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GROUND WATER
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Environmental Protection Division
Water Quality & RCRA Group (ENV-RCRA)
P.O. Box 1663, Mail Stop K490
Los Alamos, New Mexico 87545
(505) 667-0666

Date: DEC 20 2012
Refer To: ENV-RCRA-12-0271
LAUR: 12-26896

Mr. Jerry Schoeppner, Bureau Chief
New Mexico Environment Department
Ground Water Quality Bureau
Harold Runnels Building
1190 St. Francis Drive
P.O. Box 5469
Santa Fe, New Mexico 87502

Dear Mr. Schoeppner:

**SUBJECT: NOTICE OF INTENT TO DISCHARGE REDEVELOPMENT WATER FROM
REGIONAL AQUIFER MONITORING WELL R-61**

In accordance with Subsection A of 20.6.2.1201 New Mexico Administrative Code (NMAC), Los Alamos National Security, LLC (the Laboratory) is filing this notice of intent (NOI) (Enclosure 1) to discharge 57,000 gallons of regional aquifer groundwater produced during the redevelopment of monitoring well R-61. The redevelopment water will be land applied on the areas specified in the enclosed map (Enclosure 2). The sites consist of 69 acres of roadside shoulder frontage located in Mortandad Canyon and on the mesa top south of Mortandad Canyon. The discharge sites do not include any Solid Waste Management Units.

R-61 is located on the mesa top to the south of Mortandad Canyon within the Laboratory's Technical Area 05 (Enclosure 2). The addition of R-61 to the monitoring network was intended to provide information further defining the vertical and lateral extent of chromium contamination in the regional aquifer. However, review of water quality data since the installation of R-61 suggest reducing conditions developed in the well screens. Redevelopment of R-61 was the recommended approach to address these conditions. NMED approved the *Work Plan for Redevelopment of Monitoring Well R-61* on July 10, 2012 and revision on August 30, 2012 (Enclosure 3)



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Redevelopment consisted of physical and chemical treatments. The initial development water was sequestered and will be transported off-site for disposal. Analytical data of redevelopment water is included in Enclosure 4. The results were evaluated against the NMED approved *Decision Tree for the Land Application of Drilling, Development, Rehabilitation, and Sampling Purge Water* (Enclosure 5) and meet all criteria for land application set forth in the document.

Redevelopment water from R-61 will be land applied in accordance with the terms and conditions of the Laboratory's standard operating procedure, ENV-RCRA-QP-010.3, *Land Application of Groundwater*. Criteria for land application include, but are not limited to, the following:

- land application site cannot be located in or result in runoff to a watercourse
- land application cannot create ponds or pools
- land application must be conducted in a manner that maximizes infiltration

Please contact Robert S. Beers at (505) 667-7969 of the Water Quality and RCRA Group (ENV-RCRA) if you have questions or need additional information.

Sincerely,



Terrill W. Lemke
Group Leader, (Acting)
Water Quality & RCRA Group (ENV-RCRA)

MTS:RMG/lm

Enclosure:

1. Ground Water Quality Bureau Notice of Intent
2. Land Application Sites for Redevelopment Water from Regional Aquifer Monitoring Well R-61
3. Work Plan for Redevelopment of Monitoring Well R-61
4. R-61 Redevelopment Water Quality Analytical Data
5. Los Alamos National Laboratory Drilling, Development, Rehabilitation and Sampling Purge Water Decision Tree

Cy: ✓ Bruce Yurdin, NMED/SWQB, Santa Fe, NM, w/enc.
✓ Gene Turner, LASO-EPO, w/o enc., (E-File)
✓ Hai Shen, LASO-EPO, w/o enc., (E-File)
Carl A. Beard, PADOPS, w/o enc., A102
Michael T. Brandt, ADESH, w/o enc., (E-File)
Alison M. Dorries, ENV-DO, w/o enc., (E-File)
Michael T. Saladen, ENV-RCRA, w/enc., (E-File)
Robert A. Beers, ENV-RCRA, w/o enc., K490

Mr. Jerry Schoeppner
ENV-RCRA-12-0271

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Cy (continued):

Steven Paris, PMFS-DO, w/o enc., (E-File)

Tori George, REG-DO, w/o enc., (E-File)

Victor Garde, CAP-WS, w/o enc., (E-File)

IRM-RMMSO, A150, (E-File)

ENV-RCRA Correspondence File, w/enc., K490

ENCLOSURE 1

Ground Water Quality Bureau Notice of Intent

ENV-RCRA-12-0271

LAUR-12-26896

Date: DEC 20 2012



New Mexico Environment Department
Ground Water Quality Bureau

Ground Water Quality Bureau –
Pollution Prevention Section
Notice of Intent

1. Name and mailing address of person proposing to discharge:

Steven Paris
Project Management Field Services
Los Alamos National Laboratory
PO Box 1663, M992
Los Alamos, NM 87545
505-606-0915
Regulatory Point of Contact: Robert Beers, ENV-RCRA
505-667-7969
bbeers@lanl.gov

GROUND WATER

DEC 21 2012

BUREAU

2. Name of facility:

Los Alamos National Laboratory (LANL)

3. Physical location of discharge (if applicable, give street address, township, range, section, distance from closest town or landmark, directions to facility, location map):

Regional Monitoring Well 61 (R-61) is located on the mesa top to the south of Mortandad Canyon within TA-05. Redevelopment water from R-61 will be land applied on sites delineated in the attached location map (Enclosure 2). The sites consist of 69 acres of road side shoulder frontage located in Mortandad Canyon and on the mesa top south of Mortandad Canyon. The discharge sites do not include any solid waste management units (SWMU).

4. Type of operation generating the discharge (e.g., truck wash, food processing plant, restaurant, etc.):

Redevelopment of the regional aquifer monitoring well R-61 was conducted to address reducing conditions in well the screens. Well R-61 was drilled in 2011 to a total depth of 1265 ft. The primary purpose for drilling and installing the R-61 well was to further define the vertical and lateral extent of chromium contamination in the regional aquifer. Redevelopment included (1) physical redevelopment methods using swabbing, surging, jetting, and pumping techniques and (2) chemical treatment using a sequence of Johnson Nu-Well treatment products. Attached is the Work Plan, approved by NMED, for Redevelopment of Monitoring Well R-61 (Enclosure 3).

5. Source(s) of the discharge. Describe how the wastewater, sludge, or other discharges processed and/or disposed at your facility are generated. Identify all sources. Attach additional pages if needed:

The source of the discharge is redevelopment water from R-61 produced after chemical rehabilitation agents were used to address reducing conditions. The general sequence for redevelopment included: (1) application of biocaustic dispersant (potassium hydroxide) [KOH] and Nu-Well 320 biocaustic dispersant); (2) bioacid polymer and disperse mineral salts (Nu-well 120 liquid acid and Nu-Well 310 bioacid dispersant); and (3) sanitizing the well screen and filter pack using Nu-Well 410 chlorine enhancer. The process generated 57,000 gallons of redevelopment water which was containerized into 3X20, 000 gallon frac tanks. In addition to the 57,000 gallons, approximately 17,800 gallons of development water was initially produced which did not meet land application criteria. This water was sequestered and will be disposed off-site in accordance with applicable regulations.

6. Expected contaminants in the discharge (e.g., nitrate-nitrogen, metals, organic compounds, salts, etc.). Include estimated concentration if known, and copies of results of laboratory analyses, if available:

Representative samples of the redevelopment water were collected from the 3 frac tanks, composited and submitted for a full-suite analysis. The results are included in Enclosure 4. The results were evaluated against the NMED approved Decision Tree for the Land Application of Drilling, Development, Rehabilitation, and Sampling Purge Water (Enclosure 5) and determined to meet all criteria for land application set forth in the document. Water meeting the



New Mexico Environment Department
Ground Water Quality Bureau

Ground Water Quality Bureau –
Pollution Prevention Section
Notice of Intent

criteria for land application will be discharged in accordance with the Laboratory's Standard Operating Procedure, ENV.-RCRA-QP-010.3, Land Application of Groundwater.

7. Describe all components of wastewater processing, treatment, storage, and disposal system (e.g., grease interceptor, lagoon, septic tank/leachfield, etc.). Include sizes, site layout map, plans and specifications, etc. if available:

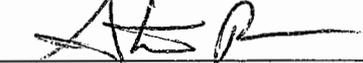
See Enclosure 2. A total of 57,000 gallons will be land applied to road shoulders as shown on land application map. Water will be dispersed from a water truck equipped with cannon (sprayers). Criteria for land application include, but are not limited to, the following:

- 8. land application site cannot be located in a watercourse
- 9. land application site cannot result in runoff to watercourse
- 10. land application cannot create ponds or pools
- 11. land application must be conducted in a manner that maximizes infiltration

12. Estimated maximum daily discharge volume in gallons per day (or other units):

The maximum daily discharge is estimated to be 25,000 per day. The tanker capacity is 5000 gallons.

13. Estimated depth to ground water (ft): Depth to groundwater ranges from 868' to 1100' (2011 Completion Report for R-61, March 2011 Groundwater Levels Status Report, 2009 Completion Report for R-45, 2009 Completion Report for R-42)

Signature:  Date: 12/17/12

Printed name: Steven Paris Title: Project Manager

Please return this form to:
NMED Ground Water Quality Bureau
P.O. Box 5469
Santa Fe, New Mexico 87502-5469

Telephone: 505-827-2900
Fax: 505-827-2965



Environmental Protection Division
WQ & RCRA Group (ENV-RCRA)
PO Box 1663, MS K490
Los Alamos, New Mexico 87545
(505) 667-0666

Date: FEB 20 2013
Refer To: ENV-RCRA-13-0039
LAUR: 13-20999

Mr. Jerry Schoeppner, Bureau Chief
New Mexico Environment Department
Ground Water Quality Bureau
Harold Runnels Building, Room N2250
P.O. Box 5469
Santa Fe, New Mexico 87502

Dear Mr. Schoeppner:

**SUBJECT: RESPONSE TO NMED INQUIRY - NOTICE OF INTENT TO DISCHARGE
REDEVELOPMENT WATER FROM REGIONAL AQUIFER MONITORING
WELL R-61**

Please find enclosed the information necessary to answer Ms. Fullam's inquiry of February 11, 2013 regarding R-61 Redevelopment Treatment Volumes. On December 20, 2013, Los Alamos National Security filed a notice of intent to discharge 57,000 gallons of regional aquifer groundwater produced during the redevelopment of monitoring well R-61.

Please contact Robert Beers at (505) 667-7969 of the Water Quality and RCRA Group (ENV-RCRA) if you have questions or need additional information.

Sincerely,


Anthony R. Grieggs
Group Leader
Water Quality & RCRA Group (ENV-RCRA)

ARG:RMG/lm

Enclosure:

1. R-61 Redevelopment Treatment Volumes

Cy: Bruce Yurdin, NMED/SWQB, Santa Fe, NM, w/enc.
Jennifer Fullam, NMED/GWQB, Santa Fe, NM, w/enc.
Gene E. Turner, NA-OO-LA, w/o enc., (E-File)
Hai Shen, NA-OO-LA, w/o enc., (E-File)
Carl A. Beard, PADOPS, w/o enc., A102
Michael T. Brandt, ADESH, w/o enc., (E-File)
Alison M. Dorries, ENV-DO, w/o enc., (E-File)
Michael T. Saladen, ENV-RCRA, w/enc., (E-File)
Robert S. Beers, ENV-RCRA, w/o enc., K490
Robert M. Gallegos, ENV-RCRA, w/enc., (E-File)
Steven M. Paris, PMFS-DO, w/o enc., (E-File)
Tori George, REG-DO, w/o enc., (E-File)
Victor Garde, CAP-WS, w/o enc., (E-File)
LASOmailbox@nnsa.doe.gov, w/enc., (E-File)
locatesteam@lanl.gov, w/enc., (E-File)
ENV-RCRA Correspondence File, w/enc., K490

ENCLOSURE 1

R-61 Redevelopment Treatment Volumes

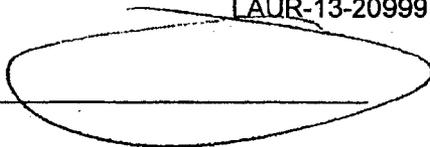
ENV-RCRA-13-0039

LAUR-13-20999

Date: FEB 20 2013

Appendix D

R-61 Redevelopment Treatment Volumes



Introduction

The following calculations and rationale were prepared for the lower screen at R-61 and were assembled from various correspondences. While the calculations presented are specific to the lower screen, the same arithmetic and assumptions apply to the upper screen as well. The treatments at the upper screen were calculated in the same fashion with the only difference being the upper screen is half the length. As such, treatment volumes for the upper screen were half the volumes presented in the following rationale.

Treatment Volumes for Lower Screen

The goal was to push the chemical solution through the screen and filter pack, well back into the formation. A solution volume of 30 gallons per foot of screen was used for R-61. This was a pragmatic choice, balancing the need to reach out into the formation while constraining the volume of chemical to a level that was readily handled (mixed) and purged from the well. The lower well screen is 20.6 feet long, so a total of 620 gallons of chemical solution was used.

Ignoring vertical flow, the distance that the mixed solution reaches beyond the borehole wall can be calculated as follows:

$$d = \sqrt{\frac{V}{7.48\pi n} - \frac{(1-n)r_s^2}{n}} - r_w$$

where,

V = volume of solution per foot of screen, in gallons (30 gallons)

r_s = inside radius of well screen, in feet (0.21 ft)

r_w = borehole radius, in feet (0.52 ft)

n = effective porosity

For several assumed values of effective porosity, the following are the penetration distances:

<u>Effective Porosity</u>	<u>Penetration Distance (feet)</u>
0.15	2.35
0.20	1.97
0.25	1.71
0.30	1.52

The distance, d, is the bulk average. The penetration distance will be less in tight strata and greater in permeable zones.

Caustic Treatment

A concentration of 3 percent of the total mixture volume was required for both the potassium hydroxide and Nu-Well 320 enhancer. The 620-gallon treatment volume weighed 5171 lbs. Three percent of this is 155 lbs of each chemical required to make up the mixture.

The potassium hydroxide flakes were of 90 percent purity. Thus, $155/0.9 = 172$ lbs of flakes, or 78 kg were used.

The Nu-Well 320 enhancer weighed 9.5 lbs per gallon. Thus, $155/9.5 = 16.3$ gallons of this chemical was used.

Acid Treatment

The acid treatment incorporated NuWell 120 Liquid Acid (phosphoric acid) in a mixture with NuWell 310 Bioacid Dispersant.

NuWell 120 acid was used at a rate of 5 percent of the total volume of the solution. The 620-gallon treatment volume weighed 5171 lbs. Five percent of this volume is 259 lbs of chemical product. The acid weighed 13 lbs per gallon, so 20 gallons were used.

NuWell 310 was used at a rate of 3 percent of the total volume of the solution, or 155 lbs. This chemical weighs 10 lbs per gallon, so 15.5 gallons were used.

Chlorine Treatment

The chlorine treatment incorporated sodium hypochlorite and NuWell 410 chlorine enhancer.

The Nu-Well 410 enhancer was used at a rate of 0.4 quarts per 100 gallons of water per 100 ppm alkalinity (expressed as CaCO_3). Based on 620 gallons of water, the amount of NuWell 410 computes to 2.5 quarts per 100 ppm alkalinity. Many of the regional wells have alkalinity values around 60 ppm or so. It was assumed that the municipal wells (the source for mix water) were similar. At this concentration, it would require $2.5 \times 0.60 = 1.5$ quarts. The objective of the NuWell 410 is to lower the water pH to just under 5.0. Therefore, less than the calculated amount was added, the pH was measured, and addition of NuWell 410 was repeated until the desired pH was reached. Approximately 1.5 quarts of NuWell 410 was used.

The desired free chlorine concentration is 200 ppm minimum; greater concentrations are fine and have no deleterious side effects. A 12.5 percent strength sodium hypochlorite solution was used, so it was mixed at a minimum concentration of $200/0.125 = 1600$ ppm, or 0.16 percent. Thus, the total weight of the chemical added was 0.16 percent of the total weight of the solution or $5171 \times 0.0016 = 8.3$ lbs. The bulk sodium hypochlorite weighs 10 lbs per gallon. This made the minimum volume requirement $8.3/10 = 0.83$ gallons. When the chlorine is mixed, some chemical is lost via evolution of chlorine gas. This, coupled with other chlorine demand such as the unsanitized mixing tank, hoses, piping, residual acid in the formation, etc., resulted in the use of additional chemical. A total of approximately one gallon was used.