

Report
Investigation of Munitions and
Explosives of Concern (MEC) Incident
Discarded Military Munitions (DMM)
Grenade, Hand, Smoke, White
Phosphorous, M15

November 9, 2009

This report was digitally provided to the regulatory agencies for review on November 2, 2009 via FTP. It was provided to the public at the October 2010 Community Involvement Workshop. It was added to the Administrative Record January 2011.

Report
Investigation of Munitions and Explosives of Concern (MEC) Incident
Discarded Military Munitions (DMM) Grenade, Hand, Smoke, White Phosphorous, M15
August 29, 2009

An investigation of the subject incident was conducted to examine the available evidence and data, determine the cause or likely cause, and provide recommendations for actions to provide for public and worker safety.

INCIDENT SUMMARY

On August 29, 2009 a wildfire burned approximately 7 acres of moderate density vegetation on the former Fort Ord approximately 250m northeast of the intersection of Evolution Road and Broadway Ave. inside the Fort Ord impact area. The suspect cause was the unprovoked (spontaneous) functioning of a DMM Grenade, Hand, Smoke, White Phosphorous (WP), M15.

The wildfire was reported to the Presidio of Monterey Fire Department (POM FD) by Monterey County Fire Command at approximately 4:00 p.m. POM FD responded and controlled the fire with assistance from California Department of Forestry aircraft limiting the area involved to approximately 7 acres.

The weather at the time of the initial fire response was clear with a temperature of approximately 80 degrees Fahrenheit, winds WSW at 12-17 mph, and 40% relative humidity. The fire was declared out at 9:30 a.m. on August 31, 2009. There was no loss of equipment or structures, and no injuries as a result of the incident.

The area of the incident is part of an inactive multi-use range area of approximately 5, 600 acres of restricted, fenced, and patrolled Army property. The area vegetation had burned last during a prescribed burn in 2003. The area was subsequently subjected to a post-burn surface MEC remedial action.

A contract Senior Unexploded Ordnance (UXO) safety officer conducted an initial inspection of the area identified by POM FD as the likely origin of the fire on August 30 and identified the remnants of an expended Grenade, Hand, Smoke, White Phosphorous, M15 at that location. The remnants included spalled steel (grenade body), a safety pin, and a portion of a safety lever intact. The UXO safety officer detected the odor of phosphorous in vicinity of the remnants and concluded that a WP item had likely recently functioned at that location.

INCIDENT INVESTIGATION

Item Description: The Grenade, Hand, Smoke, White Phosphorous, M15 is a cylindrical chemical smoke device approximately 3 inches in diameter, 7 inches long, with a weight of 31 ounces. The body is constructed of molded 18 gage sheet steel with a fuse well centered on a sealed end. The fuze is a release spring delay mechanism with an external safety pin and safety lever. The fuse is core configured connecting to a solid bursting charge surrounded by approximately 15 ounces of WP.

White phosphorous is a transparent and highly flammable solid that self-ignites upon contact with air and will burn to exhaustion while exposed to air without further cause. Use of the grenade involves pulling of the safety pin and release of the safety lever.

The function of the grenade involves activation of the fuze, the ignition of the bursting charge, rupture of the body, fragmentation, ignition, and burning of the WP filler at high temperature. The result is a dense white smoke persisting for approximately 60 seconds within the bursting radius (Attachment 1 data sheet). The grenade is used for signaling, screening, and incendiary purposes.

Grenades of this design have been in the US Army's inventory for more than 60 years. Other US munitions containing white phosphorous include rifle grenades, as well as mortar and artillery rounds.

Area of Incident: The area of the incident is coastal maritime chaparral habitat associated with Range 48, part of an inactive multi-use range complex of approximately 5,600 acres of restricted, fenced, and patrolled Army property (Grid 079528, GPS Lat 2119366.527 Long 5741774.976). An examination of the area as well as training records for the adjacent ranges (Range 43-48) indicates that the location of the grenade was likely the result of weapons training conducted during a period when the former Fort Ord was active and the area ranges were operational (approximately 1950-1994) (Attachment 2 MAP).

Examination of the remnants did not provide the age of the subject item or date of the disposal, however the item was likely disposed prior to the closure of the area ranges (1994). The point of ignition indicated that the item was at or near the ground surface and in close proximity of vegetation when it functioned. Evidence was inconclusive as to whether the item was undisturbed at the time of ignition or if erosion, animal activities, vegetation burning or other actions resulted in a change in disposition. There appeared to be no direct human involvement in the ignition of the fire or the functioning of the grenade.

The area vegetation burned last during a prescribed burn in 2003. This burning may have accelerated the oxidation of the body of the grenade by heat treating the protective paint and/or compromising the structural integrity through expansion and contraction. Munitions and

Explosives of Concern remediation documents from the Fort Ord environmental cleanup administrative record indicate that the area was subject of a visual surface remediation in 2003. Some UXO WP grenades were removed at that time. Procedures used during that remedial action did not indicate why the incident item was not removed during that action (Attachment 2 MAP) (Final MRS-RANGES 43-48 INTERIM ACTION TECHNICAL INFORMATION PAPER VOLUME 1, 26 January 2007).

Findings: The proximity and functional characteristics of the item and conditions at the point of ignition indicate that the grenade was the likely cause of the reported wildfire. Spotting (scorched areas), considered the result of the burning of fragments of WP, was identified in the area surrounding the item remnants indicating that the bursting charge functioned (Attachment 3 photos 1&2). The safety pin and a portion of the safety lever were found intact, this fact, and field technical experience with the item fuze type indicates that the grenade's bursting charge was initiated by other than the mechanical function of the fuze system (attachment 4 photo 3). The chemical composition and location of the bursting charge makes it susceptible to the heat resulting from the burning of surround WP. Limited spotting from the identified point of the fire ignition (approx. 1m) and the heavily rusted condition of the grenade remnants indicates that the body may have been corroded and degrading the efficiency of the burst and allowing air to contact the WP filler prior to the functioning of the bursting charge. It is possible that the bursting charge was initiated by heat resulting from the burning of the WP filler.

The location of UXO WP grenades found during the 2003 surface remedial action in proximity of the incident location indicates that this item was possibly associated with one or more training/simulation or demonstration events involving the employment of several of such grenades. The condition of the previously found grenades described by the project OE safety specialist indicates that the bodies of such grenades are subject to oxidation during prolonged exposure to environmental moisture. It is possible that oxidation of the DMM grenade, perhaps accelerated by exposure to fire (2003), resulted in an exposure of the WP filler sufficient to result in self-ignition and subsequently functioning of the bursting charge. Experience and after action reports from remedial actions sites on the former Fort Ord indicate that analog and digital geophysical mapping detection equipment can detect WP grenades and similar objects.

Work plans and records indicate that Fort Ord environmental and ordnance as well as BLM habitat workers routinely operate in areas where UXO/DMM WP grenades may remain.

Conclusions:

- (1) DMM/UXO WP grenades disposed in a field setting are capable of spontaneous ignition and function.
- (2) The function of these items can create a burning hazard to personnel within the bursting radius and ignite wildfires in areas of surrounding vegetation.

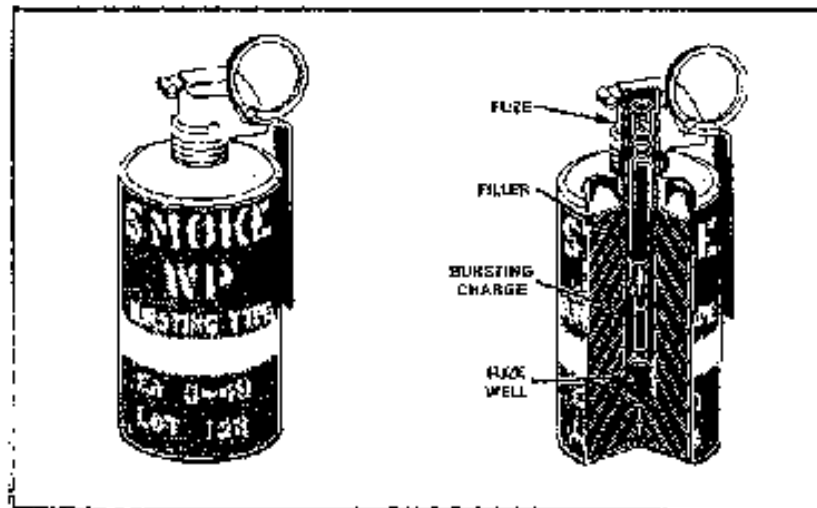
- (3) A previous visual MEC remediation of surface of the incident area did not detect the DMM WP grenade.
- (4) The presence of personnel and equipment in field areas where UXO/DMM WP grenades are present can result in an incident with the potential for loss of equipment, personal injury, or death.

Recommendations:

- (1) Implementation of UXO/DMM WP hand grenade hazard training for all workers and users of areas where those items are suspected or known to exist.
 - a. Possible presence of WP items
 - b. Identification of items and burning WP
 - c. Fire hazard
 - d. Action in response to suspected item or burning WP.
- (2) Consideration of suspected or known WP grenade locations in development of future MEC remedial action methodologies.
- (3) Periodic review of MEC database to identify concentrations of UXO/DMM WP found during remediation actions.
- (4) Use of magnetometer assisted methodologies in surface remediation of areas identified as having contained UXO/DMM WP grenades where vegetation or other obstacles obscure the surface.
- (5) Implementation of a magnetometer assisted surface remedial action in vicinity of recorded UXO/DMM WP grenades (attachment 5 MAP).
- (6) Continuation of present site security measures.

M15 White Phosphorous grenade

The M15 White Phosphorous grenade is a bursting type grenade used for signaling, screening, and incendiary purposes.



M15 WP smoke hand grenade.

(1) Body — sheet metal.

(2) Filler — 15 ounces of white phosphorus.

(3) Fuze — M206A2.

(4) Weight — 31 ounces.

(5) Capabilities — the average soldier can throw the grenade 30 meters. The grenade has a bursting radius of 17 meters. All friendly personnel within this 17-meter area should be in a covered position to avoid being struck by burning particles. The WP filler burns for about 60 seconds at a temperature of 5,000 degrees Fahrenheit. This intense heat causes the smoke produced by the grenade to rise quite rapidly, especially in cool climates. This makes the M15 grenade less desirable for use as a screening agent.

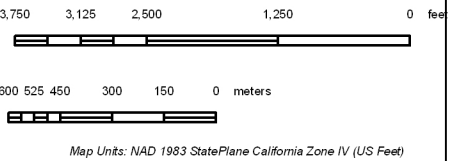
(6) Color/markings — grey with one yellow band and yellow markings.

(7) First aid — treat burns caused by WP in the same way as ordinary burns. If particles of WP are embedded in the flesh, immerse the wound in water or pack with wet cloths to halt combustion. Then pick out or squeeze out the WP. The particles will reignite spontaneously if allowed to dry. Apply copper sulphate solution to halt combustion of the WP particles. This permits them to be removed without igniting.

White phosphorous Incidental
MEC 8/29/2009

- MEC White Phosphorous Found (2003)
in Proximity of Incident Item Location
- Model Description - MM Type
- Grenade, hand, smoke, white phosphorous, M15 - ISD
 - Grenade, hand, smoke, white phosphorous, M15 - UXO
 - Grenade, hand, smoke, white phosphorous, M34 - UXO
 - Grenade, rifle, smoke, white phosphorous, M19A1 - ISD
 - Grenade, rifle, smoke, white phosphorous, M19A1 - UXO
- ★ Incident Item
- ⬭ Burn Area (7 Acres)
- Impact Area
- Range Fans
- Major Roads
- Secondary Roads
- Fort Ord Boundary
- Fuel Breaks Status
- 30' Surface/15' Sub, Total 45', Maint for vehicles
 - 45' Subsurface Clearance, Maintained for Vehicles

Report - Fort Ord MEC
Incident 29 August 2009
Attachment 2



U.S. ARMY CORPS
OF ENGINEERS



FORMER FORT ORD
MONTEREY, CALIFORNIA

PRINT DATE
Thursday, August 13, 2009

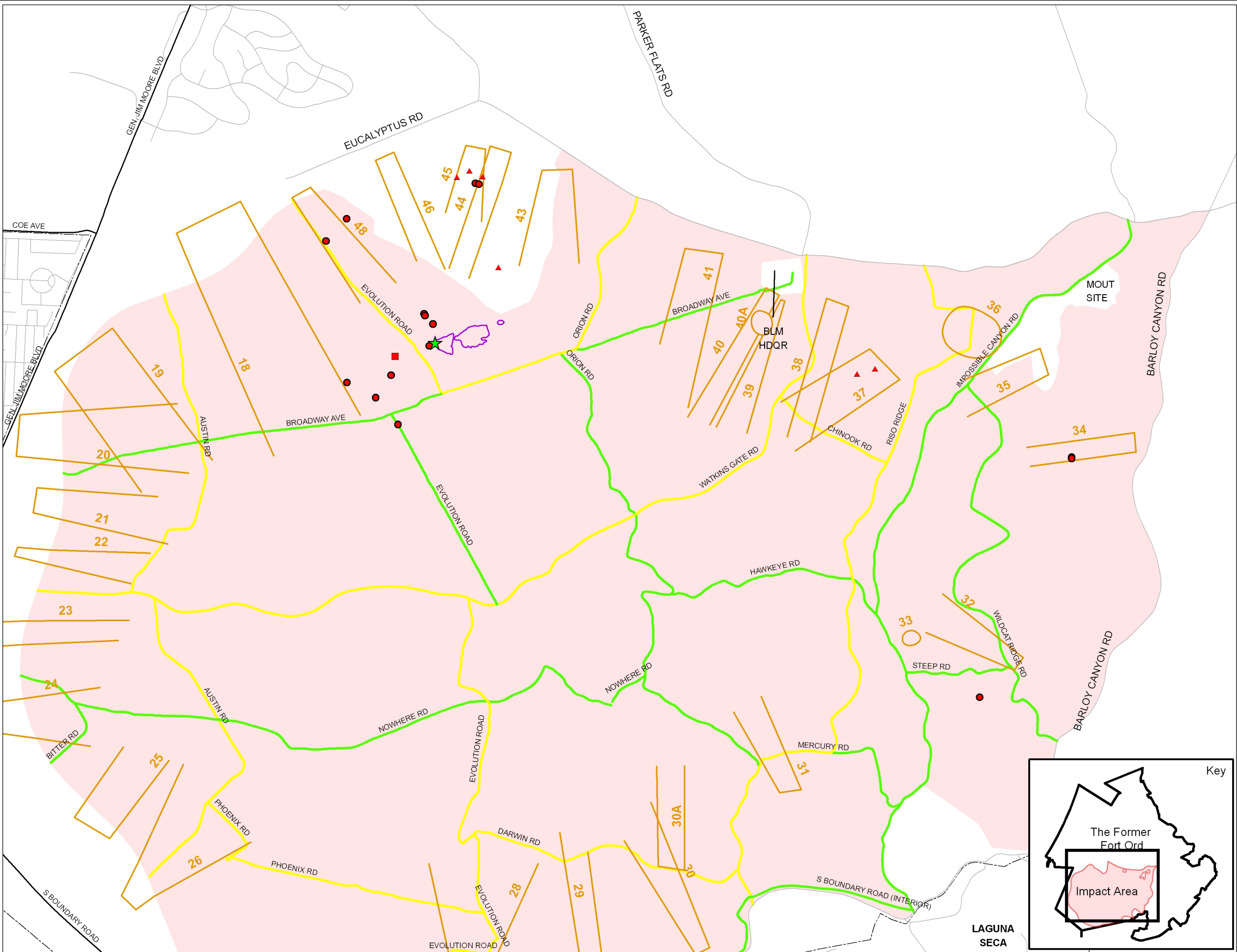
SOURCE OF DATA

SCALE
1:21,895

DRAWN BY
Cary.A.Stiebel@usace.army.mil

VERSION

FILE
UXO White Phosphorous B-size.mxd





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Photo Ground Surface 1m North East of Item Ignition Point

Spotting

2009/08/30

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Attachment 3-2

Remnants of Item at Ignition Point



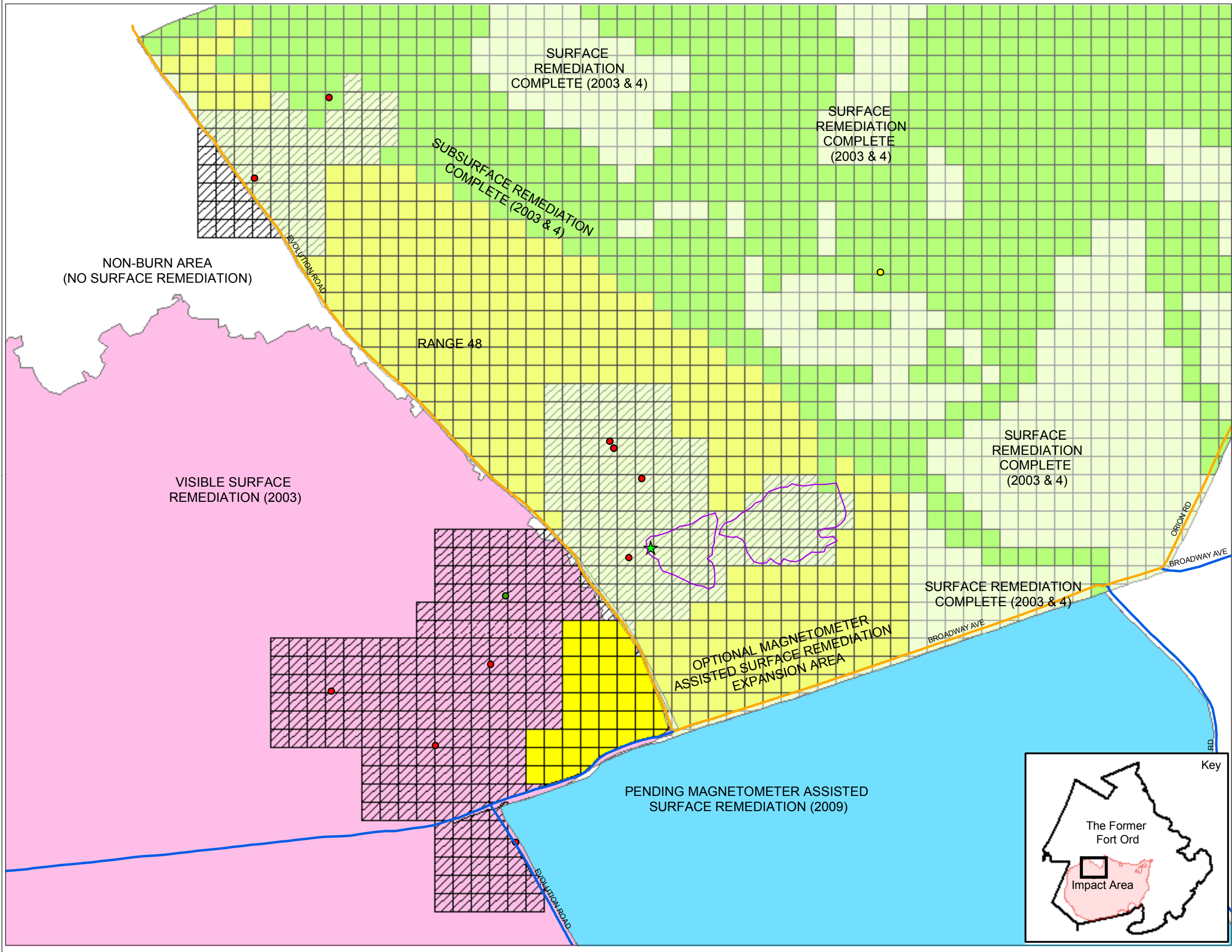
Safety level (portion) and Safety Pin

2009/08/30

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Attachment 4

Recommended Field Response
Grenade, Hand, Smoke, White
Phosphorous MEC Incident 8/29/09



Fuel Breaks Status

- 30' Surface/15' Sub, Total 45', Maint for vehicles
- 45' Subsurface Clearance, Maintained for Vehicles
- Burn Area 8/29/09 (7 Acres)
- Incident Item

White Phosphorous MEC

Model Description

- Grenade, hand, smoke, white phosphorous, M15
- Grenade, hand, smoke, white phosphorous, M34
- Grenade, rifle, smoke, white phosphorous, M19A1

Major Roads

Secondary Roads

Fort Ord Boundary

Surface Removal (2002)

Pending Magnetometer Assisted Remediation (2009)

Subsurface Remediation Complete (2003-04)

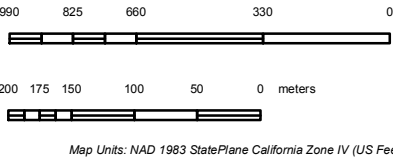
Optional Magnetometer Assisted Surface Remediation Expansion Area

Recommended Magnetometer assisted surface remediation

Visible Surface Remediation (2003)

Acres = 92
Optional Acres = 95

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Attachment 5



U.S. ARMY CORPS
OF ENGINEERS



FORMER FORT ORD
MONTEREY, CALIFORNIA

PRINT DATE:
Thursday, August 13, 2009

SOURCE OF DATA:

SCALE:
1:6,000

DRAWN BY:
Cary.A.Stiebel@usace.army.mil

VERSION:

FILE:
White Phosphorous B-size v1.mxd

