

Exhibit 3.
Failure of Draft LANL SWEIS to Address the
Environmental Impact From the Hexavalent Chromium Plume in the Regional
Aquifer

1.0. Introduction. The Final LANL SWEIS must reconcile the misrepresentation in the Draft LANL SWEIS that LANL operations will not cause significant contamination to the regional aquifer. From page 4-63 in the Draft LANL SWEIS:

“As a result, little contamination reaches the regional aquifer from the shallow perched groundwater bodies and water quality impacts on the regional aquifer, though present, are low.”

The record shows that the above statement is not true and that LANL operations have caused a large impact on water quality in the regional aquifer. Exhibit 1 describes the emerging presence of plutonium and neptunium in the drinking water supply wells for Los Alamos County and Santa Fe. One of the Los Alamos County supply wells has been shut down because of perchlorate contamination from LANL operations.

In addition, LANL was aware in January of 2004 of the hexavalent chromium contamination in the regional aquifer at the location of characterization well R-28 that exceeds the Federal and State drinking water standards. The hexavalent chromium contamination¹ in well R-28 has increased over time and was greater than 400 ug/L for water samples collected in 2006. This is more than 4 times greater than the Federal Drinking Water Standard and 8 times greater than the State Water Quality Standard.

The Final LANL SWEIS must address

- 1). the uncertainty in the knowledge of the dimensions of the hexavalent chromium
plume in the regional aquifer,
- 2). the uncertainty in the speed of travel of the plume, and
- 3). the uncertainty in the danger of the hexavalent chromium plume
 - a). to the drinking water wells of Los Alamos County,
 - b). to the drinking water wells in the Buckman well field, an important water resource
for the City of Santa Fe,
 - c). to the Rio Grande, and
 - d). to the groundwater resources of the San Ildefonso Pueblo.

Figure 1-1 shows the locations of well R-28, the Los Alamos County drinking water wells (wells PM-3 and O-4 are most threatened by the chromium plume), the Buckman well field, and the property of the San Ildefonso Pueblo.

2.0. The poor understanding of the dimensions of the chromium plume and the speed of groundwater travel. The Final LANL SWEIS must address the impact that the poor knowledge of the dimensions of the hexavalent chromium plume has on LANL operations at the present time and in the future. Presently, the proximity of the plume to the Los Alamos County drinking water wells, to the groundwater resources of the San Ildefonso Pueblo, and to the Buckman well field are not known. There is a concern for a great rise in the levels of chromium that are reported in the most recent Santa Fe Water Department Annual Report for water quality in the Buckman well field. Presently, the cause for the increase in chromium is not understood by Concerned Citizens for Nuclear Safety (CCNS). We are seeking a meeting with the Santa Fe Water Department.

Because of the close proximity of well R-28 to the property of the San Ildefonso Pueblo, it is very probable that the hexavalent chromium contamination from LANL operations has already contaminated the groundwater resources of the Pueblo. Indeed, the chromium contamination in the groundwater resources of the San Ildefonso Pueblo may be at higher levels than at well R-28.

The mistakes that were made in the installation of LANL characterization wells R-13 and R-34 confound knowledge of the dimensions of the chromium plume. The locations of the LANL property boundary with the San Ildefonso Pueblo, well R-28, and the downgradient wells R-13 and R-34 are shown on Figure 1-1.

The chromium plume at well R-28 is in aquifer strata with very high permeability² in the upper part of the regional aquifer. The borehole data from wells R-28,² R-13,³ and R-34⁴ indicate that the high permeability strata at well R-28 are continuous across the landscape from well R-28 to well R-34. The high permeability strata are a fast pathway for the horizontal travel of the chromium plume. Presently, there is poor understanding of the speed of groundwater travel in the regional aquifer of the chromium plume because the necessary studies have not been performed as shown by the following excerpts from a LANL report by Keating et al:⁵

“Travel times through the regional aquifer are poorly understood because of the lack of tracer tests and in situ measurements of effective porosity.”
“The implication of this work for contaminant transport issues is that because of parameter uncertainty, predicted fluxes and velocities are quite uncertain. Uncertainties in permeability and porosity values lead to additional model uncertainty” [page 668, Keating et al., 2005].

It is of critical importance for the Final LANL SWEIS to acknowledge the poor understanding by LANL and DOE/NNSA for the danger of the chromium plume to the water resources. Figure 1-1 shows the large region between the

chromium plume at well R-28 and the Buckman well field where there are no monitoring wells.

The perspective in LANL reports is that the chromium plume at well R-28 is of limited size because contamination is not detected in wells R-13 and R-34. However, the screens in wells R-13³ and R-34⁴ are located deep below the water table of the regional aquifer and below a layer of clay strata that have very low permeability. The layer of clay strata are a hydraulic barrier between the chromium plume and the aquifer strata where the two screens are installed.

The hydrostratigraphy for wells R-28 and R-13 are displayed on Figure 1-3. The water quality data from well R-13 are not reliable for the presence of the chromium plume at the location of well R-13 because of the layer of clay strata located above the screen. It is very probable that the chromium plume is present in the aquifer strata above the clay barrier but the contamination goes unnoticed in the water samples collected from well R-13.

Figure 1-4 displays the Schlumberger borehole geophysics for wells R-28 and R-34. Well R-34 is located downgradient of well R-28 in the direction of groundwater flow at a location on the San Ildefonso Pueblo. As with well R-13, the screen in well R-34 is located deep below the water table and below a layer of clay strata that form a hydraulic barrier between the groundwater above and below the clay layer. The water quality data from well R-34 are not reliable for knowledge of the presence of the chromium plume in the highly permeable aquifer strata above the layer of clay.

There is a pressing need for the installation of additional monitoring wells to investigate the dimensions of the hexavalent chromium plume in the strata with high permeability to the south of well R-28 on the property of the San Ildefonso Pueblo, at the location of well R-34, and between well R-34 and the Buckman well field to address the uncertainty about the presence of the chromium plume, and to address the uncertainty about travel times through the regional aquifer for the chromium plume to reach the drinking water wells.

The report by Keating et al. identified that the Buckman well field is producing water from beneath the Pajarito Plateau to the west of the Rio Grande:

"Simulations suggest that flow beneath the Rio Grande (west to east) has been induced by production at the Buckman well Field. Our calculations show that this flux may have increased from zero (pre1980) to approximately 45 kg s⁻¹ at present, or about 20% of the total annual production at Buckman" [page 658, Keating et al., 2005].

Furthermore, Keating et al. identify the need to install monitoring wells at appropriate locations between LANL operations and the Buckman well field for multi-well pumping tests and tracer tests to acquire the necessary knowledge concerning contaminant transport issues:

“The implication of this work for contaminant transport issues is that because of parameter uncertainty, predicted fluxes and velocities are quite uncertain. Uncertainties in permeability and porosity values lead to additional model uncertainty. These uncertainties can be reduced meaningfully with more data collection, including multiwell pumping and tracer tests” [page 668, Keating et al., 2005].

3.0. Misrepresentation in LANL Reports of the high permeability of the aquifer strata beneath the San Ildefonso Pueblo

A serious mistake in the LANL *Synthesis Report*⁶ is the statement that “no high permeability zones occur east of well R-13”. Well R-13 is located immediately north of the San Ildefonso Pueblo in Mortandad Canyon. Figure 1-5 is a map from the LANL *Synthesis Report* that portrays the regional aquifer to the west and south of well R-13 beneath the Pueblo property to have a permeability lower than 3.4 meters per day. Quite the opposite is true.

In fact, over a large part of the San Ildefonso Pueblo property, the regional aquifer has a permeability much greater than 3.4 meters per day. The available information from the LANL Hydrogeologic Workplan Project is that thick intervals of aquifer strata with a permeability greater than 20 meters per day occur over much and probably all of the Pueblo property to the west of the Rio Grande across the landscape to the south of well R-13. At the locations of wells R-34, R-22, and possibly well R-21, there are thick intervals of aquifer strata with a permeability greater than 40 meters per day. The LANL *Synthesis Report* is hiding the very large and very valuable groundwater resource on the San Ildefonso Pueblo.

3.1. The High Permeability of the Regional Aquifer at Well R-34. Figure 1-1 shows the location of characterization well R-34 in Cedro Canyon on the San Ildefonso Pueblo. The LANL *Synthesis Report* makes the mistake to describe the regional aquifer at well R-34 as having a low permeability of 1.07 meters per day. The spurious low permeability was measured by a pumping test that was affected by residual foam drilling fluids, and because of the mistakes that were made in the construction of the well. As described below, the available information show the regional aquifer at well R-34 to have a permeability greater than 40 meters per day.

The open borehole for the single-screen well (23-ft long screen) was drilled with fluid-assisted air rotary drilling methods that invaded the strata surrounding the borehole with organic drilling foam that contained drill air.⁴ The pumping test in well R-34 did not provide reliable information on the permeability of the aquifer strata because of the outgassing of the drill air and foam. From the LANL well R-34 pumping test report:⁴

- "The presence of air in the formation water interfered with pump operation, resulting in either erratic discharge rate fluctuations or no flow at all."
- "Furthermore, the presence of the gas phase would be expected to significantly reduce the formation hydraulic conductivity."

The LANL report documented the problems that prevented the pumping test from providing reliable measurement of the aquifer permeability. Nevertheless, the LANL *Synthesis Report*⁶ published the obviously spurious low permeability value of 1.07 m/day.

The low permeability value in the *Synthesis Report* is also contradicted by the description of the coarse strata at the screened interval in Well R-34 and by the results of the Schlumberger borehole geophysics. Table 2-5 in the *Synthesis Report*⁶ describes the aquifer strata at well R-34 as "fairly coarse gravels with some cobble beds". Table 2-5 has a similar description of the aquifer strata at the wells R-11 and R-28 where pumping tests measured permeability values of 35.51⁷ and 45.52 m/day,³ respectively.

In addition, the Schlumberger geophysics logs are similar for wells R-11,⁷ R-28,² and R-34.⁴ Figure 1-4 is a comparison of the permeability of the aquifer strata at wells R-28 and R-34 from the Schlumberger borehole geophysics that were performed in the boreholes for the two wells. The geophysics data show the presence of a 64-ft thick section of aquifer strata immediately below the water table at the location of well R-34 that warrant a permeability of greater than 40 m/day.

It is important to note that the Schlumberger Geophysics logs identify that the screened interval in well R-34 was not installed in the aquifer strata with highest permeability. In fact, the Schlumberger logs identify clay sediments to be present across the top 6 ft and in a thin zone in the middle of the screened interval. Greater than 30 % of the screened interval is surrounded by clay strata with low permeability. The clay strata had an important effect to lower the permeability measured by the pumping test in well R-34.

The drilling record and geophysics record for the well R-34 borehole document that the regional aquifer in the western region of the San Ildefonso Pueblo has a

total thickness of aquifer strata with high permeability of greater than 250-ft thick and probably greater than 500-ft thick from interpretation of regional information.

The Final LANL SWEIS must identify and reconcile the wrong information that is presented in the LANL reports. The high permeability of the aquifer strata beneath the San Ildefonso Pueblo greatly increase the danger of LANL waste to contaminate the valuable groundwater resource of the Pueblo and for the contamination to reach the Rio Grande and the Buckman well field.

4.0. The poor reliability of LANL characterization well R-16 to identify the danger of LANL operations to the Buckman well field.

The danger of the hexavalent chromium plume to contaminate the groundwater at the Buckman well field is increased because of the mistakes that were made in the construction of well R-16, the LANL sentry well for LANL groundwater contamination traveling to the Buckman well field. Figure 1-7 displays the as-built construction of the multiple-screen well R-16. Screen #1 is blocked off by the retractable drill casing that was abandoned in the borehole. Screen #4 is surrounded by bentonite clay slough sediments⁸ that were not removed from the borehole before installing the backfill materials. The bentonite clay have well known properties to mask the detection of contaminants in the water produced from the well. The borehole for the well was drilled with the mud-rotary drilling method that caused the screened intervals to be invaded with bentonite clay drilling mud and organic drilling additives. The LANL *Well Screen Analysis Report*⁹ identified that screen #2 and #4 in well R-16 do not produce reliable and representative groundwater samples (see Figure 1-2).

An additional mistake with the construction of well R-16 is that the Schlumberger borehole geophysics reveal that screen #4 was installed in a layer of strata with very low permeability and that layers of strata with markedly higher permeability are located above and below the strata that surround screen #4. The Schlumberger geophysics is displayed on Figure 1-8. Well R-16 is one of the monitoring wells for monitoring the release of contaminants from the RCRA regulated waste disposal sites at TA-54. The RCRA regulations require installation of well screens in the strata with highest permeability and the collection of representative groundwater samples. Well R-16 is not in compliance with RCRA 40 CFR §§ 264.90-100 (referred to as RCRA §264 Subpart F).

Well R-16 is not a reliable sentry well for contamination traveling to the Buckman well field. There is a pressing need to replace well R-16 and to install additional monitoring wells for the detection of LANL waste upgradient of the San Ildefonso Pueblo, the Buckman well field and the supply well of Los Alamos County.

NEPA required recognition of the deficiencies of the existing LANL monitoring well network and a finding in the Final LANL SWEIS to institute the “*Reduced Operations Alternative*” that was described as one of the alternatives in the Draft LANL SWEIS.

References

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