



Explosive Site Plan

OPERATION AND MAINTENANCE OF SAND CREEK BARRIER SYSTEM

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OH 44266

MAY 2008

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1. Site

- a. Name: Operation and Maintenance of Sand Creek Barrier System, Rocket Ridge Area of Open Demolition Area #2 (ODA2), Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio. Under U.S. Army Corps of Engineers (USACE) Omaha District, see Figure 1.
- b. State: Ohio
- c. This O&M work is being performed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and is part of a Time Critical Response Action (TCRA). If subsequent response actions are determined to be necessary, an ESS will be prepared and submitted for review and approval as necessary to support that response.

2. Anticipated Dates

- a. Start: May 31, 2008
- b. Complete: July 31, 2009

3. Purpose

- a. To prevent the downstream movement of munitions and explosives of Concern (MEC) and Munitions Debris (MD) within Sand Creek.
- b. Inspection and removal of Munitions and Explosives of Concern (MEC) and Munitions Debris (MD) accumulated on the screens.
- c. MEC Storage at Earth Covered Magazine number 1501 located at ODA2, Disposal of MEC by blow in place (BIP), or at the ODA2 demolition site.

4. Site Background and Current Conditions

- a. Rocket Ridge is a steep embankment approximately 500 feet long and 25 feet high located adjacent to Sand Creek within ODA2, approximately 2,700 feet upstream of the George Road Bridge.
- b. ODA2 was used for munitions demilitarization, including detonation of large caliber munitions and off-specification bulk explosives that could not be deactivated or demilitarized by any other means. The Rocket Ridge slope was used for the disposal of demilitarized munitions, although not all munitions appear to have been completely demilitarized.
- c. Munitions were transported from the demolition site to Rocket Ridge and dumped at the top of the slope. Sand Creek flows in an eastward direction along the northern boundary of the Rocket Ridge Area of ODA2, at the toe of the slope. Due to the steep slope of the disposal

area and the stream bank erosion resulting from high water events, some of the munitions materials have reached Sand Creek.

- d. On 18 June 2007, a rifle grenade containing white phosphorus exploded on the slope of Rocket Ridge. A survey conducted on 5-6 November 2007 upstream of the George Road Bridge identified a piece of munitions debris approximately 1,200 feet downstream of Rocket Ridge. Thirteen additional magnetometer anomalies from buried sources were found in the stream between the piece of munitions debris and the location of the barrier system. The sources of these subsurface anomalies have not been investigated.
- e. In order to prevent the downstream movement of MEC within Sand Creek, the Army constructed a barrier system. The barrier system will be installed across Sand Creek approximately 2,700 feet downstream of Rocket Ridge and 40 feet upstream of George Road Bridge. The barrier location is downstream of the farthest visible piece of munitions-related material that may have migrated from Rocket Ridge.

5. Executing Agencies

- a. U.S. Army Corps of Engineers, Omaha District

6. Scope of Investigative/Characterization Action

- a. The O&M phase of the Sand Creek Barrier System is focused on inspecting and removing the debris accumulated on the screen and assessing the integrity of the construction. This will be on a monthly basis.
- b. Inspection of any MEC and Material Potentially Presenting an Explosive Hazard (MPPEH) found on the screen.
- c. Storage and disposal of MEC and MD found on the screen.

7. Safety Criteria

- a. The MEC that has been discovered, or is expected to be on site is 75-millimeter (mm) and 105-mm projectiles, booster cups, three 500-pound bombs, white phosphorus rifle grenades, fuzes, and burster tubes. The MGFID identified is the 500 lb Bomb M64A1. During the course of this investigative action, if MEC with a greater fragmentation distance is encountered, the MSD will be adjusted in accordance with DDESB Technical Paper 16, operations will continue, and an amendment to this ESP submitted for approval expeditiously.
- b. See **Table 7-1** for Minimum Separation Distances.

Table 7-1
Minimum Separation Distances (MSD)

Area	MEC	MSD (ft) ¹				
		For Unintentional Detonations		For Intentional Detonations		
Rocket Ridge area of the ODA2 Sand Creek Barrier		Team Separation Distance (K40)	Hazardous Fragment Distance (HFD)	Without Engineering Controls	Using Sandbag Mitigation	Using Water Mitigation Carboys/Pool
RVAAP	500 lb Bomb M64A1 ²	293	680	2501	NA	NA

Notes:

- See Figure 2 for calculation sheets and documentation of MSD.
- Denotes MGF D during intrusive operation within the area indicated.

- c. Any occupied buildings or public roadways in the MSD areas will be evacuated and/or roadways blocked to prevent non-essential personnel from entering during the conduct of intrusive investigations. There are no occupied buildings or public roadways in the MSD areas, see Figure 2.
- d. The accumulated debris will be inspected for MEC/MD. Those items that are unfuzed and safe to move will be collected and placed in Igloo 1501 located at OD-2. If an item is fuzed or otherwise unsafe to move, the item will be BIP.
- e. If a smaller MEC item is identified, demolition operations will be conducted using sandbag mitigation in accordance with (IAW) HNC-ED-CS-S-98-7, August 1998 and the DDESB Fragmentation Database if permitted in the publications.
- f. Prior to initiating any disposal activities at RVAAP, the Contractor will submit the MEC Demolition/Disposal Notification to the Ohio EPA, as provided in the MEC Notification Procedure dated March 8, 2005 (Appendix C).

8. Methods of Disposal

- a. A portable ATF approved Type 2, Class ABC magazine has been previously sited for proper storage of explosives at RVAAP. The magazine is sited inside explosive storage igloo 7-C-1 in the RVAAP C-Block explosives storage area (Figure 3). The portable magazine is provided lightning protection by the existing lightning protection system intended to protect the earth-covered magazine 7-C-1. The portable magazine is approximately 44” tall, with the earth-covered magazine being approximately 10’ tall. The lightning system for 7-C-1 extends approximately 3’ above the earth-covered magazine, and the grounding system for the Type II magazine is connected into the earth-covered magazine.

- b. The portable magazine will be used for the storage of both 1.1 and 1.4 class explosives to be used for demolition operations. All 1.1 and 1.4 explosives stored in the main body of the magazine will be of compatible storage categories. Blasting caps and other initiators used for demolition operations will be stored outside the magazine in the attached 18" x 18" x 18" "cap" box that is welded to the outside of the magazine. The NEW for the demolition material magazine will be a maximum of 100 pounds NEW (Figure 3).
- c. An existing Earth Covered Magazine number 1501 located at ODA2 will be used for the storage of MEC that have been inspected by UXO-qualified personnel and determined to be "acceptable to move" (Figure 3). The ODA2 is a restricted explosives storage area within the RVAAP. Access to the ODA2 area is controlled through RVAAP Post 1 Security. The magazine will be afforded a lighting protection system IAW Department of the Army (DA) Pamphlet (PAM) 365-64.
- d. The ESQD arc for intentional detonations when conducting BIP or disposal at ODA2 is 2,501 feet and is depicted in Figure 4.








9. Maps

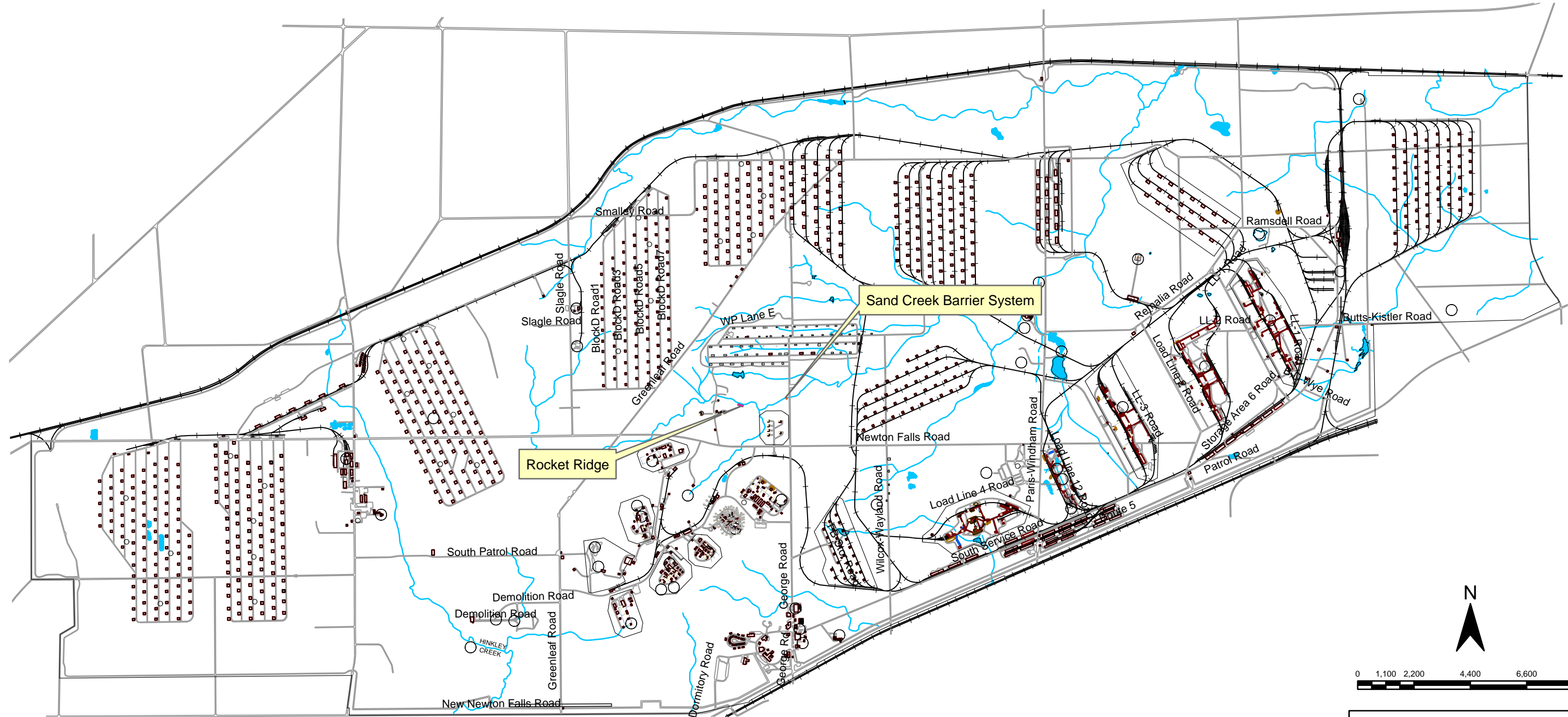
Figure 1 shows the regional location of the Sand Creek Barrier within the Ravenna Army Ammunition Plant. Figure 2 depicts the Hazardous Fragmentation Distance around each investigation area. Figure 3 identifies the Inhabited Building Distance and Public Traffic Route Distance for the explosive storage magazines. Figure 4 identifies the Maximum Fragment Range – Horizontal (MFR-H) distance each area for the munition with the greatest fragmentation distance (MGFD).

APPENDIX A

Figures

Legend

-  Water Bodies
-  Buildings
-  Walkways
-  Railroads
-  Berms
-  Pond
-  Proposed Area











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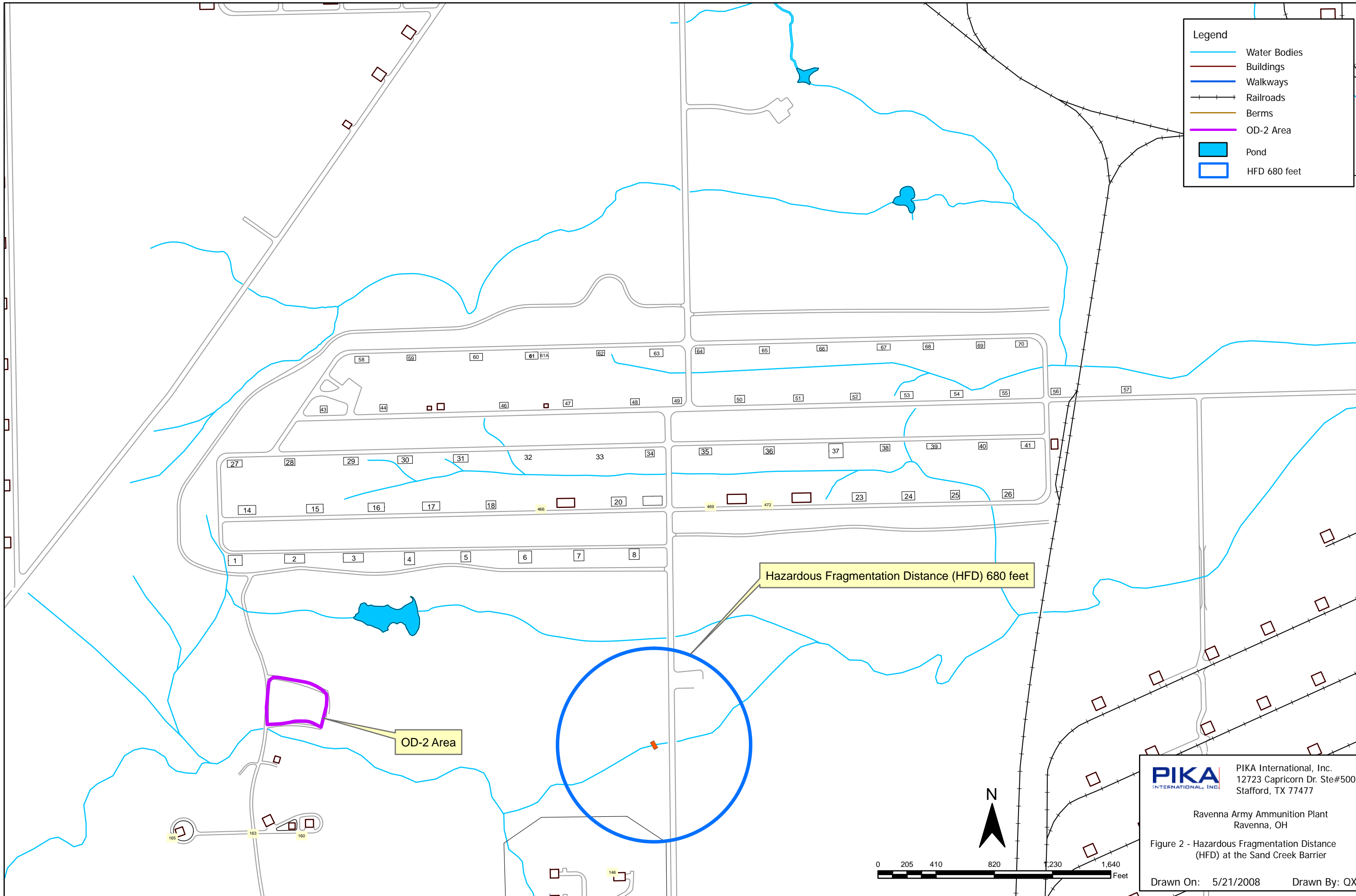
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 Ravenna, OH

Figure 1
 Regional Location of Rocket Ridge
 and the Sand Creek Barrier System

Drawn On: 5/21/2008 Drawn By: QX

Legend

-  Water Bodies
-  Buildings
-  Walkways
-  Railroads
-  Berms
-  OD-2 Area
-  Pond
-  HFD 680 feet



Hazardous Fragmentation Distance (HFD) 680 feet

OD-2 Area

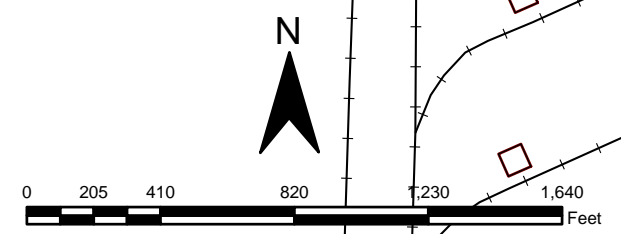
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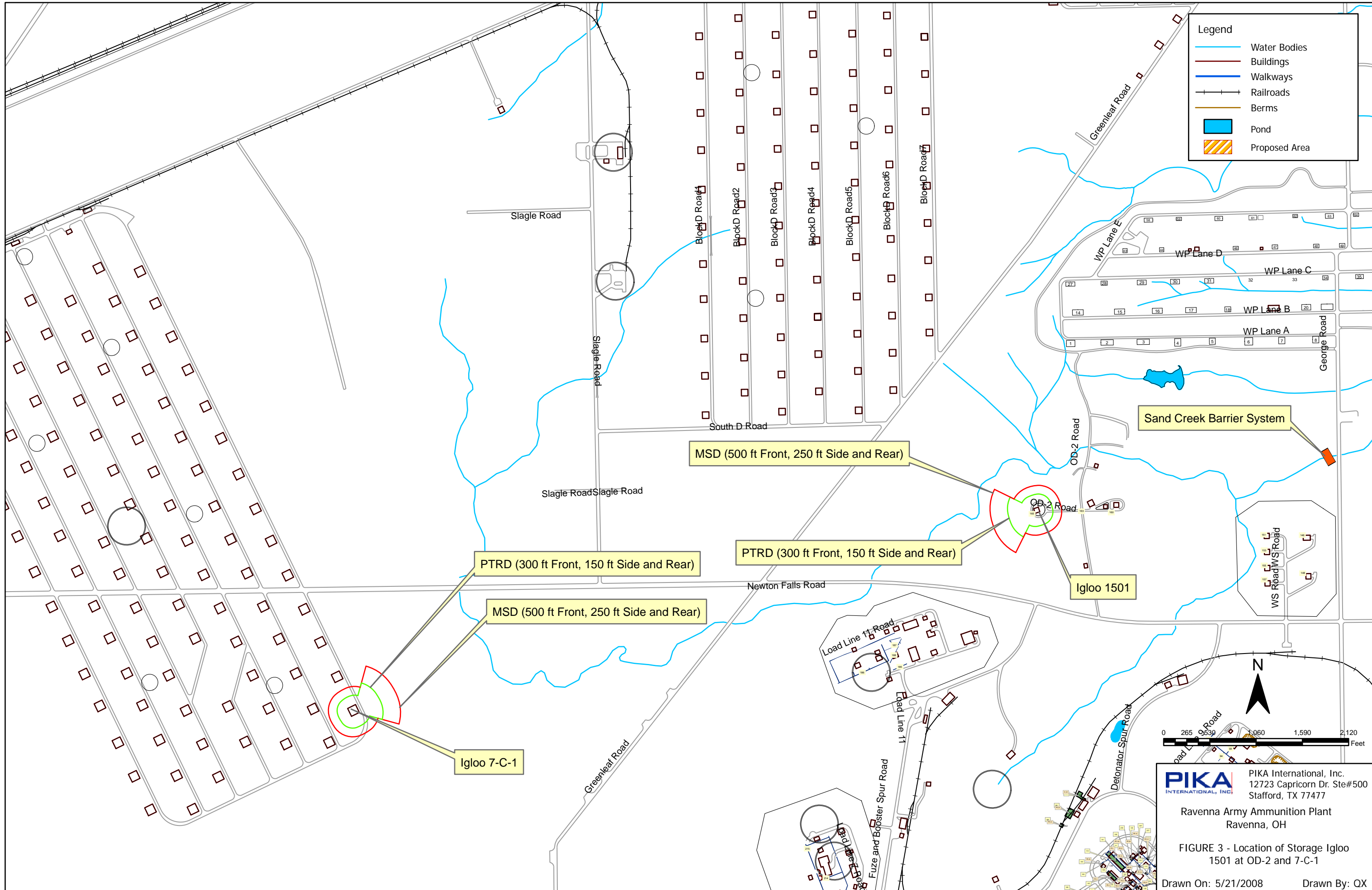
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Figure 2 - Hazardous Fragmentation Distance (HFD) at the Sand Creek Barrier

Drawn On: 5/21/2008 Drawn By: QX





Legend

- Water Bodies
- Buildings
- Walkways
- |—| Railroads
- Berms
- Pond
- Proposed Area

MSD (500 ft Front, 250 ft Side and Rear)

PTRD (300 ft Front, 150 ft Side and Rear)

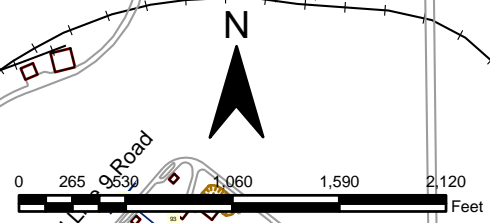
PTRD (300 ft Front, 150 ft Side and Rear)

MSD (500 ft Front, 250 ft Side and Rear)

Igloo 1501

Igloo 7-C-1

Sand Creek Barrier System

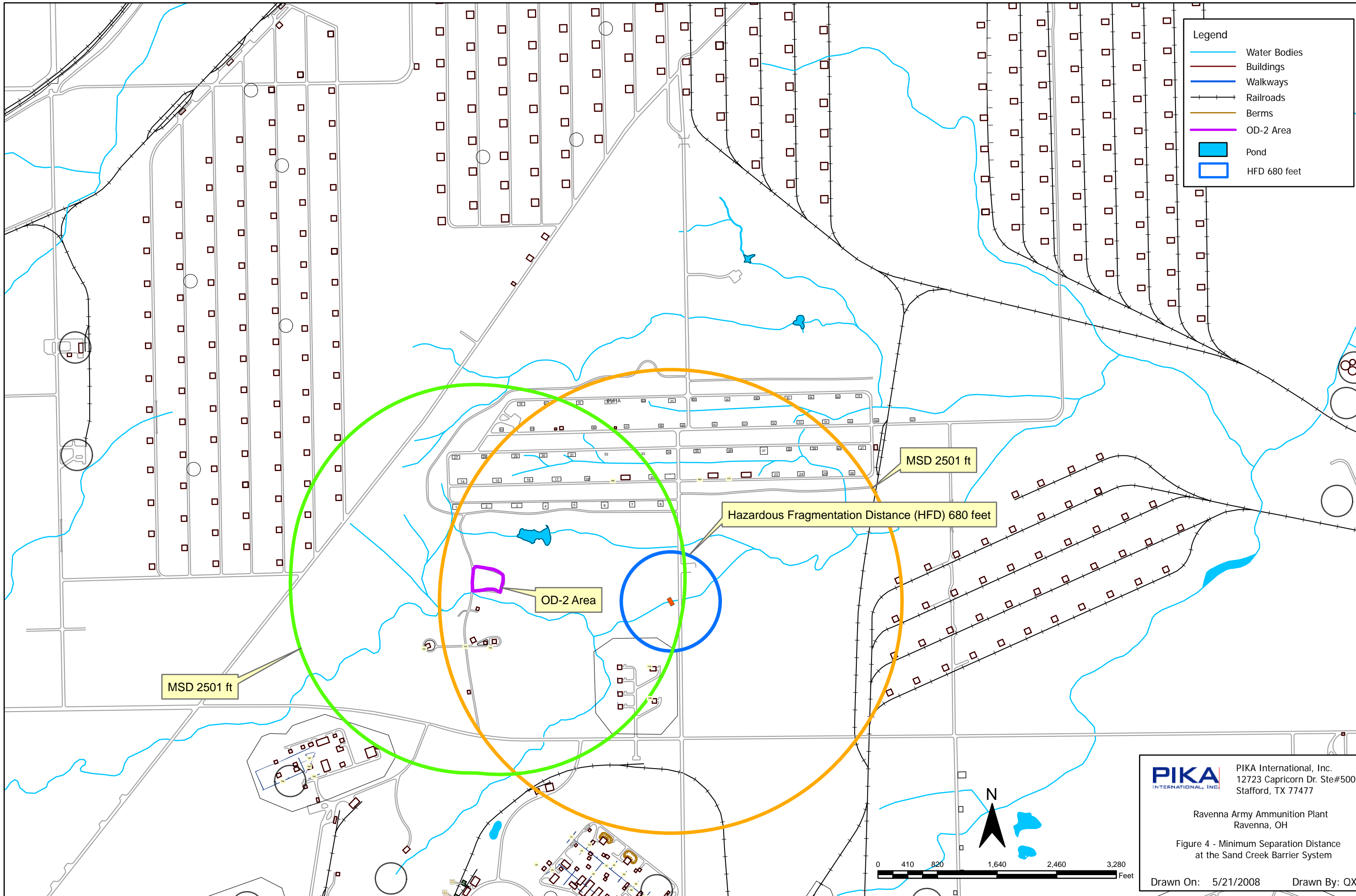


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FIGURE 3 - Location of Storage Igloo 1501 at OD-2 and 7-C-1

Drawn On: 5/21/2008 Drawn By: QX



Legend

-  Water Bodies
-  Buildings
-  Walkways
-  Railroads
-  Berms
-  OD-2 Area
-  Pond
-  HFD 680 feet

MSD 2501 ft

OD-2 Area

Hazardous Fragmentation Distance (HFD) 680 feet

MSD 2501 ft

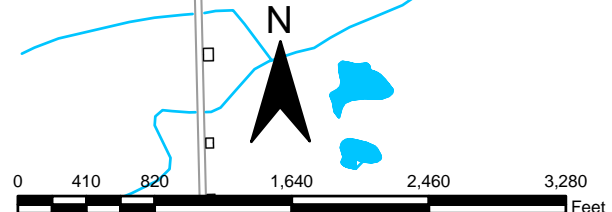
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Figure 4 - Minimum Separation Distance
at the Sand Creek Barrier System

Drawn On: 5/21/2008 Drawn By: QX



APPENDIX B
Fragmentation Calculation Sheets

FRAGMENTATION DATA REVIEW FORM

Database Revision Date 12/31/07

Category:	<input type="text" value="HE Bombs"/>	DODIC:	<input type="text"/>
Munition:	<input type="text" value="500 lb Bomb M64A1"/>	Date Record Created:	<input type="text" value="7/30/2004"/>
Primary Database Category:	<input type="text" value="bomb"/>	Last Date Record Updated:	<input type="text" value="6/25/2007"/>
Secondary Database Category:	<input type="text" value="500 lb"/>	Individual Last Updated Record:	<input type="text" value="Crull"/>
Munition Case Classification:	<input type="text" value="Non-Robust"/>	Date Record Retired:	<input type="text"/>

Munition Information and Fragmentation Characteristics

Explosive Type:	<input type="text" value="Comp B"/>
Explosive Weight (lb):	<input type="text" value="274.00000"/>
Diameter (in):	<input type="text" value="14.2000"/>
Max Fragment Weight (lb):	<input type="text" value="0.289082"/>
Critical Fragment Velocity (fps):	<input type="text" value="8116"/>

Theoretical Calculated Fragment Range

HFD [Range to No More Than 1 Hazardous Fragment per 600 Square Feet] (ft):	<input type="text" value="680"/>
MFR-V [Vertical Range of Max Weight Fragment] (ft):	<input type="text" value="1991"/>
MFR-H [Horizontal Range of Maximum Weight Fragment] (ft):	<input type="text" value="2501"/>

Overpressure Distances

Inhabited Building Distance (12 psi), K40 Distance:	<input type="text" value="293"/>
Inhabited Building Distance (09 psi), K50 Distance:	<input type="text" value="367"/>
Intentional MSD (0065 psi), K328 Distance:	<input type="text" value="2406"/>

Minimum Thickness to Prevent Perforation

4000 psi Concrete (Prevent Spall):	<input type="text" value="8.94"/>
Mild Steel:	<input type="text" value="1.46"/>
Hard Steel:	<input type="text" value="1.20"/>
Aluminum:	<input type="text" value="3.05"/>
LEXAN:	<input type="text" value="6.77"/>
Plexi-glass:	<input type="text" value="5.12"/>
Bullet Resist Glass:	<input type="text" value="4.24"/>

Required Sandbag Thickness

Max Fragment Weight (lb)SB:	<input type="text" value="0.022120"/>
Critical Fragment Velocity (fps)SB:	<input type="text" value="8116"/>
Kinetic Energy 106 (lb-ft ² /s ²)SB:	<input type="text" value="0.7285"/>
Required Wall Roof Sandbag Thickness (in)SB:	<input type="text" value="NA"/>
Expected Maximum Sandbag Throw Distance (ft)SB:	<input type="text" value="NA"/>
Minimum Separation Distance (ft)SB:	<input type="text" value="NA"/>

Water Containment System and Minimum Separation Distance:

Max Fragment Weight (lb)W:	<input type="text" value="0.022120"/>
Critical Fragment Velocity (fps)W:	<input type="text" value="8116"/>
Kinetic Energy 106 (lb-ft ² /s ²)W:	<input type="text" value="0.7285"/>
Water Containment System:	<input type="text" value="NA"/>
Minimum Separation Distance (ft)W:	<input type="text" value="NA"/>



Print This Form

Close Form

APPENDIX C

Ohio EPA MEC Demolition Notification

Munitions and Explosives of Concern (MEC) at the Ravenna Army Ammunition Plant (RVAAP) - Notification Procedures

Paragraph 9(a) of the Director's Final Findings and Orders (journalized June 10, 2004) allows for the following exemption: "The requirement to obtain a hazardous waste facility installation and operation permit, as required by ORC 3734.02 (E), for the storage and treatment (destruction) of MEC (excluding bulk storage of munitions and chemical and biological warfare materiel) at OD#2, and for the in-place treatment (destruction) of MEC (excluding bulk storage of munitions and chemical and biological warfare materiel) discovered at the RVAAP that can not be safely transported to OD#2, provided, however, that Respondent shall comply with all applicable requirements of ORC chapter 3734 and OAC chapters 3745-50 through 3745-68, including but not limited to the hazardous waste requirements set forth at Appendix E."

In the absence of obtaining emergency permits, the following is the type of information that should be provided to Ohio EPA Northeast District Office (NEDO), Division of Emergency and Remedial Response (DERR) [attn: Eileen Mohr] and Division of Hazardous Waste Management (DHWM)[attn: Greg Orr]. The information is divided into categories: prior to destruction of the MEC and subsequent to the destruction of the MEC. Prior to the MEC destruction, notification can be made via either letter or email. Subsequent to detonation, the information can be transmitted in a written summary report after each detonation event or at the conclusion of clearance activities at a particular Area of Concern (AOC).]

Information to be provided prior to Blow in Place (BIP) or Detonation at OD#2:

1. Point of Contact (POC)
2. POC's phone number(s) and fax number
3. Location/date/time/person discovering the MEC
4. Description of MEC to be blown: including type and quantity
5. Proposed destruction location: either at OD#2 or BIP
6. Proposed method of destruction
7. Proposed methods to mitigate/abate potential contamination
8. Preparedness and prevention
9. Notifications to be made

Information to be provided subsequent to BIP or Detonation at OD#2:

1. POC
2. POC's phone number(s) and fax number
3. Description of MEC blown: including type and quantity
4. Location/date/time/person responsible for the MEC destruction
5. Location of destruction activities - description and map with GPS locations listed and (if applicable) the depth and number of shot holes utilized at OD#2
6. Method of destruction utilized
7. List of donor charges and amounts
8. Any problems encountered
9. Inspection/disposal of residues
10. Confirmation of adherence to minimum isolation distances specified in OAC 3745-68-82
11. Whether or not any subsequent soil samples were collected and location of available analytical results