



TRAIL



Environmental Stewardship Division
Water Quality & Hydrology Group (ENV-WQH)
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Date: May 12, 2006
Refer To: ENV-WQH: 06-092
LA-UR: 06-3433

Mr. John Young
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Mr. Christopher F. Vick
Ground Water Quality Bureau
New Mexico Environment Department
P.O. Box 26110
Santa Fe, New Mexico 87502-6110

SUBJECT: REQUEST FOR NMED COORDINATION, LAND APPLICATION OF DRILLING AND DEVELOPMENT WATER, LOS ALAMOS NATIONAL LABORATORY

Dear Mr. Young and Mr. Vick:

As you are aware, since 1998 Los Alamos National Laboratory has been constructing a network of ground water monitoring wells on the Pajarito Plateau. Water, at quantities ranging from approximately 4,000 gallons to 100,000 gallons, is produced during the drilling and development of each well. The land application of this water has been managed in accordance with the Notice of Intent (NOI) provisions of 20.6.2.1203 NMAC. Since 2002, drilling and development water has also been managed in accordance with the NMED-approved NOI Decision Tree (Revised-7/15/02). Under the NOI Decision Tree, the land application of all drilling and development water is coordinated with the NMED if the quality of the water does not meet standards. The Laboratory has coordinated with the NMED in the land application of drilling and development water from 17 wells under the 2002 NOI Decision Tree.

The Laboratory currently has approximately 234,000 gallons drilling and development water from eight newly constructed wells in storage. A request to coordinate the land application of drilling and development water from one of these wells, R-27, is currently under your review. Attached is information regarding the following seven additional wells: LAOI-3.2, LAOI-3.2a, LAOI-7, CdV-16-2(i)r, R-16r, R-23i, and R-24 for your review:

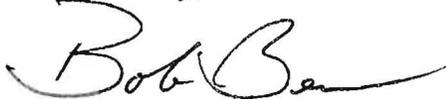
- Attachment 1.0: An NOI Fact Sheet that summarizes pertinent information on each well.
Attachment 2.0: A location map for each well.
Attachment 3.0: A CD containing analytical reports from the sampling of the water in storage at each well.



The Laboratory is aware that you have concerns regarding the quality of the drilling and development water from these eight wells. I would like to propose that we discuss your concerns during the May 17, 2006, meeting scheduled with staff from the Ground Water Quality and Hazardous Waste Bureaus.

Please contact me at (505) 667-7969 if you have questions regarding the attached information.

Sincerely,



Bob Beers
Water Quality & Hydrology Group

BB/tml

w/Attachments: Attachment 1.0
Attachment 2.0
Attachment 3.0

ENV-WQH File, MS K497
IM-9, MS A150

w/Attachments: Attachment 1.0
Attachment 2.0
M. Johansen, NNSA/LASO, MS A316
M. Everett, ENV-ECR, MS M992
J. Dewart, ENV-ERS, MS M992
K. Vanderpoel, ENV-SWRC, MS K490
S. Rae, ENV-WQH, MS K497
M. Saladen, ENV-WQH, MS K497

w/o Attachments:
J. Bearzi, NMED/HWB, Santa Fe, NM
W. Olson, NMED/GWQB, Santa Fe, NM
S. Yanicek, NMED DOE/OB, Santa Fe, NM
K. Hargis, ENV-DO, MS J591
D. Stavert, ENV-DO, MS J591
T. George, ENV-ES, MS J591
T. Grieggs, ENV-SWRC, MS K490
T. Sandoval, ENV-WQH, MS K497

Attachment 1.0

NOI Fact Sheets

LAOI-3.2

LAOI-3.2a

LAOI-7

CdV-16-2(i)r

R-16r

R-23i

R-24

NOI Fact Sheet LAOI-3.2

Date:	5/2/2006	Well Type:	intermediate
Location (Canyon):	Los Alamos	Location (TA):	73
Static Water Level:	15.8 ft.	Alluvial Water?:	yes
Volume in Storage:	3,385 gal	Type of Storage:	poly tanks (1) 55-gal drums (7)
Source of Water:	ground & decon water	Drilling Additives:	bentonite
Location of Land Applic.	drill site	Method of Applic.	irrigation sprinklers

Samples Collected

Sample Id	Collection Point	Filtered (y/n)	Composite (y/n)
CALA-05-63313	poly tank & drums	n	y
CALA-05-63314	poly tank & drums	n	y
CALA-05-63315	poly tank & drums	n	y
CALA-05-63316	poly tank & drums	n	y
CALA-05-63317	poly tank & drums	n	y
CALA-05-63318	poly tank & drums	n	y
CALA-05-66366	7 drums	y (metals)	y
CALA-05-66367	1 poly tank	y (metals)	y

Analytical Results/Detections

Sample Id	Analyte	Result (ppb)	Analyte	Result (ppb)
CALA-05-63313	acetone	11.3	toluene	0.36J
CALA-05-63314	acetone	10.6	toluene	<1.0
CALA-05-63315	acetone	11.7	toluene	0.37J
CALA-05-63316	acetone	3.8J	toluene	0.38J
CALA-05-63317	acetone	11.9	toluene	0.41J
CALA-05-63318	acetone	12.4	toluene	0.43J
CALA-05-63313	benzoic acid	<20.4	bis (2-ethylhexyl)phthalate	2.7J
CALA-05-63314	benzoic acid	17.1J	bis (2-ethylhexyl)phthalate	2.3J
CALA-05-63315	benzoic acid	16.9J	bis (2-ethylhexyl)phthalate	2.1J
CALA-05-63316	benzoic acid	17.1J	bis (2-ethylhexyl)phthalate	35.1J
CALA-05-63317	benzoic acid	17.0J	bis (2-ethylhexyl)phthalate	7.7J
CALA-05-63318	benzoic acid	<20.2	bis (2-ethylhexyl)phthalate	3.8J
CALA-05-66366	less than 3103 standards			
CALA-05-66367	less than 3103 standards			

Summary

The water in storage at the LAOI-3.2 drill site does not exceed any NM WQCC Regulation 3103 ground water standards or any applicable RCRA regulatory limits. The source of the toluene is believed to be the decon water generated during the cleaning of the drilling rig and rig-related machinery. The source of the acetone is unknown since no drilling additives were used at this well. The source of the benzoic acid is unknown. The source of the phthalates is believed to be the poly tanks. Los Alamos National Laboratory proposes to land apply the 3,385 gallons of water in storage at the LAOI-3.2 drill site in accordance with the NMED-approved Hydrogeologic Workplan NOI and Workplan Decision Tree (Revised 7/15/02).

NOI Fact Sheet LAOI-3.2a

Date:	5/3/2006	Well Type:	intermediate
Location (Canyon):	Los Alamos	Location (TA):	73
Static Water Level:	15.8 ft bgs	Alluvial Water?:	yes
Volume in Storage:	7,778 gal.	Type of Storage:	poly tanks(3), 20-yd rolloff w/water & cuttings
Source of Water:	ground & decon water	Drilling Additives:	bentonite
Location of Land Applic.	drill site	Method of Applic.	irrigation sprinklers

Samples Collected

Sample Id	Collection Point	Filtered (y/n)	Composite (y/n)
CALA-06-66636	1,500-gal poly	y (metals only)	n
CALA-06-66637	rolloff	y (metals only)	n
CALA-06-66638	2-3,000 gal poly	y (metals only)	y

Analytical Results/Detections

Sample Id/Suite	Analyte	Result	3103 Standard	Exceedence (y/n)
CALA-06-66636				
VOA	acetone	4.46J ppb		
VOA	toluene	1.8 ppb	750 ppb	n
PAHs		ND		
metals (filtered)	manganese	24.9 ppb	200 ppb	n
CN, F, Cl, SO ₄ , NO ₃ , TDS		less than 3103 stds		
PCBs		ND		
Ra-226/228		ND		
CALA-06-66637				
VOA	acetone	14.2 ppb		
VOA	toluene	0.37J ppb	750 ppb	n
VOA	2-butanone	1.53J ppb		
PAHs		ND		
metals (filtered)	manganese	407 ppb	200 ppb	y
CN, F, Cl, SO ₄ , NO ₃ , TDS		less than 3103 stds		
PCBs		ND		
Ra-226/228		1.69 pCi/L	30 pCi/L	n
CALA-06-66638				
VOA	acetone	ND		
VOA	toluene	1.38 ppb	750 ppb	n
PAHs		ND		
metals (filtered)	manganese	89.4 ppb	200 ppb	n
CN, F, Cl, SO ₄ , NO ₃ , TDS		less than 3103 stds		
PCBs		ND		
Ra-226/228		ND		

Summary

The water in storage at the LAOI-3.2a drill site does not exceed any NM WQCC Regulation 3103 ground water standards with the exception of manganese at a concentration of 407 ppb in one of three samples; in two samples the manganese concentrations were 24.9 ppb and 89.4 ppb, below the ground water standard of 200 ppb. The water in storage did not exceed any applicable RCRA regulatory limits. The source of the toluene is believed to be the decon water generated during the cleaning of the drilling rig and rig-related machinery. The source of the acetone is unknown since no drilling additives were used at this well. The source of the 2-butanone, detected in one of three samples, is unknown. Los Alamos National Laboratory proposes to coordinate the land application of the 7,778 gallons of water in storage in accordance with the NMED-approved Hydrogeologic Workplan NOI and the Workplan Decision Tree (Revised 7/15/02).

NOI Fact Sheet LAOI-7

Date:	5/4/2006	Well Type:	intermediate
Location (Canyon):	Los Alamos	Location (TA):	72
Static Water Level:	221 ft bgs	Alluvial Water?:	None
Screened Interval:	240' to 259'	Perched Water?:	21 ft
Volume in Storage:	4,126 gal.	Type of Storage:	2-2,500-gal poly tanks
Source of Water:	ground water/decon water	Drilling Additives:	none
Location of Land Application	drill site	Method of Applic.	irrigation sprinklers

Samples Collected

Sample Id	Collection Point	Filtered (y/n)	Composite (y/n)
GWi7-06-63281	poly tank #1	n	n
GWi7-06-63282	poly tank #2	n	n
GWi7-06-66391	tanks #1 & #2	y (metals only)	y

Analytical Results/Detections

Sample Id/Suite	Analyte	Result	3103 Standard	Exceedence (y/n)
<u>GWi7-06-63281</u>				
VOA	toluene	1.1 ppb	750 ppb	n
SVOA		ND		
Pu-238, Pu-239/240, Sr-90		ND		
<u>GWi7-06-63282</u>				
VOA	toluene	1.2 ppb	750 ppb	n
SVOA		ND		
Pu-238, Pu-239/240, Sr-90		ND		
<u>GWi7-06-63282</u>				
metals (filtered)		less than 3103 standards		
CN, F, Cl, SO ₄ , NO ₃ , TDS		less than 3103 standards		
Ra-226/228		less than 3103 standards		

Summary

The water in storage at the LAOI-7 drill site does not exceed any NM WQCC Regulation 3103 ground water standards or any applicable RCRA regulatory limits. The source of the toluene is believed to be the decon water generated during the cleaning of the drill rig and rig-related equipment. Los Alamos National Laboratory proposes to land apply the 4,126 gallons of water in accordance with the NMED-approved Hydrogeologic Workplan NOI and Workplan Decision Tree (Revised 7/15/02).

NOI Fact Sheet CdV-16-2(i)r

Date:	5/9/2006	Well Type:	regional
Location (Canyon):	Canon de Valle, mesa top	Location (TA):	16
Static Water Level:	835.89 ft bgs	Alluvial Water?:	None encountered
Volume in Storage:	21,418 gal	Type of Storage:	single pit
Source of Water:	ground, potable & decon water	Drilling Additives:	Quik-Foam, EZ Mud, defoamer
Location of Land Applic.	drill site	Method of Applic.	irrigation sprinklers

Samples Collected

Sample Id	Collection Point	Filtered (y/n)	Composite (y/n)
GW2i-05-63529	pit	n	y
GW2i-06-65868	pit	n	y
GW2i-06-66386	pit	y (metals only)	y

Analytical Results/Detections

Sample Id/Suite	Analyte	Result	3103 Standard	Exceedence (y/n)
GW2i-05-63529				
VOA	acetone	862 ppb	none	n
SVOA	bis(2-ethylhexyl)phthalate	4.0J ppb	none	n
Radiologicals	Sr-90, H-3	ND		
Radiologicals	Pu-238, Pu-239/240	ND		
GW2i-06-65868				
High-Explosives	ND			
GW2i-06-66386				
metals (filtered)	Mn	1260 ppb	200 ppb	y
CN, F, Cl, SO4, NO3, TDS	less than 3103 standards			
Ra-226/228	less than 3103 standards			

Summary:

The water in storage at the CdV-16-2(i)r drill site does not exceed any NM WQCC Regulation 3103 ground water standards or any applicable RCRA regulatory limits with the exception of manganese at 1260 ppb. The source of the acetone is believed to be an artifact from the drilling additive, Quik-Foam. The source of the phthalates in the stored water is believed to be the poly liner in the bottom of the pit. Los Alamos National Laboratory proposes to land apply the 21,418 gallons of water in accordance with the NMED-approved Hydrogeologic Workplan NOI and Workplan Decision Tree (Revised 7/15/02).

NOI Fact Sheet R-16r

Date:	5/4/2006	Well Type:	regional
Location (Canyon):	Overlook Park, White Rock	Location (TA):	LA County
Static Water Level:	563.6 ft bgs	Alluvial Water?:	None
Volume in Storage:	36,140 gal.	Type of Storage:	pit
Source of Water:	83% gw, 17% potable	Drilling Additives:	QuikFoam, EZ Mud
Location of Land Applic.:	drill site	Method of Applic.:	irrigation sprinklers

Samples Collected

Sample Id	Collection Point	Filtered (y/n)	Composite (y/n)
GW16-06-64316	pit, east end	n	n
GW16-06-64317	pit, east end	n	n
GW16-06-64318	pit, east end	n	n
GW16-06-66383	pit	y	y

Analytical Results/Detections

Sample Id/Suite	Analyte	Result	3103 Standard	Exceedence (y/n)
<u>GW16-06-64316</u>				
VOA	toluene	8.6 ppb	750 ppb	n
VOA	acetone	313 ppb		
SVOA	bis(2-Ethylhexyl)phthalate	5.2J ppb		
Pu-238, Pu-239/240, Sr-90, Tritium		ND		
<u>GW16-06-64317</u>				
VOA	toluene	7.8 ppb	750 ppb	n
VOA	acetone	258 ppb		
SVOA	bis(2-Ethylhexyl)phthalate	2.7J ppb		
Pu-238, Pu-239/240, Sr-90, Tritium		ND		
<u>GW16-06-64318</u>				
VOA	toluene	8.1 ppb	750 ppb	n
VOA	acetone	304 ppb		
SVOA		ND		
Pu-238, Pu-239/240, Sr-90, Tritium		ND		
<u>GW16-06-66383</u>				
metals (filtered)		less than 3103 standards		
CN, F, Cl, SO4, NO3, TDS		less than 3103 standards		
Ra-226/228		less than 3103 standards		

Summary

The water in storage at the R-16r drill site does not exceed any NM WQCC Regulation 3103 ground water standards or any applicable RCRA regulatory limits. The source of the acetone is believed to be an artifact of the drilling additive, Quik-Foam. The source of the toluene is believed to be the decon water generated during the cleaning of the drill rig and rig-related machinery. The source of the phthalates is believed to be from the poly liner in the bottom of the pit. Los Alamos National Laboratory proposes to land apply the 36,140 gallons of water in accordance with the NMED-approved Hydrogeologic Workplan NOI and Workplan Decision Tree (Revised 7/15/02).

NOI Fact Sheet R-23i

Date:	5/4/2006	Well Type:	intermediate
Location (Canyon):	Pajarito Canyon	Location (TA):	36
Static Water Level:	405.88 ft bgs	Alluvial Water?:	None encountered
Volume in Storage:	40,669 gal	Type of Storage:	pit (1), 21k gal. frac tank (1)
Source of Water:	ground, potable, & decon water	Drilling Additives:	Quik-Foam, EZ Mud, defoamer
Location of Land Applic.	drill site	Method of Applic.	irrigation sprinklers

Samples Collected

Sample Id	Collection Point	Filtered (y/n)	Composite (y/n)
GW23-06-64340	pit and frac tank	y (metals only)	y

Analytical Results/Detections

Sample Id/Suite	Analyte	Result	3103 Standards	Exceedence (y/n)
GW23-06-64340				
VOA		ND		
PAHs	Acenaphthene	1.04 ppb		
PAHs	Pyrene	0.103 ppb		
PAHs	Naphthalene	0.849 ppb	30 ppb	n
PAHs	Acenaphthylene	0.803 ppb		
PAHs	Fluorene	0.896 ppb		
PAHs	Phenanthrene	0.964 ppb		
PAHs	Anthracene	1.05 ppb		
PCBs		ND		
metals (filtered)		less than 3103 standards		
CN, F, Cl, SO4, NO3, TDS		less than 3103 standards		
Ra-226/228		ND		

Summary

The water in storage at the R-23i drill site does not exceed any NM WQCC Regulation 3103 ground water standards or any applicable RCRA regulatory limits. A potential source of the PAHs are the exhaust fumes from vehicles and on-site drilling related engines. Los Alamos National Laboratory intends to land apply the 40,669 gallons of water in storage in accordance with the NMED-approved Hydrogeologic Workplan NOI and Workplan Decision Tree (Revised 7/15/02).

NOI Fact Sheet R-24

Date:	5/4/2006	Well Type:	regional
Location (Canyon):	Bayo Canyon	Location (TA):	74
Static Water Level:	715.44 ft. bgs	Alluvial Water?:	none
Volume in Storage:	40,201	Type of Storage:	pit (1), frac tank (1)
Source of Water:	ground, potable & decon water	Drilling Additives:	Quik Foam, EZ Mud
Location of Land Applic.	drill site	Method of Applic.	irrigation sprinklers

Samples Collected

Sample Id	Collection Point	Filtered (y/n)	Composite (y/n)
GW24-05-63050	pit	n	y
GW24-05-63051	pit	n	y
GW24-05-63052	pit	n	y
GW24-06-66376	pit	y (metals only)	y
GW24-06-66377	frac tank	y (metals only)	n

Analytical Results/Detections

Sample Id/Suite	Analyte	Result (ppb)	3103 Standard	Exceedence (y/n)
GW24-05-63050 VOA	acetone	1600		
GW24-05-63051 VOA	acetone	1370		
GW24-05-63052 VOA	acetone	1270		
GW24-05-63050 SVOA	bis(2-ethylhexyl)phthalate	3.4J ppb		
GW24-05-63051 SVOA		ND		
GW24-05-63052 SVOA		ND		
GW24-06-66376	less than 3103 standards			
GW24-06-66377	iron (Fe)	2,610 ppb	1,000 ppb	y

Summary

The water in storage at the R-24 drill site does not exceed any NM WQCC Regulation 3103 ground water standards or any applicable RCRA regulatory limits with the exception of iron at 2,610 ppb. The source of the acetone is believed to be an artifact from the drilling additive, Quik-Foam. The source of the phthalates in the stored water is believed to be the poly liner in the bottom of the pit. Los Alamos National Laboratory intends to land apply the 40,201 gallons of water in accordance with the NMED-approved Hydrogeologic Workplan NOI and Workplan Decision Tree (Revised 7/15/02).

Attachment 2.0

Well Location Maps

LAOI-3.2/LAOI-3.2a

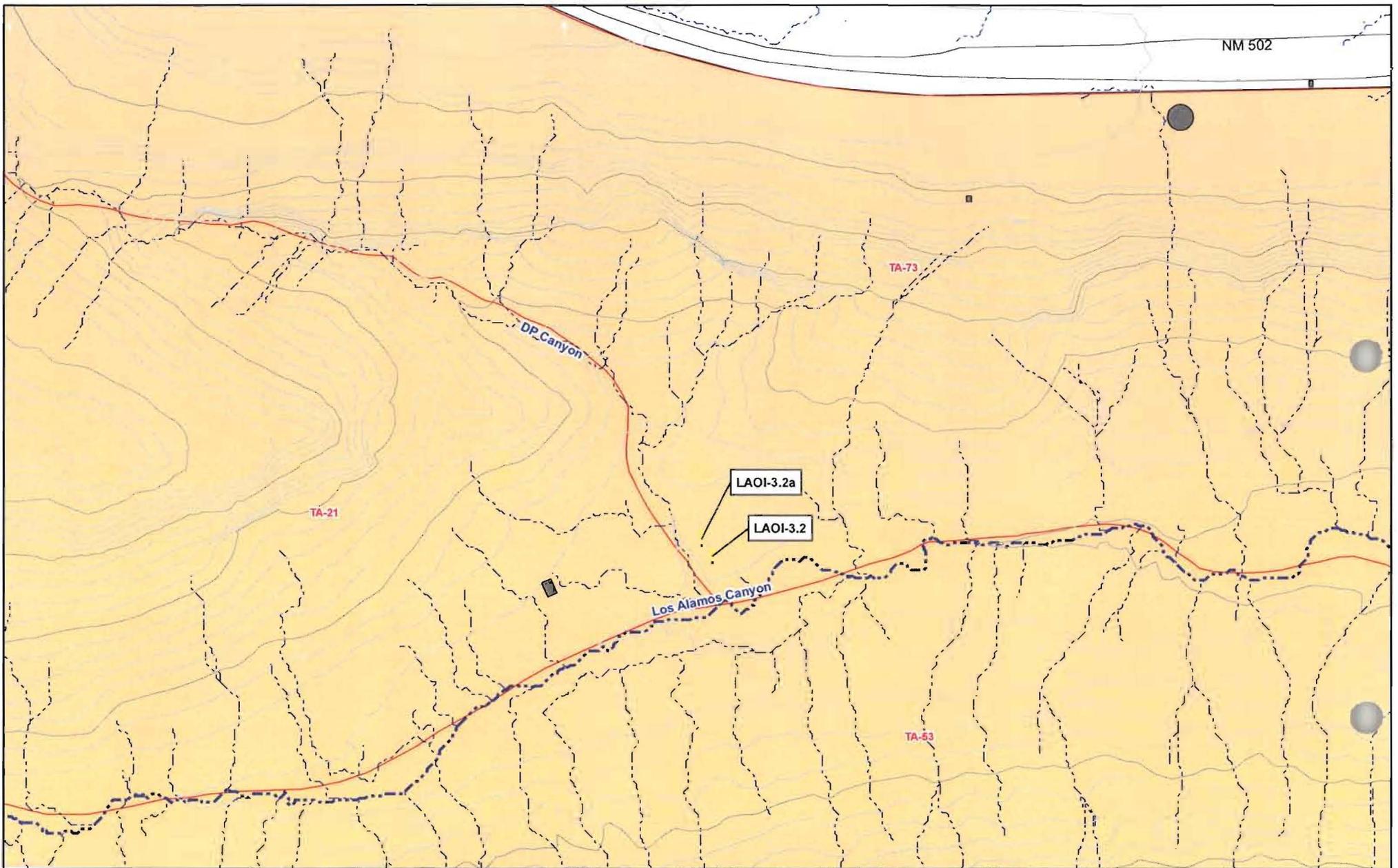
LAOI-7

CdV-16-2(i)r

R-16r

R-23i

R-24



Location of Wells LAOI-3.2 & LAOI-3.2a

Map Created By: Brad Mckown, ENV-ECR GIS Team, May 4, 2006, Map #06-0018-07

1

State Plane Coordinate System, New Mexico, Central Zone, US Feet, NAD 1983 Datum.

Meters

0 30 60 90

Feet

0 150 300 450

This map was created for work processes associated with the NOIs for Ground Water Monitoring Wells. All other uses for this map are disclaimed.

Data Sources

Hypsography, 20 and 100 Foot Contour Interval, Los Alamos National Laboratory, ENV Remediation Services Project, 1991

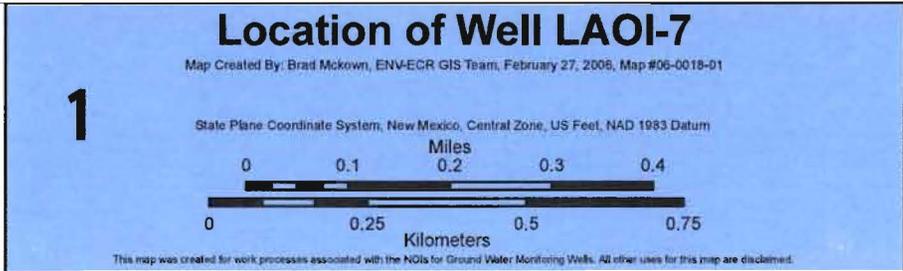
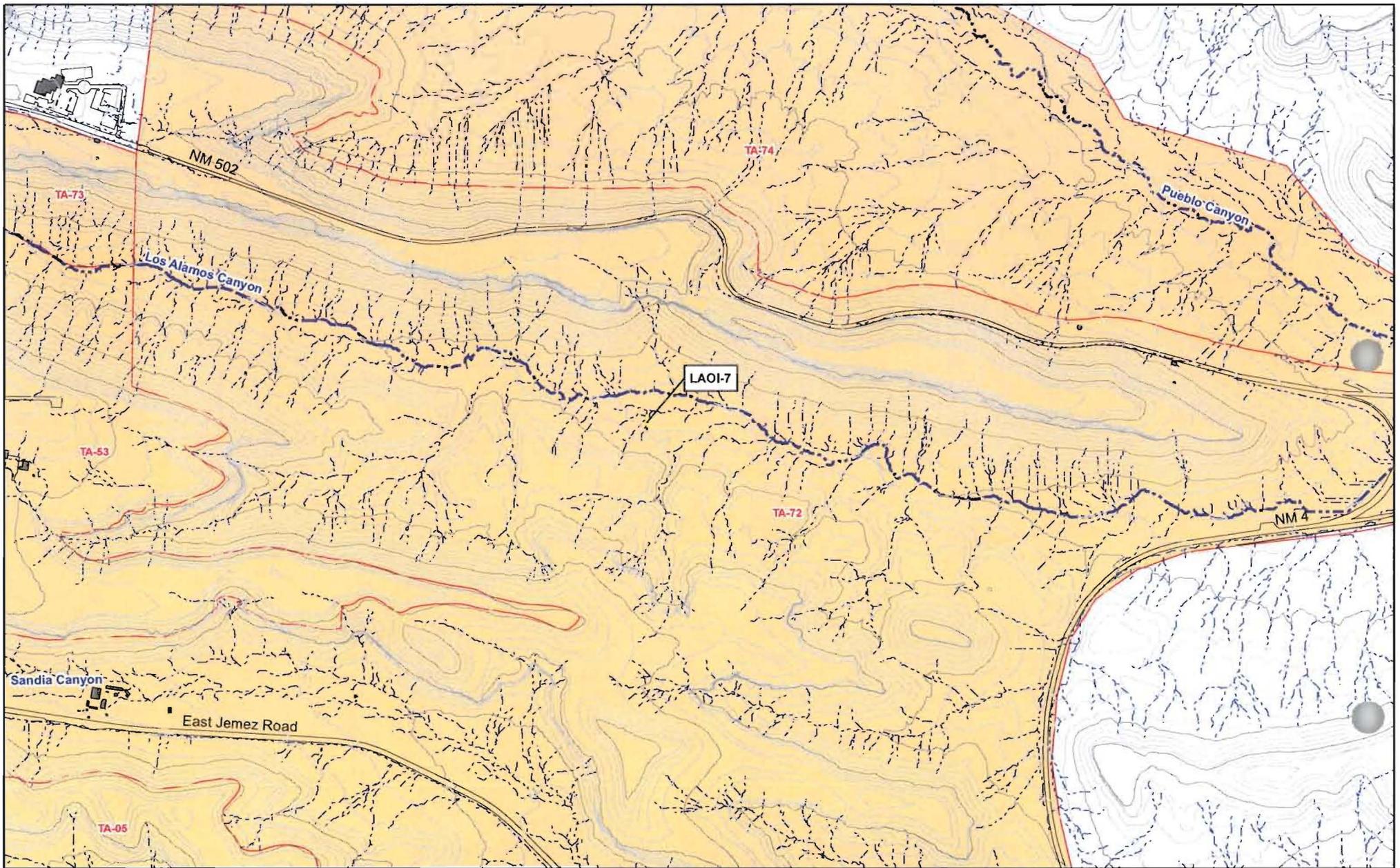
Paved Road Arcs, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, 06 January 2005

Structures, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, Development Edition of 22 June 2005.

Watercourse, Los Alamos National Laboratory, ENV Water Quality & Hydrology, 05 April 2005.

LANL and TA Boundaries, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, Development Edition of 05 January 2005.

Well locations, unpublished data, planned publication in 2006.



Data Sources

Hypsography, 20 and 100 Foot Contour Interval, Los Alamos National Laboratory, ENV Remediation Services Project, 1991.

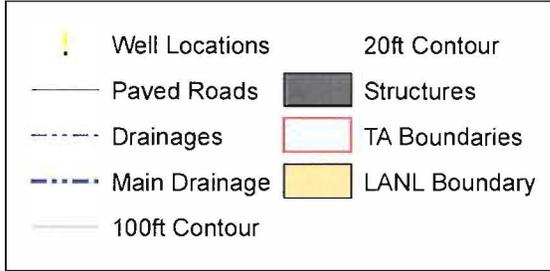
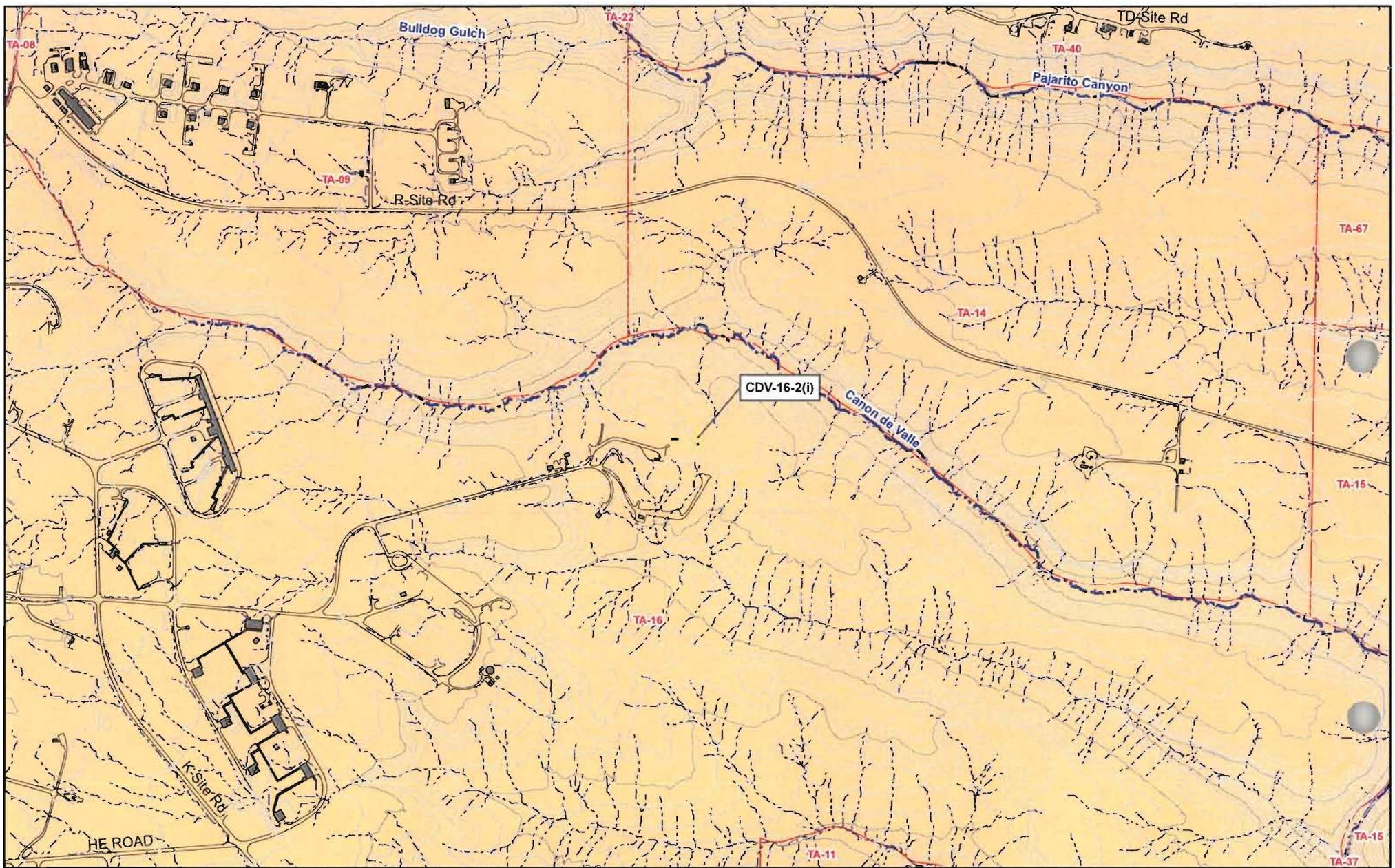
Paved Road Arcs, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, 06 January 2005

Structures, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, Development Edition of 22 June 2005.

Watercourse, Los Alamos National Laboratory, ENV Water Quality & Hydrology, 05 April 2005.

LANL and TA Boundaries, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, Development Edition of 05 January 2005.

Well locations, unpublished data, planned publication in 2006.



Location of Well CDV-16-2(i)

Map Created By: Brad Mckown, ENV/ECR GIS Team, February 27, 2006, Map #06-0019-02

1

State Plane Coordinate System, New Mexico, Central Zone, US Feet, NAD 1983 Datum

Miles

0 0.05 0.1 0.15 0.2 0.25

Kilometers

0 0.2 0.4 0.6

This map was created for work processes associated with the NOLs for Ground Water Monitoring Wells. All other uses for this map are disclaimed.

Data Sources

Hypography, 20 and 100 Foot Contour Interval, Los Alamos National Laboratory, ENV Remediation Services Project, 1991.

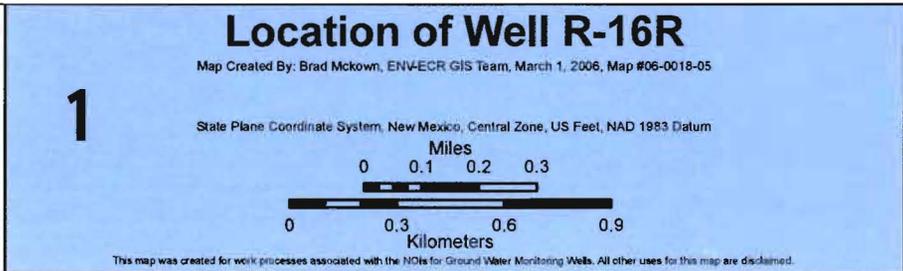
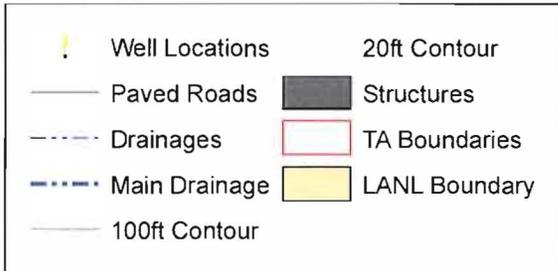
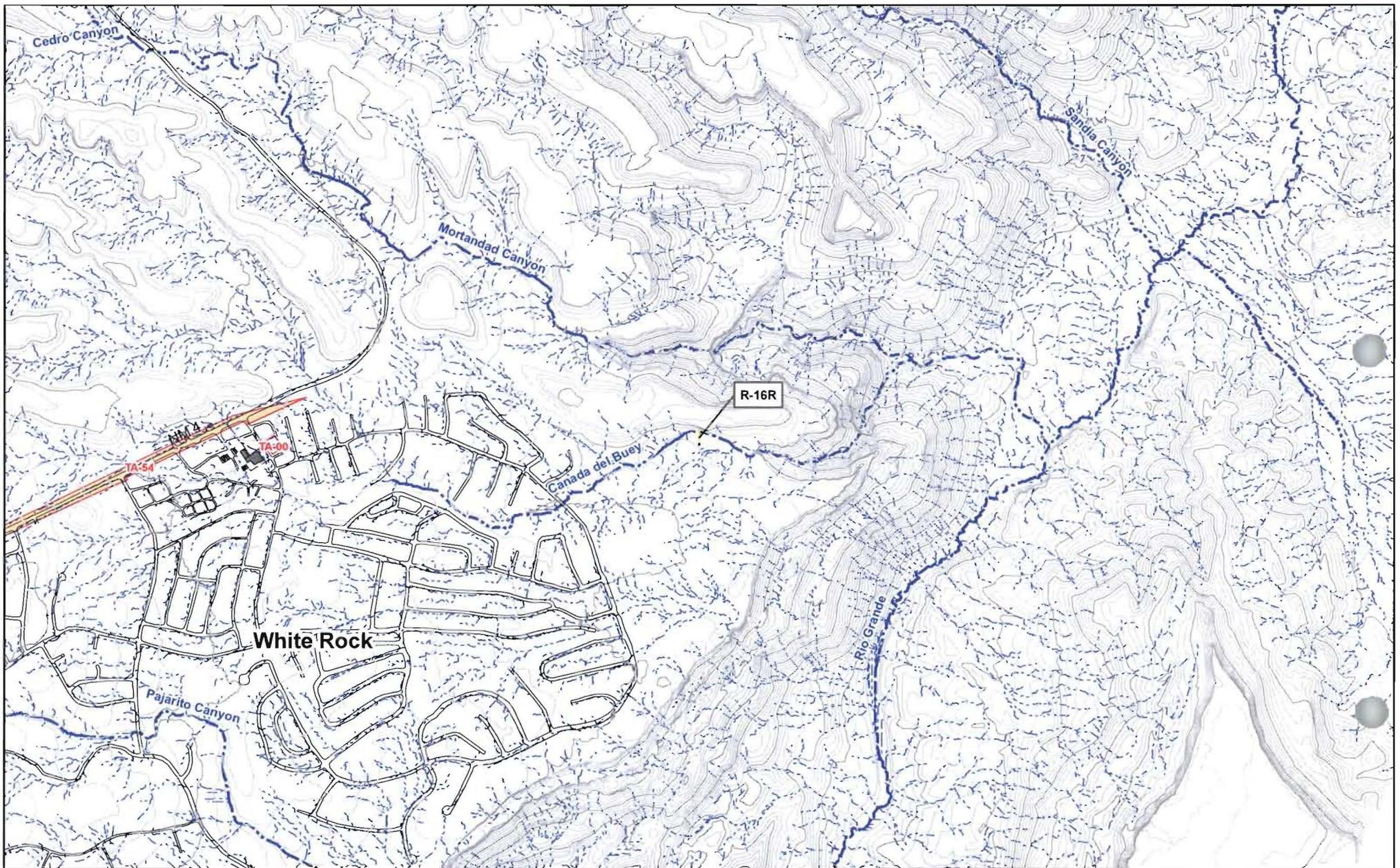
Paved Road Aps, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, 06 January 2005.

Structures, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, Development Edition of 22 June 2005.

Watercourse, Los Alamos National Laboratory, ENV Water Quality & Hydrology, 05 April 2005.

LANL and TA Boundaries, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, Development Edition of 05 January 2005.

Well locations; unpublished data, planned publication in 2006.



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Hypsography, 20 and 100 Foot Contour Interval, Los Alamos National Laboratory, ENV Remediation Services Project, 1991.

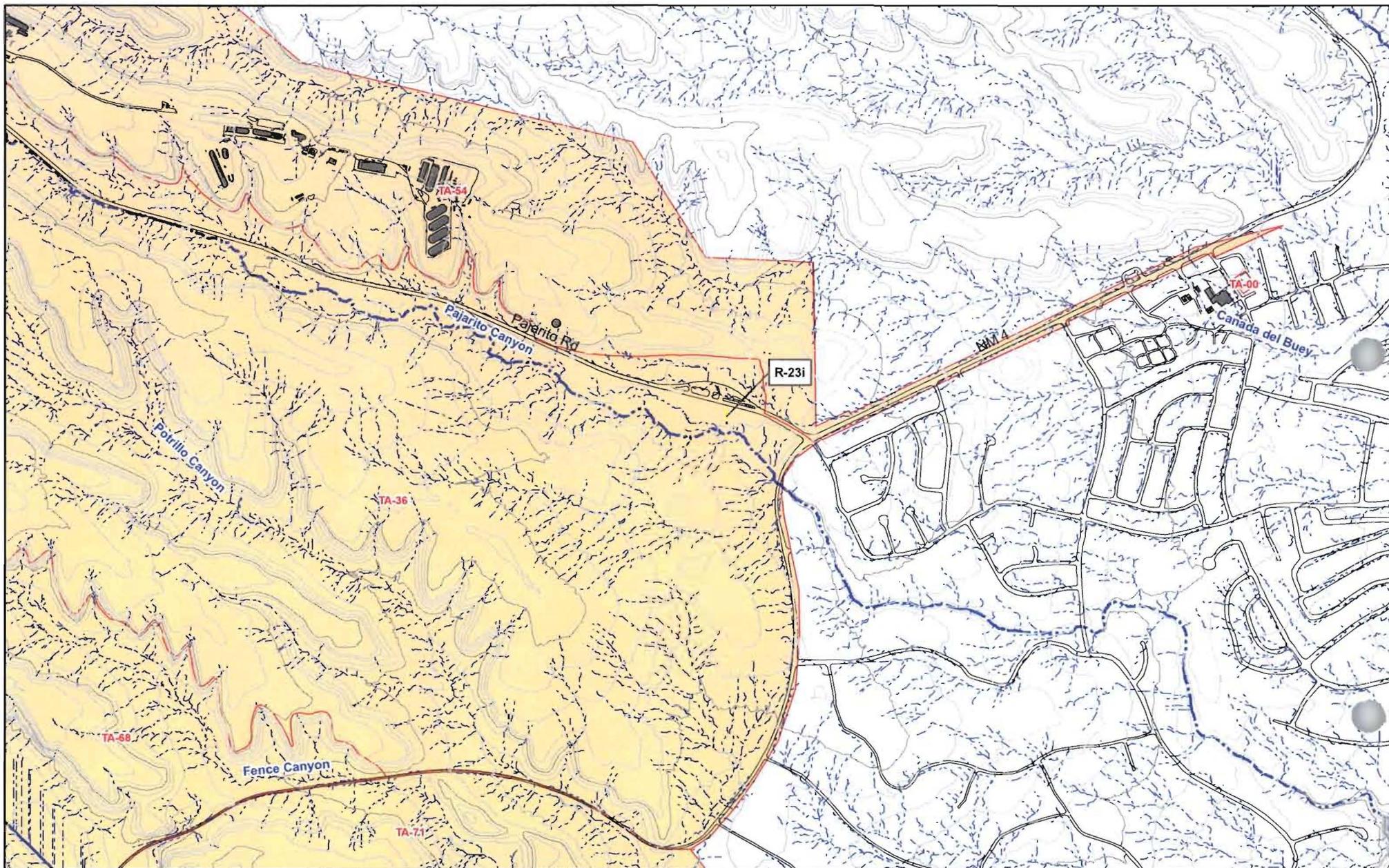
Paved Road Area, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, 06 January 2005.

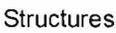
Structures, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, Development Edition of 22 June 2005.

Watercourse, Los Alamos National Laboratory, ENV Water Quality & Hydrology, 05 April 2005.

LANL and TA Boundaries, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, Development Edition of 05 January 2005.

Well locations, unpublished data, planned publication in 2006.



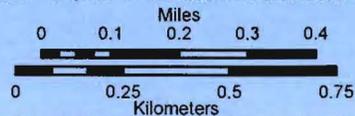
-  Well Locations
-  Paved Roads
-  Drainages
-  Main Drainage
-  100ft Contour
-  20ft Contour
-  Structures
-  TA Boundaries
-  LANL Boundary

Location of Well R-23i

Map Created By: Brad Mckown, ENW-ECR GIS Team, March 1, 2006, Map #06-0018-04

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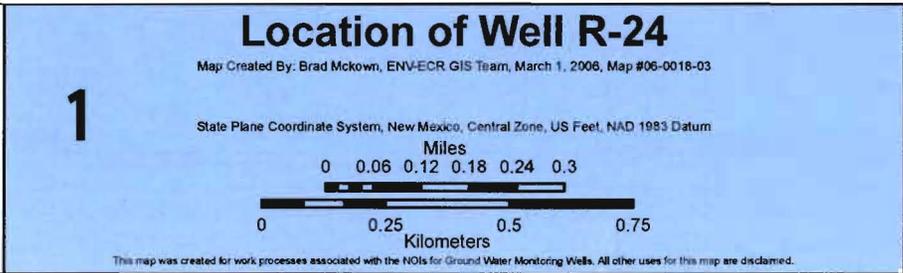
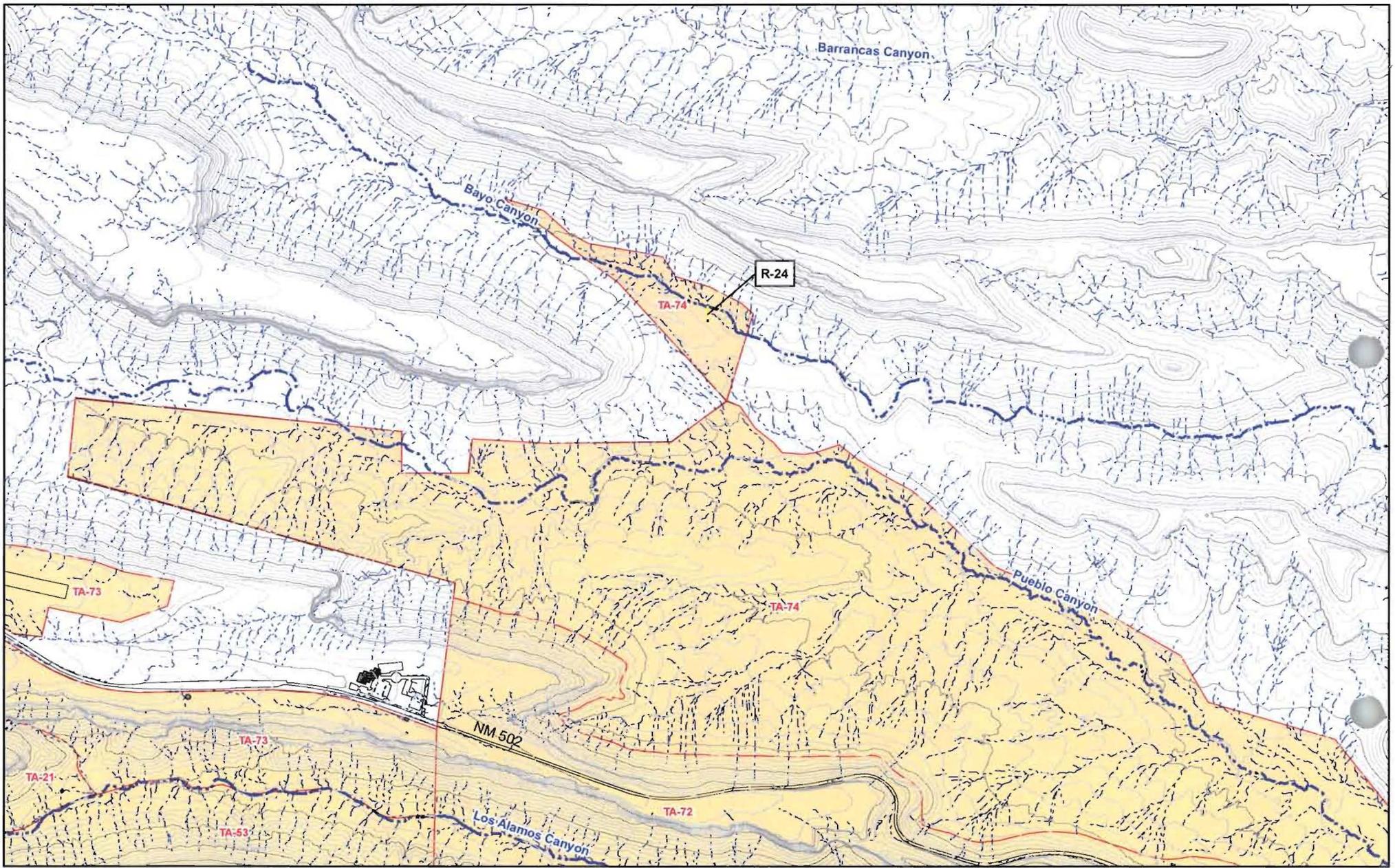
State Plane Coordinate System, New Mexico, Central Zone, US Feet, NAD 1983 Datum



This map was created for work processes associated with the NOLs for Ground Water Monitoring Wells. All other uses for this map are disclaimed.

Data Sources

Hypsography, 20 and 100 Foot Contour Interval, Los Alamos National Laboratory, ENV Remediation Services Project, 1991.
 Paved Road Arcs, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, 06 January 2005.
 Structures, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, Development Edition of 22 June 2005.
 Watercourse, Los Alamos National Laboratory, ENV Water Quality & Hydrology, 06 April 2005.
 LANL and TA Boundaries, Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section, Development Edition of 05 January 2005.
 Well locations, unpublished data, planned publication in 2006.



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Hydrography, 20 and 100 Foot Contour Interval; Los Alamos National Laboratory, ENV Remediation Services Project; 1991.

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Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; Development Edition of 22 June 2005.

Watercourse; Los Alamos National Laboratory; ENV Water Quality & Hydrology; 05 April 2005.

LANL and TA Boundaries; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; Development Edition of 05 January 2005.

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