INFORMATION ONLY

CIVILIAN RADIOACTIVE WASTE MANAGEMENT SYSTEM

Management and Operating Contractor

Contract #: DE-AC01-91-RW00134
Document #: BA0000000-01717-2200-00079 Rev. 00

WASTE ISOLATION EVALUATION PUMPING TESTS AT USW G-2, USW WT-1, UE-25 WT #12, UE-25 WT #17

by

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Waste Isolation Evaluation
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This waste isolation evaluation was prepared in accordance with M&O NLP-3-17 Rev. 0. Boreholes-USW G-2, USW WT-1, UE-25 WT #12, and UE-25 WT #17 have not been assigned a QA classification.

Waste Isolation Evaluation
Pumping Tests at USW G-2, USW WT-1, UE-25 WT #12, UE-25 WT #17

1. INTRODUCTION

1.1 Purpose of Evaluation

This evaluation was performed in response to a request from Science Applications International Corporation (SAIC) to assess the potential effects on waste isolation of the proposed pumping tests at boreholes USW G-2, USW WT-1, UE-25 WT#12, and UE-25 WT#17 [Weaver, 1993].

1.2 Planned Activities

The proposed pumping test at borehole USW G-2 (Figure 1) will be used to gather data from the saturated zone in the northern part of Yucca Mountain. This includes data for the estimation of the hydraulic conductivity of various units penetrated by the well, vertical head-gradient data [YMP, 1990], and hydrochemical data [YMP, 1992a]. This test will also be used to confirm the existence of the large hydraulic gradient north of the potential repository site. The work at USW G-2 would not preempt other site characterization activities but would be used as "fill-in" work, to be completed in a total of 20 working days. Two pumping tests (duration 8 to 72 hours) will be performed, each followed by a recovery period of 16 to 72 hours. The discharge from each test will be limited to 200 gpm with the objective of lowering the water level at the well approximately 100 ft. The pumping rate and volume will be monitored using a calibrated flow meter accurate to within 5 percent. Following these pumping and recovery tests, a packer test will be performed with the duration and rate of pumping to be determined on site [Hayes and Chaney, 1993a].

The activities at USW WT-1, UE-25 WT#12, and UE-25 WT#17 (Figure 1), which are located southeast of Yucca Mountain, consist of developing and cleaning the wells and their surrounding formations of residual drilling fluids used at the time of well construction [Hayes and Chaney, 1993b]. By monitoring the pumpage and drawdown at each well, aquifer characteristics will be obtained [YMP, 1990]. Representative water samples will be collected after the wells have been purged [YMP, 1992a]. Each well will be pumped for as few as 2 days to as much as a month and the discharge from each test will be limited to 100 gpm. Water from well USW WT-1 will be discharged to a tank truck and then removed to a suitable discharge area, whereas water from UE-25 WT#12 and UE-25 WT#17 will be discharged to the ground at least 300 ft away from these wells [Hayes and Chaney, 1993b].

1.3 Quality Assurance

The proposed activities will withdraw water from the saturated zone listed in Appendix A of the Q-list. Therefore, this report was prepared as a quality-affecting activity according to M&O NLP-3-17 Rev. 0. Some of the referenced data may not have been approved for quality-

affecting activities and the referenced analyses may not have been performed as quality-affecting activities or under software QA requirements. The extent and possible effects of non-qualified data and analyses on the evaluations, conclusions and recommendations of this report have not been specifically determined. However, the conservative assumptions, estimates and methods used in this evaluation were devised to address any reasonable scenario and are believed to bound the potential impacts on waste isolation.

A checklist (see last 2 pages) was used as guidance to ensure no activities and potential impacts were overlooked. General guidance for the format and content of waste isolation evaluations was provided by Houseworth [1993] so that all waste isolation impacts would be considered.

2. BACKGROUND INFORMATION

2.1 Evaluation Approach

This is a qualitative evaluation of potential waste isolation impacts due to the proposed pumping tests at boreholes USW G-2, USW WT-1, UE-25 WT#12, and UE-25 WT#17.

2.2 Relative Locations and Elevations

Borehole USW G-2 is located north of Yucca Mountain, at Nevada State Central Zone Coordinates (feet) N778,825 and E560,503. Boreholes USW WT-1, UE-25 WT#12, and UE-25 WT#17 are located southeast of Yucca Mountain at coordinates N753,941 and E563,739, N739,726 and E567,011, and N748,420 and E566,212, respectively [Robison et al., 1988]. USW WT-1 and UE-25 WT#17 are approximately 6,200 ft (1,890 m) and 12,200 ft (3,719 m), respectively, outside the Conceptual Perimeter Drift Boundary (CPDB) of the potential repository block. UE-25 WT#12 and USW G-2 are about 20,300 ft (6,200 m) and 9,370 ft (2,860 m), respectively, outside the CPDB [YMP, 1993a]. USW WT-1, UE-25 WT#17, UE-25 WT#12, and USW G-2 are approximately 10,930 ft (3,330 m) inside, 5,230 ft (1,595 m) inside, 2,730 ft (830 m) outside, and 1,090 ft (330 m) inside the Conceptual Controlled Area Boundary (CCAB), respectively [YMP, 1993a]. The elevations of the upper and lower block emplacement drifts are 3506 ft (1068 m) and 3275 ft (1000 m), respectively [McKenzie, 1993].

Location	Elevation	Total Depth	Depth to water	Source
USW G-2	5,098 ft (1,554 m)	6,006 ft (1,831m)	1,713 ft (522 m)	[Robison et al., 1988]
USW WT-1	3,942 ft (1,202 m)	1,689 ft (515 m)	1,544 ft (471 m)	[Robison et al., 1988]
UE WT #12	3,527 ft (1,075 m)	1,308 ft (399 m)	1,133 ft (345 m)	[Robison et al., 1988]
UE WT #17	3,689 ft (1,,24 m)	1,453 ft (443 m)	1,294 ft (394 m)	[Robison et al., 1988]

2.3 Relevant Hydrogeology

Boreholes USW G-2, USW WT-1, UE-25 WT#12, and UE-25 WT#17 each intersect the water table at approximately 1,713 ft (522 m), 1,544 ft (471 m), 1,133 ft (345 m), and 1,294 ft (394 m), respectively, below the elevation of the well casing (see Section 2.2). The geologic units at the water table for each borehole are: for USW WT-1 the tuffaceous beds of the Calico Hills; for UE-25 WT#12 the Topopah Spring Member of the Paintbrush Tuff; for UE-25

WT#17 the Prow Pass Member of the Crater Flat Tuff, and for USW G-2 nonwelded tuffs and the Prow Pass Member of the Crater Flat Tuff. South of USW G-2, Pagany Wash Fault dips to the north, away from the conceptual repository [Scott and Bonk, 1984].

2.4 Affected Natural Barriers/Engineered Items

Natural barriers/engineered items on the Q-List [YMP, 1993b] or the MC-List [YMP, 1993c] which may be affected by these activities include:

alluvium
Topopah Spring Member of the Paintbrush Tuff
Crater Flat Tuff
Calico Hills
saturated zone.

3. SPECIFIC EVALUATIONS AND INTERPRETATIONS

3.1 Hydrology

3.1.1 Flow of Water in Saturated Zone The pumping tests at USW G-2, USW WT-1, UE-25 WT#12, and UE-25 WT#17 involve the withdrawal of water from the saturated zone and therefore would affect the saturated flow regime in the vicinity of the wells. This could affect ground-water travel times and the potential for radionuclide transport if water-table elevations near the CPDB or potential repository expansion areas are found to be significantly affected by the withdrawn water. However, pumping at the UE-25 C-well complex, which is located at approximately the same distance from the CPDB as the closest of the above wells, at approximately the same pumping rates for a longer period of time, showed an insignificant drawdown near the conceptual repository [Paleologos, 1993]. Consequently, no effects on the saturated ground-water flow regime, including ground-water travel times and radionuclide transport are expected from the pumping tests at USW G-2, USW WT-1, UE-25 WT#12, and UE-25 WT#17.

3.1.2 Flow of Water in Unsaturated Zone Well USW WT-1 lies inside expansion area 6, whereas UE-25 WT#17 is located about 400 meters away from this area. Water from wells USW WT-1 and UE-25 WT#17 discharged to the ground has the potential to reach the conceptual repository through the unsaturated zone due to the elevation difference between these wells and the conceptual upper and lower block emplacement drifts (see Section 2.2) and the quantity of water involved (see Section 1.2). Infiltration from this discharge could also reach potential repository expansion areas 5 and 6. USW G-2 lies about 300 meters north of expansion areas 2 and 3 and due to its proximity, discharged water could reach these areas through the unsaturated zone. Due to the elevation difference with the conceptual block emplacement drifts and the quantity of water involved, there exists the potential for the discharged water to reach the conceptual repository. Water discharged in the vicinity of UE-25 WT#12 does not appear to have the potential to reach the conceptual repository or potential repository expansion areas due to its distance from these areas and the small elevation difference with the conceptual block emplacement drifts.

3.2 Geochemistry No geochemical effects are expected from these activities.

3.3 Thermo-Mechanical Effects No thermal or mechanical disturbances are expected from these activities.

3.4 Interpretations

3.4.1 Aqueous Radionuclide Transport. The pumping tests at USW G-2, USW WT-1, UE-25 WT #12, and UE-25 WT #17 are not expected to have any measurable influence on water flow within the saturated or unsaturated zones under the CPDB, provided that water from boreholes USW WT-1, UE-25 WT#17, and USW G-2 is discharged to a tank truck. Therefore, no impact is expected on the potential for aqueous radionuclide transport.

3.4.2 Gaseous Radionuclide Transport. Ross et al. [1992] found that lateral spreading of gaseous radionuclides would be limited to several hundred meters from the edge of the conceptual repository. Thus, due to the distance of boreholes USW G-2, USW WT-1, UE-25 WT#12, and UE-25 WT#17 (see Section 2.2) from the conceptual repository block and potential expansion areas and the fact that these boreholes will be sealed before any radioactive waste is placed in the potential repository [YMP, 1992b], no effect on gaseous radionuclide transport is expected.

4. SUMMARY

4.1 Recommendations and Conclusions

This evaluation indicates that the proposed activities at USW G-2, USW WT-1, UE-25 WT #12, and UE-25 WT #17 will not have a significant effect on the ability of the conceptual repository or the potential repository expansion areas to isolate waste, provided the following recommendation is implemented:

(1) Water from wells USW WT-1, UE-25 WT #17, and USW G-2 is discharged to a tank truck and then removed to a suitable discharge area.

No new controls are needed in addition to the controls already existing for water use, spill control, spill cleanup, recording of actual use of tracers, fluids and materials, and land reclamation.

4.2 Critical Assumptions

The assumptions used for the qualitative evaluation of the drawdown in Section 3.1.1 are the following:

aquifer is homogeneous and isotropic and of infinite extent,
flow is horizontal and there is no seepage face (Dupuit assumptions),
and Theis solution applies for unsteady flow.

5. REFERENCES

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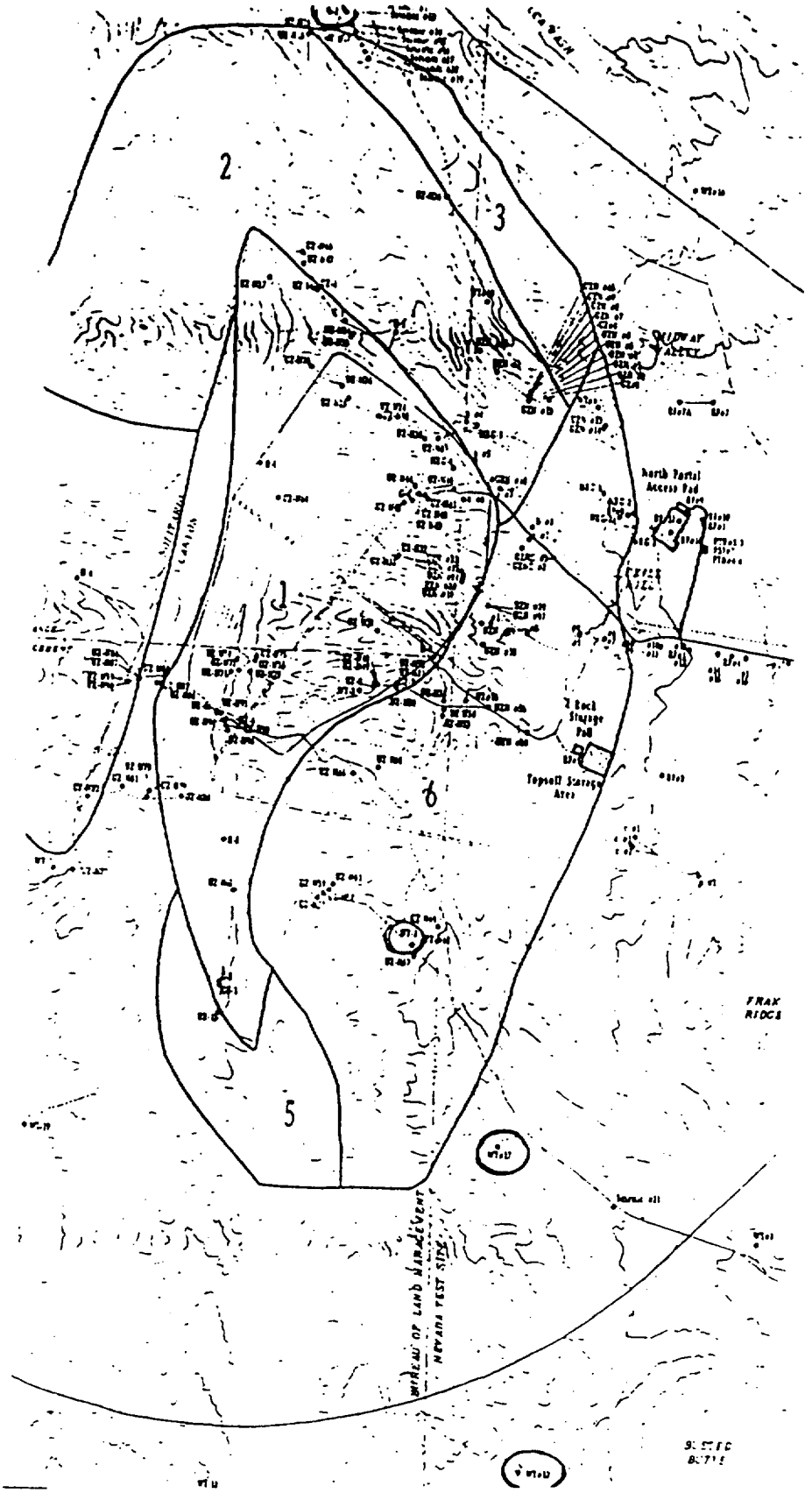
YMP, Management Control List, *YMP/93-17 Rev. 0*, August 1993c.


2
3
1
6
5
North Portal Access Pad
Topsoil Storage Area
FRAN RIDGE
BUREAU OF LAND MANAGEMENT
NEVADA TEST SITE

CHECKLIST OF ACTIVITIES AND TFM FOR WASTE ISOLATION EVALUATIONS	
ACTIVITIES / TFM	**COMMENTS**
I. Water	
A. Surface Sources	
1. Road watering for dust control	NA
2. Drill pad dust control	NA
3. Equipment washdown	See Recommendations
4. Natural surface runoff	See Recommendations
5. Accidental water spillage	NA
6. Used in testing	NA
B. Underground	
1. Water loss during drilling	
a) Fishing	NA
b) Other	NA
2. Recovered or produced during drilling	
a) Perched water	NA
b) Water table	See Section 3
3. Used in construction	
a) Drilling	NA
b) Construction Materials	NA
c) Dust Control	NA
d) Equipment washdown	NA
4. Used in testing	NA

CHECKLIST OF ACTIVITIES AND TFM FOR WASTE ISOLATION EVALUATIONS (CONTINUED)			
ACTIVITIES / TFM			**COMMENTS**
II.	**Materials (other than water)**		
	A.	Used in surface and subsurface construction	
		1. Building materials	NA
		2. Leachates from rock & muck piles	NA
		3. Fuels/lubricants/coolants	See Recommendations
	B.	Used in borehole construction and/or sealing	
		1. Grout for surface casings	NA
		2. Drilling fluids	NA
		3. Other materials left in boreholes	NA
	C.	Used in testing	NA
III.	**Other considerations**		
	A.	Physical and chemical characteristics of seals	NA
	B.	Cut-and-fill for roads, pads, trenches & pits	NA
	C.	Blasting	NA
	D.	Underground excavation	NA