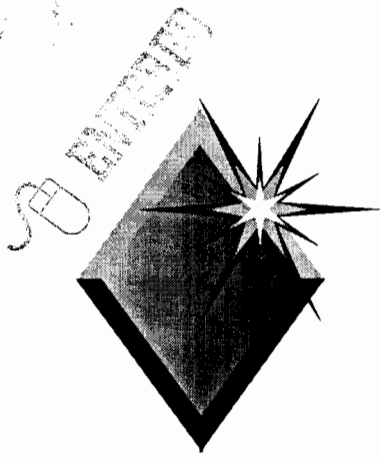


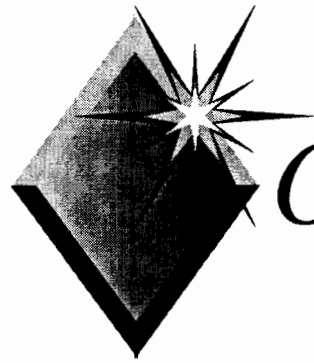
5/1/967,



# *KIRTLAND AFB*

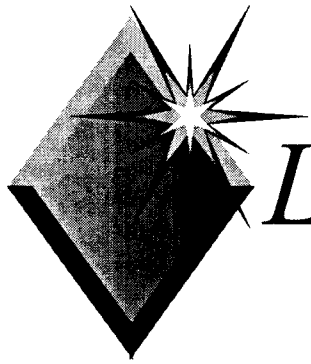
SS

## Proposed Investigation Activities Appendix I Sites



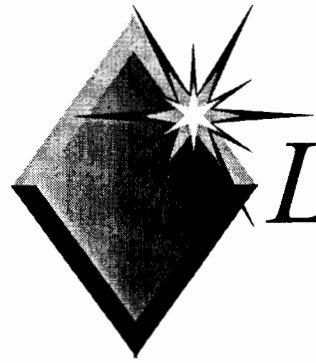
## *Objectives*

- ◆ Determine Nature and Extent
- ◆ Support Risk Assessment
- ◆ Support Potential RA
- ◆ Support Potential CMS/No Further Action
- ◆ Address EPA's Vertical Extent NOD



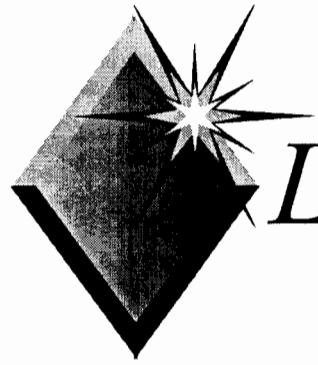
## *LF-01, Landfill 1*

- ◆ Geophysical Survey (2 Acres)
- ◆ 7 Boreholes
  - ◆ Adjacent to potential trenches
  - ◆ Next to soil gas points
  - ◆ 120' Depth
  - ◆ 5 samples per borehole, below landfill (30')
- ◆ Geotechnical Samples (20)
- ◆ Topographic Survey (1' contours)



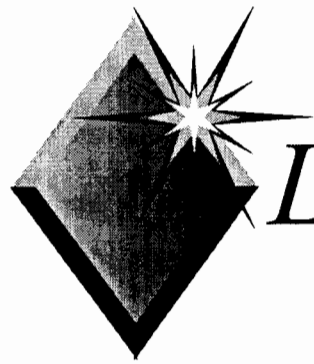
## *LF-01, Landfill 1 (con't)*

- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ VOC, SVOC, TAL Metals, Herbicides, Pesticides, PCBs
  - ◆ Field Screening
    - ◆ Gross Alpha/Beta Activity, Methane
  - ◆ Geotechnical
    - ◆ Grain Size, Atterberg Limits, Soil Moisture, Max. Dry Density



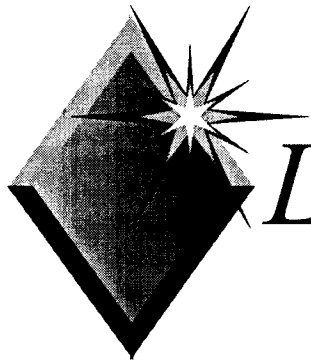
## *LF-01, Landfill 1 (con't)*

- ◆ Long Term Groundwater Monitoring
  - ◆ Hydrogeologic Gradient - Northeast
  - ◆ Upgradient Well - 0113
  - ◆ Downgradient Wells - 0111, 0114, 0115
  - ◆ Chemical Parameters
    - ◆ Groundwater Quality Parameters
    - ◆ Indicator Parameters
    - ◆ Appendix III Parameters, VOCs



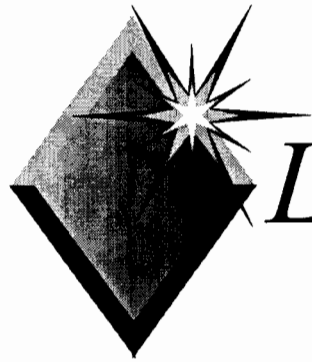
## *LF-02, Landfill 2*

- ◆ Geophysical Survey (5 Acres)
- ◆ 5 Boreholes
  - ◆ Adjacent to potential trenches
  - ◆ Next to soil gas points
  - ◆ 120' Depth
  - ◆ 5 samples per borehole, below landfill (20')
- ◆ Geotechnical Samples (20)
- ◆ Topographic Survey (1' contours)



## *LF-02, Landfill 2 (con't)*

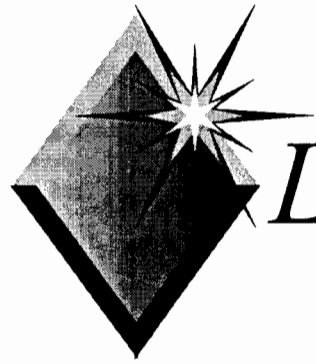
- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ VOC, SVOC, TAL Metals, Herbicides, Pesticides, PCBs
  - ◆ Field Screening
    - ◆ Gross Alpha/Beta Activity, Methane
  - ◆ Geotechnical
    - ◆ Grain Size, Atterberg Limits, Soil Moisture, Max. Dry Density



## *LF-02, Landfill 2 (con't)*

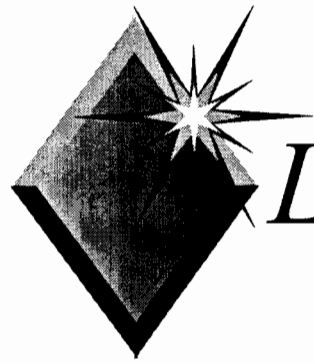
- ◆ Long Term Groundwater Monitoring
  - ◆ Hydrogeologic Gradient - Northwest
  - ◆ Upgradient Well - 0215
  - ◆ Downgradient Wells - 0214, 0216, 0218
  - ◆ Chemical Parameters
    - ◆ Groundwater Quality Parameters
    - ◆ Indicator Parameters
    - ◆ Appendix III Parameters, VOCs





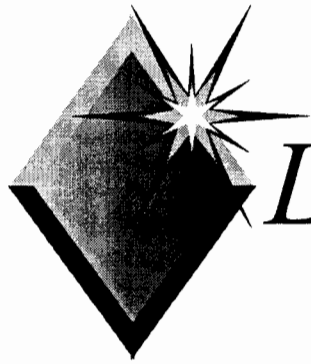
## *LF-07, Landfill 3*

- ◆ Geophysical Survey (entire site)
- ◆ 2 Boreholes
  - ◆ Adjacent to potential trenches
  - ◆ 120' Depth
  - ◆ 5 samples per borehole, below landfill (30')
- ◆ Geotechnical Samples (8)
- ◆ Topographic Survey (1' contours)



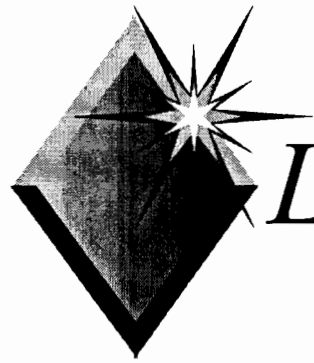
## *LF-07, Landfill 3 (con't)*

- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ VOC, SVOC, TAL Metals, Herbicides, Pesticides, PCBs
  - ◆ Field Screening
    - ◆ Gross Alpha/Beta Activity, Methane
  - ◆ Geotechnical
    - ◆ Grain Size, Atterberg Limits, Soil Moisture, Max. Dry Density



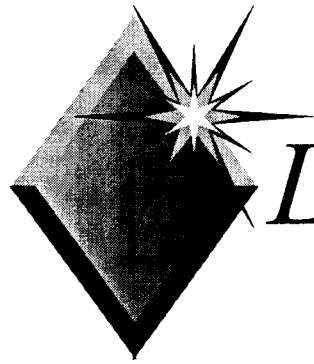
## *LF-08, Landfills 4, 5, 6*

- ◆ 7 Boreholes
  - ◆ Near soil gas points
  - ◆ Near geophysical anomalies
  - ◆ 150' Depth
  - ◆ 5 samples per borehole, below landfill (40')
- ◆ Geotechnical Samples (20)
- ◆ Topographic Survey (1' contours)



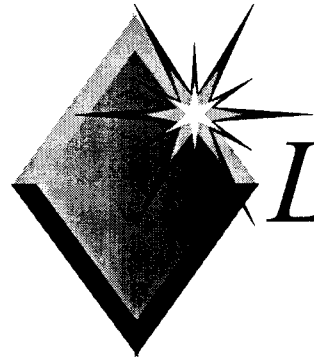
## *LF-08, Landfills 4, 5, 6 (con't)*

- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ VOC, SVOC, TAL Metals, Herbicides, Pesticides, PCBs
  - ◆ Field Screening
    - ◆ Gross Alpha/Beta Activity, Methane
  - ◆ Geotechnical
    - ◆ Grain Size, Atterberg Limits, Soil Moisture, Max. Dry Density



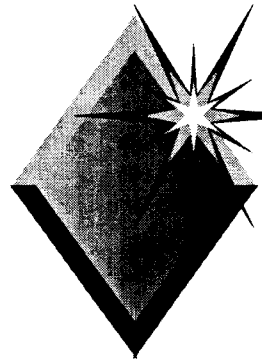
## *LF-08, Landfills 4, 5, 6 (con't)*

- ◆ Long Term Groundwater Monitoring
  - ◆ Hydrogeologic Gradient - Northwest
  - ◆ Upgradient Well - 0310
  - ◆ Downgradient Wells - 0307, 0308, 0309, 0311, TJA-2
- ◆ Chemical Parameters
  - ◆ Table I, Appendix A, EIB/SWMR-4
    - ◆ General Water Chemistry, Total Metals, PAHs, VOCs, PCBs, Radium 226/228
  - ◆ Other LTM Program Requirements
    - ◆ Pest., Herb., Gross Alpha/Beta, Coliform Bacteria



## *LF-09, Abandoned Landfill*

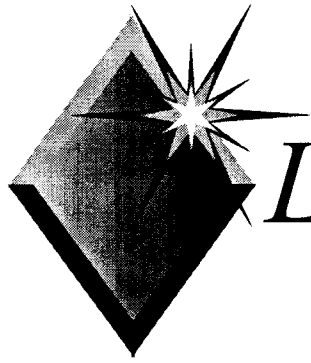
- ◆ Geophysical Survey (10 Acres)
- ◆ 6 Boreholes
  - ◆ To determine if waste activities occurred
  - ◆ Located based on geophysical survey
  - ◆ 40' Deep



# *LF-09, Abandoned Landfill*

## *(con't)*

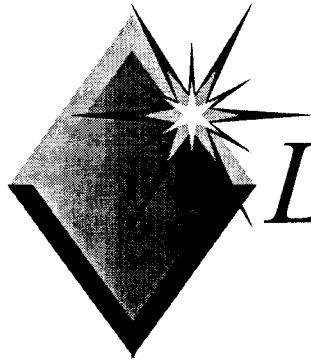
- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ VOC, SVOC, TAL Metals, Herbicides, Pesticides, PCBs
  - ◆ Field Screening
    - ◆ Gross Alpha/Beta Activity, Methane
  - ◆ Geotechnical
    - ◆ Grain Size, Atterberg Limits, Soil Moisture, Max. Dry Density



## *LF-15, Landfill B*

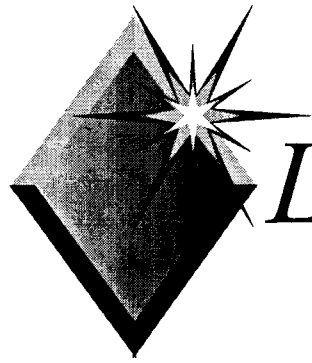
- ◆ Geophysical Survey (entire site)
- ◆ 2 Boreholes
  - ◆ Adjacent to potential trenches
  - ◆ 120' Depth
  - ◆ 5 samples per borehole, below landfill (10')
- ◆ Geotechnical Samples (2)
- ◆ Topographic Survey (1' contours)





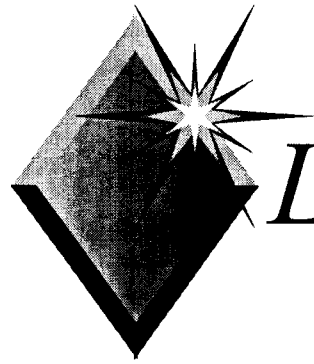
## *LF-15, Landfill B (con't)*

- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ VOC, SVOC, TAL Metals, Herbicides, Pesticides, PCBs
  - ◆ Field Screening
    - ◆ Gross Alpha/Beta Activity, Methane
  - ◆ Geotechnical
    - ◆ Grain Size, Atterberg Limits, Soil Moisture, Max. Dry Density



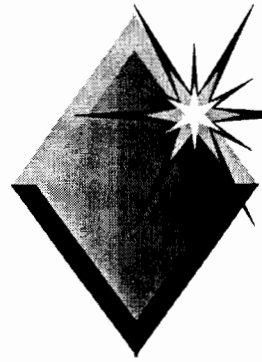
## *LF-18, Landfill A*

- ◆ Geophysical Survey (entire site)
- ◆ 5' Deep Test Pit
  - ◆ Video record of activities
  - ◆ 150' Length



## *LF-20, Manzano Landfill*

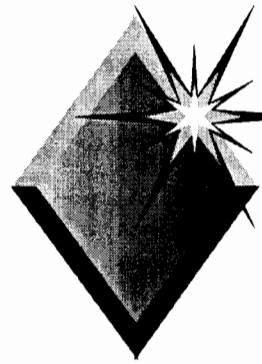
- ◆ Geophysical Survey (entire site)
- ◆ 2 Boreholes
  - ◆ Adjacent to potential trenches
  - ◆ 100' Depth
  - ◆ 4 samples per borehole, below landfill
- ◆ Geotechnical Samples (2)
- ◆ Soil Gas Survey (20 points)
- ◆ Topographic Survey (1' contours)



# *LF-20, Manzano Landfill*

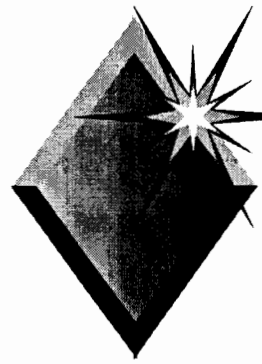
## *(con't)*

- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ VOC, SVOC, TAL Metals, Herbicides, Pesticides, PCBs
  - ◆ Field Screening
    - ◆ Gross Alpha/Beta Activity, Methane
  - ◆ Geotechnical
    - ◆ Grain Size, Atterberg Limits, Soil Moisture, Max. Dry Density



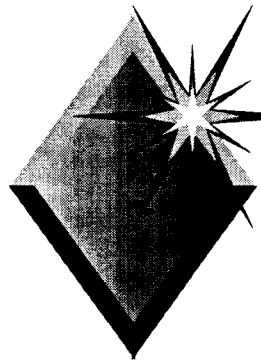
## *LF-44, Fill Area Southeast of the Sewage Lagoons*

- ◆ Geophysical Survey (entire site)
- ◆ 4 Boreholes
  - ◆ Adjacent to potential trenches
  - ◆ 40' Depth
  - ◆ Sampled at 5' intervals, 2 samples per borehole analyzed
- ◆ Topographic Survey (1' contours)



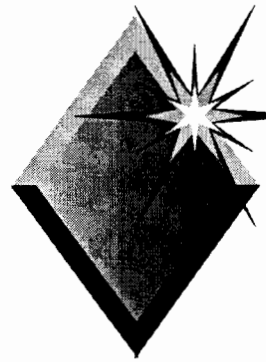
## *LF-44, Fill Area Southeast of the Sewage Lagoons (con't)*

- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ VOC, SVOC, TAL Metals, Herbicides, Pesticides, PCBs
  - ◆ Field Screening
    - ◆ Gross Alpha/Beta Activity, Methane, VOC Headspace



# *LF-45, Explosive Test Site/ Unnamed Dump*

- ◆ Geophysical Survey (entire site)
- ◆ 1 Borehole
  - ◆ Located in center of pit
  - ◆ 25' Depth
  - ◆ Sampled at 5' intervals, all analyzed

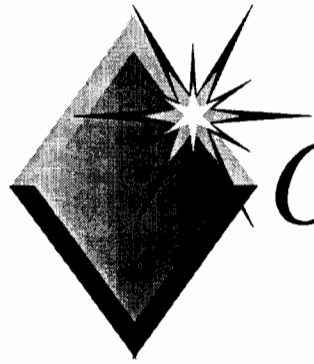


## *LF-45, Explosive Test*

### *Site/Unnamed Dump (con't)*

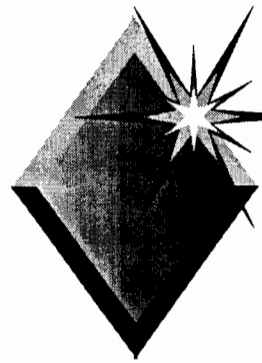
- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ TAL Metals
    - ◆ Explosives





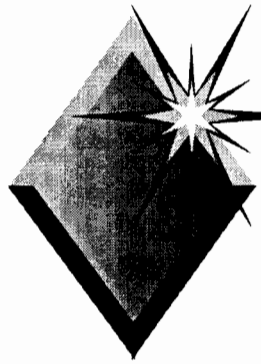
## *OT-28, McCormick Ranch*

- ◆ Two Monitoring Wells
  - ◆ Downhole Geophysics
  - ◆ 500' Depth (max)
  - ◆ One round of sampling for Nitrates
- ◆ Surface Soil Samples
  - ◆ 25 sections with 20 subsections
  - ◆ 1 Sample from a subsection within each section will be analyzed
- ◆ Topographic Survey (10' contours)



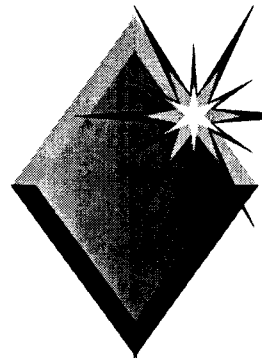
# *OT-28, McCormick Ranch* *(con't)*

- ◆ Surface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ TAL Metals, Herbicides, Pesticides, Explosives, TRPH
- ◆ Groundwater Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ Nitrates, Explosives, Metals



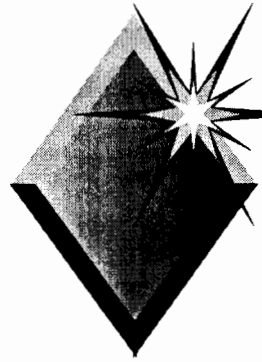
## *OT-28, McCormick Ranch* *(con't)*

- ◆ Long Term Groundwater Monitoring
  - ◆ Hydrogeologic Gradient - Northeast
  - ◆ Upgradient Well - 1002
  - ◆ Downgradient Wells - 1004, 1005, 1007
  - ◆ Chemical Parameters
    - ◆ Groundwater Quality Parameters
    - ◆ Indicator Parameters
    - ◆ Appendix III Parameters, Explosives



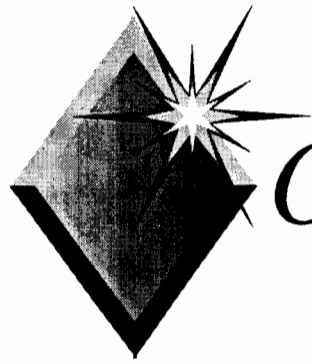
## *OT-29, Explosives Ordinance Disposal Range*

- ◆ 1 Borehole
  - ◆ Located in center of pit
  - ◆ 60' Deep
  - ◆ Sampled at 5' intervals, 2 samples per borehole analyzed
- ◆ Soil Gas Survey (20 points)



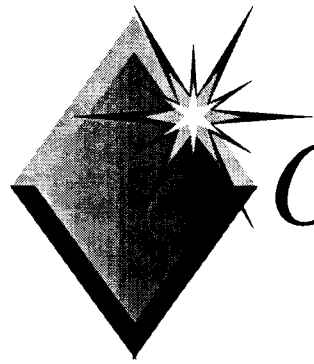
# *OT-29, Explosives Ordinance Disposal Range (con't)*

- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ VOC, SVOC, TAL Metals, Explosives, TRPH
  - ◆ Field Screening
    - ◆ TRPH Immunoassay



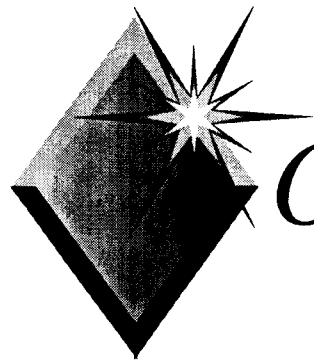
## *OT-46, Lake Christian*

- ◆ Sediment Samples
  - ◆ 4 Samples, 1 from 4 quadrants
  - ◆ No more than 100' apart
  - ◆ Optional soil samples at 1', 5' and 10', under each sediment sample
- ◆ Surface Water Samples (2)
- ◆ 1 Monitoring Well
  - ◆ 120' Deep
  - ◆ Downgradient



## *OT-46, Lake Christian (con't)*

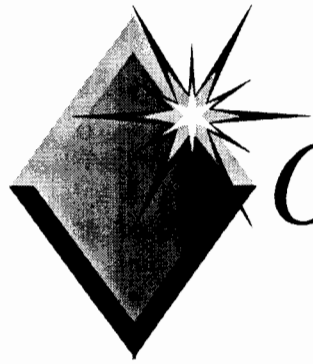
- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters (VOC, SVOC, TAL Metals, Herbicides, Pesticides, PCBs, Explosives)
  - ◆ Field Screening (Gross Alpha/Beta Activity)
- ◆ Groundwater Sampling Requirements
  - ◆ Chemical Parameters (Nitrates, TAL Metals, Pesticides, Explosives)



## *OT-46, Lake Christian (con't)*

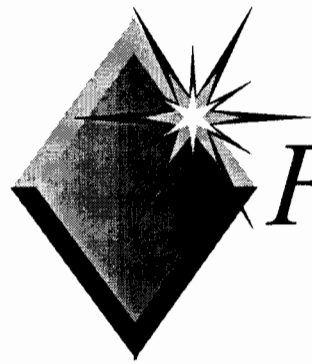
- ◆ Surface Water Sample Requirements
  - ◆ Chemical Parameters (TAL Metals, Herbicides, Pesticides, PCBs, Explosives)
  - ◆ Field Screening (Gross Alpha/Beta Activity)





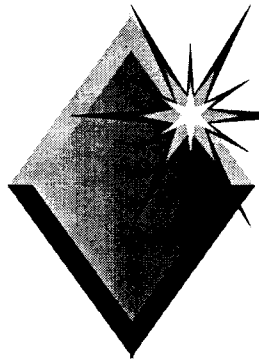
## *OT-46, Lake Christian (con't)*

- ◆ Long Term Groundwater Monitoring
  - ◆ Hydrogeologic Gradient - Southwest
  - ◆ Sample Well 1903
  - ◆ Chemical Parameters
    - ◆ Groundwater Quality Parameters
    - ◆ Indicator Parameters
    - ◆ Appendix III Parameters, Heptachlorepoide by SW 8080



## *FT-13, Fire Training Area*

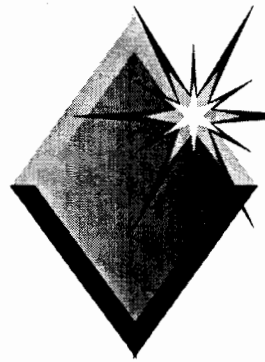
- ◆ 5 Boreholes
  - ◆ 2 located inside concrete pad area, 60' Deep
  - ◆ Sampled at 5' intervals, 2 samples per borehole analyzed
- ◆ Additional 12 Hand Augered Boreholes
  - ◆ Sampled at 0-6" and 6-8'
  - ◆ For additional soil characterization
- ◆ Soil Gas Survey (20 points)
- ◆ Geotechnical Samples (10)



# *FT-13, Fire Training Area*

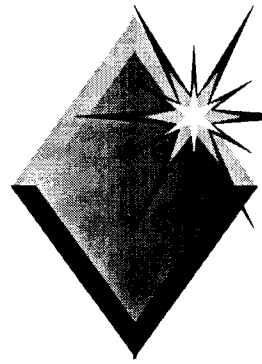
## *(con't)*

- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters (VOC, SVOC, TAL Metals)
  - ◆ Field Screening (VOC Headspace, pH)
  - ◆ Geotechnical (Soil Moisture)



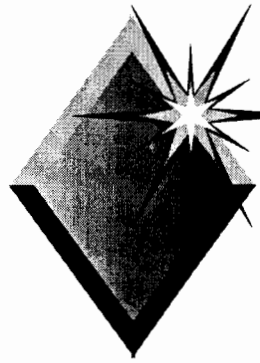
## *FT-13, Fire Training Area (con't)*

- ◆ Surface and Hand Auger Sampling Requirements
  - ◆ Chemical Parameters (VOC, SVOC, TAL Metals )
  - ◆ Field Screening (pH)
  - ◆ Geotechnical (Soil Moisture)



## *WP-16, Manzano Sewage Treatment Facility*

- ◆ 8 Boreholes
  - ◆ 10' Depth, if needed
  - ◆ 1 at each lagoon, 2 at the Imhoff tank, 2 at the sludge drying beds
  - ◆ Special decision logic
  - ◆ 1 sample analyzed per borehole
- ◆ Surface Soil Samples (8)
- ◆ Topographic Survey (1' contours)



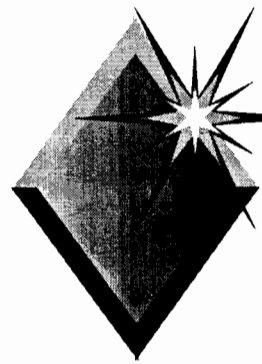
## *WP-16, Manzano Sewage Treatment Facility (con't)*

- ◆ Subsurface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ VOC, SVOC, TAL Metals, Pesticides, PCBs
  - ◆ Field Screening
    - ◆ Headspace
- ◆ Surface Soil Sampling Requirements
  - ◆ Chemical Parameters
    - ◆ VOC, SVOC, TAL Metals, Pesticides, PCBs



# *Long-Term Groundwater Monitoring*

- ◆ Voluntary collection of baseline groundwater data
- ◆ Eventual use: post-closure monitoring
- ◆ Conforms to 40 CFR 265.94 and EIB/SWMR-4, Part VIII
- ◆ Determine facility's impact on the quality of groundwater in the uppermost aquifer underlying the site



# *Long-Term Groundwater Monitoring (con't)*

## ◆ Monitor Six Sites

◆ Landfill 1 (LF-01)

◆ Landfill 2 (LF-02)

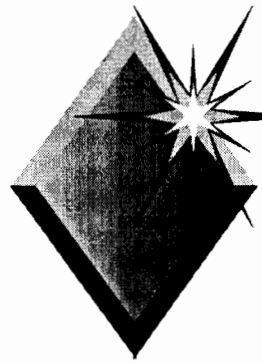
◆ Landfills 4, 5, and 6 (LF-08)

◆ McCormick Ranch (OT-28)

◆ Lake Christian (OT-46)

◆ Kirtland AFB Well 0902 (Tijeras Arroyo)

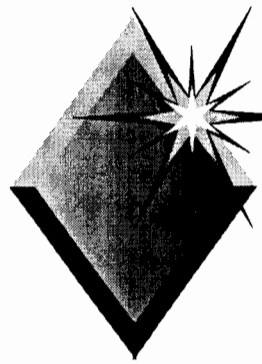




# *Long-Term Groundwater Monitoring (con't)*

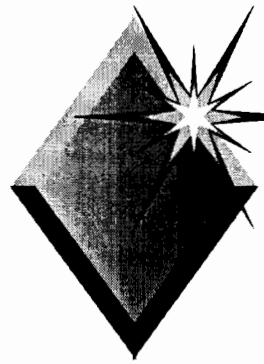
## ◆ General Approach

- ◆ Dedicated poly tank at each well to contain purge water
- ◆ Dedicated low-flow sampling pump in each well
- ◆ Broad suite of contaminants to be analyzed for the first year of monitoring



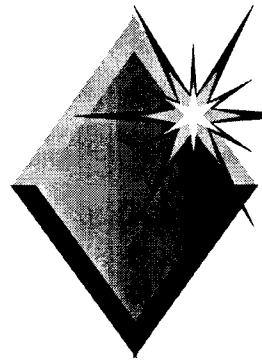
# *Long-Term Groundwater Monitoring (con't)*

- ◆ General Approach (con't)
  - ◆ Propose reduced suite of contaminants on the basis of data trends from first four quarters
  - ◆ Propose reduced frequency of monitoring on the basis of data trends



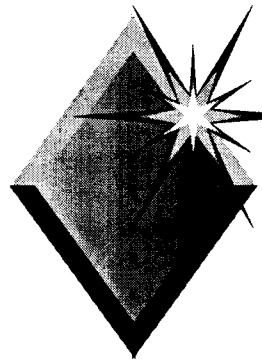
## *Long-Term Groundwater Monitoring (con't)*

- ◆ Analytical Suite for LF-01, LF-02, OT-28, OT-46, and Well 0902
  - ◆ Adheres to groundwater monitoring requirements in 40 CFR 265.92
  - ◆ Groundwater Quality Parameters: chloride, iron, manganese, phenols, sodium, and sulfate
  - ◆ Contaminant Indicator Parameters: specific conductance, total organic carbon, and total organic halogen



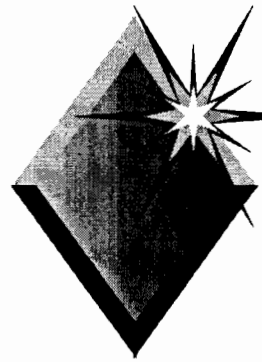
## *Long-Term Groundwater Monitoring (con't)*

- ◆ Analytical Suite for LF-01, LF-02, OT-28, OT-46, and Well 0902 (con't)
  - ◆ Part 265, Appendix III Parameters: RCRA Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), fluoride, nitrate as N, pesticides (endrin, lindane methoxychlor, toxaphene), herbicides (2, 4-D and 2,4,5-TP Silvex), radioactivity (radium, gross alpha, gross beta), coliform bacteria
  - ◆ Volatile organic compounds (VOCs)



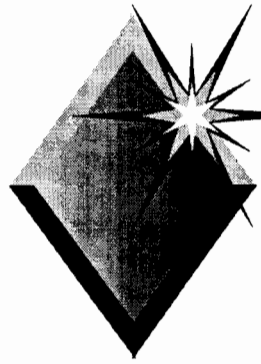
# *Long-Term Groundwater Monitoring (con't)*

- ◆ Analytical Suite for LF-08
  - ◆ Landfill was closed after May 14, 1989
  - ◆ Adheres to groundwater monitoring requirements in Table 1, Appendix A, EIB/SWMR-4
  - ◆ General Water Chemistry Parameters:  
temperature, pH, specific conductance, TDS,  
TOC, TKN, nitrate + nitrite, total nitrogen,  
ammonia, bicarbonate, carbonate, chloride,  
cyanide, fluoride, phenols, potassium, sodium,  
and sulfate



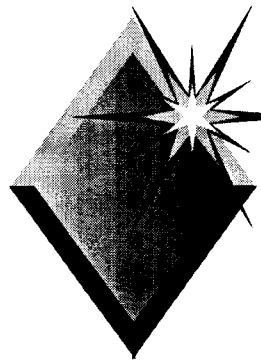
# *Long-Term Groundwater Monitoring (con't)*

- ◆ Analytical Suite for LF-08 (con't)
  - ◆ Total Metals: aluminum, antimony, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, and zinc



# *Long-Term Groundwater Monitoring (con't)*

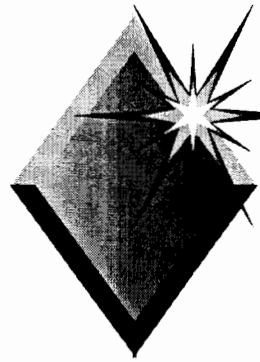
- ◆ Analytical Suite for LF-08 (con't)
  - ◆ Polynuclear Aromatic Hydrocarbons (PAHs), VOCs, PCBs, Radium 226/Radium 228
  - ◆ Pesticides (endrin, lindane methoxychlor, toxaphene), herbicides (2, 4-D and 2,4,5-TP Silvex), Gross alpha and beta radioactivity, and coliform bacteria



# *Long-Term Groundwater Monitoring (con't)*

- ◆ Compliance at LF-08
  - ◆ Point of Compliance represented by line of downgradient wells (0307, 0308, 0309, and 0311)
  - ◆ Background concentrations determined after statistical analyses of five independent sampling events (four quarterly events + an out-of-cycle event between Quarter 1 and Quarter 2)





# *Long-Term Groundwater Monitoring (con't)*

- ◆ Compliance at LF-08 (con't)
  - ◆ Analytical data will be compared with Assessment Monitoring Levels (AMLs) and Corrective Action Levels (CALs), which will be established on the basis New Mexico WQCC or Safe Drinking Water Act groundwater protection standards