05 ENTERED

Los Alamos NATIONAL LABORATORY EST. 1943

MAR 2013

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

National Nuclear Security Administration
Los Alamos Field Office, A316
3747 West Jemez Road
Los Alamos, New Mexico, 87545
(505) 667-5794/FAX (505) 667-5948

Date: FEB 2 7 2013
Refer To: ENV-RCRA-13-0045
LAUR: 13-20968

Mr. Jerry Schoeppner, Chief
Ground Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, Room N2250
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

Dear Mr. Schoeppner:

SUBJECT: REQUEST FOR TEMPORARY PERMISSION TO DISCHARGE TREATED GROUNDWATER FROM A PUMPING TEST AT WELL R-28, DP-1793

In December 2011, the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) submitted to the New Mexico Environment Department (NMED) a discharge permit application (DP-1793) for the land application of treated groundwater from a pumping test at monitoring well R-28 (ENV-RCRA-11-0284). In a January 13, 2012, letter (Enclosure 1) NMED granted DOE/LANS temporary permission to discharge treated groundwater from the pumping test at R-28 pursuant to Subsection B of 20.6.2.3106 New Mexico Administrative Code (NMAC) of the New Mexico Water Quality Control Commission (NMWQCC) Regulations. The pumping test was conducted in February 2012, and a final project report was submitted in March 2012.

The NMED Hazardous Waste Bureau recently directed DOE/LANS to prepare an interim measures work plan (Enclosure 2) that will include implementation of a second, longer-duration pumping test at R-28 to further define the characteristics of the aquifer and chromium plume. In accordance with guidance provided by the NMED Ground Water Quality Bureau staff, DOE/LANS request temporary permission to discharge treated groundwater from R-28 for up to 120 days with an estimated maximum volume of approximately 5 million gallons.

35756

A final determination on the length of the pumping test, the volume of water produced, and the proposed use of tracers will follow the NMED Hazardous Waste Bureau's approval of the interim measures work plan required for submittal by May 1, 2013.

Enclosure 3 contains the $150.00 filing fee required by regulation (20.6.2.3114 NMAC).

The proposed pumping test at R-28 will be consistent with the following two documents submitted by DOE/LANS to the NMED Ground Water Quality Bureau: *Discharge Permit Application for the Land Application of Treated Groundwater from Monitoring Well R-28* (December 2011) and *Supplemental Information, Discharge Permit DP-1793, On-Site Treatment and Land Application of Pumping Test Water* (March 2012). Project-specific information on the proposed pumping test is described below.

1. **Location**. R-28 is located in Mortandad Canyon (Township/Range/Section: T19N/R06E/S24). Enclosure 4 provides a location map.

2. **Expected Pumping Test Rate, Duration, and Volume**. The initial study design has preliminarily established the following pumping test parameters.

   - Rate: ~28 gal./min
   - Duration: 24 h/d, 7 d/wk , up to 120 d
   - Daily Volume: ~40,000 gal./d
   - Total Volume: up to ~4,800,000 gal.

3. **Expected Contaminants**. The primary contaminant expected from monitoring well R-28 is chromium (~400 µg/L). Nitrate is a potential contaminant; current concentrations, approximately 4 mg/L (as N), are elevated above background but are less than the NMWQCC Regulation 3103 groundwater standard of 10 mg/L. Water quality data from 2012 (Enclosure 5) demonstrate that no contaminants other than chromium exceed land-application criteria. No samples for organic compounds were collected from R-28 in 2012. Results from the November 15, 2011, sampling at R-28 for semivolatile organic compounds (SVOC) and volatile organic compounds (VOC) were nondetects, with the exception of the following result: chloromethane= 0.34 µg/L. (Note: The lab qualifier "J" was assigned to the value to indicate a result greater than the method detection limit but less than the reporting limit.) The removal of organic compounds at R-28 from the current Interim Facility Groundwater Monitoring Plan was based on a history of nondetects values both at R-28 and other wells that are part of a monitoring group focused on the chromium plume.

4. **Tracers.** Tracers will be placed in the aquifer at R-28 to characterize hydraulic, geochemical, and transport properties of the subsurface flow medium. The applied tracers and the estimated masses that are proposed to be used are as follows:

   - Sodium 2,6 difluorobenzoate (DFBA) or sodium 2,5 difluorobenzoate: <5 kg
   - Sodium iodide (NaI) or sodium bromide (NaBr): <5 kg
   - (Di)Sodium 1,5 naphthalene disulfonate (NDS): <200 g

Enclosure 6 contains copies of the Material Safety Data Sheets (MSDS) for the tracers listed above.

The tracers will be diluted in ambient groundwater extracted from the aquifer by pumping monitoring well R-28. The total groundwater mass will not exceed 12,000 gal. The 2,6-DFBA and NaI (or 2,5-DFBA/NaBr) will be mixed in approximately 1,500 gal. of groundwater and placed into the borehole. The 1500 gal. of tracer solution will be followed by up to 10,000 gal. of groundwater without tracer to "push" the tracer solution into the formation. After placement of the "push" water, up to 500 gal. of water containing the NDS tracer will be introduced into the borehole. The placements are expected to take less than 40 h. After that, the transients in the tracer concentrations will be observed at the monitoring well for a period of time (not likely to exceed 2 weeks) without any additional placement or withdrawal of water. Pumping for the aquifer test will then be initiated. This pumping will also withdraw the tracers. Tracer concentrations will be monitored at the well head to establish recovery curves for each unique tracer, thus providing useful information about aquifer heterogeneity. It is expected that most (possibly greater than 90%) of each tracer mass will be extracted from the aquifer during the extended pumping period at R-28.

5. **Raw Water Storage.** Groundwater produced from R-28 during the pumping test will be discharged into 21,000-gal. frac tanks before treatment. A sufficient number of frac tanks will be staged on-site to provide adequate storage capacity for the duration of the test.

6. **Treatment System.** Enclosure 7 provides a schematic of the ion exchange (IX) treatment system and technical specifications of the IX vessels and resin. The IX treatment system will be operated 10 h/d, 7 d/wk. A feed pump will transfer the daily production of groundwater from raw water storage through the IX treatment system in 10 hours. Two IX treatment vessels will be configured in series for chromium and nitrate removal. Spare vessels will be staged on-site for replacement, as needed. Sample collection ports are available at all stages of treatment. The treatment system design is based on an influent chromium concentration of 400 µg/L and a maximum effluent (product) concentration of 35 µg/L, less than 90% of the NMWQCC Regulation 3103 groundwater standard of 50 µg/L, in accordance with the NMED-approved *Decision Tree for the Land Application of Drilling, Development, Rehabilitation, and Sampling Purge Water* (March 2010).

7. **Treated Water Storage.** Treated water (product) from IX treatment systems will be stored in two synthetically lined (12 mil) pits located in the vicinity of the R-28 well site. Each pit will have a capacity of approximately 160,000 gal. The pits will be fenced to keep out wildlife.

   Design of the synthetically lined pits is currently in process. Details of the pit design and configuration will be provided in a separate submittal on or before March 15, 2013.

8. **Sampling Plan.** As a contingency against the discharge of constituents in excess of land application criteria, representative samples of treated water will be analyzed throughout the pumping test for total chromium and nitrate (as N) for comparison with the land

application criteria of 45 µg/L and 9 mg/L, respectively (90% of NMWQCC Regulation 3103 groundwater standards). Samples will be collected as follows. Periodic (~3 hr) aliquots from the IX product stream will be collected during discharge into a pit. Aliquots will be composited into a single sample for analysis to represent each pit prior to land application. No additional treated water will be added to the pit after the last aliquot is collected.

Samples will be analyzed for total chromium and nitrate (as N) by analytical laboratories at Los Alamos National Laboratory. Sampling techniques and analytical methods will conform to the requirements of 20.6.2.3107 NMAC. If chromium or nitrate concentrations in composite sample exceed 45 µg/L or 9 mg/L, respectively, then the treated water in a pit will not be land applied. Instead, the following contingency plan will be implemented: (1) the upstream IX vessel will be replaced by the downstream vessel, (2) a new downstream vessel will be installed, (3) the pit water exceeding land application criteria will retreated, and (4) aliquots of the treated water will be collected and composited for analysis, as described in this section, for comparison with land application criteria.

9. **Land Application.** Enclosure 8 provides a map showing land application areas within Mortandad Canyon.

   Treated groundwater will be land applied using either a 5000-gal. water wagon equipped with a high-pressure water sprayer or irrigation-type sprinklers fed via pumps directly from the lined pits. As a contingency against the discharge of treated groundwater into waters of the state, the land application of treated groundwater from R-28 will be conducted in accordance with Los Alamos National Laboratory's Standard Operating Procedure ENV-RCRA-QP-010.2, *Land Application of Groundwater*. Criteria for land application include, but are not limited to, the following:

   - land application site cannot be located in a watercourse
   - land application cannot result in runoff to a watercourse
   - land application cannot create ponds or pools
   - land application must be conducted in a manner that maximizes infiltration and evaporation
   - land application is restricted to daylight hours and for a maximum of 10 h/d
   - land application must be supervised at all times
   - land application is prohibited while precipitation is occurring

Please contact Robert S. Beers by telephone at (505) 667-7969 or by email at bbeers@lanl.gov if you have questions regarding this request.

Sincerely,

Alison M. Dorries
Division Leader
Environmental Protection Division
Los Alamos National Security, LLC

Sincerely,

Gene E. Turner
Environmental Permitting Manager
Environmental Projects Office
Los Alamos Field Office
U.S. Department of Energy

AMD:GET:RSB/lm

Enclosures:

1. January 13, 2012, letter from NMED granting temporary permission to discharge treated groundwater from monitoring well R-28
2. January 25, 2013, letter from NMED issuing comments and direction to DOE/LANS on the *Proposal to Submit Interim Measures Work Plan for Chromium Contamination in Groundwater*
3. Check to the NMED in the amount of $150.00 for the temporary permission filing fee
4. Location map of R-28
5. 2012 water quality data, R-28
6. Material Safety Data Sheets (MSDS) for five (5) tracers
7. Ion Exchange (IX) Treatment System Schematic, IX Vessel and Resin Technical Specifications
8. Map of approved land application areas in Mortandad Canyon

Cy: James Hogan, NMED/SWQB, Santa Fe, NM, w/enc.
John E. Kieling, NMED/HWB, Santa Fe, NM, w/enc.
Dave Cobrain, NMED/HWD, Santa Fe, NM, w/enc.
Thomas Skibitski, NMED/DOE/OB, Albuquerque, NM, w/enc.
Stephen M. Yanicak, NMED/DOE/OB, w/enc., (E-File)
Hai Shen, NA-OO-LA, w/enc., (E-File)
Gene E. Turner, NA-OO-LA, w/enc., (E-File)
Pete Maggiore, NA-OO-LA, w/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)
David J. McInroy, CAP, w/enc., (E-File)
Victoria A. George, REG-DO, w/enc., (E-File)
Danny Katzman, ET-EI, w/enc., (E-File)
Michael T. Saladen, ENV-RCRA, w/o enc., (E-File)
Robert S. Beers, ENV-RCRA, w/enc., K490
LASOmailbox@nnsa.doe.gov, w/enc., (E-File)

Cy (continued):
locatesteam@lanl.gov, w/enc., (E-File)
ENV-RCRA Correspondence File, w/enc., K490

ENCLOSURE 1

January 13, 2012, letter from NMED granting temporary permission to discharge treated groundwater from monitoring well R-28

ENV-RCRA-13-0045

LAUR-13-20968

Date: FEB 2 7 2013

NEW MEXICO
ENVIRONMENT DEPARTMENT

Resource Protection Division

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1190 Saint Francis Drive (87505)
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DAVE MARTIN
Cabinet Secretary
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JAMES H. DAVIS, Ph.D.
Division Director

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

January 13, 2012

Michael Graham
Associate Director, Environmental Programs
Los Alamos National Laboratory
PO Box 1663, MS-K490
Los Alamos, NM 87544

Chris Cantwell
Associate Director ESH & Q,
Los Alamos National Laboratory
PO Box 1663, MS-K490
Los Alamos, NM 87544

RE: Temporary Permission to Discharge, Treated Well Development and Pump Test Ground Water Discharge at Regional Monitoring Well R-28, DP-1793

Dear Messrs. Graham and Cantwell:

The New Mexico Environment Department has reviewed your application dated December 22, 2011, and request for temporary permission to discharge no more than 400,000 gallons of treated industrial wastewater generated from a proposed regional monitoring well R-28 pump test. Ground water in the area of R-28 has been determined to contain chromium at levels in exceedance the Water Quality Control Commissions (WQCC) standards. The pump test and development water is to be treated for chromium using an ion exchange treatment system. Treated water is proposed to be land applied on approximately 83 acres via water trucks along approximately three miles of dirt road in the vicinity of regional monitoring well R-28. The proposed discharge is located in Mortandad Canyon, approximately three miles southeast of Los Alamos in Section 24, Township 19N, Range 06E, within the boundaries of Los Alamos National Laboratory, Los Alamos County.

Temporary permission to discharge is hereby granted until May 5, 2012, pursuant to Subsection B of 20.6.2.3106 NMAC of the New Mexico Water Quality Control Commission Regulations. This approval is contingent on your discharging and reporting as described in your December 22, 2011 request and upon the following conditions:

1. Water generated from the pump testing of monitoring well R-28 shall be contained and treated to a chromium concentration of less than 0.05 mg/L prior to discharge.
2. The total volume of treated water discharged shall be recorded.
3. Land application of the treated water shall not occur in a watercourse or result in run-off to a watercourse.
4. Land application of the treated water shall not result in ponding.
5. Land application shall be conducted in a manner that minimizes potential impacts to ground water quality and maximizes evaporation.
6. Land application is restricted to daylight hours and a maximum of 10 hours per day.
7. Land application must be supervised at all times.
8. Land application of the treated water is prohibited while precipitation is occurring or during times when the ground is saturated or frozen to the extent that land applied water cannot be absorbed.
9. LANL shall collect representative samples of the treated water twice daily and analyze the samples for chromium using a method with a minimum detection limit below the required discharge limit of 0.05 mg/L. All sample collection, preservation and analysis shall conform to the methods identified in Subsection B of 20.6.2.3107 NMAC of the WQCC Regulations.
10. Should a chromium sample analysis reveal the presence of chromium at a concentration of 0.05 mg/L or greater, discharge of treated water shall immediately cease and NMED shall be notified. Following the implementation of corrective actions to ensure that chromium concentrations of the treated water meet less than 0.05 mg/L and NMED's approval, discharge may resume.
11. All ion exchange treatment vessels used in the treatment system shall be properly disposed of in accordance with all local, state and federal laws and regulations.
12. A final project report shall be submitted to NMED within 30 days of the final cessation of discharge. The report shall provide the total volume of treated water discharged and the analytical results of the chromium analyses for the project, and identify the locations that received the treated water.

Although NMED is granting temporary permission for the proposed discharge, the application which was submitted on December 22, 2011, contains insufficient information to proceed with the issuance of a Discharge Permit. NMED has requested several times in writing (letters dated December 16, 2010 and November 9, 2011) and during several recent teleconference calls (November 16 and December 7, 2011) that LANL submit a single application for a ground water Discharge Permit to cover all potential such temporary on-site treatment and discharge activities associated with contaminated ground water which is intended to be land applied. NMED is seeking supplemental information regarding such discharges in accordance with the required elements under Subsection C of 20.6.2.3106 NMAC. NMED is aware that the timelines and volumes of each event may be variable and therefore recommends using a conservative approach in estimating volumes and locations in the supplemental information. The supplemental information is required to be submitted by NMED **within 60 days of the date of this letter (by February 10, 2012).**

This temporary permission does not relieve you of the responsibility to comply with any other applicable federal, state, and/or local laws and regulations, such as zoning requirements and nuisance ordinances. Also, this approval does not relieve you of liability should your operation result in actual pollution of surface or ground waters.

If you have any questions, please contact Jennifer Fullam of the Ground Water Pollution Prevention Section at 505-827-2909.

Sincerely,

James H. Davis, Ph.D.
Director, Resource Protection Division

JD:JF

cc: Robert Italiano, District Manager, NMED District II
NMED Santa Fe Field Office
County File
James Bearzi, NMED SWQB
Richard Powell, NMED SWQB
John Kieling, NMED HWB
Steven Yanicak, NMED-DOE-Oversight Bureau
Gene Turner, LASO-EO, Los Alamos National Laboratory, A316, Los Alamos, NM 87545
Hai Shen, LASO-EO, Los Alamos National Laboratory, A316, Los Alamos, NM 87545
Carl Beard, PADOPS, Los Alamos National Laboratory, A102, Los Alamos, NM 87545
Victoria George, REG-DO, Los Alamos National Laboratory, M991, Los Alamos, NM 87545
Kate Lynnes, REG-COM, Los Alamos National Laboratory, M991, Los Alamos, NM 87545
Steve Veenis, PMFS-DO, Los Alamos National Laboratory, M997, Los Alamos, NM 87545
Ted Ball, PMF-FUNCT, Los Alamos National Laboratory, M996, Los Alamos, NM 87545
Mark Everett, ET-EI, Los Alamos National Laboratory, M992, Los Alamos, NM 87545
Michael Saladen ENV-RCRA, Los Alamos National Laboratory, K490, Los Alamos, NM 87545
Bob Beers, ENV-RCRA, Los Alamos National Laboratory, K490, Los Alamos NM, 87545

ENCLOSURE 2

January 25, 2013, letter from NMED issuing comments and direction to DOE/LANS on the *Proposal to Submit Interim Measures Work Plan for Chromium Contamination in Groundwater*

ENV-RCRA-13-0045

LAUR-13-20968

Date: FEB 2 7 2013

NEW MEXICO ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau

2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Phone (505) 476-6000 Fax (505) 476-6030
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Lieutenant Governor

DAVE MARTIN
Secretary

BUTCH TONGATE
Deputy Secretary

THOMAS SKIBITSKI
Acting Director
Resource Protection Division

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

January 25, 2013

Peter Maggiore
Assistant Manager, Env. Projects Office
Los Alamos Site Office, DOE
3747 West Jemez Rd, MS A316
Los Alamos, NM 87544

Jeffrey D. Mousseau, Associate Director
Environmental Programs
Los Alamos National Security, L.L.C.
P.O. Box 1663, MS M991
Los Alamos, NM 87545

RE: RESPONSE
PROPOSAL TO SUBMIT INTERIM MEASURES WORK PLAN FOR CHROMIUM CONTAMINATION IN GROUNDWATER
LOS ALAMOS NATIONAL LABORATORY
EPA ID#NM0890010515
HWB-LANL-12-022

Dear Messrs. Maggiore and Mousseau:

The New Mexico Environment Department (NMED) is in receipt of the United States Department of Energy (DOE) and the Los Alamos National Security, L.L.C.'s (collectively, the Permittees) document entitled *Proposal to Submit Interim Measures Work Plan for Chromium Contamination in Groundwater* (Proposal) dated December 21, 2012 and referenced by EP2012-0302. NMED has reviewed the Proposal and hereby issues the following comments and direction.

1. The scope of work for the interim measures work plan (IMWP) for chromium contamination, as proposed by the Permittees, includes tasks that are not interim measures but are more appropriately described as an additional site investigation. The IMWP must address the removal of chromium-contaminated groundwater from the regional aquifer and/or containment of the chromium plume. Specifically, the Permittees must include in the IMWP the following two tasks:

a. A proposal to initiate the removal, treatment, and disposal of chromium-contaminated groundwater from existing wells R-28 and R-42, which have the highest concentrations of chromium detected in the regional aquifer, as soon as possible; and

b. A proposal to assess the potential for an increased, long-term removal of chromium from the regional aquifer by installing pilot extraction test well in the vicinity of wells R-28 and R-42, including a high-capacity pump and a system to treat contaminated groundwater. The test well must be capable of pumping at a sufficient rate to stress the regional aquifer with the intent to better refine the capture zone near R-28 and R-42, and to assess chromium plume response to the long-term, high-volume pumping. During pumping of the test well, site-specific hydraulic-properties data, water chemistry, and pressure responses must be collected from the extraction well and from all nearby monitoring wells.

2. In the IMWP, the Permittees must propose to prioritize the available funding and other resources in the following manner: (i) installation of the pump-and-treat system for wells R-28 and R-42; (ii) construction and performance assessment of the high-capacity chromium extraction test well and the pump-and-treat system for that well, and (iii) performance of other tasks outlined in the Proposal.

3. To avoid unnecessary delay in activating the pump-and-treat systems for R-28 and R-42, the Permittees must expeditiously submit the Notice of Intent (NOI) to discharge, or other appropriate request, to the NMED Ground Water Quality Bureau, and apply for any other required permits. The Permittees must provide NMED with proof of the NOI submittal (or another applicable groundwater discharge permit submittal), and any other required permit-related submittals no later than **March 1, 2013**.

4. In the IMWP, the Permittees must propose to submit a work plan for installation of the extraction test well and associated groundwater treatment system that includes a proposed work plan submittal date. In the IMWP, the Permittees must provide preliminary options for disposal of water from the test well treatment system, including information on any required permits and the estimated time typically needed to obtain them.

5. In the IMWP, the Permittees must propose to submit periodic status reports on the implementation and performance of the interim measures for chromium contamination.

The Permittees must submit the IMWP for chromium contamination no later than **May 1, 2013**.

Should you have any questions, please contact Jerzy Kulis of my staff at (505) 476-6039.
Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: T. Skibitski, NMED RPD
D. Cobrain, NMED HWB
N. Dhawan, NMED HWB
B. Wear, NMED HWB
J. Kulis, NMED HWB
M. Dale, NMED HWB
J. Schoeppner, NMED GWQB
S. Yanicak, NMED DOE OB, MS M894
L. King, EPA 6PD-N
S. Rydeen, San Ildefonso Pueblo
J. Chavarria, Santa Clara Pueblo
D. Katzman, EP-CAP, MS M992
J. McCann, EP-CAP, MS M992
C. Rodriquez, DOE-LASO, MS A316
H. Shen, DOE-LASO, MSA316

File: Reading and Groundwater Chromium Plume, Sandia and Mortandad Canyon Watersheds

ENCLOSURE 3

Check to the NMED in the amount of $150.00
for the temporary permission filing fee

ENV-RCRA-13-0045

LAUR-13-20968

Date: FEB 2 7 2013

INVOICE NO	DATE	DESCRIPTION	DISCOUNT	NET AMOUNT
ACT3187-3	02/11/13	MONITOR WELL R-28		$150.00

CHECK NO	DATE	VENDOR NO.	VENDOR NAME	TOTAL AMOUNT
269522	02/12/2013	AC0604401	NEW MEXICO ENVIRONMENTAL DEPT	150.00

THE FACE OF THIS DOCUMENT HAS A COLORED BACKGROUND ON WHITE PAPER, A VOID PANTOGRAPH AND MICROPRINTING.

WELLS FARGO BANK OHIO, N.A.
115 Hospital Drive
Van Wert. Ohio 45891

LOS ALAMOS NATIONAL LABORATORY
PO BOX 1663, MS P240
LOS ALAMOS, NM 87545

269522

PLEASE CASH PROMPTLY
SUBJECT TO CANCELLATION
NINETY (90) DAYS AFTER DATE

MO DAY YR
02/12/13

56-382
412

PAY One Hundred Fifty and 00/100 Dollars

$ *******150.00

TO THE ORDER OF

NEW MEXICO ENVIRONMENTAL DEPT
GROUND WATER QUALITY BUREAU
PO BOX 5469
SANTA FE, NM 87502

Authorized Signature

⑈00269522⑈ ⑆041203824⑆ 9600078684⑈

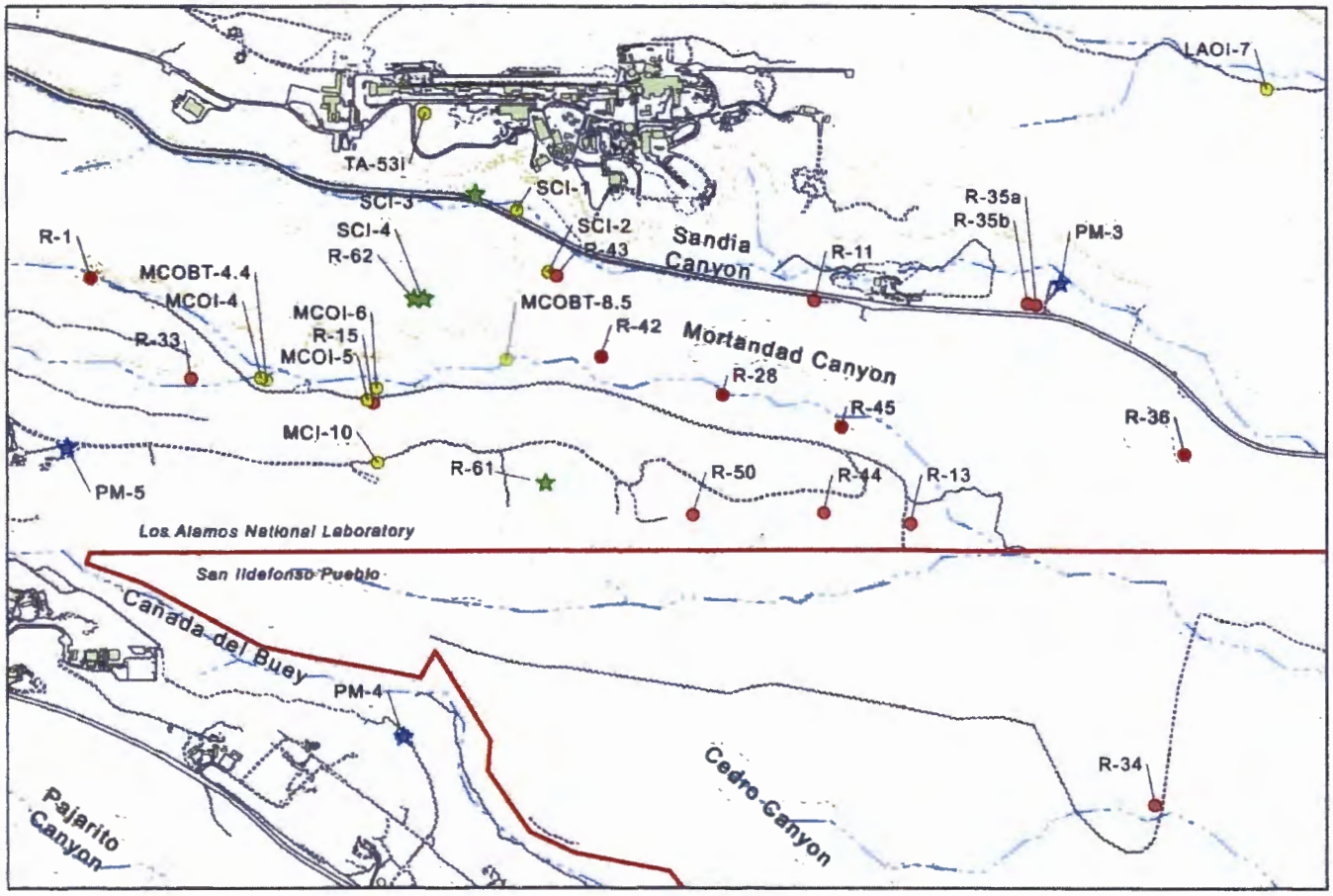
ENCLOSURE 4

Location map of R-28

ENV-RCRA-13-0045

LAUR-13-20968

Date: FEB 2 7 2013



Existing regional aquifer monitoring well or borehole
Existing or abandoned perched intermediate monitoring well or borehole
Municipal supply well
Proposed monitoring well

N

0 750 1,500 3,000 Feet

0 0.25 0.5 1 Kilometers

ENCLOSURE 5

2012 water quality data, R-28

ENV-RCRA-13-0045

LAUR-13-20968

Date: FEB 2 7 2013

Table 1.0. Monitoring Well R-28 Water Quality Data, 2012.

Location	Sample Date	Parameter Name	Analytical Method	Field Prep Code	Result	Units	Lab Qualifier	Detect Flag	Lab MDA	Lab MDL	Parameter Group Name	Field_Sample_ID
R-28	2012-03-13	Aluminum	SW-846:6010B	F	200	ug/L	U	N		68	METALS	CAMO-12-12027
R-28	2012-05-24	Aluminum	SW-846:6010B	F	200	ug/L	U	N		68	METALS	CAMO-12-14023
R-28	2012-08-08	Aluminum	SW-846:6010B	F	68	ug/L	U	N		68	METALS	CAMO-12-21743
R-28	2012-10-31	Aluminum	SW-846:6010B	F	68	ug/L	U	N		68	METALS	CAMO-13-24260
R-28	2012-03-13	Ammonia as Nitrogen	EPA:350.1	F	0.050	mg/L	U	N		0.016	GEN_CHEM	CAMO-12-12027
R-28	2012-05-24	Ammonia as Nitrogen	EPA:350.1	F	0.026	mg/L	J	N		0.017	GEN_CHEM	CAMO-12-14023
R-28	2012-08-08	Ammonia as Nitrogen	EPA:350.1	F	0.144	mg/L		Y		0.017	GEN_CHEM	CAMO-12-21743
R-28	2012-10-31	Ammonia as Nitrogen	EPA:350.1	F	0.057	mg/L		Y		0.017	GEN_CHEM	CAMO-13-24260
R-28	2012-03-13	Arsenic	SW-846:6020	F	5	ug/L	U	N		1.7	METALS	CAMO-12-12027
R-28	2012-05-24	Arsenic	SW-846:6020	F	3.4	ug/L	J	Y		1.7	METALS	CAMO-12-14023
R-28	2012-08-08	Arsenic	SW-846:6020	F	1.7	ug/L	U	N		1.7	METALS	CAMO-12-21743
R-28	2012-10-31	Arsenic	SW-846:6020	F	1.7	ug/L	U	N		1.7	METALS	CAMO-13-24260
R-28	2012-03-13	Barium	SW-846:6010B	F	70.2	ug/L		Y		1	METALS	CAMO-12-12027
R-28	2012-05-24	Barium	SW-846:6010B	F	70.6	ug/L		Y		1	METALS	CAMO-12-14023
R-28	2012-08-08	Barium	SW-846:6010B	F	70.9	ug/L		Y		1	METALS	CAMO-12-21743
R-28	2012-10-31	Barium	SW-846:6010B	F	66.3	ug/L		Y		1	METALS	CAMO-13-24260
R-28	2012-03-13	Boron	SW-846:6010B	F	24.6	ug/L	J	Y		15	METALS	CAMO-12-12027
R-28	2012-05-24	Boron	SW-846:6010B	F	23.6	ug/L	J	Y		15	METALS	CAMO-12-14023
R-28	2012-08-08	Boron	SW-846:6010B	F	26.7	ug/L	J	Y		15	METALS	CAMO-12-21743
R-28	2012-10-31	Boron	SW-846:6010B	F	23.7	ug/L	J	Y		15	METALS	CAMO-13-24260
R-28	2012-03-13	Cadmium	SW-846:6020	F	1	ug/L	U	N		0.11	METALS	CAMO-12-12027
R-28	2012-05-24	Cadmium	SW-846:6020	F	1	ug/L	U	N		0.11	METALS	CAMO-12-14023
R-28	2012-08-08	Cadmium	SW-846:6020	F	0.11	ug/L	U	N		0.11	METALS	CAMO-12-21743
R-28	2012-10-31	Cadmium	SW-846:6020	F	0.11	ug/L	U	N		0.11	METALS	CAMO-13-24260
R-28	2012-03-13	Chloride	EPA:300.0	F	28.7	mg/L		Y		0.335	GEN_CHEM	CAMO-12-12027
R-28	2012-05-24	Chloride	EPA:300.0	F	34.1	mg/L		Y		0.335	GEN_CHEM	CAMO-12-14023
R-28	2012-08-08	Chloride	EPA:300.0	F	32.9	mg/L		Y		0.67	GEN_CHEM	CAMO-12-21743
R-28	2012-10-31	Chloride	EPA:300.0	F	35.8	mg/L		Y		0.335	GEN_CHEM	CAMO-13-24260
R-28	2012-03-13	Chromium	SW-846:6020	F	336	ug/L	E	Y		2	METALS	CAMO-12-12027
R-28	2012-05-24	Chromium	SW-846:6020	F	351	ug/L		Y		2	METALS	CAMO-12-14023
R-28	2012-08-08	Chromium	SW-846:6020	F	450	ug/L		Y		2	METALS	CAMO-12-21743
R-28	2012-10-31	Chromium	SW-846:6020	F	415	ug/L		Y		20	METALS	CAMO-13-24260
R-28	2012-03-13	Cobalt	SW-846:6010B	F	5	ug/L	U	N		1	METALS	CAMO-12-12027
R-28	2012-05-24	Cobalt	SW-846:6010B	F	5	ug/L	U	N		1	METALS	CAMO-12-14023
R-28	2012-08-08	Cobalt	SW-846:6010B	F	1	ug/L	U	N		1	METALS	CAMO-12-21743
R-28	2012-10-31	Cobalt	SW-846:6010B	F	1	ug/L	U	N		1	METALS	CAMO-13-24260
R-28	2012-03-13	Copper	SW-846:6010B	F	4.77	ug/L	J	Y		3	METALS	CAMO-12-12027
R-28	2012-05-24	Copper	SW-846:6010B	F	10	ug/L	U	N		3	METALS	CAMO-12-14023
R-28	2012-08-08	Copper	SW-846:6010B	F	3	ug/L	U	N		3	METALS	CAMO-12-21743
R-28	2012-10-31	Copper	SW-846:6010B	F	3	ug/L	U	N		3	METALS	CAMO-13-24260
R-28	2012-03-13	Fluoride	EPA:300.0	F	0.287	mg/L		Y		0.033	GEN_CHEM	CAMO-12-12027
R-28	2012-05-24	Fluoride	EPA:300.0	F	0.328	mg/L		Y		0.033	GEN_CHEM	CAMO-12-14023
R-28	2012-08-08	Fluoride	EPA:300.0	F	0.271	mg/L		Y		0.033	GEN_CHEM	CAMO-12-21743
R-28	2012-10-31	Fluoride	EPA:300.0	F	0.308	mg/L		Y		0.033	GEN_CHEM	CAMO-13-24260

Location	Sample Date	Parameter Name	Analytical Method	Field Prep Code	Result	Units	Lab Qualifier	Detect Flag	Lab MDA	Lab MDL	Parameter Group Name	Field_Sample_ID
R-28	2012-08-08	Gross alpha	EPA:900	UF	1.93	pCi/L	U	N	1.99		RAD	CAMO-12-21735
R-28	2012-10-31	Gross alpha	EPA:900	UF	1.61	pCi/L	U	N	2.71		RAD	CAMO-13-24243
R-28	2012-08-08	Gross beta	EPA:900	UF	0.842	pCi/L	U	N	2.99		RAD	CAMO-12-21735
R-28	2012-10-31	Gross beta	EPA:900	UF	2.2	pCi/L	U	N	2.52		RAD	CAMO-13-24243
R-28	2012-03-13	Iron	SW-846:6010B	F	100	ug/L	U	N		30	METALS	CAMO-12-12027
R-28	2012-05-24	Iron	SW-846:6010B	F	100	ug/L	U	N		30	METALS	CAMO-12-14023
R-28	2012-08-08	Iron	SW-846:6010B	F	30	ug/L	U	N		30	METALS	CAMO-12-21743
R-28	2012-10-31	Iron	SW-846:6010B	F	30	ug/L	U	N		30	METALS	CAMO-13-24260
R-28	2012-03-13	Lead	SW-846:6020	F	2	ug/L	U	N		0.5	METALS	CAMO-12-12027
R-28	2012-05-24	Lead	SW-846:6020	F	2	ug/L	U	N		0.5	METALS	CAMO-12-14023
R-28	2012-08-08	Lead	SW-846:6020	F	0.5	ug/L	U	N		0.5	METALS	CAMO-12-21743
R-28	2012-10-31	Lead	SW-846:6020	F	0.5	ug/L	U	N		0.5	METALS	CAMO-13-24260
R-28	2012-03-13	Manganese	SW-846:6010B	F	7.69	ug/L	J	Y		2	METALS	CAMO-12-12027
R-28	2012-05-24	Manganese	SW-846:6010B	F	3.65	ug/L	J	Y		2	METALS	CAMO-12-14023
R-28	2012-08-08	Manganese	SW-846:6010B	F	2.14	ug/L	J	Y		2	METALS	CAMO-12-21743
R-28	2012-10-31	Manganese	SW-846:6010B	F	2	ug/L	U	N		2	METALS	CAMO-13-24260
R-28	2012-03-13	Mercury	EPA:245.2	F	0.2	ug/L	U	N		0.066	METALS	CAMO-12-12027
R-28	2012-05-24	Mercury	EPA:245.2	F	0.2	ug/L	U	N		0.067	METALS	CAMO-12-14023
R-28	2012-08-08	Mercury	EPA:245.2	F	0.067	ug/L	U	N		0.067	METALS	CAMO-12-21743
R-28	2012-10-31	Mercury	EPA:245.2	F	0.067	ug/L	U	N		0.067	METALS	CAMO-13-24260
R-28	2012-03-13	Molybdenum	SW-846:6020	F	1.12	ug/L		Y		0.165	METALS	CAMO-12-12027
R-28	2012-05-24	Molybdenum	SW-846:6020	F	0.847	ug/L		Y		0.165	METALS	CAMO-12-14023
R-28	2012-08-08	Molybdenum	SW-846:6020	F	0.889	ug/L		N		0.165	METALS	CAMO-12-21743
R-28	2012-10-31	Molybdenum	SW-846:6020	F	0.822	ug/L		Y		0.165	METALS	CAMO-13-24260
R-28	2012-03-13	Nickel	SW-846:6020	F	14.6	ug/L		Y		0.5	METALS	CAMO-12-12027
R-28	2012-05-24	Nickel	SW-846:6020	F	14.4	ug/L		Y		0.5	METALS	CAMO-12-14023
R-28	2012-08-08	Nickel	SW-846:6020	F	17.8	ug/L		Y		0.5	METALS	CAMO-12-21743
R-28	2012-10-31	Nickel	SW-846:6020	F	21.1	ug/L		Y		0.5	METALS	CAMO-13-24260
R-28	2012-03-13	Nitrate-Nitrite as Nitrogen	EPA:353.2	F	3.37	mg/L		Y		0.1	GEN_CHEM	CAMO-12-12027
R-28	2012-05-24	Nitrate-Nitrite as Nitrogen	EPA:353.2	F	3.74	mg/L		Y		0.17	GEN_CHEM	CAMO-12-14023
R-28	2012-08-08	Nitrate-Nitrite as Nitrogen	EPA:353.2	F	3.74	mg/L		Y		0.085	GEN_CHEM	CAMO-12-21743
R-28	2012-10-31	Nitrate-Nitrite as Nitrogen	EPA:353.2	F	3.63	mg/L		Y		0.085	GEN_CHEM	CAMO-13-24260
R-28	2012-03-13	Perchlorate	SW-846:6850	F	1.01	ug/L		Y		0.1	GEN_CHEM	CAMO-12-12027
R-28	2012-05-24	Perchlorate	SW-846:6850	F	0.987	ug/L		Y		0.1	GEN_CHEM	CAMO-12-14023
R-28	2012-08-08	Perchlorate	SW-846:6850	F	1.02	ug/L		Y		0.1	GEN_CHEM	CAMO-12-21743
R-28	2012-10-31	Perchlorate	SW-846:6850	F	0.93	ug/L		Y		0.05	GEN_CHEM	CAMO-13-24260
R-28	2012-03-13	Selenium	SW-846:6020	F	5	ug/L	U	N		1.5	METALS	CAMO-12-12027
R-28	2012-05-24	Selenium	SW-846:6020	F	5	ug/L	U	N		1.5	METALS	CAMO-12-14023
R-28	2012-08-08	Selenium	SW-846:6020	F	1.5	ug/L	U	N		1.5	METALS	CAMO-12-21743
R-28	2012-10-31	Selenium	SW-846:6020	F	1.5	ug/L	U	N		1.5	METALS	CAMO-13-24260
R-28	2012-03-13	Silver	SW-846:6020	F	1	ug/L	U	N		0.2	METALS	CAMO-12-12027
R-28	2012-05-24	Silver	SW-846:6020	F	1	ug/L	U	N		0.2	METALS	CAMO-12-14023
R-28	2012-08-08	Silver	SW-846:6020	F	0.2	ug/L	U	N		0.2	METALS	CAMO-12-21743
R-28	2012-10-31	Silver	SW-846:6020	F	0.2	ug/L	U	N		0.2	METALS	CAMO-13-24260
R-28	2012-03-13	Sulfate	EPA:300.0	F	39.6	mg/L		Y		0.665	GEN_CHEM	CAMO-12-12027

Location	Sample Date	Parameter Name	Analytical Method	Field Prep Code	Result	Units	Lab Qualifier	Detect Flag	Lab MDA	Lab MDL	Parameter Group Name	Field_Sample_ID
R-28	2012-05-24	Sulfate	EPA:300.0	F	47.9	mg/L		Y		0.665	GEN_CHEM	CAMO-12-14023
R-28	2012-08-08	Sulfate	EPA:300.0	F	47.3	mg/L		Y		1.33	GEN_CHEM	CAMO-12-21743
R-28	2012-10-31	Sulfate	EPA:300.0	F	51.3	mg/L		Y		0.665	GEN_CHEM	CAMO-13-24260
R-28	2012-03-13	Total Dissolved Solids	EPA:160.1	F	396	mg/L		Y		3.4	GEN_CHEM	CAMO-12-12027
R-28	2012-05-24	Total Dissolved Solids	EPA:160.1	F	273	mg/L		Y		3.4	GEN_CHEM	CAMO-12-14023
R-28	2012-08-08	Total Dissolved Solids	EPA:160.1	F	287	mg/L		Y		3.4	GEN_CHEM	CAMO-12-21743
R-28	2012-10-31	Total Dissolved Solids	EPA:160.1	F	303	mg/L		Y		3.4	GEN_CHEM	CAMO-13-24260
R-28	2012-03-13	Total Kjeldahl Nitrogen	EPA:351.2	UF	0.16	mg/L		Y		0.035	GEN_CHEM	CAMO-12-12018
R-28	2012-05-24	Total Kjeldahl Nitrogen	EPA:351.2	UF	0.05	mg/L	J	Y		0.035	GEN_CHEM	CAMO-12-14008
R-28	2012-08-08	Total Kjeldahl Nitrogen	EPA:351.2	UF	0.04	mg/L	U	N		0.035	GEN_CHEM	CAMO-12-21735
R-28	2012-10-31	Total Kjeldahl Nitrogen	EPA:351.2	UF	0.19	mg/L		N		0.035	GEN_CHEM	CAMO-13-24243
R-28	2012-03-13	Uranium	SW-846:6020	F	1.9	ug/L		Y		0.067	METALS	CAMO-12-12027
R-28	2012-05-24	Uranium	SW-846:6020	F	1.7	ug/L		Y		0.067	METALS	CAMO-12-14023
R-28	2012-08-08	Uranium	SW-846:6020	F	1.5	ug/L		Y		0.067	METALS	CAMO-12-21743
R-28	2012-10-31	Uranium	SW-846:6020	F	1.5	ug/L		Y		0.067	METALS	CAMO-13-24260
R-28	2012-03-13	Zinc	SW-846:6010B	F	29.4	ug/L		Y		3.3	METALS	CAMO-12-12027
R-28	2012-05-24	Zinc	SW-846:6010B	F	11.2	ug/L		Y		3.3	METALS	CAMO-12-14023
R-28	2012-08-08	Zinc	SW-846:6010B	F	7.55	ug/L	J	Y		3.3	METALS	CAMO-12-21743
R-28	2012-10-31	Zinc	SW-846:6010B	F	3.67	ug/L	J	Y		3.3	METALS	CAMO-13-24260

ENCLOSURE 6

Material Safety Data Sheets (MSDS)
for five (5) tracers

ENV-RCRA-13-0045

LAUR-13-20968

Date: FEB 2 7 2013

Material Safety Data Sheet

1,5-Naphthalenedisulfonic Acid Disodium Salt, Dihydrate, 98% (HPLC)

ACC# 96699

Section 1 - Chemical Product and Company Identification

MSDS Name: 1,5-Naphthalenedisulfonic Acid Disodium Salt, Dihydrate, 98% (HPLC)
Catalog Numbers: AC415210000, AC415211000, AC415215000
Synonyms: None.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
1655-29-4	1,5-naphthalenedisulfonic acid, disodium salt	98	216-732-0

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white powder.
Caution! May cause eye and skin irritation. May cause respiratory and digestive tract irritation. Hygroscopic (absorbs moisture from the air). The toxicological properties of this material have not been fully investigated.
Target Organs: None known.

Potential Health Effects

Eye: May cause eye irritation. The toxicological properties of this material have not been fully investigated.
Skin: May cause skin irritation. The toxicological properties of this material have not been fully investigated.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. The toxicological properties of this substance have not been fully investigated.
Inhalation: May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated.
Chronic: No information found.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Use agent most appropriate to extinguish fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: N/A
Upper: N/A
NFPA Rating: (estimated) Health: 1; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,5-naphthalenedisulfonic acid, disodium salt	none listed	none listed	none listed

OSHA Vacated PELs: 1,5-naphthalenedisulfonic acid, disodium salt: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use. Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms

are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Powder
Appearance: white
Odor: Not available.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point: Not available.
Decomposition Temperature: Not available.
Solubility: Not available.
Specific Gravity/Density: Not available.
Molecular Formula:C10H6Na2O6S2.2H2O
Molecular Weight:368.29

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, strong oxidants.
Incompatibilities with Other Materials: Oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, sodium oxide.
Hazardous Polymerization: Has not been reported

Section 11 - Toxicological Information

RTECS#:
CAS# 1655-29-4 unlisted.
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 1655-29-4: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Please contact Fisher Scientific for shipping information	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 1655-29-4 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 1655-29-4 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
Not available.
Risk Phrases:

Safety Phrases:
S 24/25 Avoid contact with skin and eyes.
S 37 Wear suitable gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 28A After contact with skin, wash immediately with plenty of water.

WGK (Water Danger/Protection)
CAS# 1655-29-4: 1
Canada - DSL/NDSL
CAS# 1655-29-4 is listed on Canada's DSL List.
Canada - WHMIS
WHMIS: Not available.
Canadian Ingredient Disclosure List

Section 16 - Additional Information

MSDS Creation Date: 4/13/1998
Revision #2 Date: 3/18/2003

SAFETY DATA SHEET

SODIUM 2,6-DIFLUOROBENZOATE 20% SOLUTION

Issued: 19/01/2006

Revision No: 2

1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Product name: SODIUM 2,6-DIFLUOROBENZOATE 20% SOLUTION

CAS number: 385-00-2

Product code: PC2660S

Company name: Apollo Scientific Ltd

Bredbury, Stockport, SK6 2QR, Tel 0161 406 0505

2. HAZARDS IDENTIFICATION

Main hazards: Irritating to eyes, respiratory system and skin.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous ingredients: SODIUM 2,6-DIFLUOROBENZOATE 20% SOLUTION >90%

4. FIRST AID MEASURES (SYMPTOMS)

Skin contact: There may be irritation and redness at the site of contact.

Eye contact: There may be irritation and redness. The eyes may water profusely.

Ingestion: There may be soreness and redness of the mouth and throat.

Inhalation: There may be irritation of the throat with a feeling of tightness in the chest. Exposure may cause coughing or wheezing.

4. FIRST AID MEASURES (ACTION)

Skin contact: Remove all contaminated clothes and footwear immediately unless stuck to skin. Wash immediately with plenty of soap and water.

Eye contact: Bathe the eye with running water for 15 minutes. Consult a doctor.

Ingestion: Wash out mouth with water. Consult a doctor.

Inhalation: Remove casualty from exposure ensuring one's own safety whilst doing so. Consult a doctor.

5. FIRE-FIGHTING MEASURES

Extinguishing media: Suitable extinguishing media for the surrounding fire should be used. Carbon dioxide. Dry chemical powder.

Exposure hazards: In combustion emits toxic fumes.

Protection of fire-fighters: Wear self-contained breathing apparatus. Wear protective clothing to prevent contact with skin and eyes.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Refer to section 8 of SDS for personal protection details. If outside do not approach from downwind. If outside keep bystanders upwind and away from danger point. Mark out the contaminated area with signs and prevent access to unauthorised personnel. Turn leaking containers leak-side up to prevent the escape of liquid.

Environmental precautions: Do not discharge into drains or rivers. Contain the spillage using bunding.

[cont...]

Clean-up procedures: Absorb into dry earth or sand. Transfer to a closable, labelled salvage container for disposal by an appropriate method.

7. HANDLING AND STORAGE

Handling requirements: Avoid direct contact with the substance. Ensure there is sufficient ventilation of the area. Do not handle in a confined space. Avoid the formation or spread of mists in the air. Only use in fume hood.

Storage conditions: Store in cool, well ventilated area. Keep container tightly closed.

Suitable packaging: Must only be kept in original packaging.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures: Ensure there is sufficient ventilation of the area.

Respiratory protection: Self-contained breathing apparatus must be available in case of emergency.

Hand protection: Protective gloves.

Eye protection: Safety glasses. Ensure eye bath is to hand.

Skin protection: Protective clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solution

10. STABILITY AND REACTIVITY

Stability: Stable under normal conditions.

Conditions to avoid: Heat.

Materials to avoid: Strong oxidising agents. Strong acids.

Haz. decomp. products: In combustion emits toxic fumes.

11. TOXICOLOGICAL INFORMATION

Chronic toxicity: MAY BE HARMFUL BY INHALATION, INGESTION, OR SKIN ABSORPTION.

Routes of exposure: MAY BE HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN Refer to section 4 of SDS for routes of exposure and corresponding symptoms.

12. ECOLOGICAL INFORMATION

Mobility: No data available.

Persistence and degradability: No data available.

Bioaccumulative potential: No data available.

Other adverse effects: Data not known

13. DISPOSAL CONSIDERATIONS

Disposal operations: MATERIAL SHOULD BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS

Disposal of packaging: Dispose of as special waste in compliance with local and national regulations Observe all federal, state and local environmental regulations.

[cont...]

NB: The user's attention is drawn to the possible existence of regional or national regulations regarding disposal.

14. TRANSPORT INFORMATION

ADR / RID

UN no: Not Classified.

IMDG / IMO

UN no: Not Classified.

IATA / ICAO

UN no: Not Classified.

15. REGULATORY INFORMATION

Hazard symbols: Irritant.

Risk phrases: R36/37/38: Irritating to eyes, respiratory system and skin.

Safety phrases: S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S36/37/39: Wear suitable protective clothing, gloves and eye / face protection.

S45: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

Note: The regulatory information given above only indicates the principal regulations specifically applicable to the product described in the safety data sheet. The user's attention is drawn to the possible existence of additional provisions which complete these regulations. Refer to all applicable national, international and local regulations or provisions.

16. OTHER INFORMATION

Legal disclaimer: The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. This company shall not be held liable for any damage resulting from handling or from contact with the above product.

SIGMA-ALDRICH

sigma-aldrich.com

Material Safety Data Sheet

Version 3.1
Revision Date 01/17/2012
Print Date 03/20/2012

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Sodium bromide
Product Number	:	S4547
Brand	:	Sigma-Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Target Organ Effect

Target Organs

Central nervous system

GHS Classification
Acute toxicity, Dermal (Category 5)
Acute toxicity, Oral (Category 5)
Eye irritation (Category 2B)

GHS Label elements, including precautionary statements

Pictogram	none
Signal word	Warning

Hazard statement(s)

H303 + H313	May be harmful if swallowed or in contact with skin.
H320	Causes eye irritation.

Precautionary statement(s)

P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	0
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : BrNa
Molecular Weight : 102.89 g/mol

Component		Concentration
Sodium bromide		
CAS-No.	7647-15-6	-
EC-No.	231-599-9	

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Hydrogen bromide gas, Sodium oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

Environmental precautions
Do not let product enter drains.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

Hygroscopic.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	crystalline
Colour	colourless

Safety data

pH	5.4 at 50 g/l at 20 °C (68 °F)
Melting point/freezing point	Melting point/range: 755 °C (1,391 °F) - lit.
Boiling point	1,393 °C (2,539 °F) at 1,013 hPa (760 mmHg)
Flash point	not applicable
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	1 hPa (1 mmHg) at 806 °C (1,483 °F)
Density	no data available
Water solubility	soluble
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available

Odour	odourless
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
Avoid moisture. Heat.

Materials to avoid
Strong acids, Strong oxidizing agents, Alkali metals, Halogens

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Hydrogen bromide gas, Sodium oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 3,500 mg/kg

Inhalation LC50
no data available

Dermal LD50
LD50 Dermal - rabbit - > 2,000 mg/kg

Other information on acute toxicity
no data available

Skin corrosion/irritation
Skin - rabbit - No skin irritation

Serious eye damage/eye irritation
Eyes - rabbit - Mild eye irritation

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
Reproductive toxicity - rat - Oral
Paternal Effects: Testes, epididymis, sperm duct.
Reproductive toxicity - rat - Oral

Effects on Fertility: Mating performance (e.g., # sperm positive females per # females mated; # copulations per # estrus cycles). Effects on Newborn: Viability index (e.g., # alive at day 4 per # born alive). Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4).

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Effects due to ingestion may include:, sedation

Synergistic effects
no data available

Additional Information
RTECS: VZ3150000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	mortality NOEC - Oryzias latipes - 7,800 mg/l - 96 h
	LC50 - Poecilia reticulata (guppy) - 160,000 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	mortality NOEC - Daphnia magna (Water flea) - 7,800 mg/l - 48 h
	EC50 - Daphnia magna (Water flea) - 5,800 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards
Target Organ Effect

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Sodium bromide	7647-15-6	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Sodium bromide	7647-15-6	

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

SIGMA-ALDRICH

sigma-aldrich.com

Material Safety Data Sheet

Version 3.2
Revision Date 01/17/2012
Print Date 03/20/2012

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Sodium iodide
Product Number	:	71710
Brand	:	Sigma-Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Target Organ Effect, Irritant

Target Organs

Thyroid., Blood, Bone marrow

GHS Classification
Acute toxicity, Oral (Category 5)
Skin irritation (Category 2)
Eye irritation (Category 2A)
Acute aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H303	May be harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H400	Very toxic to aquatic life.

Precautionary statement(s)

P273	Avoid release to the environment.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0

Physical hazards: 0

NFPA Rating

Health hazard: 2
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. Causes respiratory tract irritation.
Skin May be harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : INa
Molecular Weight : 149.89 g/mol

Component		Concentration
Sodium iodide		
CAS-No.	7681-82-5	-
EC-No.	231-679-3	

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Hydrogen iodide, Sodium oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

Light sensitive. Air, light, and moisture sensitive.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	crystalline
Colour	white

Safety data

pH	6.0 - 9.0 at 50 g/l at 20 °C (68 °F)
Melting point/freezing point	Melting point/range: 661 °C (1,222 °F) - lit.
Boiling point	1,304 °C (2,379 °F) at 1,013 hPa (760 mmHg)
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	3.670 g/cm3

Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
Exposure to light may affect product quality.
Air sensitive.

Materials to avoid
Oxidizing agents, Strong acids, Bromine trifluorideOxidizing agents, Strong acids, Bromine trifluoride

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Hydrogen iodide, Sodium oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 4,340 mg/kg

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
Skin - rabbit - Skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - rabbit - Moderate eye irritation - 24 h

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

Developmental Toxicity - Human - female - Oral
Specific Developmental Abnormalities: Endocrine system. Effects on Newborn: Other postnatal measures or effects.

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
Prolonged exposure to iodides may produce iodism in sensitive individuals. Symptoms of exposure include: skin rash, running nose, headache and irritation of the mucous membrane. For severe cases the skin may show pimples, boils, hives, blisters and black and blue spots. Iodides are readily diffused across the placenta. Neonatal deaths from respiratory distress secondary to goiter have been reported. Iodides have been known to cause drug-induced fevers, which are usually of short duration., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional information
RTECS: WB6475000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 860 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.17 mg/l - 48 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	Chasmichthys gulosus - 20 d Bioconcentration factor (BCF): 344

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Sodium iodide)
Marine pollutant: Marine pollutant

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Sodium iodide)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Target Organ Effect, Irritant

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Sodium iodide	7681-82-5	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Sodium iodide	7681-82-5	

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

APOLLO Scientific Limited
A CENTRAL GLASS CO., LTD. company

SAFETY DATA SHEET

SODIUM 2,5-DIFLUOROBENZOATE

Compilation date: 12/12/2006

Revision date: 16/08/2012

Revision No: 3

Section 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name: SODIUM 2,5-DIFLUOROBENZOATE

CAS number: 522651-42-9

Product code: PC6585

Synonyms: 2,5-DIFLUOROBENZOIC ACID, SODIUM SALT

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.3. Details of the supplier of the safety data sheet

Company name: Apollo Scientific Ltd
Units 3 & 4
Parkway
Denton
Manchester
M34 3SG
UK

Tel: 0161 337 9971

Fax: 0161 336 6932

Email: david.tideswell@apolloscientific.co.uk

1.4. Emergency telephone number

Section 2: Hazards identification

2.1. Classification of the substance or mixture

Classification under CHIP: Xi: R36/37/38

Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrit. 2: H315

Most important adverse effects: Irritating to eyes, respiratory system and skin.

2.2. Label elements

Label elements under CLP:

Hazard statements: H315: Causes skin irritation.
H319: Causes serious eye irritation.
H335: May cause respiratory irritation.

Signal words: Warning

Hazard pictograms: GHS07: Exclamation mark

[cont...]

SAFETY DATA SHEET

SODIUM 2,5-DIFLUOROBENZOATE

Precautionary statements: P261: Avoid breathing dust.

P271: Use only outdoors or in a well-ventilated area.

P280: Wear protective gloves/protective clothing/eye protection/face protection.

Label elements under CHIP:

Hazard symbols: Irritant.

Risk phrases: R36/37/38: Irritating to eyes, respiratory system and skin.

Safety phrases: S22: Do not breathe dust.

S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S36/37/39: Wear suitable protective clothing, gloves and eye / face protection.

2.3. Other hazards

PBT: This substance is not identified as a PBT substance.

Section 3: Composition/information on ingredients

3.1. Substances

Chemical identity: SODIUM 2,5-DIFLUOROBENZOATE

Section 4: First aid measures

4.1. Description of first aid measures

Skin contact: Remove all contaminated clothes and footwear immediately unless stuck to skin. Wash immediately with plenty of soap and water.

Eye contact: Bathe the eye with running water for 15 minutes. Consult a doctor.

Ingestion: Wash out mouth with water. Consult a doctor.

Inhalation: Remove casualty from exposure ensuring one's own safety whilst doing so. Consult a doctor.

4.2. Most important symptoms and effects, both acute and delayed

Skin contact: There may be irritation and redness at the site of contact.

Eye contact: There may be irritation and redness. The eyes may water profusely.

Ingestion: There may be soreness and redness of the mouth and throat.

Inhalation: There may be irritation of the throat with a feeling of tightness in the chest. Exposure may cause coughing or wheezing.

4.3. Indication of any immediate medical attention and special treatment needed

Section 5: Fire-fighting measures

[cont...]

SAFETY DATA SHEET

SODIUM 2,5-DIFLUOROBENZOATE

5.1. Extinguishing media

Extinguishing media: Carbon dioxide, dry chemical powder, foam. Suitable extinguishing media for the surrounding fire should be used.

5.2. Special hazards arising from the substance or mixture

Exposure hazards: In combustion emits toxic fumes. Carbon oxides. Hydrogen fluoride (HF). Sodium oxides.

5.3. Advice for fire-fighters

Advice for fire-fighters: Wear self-contained breathing apparatus. Wear protective clothing to prevent contact with skin and eyes.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions: Refer to section 8 of SDS for personal protection details. If outside do not approach from downwind. If outside keep bystanders upwind and away from danger point. Mark out the contaminated area with signs and prevent access to unauthorised personnel. Do not create dust.

6.2. Environmental precautions

Environmental precautions: Do not discharge into drains or rivers.

6.3. Methods and material for containment and cleaning up

Clean-up procedures: Transfer to a closable, labelled salvage container for disposal by an appropriate method.

6.4. Reference to other sections

Section 7: Handling and storage

7.1. Precautions for safe handling

Handling requirements: Avoid direct contact with the substance. Ensure there is sufficient ventilation of the area. Do not handle in a confined space. Avoid the formation or spread of dust in the air. Only use in fume hood.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions: Store in cool, well ventilated area. Keep container tightly closed.

Suitable packaging: Must only be kept in original packaging.

7.3. Specific end use(s)

Specific end use(s): No data available.

Section 8: Exposure controls/personal protection

[cont...]

SAFETY DATA SHEET

SODIUM 2,5-DIFLUOROBENZOATE

8.1. Control parameters

Workplace exposure limits: Not applicable.

8.2. Exposure controls

Engineering measures: Ensure there is sufficient ventilation of the area.

Respiratory protection: Self-contained breathing apparatus must be available in case of emergency. Respiratory protective device with particle filter.

Hand protection: Protective gloves.

Eye protection: Safety glasses. Ensure eye bath is to hand.

Skin protection: Protective clothing.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

State: Solid

Colour: White

9.2. Other information

Other information: Not applicable.

Section 10: Stability and reactivity

10.1. Reactivity

Reactivity: Stable under recommended transport or storage conditions.

10.2. Chemical stability

Chemical stability: Stable under normal conditions.

10.3. Possibility of hazardous reactions

Hazardous reactions: Hazardous reactions will not occur under normal transport or storage conditions.

10.4. Conditions to avoid

Conditions to avoid: Heat.

10.5. Incompatible materials

Materials to avoid: Strong oxidising agents. Strong acids.

10.6. Hazardous decomposition products

Haz. decomp. products: In combustion emits toxic fumes of carbon dioxide / carbon monoxide. Hydrogen fluoride (HF). Sodium oxides.

Section 11: Toxicological information

11.1. Information on toxicological effects

[cont..:]

SAFETY DATA SHEET

SODIUM 2,5-DIFLUOROBENZOATE

Relevant hazards for substance:

Hazard	Route	Basis
Skin corrosion/irritation	DRM	Based on test data
Serious eye damage/irritation	OPT	Based on test data
STOT-single exposure	INH	Based on test data

Symptoms / routes of exposure

Skin contact: There may be irritation and redness at the site of contact.

Eye contact: There may be irritation and redness. The eyes may water profusely.

Ingestion: There may be soreness and redness of the mouth and throat.

Inhalation: There may be irritation of the throat with a feeling of tightness in the chest. Exposure may cause coughing or wheezing.

Section 12: Ecological information

12.1. Toxicity

Ecotoxicity values: Not applicable.

12.2. Persistence and degradability

Persistence and degradability: No data available.

12.3. Bioaccumulative potential

Bioaccumulative potential: No data available.

12.4. Mobility in soil

Mobility: No data available.

12.5. Results of PBT and vPvB assessment

PBT identification: This substance is not identified as a PBT substance.

12.6. Other adverse effects

Other adverse effects: No data available.

Section 13: Disposal considerations

13.1. Waste treatment methods

Disposal operations: MATERIAL SHOULD BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS

Disposal of packaging: Dispose of as special waste in compliance with local and national regulations Observe all federal, state and local environmental regulations.

NB: The user's attention is drawn to the possible existence of regional or national regulations regarding disposal.

Section 14: Transport information

[cont...]

SAFETY DATA SHEET

SODIUM 2,5-DIFLUOROBENZOATE

14.1. UN number

UN number: UNnone

14.2. UN proper shipping name

Shipping name: NOT CLASSIFIED AS DANGEROUS IN THE MEANING OF TRANSPORT REGULATIONS.

14.3. Transport hazard class(es)

14.4. Packing group

14.5. Environmental hazards

Environmentally hazardous: No **Marine pollutant:** No

14.6. Special precautions for user

Section 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.2. Chemical Safety Assessment

Chemical safety assessment: A chemical safety assessment has not been carried out for the substance or the mixture by the supplier.

Section 16: Other information

Other information

Other information: This safety data sheet is prepared in accordance with Commission Regulation (EU) No 453/2010.

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* Data predicted using computational software. Toxtree - Toxic Hazard Estimation by decision tree approach. http://ecb.jrc.ec.europa.eu/qsar/qsar-tools/index.php?c=TOXTREE

~ Data predicted using computatioanl software ACD/ToxSuite v 2.95.1 Copyright 1994-2009 ACD/labs, Copyright 2001-2009 Pharma Algorithms, Inc, Advanced Chemistry Development, Inc (ACD/Labs). http://www.acdlabs.com/products/pc_admet/tox/tox/

Phrases used in s.2 and 3: H315: Causes skin irritation.

H319: Causes serious eye irritation.

H335: May cause respiratory irritation.

R36/37/38: Irritating to eyes, respiratory system and skin.

Legal disclaimer: The material is intended for research purposes only and should be handled exclusively by those who have been fully trained in safety, laboratory and chemical handling procedures. The above information is believed to be correct to the best of our knowledge. The above information is believed to be correct to the best of our knowledge at the date of its publication, but should not be considered to be all inclusive. It should be used only as a guide for safe handling, storage, transportation and disposal. We cannot guarantee that the hazards detailed in this document are the only hazards that

[cont...]

exist for this product. This is not a warranty and Apollo Scientific Ltd shall not be held liable for any damage resulting from handling or from contact with the above product.

ENCLOSURE 7

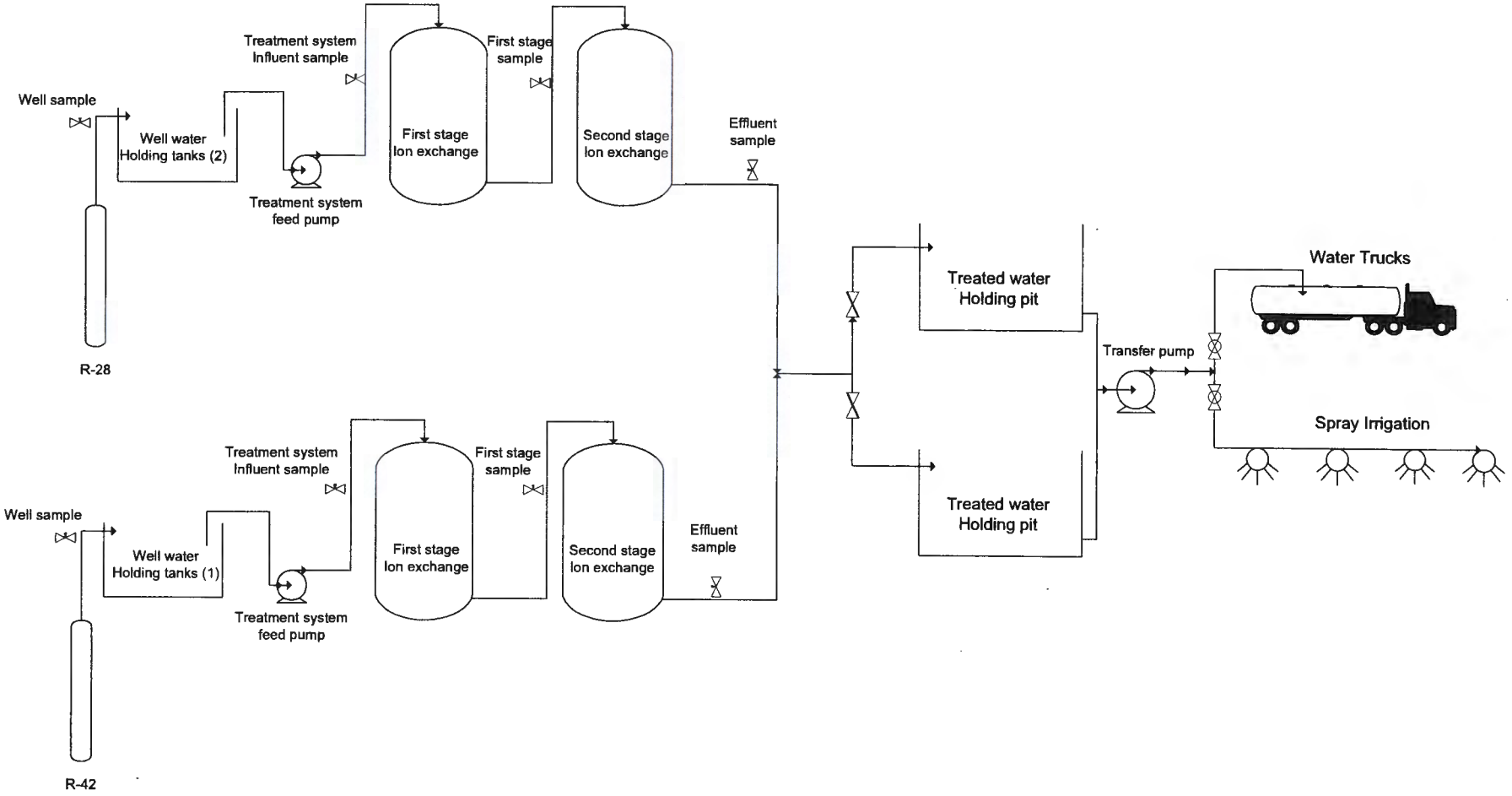
Ion Exchange (IX) Treatment System
Schematic, IX Vessel and Resin Technical Specifications

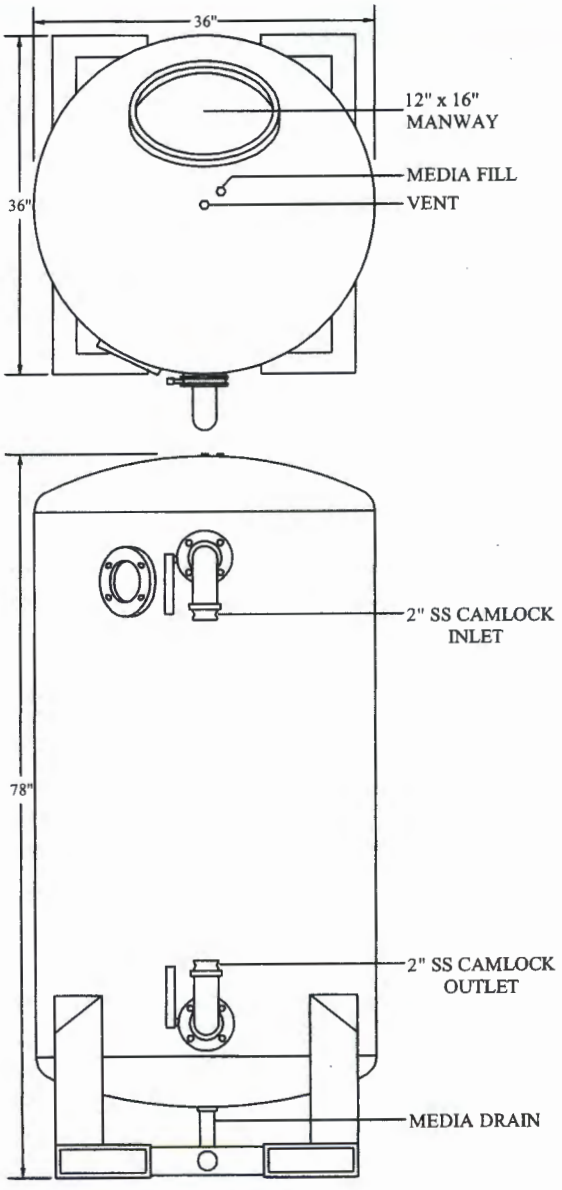
ENV-RCRA-13-0045

LAUR-13-20968

Date: FEB 2 7 2013

LANL Groundwater Chromium Treatment
Dual System – February 21, 2013





SERVICE FLOW RATE:	25-75gpm
MAX. OPERATING PRESSURE:	100psig
MAX. OPERATING TEMPERATURE:	110°F
WEIGHT (EMPTY):	1,815lbs
WEIGHT (FULL):	3,500lbs

SCALE: FILE: DESIGNER DATE
MANAGER DATE CHECKER DATE
ENGINEER DATE CLIENT TITLE

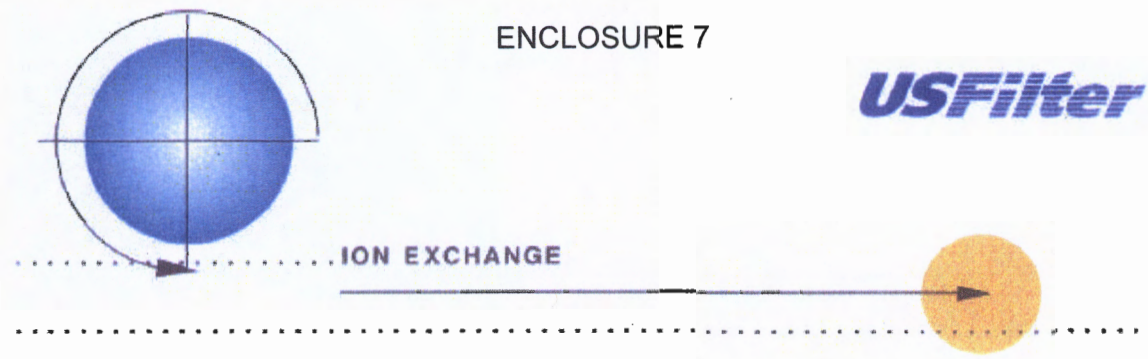
PROJECT CODE DWG/NO SHEET OF REV

SIEMENS Water Technologies
Roseville, MN
651-638-1300 Fax 651-633-5074

STD: BORDER-0106-BX11A INTL REF:

BAR = 1" AT PLOT SCALE

ENCLOSURE 7



USF A-284 ANION RESIN

Description:

USF A-284 is a strong base Type I gel anion resin consisting of a styrene divinylbenzene matrix. The general appearance is a hard spherical bead which is amber in color. This resin has the ability to remove anions and weak acids from aqueous solutions, such as carbonic and silicic acids. This resin is particularly well-suited for low silica effluent requirements.

Chemical Properties

Ionic Form (as shipped)	Chloride
Moisture Content	43 - 48% (Cl form)
Exchange Capacity	1.4 meq / ml minimum (Cl form)
Kinetics	> 15 megohm (USFilter Kinetics Test)

Physical Properties

Particle Screen Sizing	
+16 Mesh	5% maximum
-50 Mesh	1% maximum
Effective Size	0.45 - 0.60 mm
Whole Beads (%)	90 minimum
Shipping Weight	44 lbs. / cu. ft.

Operating Conditions

Operating pH Range	0 to 14
Service Flow Rate	2 - 4 gpm / cu. ft.
Regenerant Flow Rate	0.25 - 0.5 gpm / cu. ft.
Rinse Flow Rate	0.25 - 0.5 gpm / cu ft. initially, then 1.5 gpm / cu. ft.
Rinse Volume	60 - 75 gallons / cu. ft.
Maximum Operating Temperature	140°F

TECH SHEET MED-301

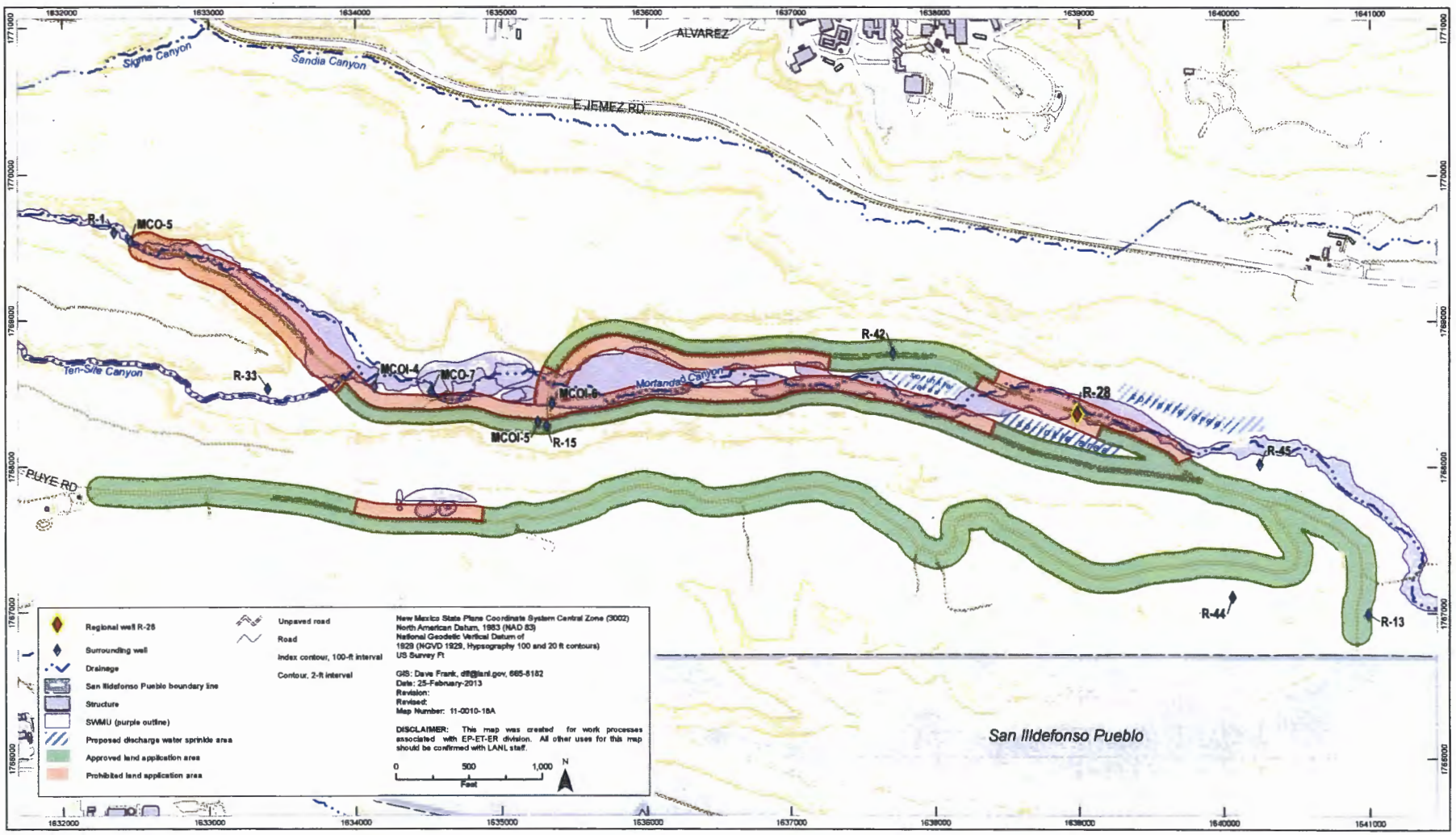
ENCLOSURE 8

Map of approved land application areas in Mortandad Canyon

ENV-RCRA-13-0045

LAUR-13-20968

Date: FEB 2 7 2013


Skyline Canyon
Sandia Canyon
ALVAREZ
E. JEMEZ RD
R-1
MCO-5
Ten-Site Canyon
R-33
MCOI-4
MCO-7
MCOI-6
Mortandad Canyon
MCOI-5
R-15
R-42
R-28
R-45
R-44
R-13
PUYE RD
San Ildefonso Pueblo
Regional well R-28
Surrounding well
Drainage
San Ildefonso Pueblo boundary line
Structure
SWMU (purple outline)
Proposed discharge water sprinkle area
Approved land application area
Prohibited land application area
Unpaved road
Road
Index contour, 100-ft interval
Contour, 2-ft interval
New Mexico State Plane Coordinate System Central Zone (3002)
North American Datum, 1983 (NAD 83)
National Geodetic Vertical Datum of
1929 (NGVD 1929, Hypsography 100 and 20 ft contours)
US Survey Ft
GIS: Dave Frank, dff@lanl.gov, 665-8182
Date: 25-February-2013
Revision:
Revised:
Map Number: 11-0010-18A
DISCLAIMER: This map was created for work processes associated with EP-ET-ER division. All other uses for this map should be confirmed with LANL staff.
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Los Alamos
NATIONAL LABORATORY
EST. 1943

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

National Nuclear Security Administration
Los Alamos Field Office, A316
3747 West Jemez Road
Los Alamos, New Mexico, 87545
(505) 667-5794/FAX (505) 667-5948

Date: FEB 2 7 2013
Refer To: ENV-RCRA-13-0045
LAUR: 13-20968

Mr. Jerry Schoeppner, Chief
Ground Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, Room N2250
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502

GROUND WATER
FEB 28 2013
BUREAU

Dear Mr. Schoeppner:

SUBJECT: REQUEST FOR TEMPORARY PERMISSION TO DISCHARGE TREATED GROUNDWATER FROM A PUMPING TEST AT WELL R-28, DP-1793

In December 2011, the U.S. Department of Energy and Los Alamos National Security, LLC (DOE/LANS) submitted to the New Mexico Environment Department (NMED) a discharge permit application (DP-1793) for the land application of treated groundwater from a pumping test at monitoring well R-28 (ENV-RCRA-11-0284). In a January 13, 2012, letter (Enclosure 1) NMED granted DOE/LANS temporary permission to discharge treated groundwater from the pumping test at R-28 pursuant to Subsection B of 20.6.2.3106 New Mexico Administrative Code (NMAC) of the New Mexico Water Quality Control Commission (NMWQCC) Regulations. The pumping test was conducted in February 2012, and a final project report was submitted in March 2012.

The NMED Hazardous Waste Bureau recently directed DOE/LANS to prepare an interim measures work plan (Enclosure 2) that will include implementation of a second, longer-duration pumping test at R-28 to further define the characteristics of the aquifer and chromium plume. In accordance with guidance provided by the NMED Ground Water Quality Bureau staff, DOE/LANS request temporary permission to discharge treated groundwater from R-28 for up to 120 days with an estimated maximum volume of approximately 5 million gallons.