NOTICE

All drawings located at the end of the document.

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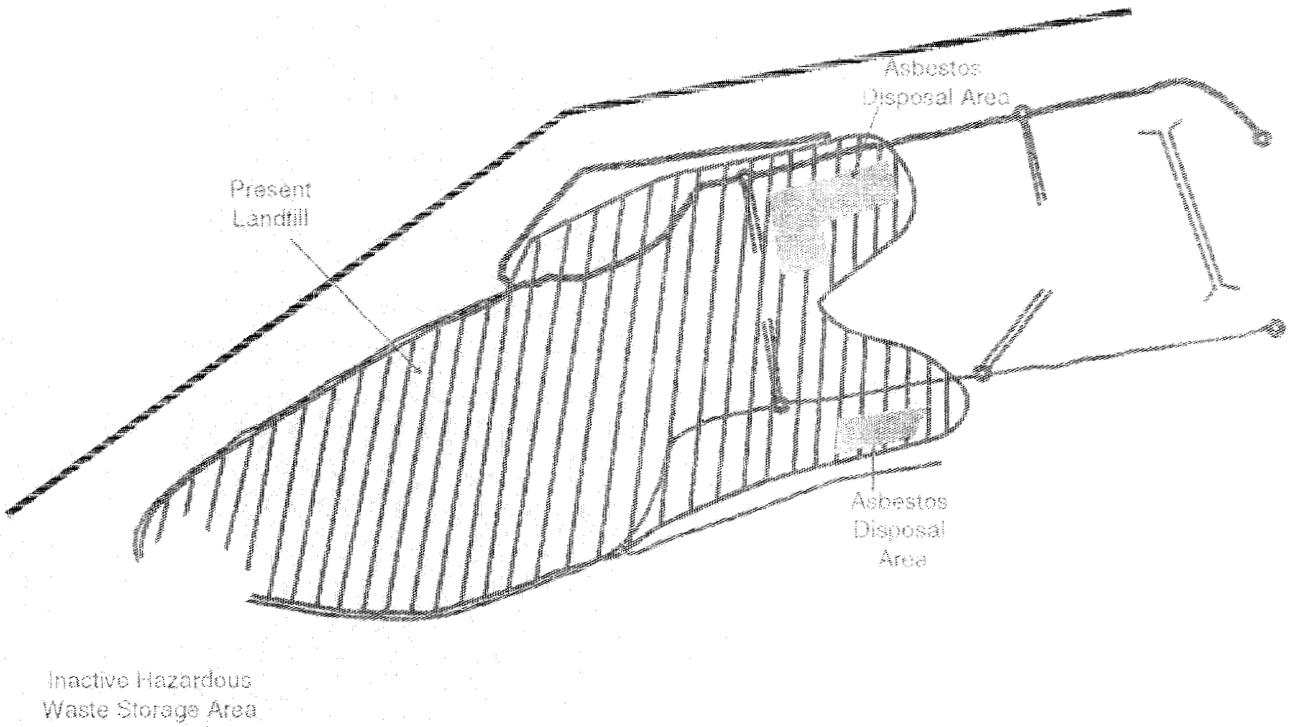
Proposed Closure Strategy for Operable Unit No. 7



U.S. Department of Energy

Rocky Flats Environmental Technology Site
Golden, Colorado

ADMIN RECORD

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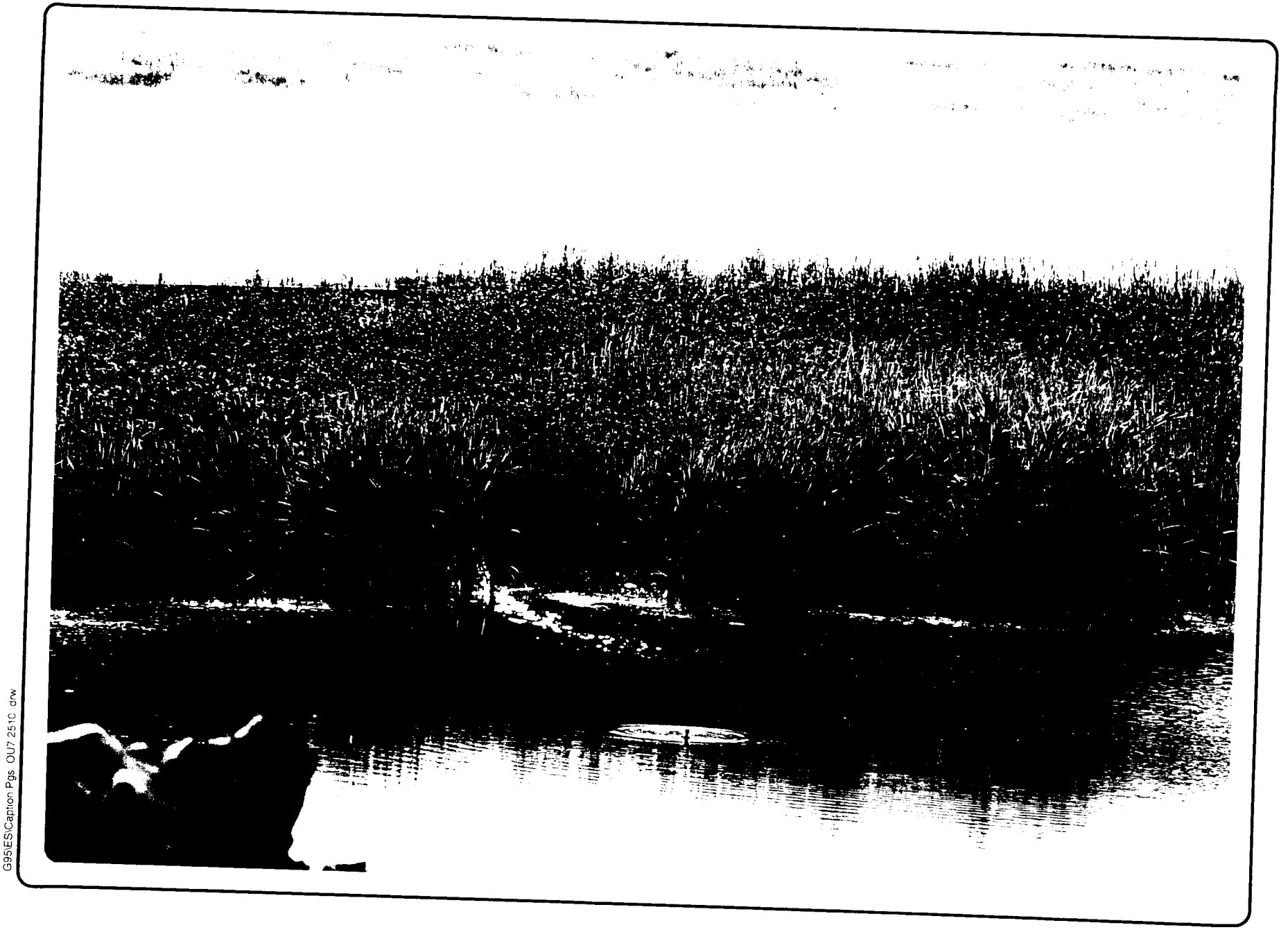
East Landfill Pond at Operable Unit No. 7 (June 1991)



Tall Marsh in Wetlands Around East Landfill Pond (October 1991)

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OU 7 PROPOSED CLOSURE STRATEGY FACT SHEETS

LANDFILL SOURCE AREA

Present Landfill (IHSS 114) - Disposal

- Operational from 1968 to present
- WSIC (1968-1986) 30% hazardous waste streams
- WSRIC (1989-present) 0% hazardous waste streams
- Volume is 415,000 cy landfill / 290,000 cy waste, volume at closure will be 506,000 cy
- Thickness of waste is 1 to 40 feet
- Eastward landfill expansion occurred from 1977 to 1981

Present Landfill (IHSS 114) - Hydrogeology

- Lithology of the landfill is 70% waste and 30% interim soil cover
- Hydraulic conductivity of landfill waste ranges from 10^{-4} to 10^{5} cm/sec
- Lithologies beneath landfill are claystones and siltstones of the Laramie Formation
- Hydraulic conductivity of bedrock ranges from 10^{6} to 10^{7} cm/sec
- Depth to water is 15 to 30 feet, maximum thickness of saturated waste is 20 feet

Inactive Hazardous Waste Storage Area (IHSS 203)

- Operational from 1986 to 1987
- Storage area for drummed hazardous solids and liquids, including PCBs
- Soil-gas survey detected primarily landfill gas (methane)
- PCBs detected at low concentrations in surface soils

Asbestos Disposal Areas

- Operational from 1985 to 1990
- Bagged, friable asbestos disposed in 10-foot-deep pits
- Molds disposed in southern pit
- Trace (less than 1%) chrysotile asbestos in surface soil
- Disposal areas are delineated with warning signs

Landfill Gas

- 5 gas vents present within the operating landfill
- Volume of landfill gas is 95,000 cy
- Gas composition is 45-70% methane and 20-40% carbon dioxide indicating anaerobic conditions
- Concentrations highest at east end where wastes are thickest and youngest
- Landfill gas contained within the existing intercept system
- Concentrations of non-methane organic compounds (NMOCs) less than trigger levels
- Concentrations of hazardous air pollutants (HAPs) may be greater than trigger levels

Proposed Final Remedy for Landfill Closure (Spring 1997) - See Figure 1

- RCRA Subtitle C equivalent cover
- Passive gas-venting system with discharge points
- Leave portion of pond and wetlands not covered by cap in place
- Wetlands and Preble's habitat mitigation
- Delist leachate and pond water, discharge down drainage
- Post-closure groundwater monitoring

LANDFILL SOURCE AREA - LEACHATE

Leachate "Contained in" Groundwater

- Leachate has been forming from biodegradation, infiltration, and groundwater inflow since 1968
- Leachate discharges at the seep (SW097) at 2 to 7 gpm
- Tritium (300,000 pCi/L) and strontium (7 pCi/L) were detected in leachate in 1973
- Maximum concentration of tritium at the seep is 1,500 pCi/L (1990-1995 data)
- Mean concentrations of analytes that exceed ARARs include cobalt, manganese, zinc, gross beta, 2-methylnaphthalene, naphthalene, 1,1-dichloroethane, 1,2-dichloroethene, chloroethane, methylene chloride, and vinyl chloride
- Focused risk assessment on seep water - all analytes below open-space recreational user PRGs

Existing Surface-Water Diversion Ditch

- Surface-water diversion ditch constructed in 1974 as part of IRA
- Ditch is 2- to 3-feet deep and 5-feet wide at bottom
- No known waste disposal outside of ditch
- Existing ditch will be used to divert surface water as part of the final remedy

Existing Groundwater Intercept System

- Built October 1974 to January 1995
- Diverts "clean" groundwater around landfill
- Consists of a 4-foot clay barrier, sand/gravel drainage layer and perforated pipe
- Present discharge of the system (west pond, east pond, or downstream) is unknown
- No known waste disposal outside of clay barrier in drain
- 275 ft along the northwest and 400 ft along the southwest are not keyed into bedrock
- A portion of the north side has failed
- Water balance shows 60% inflow from groundwater, 40% from infiltration of precipitation

Existing Slurry Walls

- Built in 1982 to augment the groundwater intercept system as landfill expanded eastward
- Soil-bentonite slurry wing walls on northeast and southeast sides of landfill
- Slurry walls are 700 feet long and 10 to 25 feet deep
- Tied into existing groundwater intercept system
- North slurry wall has failed

Proposed Slurry Wall Maintenance (Fall 1995) - See Figure 1

- Address failure of existing groundwater intercept system and north wing wall
- Decrease groundwater inflow, leachate generation, and outflow at the seep
- Extends east from approximately well B106089 and parallels existing northern slurry wall
- Approximately 2000 feet long and varies in depth from 15 to 30 feet
- Keyed into weathered bedrock
- Not in wetlands area, no wetlands or Preble's habitat mitigation required
- Construction cost approximately $1,000,000

Proposed Leachate Collection and Passive Treatment System (Summer 1995) - See Figure 1

- Collect leachate and direct it to a series of passive treatment reactors
- Packing material may consist of adsorbents, biofilters, or zero valent metallic materials
- Influent and effluent samples will be taken for performance monitoring
- Treated water will be discharged to the pond
- Wetlands and Preble's habitat mitigation will be addressed in the IM/IRA/EA Decision Document
- Construction cost approximately $100,000

EAST LANDFILL POND

East Landfill Pond - Surface Water (See June 1991 Photo)

- Pond constructed in 1974
- Purpose of pond is to collect overflow from west pond and intercepted groundwater
- Embankment has a clay core keyed into bedrock and a spillway
- Pond covers 2 5 acres
- Volume of water is approx 5,000,000 gallons
- Spray evaporation used to keep pond at 75% capacity from 1974 to 1994
- Recharge - groundwater below pond, leachate seep, surface-water runoff
- Discharge - evaporation and water transfer to A-series ponds
- Mean concentrations of analytes that exceed ARARs is limited to gross beta
- Focused risk assessment on pond water - all analytes below open-space recreational user PRGs

East Landfill Pond - Sediments

- Sediment has been accumulating in the pond since it was constructed in 1974
- Thickness is 6 to 10 inches
- Sediment overlies claystone of the Laramie Formation
- PCOCs include metals, radionuclides, VOCs (acetone, 2-butanone, and toluene) and SVOCs
- Focused risk assessment on sediment - all analytes below residential/recreational user PRGs

East Landfill Pond - Wetlands (See October 1991 Photo)

- Wetlands have been identified along the shoreline of the pond and in the pond itself
- Palustrine Emergent = 0 80 acres, Palustrine Unconsolidated Bed = 2 26 acres
- Drainage is potential habitat for Preble's Meadow Jumping Mouse
- Approximately 0 2 acres will be damaged during construction of the leachate treatment system
- Approximately 1 acre will be damaged during construction of the cap
- Wetlands and Preble's habitat mitigation (if required) will be addressed in the Landfill Closure IM/IRA/EA Decision Document

SOILS AND DOWNGRADIENT GROUNDWATER

Spray Evaporation Areas - Surface Soils

- Spray evaporation occurred from 1974 to 1994
- Pond Area Spray Field (north) is 100 feet by 460 feet
- South Area Spray Field (south) is 120 feet by 440 feet
- Surface soils downgradient of the dam are downwind of these spray evaporation areas
- PCOCs include metals and radionuclides (max arsenic is 16 mg/kg, max radium-226 is 1 8 pCi/g)
- Arsenic and radium-226 exceed open-space recreational user PRGs
- Focused risk assessment on soils - no risk for ingestion, inhalation, or dermal exposure to an open-space recreational user

Downgradient Groundwater

- Recharge to UHSU - precipitation, snowmelt, runoff, and seepage from pond
- Discharge from UHSU - evapotranspiration and seepage where water table intersects ground surface
- Regional groundwater flow is west to east
- Local flow is toward the pond or toward the drainage below the dam
- Depth to groundwater is 5 feet
- Mean concentrations of analytes that exceed ARARs include chloride, sulfate, selenium, and nitrate/nitrite in downgradient wells
- Focused risk assessment on groundwater - no carcinogenic risk for ingestion by an office worker, hazard quotient for noncarcinogenic risk is 2 (risk is driven by selenium)
- Post-closure groundwater monitoring will be performed

METHODOLOGY

Data Used - Landfill Area

- Surface soils in landfill - 20 samples (0-2 inches), one sampling event from Phase I (1993)
- Surface soils in asbestos disposal areas - two samples (0-2 inches), one sampling event from Phase I (1993)
- Leachate/groundwater in landfill - 26 samples from 16 locations, one sampling event from Phase I (1992-1993)
- Soil gas in landfill -163 soil-gas measurements at 33 locations, 67 soil-gas samples collected/analyzed at 33 locations, one sampling event from Phase I (1992-1993)
- Soil gas in IHSS 203 - 35 soil-gas samples collected/analyzed (5 feet), one sampling event from Phase I (1992)

  Surface soils in IHSS 203 - 49 samples collected/analyzed (0-2 and 0-10 inches), one sampling event from Phase I (1992)

Data Used - East Landfill Pond and Downgradient

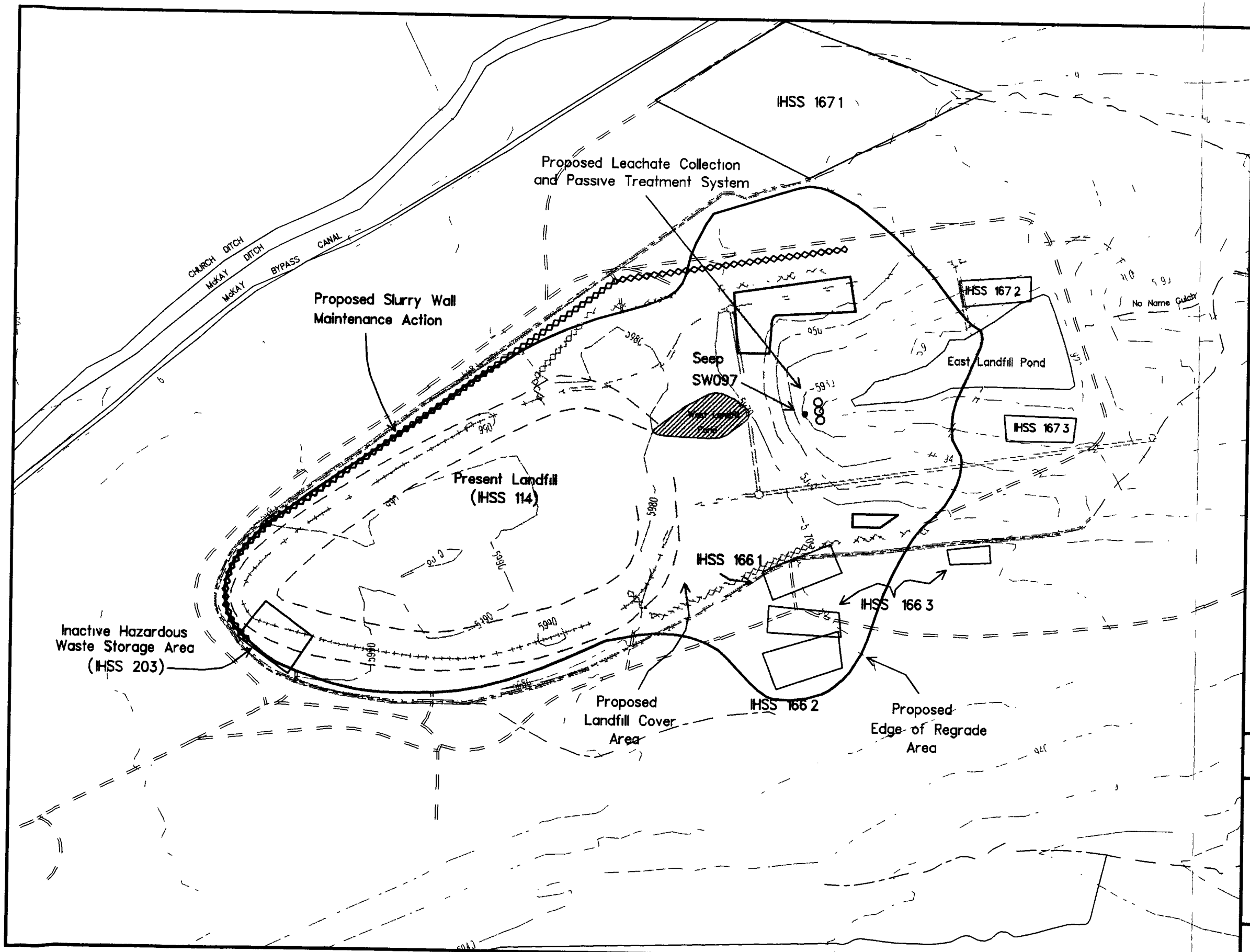
- Leachate seep water (SW097) - monthly data (1990-1991), four months from Phase I (1992-1993)
- East Landfill Pond water (SW098) - monthly data (1990-1991), four months from Phase I (1992-1993)
- Pond sediments - three samples, one sampling event from Phase I RFI/RI (1993)
- Surface soils near or downwind of spray evaporation areas - 133 samples from 0-2 inches, 67 samples from 0-10 inches, one event from Phase I (1993)
- Surface soils downwind of spray evaporation areas - 12 samples from 0-2 inches, 4 samples from 0-10 inches, one sampling event from Phase II (1994)
- Groundwater - quarterly data (1990-1994), four months from Phase I wells (1992-1993), one month from Phase II wells (1994)

ARARs

- Surface water - most stringent standard for each analyte (SDWA MCLs, Colo MCLs, RCRA MCLs, MCLGs, Colo Water Quality Stds, PQLs)
- Groundwater - most stringent standard (SDWA MCLs, Colo MCLs, RCRA MCLs, MCLGs, Colo Water Quality Stds, Colo Basic Std for Groundwater, PQLs)

Focused Risk Assessment Scenarios

- Leachate seep water (SW097) - ingestion or dermal exposure of an open-space recreational user
- East Landfill Pond water (SW098) - ingestion or dermal exposure of an open-space recreational user
- East Landfill Pond sediments - ingestion by future residential recreational user
- Surface soils in spray evaporation areas - ingestion, inhalation, or dermal exposure of an open-space recreational user
- Groundwater downgradient of the source area - ingestion of groundwater by a future office worker



EXPLANATION

- OU 6 IHSS Boundary
- OU 7 IHSS Boundary
- Ditch and Drainage Feature
- Intermittent Stream
- Dirt Road
- Existing Surface-Water Diversion Ditch
- Existing Slurry Wall
- New Slurry Wall
- Groundwater Intercept System
  - (perforated)
  - (non-perforated)
- Leachate Collection Trench
- Approximate Extent of Asbestos Disposal

N

0 Feet 250 500

Topographic Contour Interval 20 Feet

U.S. DEPARTMENT OF ENERGY
Rocky Flats Environmental Technology Site, Golden, Colorado

Proposed Maintenance and Remedial Actions

Operable Unit No. 7

May 1995

Figure 1

3

05/18/95 MAINTENANCE.MAP