Annotated Outline (Draft)
Moisture Monitoring of MDA Caps

Executive Summary
This will include a concise overview of the Los Alamos cap and cover monitoring program and recommendations for a standardized approach to satisfy technical and regulatory requirements.

1.0 Introduction and Objectives

1.1 Introduction

Provide background information on the problem existing at TA-49, the actions taken at that site to understand and control water accumulation, and the existing monitoring plan. Summarize the RSI and the RSI response.

1.2 Objectives

Primary objective is to review existing cap/cover installations, their corresponding monitoring efforts undertaken at Los Alamos, and recommend a standardized approach to moisture monitoring for future efforts. This effort will not address cap/cover design or RCRA cap monitoring.

2.0 History of Moisture Monitoring at LANL

This section will review results and procedures used at LANL for monitoring moisture content at mesa top sites.

2.1 Hydrogeologic Setting

MDAs at LANL are principally located on mesa tops along the Pajarito Plateau. MDA AB at TA-49 is located on the Frijoles Mesa. The mesa-top setting of most of the MDAs is advantageous with regard to natural hydrologic contaminant transport properties. Generally MDAs consist of excavated pits, trenches, shafts, and/or cavities within Bandelier Tuff. Additionally many MDAs are covered with various materials in an attempt to preclude infiltration. Cap construction varies for each disposal unit and may consist of concrete plugs, crushed tuff, asphalt, vegetative covers, or multi-layer systems. The hydrogeologic setting of the MDAs will be summarized.

2.2 Objectives

Moisture monitoring has been performed at several MDAs to assess to the performance of caps and the natural disposal environment relative to prevention of contaminant transport via infiltration and leaching. The most comprehensive in-situ periodic moisture monitoring has been preformed at TA-54, MDA G. Moisture monitoring has also been performed at TA-49, MDA AB, and several cap design test plots at LANL. The objectives at each site will be summarized.

2.3 Methods

Soil moisture has been measured at LANL by the neutron attenuation method, direct soil sampling and laboratory analysis, and time domain reflectometry. Published approaches and results will be summarized.

2.4 Summary of LANL Moisture Monitoring Results

Brief summary of moisture monitoring results at TA-54, MDA G and TA-49, MDA AB using the neutron attenuation method. This section will include a discussion of lessons learned relative to calibration and field implementation.

3.0 Overview of Industry, EPA, DOD, and DOE Practices

This section will include a brief survey of literature to describe what others, in similar arid climates, are doing to control and monitor moisture in capping settings. Within the DOE it will focus particularly on Hanford, INEEL, and Sandia.

4.0 Regulatory Requirements for Moisture Monitoring

Regulatory drivers will be identified. DOE orders will be reviewed (particularly DOE Orders 5820.2A and 5400.

5.0 Technical Issues

This section will include a discussion of the technical issues that influence moisture measurements relevant to caps: infiltration through faulted caps, mechanisms of moisture accumulation, what can be measured readily and what is the most relevant data to the problem, etc.

5.1 Moisture content monitoring vs. potential

5.2 Logging vs permanent in-situ instrumentation

6.0 Available Instrumentation

Brief survey of available and state-of-the-practice instruments, and their applicability to Los Alamos. This will focus on mature measurement systems.

6.1 Moisture content

6.2 Water potential

6.3 Well construction assessment methods

6.4 Applicability to Los Alamos settings

7.0 Recommendations

This is the final product of the deliverable: specific recommendation of the appropriate MDA monitoring program given the regulatory and technical requirements and constraints.

7.1 Routine monitoring

7.2 Special circumstances

7.3 Decision process map

8.0 References