

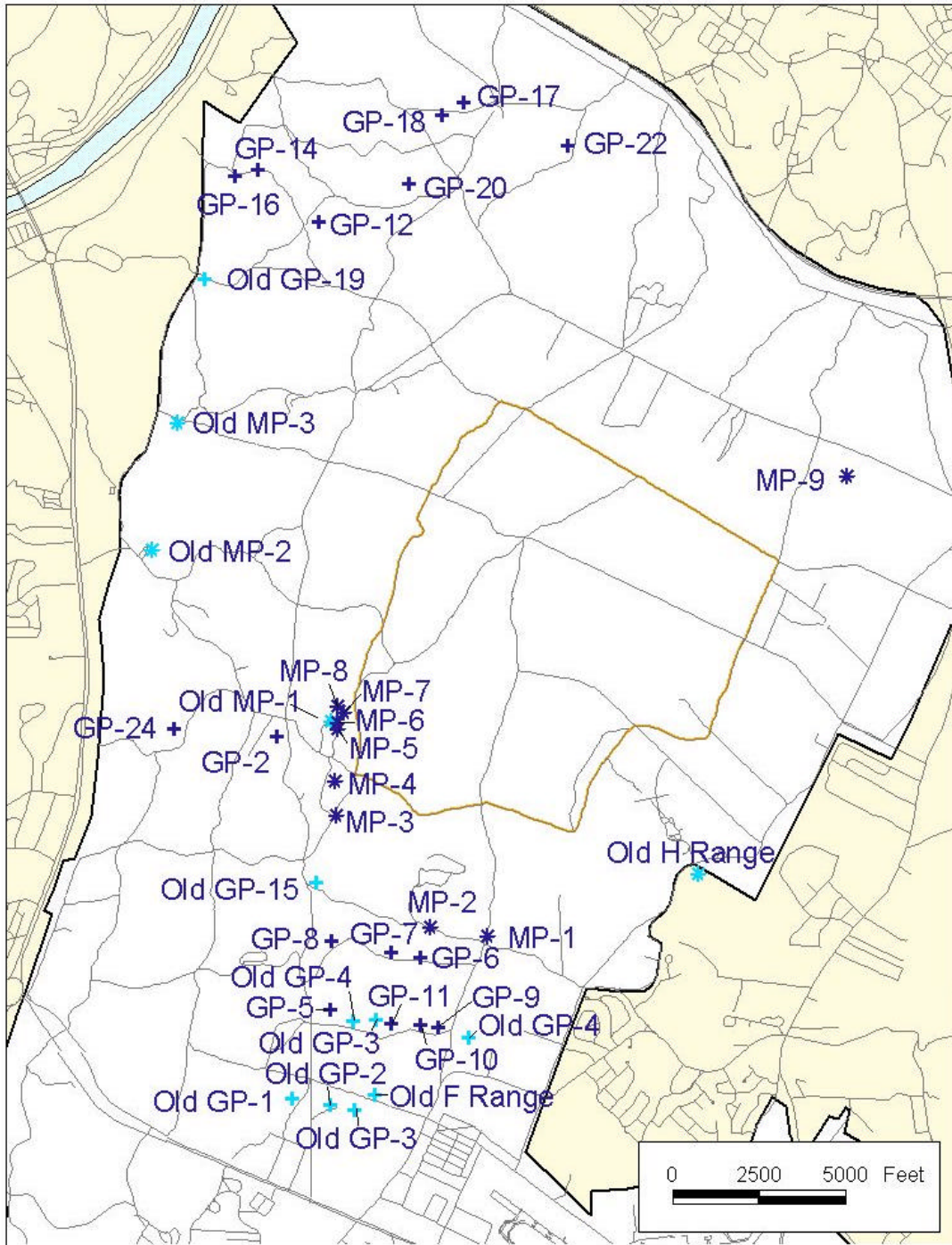
# SOIL AND GROUNDWATER RESULTS GUN AND MORTAR FIRING POSITIONS CAMP EDWARDS, MA



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# Specific Areas of Investigation



**LEGEND**

- + Formerly Active Gun Position
- \* Formerly Active Mortar Position
- + Formerly Inactive Gun Position
- \* Formerly Inactive Mortar Position
- ~ Impact Area Boundary

## Site Use

- 24 Gun Firing Positions:
  - 37mm, 40mm, 75mm, 90mm, 105mm and 155mm and 8-inch HE and inert rounds (HE discontinued in 1989)
- 13 Mortar Positions:
  - 40mm, 60mm, 81mm, 3-inch Stoke and 4.2-inch HE and inert rounds (discontinued in 1997)
- Propellant bags burned and allegedly buried
- Solvents allegedly used to clean artillery barrels

# Investigations

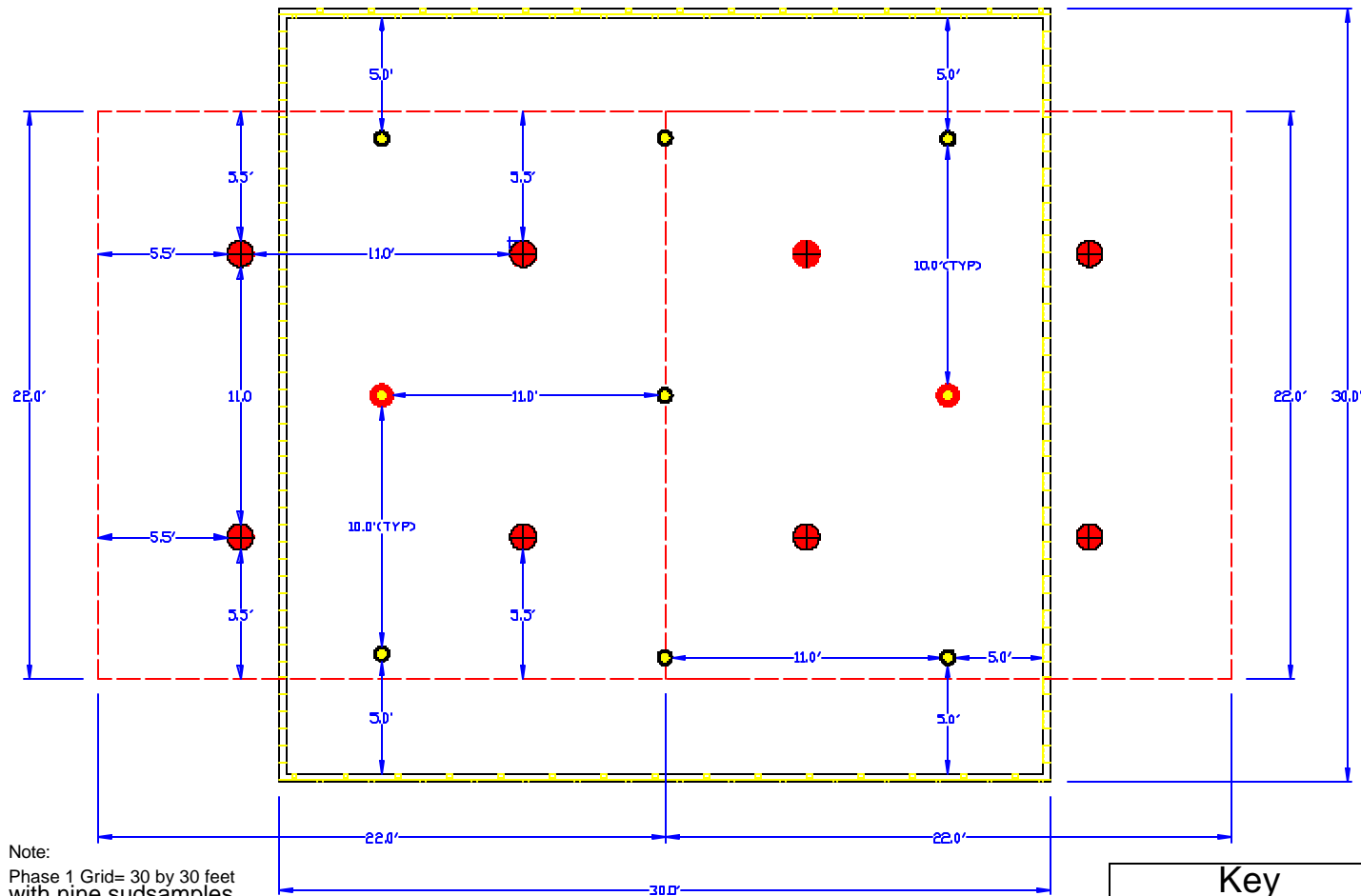
## Phase I

- Soil grid sampling at 3 Gun Positions and 4 Mortar Positions
- 30' x 30' grids with 9 evenly spaced subsamples
- Grids placed near access road and downwind and downrange from firing position

## Phase II(a)

- Soil grid sampling at remaining G&M Positions
- 22' x 22' grids with 5 evenly spaced subsamples
- Groundwater sampling at 4 Gun and 4 Mortar Positions

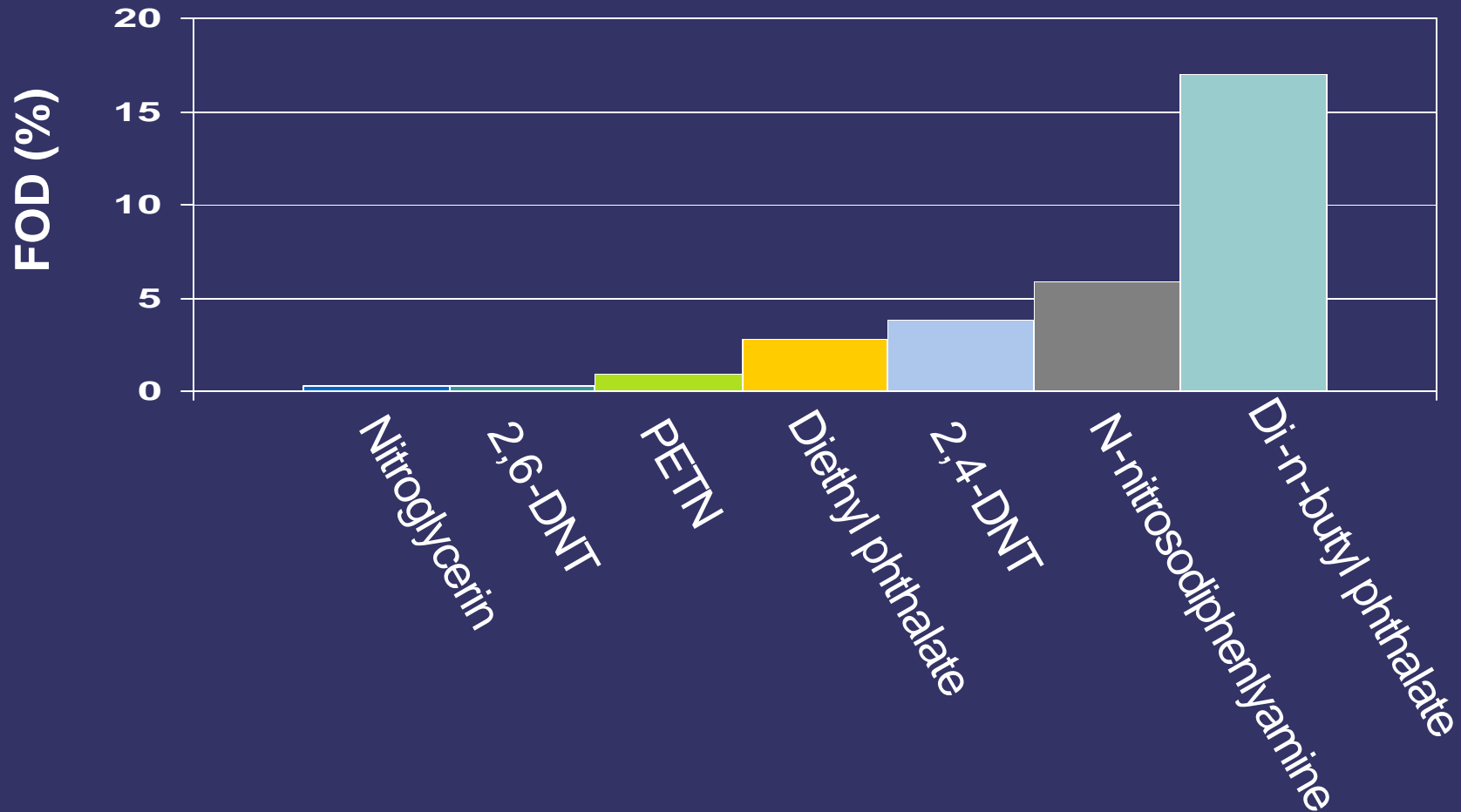
# Composite Sampling Grid Layout



Note:  
 Phase I Grid= 30 by 30 feet  
 with nine subsamples  
 Phase II(a) Grid= 22 by 22 feet  
 with five subsamples

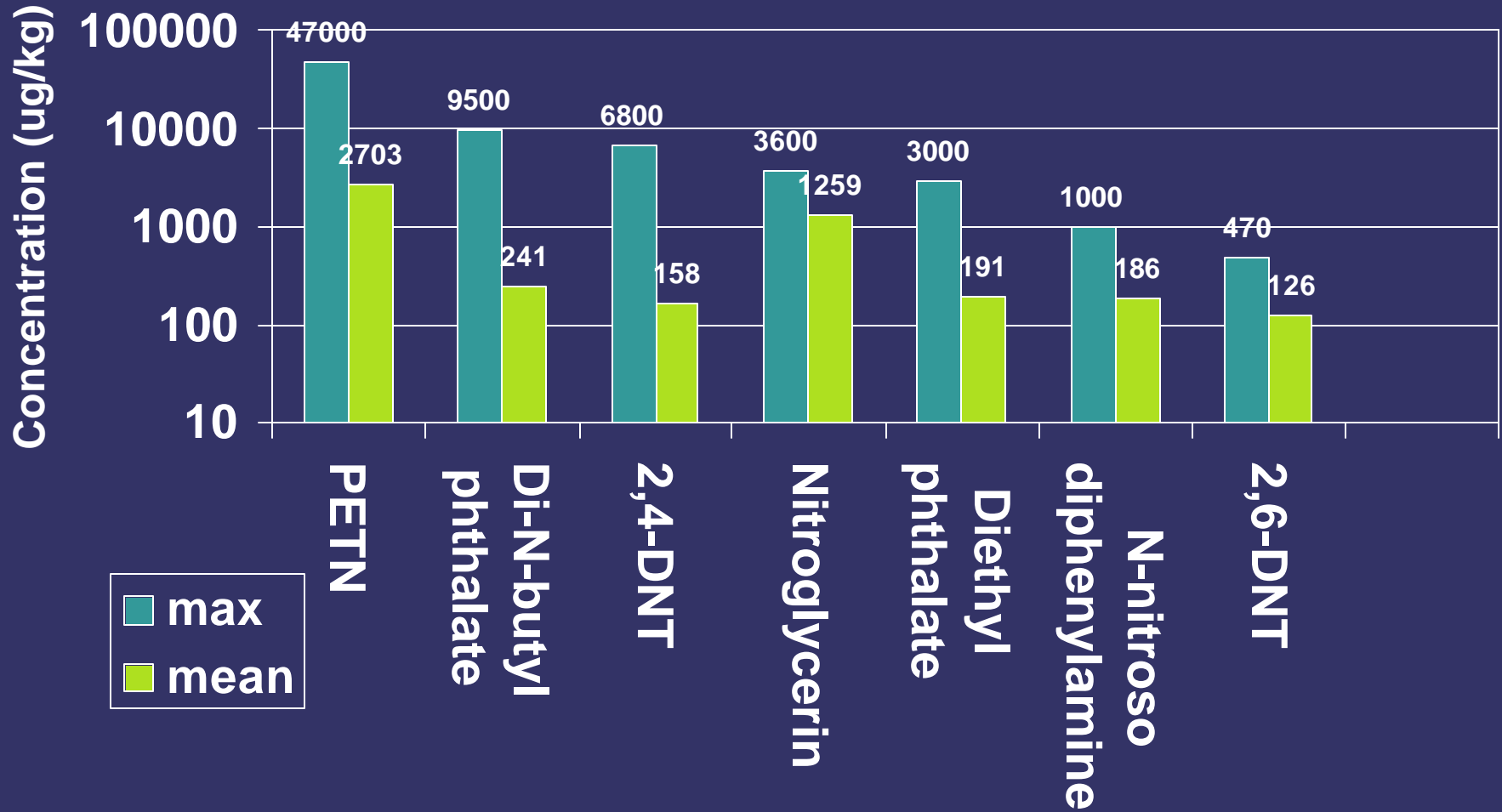
Key	
	Phase II(a) Subsample
	Phase I Subsample

# Propellant, Explosive and Pyrotechnic Compounds in Soil - Frequency of Detection



# PEP Compounds in Soil

## Maximum and Mean Concentrations



## Dinitrotoluenes in Soil

### 2,4-DNT

- Detected in 4% of all samples collected
- Detected at 15 of 37 investigated positions
- 29 of 49 detections were from < 1 ft
- Max. = 6,800 ug/kg; mean = 158 ug/kg

### 2,6-DNT

- Detected in 1% of all samples collected
- Detected at 8 of 37 investigated positions
- Detected with 2,4-DNT at most locations
- Max. = 470 ug/kg; mean = 1 ug/kg



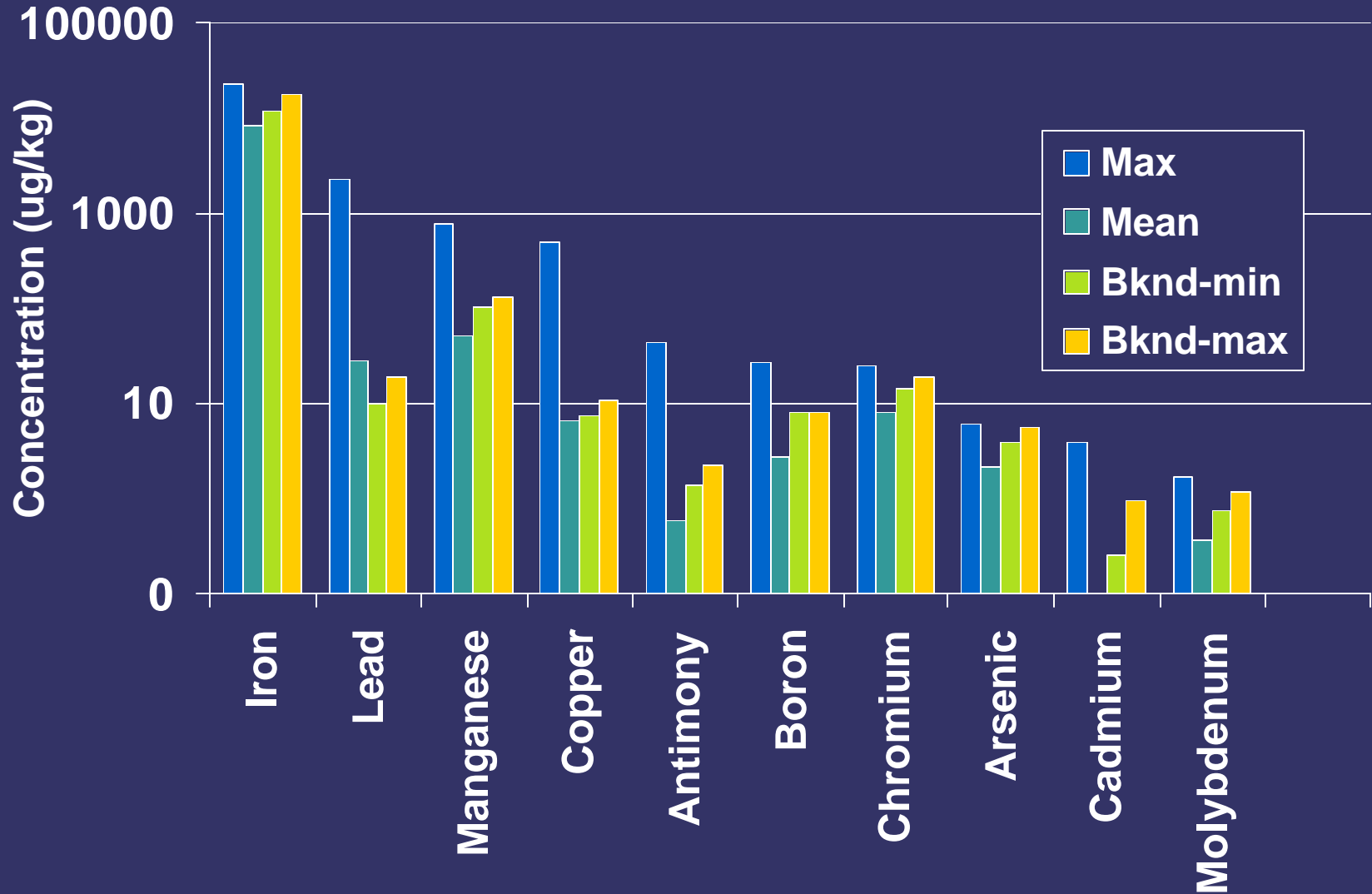
## VOCs in Soil

- 11 VOC compounds
- Maximum concentration less than 10 ug/kg for all compounds except acetone (1300 J ug/kg) and MEK (39 ug/kg)
- Most likely laboratory or field artifacts

## SVOCs in Soil

- 17 PAHs, BEHP
- Likely attributable to burning of vegetation and/or propellants

# Metals in Soil



## Pesticides in Soil

- DDT and DDE detected in soil samples and in control samples at approximately the same frequency
- Dieldren detected in 16 % (97 of 610) of soil samples; not detected in control samples
- Several other pesticides sporadically detected at concentrations below 50 ug/kg

## Herbicides in Soil

- Six herbicides sporadically detected at concentrations below 20 ug/kg but not detected in control samples (2,4-DB, 2,4,5-T, acifluorfen, DCPA, dicamba and picloram)
- Initial false positives for MCPP and MCPA; refinement of laboratory technique resulted in non-detect

## Groundwater Findings

- 20 monitoring wells placed at 8 of most heavily used G&M sites
- No PEP compounds or pesticides/herbicides detected in any G&M well
- Perchlorate detected above EPA MMR Relevant Standard at GP-16.
- VOCs: chloroform (ubiquitous) and toluene (artifact)
- SVOCs: BEHP and diethyl phthalate (not reproducible)
- Metals above background: barium, calcium, chromium, iron, magnesium, and potassium

## Conclusions - Gun and Mortar Positions

- Propellants, PAHs, metals and pesticides/herbicides in shallow soil consistent with training activities
- No evidence of propellant, metal, PAHs, and/or pesticides/herbicides impacts to groundwater
- No explosives detected in soil
- Perchlorate, dioxins, furans may be an issue



## Next Steps

- Soil sampling for perchlorate, dioxin/furans
- Investigation of potential propellant bag burial using GPR
- Further evaluation of perchlorate in groundwater at GP-16
- Delineation of propellants (DNT) and dieldren, possibly perchlorate, dioxin/furans, PAHs and metals
- Remediation of impacted soil

