyls (PCBs) at concentrations greater than or equal to 50 ppm.

3. Liquid hazardous wastes that are primarily water and contain halogenated organic compounds (HOCs) in total concentration greater than or equal to 1,000 mg/l and less that 10,000 mg/l HOCs.

4. The following spent solvent wastes: F001, F002, F003, F004, and F005.

5. The requirements of this section do not apply until November 8, 1988 where the wastes are contaminated soil or debris resulting from a response action taken under section 104 or 106 of the Comprehensive Environmental Response, Compensation and Liability Act or a corrective action required under RCRA Subtitle C.

J-7 ADDITIONAL REQUIREMENTS FOR WASTES GENERATED OFF-SITE

The material received from off-site does not become hazardous waste until it is delivered to the OB/OD facility. The material will be identified by visual inspection and container markings since sampling and analysis is either impossible or dangerous to human health.

J-8 IGNITABLE, REACTIVE AND INCOMPATIBLE WASTES

The information provided in this section is submitted in accordance with the regulatory requirements of 40 CFR 270.14(b)(9).

Management of Ignitable and Reactive Wastes

All hazardous materials handled at the demolition range shall be assumed to be reactive due to inherent physical and chemical characteristics. As such, personnel must take appropriate precautions to prevent reactions which:

1. Generate extreme heat or pressure, fire or explosions, or violent reaction;

2. Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment;

3. Produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosion;

4. Damage the structural integrity of the device or facility;

5. Through other like means threaten human health or the environment.

Safety Guidelines

Safe handling criteria are provided through the establishment of safety guidelines stated in written Navy procedures. These procedures are closely held military documents which are not for publication for the general public. However, these documents may be reviewed at the Naval installation by any authorized representative of the USEPA or the FDER.

The full operating procedures from NAVSEA OP-5 have been paraphrased in great detail and are provided in Attachment L of this document. The OP-5 guidelines are supplemented by written Navy standing operating procedures (SOP's). The preponderance of the written procedures are to assure personal safety. The safety guidelines include, but are not limited to, the following:

1. No smoking signs shall be posted at the demolition range.

2. Ignition sources shall be prohibited at the demolition range.

3. Spark producing equipment and tools shall be prohibited from use near explosive materials unless specifically authorized.

4. Incompatible materials shall not be treated or stored in the same locations.

5. Supervisors shall perform inspections of hand tools and mechanical devices to ensure that they have not become unsafe for use as designated either to the item or to the operator.

6. Motor vehicles used to transport waste explosives, ammunition, or other material to the destruction site shall meet the requirements of NAVSEA OP-5.
m
7. Thermal treatment operations shall not be conducted during electrical storms.

Compatibility of Waste and Container

Explosive hazardous wastes shall only be stored in the original containment device or in U.S. Navy/DOD approved containers. Residual ash shall be stored in containers that are compatible with the ash. If there is any indication that the ash and container may not be compatible with each other, a polyethylene liner may be used for the waste drum. This will ensure that adverse reactions do not occur.

APPENDIX J-1

REACTIVITY TEST METHODS

1) US GAP TEST

The apparatus for the US Gap Test, Bureau of Mines reactivity test, is shown in Figure 1. The test is contained in a cylinder consisting of a 16-inch (40.6-cm) length of 1 1/2-inch schedule 80 black seamless steel pipe. A mild steel witness plate 6-inches (15.24 cm) square and 0.125-inch (0.32 cm) thick is mounted at the upper end of the sample tubing and separated from it by spacers 0.062-inch (0.16 cm) thick. The bottom of the cylinder is closed with two layers of 0.003-inch (0.008 cm) thick polyethylene sheet held in place with gum rubber bands and polyvinyl chloride electrical insulation tape. There is no other gap between the pentolite booster and the test sample as used in this test. A continuous velocity of detonation probe make of thin aluminum tube with an axial resistance of 7.62 ohms/inches (3.0 ohms/cm) is mounted on the wall of the sample tubing. The outer tubing of the probe is crimped against the inner wire at the lower end forming a resistor. When this assembly is inserted in a medium which 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 amperes) is make to flow between the outer and inner conductors, the voltage between them is proportional to the effective length and con be recorded as a function of the time using an oscilloscope. The slope of the oscilloscope trace is thus proportional to the velocity of the shock wave.

The sample is loaded to the top of the steel tube. Solid samples are loaded to the density attained by tapping the cylinder until further settling becomes imperceptible. The sample at 20 o C ± 3 o C is subjected to the shock wave generated by the detonation of a pentolite (50/50 PETN/TNT) pellet, 2 inches (5.08 cm) in diameter and 2-inches (5.08 cm) thick having a density of 1.6 ± 0.05 g/cc. The pentolite pellet is butted against the bottom of the test sample and initiated with a No. 8 strength detonator. The detonator is held in place by a cork detonator holder.

The criteria for propagation are:

1. A stable propagation velocity greater than 4,900 ft/sec (1.5 km/sec) is observed.
2. A hole is punched through the witness plate.
3. The sample tube is fragmented along its entire length.

The overall test results are considered positive is any two of the three criteria are met.

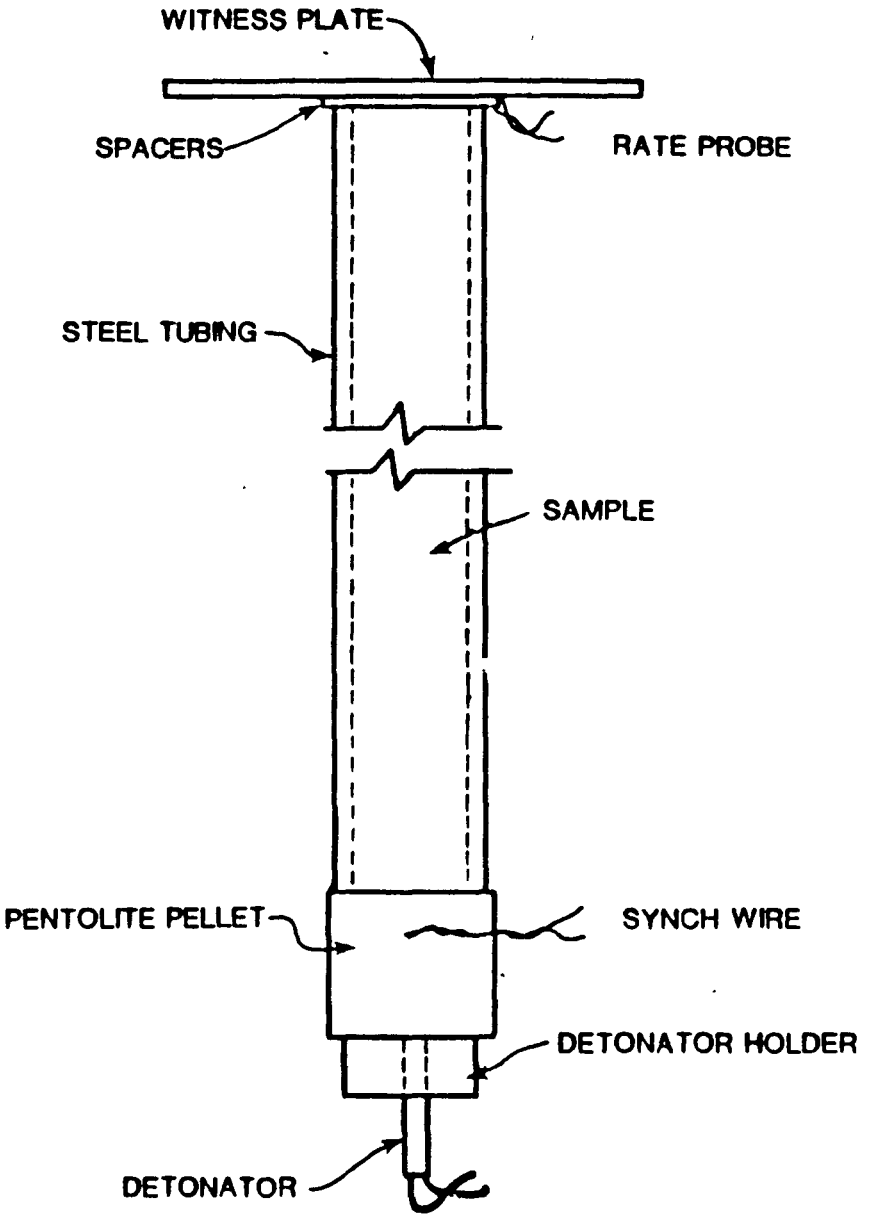


FIGURE 1

U.S. GAP TEST FOR SOLIDS

2) DEFLAGRATION, DETONATION AND TRANSITION (DDT) TEST

The experimental arrangement for this Bureau of Mines is shown in Figure 2. The sample of material to be tested is contained in an 18-inch (45.7 cm) length of 3-inch in a schedule 80 carbon steel pipe with inside diameter 2.9-inch (7.37 cm) wall thickness 0.30 inch (0.76 cm), capped at both ends with "3,000 lbs." forged steel pipe caps.

The sample is subjected to the thermal and pressure stimulus generated by an ignitor consisting of 0.7 oz. (20 g) of grade FFF black powder located at the center of the sample vessel. The ignitor assembly consists of a cylindrical container 0.81-inch (2.06 cm) in diameter and 2.5-inch (6.4 cm) long, which is held together by two layers of nylon filament cellulose acetate tape. The ignitor capsule contains a small loop formed from a 1-inch (2.54 cm) length of nickel-chromium alloy resistance wire 0.012 inch (0.030 cm) in diameter, having a resistance of 0.343 ohms. This loop is attached to two insulated copper-tinned lead wires 0.026 inch (0.066 cm) in diameter. The overall wire diameter including insulation is 0.05 inch (0.127 cm). These lead wires are fed through small holes in a brass disc approximately 0.4 inch (1 cm) in diameter and 0.03 inch (.08 cm) thick, which is soldered to the end of a 9-inch (23 cm) length of 1/8 inch steel pipe having a diameter of 0.405 inch (1.03 cm), which 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 ignitor capsule and serves as a channel for the ignitor wires. The ignitor is fired by a current of 15 amperes obtained from a 20-voltx transformer.

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 cops 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.

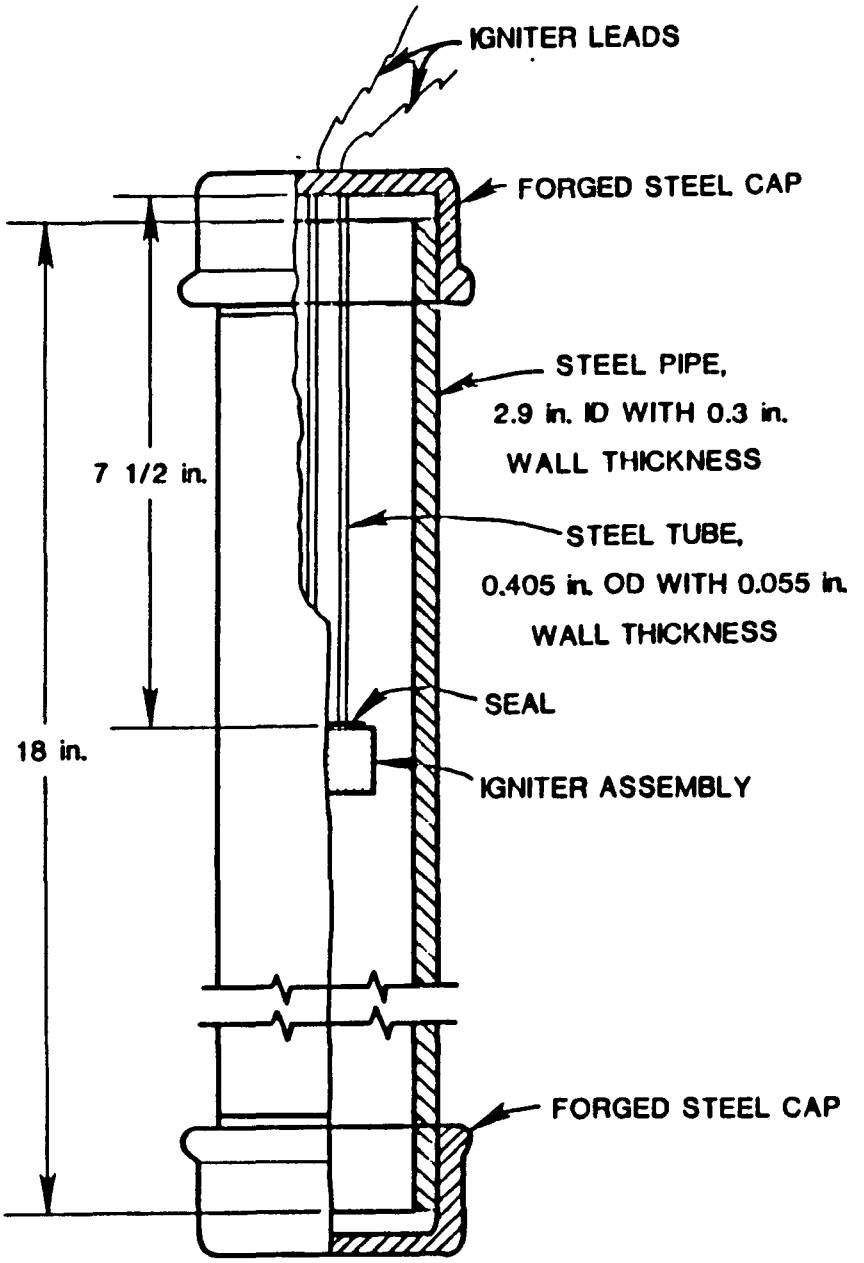


FIGURE 2

PIPE BOMB USED IN THE DEFLAGRATION DETONATION TRANSITION TEST

ATTACHMENT K

WASTE MANIFEST SYSTEM, RECORD KEEPING AND REPORTING

ATTACHMENT K

WASTE MANIFEST SYSTEM, RECORD KEEPING AND REPORTING

REFERENCE: FDER PART II, SECTION A.7
EPA 264.12 and SUBPART E

K-1 SHIPPING AND TRANSPORTATION REQUIREMENTS

All shipments of hazardous waste must be manifested when transported off-site. Prior to offering hazardous waste for transportation, EOD will inspect each container to assure that waste material is properly classified described, packaged, marked, labeled and is in proper condition for transportation.

The treatment facility receives materials from off-site. These materials are not wastes until form 1348-1 is signed. However, these materials are readily identifiable. The materials transported within the cognizance of the same EOD group that receives them. Therefore, these people will have direct knowledge of waste content which arrives from other complexes. Because these materials are not hazardous waste until they are received, no manifest will be needed.

However, all materials transported back to Boca Chica from Demolition Key must comply with DOT/DER shipping regulations regarding proper marking, labeling, and manifesting. These requirements are thoroughly delineated in the Hazardous Waste Management Plan for NAS Key West. Received information must also be adequate to permit ultimate disposal and compatible storage.

K-2 HAZARDOUS WASTE MANIFEST

GENERAL

NAS Key West must use the National Uniform Hazardous Waste Manifest. State regulations applicable to the state in which final disposal occurs may require a specific variation of this manifest.

The regulations specify minimum information to be included on all hazardous waste manifests. The manifest must contain all of the following information:

1. A manifest document number;
2. The generator's name, mailing address, telephone number, and U.S. Environmental Protection Agency (EPA) identification number;
3. The name EPA identification number of each transporter;
4. The name, address and EPA identification number of the designated facility and alternate facility, if any;
5. The description of the waste(s) required by 49 CFR 172.202 and 172.203;
6. The total quantity of each hazardous waste by weight or volume, and the type and number of containers loaded into or onto the transport vehicle; and
7. The following certification: "This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation and the Department of Environmental Regulations."

Figure K-1 contains an example copy of the Uniform Manifest which meets the above requirements. The manifest must consist of at least the number of copies which will provide the generator, each transporter, and the owner or operator of the designated facility one copy each for their records and another copy for the facility to return to the generator.

PREPARATION OF MANIFEST

Caution must be exercised in preparing the manifest to assure that all copies are legible. Entries on the manifest must either be typewritten or printed manually. The following discussion relates to specific entries to be made on the manifest.

Please print or type (Form designed for use on elite (12 pitch) typewriter.)

Form Approved. OMB No. 2050-0404 Expires 7-31-86

UNIFORM HAZARDOUS WASTE MANIFEST

1 Generator's US EPA ID No | Manifest Document No | 2 Page 1 of | Information in the shaded areas is not required by Federal law

3 Generator's Name and Mailing Address

A State Manifest Document Number

B State Generator's ID

4 Generator's Phone ( )

5 Transporter 1 Company Name | 6 US EPA ID Number | C State Transporter's ID | D Transporter's Phone

7 Transporter 2 Company Name | 8 US EPA ID Number | E State Transporter's ID | F Transporter's Phone

9 Designated Facility Name and Site Address | 10 US EPA ID Number | G State Facility's ID | H Facility's Phone

GENERATOR

11 US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12 Containers No	12 Containers Type	13 Total Quantity	14 Unit Wt/Vol	I Waste No
a					
b					
c					
d					

J. Additional Descriptions for Materials Listed Above

K Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

16. **GENERATOR'S CERTIFICATION.** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national governmental regulations

Printed/Typed Name | Signature | Date Month Day Year

TRANSPORTER

17 Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Date Month Day Year

18 Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Date Month Day Year

FACILITY

19 Discrepancy Indication Space

20 Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19

Printed/Typed Name | Signature | Date Month Day Year

EPA Form 8700-22 (3-84)

Figure K-1
Uniform Hazardous
Waste Manifest

Manifest Document Number:

This number is determined as follows: two digit designation of year, month, day, and the sequential manifest number. To illustrate, if the fifteenth waste shipment is to be made on September 30, 1982, the manifest would be number 82093015.

Note that the manifest document number must be posted to the hazardous waste label on each container and to the Hazardous Waste Storage Record.

Identification:

Enter EPA identification number, name, mailing address and telephone number for the generator, each transporter and the designated facility. An alternate designated facility should be entered even if it is NAS Key West. This ensures the transporter an alternative if, for any reason, the shipment cannot be delivered to the primary facility.

Number of Units and Container Type:

Describe the number and type of containers; e.g., 7 drums. Enter an "X" to indicate hazardous waste.

EPA Hazardous Waste I.D. No.:

Enter the appropriate EPA waste number from Appendix F.

Description and Classification:

Enter the proper Department of Transportation (DOT) shipping name and hazard classification for the waste. Except for "n.o.s.", abbreviations are not authorized.

UN NO. OR NA NO.:

Enter the applicable UN/NA number for the waste.

Exemption or No Labels Required:

Enter "N/A" to indicate the entry is not applicable.

Flash Point:

Enter "N/A".

Units Wt./Vol.:

Enter the quantity in each container.

Total:

Enter the total weight of the container. Note: The annual report must show quantity of waste shipped off-site by weight.

Placards Tendered:

Check "yes" to indicate when 1,000 pounds or more of a waste which is not classified as an ORM is being shipped. Check "no" for other shipments.

Generator's Signature:

Signature must be handwritten.

Transporter's Signature:

Obtain the handwritten signature of the designated transporter.

MANIFEST COPY DISTRIBUTION

One copy of the manifest must be retained pending receipt of a signed copy of the manifest from the owner or operator of the designated facility. A copy of the manifest containing the handwritten acceptance signature and date of

acceptance by the designated facility must be retained for 3 years. A copy of all manifests must be submitted to DER within 30 days.

ROUTING AND OUT-OF-STATE MANIFESTS

Many of the individual states require additional information on the manifest. Careful attention to the various state's manifest requirements should be given when selecting routes for hazardous waste shipments to minimize the paperwork and associated regulatory compliance burdens. Out-of-state hazardous waste shipments should be coordinated with DER and its counterpart in states to be transited to ensure compliance in each state.

MANIFEST FOLLOW-UP REQUIREMENTS

If a copy of the manifest with the handwritten acceptance signature of the owner or operator of the designated treatment, storage or disposal (TSD) facility is not received by EOD within 35 days of the date the waste was shipped, EOD must promptly contact the transporter and/or the owner or operator of the designated facility to determine the status of the waste. Efforts to locate the waste and the results of those efforts must be documented.

Written Exception Reports:

If a signed copy of the manifest has not been received by EOD from the designated facility within 45 days of the date of acceptance by the transporter, a written report must be made. The exception report must include a cover letter explaining the efforts to locate the shipment of waste and the results of those efforts; a legible copy of the manifest which does not have confirmation must also be included with the exception report. The exception report must be submitted to:

State of Florida
Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Copies of all exception reports must be retained for 3 years.

Out-Of-State Shipments:

In the case of out-of-state shipments of hazardous waste for which EOD has not received a return copy of the manifest within 45 days, Public Works must notify the appropriate regulatory agency of a state in which the designated facility is located and the appropriate regulatory agency in which the shipment may have been delivered. Those actions and the results of those actions are to be included in the written exception report to the DER.

K-3 USE OF DD FORM 1348-1, TURN-IN DOCUMENT

All materials to be turned in to Defense Property Disposal Office (DPDO), must be accompanied by a properly prepared DD Form 1348-1 Turn-in Document. EOD will review work-centered prepared copies of DD Form 1348-1 in relation to the preparation instructions.

K-4 TRUCK LOADING PROCEDURES

EOD will ensure that, in cases where a STC container is being reused for transportation of hazardous waste, the container has been held for at least 24 hours after filling and that the containers are transported only by highway.

Each container of hazardous waste must be inspected for leakage, proper container, markings and labels before it loaded onto a transport vehicle. The containers must be secured on the transport vehicle to prevent longitudinal or lateral movement during transportation.

K-5 PLACARDING

When 1,000 pounds or more of waste which is <u>not</u> classed as ORM is loaded onto a transport vehicle for transportation on a public highway, the vehicle must be placarded with the appropriate DOT placard. The placards must be displayed on

each end and on each side of the vehicle while the waste is on the vehicle. Public Works must affix the placards to the vehicles or offer the required placards to the transporter (unless the vehicle already displays the proper placards).

K-6 ANNUAL HAZARDOUS WASTE REPORT

This report, which is submitted on EPA Form 8700-13A[1] must be submitted by March 1 each year and cover activities for the preceding calendar year. The report is to be prepared according to instructions on the form and submitted to DER.

K-7 OPNAV HAZARDOUS WASTE ANNUAL REPORT

OPNAVINST 5090.1 of May 1983 requires that NAS Key West submit an annual report of all hazardous waste generated. The report must be prepared according to instructions provided with OPNAVINST 5090.1 and be submitted by February 1 each year to cover hazardous waste generated during the preceding calendar year.

K-8 RECORD KEEPING AND REPORTING

The Florida DER/US EPA hazardous waste management rules require certain records be kept at Naval Air Station (NAS) Key West. Those records and retention periods are as described below. These records must be made available upon request to the U.S. Environmental Protection Agency (EPA) or Department of Environmental Regulation (DER).

MANIFESTS

A copy of each hazardous waste manifest that contains an acceptance signature of the owner or operator of the designated facility must be kept at least 3 years. Those records will be maintained by EOD.

EXCEPTION REPORTS

A copy of each exception report must be kept for at least 3 years. EOD will maintain these records.

STORAGE RECORDS

All hazardous waste storage records become a permanent record at NAS Key West. Tenant activities will turn in their storage logs if their operation at NAS Key West is closed.

INSPECTION RECORDS

Inspection records for each of the temporary areas must be kept for at least three years. When training tenant activities leave NAS Key West, their inspection records will be turned over to Public Works for retention.

OPNAV HAZARDOUS WASTE ANNUAL REPORT

Public Works will retain, for at least 3 years, file copies of the Hazardous Waste Annual Report required by OPNAVINST 5090.1.

ANNUAL HAZARDOUS WASTE REPORT

A copy of each annual hazardous waste report (EPA Form 8700-13) must be kept for at least 3 years. Public Works will maintain these records.

INCIDENT REPORTS

A record of all hazardous waste incidents which require implementation of the contingency plan must be kept as a permanent record at NAS Key West. These records must include details of the incident and will be maintained by Public Works.

CONTINGENCY PLAN

A copy of the contingency plan must be kept at each hazardous waste temporary storage area. Additionally, copies of the contingency plan must be submitted to the station security officer, station fire chief and station dispensary.

TRAINING RECORDS

Training records must include the following information:

1. The job title for each position at the NAS related to hazardous waste management and the name of the person filling each position.

2. A written job description for positions listed in Item 1 above

3. A written description of the type and amount of both initial and continuing training that will be given to each person filling a position listed in Item 1 above.

4. Documentation that the training or job experience required has been given to, and completed by, persons listed in Item 1 above.

Training records for current personnel must be kept as permanent records. Training records on former personnel must be kept for at least 3 years from the date the personnel last worked at NAS Key West. Personnel training records may accompany personnel transferred with the Navy.

Hazardous waste training records will be maintained by Public Works for all hazardous waste activity, including records of tenant commands.

K-9 REQUIRED NOTICES

Any changes of status relating to hazardous waste requires certain notices by Public Works to DER. These notices are described below.

HAZARDOUS WASTE FROM A FOREIGN SOURCE

When receipt of a hazardous waste from a foreign source is anticipated, Public Works must notify in writing the DER at least four weeks advance of the date the waste is expected to arrive at the facility.

TRANSFER OF OWNERSHIP OR OPERATION

Should ownership or operation of the hazardous waste facility be transferred, Public Works must notify in writing the new owner or operator of the requirements of 40 CFR 270 and 264 and of the DER hazardous waste regulation in Chapters 17-30 of the Florida Administrative Code.

ATTACHMENT L

UNIT DESCRIPTION

ATTACHMENT L

UNIT DESCRIPTION

REFERENCE: FDER PART II, SECTION I.1
EPA 40 CFR 264.73, 264.33, 264.15

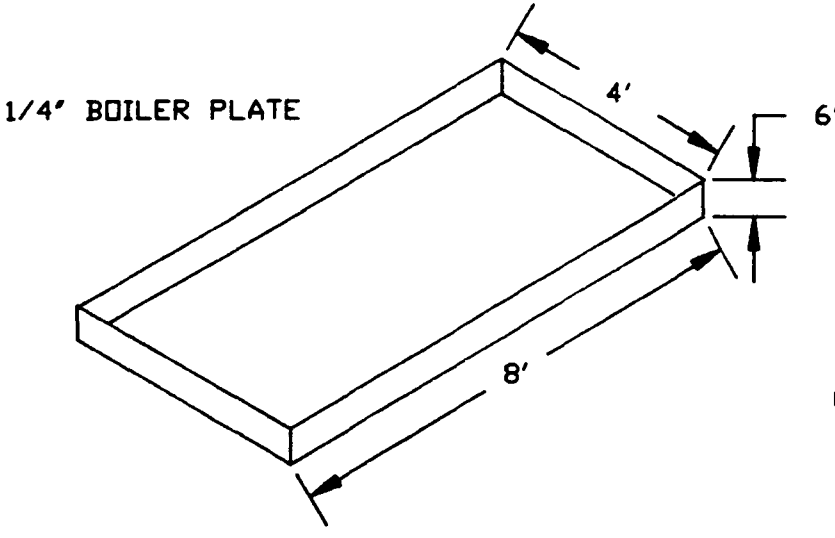
L-1 PHYSICAL CHARACTERISTICS, MATERIALS OF CONSTRUCTION, AND DIMENSIONS OF UNIT

Open burning and open detonation operations are conducted at separate locations at the OB/OD facility. Operational characteristics include open detonation of high explosives on the ground and open burning of waste propellants and pyrotechnics in a burning tray. The specific location for each of these operations is identified on the facility topographic map (Figure A-1).

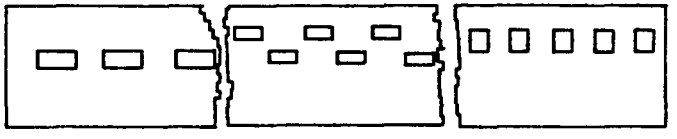
Open detonation is conducted in an open earthen pit. The pit is a nominal six feet in diameter, but this may vary with use.

A burning tray will be used for open burning to provide containment of hazardous waste explosives and the resultant ash to prevent contamination of the soils, ground-water and surface water. It will be approximately 4 ft. x 16 ft. x 2 ft. (Figure L-1). It is constructed of one-quarter inch boiler plate steel. This containment device is specifically designed to contain any ash that may be generated and any initiating fluids that may be required. The burning tray is equipped with a removable cover which is used to keep precipitation out. The burning tray will be kept covered at all times except during burning operations.

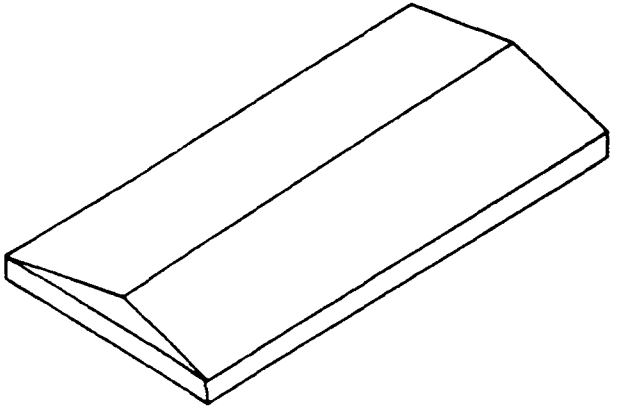
A crew shelter bunker exists sorely for the purpose of protecting EOD personnel during treatment. It is an wooden structure with an earthen berm in front of it. It is equipped with a periscope system to view the detonations and burns.



CONTROL TRAY



AIR COOLED SIDE WALLS



ALUMINUM COVER

FIGURE L-1
OPEN BURNING
CONTAINMENT DEVICE

L-2 UNIT OPERATIONS

CAPACITIES

These facilities are limited in operation by the following propellants, explosives and pyrotechnics (PEP) weight limits: 100 pounds per detonation for open detonation and 100 pounds per burn for open burning. An open burn and an open detonation will occur four to five times per month. Total annual requested permitted capacities are 2,000 pounds, net explosive weight,for open burning and 3,000 pounds, net explosive weight, for open detonation. Theoretically, the units could dispose much more than these amounts, but weather and scheduling restrictions prohibit attaining those amounts further, such quantities are not needed.

GENERAL OPERATING INFORMATION

Guidelines:

This section includes a description of the minimum protective distances and a summary of the standing operating procedures (SOP's) for open burning and open detonation operations. All SOP'S are written in accordance with NAVSEA OP-5 guidelines. It should be noted, however, that SOP's change on a routine basis as work load changes and as safer procedures are developed. The Explosive Ordnance Detachment at Demolition Key maintains current SOP's on site, and all personnel involved in the handling and/or treatment of such materials are fully knowledgeable in these operational requirements.

Open Burning:

Explosives from screw top munitions, pyrotechnics and initiators will be burned in a burning tray. This device will be elevated from the ground for easy inspection. Waste materials have already been disassembled from the cartridge prior to transportation to the demolition range and are then placed in the burning tray according to Standing Operating Procedures (SOP's). A primer cord is attached to the circuit wire. Operators retire to the

protective shelter, close the gate, raise the red flag, unlock the control panel, and ignite the propellants. This flashing process generated sufficient heat to completely burn residual propellants.

Open Detonation of High Explosives:

All munitions and components which require treatment through open detonation are buried under two to eight feet of soil. The hole is prepared prior to the arrival of the waste material.

Material to be detonated is carefully placed in the hole according to SOP's. Demolition material which is used to destroy the ammunition or components is transferred from storage to the demolition range. A primer cord is attached to the demolition material and blasting caps are attached to the primer cord. The primer cord is then attached to the circuit wire and the bulldozer then covers the ammunition or components with two to eight feet. Operators will retire to the protective shelter, close gate, raise the red flag, unlock control panel, and detonate the ammunition or component.

Minimum Protective Distances:

The following minimum protective distances from the open burning/open detonation operations to the property of others shall be adhered to in accordance with 40 CFR 265.382:

Open Burning of PEP's: 670 feet
Open Detonation of Explosives: 670 feet

OPEN DETONATION

SOP's for Open Detonation Operations:

This section provides a summary of the general safety requirements established in the SOP's for open detonation operations. Copies of the SOP's which specify detailed assignments and operating parameters have not been included due to the fact that they are constantly being revised to address safety concerns and changes in the types of

munitions treated. The most up to date version of SOP's are on file at the EOD for review.

1. Standing operating procedures (SOP's), applicable portion, shall be conspicuously posted in rooms, bay, or other areas involving the handling of munitions. Supervisory personnel shall maintain copies of a complete standing operating procedure and be responsible for the enforcement of its provisions. There will be no deviation or changes from the approved SOP without prior approval of the installation Commander or his designated representative.

2. Any defect or unusual condition noted that is not covered in SOP's will be reported immediately to supervisory personnel.

3. Care will be taken to limit exposure to a minimum number of personnel, for a minimum time, to a minimum amount of hazardous material consistent with safe and efficient operations.

4. Each MHE/vehicle operator will have in his possession a valid operator's permit for the particular piece of equipment to be operated.

5. Explosive-loaded ammunition, packaged ammunition or bulk explosives shall not be handled roughly. Large ammunition items, packaged in DOT approved containers designed to permit dragging, rolling, or towing may be so moved when necessary during handling for storage and transportation. Any ammunition determined to be dangerous to handle or store will be reported immediately to supervisory personnel. Operations will be suspended and if warranted, personnel will be evacuated pending further instructions. Doors of operating buildings should have panic hardware installed and must never be bolted or locked when operation are being conducted. Posted personnel and explosive limits must not be exceeded.

6. Equipment and grounds shall be tested for electrical resistance and continuity when installed and at intervals determined locally. All exposed explosives or hazardous materials shall be removed prior to making the test.

7. Appropriate fire symbols and/or chemical hazard symbols shall be displayed on vehicles used in transportation ammunition. Leather or leather palmed gloves will be worn by all personnel engaged in material handling operations. Steel-toed shoes will be worn by all personnel engaged in material handling operations.

8. No demilitarization/treatment operation will be conducted during an electrical storm or when such a storm is approaching within five kilometers. All personnel will be evacuated to a safe distance.

9. The supervisor is responsible to report to the Safety Office, all injuries and accidents occurring during his/her sift. In the event of a fire or explosion, the person discovering the fire/explosion will notify the appropriate authorities in accordance with the Contingency Plans.

10. All material transferred to salvage will be certified free of explosive contamination by the supervisor in charge and verified by Director of Quality Assurance representative. In addition, all areas that the noise decibel reading is 85 or above, operators will wear ear protection and the area(s) will be properly marked.

11. Components or material being transported from disassembly operation to demolition grounds or deactivation will be properly identified on the exterior pack; any misleading markings will be marked out or obliterated.

12. Servicing of Destruction Site:

a. Trucks transporting explosives material to burning grounds shall meet the requirements of NAVSEA OP-5. No more than two people shall ride in the cab.

b. Upon arriving at a burning or demolition ground, trucks may distribute explosive containers or explosive items to be destroyed at sites where destruction (treatment) is to take place. As soon as all item have been removed, trucks shall be withdrawn from the burning or demolition area to a safe location until destruction is complete. Containers of explosives shall not be opened until the truck has been withdrawn.

c. Containers of explosives or ammunition items to be destroyed at the destruction site shall be spotted and opened at least 10 feet from each other and from explosive material previously laid for destruction to prevent rapid transmission of fire in the event of premature ignition.

d. Empty containers shall be closed and moved a sufficient distance away to prevent charring or damage during burning of the explosives. Empty containers may be picked up by truck on the return trip after delivery of the next quantity to be destroyed.

e. When materials being processed at destruction sites are to be handled by gasoline or diesel powered forklift truck, the requirements of NAVSEA OP-5 will be observed. All such material handled will be properly packaged and must not be contaminated with explosives.

13. Materials for detonating Ammunition:

a. Detonation of explosives or ammunition should, where practicable, be initiated by electric blasting caps using blasting machines or permanently installed electric circuits energized by storage batteries or conventional power lines. Improvised methods for exploding electric blasting caps shall not be used. The initiating explosives should be primed with detonating cord of sufficient length to reach up through the covering to a point where the blasting cap may be connected above the ground level. Ammunition and explosives shall not be burned in containers.

b. Special requirements for using electric blasting caps and electric blasting circuits.

1. Electric blasting caps, other electric initiators, electric blasting circuits, and the like may be energized to dangerous levels by extraneous electricity of types and sources such as: static electricity, galvanic action, induced electric currents, high tension wires, and radio frequency energy from radio, radar, and television transmitters. Safety precautions shall be taken to reduce the probability of a premature initiation of electric blasting caps and explosive charges of which they form a part.

2. The shunt shall not be removed from the lead wires of the blasting cap until the moment of connecting them to the blasting circuit, except during electrical continuity testing of the blasting cap and lead wires. The individual who removed the shunt should ground himself by grasping the firing wirer prior to performing the operation in order to prevent accumulation of static electricity from firing the blasting cap. NOTE: After electrical continuity testing of the blasting sap lead wires must be short-circuited by twisting the bare ends of the wires together immediately after testing. The wires shall remain short circuited until the time to connect them to the blasting circuit. The Blaster's Galvanometer or DuPont Blaster's Multimeter, Model 101, may be used for continuity testing of blasting caps and lead wires.

3. When uncoiling the lead wires of blasting caps, the explosives end of the cap should not be held directly in the hand. The lead wires should be straightened out as far as necessary by hand and shall not be thrown, waved through the air, or snapped as a whip to unloosen the wire coils. Avoid loops by running lead wires parallel to each other and close together. If loops are unavoidable, keep them small. Keep wires on the ground in blasting layouts.

4. Firing wires shall be twisted pairs. Blasting circuit firing wires shall at all times be twisted together and connected to ground at the power source and the ends of the circuit wires where blasting cap wires are connected except when actually firing the charge or testing circuit continuity. The connection between blasting caps and the circuit firing wires must not be made unless the power end of the circuit lead, are shorted and grounded. The following methods should be followed when connecting electric type blasting cap lead wires to the firing circuit wires:

a. Check wires leading to the blasting machine for continuity and stray currents.

b. Test electric blasting cap wires for electrical continuity, and after the test, connect to wires leading to the blasting machine.

c. Evacuate all but two personnel from the area. Place cap into charge to be detonated.

d. Unshort firing lead wire circuit and check for continuity.

e. Connect firing lead wire to blasting machine and fire charge(s).

f. After firing remove lead wires from blasting machine and twist the end to short them.

g. Arrange a dummy test circuit, essentially the same as the actual blasting circuit except that a No. 47 radio pilot lamp of known good quality inserted in place of the blasting cap shall be used without applying electric current to the circuit. Any glow is evidence of the presence of possible dangerous amount of RF energy, and blasting operations in such areas must be performed with non-electric blasting caps and safety fuse.

h. The Dupont Blaster's Multimeter, Model 101 may be substituted for the No. 47 radio pilot lamp when testing for extraneous electricity, but will not detect RF energy.

6. Blasting or demolition shall not be conducted during an electrical storm or when a storm is approaching. All operations shall be suspended, cap wires shall be short-circuited and all personnel must be removed fro the demolition area to a safe location when an electrical storm approaches.

7. Prior to making connections to the blasting machine, the firing circuit shall be tested. The individual assigned to made the connection shall not complete the circuit at the blasting machine or at the panel, nor shall he give the signal for detonation until he is satisfied that all persons in the vicinity are in a safe place. When used, the blasting machine or its actuating device shall be in the individual's possession at all times. When the individual uses a panel, the switch must be locked in the open position until ready and the single key plug must be in his possession.

8. Electric blasting caps must be in closed metal boxes when being transported by vehicles equipped with two-way radios and also when in areas where extraneous electricity is known to be present or is suspected of being present.

c. Although electrical blasting caps are the preferred method of initiation, safety fuses may be used in the detonation of explosives and ammunition when enhanced safety and efficiency will result. Safety fuses, when used, must be tested for burning rate at the beginning of each day's operation and whenever a new coil is used. Sufficient length of fuse shall be used to allow personnel to retire to a safe distance, but under no circumstances should a length be less than three feet or have less than a 120 second burning time. Crimping of a fuse which is too large in diameter to enter the blasting cap without forcing shall not be used. Before igniting the safety fuse, all personnel, except the supervisor and not more than one assistant, shall retire to the personnel protective shelter or be evacuated from the demolition area.

d. when using blasting caps involving the electric or non-electric system of destruction, the explosives end of the blasting cap shall always be pointed away from the body.

14. Detonation of Ammunition

a. Ammunition of explosives to be destroyed by detonation should be detonated in a pit not less than four feet deep and covered with not less than two feet of earth. The components should be placed in intimate contact on top of the item to be detonated and held in place by earth packed over the demolition blocks. Where space permits, and the demolition area is remotely located from inhabited buildings, boundaries, work areas, and storage areas, detonation of shells and explosives may be accomplished without the aid of a pit. In either event, however, the total quantity to be destroyed at one time, dependent on local conditions, should be established by trial methods to assure that adjacent and nearby structures and personnel are safe from the blast effect or missiles resulting from the explosion. This procedure should be used for the destruction of fragmentation grenades, HE projectiles, mines, photo flash munitions, mortar shells, bombs, and HE rockets heads which have been separated from motors. Rocket motors containing solid propellants should not be destroyed by detonation.

b. After each detonation, a search shall be made of the surrounding area for unexploded material and items. Items or material such as lumps of explosives or unfused

ammunition may be picked up and prepared for the next detonation. Fused ammunition or items which may have internally damaged components should be detonated in place unless the item can be safely handled by using mechanical retrievers providing protection to personnel.

c. In case of misfires, personnel shall not return to the point of detonation for at least 30 minutes after which not more than two qualified personnel shall be permitted to examine the misfire.

15. Operation of Motor Vehicles

a. During loading and unloading of munitions, the brakes must be set. In addition, when on a grade at least one wheel must be chocked.

b. Trucks containing ammunition or explosives should not be refueled within magazines or explosives areas of installations, including refueling from mobile units. A central station located outside the restricted area should be used.

c. No person shall be allowed to ride in or on the truck body or van of a motor vehicle transporting ammunition or explosives except in cases involving limited quantities of small arms ammunition with non-explosive bullets. In the latter case, the small arms ammunition must be in closed containers which are properly secured in the truck body and seats shall be provided for personnel, restricted in number to the minimum required.

e. No explosives shall be loaded or unloaded from motor vehicles while their motors are running. Motors may be kept running when required to provide power to vehicle accessories such as mechanical handling equipment used in the loading and unloading of the vehicle, provided:

1. The accessory is an integral part of the vehicle.

2. The exhaust gases from the motor are emitted at least six feet from the point at which the loading operations are conducted and are directed away from this point.

3. The exhaust pipe is equipped with a spark arrestor.

16. Inspection of Vehicles

a. All vehicles used to transport ammunition and/or explosives will be inspected monthly using DD Form 626.

b. Government owned motor vehicles used for transportation of hazardous materials shall be inspected at frequent intervals by a competent person to see that mechanical conditions and safety devices are in good working order and that oil and motor pans under engines are clean. Daily inspection shall be made by operators to determine that:

1. Fire extinguishers are serviceable.

2. Electric wiring is in good condition and properly attached.

3. Fuel tank and piping are secure and not leaking.

4. Brakes, steering, and other equipment are in good condition.

5. The exhaust system is not exposed to accumulation of grease, oil, gasoline, or other fuels, and has ample clearance from fuel lines and other combustible materials.

17. Government motor vehicles involved only in on post shipments shall be equipped, as a minimum, with one Class 10-BC rated portable fire extinguisher mounted outside the cab on the driver's side of the vehicle.

OPEN BURNING

This section provides only a summary of the servicing of the destruction site, the general burning requirements, and the open burning of out-loaded HE projectiles. Other general safety precautions for the handling of pyrotechnics and propellants are the same as those for handling explosives described in the previous section.

1. Servicing OD Destruction Area

a. Trucks transporting explosive material to burning grounds shall meet the requirements of NAVSEA OP-5. No more than two people shall ride in the cab.

b. Upon arriving at a burning or demolition ground, trucks may distribute explosives containers or explosive items to be destroyed (treated) at sites where destruction is to take place. As soon as all items have been removed, trucks shall be withdrawn from the burning or demolition area to a safe location until destruction is completed. Containers of explosives shall not be opened until the truck has been withdrawn.

c. Containers of explosives or ammunition items to be destroyed at the destruction site shall be spotted and opened at least 10 feet from each other and from explosives material previously laid for destruction to prevent rapid transmission of fire in event of premature ignition.

d. Empty containers shall be closed and moved a sufficient distance away to prevent charring or damage during burning of the explosives. Empty containers may be picked up by truck on the return trip after delivery of the next quantity to be destroyed.

e. When materials being processed at destruction sites are to be handled by gasoline or diesel powered forklift truck, the requirements of NAVSEA OP-5 will be observed. All such material handled will be properly packaged and must not be contaminated with explosives.

2. General Burning Requirements

a. Except in specific cases, such as Explosive D loaded projectiles, ammunition and explosives shall not be burned in containers.

b. Bulk initiating explosives and others used predominantly in detonator and photo-flash compositions shall be destroyed by detonation except that small quantities (not exceeding 28 grams) may be decomposed chemically.

c. Loose explosives, other than initiating explosives, may be burned in beds not more than three inches deep. Wet explosives may require a thick bed of readily combustible material such as excelsior underneath and beyond to assure that all the explosives will be consumed once the materials are ignited. From the end of the layer of explosives the combustible material should be extended in a train to serve as the ignition point. If an ignition train of combustible

material leading to the explosives is used, it must be arranged so that both it and the explosives burn into the wind. The combustible train of explosive, if ignited directly, must be ignited by a safety fuze of a length which will permit personnel to withdraw safely to the protective shelter. In some cases, it may be necessary to tie two or more squibs together to assure ignition of the combustible train. When a misfire occurs, personnel shall not return to the point of initiation for at least 30 minutes. Not more than two qualified persons shall be permitted to examine the misfire.

1. Loose, dry explosive may be burned without being placed on combustible material if burning will be complete and the burning does not become unduly contaminated. The ground must be decontaminated as frequently as is necessary for the safety of personnel and operations.

2. Wet explosives shall not be burned without first preparing a bed of nonexplosive combustible material upon which the explosives are placed to assure complete burning. It is necessary to burn RDX wet to prevent detonation.

3. Dry grass, leaves, and other extraneous combustible material in amounts sufficient to spread fire shall be removed within a radius of 200 feet from the point of destruction.

3. Burning Out-loaded HE projectiles

a. TNT, Explosive D, Composition B, pentolite, and other explosives filler in open projectiles may be burned out when destruction by detonation or washing out and burning the explosive filler separately is impracticable.

b. Projectiles to be burned out should be placed on their sides and arranged in groups of not more than six projectiles, with all open ends facing in one direction. Open ends of projectiles should not be pointed into the wind.

c. Combustible material such as excelsior or scrap lumber should be used to ignite the explosive filler. Oil-soaked waste may also be used; however, it shall not be placed in the interior of the fuze activities. Use of oil or wood treated pentachlorophenol (PCP) is prohibited.

L-3 MAINTENANCE

The burning trays will be inspected for leaks or other deteriorated conditions prior to each burn. All communication equipment with be checked prior to arrival at the site. The crew shelter bunker will be inspected for structural integrity prior to each treatment. The ash drum at the satellite collection area will be inspected verify structural integrity and that the lid is closed.

L-4 MONITORING

The United States Army Environmental Hygiene Agency prepared a permit writers' guidance for the Environmental Protection Agency for open burning/ open detonation sites. This was written based on a study of twenty-six different sites that the Army operates. The study concluded that no significant contamination to the environment exists for operation using open detonation and open burning in trays. Therefore, monitoring of the soils, surface water, ground water or air during the operational life of the facility is not necessary.

ATTACHMENT M

DETAILED ENVIRONMENTAL ASSESSMENTS

ATTACHMENT M

DETAILED ENVIRONMENTAL ASSESSMENTS

REFERENCE: FDER PART II, I.2
EPA 40 CFR 264.601

M-1 NATURAL ENVIRONMENT

This section is a description of the overall natural environment of the Florida keys which has been studied in great detail. Much of the research information (i.e., climate), especially that for Key West, is consistent with and applicable to the conditions found on Demolition Key. This information, supplemented with a site visit by a registered geologist, will be used in Sections M-2 through M-4 to assess the specifics of Demolition Key.

GEOLOGY

The Florida Keys were created through eustatic elevation of limestone rock units. Two distinct Pleistocene rock formations compose the upper portion of the islands.

All the Lower Keys are composed of Miami Oolite. These formations are soft, white to yellow, stratified to massive, cross-bedded and are constituted of pure calcium carbonate (limestone) which may contain shell fragments and minor quartz sand. Its major constituents are tiny oolids which are spherical calcereous grains of concentric structure and cemented to form Oolitic rock.

Key Largo limestone underlies the Miami Oolite on all of the Lower Keys. Its major constituents are the cemented remains of ancient coral reefs and a subsidiary amount of fossils or coral, shell, algae and echinidids.

SEISMOLOGY

The Keys have been grouped into Zone 0 of the building codes seismic ratings for potential damage by earthquakes. Areas in Zone 0 are the areas with no potential damage.

Although the Keys have felt minor shocks from earthquakes in the Caribbean, there have been no recorded earthquakes of local origin. No adverse impact is expected from seismic action.

TOPOGRAPHY

Ground elevations in the Key West area range from sea level to approximately fifteen feet above mean sea level with an average elevation of four to five feet above mean sea level.

CLIMATE

Key West has an average annual temperature of 77oF. The difference between average summer and winter temperatures is 14oF. The nearness of the Gulf Stream combined with the effects of the Gulf of Mexico tend to mitigate advancing cold fronts. Easterly trade winds and sea breezes suppress the summer heat.

Hurricanes normally form in the warm moist air over the tropical sea areas around the Lesser Antilles and occasionally in the Caribbean. They move in a westerly to northwesterly direction gradually turning northward and eastward. The majorities of hurricanes approach Key West from the south and east with their effects felt on the south, east and west sides of the island; however, severe hurricanes have struck Key West from all directions. It is estimated that 75% of all damage that occurs during the hurricane is from tidal flooding. The probability that a hurricane or a great hurricane will occur in a year within a fifty mile segment of the U.S. coastline near Key West is 13% and 4%, respectively.

HYDROLOGY

Precipitation and Surface Drainage:

During the period of December through April, the Keys receive approximately 25% of the total annual precipitation, which, over the years, has averaged 38.5 inches. The bulk of the annual rainfall, approximately 53%, falls in the period of June through October.

Rainfall runoff from Key West is carried to the tidal waters by overland flow or storm drains that cover approximately 50% of the island: however, much of the rainfall percolates directly into the porous limestone.

Wetlands and Flood Plains:

The coastal wetlands and intertidal zone consists of narrow beach areas, shallow mud and sand banks, salt ponds, and mangrove areas which are exposed or partially exposed at low tide. Tidal ranges are low in the Keys, but the typical lack of appreciable slope to the shore lines results in large expanses of such areas fringing most of the islands, with mangroves and salt ponds being the most extensive components.

The low elevations make it necessary to consider tidal surge in design of site and structure. Hurricane tides for a 100 year frequency storm are estimated to be eight to twelve above mean sea level along the Keys with an eight feet elevation for Key West. Since it is close to deep water and tropical storms occur in the area, all of the Key West area is susceptible to flooding and damage from flood action.

Ground Water:

The layer of fresh water beneath Key West is subject to salt water intrusion through the porous Key Largo limestone formation underlying the less porous Miami Oolite limestone formation which forms the Key West Islands. No known source of potable artesian water exists in Key West.

VEGETATION AND WILDLIFE

Key West has an abundance of trees, vines, flowers, and fruits indicative of the island's tropical climate. The predominate plant associations are mangrove swamps, pinelands and tropical hardwood hammocks. Typical vegetation associated with Key West and the Lower Keys include sandbox, tamarind, avocado, aralea, Spanish bayonet and elephant ear.

Mangrove communities are considered to be most critical in maintaining the environmental structure in the Key West area. Mangroves buffer storm winds and tidal surges, stabilize and extend the shoreline and provide food, shelter and nesting areas required by a large number of species of marine animals and wildlife. Demolition Key has a healthy community of mangroves around its shoreline and is flourishing in the presence of Demolition Key military activities.

Marine grass beds are found throughout the island chain in shallow depths. These beds provide habitat for fish and other marine organisms and are a vital link in the bethnic food chain. Healthy communities of marine grass beds are flourishing near Demolition Key.

M-2 GROUNDWATER AND SUBSURFACE ENVIRONMENTS

WASTE ANALYSIS PLAN

The volume and physical and chemical characteristics of the waste explosive which may be treated at the OB/OD facility have been addressed in Attachment I of this permit application. The maximum batch weight for open burning or for open detonation is 100 pounds, net explosive weight. Since the material is packaged solids, spilled material would be easy to collect and containerize. Therefore, spill residues can reasonably be estimated to be significantly less than one pound, net explosive weight. Historically, spills have been infrequent, less than once per year. Therefore, waste constituent migration into the soil and subsurface from spills are conservatively estimated to be much less than 0.1 pound, net explosive weight per year.

Open burning will occur in trays which will prevent any hazardous constituent in the residue from entering the groundwater directly through the soil. Open detonation occurs on the soil. The nature of the operation prevents the use of any containment device.

The extent of reaction during open detonation can reasonably be estimated to be in excess of 99%. The majority of the unreacted explosives will enter the environment through the air via dispersion of the explosion plume. Also, only a minority of the unreacted material will be hazardous constituents. Therefore, less than 0.1% of the

annual 3,000 pounds, net explosive weight, of the open detonated material will directly enter soil during the detonation. Of the less than 3 pounds net explosive weight, only the water soluble portion will enter the ground water.

The vast majority of the unreacted explosives will enter the air during the detonation and will be dispersed into the atmosphere. Some portion of that will fall back to the surface. However, the small size of Demolition Key will result in most of this returning to surface water rather than soil. Based on this scenario, less than one pound, net explosive weight, of hazardous constituents will enter the soil each year.

Appendices M-1 and M-2 show the combustion by-products resulting from open detonation and open burning of various explosives. These number are computations derived from a computer model used by the EOD Environmental Support Group in Indian Head, Maryland. The computer model was developed by the military for their own internal research for the development of ordnance. This is not a model developed solely for the purpose of this application. Therefore, the numbers represent the best, objective estimate of what the by-products will be and were not generated to represent the best possible scenario for environmental permit applications.

The by-products of explosives combustion during open burning and open detonation will be volatile and will not return to the soil or surface water. However, oxidized lead will return to the soil. No more than 20 pounds net explosive weight of lead azide and lead styphnate, total, will ever be open detonated in a year (currently none is). Over 99% of this material can be assumed to be oxidized. Again, taking into account atmospheric dispersion, less than 1% of the original material, 0.2 pounds net explosive weight per year, is estimated to return to the soil.

HYDROLOGIC AND GEOLOGIC CHARACTERISTICS

Demolition Key is an artificially made dredge fill island. The island is elevated 6 fett MSL at its highest point. Appendix M-3 contains report of the geohydrologic characteristics of Demolition Key based upon the research and field observations of a certified geologist. The following observation was made in that document: "In order

to support a fresh water lens, a key must have an appreciable amount of topographic relief to counterbalance the "flushing" effects of the tides on groundwater in the subsurface. The tides have a direct relationship to the levels of groundwater on Demolition Key. The absence of sufficient topographic relief (less than 5 ft. on Demolition Key as compared to 15 ft. on Key West) not only rules out the possibility of any fresh water lenses, but also surface water runoff from precipitation is diminished and infiltration is enhanced."

Based upon this description, the water soluble hazardous constituents that enter the soil on Demolition Key can be assumed to enter a brackish groundwater which is already unsuitable for potable water. From there, the groundwater is continually flushed by the tides and currents into the surrounding surface water where it is dispersed. Given these geohydrologic conditions, and the relatively small amounts of hazardous constituents entering the groundwater via the soil, the operation should pose no threat to human health or the environment.

EXISTING QUALITY OF GROUND WATER

Based upon the geohydrologic characteristics of the key as described above and Appendix M-3, the current groundwater is brackish and unsuitable for human consumption. No drinking water wells exist on the key or the surrounding area for this reason. The nature of the hydrogeology of the key is such that it and the surrounding gulf waters are essentially the same. The proposed operations will not adversely affect the current environmental use of the ground water.

VOLUME AND DIRECTION OF GROUND WATER FLOW

The volume of ground water is calculated to be 30% of the total soil saturated at high tides that is above the low tide sea level. The area of the island is approximately 24 acres. The average difference in high tide and low tide is 2 ft. Based on these assumptions, the total volume of groundwater is calculated to be 6.7 million gallons. The ground water will flow radially from the key and then in the direction of the current of the adjacent channel.

WITHDRAWAL RATES OF GROUND WATER

There are no ground water withdrawal wells on Demolition Key.

PATTERNS OF LAND USE

This information has already been provided in Figure A-1 of this permit application. Demolition Key (24 acres) is surrounded by the Gulf of Mexico.

MIGRATION OF CONTAMINANTS TO SUBSURFACE STRUCTURES AND THE ROOT ZONE OF FOOD CHAIN CROPS

There are no food chain crops on Demolition Key, nor is it likely that any contaminants would ever reach any other food chain crops. However, the key is man-made and has been used for ordnance detonation and burning for over twenty years. During that time, the vegetation has naturally migrated to the island and thrived in there. Also, animal life continues to thrive around the key. All this suggests that the effluents from the treatment are not adversely affecting the food chain.

HEALTH RISKS

No evidence exists that any increase in health risks will result from operation of this facility. While some people are known to become sensitized to some explosives, there is essentially no direct public contact with explosives at Demolition Key. The primary health risk is the explosivity of the waste which is a safety concern. The Navy has a long history of safely handling explosives at Demolition Key.

DAMAGE TO DOMESTIC ANIMALS, WILDLIFE, CROPS, VEGETATION, AND PHYSICAL STRUCTURES CAUSED BY EXPOSURE TO WASTE CONSTITUENTS

No evidence exists that there is any damage to domestic animals, wildlife, crops, vegetation, or physical structures due operation of this facility because of the low emissions already described. Further, animal life is limited to birds and insects; there are no crops; and the only structure is the crew protection bunker.

M-3 SURFACE WATER, WETLANDS AND SOIL

WASTE ANALYSIS PLAN

The volume and physical and chemical characteristics of the waste explosive which may be treated at the OB/OD facility have been addressed in Attachment I of this permit application. The maximum batch weight for open burning or for open detonation is 100 pounds, net explosive weight. Since the material is packaged solids, spilled material would be easy to collect and containerize. Therefore, spill residues can reasonably be estimated to be significantly less than one pound, net explosive weight. Historically, spills have been infrequent, less than once per year. Therefore, waste constituent migration into the soil and subsurface (and therefore into the surrounding surface water) from spills are conservatively estimated to be much less than 0.1 pound, net explosive weight per year.

Open burning will occur in trays which will prevent any hazardous constituent in the residue from entering the soil or surface water. Open detonation occurs on the soil. The nature of the operation prevents the use of any containment device.

The extent of reaction during open detonation can reasonably be estimated to be in excess of 99%. The majority of the unreacted explosives will enter the environment through the air via dispersion of the explosion plume. Also, only a minority of the unreacted material will be hazardous constituents. Therefore, less than 0.1% of the annual 3,000 pounds, net explosive weight, of the open detonated material will directly enter soil during the detonation.

The majority of the unreacted explosives will enter the air during the detonation. The vast majority will be dispersed into the atmosphere. Some portion of that will fall back to the surface. However, the smallness of Demolition Key will result in most of this returning to surface water rather than soil. Based on this scenario, less than one pound, net explosive weight, of hazardous constituents will enter the soil each year. Probably less than 10% of the dispersed unreacted explosives will return to the surface water. This is also estimated to be 3 pounds, net explosive weight, per year.

Appendices M-1 and M-2 show the combustion by-products resulting from open detonation and open burning of various explosives. These number are computations derived from a computer model used by the EOD Environmental Support Group in Indian Head, Maryland. The computer model was developed by the military for their own internal research for the development of ordnance. This is not a model developed solely for the purpose of this application. Therefore, the numbers represent the best, objective estimate of what the by-products will be and were not generated to represent the best possible scenario for environmental permit applications.

The by-products of explosives combustion during open burning and open detonation will be volatile and will not return to the soil or surface water. However, oxidized lead will return to the soil. No more than 20 pounds net explosive weight of lead azide and lead styphnate, total will ever be open detonated in a year (currently none is). Over 99% of this material can be assumed to oxidize. Oxidized lead is not water soluble and does not contribute to EP Toxicity. Again, taking into account atmospheric dispersion, less than 0.1% of the original material, 0.2 pounds net explosive weight per year, is estimated to return to the soil as EP Toxic lead. An estimated 1%, 2 pounds net explosive weight, will enter surface waters each year.

CONTAINMENT STRUCTURES

Open burning will be conducted in burning trays which will contain the explosive wastes and resultant ash. This will prevent migration to the soils, ground-water and surface waters. Waste will be stored at the facility only on the day of treatment. Since treatment will never occur during adverse weather, there will be no chance of runoff or run-on.

HYDROLOGIC CHARACTERISTICS OF THE UNIT INCLUDING TOPOGRAPHY

A topographic map (Figure A-1) has been submitted with this permit application which delineates the topography at the OB/OD facility and surrounding area. Demolition Key is a man-made dredge spoil island which is completely surrounded by either the Atlantic Ocean or the Gulf of Mexico. The highest point of the island is five feet above mean sea
o
level. All surface water run-off is directly to the surrounding waters. The porosity of the soils allows for

level. All surface water run-off is directly to the surrounding waters. The porosity of the soils allows for easy infiltration into the saline groundwater beneath the key.

PATTERNS OF PRECIPITATION

Demolition Key is in a tropical climate with frequent rain and warm temperatures. Hurricanes are the only cause for flooding, but are easily tracked and forecasted. Since explosive hazardous waste is transported to Demolition Key only on days of treatment, and since treatment never occurs during foul weather, hazardous waste is not susceptible to run-off and run-on.

QUANTITY, QUALITY; AND DIRECTION OF GROUND WATER FLOW

The volume of ground water is calculated to be 30% of the total soil saturated at high tides that is above the low tide sea level. The area of the island is approximately 24 acres. The average difference in high tide and low tide is 2 ft. Based on these assumptions, the total volume of groundwater is calculated to be 6.7 million gallons. The ground water will flow radially from the key and then in the direction of the current of the adjacent channel. All groundwater is saline and unsuitable for human consumption.

PROXIMITY OF THE UNIT TO SURFACE WATERS

The two units are within a few feet of surface water, specifically the Gulf of Mexico and the Atlantic Ocean. It is conceded that any hazardous run-off would go into the surface waters. However, by using open burning trays and open detonation as the only means of treatment no hazardous waste run-off should occur.

USES OF NEARBY SURFACE WATERS

The nearby surface waters are used for recreation and transportation. A navigable channel, Garrison Bight Channel, runs adjacent to the key. The channel is closed during treatment operations.

EXISTING QUALITY OF SURFACE WATERS AND SOILS

The existing quality of soil and surface water is assumed to be good given the abundance of flora and fauna on and around the key. The primary source of adverse effects on the quality of surface water adjacent to the key and the soil of the key is the existing ordnance training and testing operations conducted by the Navy on Demolition Key. The quantity of ordnance detonated and burned during these operations (which are outside the scope of RCRA) far exceeds the quantity of waste ordnance proposed to be treated under this permit. Run-off from Key West and Fleming Key as well as hydrocarbon emissions from boats in Garrison Bight Channel can reasonably be assumed to be greater sources of heavy metals and organic constituents into the surface water.

PATTERNS OF LAND USE

This information is presented in Figure A-1 of this permit application. Demolition Key (24 acres) is completed surrounded by the Gulf of Mexico.

HEALTH RISKS

No evidence exists that any increase in health risks will result from operation of this facility. While some people are known to become sensitized to some explosives, there is little or no direct contact with explosives at Demolition Key. The primary health risk is the explosivity of the waste which is a safety concern. The Navy has a long history of safely handling explosives at Demolition Key.

DAMAGE TO DOMESTIC ANIMALS, WILDLIFE, CROPS, VEGETATION, AND PHYSICAL STRUCTURES CAUSED BY EXPOSURE TO WASTE CONSTITUENTS

No evidence exists that there is any damage to domestic animals, wildlife, crops, vegetation, or physical structures due operation of this facility because of the low emissions already described. Further, animal life is limited to birds and insects; there are no crops; and the only structure is the crew protection bunker. In fact, an abundance of flora and fauna have naturally transferred to Demolition Key even though the actions in question have

taken place at the key since the Navy built it. Continued operations should allow for the continued hospitable environment for these species.

M-4 AIR

WASTE ANALYSIS PLAN

The volume and physical and chemical characteristics of the waste explosive which may be treated at the OB/OD facility have been addressed in Attachment I of this permit application. The extent of reaction during open detonation can reasonably be estimated to be in excess of 99%. The majority of the unreacted explosives will enter the environment through the air via dispersion of the explosion plume and will be dispersed into the atmosphere. Therefore, no more than 30 pounds, net explosive weight, of hazardous constituents will enter the atmosphere. Since the Key West area is an attainment zone for all air pollutants, these VOC emission rates are acceptable.

Appendices M-1 and M-2 show the combustion by-products resulting from open detonation and open burning of various explosives. These number are computations derived from a computer model used by the EOD Environmental Support Group in Indian Head, Maryland. The computer model was developed by the military for their own internal research for the development of ordnance. This is not a model developed solely for the purpose of this application. Therefore, the numbers represent the best, objective estimate of what the by-products will be and were not generated to represent the best possible scenario for environmental permit applications.

The 20/80, 25/75 and 40/60 explosives-to-air ratios best represent the conditions during treatment. Under these conditions, the computer model shows that reaction conversion rates will always be less than 0.5% of the weight of explosive for SOx, NOx and CO. Even assuming conversion rates of 1% for each of these chemical species, the total annual production for each is 30 pounds.

The only exception to the above calculations is for flashless powder which has a conversion rate of 50% for SOx. No more than 200 pounds of flashless powder would ever be treated in a year. At that rate, 100 pounds of SOx would be produced. This would mean that 130 pounds per year of SOx from all treatment would be dispersed into the atmosphere.

The by-products of explosives combustion during open burning and open detonation will be volatile and will not return to the soil or surface water. However, oxidized lead will return to the soil. No more than 20 pounds net explosive weight of lead azide and lead styphnate, total will ever be open detonated in a year (currently none is). Over 99% of this material can be assumed to oxidized.

EFFECTIVENESS AND RELIABILITY OF STRUCTURES TO REDUCE OR PREVENT EMISSIONS OF HAZARDOUS CONSTITUENTS TO THE AIR

Due to the inherent nature of treatment, it is not technically feasible to utilize emission control devices for open burning or open detonation operations. But, the nature of the material, along with the skill of the operators assures that the explosives will be burned to completion.

OPERATING CHARACTERISTICS OF THE UNIT

The operational characteristics of the facility have been fully addressed in Attachment L. The plumes generated from open detonation and open burning can vary considerably from treatment to treatment. However, the openness of the surrounding area should allow for extensive dissipation before reaching nearby land masses. Figure A-5 is the wind rose for Key West. This shows that the prevailing winds in the area are easterly. This means that the winds would blow the plume away from Key West most of the time.

ATMOSPHERIC, METEOROLOGIC, AND TOPOGRAPHIC CHARACTERISTICS OF THE UNIT AND SURROUNDING AREA

The topography is shown in Figures A-1 and A-3. These considerations should have no adverse effect on the extent of emissions to the surrounding environment. In fact, the openness of the terrain allows for efficient dispersal of the plume components.

EXISTING QUALITY OF THE AIR, INCLUDING OTHER SOURCES OF CONTAMINATION AND THE CUMULATIVE IMPACT ON THE AIR

The Key West area is an attainment area for air pollutant emissions. Florida DER on monitors TSP at the two air monitoring stations in the Key West area. The low terrain surrounded by open ocean waters combined with the minimal industrial sources result in high air quality. Open burning and open detonation which will occur intermittently will have no adverse effect on existing air quality.

POTENTIAL FOR HEALTH RISKS

No evidence exists that any increase in health risks will result from operation of this facility. While some people are known to become sensitizes to some explosives, there is little or no direct contact with explosives at Demolition Key. This waste is a characteristic waste which is essentially completely destroyed during treatment and will have no potential for reactivity after treatment.

DAMAGE TO ANIMALS, WILDLIFE, CROPS, VEGETATION AND PHYSICAL STRUCTURES CAUSED BY EXPOSURE TO WASTE CONSTITUENTS

No evidence exists that there is any damage to domestic animals, wildlife, crops, vegetation, or physical structures due operation of this facility because of the low emissions already described. Further, animal life is limited to birds and insects; there are no crops; and the only structure is the crew protection bunker.

APPENDIX M-3

GEOHYDROLOGIC CHARACTERISTICS OF THE DEMOLITION KEY AREA

I. INTRODUCTION

Demolition Key is small dredge spoil island located just off the coast of Key West and Fleming Key. It was built around the late 1950's or early 1960's during dredging operations to enlarge a nearby navigation channel. It is currently owned by the United States Navy and its primary use is the Open Burning/Open Detonation of explosive hazardous wastes.

To appropriately address environmental impact concerns related to the Open Burning/Open Detonation operations conducted at the key, it is essential to consider the geologic as well as hydrologic components of the area. Surficial soils, surface waters, and groundwater will be the major focus of interest as potential migration pathways for hazardous constituents.

II. GEOHYDROLOGIC CHARACTERISTICS

The surficial soils which comprise Demolition Key are primarily unconsolidated sands and broken shell fragments dredged from the nearby navigation channel. Wave action from the surrounding waters tend to create well-sorted sediments. The more well-sorted a sediment is, the higher the porosity will be; therefore, although no formal analyses have been conducted,it is safe to assume that these sediments are reasonably porous as well as permeable and transmit surface waters readily into the subsurface.

The two primary lithologic units underlying the unconsolidated sands and sediments are the Miami Oolitic Limestone and the Key Largo Limestone. The Miami Oolitic is so named for the abundance of oolites forming the rock. These small calcareous accretionary bodies range in size from 0.25 to 2.00 mm in diameter and range in shape from spherical to ellipsoidal. The Key Largo limestone is an ancient reef complex. It has a very high intrinsic permeability and is able to support small fresh water lenses on some of the larger Florida keys.

In order to support a fresh water lens, a key must have an appreciable amount of topographic relief to counterbalance the "flushing" effects of the tides on groundwater in the subsurface. The tides have a direct relationship to the levels of groundwater on Demolition Key. The absence of topographic relief (less than 5 ft.) on Demolition Key not only rules out the possibility of any fresh water lenses, but also surface water runoff from precipitation is diminished and infiltration is enhanced.

The geohydrological environment of the keys is a very dynamic, constantly changing system; therefore; surficial soils, surface waters, and groundwater must all be considered potential migration pathways for hazardous constituents created through Open Burning/Open Detonation of explosive hazardous wastes at Demolition Key.

ATTACHMENT N

POTENTIAL PATHWAYS OF EXPOSURE

ATTACHMENT N

POTENTIAL PATHWAYS OF EXPOSURE

REFERENCE: FDER PART II, SECTION I.3

N-1 INTRODUCTION

There is a potential for the treated hazardous waste, hazardous waste constituents and treatment byproduct hazardous constituents to enter the environment. By entrance into the environment, there is also a potential for human exposure. These potential routes of exposure are described, quantified and evaluated below. This analysis is performed for each environmental medium. Based upon these evaluations, no adverse effects on human health on the environment are expected to result from the operation of this facility.

N-2 GROUNDWATER AND SUBSURFACE ENVIRONMENTS

The volume and physical and chemical characteristics of the waste explosive which may be treated at the OB/OD facility have been addressed in Attachment I of this permit application. The maximum batch weight for open burning or for open detonation is 100 pounds, net explosive weight. Since the material is packaged solids, spilled material would be easy to collect and containerize. Therefore, spill residues can reasonably be estimated to be significantly less than one pound, net explosive weight. Historically, spills have been infrequent, less than once per year. Therefore, waste constituent migration into the soil and subsurface from spills are conservatively estimated to be much less than 0.1 pound, net explosive weight per year.

Open burning will occur in trays which will prevent any hazardous constituent in the residue from entering the groundwater directly through the soil. Open detonation occurs on the soil. The nature of the operation prevents the use of any containment device.

The extent of reaction during open detonation can reasonably be estimated to be in excess of 99%. The majority of the unreacted explosives will enter the environment through the air via dispersion of the explosion plume. Also, only a minority of the unreacted material will

be hazardous constituents. Therefore, less than 0.1% of the annual 3,000 pounds, net explosive weight, of the open detonated material will directly enter soil during the detonation. Of the less than 3 pounds net explosive weight, only the water soluble portion will enter the ground water.

The vast majority of the unreacted explosives will enter the air during the detonation and will be dispersed into the atmosphere. Some portion of that will fall back to the surface. However, the small size of Demolition Key will result in most of this returning to surface water rather than soil. Based on this scenario, less than one pound, net explosive weight, of hazardous constituents will enter the soil each year.

Appendices M-1 and M-2 show the combustion by-products resulting from open detonation and open burning of various explosives. These number are computations derived from a computer model used by the EOD Environmental Support Group in Indian Head, Maryland. The computer model was developed by the military for their own internal research for the development of ordnance. This is not a model developed solely for the purpose of this application. Therefore, the numbers represent the best, objective estimate of what the by-products will be and were not generated to represent the best possible scenario for environmental permit applications.

The by-products of explosives combustion during open burning and open detonation will be volatile and will not return to the soil or surface water. However, oxidized lead will return to the soil. No more than 20 pounds net explosive weight of lead azide and lead styphnate, total, will ever be open detonated in a year (currently none is). Over 99% of this material can be assumed to be oxidized. Oxidized lead is not water soluble and does not contribute to EP Toxicity. Again, taking into account atmospheric dispersion, less than 0.1% of the original material, 0.2 pounds net explosive weight per year, is estimated to return to the soil as EP Toxic lead.

There are no food chain crops on Demolition Key, nor is it likely that any contaminants would ever reach any other food chain crops. However, the key is man-made and has been used for ordnance detonation and burning for over twenty years. During that time, the vegetation has naturally migrated and thrived in the area. Also, animal life continues to thrive around the key. All this suggests that the effluents from the treatment are not adversely affecting the food chain.

No evidence exists that any increase in health risks will result from operation of this facility. While some people are known to become sensitized to some explosives, there is essentially no direct public contact with explosives at Demolition Key. The primary health risk is the explosivity of the waste which is a safety concern. The Navy has a long history of safely handling explosives at Demolition Key.

N-3 SURFACE WATER, WETLANDS AND SOIL

The volume and physical and chemical characteristics of the waste explosive which may be treated at the OB/OD facility have been addressed in Attachment I of this permit application. The maximum batch weight for open burning or for open detonation is 100 pounds, net explosive weight. Since the material is packaged solids, spilled material would be easy to collect and containerize. Therefore, spill residues can reasonably be estimated to be significantly less than one pound, net explosive weight. Historically, spills have been infrequent, less than once per year. Therefore, waste constituent migration into the soil and subsurface (and therefore into the surrounding surface water) from spills are conservatively estimated to be much less than 0.1 pound, net explosive weight per year.

Open burning will occur in trays which will prevent any hazardous constituent in the residue from entering the soil or surface water. Open detonation occurs on the soil. The nature of the operation prevents the use of any containment device.

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explosive weight, of hazardous constituents will enter the soil each year. Probably less than 10% of the dispersed unreacted explosives will return to the surface water. This is also estimated to be 3 pounds, net explosive weight, per year.

Appendices M-1 and M-2 show the combustion by-products resulting from open detonation and open burning of various explosives. These number are computations derived from a computer model used by the EOD Environmental Support Group in Indian Head, Maryland. The computer model was developed by the military for their own internal research for the development of ordnance. This is not a model developed solely for the purpose of this application. Therefore, the numbers represent the best, objective estimate of what the by-products will be and were not generated to represent the best possible scenario for environmental permit applications.

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Open burning will be conducted in burning trays which will contain the explosive wastes and resultant ash. This will prevent migration to the soils, ground-water and surface waters. Waste will be stored at the facility only on the day of treatment. Since treatment will never occur during adverse weather, there will be no chance of runoff or run-on.

No evidence exists that any increase in health risks will result from operation of this facility. While some people are known to become sensitized to some explosives, there is little or no direct contact with explosives at Demolition Key. The primary health risk is the explosivity of the waste which is a safety concern. The Navy has a long history of safely handling explosives at Demolition Key.

No evidence exists that there is any damage to domestic animals, wildlife, crops, vegetation, or physical structures due operation of this facility because of the low emissions already described. Further, animal life is limited to birds and insects; there are no crops; and the only structure is the crew protection bunker. In fact, an abundance of flora and fauna have naturally transferred to Demolition Key even though the actions in question have taken place at the key since the Navy built it. Continued operations should allow for the continued hospitable environment for these species.

N-4 AIR

The volume and physical and chemical characteristics of the waste explosive which may be treated at the OB/OD facility have been addressed in Attachment I of this permit application. The extent of reaction during open detonation can reasonably be estimated to be in excess of 99%. The majority of the unreacted explosives will enter the environment through the air via dispersion of the explosion plume and will be dispersed into the atmosphere. Therefore, no more than 30 pounds, net explosive weight, of hazardous constituents will enter the atmosphere. Since the Key West area is an attainment zone for all air pollutants, these VOC emission rates are acceptable.

Appendices M-1 and M-2 show the combustion by-products resulting from open detonation and open burning of various explosives. These number are computations derived from a computer model used by the EOD Environmental Support Group in Indian Head, Maryland. The computer model was developed by the military for their own internal research for the development of ordnance. This is not a model developed solely for the purpose of this application. Therefore, the numbers represent the best, objective estimate of what the by-products will be and were not generated to represent the best possible scenario for environmental permit applications.

The 20/80, 25/75 and 40/60 explosives-to-air ratios best represent the conditions during treatment. Under these conditions, the computer model shows that reaction conversion rates will always be less than 0.5% of the weight of explosive for SOx, NOx and CO. Even assuming conversion rates of 1% for each of these chemical species, the total annual production for each is 30 pounds.

The only exception to the above calculations is for flashless powder which has a conversion rate of 50% for SOx. No more than 200 pounds of flashless powder would ever be treated in a year. At that rate, 100 pounds of SOx would be produced. This would mean that 130 pounds per year of SOx from all treatment would be dispersed into the atmosphere.

The by-products of explosives combustion during open burning and open detonation will be volatile and will not return to the soil or surface water. However, oxidized lead will return to the soil. No more than 20 pounds net explosive weight of lead azide and lead styphnate, total will ever be open detonated in a year (currently none is). Over 99% of this material can be assumed to oxidized.

No evidence exists that any significant increase in health risks will result from operation of this facility. While some people are known to become sensitized to some explosives, there is little or no direct contact with explosives at Demolition Key. This waste is a characteristic waste which is essentially completely destroyed during treatment and will have no potential for reactivity after treatment.

No evidence exists that there is any damage to domestic animals, wildlife, crops, vegetation, or physical structures due operation of this facility because of the low emissions already described. Further, animal life is limited to birds and insects; there are no crops; and the only structure is the crew protection bunker.

ATTACHMENT O

DEMONSTRATION OF EFFECTIVENESS OF TREATMENT

ATTACHMENT O

DEMONSTRATION OF EFFECTIVENESS OF TREATMENT

REFERENCE: FDER PART II, SECTION I.4
EPA 40 CFR 264.17

Materials which are thermally treated at Demolition Key are conventional munitions, propellants, pyrotechnics, and explosives. As part of the manufacturing process, these items are specifically designed to combust or explode completely. No ash analyses from open burning operations at Demolition Key are available. Ash analyses from other military installations show that ash from open burning is no longer reactive. In fact the procedure calls for open burning of any ash which tests reactive. Any kick-outs from an open detonation are retrieved and either detonated or burned until no material is left. No ash or other potentially reactive material is left after open detonation treatment is complete.

ATTACHMENT P

REQUIREMENTS FOR IGNITABLE, REACTIVE OR INCOMPATIBLE WASTES

ATTACHMENT P

REQUIREMENTS FOR IGNITABLE, REACTIVE OR INCOMPATIBLE WASTES

REFERENCE: FDER PART II, I.5
EPA 40 CFR 264.17

P-1 PREVENTION OF ACCIDENTAL IGNITION OR REACTION

No ignition sources will be allowed while waste explosives are on site. The base weather station is contacted prior to scheduling operations to verify that there is no likelihood for electrical storms on the day of treatment. "No Smoking" signs will be posted at the treatment areas. All explosive wastes will placed away from any potential heat source during temporary storage.

P-2 PRECAUTIONS FOR UNWANTED REACTIONS

The details for operating procedures for Demolition Key are in accordance with the Navy document, NAVSEA OP-5. A thorough summary of the operating procedures are given in Attachment L. Because of the nature of military explosives, all procedures were written with precautions of this nature in mind. Further, the danger involved in these operations are thoroughly taught and understood. If inspections reveal any problems or potential problems, the situation will be reported to the highest ranking officer present. Treatment will be postponed until remedial action is taken.

P-3 DOCUMENTATION

All military ordnances are developed through extensive, expensive research and development programs which are centers on reactive properties and mechanisms of the ordnance. From these programs, come the data for developing NAVSEA OP-5.

ATTACHMENT Q

CLOSURE, POST CLOSURE AND FINANCIAL REQUIREMENTS

ATTACHMENT Q

CLOSURE, POST-CLOSURE, FINANCIAL REQUIREMENTS

REFERENCE: FDER PART II, SECTION K
EPA 40 CFR 264 SUBPARTS G & H

Q-1 CLOSURE PLAN

CLOSURE PERFORMANCE STANDARDS

The owner, by implementing the closure plan, will:

* Minimize the need for further maintenance; and

* Control, minimize or eliminate, to the extent necessary to protect human health and the environment, post closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off or hazardous waste decomposition products to the ground or surface waters or to the atmosphere; and

* Comply with 40 CFR 264 Subpart G and § 264.197.

This closure plan meets these criteria by calling for removal of all sources of potential contamination which will eliminate the possibility of future contamination of ground-water, surface water or the atmosphere. This will fully protect human health and the environment from the effects of the hazardous constituents. All work performed during the closure will be in accordance with all relevant OSHA guidelines to protect the health of workers at the facility.

Until final closure is completed and certified in accordance with § 264.115, a written copy of the approved plan and all approved revisions will be furnished to either the Director of the United States Environmental Protection Agency (USEPA) or a properly designated representative of the state.

PARTIAL CLOSURE AND FINAL CLOSURE ACTIVITIES

Closure will consist of removal of contaminated soils surrounding the open burning and open detonation areas, removal and disposal of the waste inventory and cleaning of the burning trays. The open burning and open detonation areas will be closed simultaneously. Therefore, there will be no partial closure.

The burning trays will be cleaned, first. The waste inventory will be removed from each tray. Then, the trays will be washed and rinsed until the metal is decontaminated. After the facility is decontaminated, the closure equipment used to remove hazardous waste or to decontaminate the facility will be decontaminated. All hazardous waste will be disposed at properly permitted disposal facilities.

Next, the closure plan provides for sampling the soil surrounding the units and analyzing for contamination. All soil found to be contaminated will excavated, and the underlying area will be sampled and analyzed. These steps will be repeated until all contaminated soil are removed and replaced with clean soil.

MAXIMUM WASTE INVENTORY

The maximum hazardous waste inventory is assumed to be the maximum planned single day disposal since that is the maximum amount of waste ever on site. For this facility, that amount is 3,000 pounds, net explosive weight.

The first volume of sludge / rinse water generated during contamination will be expected to have a high organic content. This material will be assumed to be a hazardous waste. The material will be removed by a vacuum truck and sent to a properly permitted hazardous waste treatment facility.

The subsequent rinse water generated during decontamination is expected to contain only trace contaminants of organic material. This material will be sampled and analyzed to determine if decontamination is complete. These analyses can also be used to determine if the rinse water is a

sent to the water treatment plant if it will not violate the NPDES permit for the plant. That decision must be deferred until that time. If the water treatment plant cannot be used, the water will be sent to a properly permitted hazardous waste treatment plant.

All excavated soils will be handled as hazardous waste. The excavated contaminated soil will be sampled and analyzed to determine if the material meets the criteria established under 40 CFR 268, Subpart D to determine if the soil can be landfilled. If so, the material will be transported by truck to a landfill. If not, the material will be trucked to a properly permitted hazardous waste treatment facility. All sampling procedures will be the same as those listed on page Q-6 of this application under the section, "Methods for Sampling and Testing Surrounding Soils".

SCHEDULE FOR CLOSURE

The regulations under 40 CFR Subpart G require closure to commence within ninety (90) days of approval of the plan and to be completed within one-hundred eighty (180) days of approval unless an extension is approved. Because military appropriations are lengthy and deliberate, an extension is being requested for the closure initiation to begin within one-hundred fifty (150) days of approval and for closure to be completed within two-hundred forty (240) days after approval (Figure Q-1).

INVENTORY DISPOSAL, REMOVAL OR DECONTAMINATION OF EQUIPMENT

Procedures for Cleaning Equipment and Removing Contaminated Soils:

The final inventory of containerized ash will be handled routinely by hauling off site as discussed above. Then, each tray will be inspected for any remaining ash. If ash remains, trained employees wearing rubber gloves, rubber boots, protective coveralls and appropriate breathing apparatus will remove such material with non-sparking shovels and brushes. This material will be containerized and disposed using normal ash handling procedures. The tray will then be inspected to verify that it is ready for decontamination.

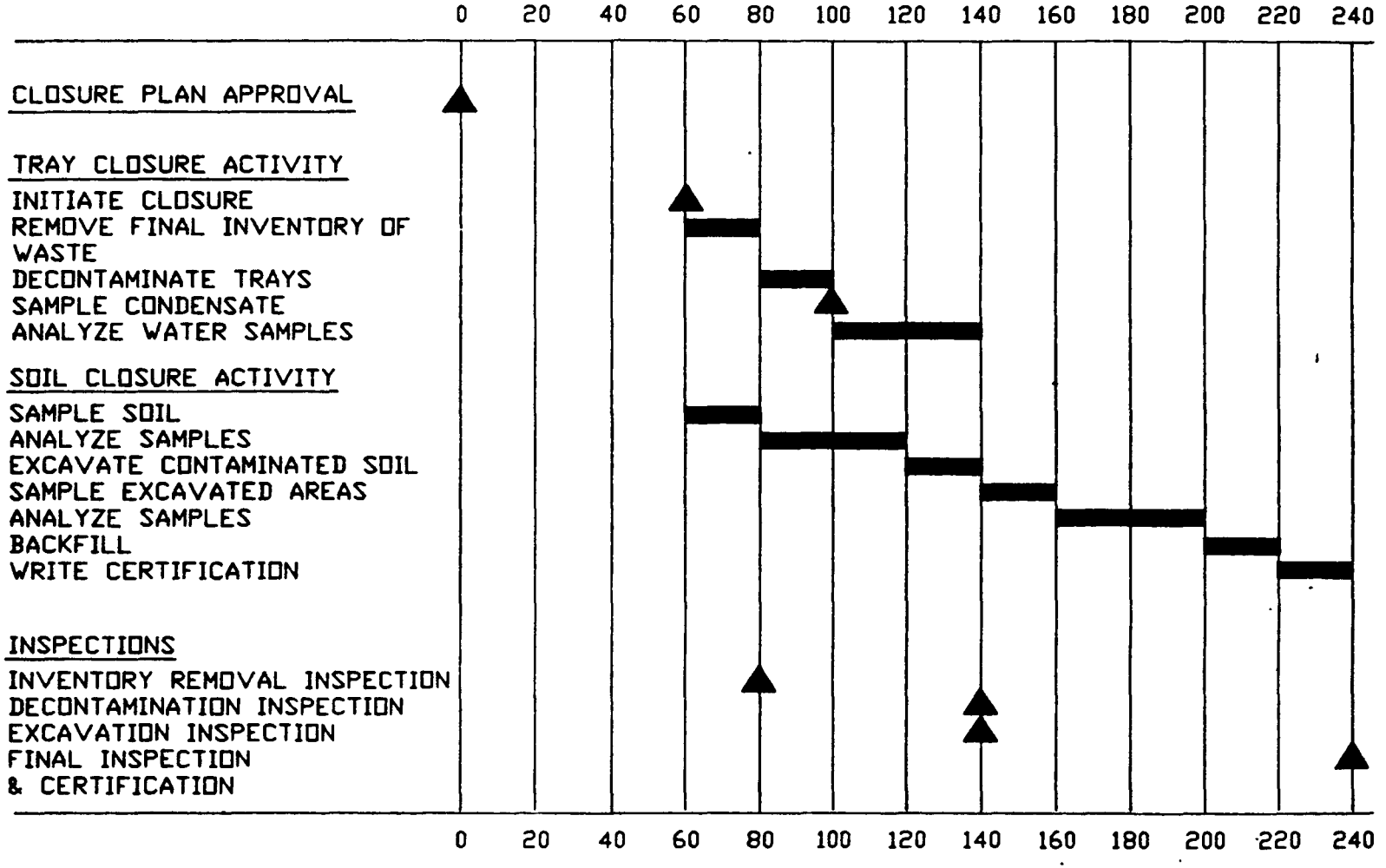

FIGURE Q-1 CLOSURE SCHEDULE FOR DEMOLITION KEY OB/OD FACILITY

The trays will be washed with water by trained employees wearing rubber gloves, rubber boots and a protective apron. The rinse water will be collected in appropriate drums. When this rinse is completed, the rinse water will be sampled and analyzed to determine if decontamination is complete. The drums of rinse water will be transferred to a truck and properly disposed. If the analyses show that decontamination is not complete, the procedure will be repeated until the tray is decontaminated.

Methods for Sampling and Testing Surrounding Soils:

All sampling and analysis will be done in accordance with the procedures in the USEPA Publication SW-846, Test Methods for Evaluating Solid Waste", Fourth Edition. Soil sampling will be by method 5030. Atomic absorption methods, 7081, 7130, 7190, 7420 and 7471, will be used to determine the EP Toxicity of barium, cadmium, chromium, lead and mercury, respectively. The presence of reactive material will determined by the use of the U.S. Bureau of Mines standard tests, Gap Test or Detonation and Deflagration Test.

Concurrent to the tray cleaning activities, the soil at the open burning and open detonation areas will be sampled and analyzed to determine the existence of contaminated soil. Four soil samples, twenty feet apart, will be taken at each unit. At each sample location, a six inch sample will be cored from the first foot of soil.

Criteria for Determining the Extent of Contamination:

The presence or extent of metals (barium, cadmium, chromium, lead and mercury) contamination in soil samples and rinse water samples with respect to a quantified reference will be made for each analysis. The set of samples will consist of three soil or water samples representing known uncontaminated background conditions and a fourth similar sample being evaluated for contamination. The arithmetic mean of the test analyses for the background samples will compared to the test analysis for the sample in question. If the analysis for the sample in question is less than ten times the mean of the background analyses, the material in question will be considered clean.

Soil samples will be tested for reactivity using either Detonation and Deflagration test or the U.S. Bureau of Mines Gap test. If the sample is not reactive, the soil will not be considered a hazardous waste.

At each sample location which is a source of contamination, an area extending a minimum of ten feet beyond the sampling point will be excavated a minimum depth of one foot. The excavated soil will be transported off site for disposal as a hazardous waste. Following excavation of the contaminated soil, the excavated area will be randomly sampled at three locations to a depth of six inches. These samples will be analyzed for the contaminants found in the analyses of the composite sample.

If the remaining soil in the excavated area is shown to be clean, no further excavation at that area will be needed. If not, the excavation and analytical procedures will be repeated until clean soil is reached or until the owner determines that clean closure cannot be achieved. After all contaminated soil has been excavated, the excavated areas will be backfilled with clean soil.

Other Activities:

No need for ground-water monitoring or leachate collection is anticipated at this location during closure. The existing run-on control and run-off control is sufficient.

Q-2 POST-CLOSURE PLAN

A post-closure is required for miscellaneous units only if contaminated soils cannot be completely removed during closure or if the facility is a disposal facility or if it is a surface impoundment, waste pile or land teatment unit. All contaminated soils will be removed during closure of this facility. Also, the facility is not nor is it similar to a waste pile or surface impoundment. In addition, the EPA has declared that open burning and open detonation units are not land treatment units.

Q-3 NOTICES REQUIRED FOR DISPOSAL FACILITIES

Open burning and open detonation is considered to be treatment and not disposal. Therefore, the requirements do not apply.

Q-4 CLOSURE COST ESTIMATES

Under 40 CFR 264.140(c), the federal government is exempt from 40 CFR Subpart H, "Financial Requirements".

Q-5 FINANCIAL ASSURANCE MECHANISM FOR CLOSURE

Under 40 CFR 264.140(c), the federal government is exempt from 40 CFR Subpart H, "Financial Requirements".

Q-6 POST-CLOSURE COST ESTIMATE

Under 40 CFR 264.140(c), the federal government is exempt from 40 CFR Subpart H, "Financial Requirements".

Q-7 FINANCIAL ASSURANCE MECHANISM FOR POST-CLOSURE COST

Under 40 CFR 264.140(c), the federal government is exempt from 40 CFR Subpart H, "Financial Requirements".

Q-8 LIABILITY REQUIREMENTS

Under 40 CFR 264.140(c), the federal government is exempt from 40 CFR Subpart H, "Financial Requirements".

Q-9 STATE FINANCIAL MECHANISM

Under 40 CFR 264.140(c), the federal government is exempt from 40 CFR Subpart H, "Financial Requirements".

ATTACHMENT R

GROUND WATER PROTECTION

ATTACHMENT R

GROUND WATER PROTECTION

REFERENCE: FDER PART II, SECTION M
EPA 40 CFR SUBPART F

This facility is not a hazardous waste surface impoundment, landfill, waste pile or land treatment unit. Therefore, groundwater protection is not required under § 264.90(b). Further, based on an Army study of twenty-six open burning and open detonation sites, sites which limit their treatment to open burning in trays and open detonation do not contaminate the groundwater. Therefore, no groundwater protection or monitoring system will be installed under § 264.601, § 264.602 or § 264.603.

ATTACHMENT 8

EXPOSURE INFORMATION

ATTACHMENT S

EXPOSURE INFORMATION

REFERENCE: FDER PART II, Q
EPA 40 CFR 270.10(j)

S-1 POTENTIAL RELEASES

During normal operations, releases could come only during handling of bulk explosives. Since such material is in solid form, and since operations never occur during rainy conditions, there is little chance for migration of spilled waste. Such material is easily containerized.

The explosives may be lost overboard during transportation. However, the waste will be containerized, mostly in waterproof packages during transits. The EOD is trained and skilled in retrieving ordnance from below the water surface.

S-2 POTENTIAL PATHWAYS OF EXPOSURE

The potential pathways for exposure of spills during normal operations is soil contamination. Spills during transit would enter the environment through surface waters.

S-3 MAGNITUDE AND NATURE OF EXPOSURE

It is unlikely that spills during normal operations would be of quantities greater than one hundred pounds. Human exposure would be minimal except to those EOD personnel involved in cleanup. Spills during transit would not be greater than one hundred pounds. It is possible for such materials enter the surface water directly, but such material would soon dissipate to non-reactive concentrations. If the material remained containerized, the EOD could readily retrieve the material prior to harming the environment.

APPENDIX M-1

DECOMPOSITION PRODUCTS FROM OPEN BURNING

TABLE 1

OPEN BURNING SIMULATION OF

MATERIAL C-4

COMBUSTION PRODUCTS	g 100 gm	RATIO OF MATERIAL C-4 TO AIR 100 0	50 50	25 75
CO		41.1518	26.6440	0.0000
N_2		34.4283	113.2815	349.3828
CO_2		16.0265	40.4570	82.3220
H_2O		4.6955	17.8398	33.7172
H_2		3.0967	1.7766	0.0000
CH_4		.5972	0.0000	0.0000
NH_3		.0044	.0002	0.0000
CNH		.0002	0.0000	0.0000
O_2		0.0000	0.0000	34.1265
NO_2		0.0000	0.0000	0.0002
NO		0.0000	0.0000	0.0019

TABLE 2

OPEN BURNING SIMULATION OF

COMP. A-3

COMBUSTION PRODUCTS	g 100 gm	RATIO OF COMP. A-3 TO AIR 100 0	50 50	25 75
CO		41.114	36.184	1.02E-07
CO_2		16.120	41.226	81.249
H_2		2.953	1.153	8.04E-09
H_2O		5.187	18.491	32.013
N_2		34.429	113.282	270.978
NH_3		0.00334	0.00060	-
CNH		0.0002	0.00001	-
CH_2O		1.74E-05	2.85E-06	-
H		1.34E-08	3.69E-07	2.22E-12
NH_2		2.18E-10	1.89E-09	-
CNHO		1.26E-05	5.69E-06	-
CH_3		1.16E-07	1.61E-09	-
HO		1.17E-10	6.04E-08	5.30E-05
C_2H_4		1.49E-06	2.14E-11	-
C_2H_2		1.72E-08	1.32E-11	-
C_3H_6		1.05E-10	-	-
C_2H_6		7.85E-07	-	-
CHO		2.48E-09	8.89E-09	-
C_3H_6		6.67E-12	-	-
NO		-	1.04E-09	1.01E-02
NHO_3		-	-	6.05E-09
NO_3		-	-	1.78E-11
HO_3		-	-	9.77E-08
NHO_2		-	-	1.11E-06
O		-	-	3.27E-08
O_3		-	-	9.79E-11
O_2		-	-	15.749
H_2O_2		-	-	6.19E-08
NHO_2		-	-	5.21E-11

TABLE 3

OPEN BURNING SIMULATION OF

AMATOL 80-20

COMBUSTION PRODUCTS	g 100 gm	RATION OF AMATOL 80-20 TO AIR 100 0	50 50	25 75
N_2		31.697	110.550	266.250
CO_2		27.126	27.127	27.127
CO^2		9.95E-06	3.39E-09	0.000
O_2		1.195	22.348	64.647
H^2_2		1.64E-06	0.000	0.000
H_2O		39.976	39.976	39.976
NO		4.77E-03	4.58 E05	8.62E-10
O		4.39E-07	0.000	0.000
HO		4.15E-04	5.52E-09	0.000
HO_2		2.68E-07	5.47E-11	0.000
H_2O_2		2.70-E-07	2.95E-10	0.000
NHO^2_2		3.57E-07	1.32E07	1.13E-09
H		9.03E-10	0.000	0.000
NHO		7.22E-10	0.000	0.000
NO_3		1.65E-12	0.000	0.000
NHO_3		3.62E-10	3.08E-08	7.58E-07
O_3		4.91E-11	0.000	0.000
NO_2		0.000	4.70E-05	2.27E-06

TABLE 4

OPEN BURNING SUMULATION OF

MATERIAL PBX (PLASTIC BONDED EXPLOSIVE)

COMBUSTION PRODUCTS	g 100 gm	RATIO OF PBX TO AIR 100 0	50 50	25 75
CO		43.543	39.246	0.000
N_2		32.158	111.008	347.559
CO_2		12.082	36.786	98.681
H_2O		3.692	10.044	35.473
H_2		3.338	2.823	0.000
CH_4		0.867	0.086	0.000
NH_3		0.005	0.004	0.000
O_2		0.000	0.000	18.276
NO		0.000	0.000	0.007
O_2		0.000	0.000	46.112
NO		0.000	0.000	0.001

TABLE 5

OPEN BURNING SIMULATION OF EXPLOSIVE C-3

COMBUSTION PRODUCTS	g 100 gm	RATIO OF EXLPOSIVE C-3 TO AIR 100 0	50 50	25 75
CO		39.888	20.255	0.000
N_2		33.039	111.890	348.440
CO_2		18.077	48.926	80.747
H_2O		7.015	18.200	24.697
H_2		1.978	0.727	0.000
CH_4		0.001	0.000	0.000

TABLE 6

OPEN BURNING SIMULATION OF

RDX EXPLOSIVE

COMBUSTION PRODUCTS	q 100 gm	RATIO OF RDX EXPLOSIVE TO AIR 100 0	50 50	25 75
N_2		37.8374	116.6874	353.2383
CO		23.0023	.5979	.0000
CO_2		22.8415	58.5039	59.4390
H_2O		15.3090	24.1963	24.3318
H_2		1.0096	.0151	.0000
HO		.0001	.0009	.0000
O_2		.0000	.0001	62.9900
NO		.0000	.0006	.0001
NO_2		.0000	.0000	.0000

TABLE 7

OPEN BURNING SIMULATION OF

PETN EXPLOSIVE

COMBUSTION PRODUCTS	g 100 gm	RATIO OF PETN EXPLOSIVE TO AIR 100 / 0	50 / 50	25 / 75
CO_2		47.0626	69.6041	69.6044
H_2O		20.6046	22.7952	22.7942
N_2		17.7220	96.5448	333.1240
CO		14.3469	.0002	.0000
H_2		.2430	.0000	.0000
HO		.0166	.0031	.0000
NO		.0024	.0000	.0000
H		.0011	.0000	.0000
O_2		.0008	10.9948	24.4773
O^2		.0001	.0000	.0000
NO		.0000	.0613	.0000
NO_2		.0000	.0000	.0000

TABLE 8

OPEN BURNING SIMULATION OF

SMOKELESS POWDER

COMBUSTION PRODUCTS	q 100 gm	RATIO OF SMOKELESS POWDER TO AIR 100 0	50 50	25 75
CO		39.412	18.991	4.77E-10
H_2		1.814	0.624	4.76E-11
CO_2		37.137	46.822	99.093
H_2O		9.069	19.724	25.303
N_2		12.555	91.406	249.105
CH_4		0.0112	1.27E-06	-
NH_3		0.00087	0.00012	-
CNH		0.0004	-	-
CH_2O		1.13E-05	9.20E-07	-
CNHO		6.48E-06	2.63E-06	-
H		2.88E-08	-	-
CH_3		2.28E-08	1.37E-10	-
C_2H_4		3.30E-08	-	-
C_2H_6		6.17E-09	-	-
CHO		4.25E-09	8.53E-09	-
HO		9.87E-10	3.23E-07	2.55E-06
C_2h_2		1.88E-10	1.47E-09	-
NO		3.01E-12	9.69E-09	2.33E-03
O_2		-	2.06E-12	26.495
NHO_2		-	-	6.16E-07
HO_2		-	-	9.24E-09
NO_2		-	-	2.09E-04
H_2O_2		-	-	8.72E-09
NHO_3		-	-	1.28E-08
O		-	-	3.75E-10
O_3		-	-	1.49E-11
NO_3		-	-	9.86E-12
NO_2		-	-	2.09E-04
H_2O_2		-	-	8.72E-09
NHO_3		-	-	1.28E-08
O		-	-	3.75E-10
O_3		-	-	1.49E-11
NO_3		-	-	9.86E-12

TABLE 9

OPEN BURNING SIMULATION OF PHOSPHOROUS

COMBUSTION PRODUCTS	g 100 gm	RATIO OF PHOSPHOUROUS TO AIR 100 0	50 50	25 75
P_4		78.306	56.882	6.29E-03
P_3N_5	(s)	29.584	-	-
P_4O_6		8.549	48.446	145.293
PN		8.05E-03	11.561	21.307
P_2		1.98E-03	7.860	3.422
N_2		1.197	75.250	229.916
PO		-	0.00000	5.12E-02
P		-	0.00000	6.25E-04
PO_2		-	0.00000	4.93E-03
O_2		-	-	5.02E-11
NO		-	-	8.72E-07
O		-	-	2.79E-08
N		-	-	6.19E-10

TABLE 10

OPEN BURNING SIMULATION OF

FLASH POWDER

COMBUSTION PRODUCTS	g 100 gm	RATIO OF FLASH POWDER TO AIR 100 0	50 50	25 75
BaCl		16.529	16.528	0.000
S_2		15.735	3.445	0.000
S^2		6.691	0.177	0.000
K		4.836	3.734	0.000
KCl		4.221	6.316	0.004
N_2		2.670	81.520	318.079
SO		2.078	4.728	0.000
AlS		1.956	0.000	0.000
AlCl		1.366	0.000	0.000
Al_2O		0.708	0.000	0.000
Al^2		0.702	0.000	0.000
Cl		0.151	0.001	0.000
SO_2		0.131	36.044	49.946
AlOCl		0.096	0.000	0.000
AlO		0.081	0.000	0.000
S_2O		0.056	0.226	0.000
$AlCl_2$		0.038	0.000	0.000
NS		0.020	0.002	0.000
O		0.019	0.001	0.000
NO		0.008	0.019	0.003
KO		0.007	0.012	0.000
Al_2O_2		0.002	0.000	0.000
O_2		0.001	0.004	56.612
$BaCl_2$		0.000	0.000	0.001
Ba		0.000	0.000	0.001
SO_3		0.000	0.001	0.000

TABLE 11

OPEN BURNING SIMULATION OF

BLACK POWDER

COMBUSTION PRODUCTS	g 100 gm	RATIO OF BLACK POWDER TO AIR 100 0	50 50	25 75
CO_2		16.635	32.227	32.105
S_2		7.637	-	-
N_2		10.391	89.235	246.941
H_2O		1.777	3.770	0.580
CO		10.300	6.86E-06	-
H_2S		1.714	-	-
K_2CO_3	(l)	46.842	50.879	-
K_2CO_3	(s)	-	-	51.261
KHO		2.470	0.1301	5.04E-11
H_2		0.080	9.04E-08	-
HS		5.13E-02	-	-
CS_2		1.10E-02	-	-
H		2.72E-06	2.13E-10	-
HO		2.77E-06	2.13E-10	-
CNHO		7.7E-07	-	-
CH_4		1.12E-08	-	-
O		1.61E-10	7.41E-07	-
NHO		1.01E-11	4.42E-10	-
K		9.47E-02	2.79E-05	-
$K_2H_2O_2$		9.47E-02	9.81E-05	-
S		3.07E-04	-	-
K_2		1.74E-04	-	-
KO		4.82E-06	2.02E-05	-
CH_2O		2.41E-07	-	-
SO_3		4.48E-08	0.659	-
$K_2C_2N_2$		3.55E-10	-	-
S_8		1.25E-11	-	-
CSO		0.938	-	-
S_2O		5.16E-02	-	-
CS		2.73E-04	-	-

TABLE 12

OPEN BURNING SIMULATION OF

TNT

COMBUSTION PRODUCTS	g 100 gm	RATIO OF TNT TO AIR 100 0	50 50	25 75
CO		57.4357	61.4025	.0000
N_2		10.4999	97.3492	333.0965
CO_2		10.0577	34.8207	135.3325
H_2		1.9633	1.7765	.0000
H_2O		1.7593	3.4040	19.8291
CH_4		.2315	.2426	.0000
NH_3		.0015	.0026	.0000
CNH		.0004	.0002	.0000
O_2		.0000	.0000	10.6290
NO		.0000	.0000	.0121

TABLE 13

OPEN BURNING SIMULATION OF TOVEX

COMBUSTION PRODUCTS	g / 100 gm	RATIO OF TOVEX TO AIR 100 / 0	50 / 50	40 / 60
H_2O		47.254	45.356	31.157
N_2		29.125	107.975	213.109
O_2		15.297	36.449	64.650
CO_2		2.088	2.087	2.085

TABLE 14

OPEN BURNING SIMULATION OF COMP B

COMBUSTION PRODUCTS	g 100 gm	RATIO OF COMP B TO AIR 100 0	50 50	25 75
CO		48.4579	28.2903	.000
N_2		29.0035	108.6550	345.2051
CO_2		15.7407	47.5344	92.0142
H_2O		3.7625	14.4943	23.3935
H_2		2.1840	.9958	.0000
CH_4		.0495	.0000	.0000
NH_3		.0016	.0003	.0000
CNH		.0002	.0000	.0000
HO		.0000	.0000	.0000
O_2		.0000	.0000	39.3855
NO		.0000	.0000	.0014
NO_2		.0000	.0000	.0002

TABLE 15

OPEN BURNING SIMULATION OF

H6

COMBUSTION PRODUCTS	g 100 gm	RATIO OF H6 TO AIR 100 0	50 50	25 75
CO		45.0210	48.6565	.0000
N_2		15.7633	101.3153	337.8318
H_2		2.4731	2.0162	.0000
CNH		.3616	.0001	.0000
$CACl_2$		.3508	.4225	.0353
$AlCl^2$		.0595	.0000	.0000
CACl		.0403	.0025	.0000
HCl		.0321	.0401	.0005
CA		.0243	.0001	.0000
C_2H_2		.0185	.0000	.0000
CH_4		.0033	.0000	.0000
H		.0022	.0000	.0000
$AlCl_2$		.0020	.0000	.0000
Al		.0017	.0000	.0000
H_2O		.0016	4.2335	22.2700
CO_2		.0012	5.6665	82.1160
Al_2O		.0007	.0000	.0000
CAHO		.0006	.0365	.0004
AlH		.0003	.0000	.0000
CH_3		.0002	.0000	.0000
NH_3		.0001	.0002	.0000
HO^3		.0000	.0000	.0012
O_2		.0000	.0000	19.6069
$AlCl_2$		.0000	.0000	.0000
NO		.0000	.0000	.0750
Al_2O_3		.0000	.0000	.0000
H		.0000	.0002	.0000
$Al(cl)_3$		.0000	.0000	.0000
NO_2		.0000	.0000	.0000

TABLE 16

OPEN BURNING SIMULATION OF

HBX-1

COMBUSTION PRODUCTS	g 100 gm	RATIO OF HBX-1 TO AIR 100 0	50 50	25 75
CO		43.6463	52.2548	.0000
N_2		18.0629	100.9055	332.4292
H_2		2.5141	2.0295	.0000
CNH		.3714	.0002	.0000
$CaCl_2$		.3695	.4506	.0401
$Al(cl)_3$		.0490	.0000	.0000
CaCl		.0456	.0009	.0000
HCl		.0392	.0251	.0004
CA		.0216	.0000	.0000
C_2H_2		.0172	.0000	.0000
CH_4		.0035	.0000	.0000
H		.0020	.0000	.0000
$AlCl_2$		.0017	.0000	.0000
H_2O		.0016	4.4922	22.6381
Al		.0013	.0000	.0000
CO_2		.0012	7.8521	89.9553
CAHO		.0006	.0193	.0003
Al_2O_3		.0005	.0000	.0000
CH_3		.0002	.0000	.0000
AlH		.0002	.0000	.0000
NH_3		.0001	.0003	.0000
HO		.0000	.0000	.0009
O_2		.0000	.0000	17.4581
Al_2Cl_3		.0000	.0000	.0000
NO_2		.0000	.0000	.0605
H		.0000	.0000	.0000
Al_2O_3		.0000	.0000	.0000
$Al(cl)_3$		.0000	.0000	.0000
NO_2		.0000	.0000	.0000

TABLE 17

OPEN BURNING SIMULATION OF HBX3

COMBUSTION PRODUCTS	g / 100 gm	RATIO OF HBX3 TO AIR 100 / 0	50 / 50	25 / 75
CO		44.481	46.157	0.008
Al_2O_3		2.246	0.032	0.000
H_2		2.075	2.085	0.000
Al		1.027	0.039	0.000
N_2		0.339	89.785	332.353
CNH		0.130	0.196	0.000
AlH		0.101	0.003	0.000
C_2H_2		0.085	0.001	0.000
H		0.010	0.008	0.000
CH_4		0.001	0.000	0.000
H_2O		0.001	0.003	18.762
CO_2		0.000	0.002	72.830
O_2		0.000	0.000	9.583
NO		0.000	0.000	0.306
HO		0.000	0.000	0.022

TABLE 18

OPEN BURNING SIMULATION OF

HMX

COMBUSTION PRODUCTS	g 100 gm	RATIO OF HMX TO AIR 100 0	50 50	25 75
N_2		37.8374	116.6075	353.2383
CO		23.7072	.5935	.0000
CO_2		22.1909	58.5073	59.4398
H_2O		15.2478	24.1951	24.3318
H_2		1.0164	.0152	.0000
HO		.0000	.0001	62.9900
O_2		.0000	.0005	.0000
NO		.0000	.0005	.0000
NO_2		.0000	.0000	.0001

APPENDIX M-2

OPEN DETONATION DECOMPOSITION PRODUCTS

TABLE 1

OPEN DETONATION SIMULATION OF

TETRYL

COMBUSTION PRODUCTS	g / 100 gm	RATIO OF TETRYL TO AIR 100 / 0	50 / 50	20 / 80
CO_2		35.3929	61.3952	107.2852
CO^2		26.1509	28.7367	.0000
N_2		24.3891	103.2388	339.7916
H_2O		4.3954	5.2587	15.6840
H_2		1.1689	1.0985	.0000
CH_4		.3743	.2692	.0000
NH_3		.0021	.0027	.0000
O_2		.0000	.0000	37.2380
NO		.0000	.0000	.0001

TABLE 2

OPEN DETONATION SIMULATION OF

EXPLOSIVE C3

COMBUSTION PRODUCTS	g / 100 gm	RATIO OF EXPLOSIVE C3 TO AIR 100 / 0	50 / 50	20 / 80
CO_2		37.341	60.904	80.747
N_2		33.036	111.887	348.440
CO		12.843	12.508	0.000
H_2O		8.638	13.377	24.697
H_2		1.486	1.249	0.000
CH_4		1.237	0.071	0.000
NH_3		0.005	0.003	0.000
O_2		0.000	0.000	46.112

TABLE 3

OPEN DETONATION SIMULATION OF

PBX (PLASTIC BONDED EXPLOSIVE)

COMBUSTION PRODUCTS	q 100 gm	RATIO OF PBX TO AIR 100 0	50 50	20 80
N_2		32.155	111.004	347.562
CO_2		28.929	50.481	98.681
H_2O		10.922	11.389	35.473
CO		10.856	19.723	0.000
CH_4		2.530	1.574	0.000
H_2		2.110	2.298	0.000
NH_3		0.008	0.009	0.000
O_2		0.000	0.000	18.280
C_2				

TABLE 4

OPEN DETONATION SIMULATION OF

C4

COMBUSTION PRODUCTS	g 100 gm	RATIO OF C4 TO AIR 100 / 0	50 / 50	20 / 80
N_2		34.4253	113.2748	349.8329
CO_2		32.6450	55.9038	82.3220
H_2O		11.5711	13.0497	33.7172
CO		9.3073	14.4287	.0000
CH_4		2.4459	1.3661	.0000
H_2		1.8620	1.9677	.0000
NH_3		.0003	.0091	.0000
O_2		.0000	.0000	34.1277

TABLE 5

OPEN DETONATION SIMULATION OF

RDX

COMBUSTION PRODUCTS	g 100 gm	RATIO OF RDX TO AIR 100 0	50 50	20 80
CO_2		48.7416	58.9424	59.4398
N_2		37.8328	116.6877	353.2383
H_2O		9.9767	24.3318	24.3318
CO		8.2893	.3135	.0000
CH_4		1.4184	.0000	.0000
H_2		1.2488	.0351	.0000
NH_3		.0057	.0000	.0000
O_2		.0000	.0000	62.9901
NO		.0000	.0000	.0000

TABLE 6

OPEN DETONATION SIMULATION OF

PETN

COMBUSTION PRODUCTS	g 100 gm	RATIO OF PETN TO AIR 100 0	50 50	20 80
CO_2		57.0348	69.6044	69.6044
N_2		17.7227	96.5733	333.1241
H_2O		16.5448	22.7942	22.7942
CO		7.9963	.0000	.0000
H_2		.6987	.0000	.0000
CH_4		.0021	.0000	.0000
NH_3		.0006	.0000	.0000
O_2		.0000	11.0279	24.4774
NO		.0000	.0003	.0000

TABLE 7

OPEN DETONATION SIMULATION OF

FLASH POWDER

COMBUSTION PRODUCTS	g 100 gm	RATIO OF FLASH POWDER TO AIR 100 / 0	50 / 50	20 / 80
Al_2O_3		43.774	0.000	0.001
S_2		21.363	4.558	0.000
BaCl		16.529	16.528	0.000
KCl		5.172	6.318	0.000
K		4.342	3.739	0.000
N_2		2.677	81.529	318.080
S^2		2.328	0.026	0.000
AlS		2.188	0.000	0.000
AlCl		0.882	0.000	0.000
Al_2O		0.266	0.000	0.000
Al^2		0.232	0.000	0.000
SO		0.158	1.670	0.000
$AlCl_2$		0.027	0.000	0.000
Cl^2		0.019	0.000	0.000
AlOCl		0.014	0.000	0.000
S_2O		0.010	0.297	0.000
NS^2		0.008	0.000	0.000
AlO		0.005	0.000	0.000
SO_2		0.002	38.087	49.840
KO^2		0.000	0.003	0.000
NO		0.000	0.001	0.000
O		0.000	0.000	0.000
$BaCl_2$		0.000	0.000	0.001
Ba		0.000	0.000	0.001
SO_3		0.000	0.000	0.000
$O2^3$		0.000	0.000	56.613

TABLE 8

OPEN DETONATION SIMULATION OF

TNT

COMBUSTION PRODUCTS	q 100 gm	RATIO OF TNT TO AIR 100 0	50 50	20 80
CO_2		32.7455	52.5221	135.6325
CO^2		23.8155	35.5236	.0000
N_2		18.4991	97.3486	333.9009
H_2O		5.4634	5.5565	19.8291
H_2		1.4507	1.4984	.0000
CH_4		.6223	.3904	.0000
NH_3		.0026	.0034	.0000
O_2		.0000	.0000	10.6348
NO_2		.0000	.0000	.0001
NO^2		.0000	.0000	.0026

TABLE 9

OPEN DETONATION SIMULATION OF TOVEX

COMBUSTION PRODUCTS	g 100 gm	RATIO OF TOVEX TO AIR 100 0	50 50	40 60
H_2O		34.474	20.837	14.960
N_2		29.125	107.975	147.400
O_2		15.297	36.449	47.024
CO_2		2.088	2.087	2.086

TABLE 10

OPEN DETONATION SIMULATION OF COMP B

COMBUSTION PRODUCTS	g 100 gm	RATIO OF COMP B TO AIR 100 0	50 50	20 80
CO_2		36.5118	61.0846	92.0142
N_2		29.8013	108.6513	345.2058
CO		16.0221	18.9525	.0000
H_2O		7.6196	9.4311	23.3935
H_2		1.0082	1.4561	.0000
CH_4		1.4184	.4197	.0000
NH_3		.0144	.0047	.0000
O_2		.0000	.0000	39.3864
NO		.0000	.0000	.0000

TABLE 11

OPEN DETONATION SIMULATION OF

H6

COMBUSTION PRODUCTS	g 100 gm	RATIO OF H6 TO AIR 100 0	50 50	20 80
CO		25.4296	46.4200	.0000
N_2		22.4190	101.3142	337.8310
CO_2		35.3929	61.3952	107.2852
H_2		2.4846	2.1745	.0000
$CaCl_2$		.4704	.0012	.0003
CNH		.0882	.0003	.0000
CaCl		.0089	.0000	.0000
HCl		.0002	.0002	.0000
H_2O		.0005	2.8213	22.2700
CO_2		.0032	9.1624	82.1161
Ca^2		.0015	.0000	.0000
C_2H_2		.0012	.0000	.0000
$CaHO_2$		.0009	.0002	.0000
NH_3		.0003	.0014	.0000
H		.0001	.0000	.0000
O_2		.0000	.0000	19.6408
CH_4		.0122	.0065	.0000
NO^4		.0000	.0000	.0132

TABLE 12

OPEN DETONATION SIMULATION OF

HBX 1

COMBUSTION PRODUCTS	g 100 gm	RATIO OF HBX 1 TO AIR 100 / 0	50 / 50	20 / 80
CO		32.0044	48.9195	.0000
N_2		22.0497	100.9035	337.4522
H_2		2.5107	2.2183	.0000
CO_2		.0840	12.8132	89.9553
H_2O		.0677	2.5818	22.6387
CH_4		.0576	.1017	.0000
$CaCl_2$		.0242	.0000	.0002
CNH		.0095	.0004	.0000
NH_3		.0000	.0026	.0000
HCL		.0002	.0000	.0000
$CaHO_2$		.0005	.0000	.0000
O_2		.0000	.0000	12.4853
NO		.0000	.0000	.0102

TABLE 13

OPEN DETONATION SIMULATION OF HBX3

COMBUSTION PRODUCTS	g 100 gm	RATIO OF HBX3 TO AIR 100 / 0	50 / 50	20 / 80
CO		31.288	37.359	0.000
N_2		3.523	92.571	332.441
H_2		2.089	2.083	0.000
CNH		0.198	0.425	0.000
C_2H_2		0.023	0.005	0.000
Al		0.006	0.000	0.000
Al_2O_3		0.004	0.000	0.000
CH_4		0.003	0.002	0.000
H		0.002	0.001	0.000
H_2O		0.001	0.001	18.772
CO_2		0.001	0.001	72.841
O_2		0.000	0.000	9.688
NO		0.000	0.000	0.116
HO		0.000	0.000	0.004

TABLE 14

OPEN DETONATION SIMULATION OF HMX

COMBUSTION PRODUCTS	g 100 gm	RATIO OF HMX TO AIR 100 0	50 50	20 80
CO_2		40.8240	58.9476	59.4398
N_2		37.8328	116.6877	353.2383
H_2O		10.0549	24.0161	24.3318
CO		8.0631	.3133	.0000
CH_4		1.4329	.0000	.0000
H_2		1.2364	.0353	.0000
NH_3		.0057	.0000	.0000
O_2		.0000	.0000	62.9901
NO		.0000	.0000	.0000