Crawler for U-Plant Drain Line Inspection

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Canyon Disposition Initiative (CDI)

- Canyon Disposition Initiative (CDI) is evaluating feasibility of using canyon buildings as assets for disposal of low-level wastes
- U-Plant facility is being used as a pilot

Canyon Disposition Initiative

- Previous CDI activities at U-Plant
  - remote characterization of the rail tunnel, FY 98
  - 3-D gamma ray imaging, FY 98
  - non-intrusive liquid level detection, 3-D visual and gamma-ray imaging, FY 99
  - Remote characterization of ventilation tunnel FY 99
  - Ultrasonic liquid level detection, FY 00
  - Overview video system deployment, FY 00
  - Remote concrete coring, FY 00
  - In-situ object counting, FY 00

U-Plant Description

- Similar to four other canyon building at Hanford
- 221-U Facility approximately 810 feet long
- Originally designed to support plutonium production but used for recovery of uranium from tank wastes

Aerial View of U-Plant

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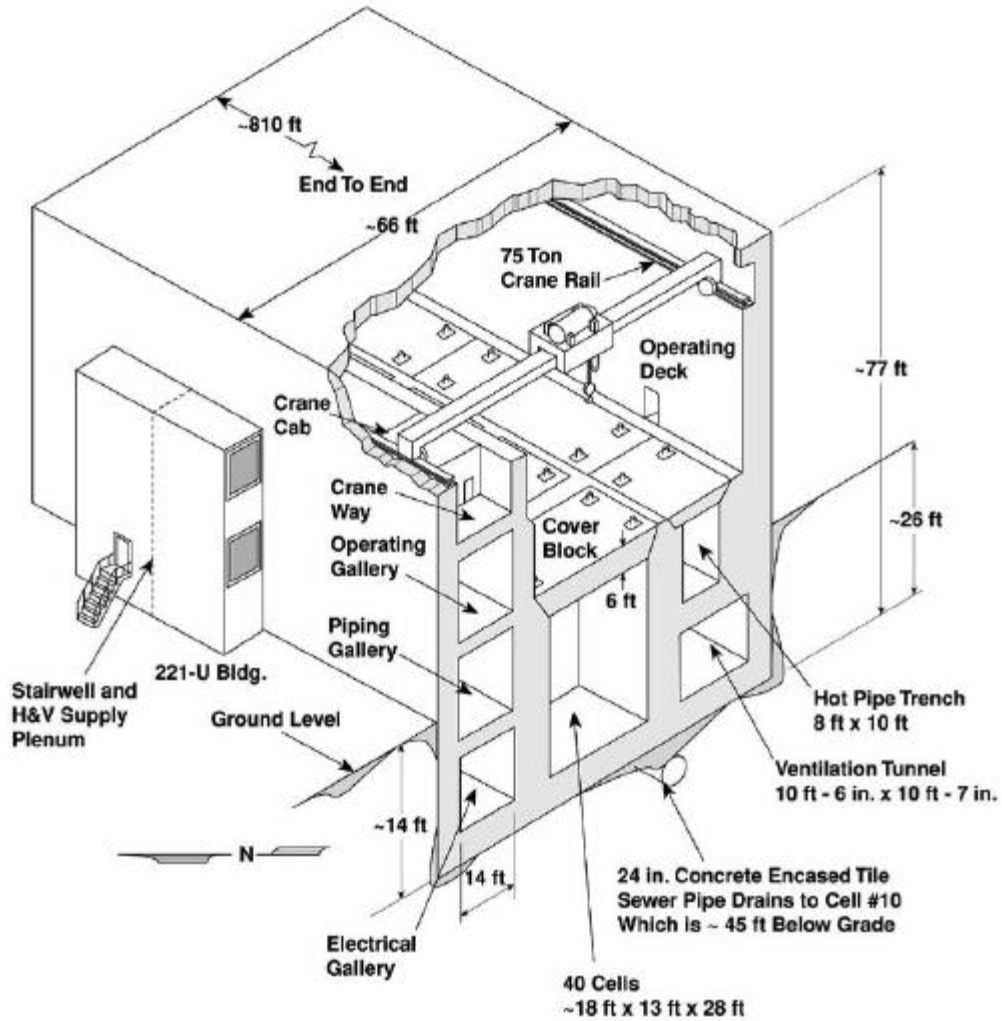
Cross Section of U-Plant



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Requirements

- Visual Inspection of Entire Length of Drain Line
  - Visual Record for Structural Integrity Assessment
  - Locations Where Liquids Might Be Entering
- Gross Gamma Ray Measurements
- Samples of Materials in the Drain Line
  - Scale or Sludge Sample for Isotopic Distribution

Drain Line

- Only access by crane and 40 feet below deck level in congested cell
- 24-inch diameter terracotta
- Two sections – one 160 feet, other 600 feet
- Unknown condition
- Suspected but uncharacterized in-drain obstructions may have fallen into drain through six-inch drains from cells above

Design Constraints

- Access to deck 200 feet from deployment cell
- Canyon access is through 20 inch wide door
- Operations on deck in high radiation, high contamination, airborne radiation area
- Conductivity probes had been installed that vertically bisect the drain line at 13 places
- Three months from beginning of project to deployment

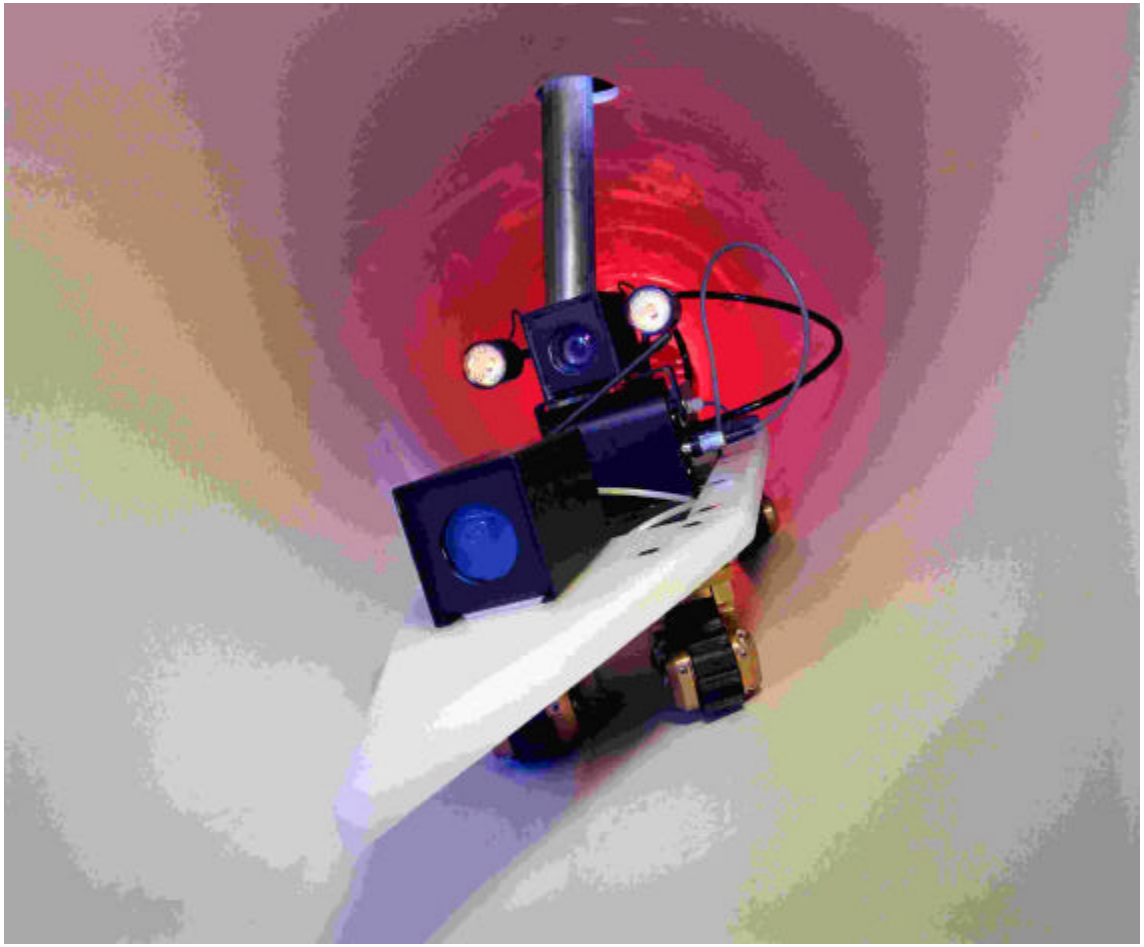
System Development Approach

- Obtain information
- Identify available system components
- Assemble prototype vehicles
- Mockup testing
- Modify
- Practice, practice, practice

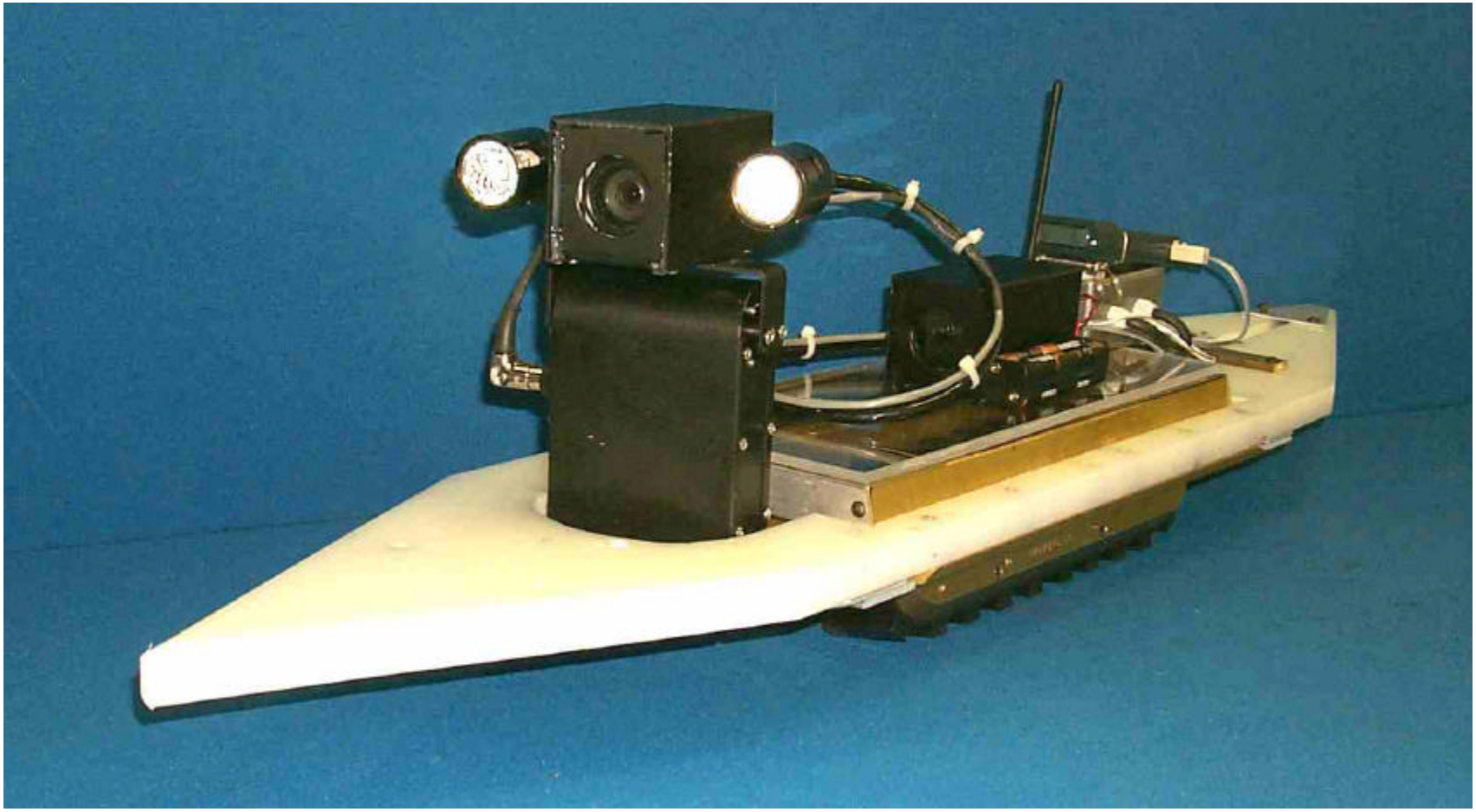
Sub-Systems

- Drain Inspection Vehicle
- Deployment Platform
- Cable Management Components
- Operator Control Station
- Radio Communications
- The People

Early Prototype with Minitracs



Drain Line Crawler



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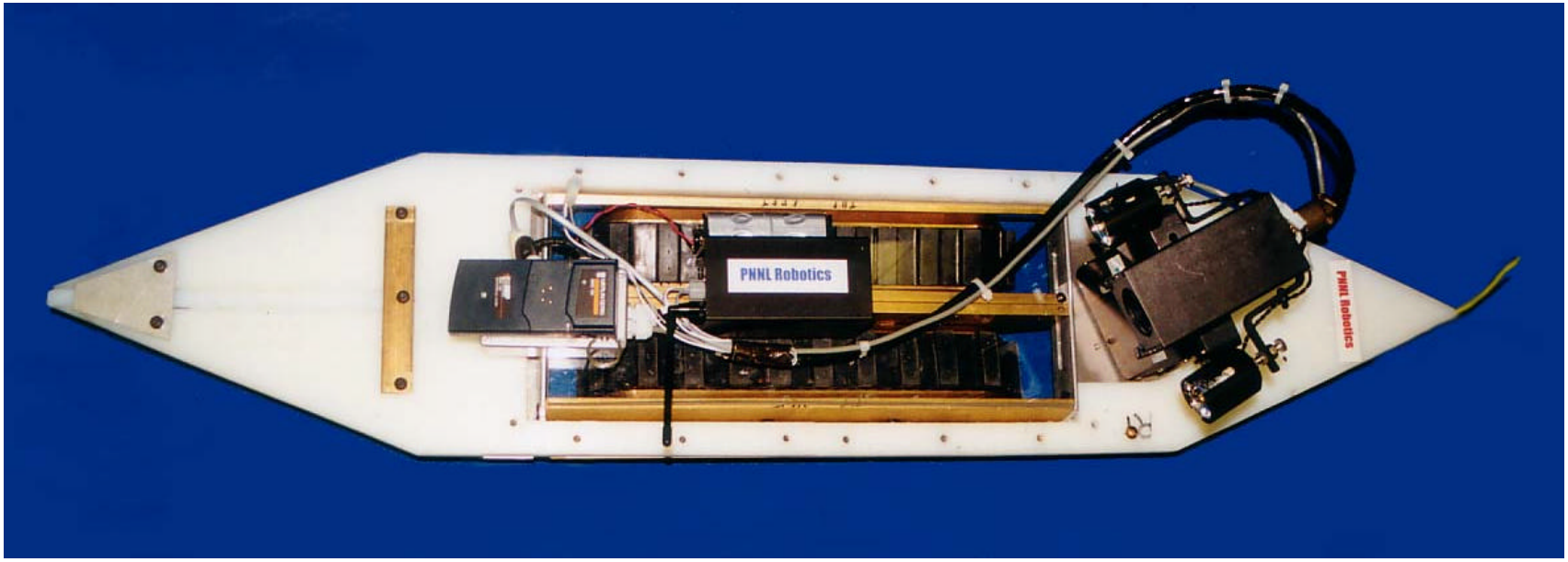
Drain Line Crawler



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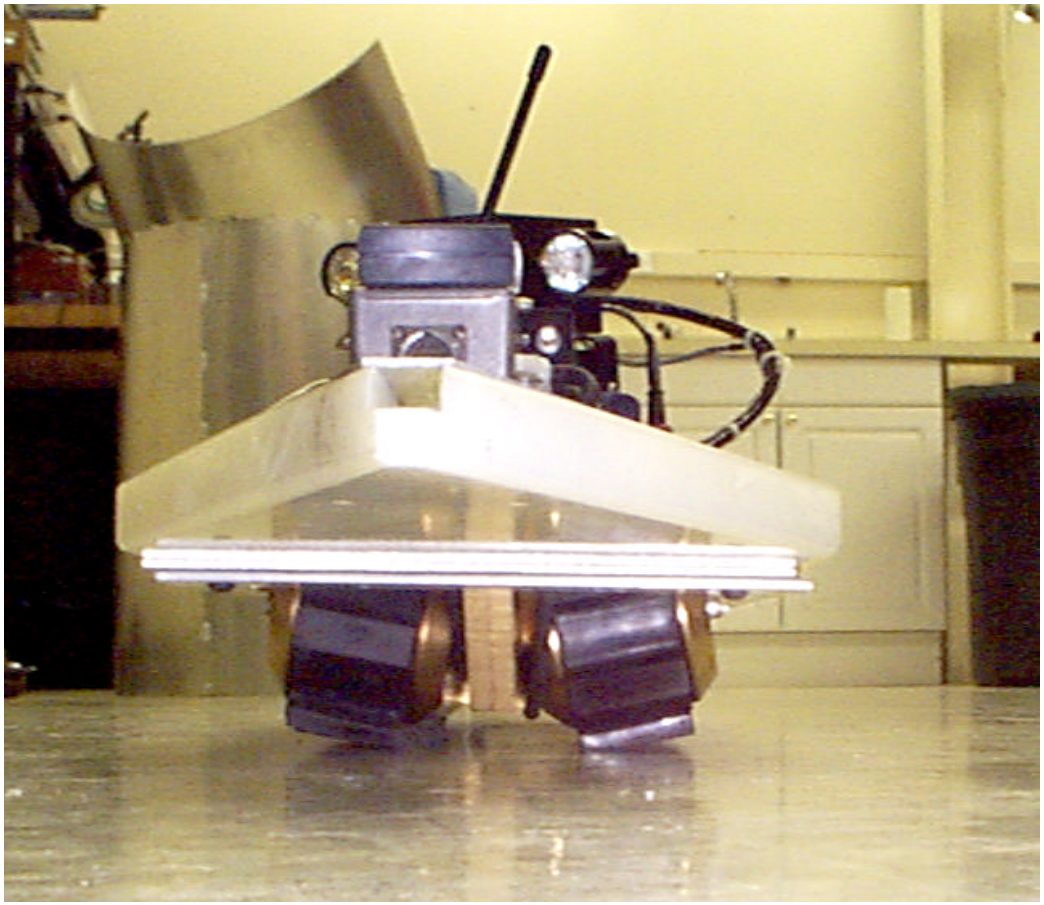
Cable Strain Relief

End View Vehicle

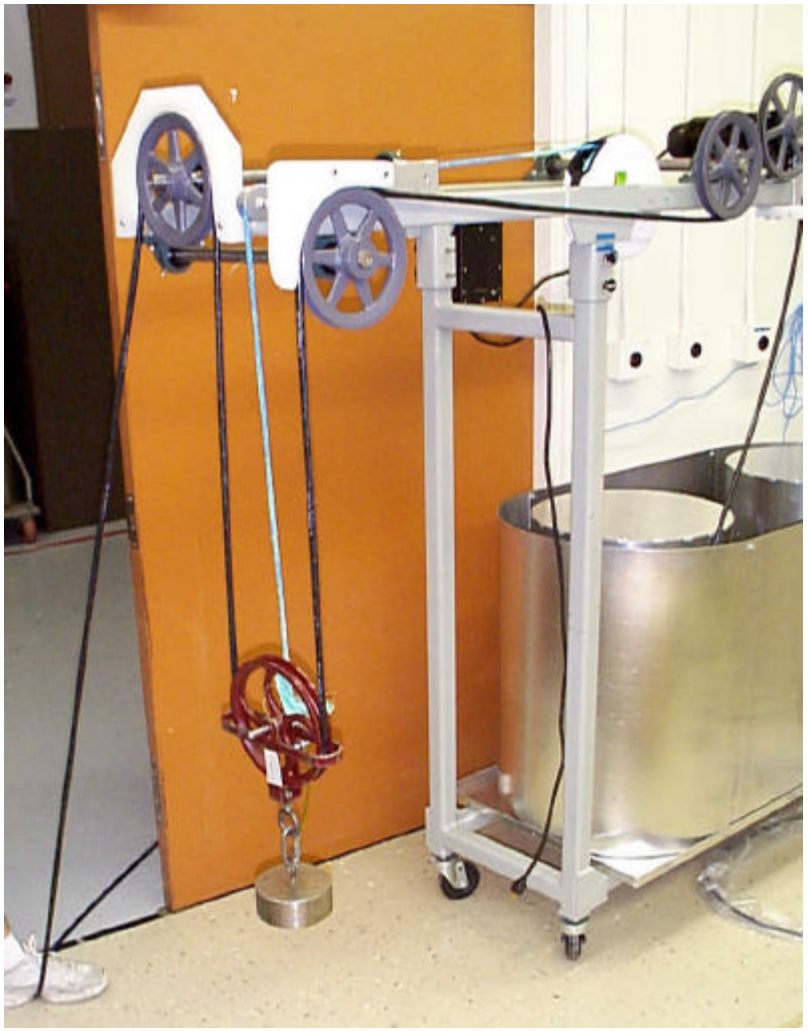


Deployment Platform

Device for Collecting Sample from Tether

Cable Management Platform

Cable Platform Details



Tether Sampling/Cleaning Device

Operator Control Station

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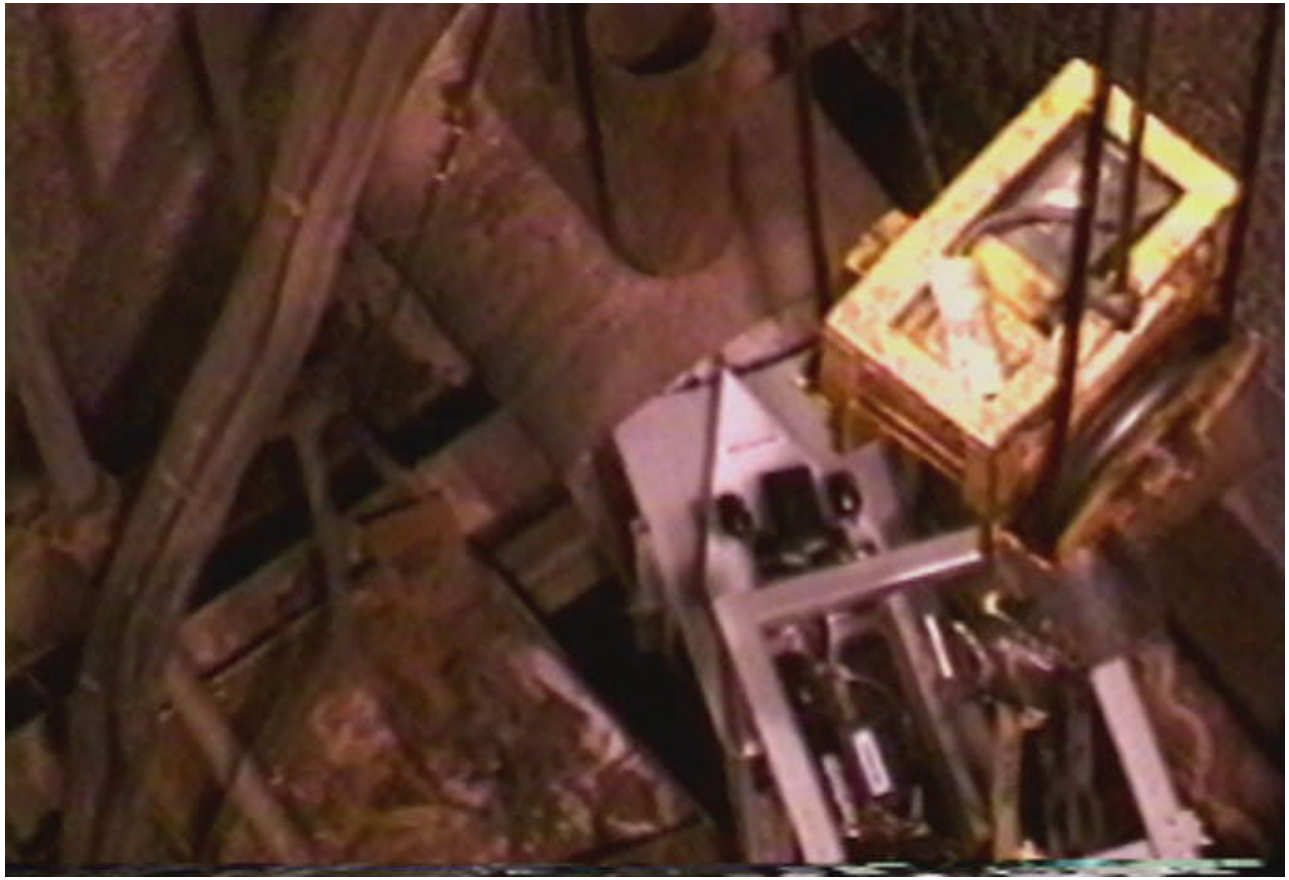
Setup on Canyon Deck

On-Deck Activities

Aligning Platform with Drain Line Outfall



East End

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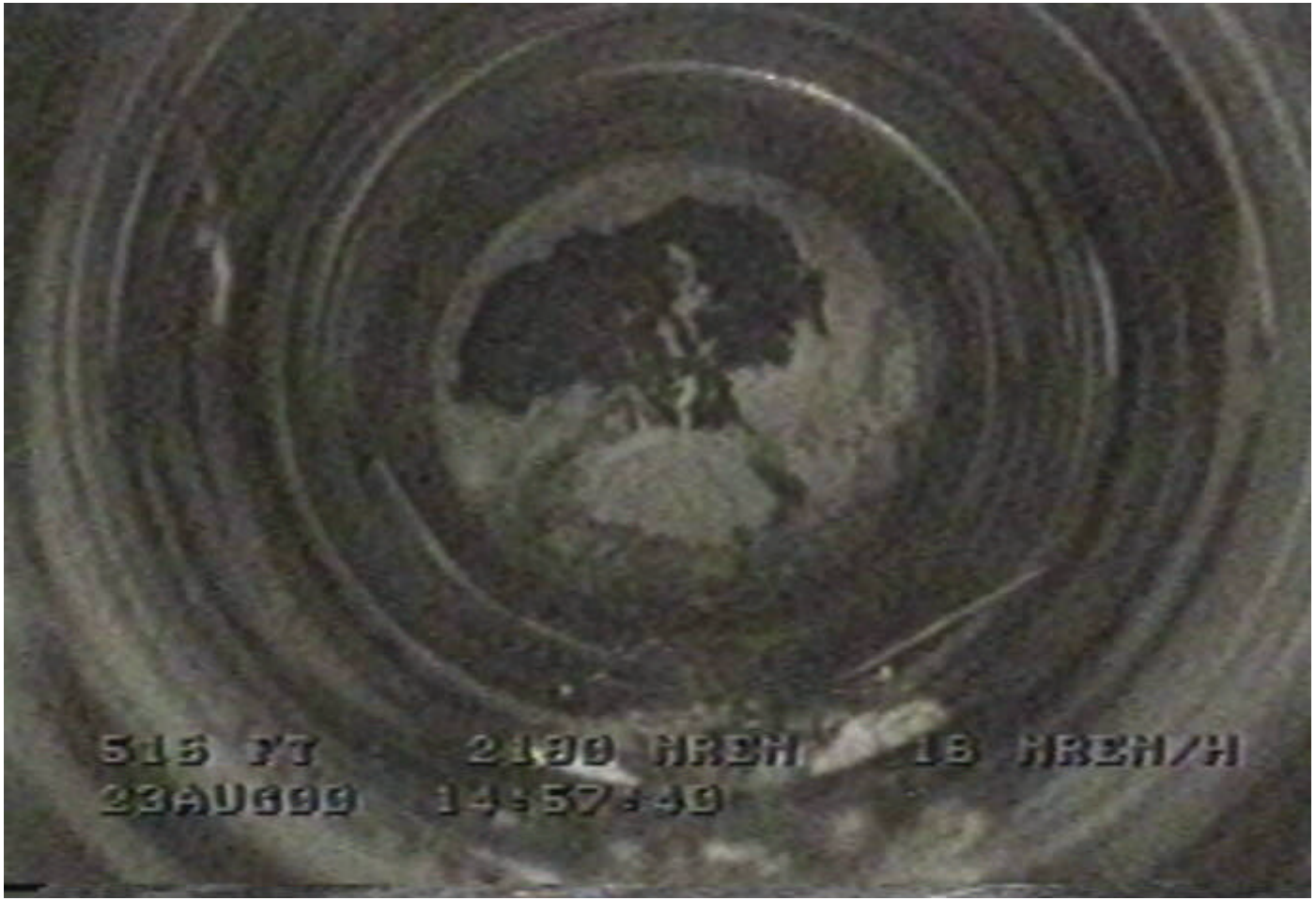
West End



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Typical Conductivity Probe

Spider Webs

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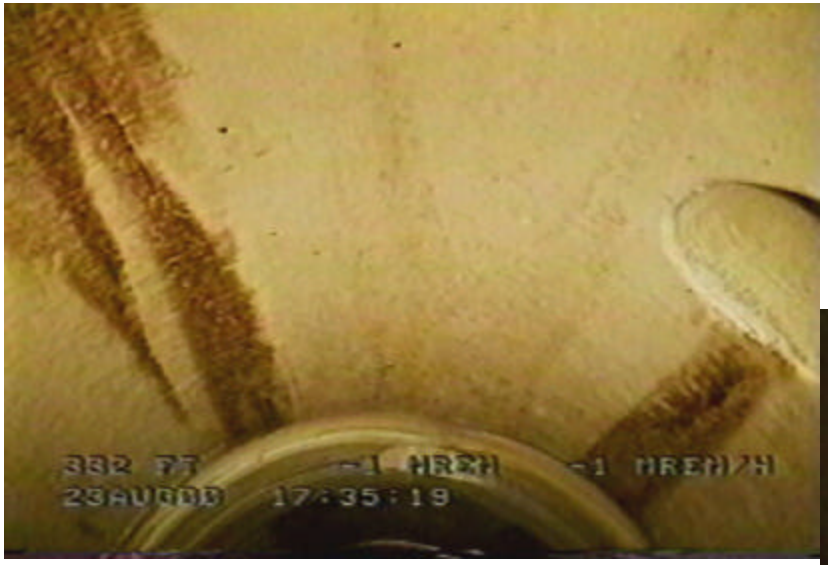
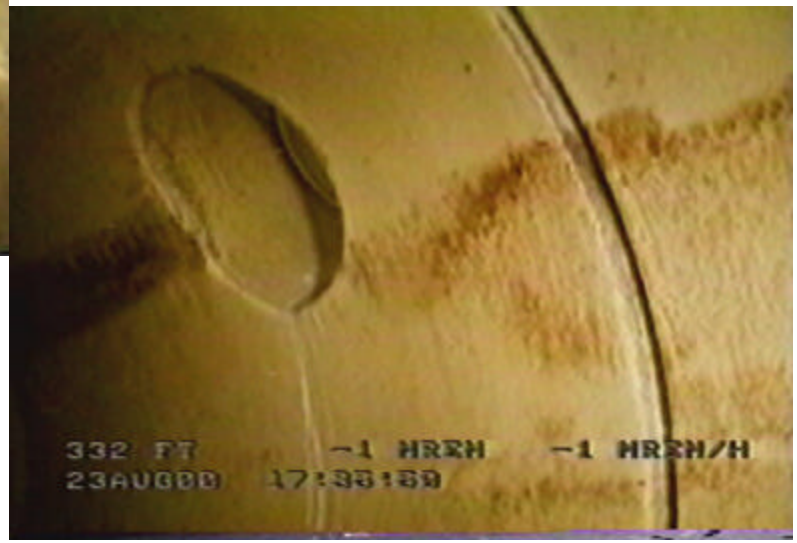
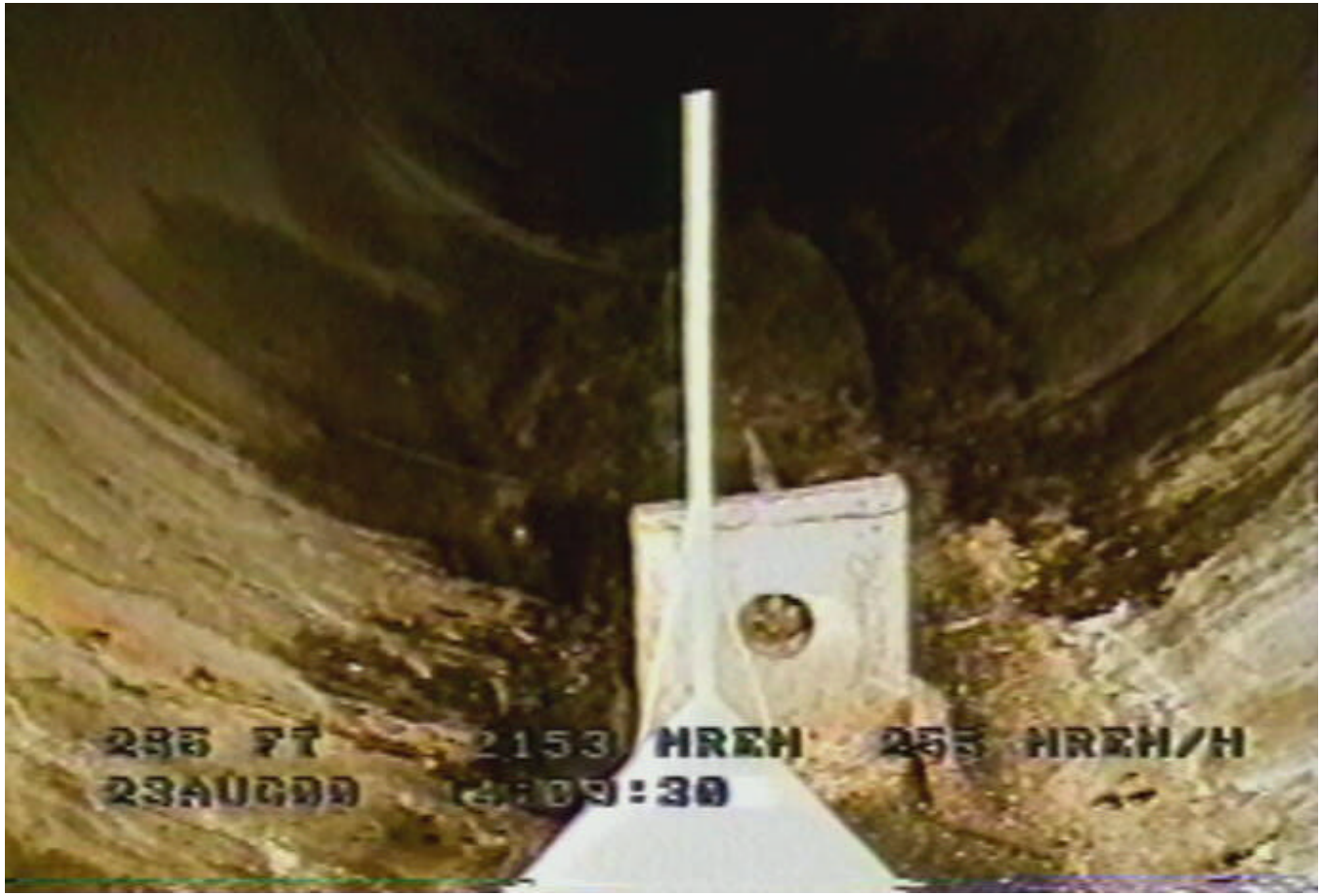
Another Conductivity Probe

Drain Line Condition





Unexpected Obstruction



Almost Back Out

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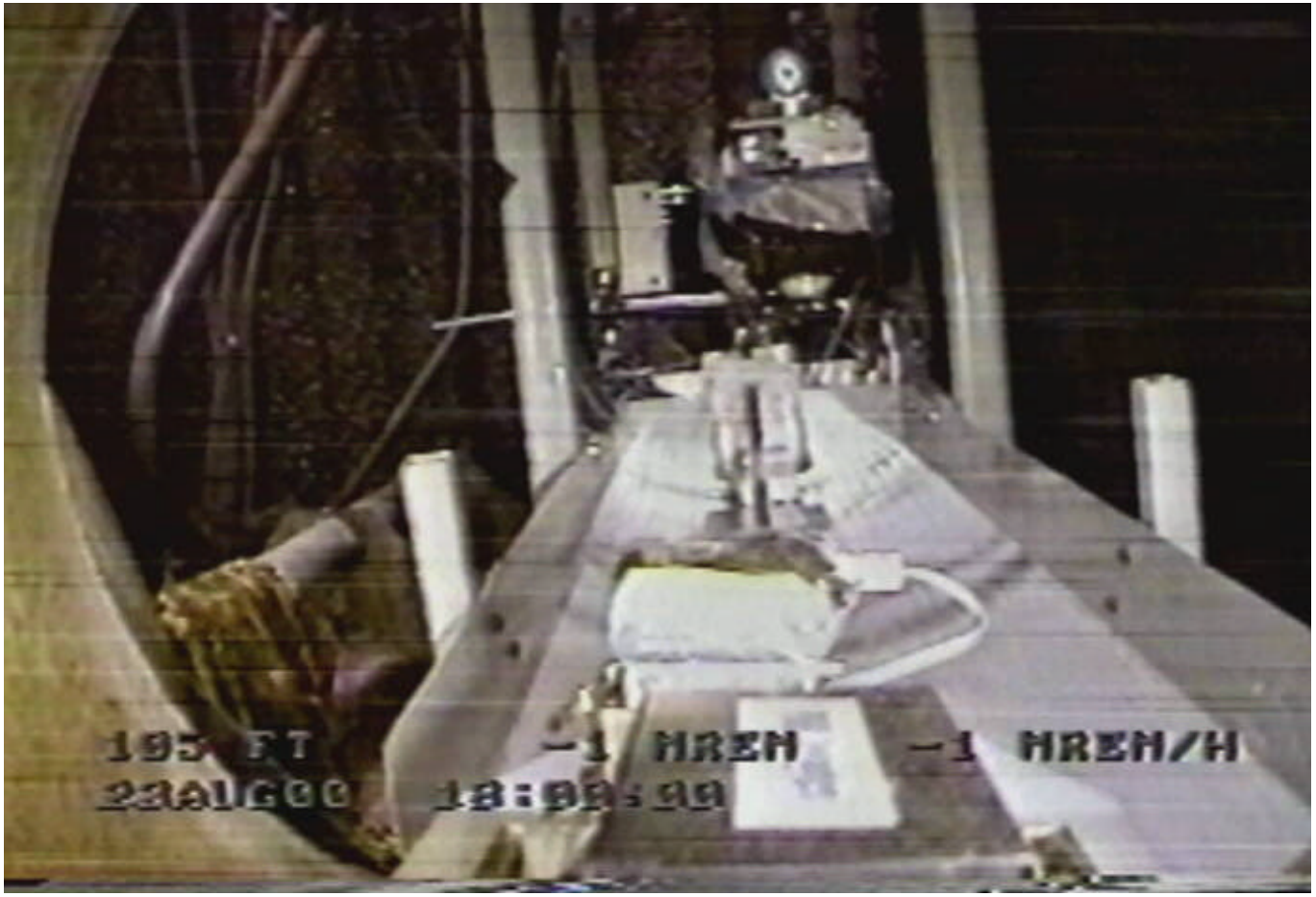
Returning to Platform



Coming Back To Deck Level

Accomplishments

- Visual Inspection of Entire Length of Both Drain Line Sections
- Navigated Around All Obstructions
- Retrieved Vehicle
- Maximum Gamma Radiation of 2500 Mrem Per Hour
- Analysis of Samples Did Not Reveal Any Unexpected Materials

Conclusion

- Deployment Considered a Complete Success
- No Indications of Any Structural Integrity Issues
- No Unexpected Radiation Levels or Materials Discovered