Seaside Groundwater Basin, Fort Ord Training Area Site 39, and Potential PFOA & PFOS Contamination

The FOCAG is particularly concerned with the safety of Monterey Peninsulas water supply which is injected, stored, pumped, and distributed from the Seaside Groundwater Basin within the former Fort Ord. (Map 1)

The Seaside Groundwater Basin area was formerly one of the nations largest Military Training Areas known as Site 39. This 8000 acre multi-range and high-impact Training Area (1917-1994) overlays the entire Seaside Groundwater Basin. A wide range of activities occurred there. (Map 2 & 3)

Over the 70 year history of Site 39, millions of soldiers received Basic and Special Operations training. In the training of soldiers, every munition imaginable was used. We are concerned with the BRAC Super Fund cleanup failure to identify all Known and Suspected Chemicals used in munitions, training devices, training exercises, range control (pesticides), and the fate of these chemicals into the environment and ground water. (Tables 1,2,3,4)

Of fairly recent concern, some Fire Retardants referred to as PFOA and PFOS are known to have been used at Fort Ord. Cleanup documents identify Training Areas in the North East side of Site 39 where Fire/Flame Training operations are suspected and known to have occurred.

In 1994, during Site 39 investigations, several Ranges where identified as known or suspected Fire/Flame Training/Demonstration areas. These training areas, Range 33, 40, 40A, 41, and 49 are identified in Fort Ord cleanup document BW-0540. Additional training areas of concern inland of Site 39 include Napalm Road and Oil Well Road, as their names imply these areas are identified as fire/flame training areas.

Because of extremely poor Training Range record keeping, all of these areas should be considered potential areas of widespread contamination and thoroughly sampled.

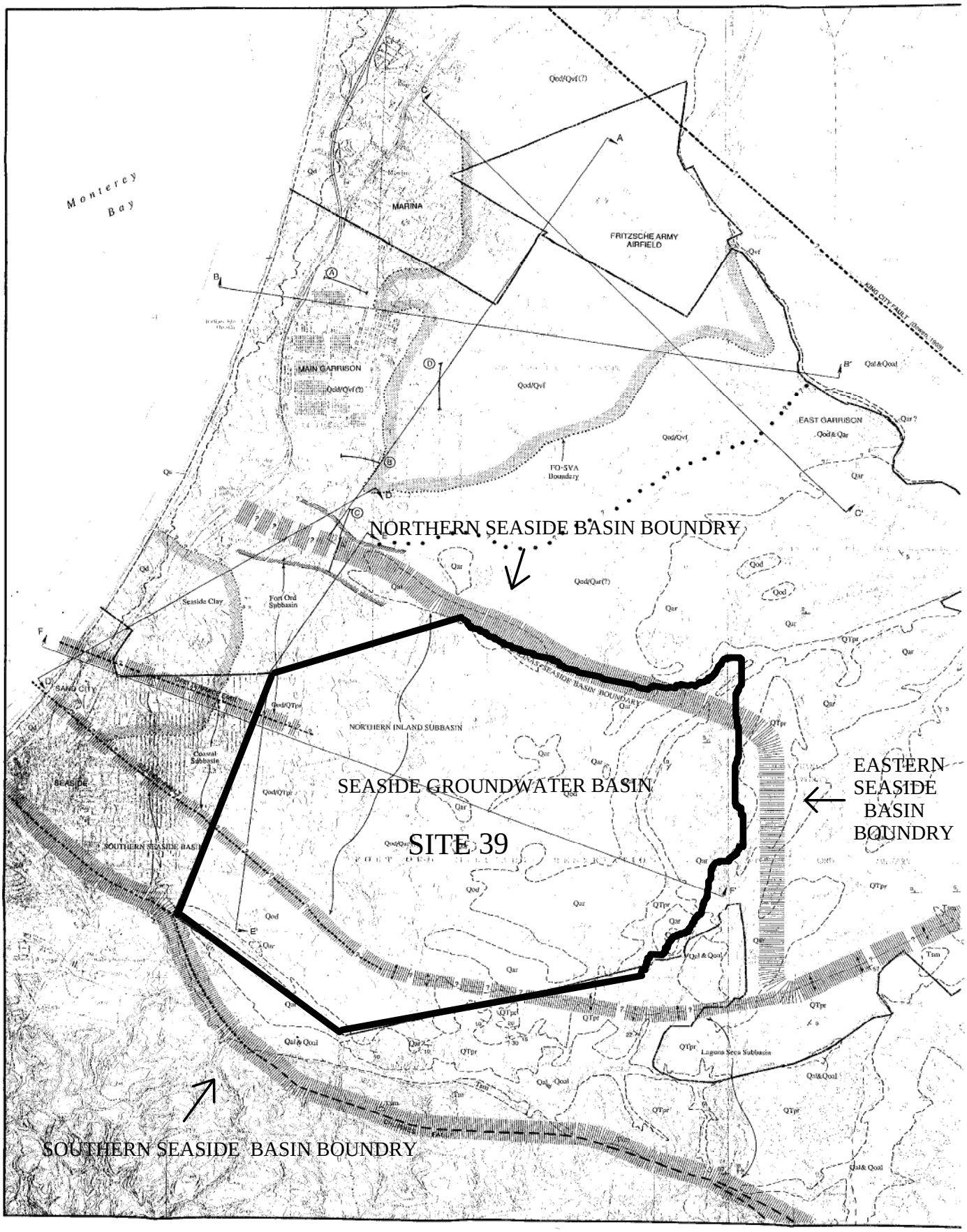
Attachments:

Maps:
- Map 1 Seaside Groundwater Basin
- Map 2 Site 39 Training Areas
- Map 3 Site 39 Pesticide Sampling

Tables:
- Table 1 Chemicals practice and pyrotechnic munitions
- Table 2 Pyrotechnic munitions Chemicals Chapter 10
- Table 3 Pyrotechnic chemicals also used in Pesticides
- Table 4 Pesticides used at Fort Ord

SEASIDE GROUNDWATER BASIN / SITE 39 IMPACT AREA

Basewide Hydrogeologic Characterization
BW-0608 PLATE 3



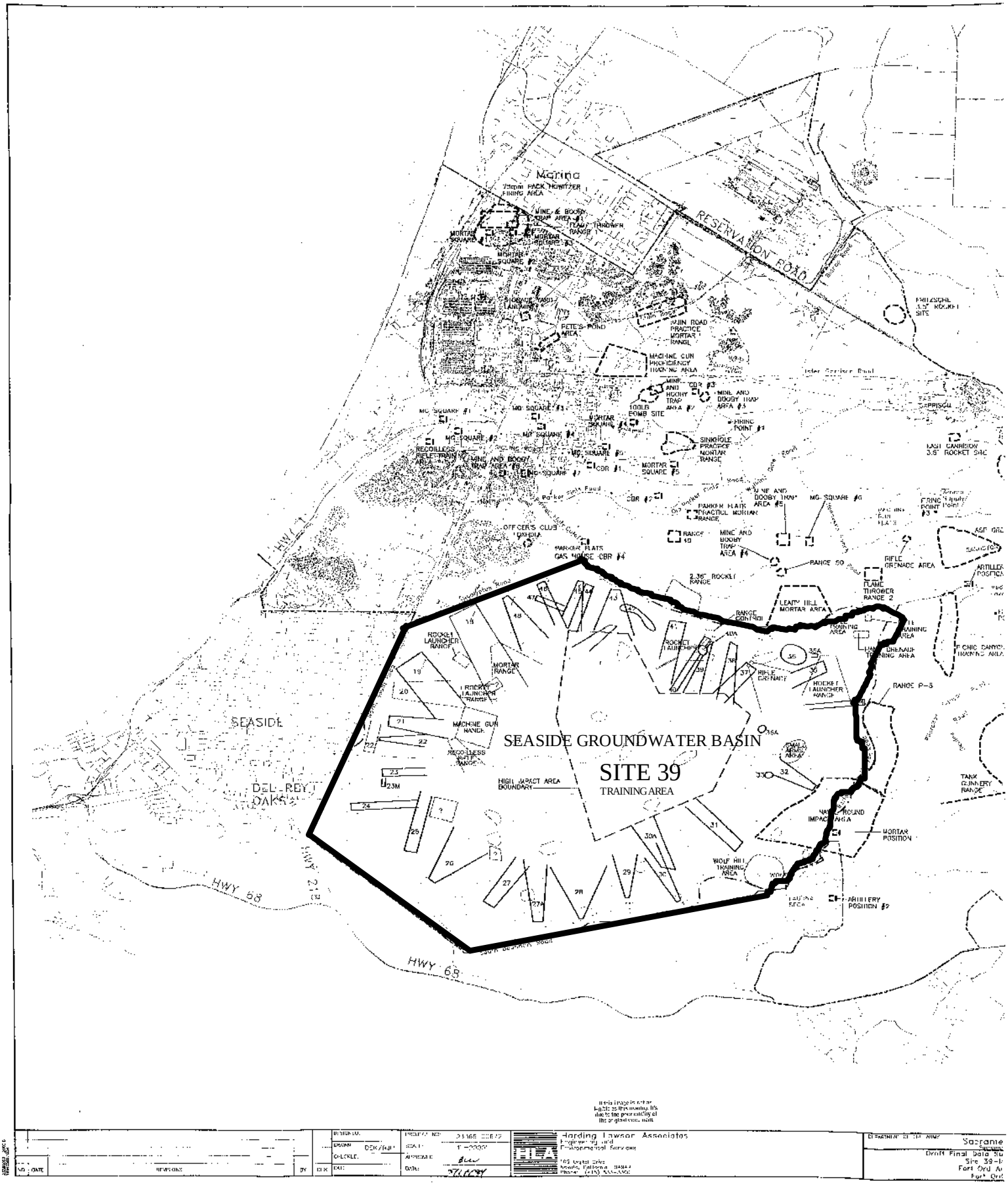
SITE 39 BOUNDRY (8000 Acres, one of the countries largest munitions training areas.)

SEASIDE GROUNDWATER BASIN BOUNDRY (Supplies City of Seaside drinking water.)

Where did all the munitions chemicals go? What chemicals where looked for? What where the actual chemical detection levels?

SEASIDE GROUNDWATER BASIN / SITE 39 TRAINING AREA

Map Derived from Site 39 Investigation BW-0540 - Basewide Hydrogeologic Characterization BW-0608



Former Fort Ord Militay Base: SITE 39 BOUNDRY (8000) Acres, one of the Militarys largest Impact/Training Areas in the country; Gigling Artillery Range / Multi Use Training Area 1917-1992

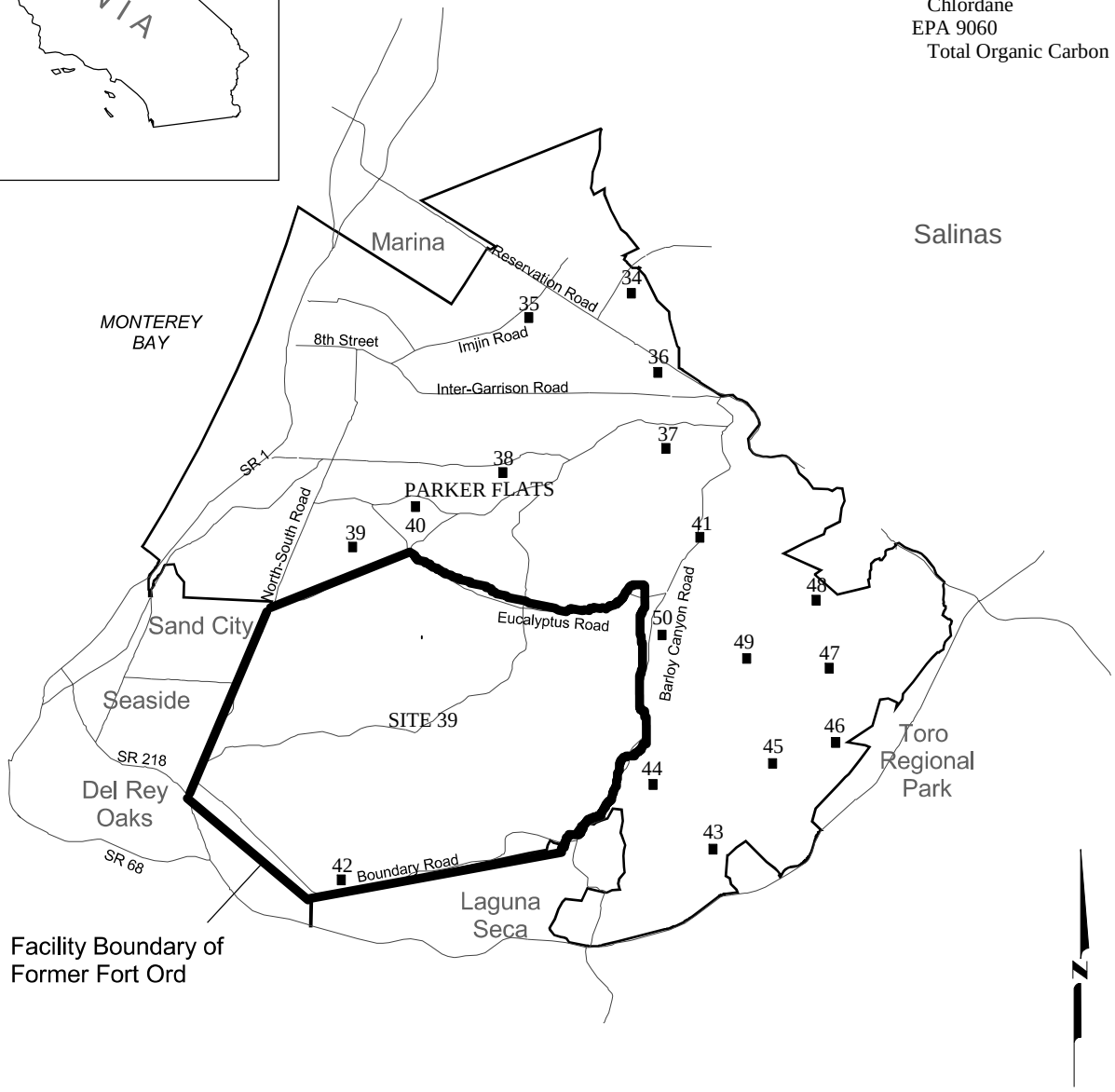
The only Pesticides sampling known at Site 39. 1 sample within 8000 acres of training areas known to have been heavily treated with pesticides for decades.

See Table 4 additional pesticides identified in cleanup documents that should be looked for throughout training areas.

Test Method/Analyte Name

EPA 8080
- Gamma - BHC
- Heptachalor epoxide
- Dieldrin
- 4,4' -DDE
- Endrin
- 4,4' -DDD
- 4,4' -DDT
- Chlordane

EPA 9060
- Total Organic Carbon



Site 39 Boundry / Seaside Groundwater Basin

Approximate On Base Soil Sample Locations

Note: Map generated from Fort Ord cleanup documents

10000 0 10000 Feet

Pesticide Sampling
Fort Ord RI/FS 1995, Vol II - Remedial Investigation
Basewide Background Soil Investigation
BW-1283E

Table 1. Pyrotechnic Munitions Chemicals

Chemicals found in practice and pyrotechnic munitions [1] [2]

Aluminum	Copper powder	Potassium chromate
Ammonium chloride	Chlorinated rubber (Parlon)	Potassium chlorate
Ammonium perchlorate	Cupric oxide	Polyvinyl acetate
Amorphous boron	Cuprous chloride	Polyvinylchloride (PVC)
Antimony sulfide	Calcium silicide	Perchlorate
Antimony metal powder	Cellulose-nitrate-plastic	Potassium dichromate
Anthracene	Dichloromethane	Potassium perchlorate
Asphaltum	Gilsonite	Resin (laminac)
Barium nitrate	Graphite	Red phosphorous
Barium chromate	Hexachlorobenzene	Selenium
Barium chlorate	Hexachloroethane (HC)	Sodium oxalate
Barium peroxide	Iron oxide	Sodium bicarbonate
Barium sulfate	Infusorial earth	Stearic acid
Bismuth tetroxide	Lead dioxide	Strontium nitrate
Butyl rubber	Lithium peroxide	Strontium carbonate
Calcium resinate	Lithium perchlorate	Strontium nitrate
Calcium fluoride	Magnesium	Strontium peroxide
Carbon tetrachloride	Magnese dioxide	Shellac
Calcium metal	Mercurous chloride	Tellurium
Cobalt naphthenate	Polyisobutylene (vistanex)	Titanium
Copper carbonate	Potassium iodate	Tungsten
Zirconium hydride	Zinc stearate	White phosphorous
Polychlorotrifluoroethylene	Manganese	Magnesium aluminum
Lead monoxide	Lead chromate	Diatomaceous Earth
Saltpeter	Cupric Oxide	Charcoal
Calcium Resinate	Sulphur	Calcium Phosphide
Red Gum	Barium Oxalate	Adhesive, Dextrin
Dextrin	Ammonium Nitrate	Orange Shellac
Auramine Hydrochloride	Stearin	Arsenic Disulphide

Dyes

1-(2-Methoxyphenylazo)-2-Napthol Sudan Red G	4-Dimethylamino Azobenzene
1, 4 Dimethylamino Anthraquinone Fast Blue B	1, 4 Diphenyl Toluidino Anthraquinone
2-(4-Dimethylamino Phenylazo) Napthalene	1-Amino Anthraquinone Fast Red A1
Indanthrene Dye Golden Yellow GKAC	4-Methylamino Anthraquinone

[1] Book: Military Pyrotechnics, 1919; Henry B. Faber; Dean of Pyrotechnic Schools Ordnance Department U.S. Army
[2] Book: Military and Civilian Pyrotechnics, 1968; Dr. Herbert Ellern

Table 2. Pyrotechnic Munitions Chemicals

Chemicals found in practice and pyrotechnic munitions[1]

Color intensifiers
hexachloroethane (C2CI6)
hexachlorobenzene (C6CI6)
polyvinyl chloride
dechlorane (C1oCI12)
Infrared Flare Formulas
Silicon
Potassium nitrate (KNO3)
Cesium Nitrate (CsNO3)
Rubidium Nitrate (RbNO3)
Hexamethylene
tetra mine
Epoxy resin
Red-Green Flare System
Barium nitrate
Strontium nitrate 13
Potassium per chlorate
Magnesium
Dechlorane
Polyvinyl acetate resin
Smoke Agent Mixtures
White phosphorus
Sulfur trioxide
FS agent
HC mixture
FM agent
Crude oil
Igniter and Tracer Compositions
Strontium peroxide
Magnesium
1-136 Igniter
Calcium resinate
Barium peroxide
Zinc stearate
Toluidine red (identifier)
Strontium nitrate
Strontium oxalate
Potassium per chlorate
Polyvinyl chloride
Pyrophoric Metals
U Uranium
Th Thorium
Zr Zirconium
Hf Hafnium
Ce Cerium
La Lanthanum
Pr Praseodymium
Nd Neodymium
Sm Samarium
Y Yttrium
Ti Titanium
Colored smokes
Yellow: Auramine hydrochloride
Green: 1,4-Di-p-toluidinoanthraquinone with auramine hydrochloride
Red: 1-Methylanthraquinone
Currently used dyes:
Orange: 1-(4-Phenylazo)-2-naphthol
Yellow: N, N-Dimethyl-p-phenylazoaniline
Blue: 1,4-Diamylaminoanthraqdinone
Black Powders Used in Pyrotechnics
Potassium nitrate
Sodium nitrate
Charcoal
Coal (semibituminous)
Sulfur
Ignition Mixtures Components
Aluminum (powdered)
Ammonium dichromate
Asphaltum
Barium chromate
Barium peroxide
Boron (amorphous)
Calcium resinate
Charcoal
Diatomaceous earth
Specular Hematite / Barshot (Fe203) (Red)
Zirconium
Magnetite/Black Iron Oxide (Fe304)
Powder from READE (Black)
Potassium nitrate
Potassium perchlorate
Laminac
Magnesium (powdered)
Sodium nitrate
Nitrocellulose
Parlon (chlorinated rubber)Pb02 -
Paleo Bond Adhesive Pb304
Sr peroxide
Sugar
Superfloss
Titanium
Toluidine red toner
Vegetable oil
Vistanex (polyisobutylene)
Zinc Stearate

[1] Compiled from: Military Explosives (Chemistry) 30 September 1984; Chapter 10 Pyrotechnics

Table 3. Pyrotechnic Munitions Chemicals

Pyrotechnic munitions chemicals also used as Pesticides (23)

Chemical		CAS	Pesticide/Biocide/Repellant
Arsenic sulfide	12344-68-2	12612-21-4	Herbicide, Insecticide, Rodenticide
Ammonium Nitrate		6484-52-2	Microbiocide, Rodenticide
Ammonium Chloride		12125-02-9	Algaecide, Microbiocide
Anthracene		120-12-7	Herbicide, Insecticide, Rodenticide
Barium nitrate		10022-31-8	Repellant
Calcium phosphide		1305-99-3	Rodenticide
Carbon tetrachloride		56-23-5	Fumigant,
Cobalt naphthenate		61789-51-3	Fungicide, Insecticide
Copper powder		7440-50-8	Fungicide,
Copper carbonate		12069-69-1	Algaecide, Fungicide, Insecticide
Cupric oxide		1317-38-0	Fungicide, Insecticide
Cuprous chloride		7758-89-6	Fungicide
Dichloromethane		75-09-2	Dog and Cat Repellant
Diatomaceous Earth		61790-53-2	Insecticide, Molluscicide
Iron oxide		1309-37-1	Herbicide
Potassium chlorate		3811-04-9	Defoliant, Herbicide, Microbiocide
Saltpeter		7757-79-1	Microbiocide, Rodenticide
Sodium bicarbonate		144-55-8	Fungicide
Sodium oxalate		62-76-0	Microbiocide
Sulphur		7704-34-9	Fungicide, Insecticide
Stearic acid		57-11-4	Adjuvant
Naphthalene (smoke dye)		91-20-3	Insecticide, insect repellant
Anthraquinone (smoke dye) (found in 4 smoke dye formulas)		84-65-1	Bird Repellant

Note: May explain why training areas are devoid of a robust insect and bird population.

Pesticide Use Information Source:
Pesticide Action Network North America: www.pesticideinfo.org/Search_Chemicals.jsp

Table 4. Pesticides known to have been used at Fort Ord

(potentially used in all training areas)

48 Pesticides known as used at Fort Ord

Calcium Cyanide Gas	Mercury	DDT
DDD	DDE	2,4-D
Malathion	Chlordane	Dieldrin
Warfarin	Diazinon	Baygon
Altosid SR-10	Tordon 101	Hyvar X
Sevin (Carbyrl Dust)	1080	Diphacinone
Chlorophacinone	Zinc Phosphide	Endrin
Heptachlor Epoxide	Gamma-BHC	Derzan-T
Derzvan	Methyl Bromide	Cyntroid 3-EC
Pyrethrum	Permaguard	Ficam W
Gophercide	Diphacin	Weed-Rhap LY-4P
Monuron	Ded-Weed Silvex LV	Simazine
Aertex	Paraquat CL	Betasan
Trexsan	Amino Triazole	Amitrol-T
Diquat	Tok-E-25	Surflan
Enide	Metalde HTDE	Arochlor 1254
Banvel		

Note: Pesticides where applied to training areas for decades. Pesticides were applied by air and ground to manage pests (rodents, insects, fungi, and vegetation) the extent of which is unknown.

Former Fort Ord Pesticide Use; Research Documents:

Available at Fort Ord Administrative Record ; http://fortordcleanup.com/adminrec/arsearch.asp
enter record number, example: BW-0013

1) Fort Ord Installation Assessment 1983; BW-0013, pesticide types and uses
2) Fort Ord Base Closure Preliminary Assessment1990; BW-2427, pesticide types and uses
3) Fort Ord Literature review and Base Inventory Report Vol I, 1991; RI/FS BW-0136
4) Fort Ord Basewide Background Soil Investigation draft 1992; BW-0289
5) Fort Ord Basewide Background Soil Investigation draft final 1993; BW-0352
6) Fort Ord Basewide Background Soil Investigation final 1995; BW-1283E Basewide RI/FS
7) Fort Ord 2003 Burn ATSDR Health Consultation; OE-0522