GW - 28

REPORTS

YEAR(S):

2002-2001

PA

ENTERED

NAVAJO REFINING COMPANY

FAX
(505) 746-5283 DIV. ORDERS
(505) 746-5481 TRUCKING
(505) 746-5458 PERSONNEL

501 EAST MAIN STREET • P. O. BOX 159
ARTESIA, NEW MEXICO 88211-0159
TELEPHONE (505) 748-3311

FAX
(505) 746-5419 ACCOUNTING
(505) 746-5451 EXECUTIVE
(505) 746-5421 ENGINEERING
(505) 746-5480 P / L

KED 2RCA 101

December 4, 2001

Mr. Dave Cobrain
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Bldg 1
Santa Fe, NM 87505-6303

RE: Monitor Well Request

Dear Dave,

Enclosed, please find a list of all wells at this refinery. I have also included drawings of the wells that are available. Some of these wells were installed in the late 70's and early 80's and no drawings have been found. Therefore, the screening levels are not known exactly. However, based on Total Depth (TD), we know which zone they must be in.

We are continuing to search our files for drawings and will forward if those are located. If there are any questions concerning this submission, please call me at 505-748-3311. Thank you for your time.

Sincerely,
NAVAJO REFINING COMPANY

Darrell Moore

Darrell Moore
Environmental Manager for Water and Waste

Encl.

NAVAJO REFINING WELLS

Well	Status	Purpose	Aquifer
OCD-1	Existing	Monitor	Shallow
OCD-2A	Existing	Monitor	Shallow
OCD-2B	Existing	Monitor	Intermediate
OCD-3	Existing	Monitor	Shallow
OCD-4	Existing	Monitor	Shallow
OCD-5	Existing	Monitor	Shallow
OCD-6	Existing	Monitor	Shallow
OCD-7A	Existing	Monitor	Shallow
OCD-7B	Existing	Monitor	Intermediate
OCD-7C	Existing	Monitor	Deep
OCD-8A	Existing	Monitor	Shallow
OCD-8B	Existing	Monitor	Intermediate
MW-1	Unusable		
MW-2A	Existing	Monitor	Shallow
MW-2B	Existing	Monitor	Shallow
MW-3	Existing	Monitor	Shallow
MW-4A	Existing	Monitor	Shallow
MW-4B	Existing	Monitor	Intermediate
MW-5A	Existing	Monitor	Shallow
MW-5B	Existing	Monitor	Intermediate
MW-5C	Existing	Monitor	Deep
MW-6A	Existing	Monitor	Shallow
MW-6B	Existing	Monitor	Intermediate
MW-7A	Existing	Monitor	Shallow
MW-7B	Existing	Monitor	Intermediate
MW-8	Existing, poor	Monitor	Shallow
MW-9	Existing, poor	Monitor	Shallow
MW-10	Existing	Monitor	Shallow
MW-11A	Existing	Monitor	Shallow
MW-11B	Existing	Monitor	Intermediate
MW-12	Existing	Monitor	Shallow
MW-13	Existing	Monitor	Shallow
MW-14	Existing	Monitor	Shallow
MW-15	Existing	Monitor	Shallow
MW-18A(ponds)	Existing	Monitor	Shallow
MW-18B(ponds)	Existing	Monitor	Intermediate
MW-18T(ponds)	Existing	Monitor	Deep
MW-18(Plant)	Existing	Monitor	Shallow
MW-19	Existing	Monitor	Shallow
MW-20	Existing, poor	Monitor	Shallow
MW-21	Existing, Poor	Monitor	Shallow
MW-22A	Existing	Monitor	Shallow
MW-22B	Existing	Monitor	Intermediate
MW-23	Poor	Monitor	Shallow
MW-24(Plant)	Poor	Monitor	Shallow
MW-24(ponds)	Existing	Monitor	Shallow
MW-25	Existing	Monitor	Shallow
MW-28	Existing	Monitor	Shallow

MW-29	Existing	Monitor	Shallow
MW-30	Existing,Poor	Monitor	Shallow
MW-39	Existing	Monitor	Shallow
MW-40	Abandoned	NA	NA
MW-41	Existing	Monitor	Shallow
MW-42	Existing	Monitor	Shallow
MW-43	Existing	Monitor	Shallow
MW-45	Existing, poor	Monitor	Shallow
MW-46	Existing, Poor	Monitor	Shallow
MW-47	Abandoned	NA	NA
MW-48	Existing	Monitor	Shallow
MW-49	Existing	Monitor	Shallow
MW-50	Existing	Monitor	Shallow
MW-51	Abandoned	NA	NA
MW-52	Existing	Monitor	Shallow
MW-53	Existing	Monitor	Shallow
MW-54A	Existing	Monitor	Shallow
MW-54B	Existing	Monitor	Intermediate
MW-55	Existing	Monitor	Shallow
MW-56	Existing	Monitor	Shallow
KWB-1A	Existing	Monitor	Shallow
KWB-1B	Existing	Monitor	Shallow
KWB-1C	Existing	Monitor	Intermediate
KWB-2A	Abandoned	NA	NA
KWB-2B	Abandoned	NA	NA
KWB-3A	Existing	Monitor	Shallow
KWB-3B	Existing	Monitor	Intermediate
KWB-4	Existing	Monitor	Shallow
KWB-5	Existing	Monitor	Shallow
KWB-6	Existing	Monitor	Shallow
KWB-7	Existing	Monitor	Shallow
KWB-8	Existing	Monitor	Shallow
KWB-9	Existing	Monitor	Shallow
KWB-10	Existing	Monitor	Shallow
KWB-11A	Existing	Monitor	Shallow
KWB-11B	Existing	Monitor	Intermediate
KWB-12A	Existing	Monitor	Shallow
KWB-12B	Existing	Monitor	Intermediate
E	Abandoned	NA	NA
F	Abandoned	NA	NA
I	Abandoned	NA	NA
S	Abandoned	NA	NA
AE	Existing, Poor	Monitor	Shallow
AH	Existing, Poor	Monitor	Shallow
TEL-1	Existing	Monitor	Shallow
TEL-2	Existing	Monitor	Shallow
TEL-3	Existing	Monitor	Shallow
TEL-4	Existing	Monitor	Shallow
NCL-31	Existing	Monitor	Shallow
NCL-32	Existing	Monitor	Shallow
NCL-33	Existing	Monitor	Shallow
NCL-34	Existing	Monitor	Shallow

NCL-49	Existing	Monitor	Shallow
NP-1	Existing	Monitor	Shallow
NP-2	Existing	Monitor	Shallow
NP-3	Existing	Monitor	Shallow
NP-4	Existing	Monitor	Shallow
RA-307	Existing	Irrigation	San Andres
RA-313	Existing	Irrigation	San Andres
RA-314	Existing	Irrigation	San Andres
RA-1227	Existing	Irrigation	San Andres
RA-1331	Existing	Irrigation	San Andres
RA-3156	Existing	Irrigation	San Andres
RA-3353	Existing	Irrigation	San Andres
RA-4196	Existing	Irrigation	San Andres
RA-4798	Existing	Irrigation	San Andres
RA-3723	Existing	Dry	San Andres

Sym	Samp	Loc	Pr (ppm)	Depth (Feet)
				2
				4
				6
				8
				10
				12
				14
				16
				18
				20
				22
				24
				26
				28
				30
				32

Geologic Description

0–2' SANDY CLAY, dark brown, with roots.

2–14' SANDY CLAY, brown, dry to moist, lighter in color with increasing depth, white caliche pebbles showing up at 9–10 feet, occasional pockets of fine white sand.

14–20' CLAY, reddish brown, moist, some caliche pebbles and sand pockets.

20–22' SANDY CLAY, brown and white, saturated increasing pebble content.

22–23' GRAVEL, 1 to 2" rocks, saturated.

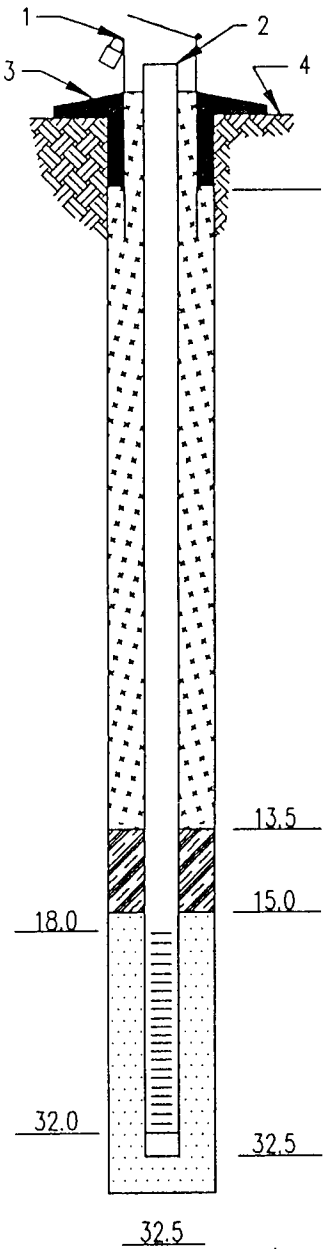
23–32.5' SANDY CLAY, brown and white, moist dry, pebble content decreasing with depth.

TD = 32.5'

NOTE: 5 foot core barrel recovery system used as sampling technique

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Mon Well ☒
Piezometer



Depths in Feet
from Ground Surface
(Not to Scale)

Design Specification

Elevations: (feet MSL) 1 3351.07 2 3350.87 3 3349.10 4 3348.7

Coordinates: X 5171.71 Y 5193.86

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☒ 2" ☐ 3" ☐ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: CSSI 16–40

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ _____

Grout Type: Portland Weight: _____

Bore Hole Diameter: 8"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: PRECISION ENGINEERING

Logged By: PHILIP CADARETTE

Completion Date: FEBRUARY 11, 1992

Date	D-T-W	MSL	Date	Field pH	Field EC
2/19/92	14.7	3336.4			
3/10/92	14.5	3336.2			

Comments: Concrete with 5% bentonite used to grout from seal to surface.

KWBES

Navajo

KWB1A

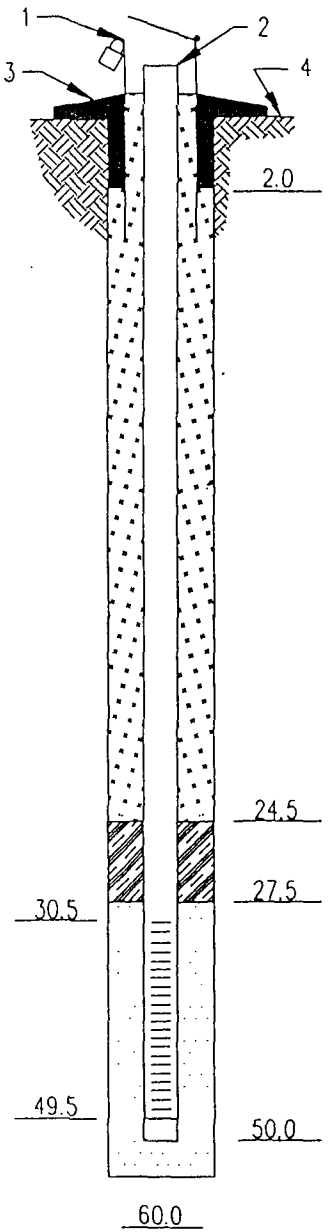
Project: 622092001–237 (1A)
Location: ARTESIA, NEW MEXICO

DRAFT

Sym	Samp Loc	PID (ppm)	Depth (Feet)	Geologic Description
			3	0-2' SANDY CLAY, dark brown to brown, moist, plastic.
			6	
			9	2-6' CLAYEY SAND, brown to tan, moist to slightly moist, friable.
			12	
			15	6-14' SANDY CLAY, brown, moist, friable to firm, occasioal fragments fo claiche gravel, angular
			18	14-20' CLAY, brown, moist, plastic, thin gravel seam @ 17', saturated, gypsum crystals throughout clay.
			21	
			24	20-25' SILTY CLAY, brown to white, saturated from 20-23', very moist to moist 23-25'.
			27	
			30	25-28' SILT, brown to white, saturated.
			33	28-32' SILTY CLAY, brown to white, moist with thin intermittent seams fo caliche pebbles, saturated.
			36	
			39	32-33' SANDY CLAY, brown, moist, plastic.
			42	33-44' GRAVEL, CLAY, SILT MIX, saturated clay lenses with saturated pebble seams throughout.
			45	
			48	44-45' SANDY CLAY, brown to white, slightly moist, stiff.
			51	45-59' CLAY, brown, moist with saturated pebble seams throughout
			54	59-60' CLAY, brown, slightly moist, stiff.
			57	TD = 60.0'
			60	CME 5' core barrel recovery system

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Monitoring Well ☒
Piezometer



Depths in Feet from Ground Surface (Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 _____ 2 _____ 3 _____ 4 _____

Coordinates: X _____ Y _____

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☐ 2" ☐ 3" ☒ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: Colorado Silica Sand 20/40

Bentonite Seal: ☒ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☐ 1/4" Pellets ☐ _____

Grout Type: Portland/5% Bentonite Weight: _____

Bore Hole Diameter: 13.5"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: Precision Engineering

Logged By: PWC

Completion Date: 09/29/92

Date	D-T-W	MSL	Date	Field pH	Field EC

Comments: Boring plugged back to 50 feet before well set

KWBES

KWB-1C

Project: Navajo 622092003-236
Location: Artesia, New Mexico

Sym	Samp Loc	PID (ppm)	Depth (Feet)
			2
			4
			6
			8
			10
			12
			14
			16
			18
			20
			22
			24
			26
			28
			30
			32
			34
			36
			38
			40
			42
			44
			46
			48
			50

Geologic Description

0–16.5' SANDY CLAY, brown, moist to dry, becoming lighter in color with decreasing moisture, pockets of fine white caliche appearing at 14'.

16.5–23' CLAY, brown, moist, stiff to plastic, some black stippling.

23–29.5' SANDY CLAY, brown, moist, reaching saturation near 29'.

29.5–45' CLAYEY GRAVEL, saturated, fine sand, pebbles, rocks to 3" in diameter, gravel sand–clay mix.

45–47.5' SAND, fine grained, brown, saturated.

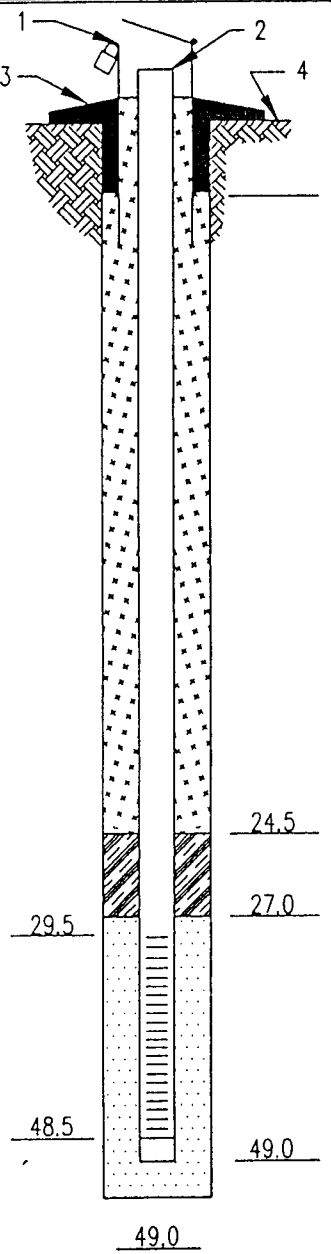
47.5–49' SANDY CLAY, brown, moist to dry.

TD = 49.0'

NOTE: 5 foot core barrel recovery system used as sampling technique

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Monitoring Well ☒
Piezometer ☐



Depths in Feet from Ground Surface (Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 3366.18 2 3366.04 3 3364.03 4 3363.8

Coordinates: X 1659.24 Y 3905.78

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☒ 2" ☐ 3" ☐ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: CSSI 16-40

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ _____

Grout Type: Portland Weight: _____

Bore Hole Diameter: 8"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: PRECISION ENGINEERING

Logged By: PHILIP CADARETTE

Completion Date: FEBRUARY 14, 1992

Date	D-T-W	MSL	Date	Field pH	Field EC
2/19/92	29.0	3337.0			
3/10/92	29.3	3336.7			

Comments: Concrete with 5% bentonite used to grout from seal to surface.

KWBES

Navajo Nation

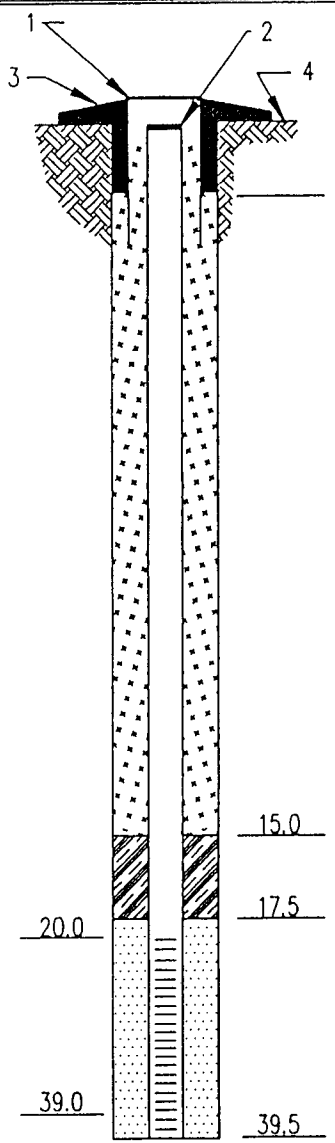
KWB2A

Project: 622092001-237 (2A)
Location: ARTESIA, NEW MEXICO

Sym	Samp Loc	PID (ppm)	Depth (Feet)	Geologic Description
			2	0-24' SANDY CLAY, brown, moist, becoming lighter in color with depth to @ 5'
			4	- dryer with depth
			6	- large pockets of white caliche starting around 8'.
			8	- small seam of pebbles @ 17.5'
			10	- intermittent thin seams
			12	- small seam of pebbles @ 17.5'
			14	- intermittent thin seams of fine sand from 17.5 to 20', moist
			16	- occasional small pebbles
			18	24-25' CLAY, brown, stiff, moist.
			20	25-29' SANDY CLAY, brown, interspersed with 6" seams of gravel, saturated.
			22	
			24	29-30' CLAYEY GRAVEL, saturated.
			26	30-35' CLAYEY SAND, brown, saturated with pebbles and rock.
			28	
			30	35-39.5' CLAY, brown, dry to moist, increasing sand and moisture with depth - gravel, dry at 39'.
			32	
			34	TD = 39.5'
			36	
			38	
			40	NOTE: 5 foot core recovery system used as sampling technique.
			42	
			44	
			46	
			48	
			50	

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Mon... g Well ☒
Piezometer



Depths in Feet
from Ground Surface
(Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 3345.49 2 3345.31 3 3345.49 4 3345.3

Coordinates: X 2183.45 Y 7907.17

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ ____

Casing Diameter: ☒ 2" ☐ 3" ☐ 4" ☐ 6" ☐ ____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ ____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ ____

Sand Pack: 20/40 Colorado

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ ____

Grout Type: Type I Portland Weight: ____

Bore Hole Diameter: 8"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ ____

Drilled By: PRECISION ENGINEERING

Logged By: PHILLIP CADARETTE

Completion Date: FEBRUARY 14, 1992

Date	D-T-W	MSL	Date	Field pH	Field EC
2/19/92	20.7	3324.6			
3/10/92	21.0	3324.3			

Comments: Concrete with 5% bentonite used to grout from seal to surface.

KWBES

KWB3A

Project: 622092001-237 (3A)
Location: ARTESIA, NEW MEXICO

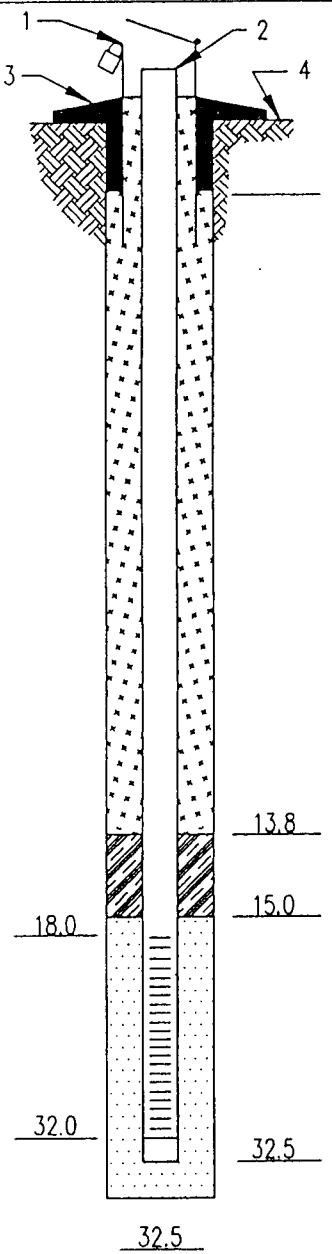
Sym	Samp Loc	PID (ppm)	Depth (Feet)
			2
			4
			6
			8
			10
			12
			14
			16
			18
			20
			22
			24
			26
			28
			30
			32

Geologic Description

0–2'	SANDY CLAY, dark brown, with roots.
2–14'	SANDY CLAY, brown, dry to moist, lighter in color with increasing depth, white caliche pebbles showing up at 9–10 feet, occasional pockets of fine white sand.
14–20'	CLAY, reddish brown, moist, some caliche pebbles and sand pockets.
20–22'	SANDY CLAY, brown and white, saturated, increasing pebble content.
22–23'	GRAVEL, 1 to 2" rocks, saturated.
23–32.5'	SANDY CLAY, brown and white, moist to dry, pebble content decreasing with depth.
	TD = 32.5'

ST=Shelby Tube | SS=Split Spoon | ☒ C=Cuttings

Monitoring Well ☒
Piezometer



Depths in Feet
from Ground Surface
(Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 3351.06 2 3350.83 3 3349.18 4 3348.8

Coordinates: X 5172.42 Y 5181.92

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☐ 2" ☐ 3" ☒ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: CSSI 16-40

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ _____

Grout Type: Portland Weight: _____

Bore Hole Diameter: 12"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: PRECISION ENGINEERING

Logged By: PHILIP CADARETTE

Completion Date: FEBRUARY 15, 1992

Date	D-T-W	MSL	Date	Field pH	Field EC
2/19/92	14.4	3336.4			
3/10/92	14.5	3336.3			

Comments: Concrete with 5% bentonite used to grout from seal to surface.

KWBES

Navajo Nation

KWB1B

Project: 622092001-237 (1B)
Location: ARTESIA, NEW MEXICO

Sym	Samp Loc	PID (ppm)	Depth (Feet)
			2
			4
			6
			8
			10
			12
			14
			16
			18
			20
			22
			24
			26
			28
			30
			32
			34
			36
			38
			40
			42
			44
			46
			48
			50

Geologic Description

0-16.5' SANDY CLAY, brown, moist to dry, becoming lighter in color with decreasing moisture, pockets of fine white caliche (appearing at 14').

16.5-23' CLAY, brown, moist, stiff to plastic, some black stippling.

23-29.5' SANDY CLAY, brown, moist, reaching saturation near 29'.

29.5-45' CLAYEY GRAVEL, saturated, fine sand, pebbles, rocks to 3" in diameter, gravel sand-clay mix.

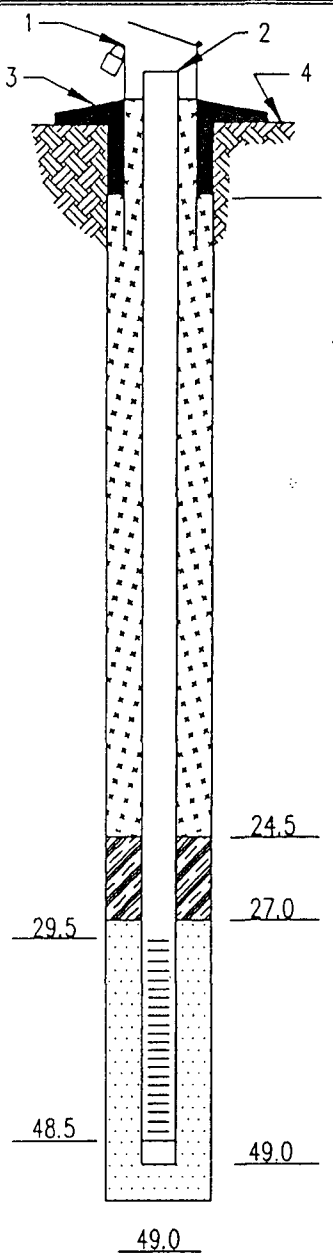
45-47.5' SAND, fine grained, brown, saturated.

47.5-49' SANDY CLAY, brown, moist to dry.

TD = 49.0'

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Mon. ng Well ☒
Piezometer



Depths in Feet
from Ground Surface
(Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 3366.40 2 3366.26 3 3364.12 4 3363.9

Coordinates: X 1646.63 Y 3905.71

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ ____

Casing Diameter: ☐ 2" ☐ 3" ☒ 4" ☐ 6" ☐ ____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ ____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ ____

Sand Pack: CSSI 16-40

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ ____

Grout Type: Portland Weight: ____

Bore Hole Diameter: 12"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ ____

Drilled By: PRECISION ENGINEERING

Logged By: PHILIP CADARETTE

Completion Date: FEBRUARY 18, 1992

Date	D-T-W	MSL	Date	Field pH	Field EC
2/19/92	28.9	3337.4			
3/10/92	29.2	3337.1			

Comments: Concrete with 5% bentonite used to grout from seal to surface.

KWBES

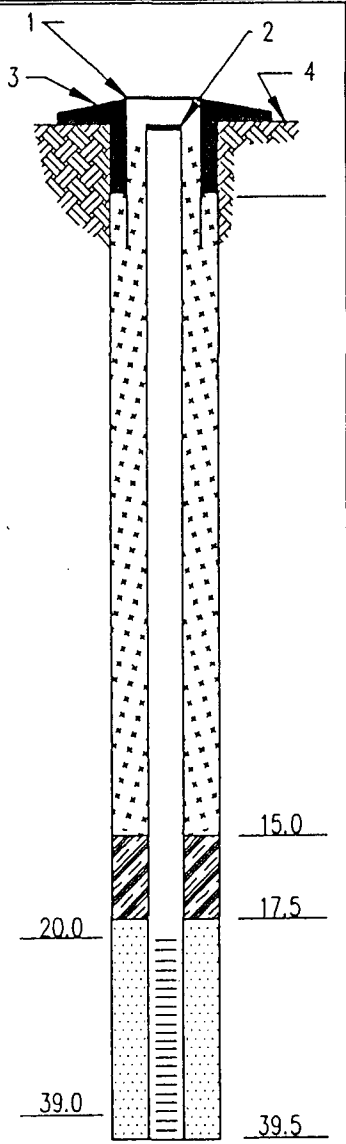
KWB2B

Project: 622092001-237 (2B)
Location: ARTESIA, NEW MEXICO

Sym	Samp Loc	PID (ppm)	Depth (Feet)	Geologic Description
			2	0–24' SANDY CLAY, brown, moist, becoming lighter in color with depth to @ 5'
			4	– dryer with depth
			6	– large pockets of white caliche starting around 8'.
			8	– small seam of pebbles @ 17.5'
			10	– intermittent thin seams
			12	– small seam of pebbles @ 17.5'
			14	– intermittent thin seams of fine sand from 17.5 to 20', moist
			16	– occasional small pebbles
			18	24–25' CLAY, brown, stiff, moist.
			20	25–29' SANDY CLAY, brown, interspersed with 6" seams of gravel, saturated.
			22	29–30' CLAYEY GRAVEL, saturated.
			24	30–35' CLAYEY SAND, brown, saturated with pebbles and rock.
			26	35–39.5' CLAY, brown, dry to moist, increasing sand and moisture with depth – gravel, dry at 39'.
			28	
			30	TD = 39.5'
			32	
			34	
			36	
			38	
			40	
			42	
			44	
			46	
			48	
			50	

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Mon. g Well ☒
Piezometer



Depths in Feet
from Ground Surface
(Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 3345.52 2 3345.10 3 3345.52 4 3345.3

Coordinates: X 2193.17 Y 7905.71

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☒ 2" ☐ 3" ☐ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: 20/40 Colorado

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ _____

Grout Type: Type I Portland Weight: _____

Bore Hole Diameter: 12"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: PRECISION ENGINEERING

Logged By: PHILLIP CADARETTE

Completion Date: FEBRUARY 15, 1992

Date	D-T-W	MSL	Date	Field pH	Field EC
2/19/92	21.0	3324.1			
3/10/92	21.2	3323.9			

Comments: Concrete with 5% bentonite used to grout from seal to surface.

KWBES

Navajo

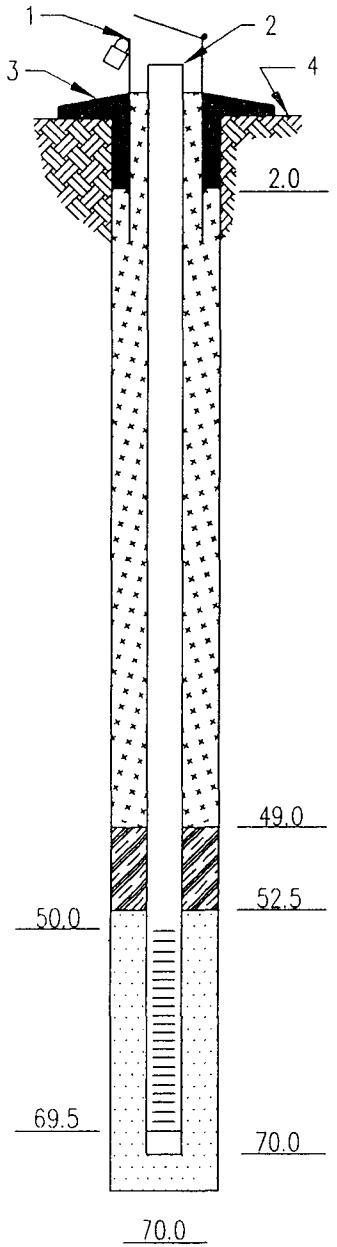
KWB3B

Project: 622092001-237 (3B)
Location: ARTESIA, NEW MEXICO

Sym	Samp Loc	PID (ppm)	Det (Feet)	Geologic Description
			3	0–10' CLAYEY SAND, dark brown to brown, moist to slightly moist, plastiec to stiff. –thin caliche pebble zone @ 9.0', dry.
			6	
			9	
			12	10–15' CLAY, brown to white, moist, blocky, gypsum crystals appearing near 15.0'.
			15	
			18	15–25' CLAYEY SAND, brown to white, moist, plastic. –saturated at 20.5' with gravel and fine tan sand seams interbedded.
			21	
			24	25–45' GRAVEL WITH CLAY AND SILT, saturated, ravel is caliche with angular fragments up to 2" in size.
			27	
			30	
			33	45–48.5' RIVER ROCK, blue to gray, well rounded, saturated, 1/4" in diameter.
			36	48.5–50' SANDY CLAY, reddish brown, slightly moist, very stiff.
			39	
			42	50–55' CLAY WITH SAND, slightly moist to dry, very stiff, occassional rock fragments.
			45	
			48	55–69' CLAY, reddish brown, moist, plastic to stiff. –thin pebble beds, saturated, starting @ 58.0', occuring intermittently to 65.0'
			51	
			54	
			57	69–70' CLAY, reddish brown, moist to slightly, moist, very stiff.
			60	TD = 70.0'
			63	CME 5' core barrel recovery system
			66	
			69	
			72	
			75	

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Monitor Well ☒
Piezometer



Depths in Feet
from Ground Surface
(Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 _____ 2 _____ 3 _____ 4 _____

Coordinates: X _____ Y _____

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☐ 2" ☐ 3" ☒ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: Colorado Silica Sand 20/40

Bentonite Seal: ☒ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☐ 1/4" Pellets ☐ _____

Grout Type: Portland/5% Bentonite Weight: _____

Bore Hole Diameter: 13.5"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: Precision Engineering

Logged By: PWC

Completion Date: 10/04/92

Date	D-T-W	MSL	Date	Field pH	Field EC

Comments: 10" PVC casing grouted in from 0–50.0' to seal off first saturated zone. After curing, well completed to 70.0'.

KWBES

Navajo Nation

KWB–11B

Project: Navajo 622092003–236
Location: Artesia, New Mexico

Sym	Samp Loc	PID (ppm)	Depth (Feet)
			2
			4
			6
			8
			10
			12
			14
			16
			18
			20
			22
			24
			26
			28
			30
			32
			34
			36
			38
			40
			42
			44
			46
			48
			50

Geologic Description

0–4' SANDY CLAY, dark brown to brown, moist, plastic.

4–10' CLAYEY SAND, brown to tan, moist, plastic, occassional gypsum crystals.

10–13' SANDY CLAY, moist, plastic, thin bands of fine sand interbedded.

13–15' CLAYEY SAND, slightly moist, stiff.

15–20' CLAY, with gravel, sand, silt, brown, moist, thin saturated gravel seam @ 18.0'.

20–22' GRAVEL WITH CLAY AND SAND, saturated.

22–35' CLAY, brown, slightly moist, very stiff, occassional caliche rock fragments, dry.
–thin saturated seams of rock at 30.0', 32.0', 35.0'.

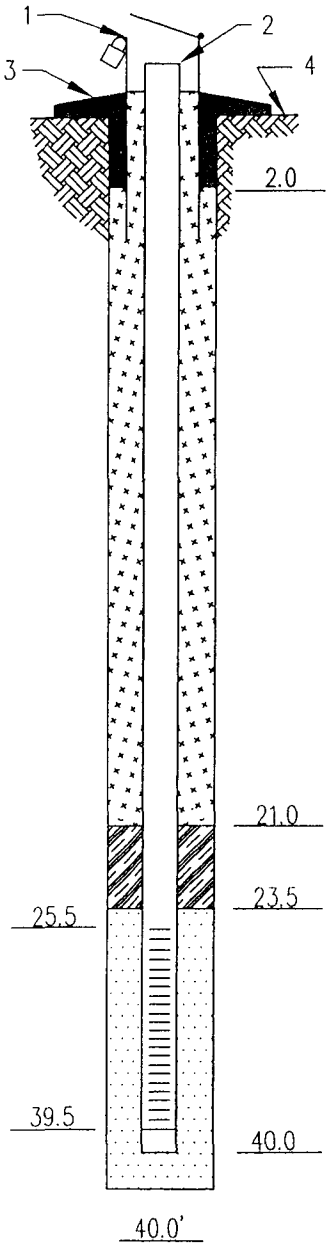
35–40' CLAY, reddish brown, moist with thin saturated caliche zones at 36.0' and 37.0'.
–slightly moist and stiff from 38–40.0'.

TD = 40.0'

CME 5' core barrel recovery system

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Monitor Well ☒
Piezometer



Depths in Feet from Ground Surface (Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 _____ 2 _____ 3 _____ 4 _____

Coordinates: X _____ Y _____

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☐ 2" ☐ 3" ☒ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: Colorado Silica Sand 20/40

Bentonite Seal: ☒ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☐ 1/4" Pellets ☐ _____

Grout Type: Portland/5% Bentonite Weight: _____

Bore Hole Diameter: 13.5"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: Precision Engineering

Logged By: PWC

Completion Date: 10/04/92

Date	D–T–W	MSL	Date	Field pH	Field EC

Comments: 10" PVC casing grouted in from 0–25.0' to seal off first saturated zone. After curing, well completed to 40.0'.

KWBES

KWB–12B

Project: Navajo 622092003–236
Location: Artesia, New Mexico

Samp. Meth.	Samp. Log	PID (ppm)	Depth (Feet)
RB			1–24

Geologic Description

0–1' SILTY SAND, brown, moist, medium to fine grained, many roots.

1–8.5' CLAYEY SAND, brown, changing to tan near 4', moist, friable, many roots and root channels, clay content increasing with depth.

8.5–13' CLAY, brown, moist, plastic, some gray mottling, gypsum crystals noted.

13–14' CLAYEY SAND, tan, moist, friable.

14–14.5' SAND with silt, tan, saturated, fine to medium grain.

14.5–20' CLAY, with gravel, clay is reddish/brown, very moist, plastic; gravel is < 1" dia. and saturated.

20–20.5 CLAYEY SAND, gray, saturated, some gravel fragments.

20.5–24' CLAY, reddish/brown, moist, plastic, blocky.
- thin zone of gravel near 23' is saturated (<4").

TD = 24'

Sample Method Symbols

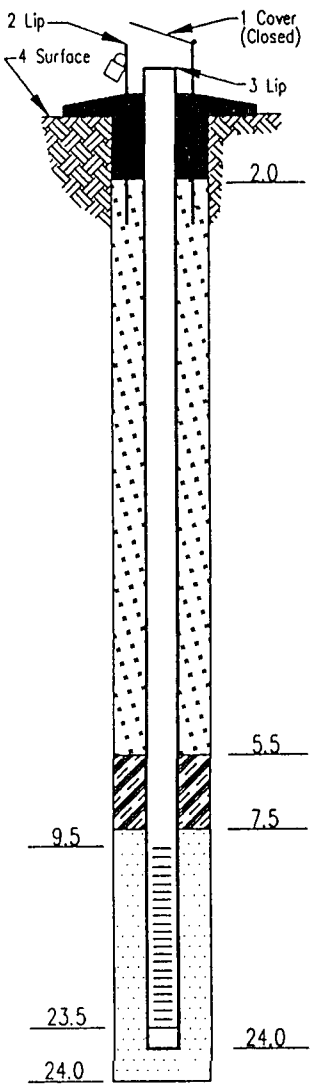
RB=Recovery Barrel ☒ 5' ☐ ____

ST=Shelby Tube | SS=Split Spoon | C=Cutting

Monitoring Well X

Piezometer

Protective Casing YES



Depths in Feet from Ground Surface (Not to Scale)

LOG-1

Design Specifications

Elevations: (feet MSL) 1 3340.69 2 3340.67 3 3340.00 4 3337.20

Coordinates: X 5606.12 Y 2420.80

Bore Hole Diameter: 12"

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ ____

Casing Diameter: ☐ 2" ☒ 4" ☐ 6" ☐ ____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ ____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ ____

Sand Pack: C.S.S.I. 20/40

Bentonite Seal: ☐ 1/4" Pellets ☒ 1/2" Pellets ☐ 1/2" Chips ☐ Hole Plug ☐ ____

Grout Type: Portland/Bentonite Weight: ____

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ ____

Drilled By: Pool Environmental Lic. #: WD 1266

Logged By: PWC

Completion Date: 01/21/93

Depth First Encountered Water: 14.0' BLS

Date	D-T-W	D-T-P	Prod Thick	Field pH	Field EC
1/26/93	10.18			6.93	7,600
2/10/93	10.41				

Comments: ____

KWBES

Navajo

MW-20

Project: 622092005-110 (MW-20)
Location: Artesia, New Mexico

Samp. Meth.	Samp. Log	PID (ppm)	Depth (Feet)
RB			2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24

Geologic Description

0-3.0' CLAYEY SAND, light brown, fine grained, white (carbonate nodules throughout, hard, dry, earthy odor.

3.0-7.5' SANDY CLAY, dark brown, color change to light gray at 6.0', fine grained sand, rust staining (dendritic) throughout, some clear crystals (gypsum?), soft, moist, earthy odor.

7.5-10.5' CALICHE (carbonate) GRAVEL, light gray, some clay throughout, hard, saturated at 10.0', no odor.

10.5-12.0' SANDY CLAY, light gray, fine grained sand, moist, no odor.

12.0-13.0' CALICHE (carbonate) GRAVEL, light gray, some clay throughout, hard, saturated, no odor.

13.0-23.0' CALICHE (carbonate) GRAVEL, reddish/brown, some clay throughout, hard, saturated at 13.0-13.5', 14.5-15.5', and 19.0-19.5', no odor.

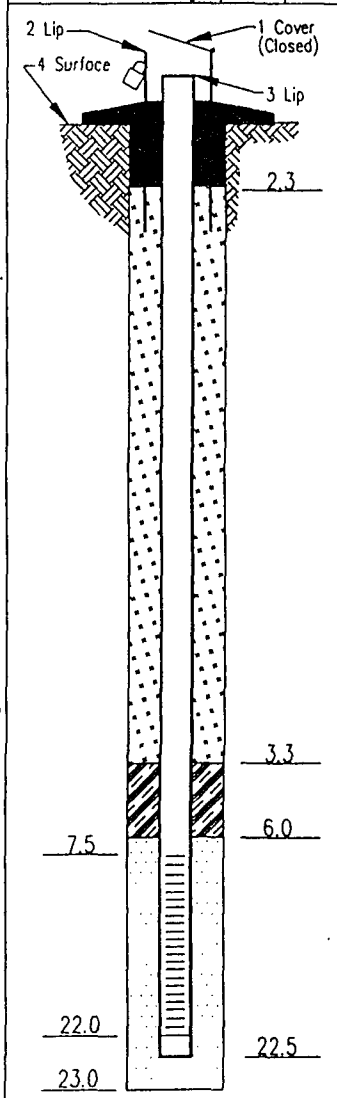
TD = 23.0'

Sample Method Symbols

RB=Recovery Barrel ☒ 5' ☐ ____

ST=Shelby Tube | SS=Split Spoon | C=Cutting

Monitoring Well	X
Piezometer	
Protective Casing	YES



Depths in Feet from Ground Surface (Not to Scale)

LOG-1

Design Specifications

Elevations: (feet MSL) 1 3336.39 2 3336.37 3 3336.18 4 3333.50

Coordinates: X 6925.27 Y 1807.82

Bore Hole Diameter: 12"

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ ____

Casing Diameter: ☐ 2" ☒ 4" ☐ 6" ☐ ____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ ____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ ____

Sand Pack: Colorado Silica 20-40

Bentonite Seal: ☐ 1/4" Pellets ☒ 1/2" Pellets ☐ 1/2" Chips ☐ Hole Plug ☐ ____

Grout Type: None Weight: ____

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ ____

Drilled By: Precision Engineering Lic. #: ____

Logged By: WCZ

Completion Date: 1/23/93

Depth First Encountered Water: 10.0' BLS

Date	D-T-W	D-T-P	Prod Thick	Field pH	Field EC
1/27/93	10.65			6.85	5,200
2/10/93	10.92				

Comments: Replacement well between MW-8 and MW-9.

KWBES

MW-21

Project: 622092005-110 (MW-21)
Location: Artesia, New Mexico

Samp. Meth.	Samp. Log	PID (ppm)	Depth (Feet)	Geologic Description
			0	0-0.5' Silt, roots, topsoil.
			2	1-7' Silty clay, light gray, dry 1-3', crystals (calcite?) 3-4', brown with some black, no odor, roots 4-4.5', brown olive brown mottling with crystals 5-6', less mottling 6-7'.
			4	
			6	
			8	7-8' Clay, light gray, fine gravel, crystals, very plastic, no odor.
			10	8-10' Missing.
RB			12	10-13' Clay, light gray, granular, saturated at 10', light gray brown, moist and plastic 10.5-13'.
			14	13 -15.5' Silty clay, light brown, moist, 2" piece of broken limestone gravel at 15'.
			16	15.5-17' Clay, light brown, plastic, slightly moist, platy caliche 16.5-17'.
			18	17-17.5' Gravely clay, light gray, 3/4" gravel, cemented, saturated.
			20	17.5-20' Silty clay, light brown, slightly moist and plastic.
			22	
			24	
			26	

Sample Method Symbols

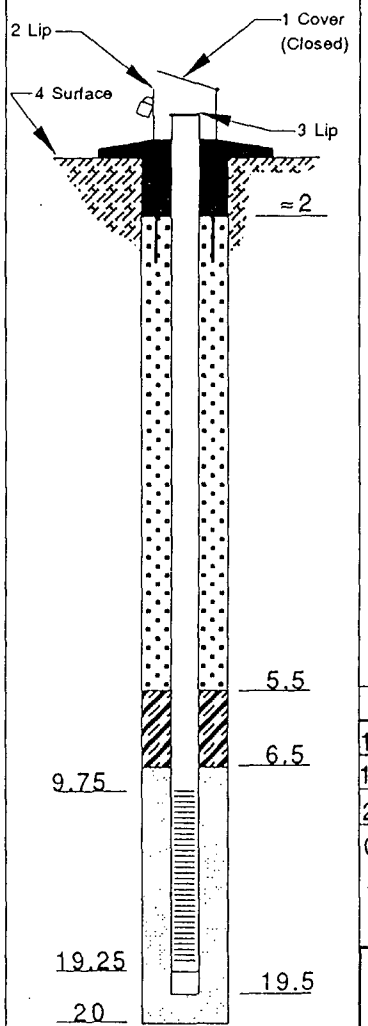
☒ RB=Recovery Barrel ☒ 5' ☐ _____

ST=Shelby Tube | SS=Split Spoon | C=Cutting

Monitoring Well ☒

Piezometer ☐

Protective Casing YES



Depths in Feet from Ground Surface (Not to Scale)

LOG - 1

Design Specifications

Elevations: (feet MSL) 1 3334.52 2 _____ 3 3334.29 4 3331.6

Coordinates: X 7336.58 Y 1645.21

Bore Hole Diameter: 8 1/4"

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☒ 2" ☐ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: CSSI 16-40 silica sand

Bentonite Seal: ☐ 1/4" Pellets ☒ 1/2" Pellets ☐ 1/2" Chips ☐ Hole Plug ☐ _____

Hydrated w/ 5 gallons water

Grout Type: 6% bentonite/Portland Weight: _____

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled by: Precision Engineering Lic.#: _____

Logged by: DGB

Completion Date: 1/10/95

Depth First Encountered Water: 10 ft. BLS

Date	D-T-W	D-T-P	Prod Thick	Field pH	Field EC
1/10/95	11.07				
1/12/95	11.05			6.5	6100
2/5/95	11.19				

Comments: D-T-W from casing lip.

RE/SPEC

MW-29

Project: 318/3.3

Location: Artesia, New Mexico

Samp. Meth.	Samp. Log	PID (ppm)	Depth (Feet)
RB			1–24

Geologic Description

0–1.5' CLAYEY GRAVELS, brown clay, gray gravel, clay is dry, gravel is well rounded.

1.5–8' CLAYEY SAND, brown, moist, friable, clay content increasing with depth.

8–11.5' SILTY GRAVELS, tan silts and sand, gravel is well-rounded, saturated.

11.5–13' CLAYEY SAND, brown, very moist, friable.

13–16' CLAYEY GRAVELS, brown clay, gray gravel, saturated, gravel is well rounded.

16–19' SILTY SAND, tan, satruated, fine grained.

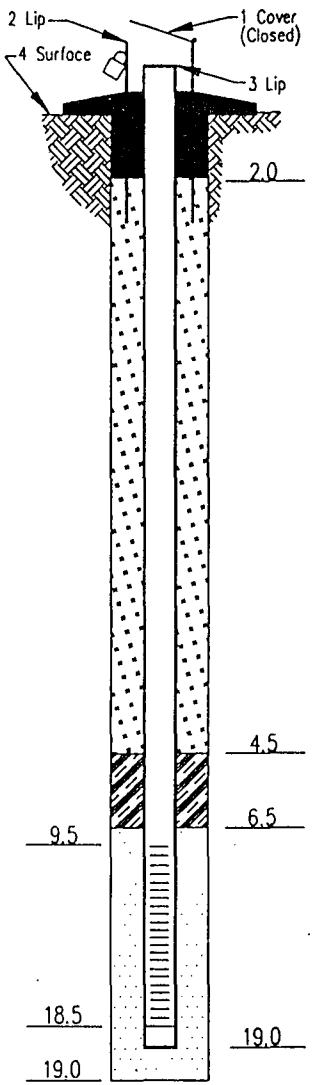
TD = 19.0'

Sample Method Symbols

☒ RB=Recovery Barrel ☒ 5' ☐ ____

ST=Shelby Tube | SS=Split Spoon | C=Cutting

Monitoring Well	
Piezometer	X
Protective Casing	YES



Depths in Feet from Ground Surface (Not to Scale)

LOG-1

Design Specifications

Elevations: (feet MSL) 1 3342.24 2 3342.22 3 3342.05 4 3339.40

Coordinates: X 5790.02 Y 2612.22

Bore Hole Diameter: 8"

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ ____

Casing Diameter: ☒ 2" ☐ 4" ☐ 6" ☐ ____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ ____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ ____

Sand Pack: C.S.S.I. 20/40

Bentonite Seal: ☐ 1/4" Pellets ☒ 1/2" Pellets ☐ 1/2" Chips ☐ Hole Plug ☐ ____

Grout Type: Portland/Bentonite Weight: ____

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ ____

Drilled By: Pool Environmental Lic. #: WD 1266

Logged By: PWC

Completion Date: 01/22/93

Depth First Encountered Water: 8.0' BLS

Date	D-T-W	D-T-P	Prod Thick	Field pH	Field EC
2/10/93	13.32				

Comments: ____

KWBES

EC-NP3

Project: 622092005-110 (EC-P3)
Location: Artesia, New Mexico

Samp. Meth.	Samp. Log	PID (ppm)	Depth (Feet)
RB			1–24

Geologic Description

0–8.5' CLAYEY SAND, brown to tan, dry to moist, friable, roots decreasing with depth.

8.5–9' CLAYEY GRAVELS, brown and tan, dry, clay very stiff.

9–10' GRAVEL, tan to white, up to 1–1/2" dia., dry.

10–12' CLAYEY GRAVELS, brown and white, saturated.

12–13.5' SILTY SAND, brown, saturated, fine grained, some small gravel fragements.

13.5–17' CLAYEY SAND, brown, saturated to 16' then moist, clay content increasing with depth.

17–18' CLAYEY GRAVEL, brown and white, saturated.

18–19' SILTY SAND, saturated, fine grained.

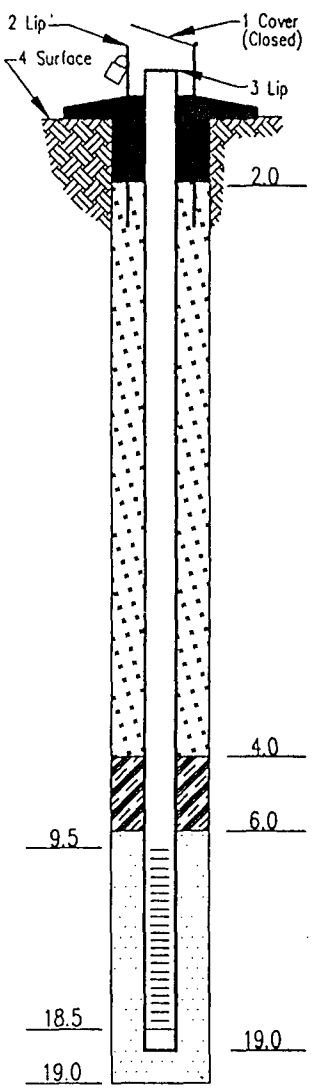
TD = 19.0'

Sample Method Symbols

☒ RB=Recovery Barrel ☒ 5' ☐ ____

ST=Shelby Tube | SS=Split Spoon | C=Cutting

Monitoring Well	
Piezometer	X
Protective Casing	YES



Depths in Feet from Ground Surface (Not to Scale)

LOG-1

Design Specifications

Elevations: (feet MSL) 1 3342.09 2 3342.07 3 3341.89 4 3339.10

Coordinates: X 5384.01 Y 2190.68

Bore Hole Diameter: 8"

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ ____

Casing Diameter: ☒ 2" ☐ 4" ☐ 6" ☐ ____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ ____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ ____

Sand Pack: C.S.S.I. 20/40

Bentonite Seal: ☐ 1/4" Pellets ☒ 1/2" Pellets ☐ 1/2" Chips ☐ Hole Plug ☐ ____

Grout Type: Portland/Bentonite Weight: ____

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ ____

Drilled By: Pool Environmental Lic. #: WD 1266

Logged By: PWC

Completion Date: 01/21/93

Depth First Encountered Water: 10.0' BLS

Date	D-T-W	D-T-P	Prod Thick	Field pH	Field EC
2/10/93	11.13				

Comments: ____

KWBES

EC-NP2

Project: 622092005-110 (EC-P2)
Location: Artesia, New Mexico

Samp. Meth.	Samp. Log	PID (ppm)	Depth (Feet)
RB			2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

Geologic Description

0–11.5' SILTY GRAVELS, sand and silt are tan, dry, gravel is well rounded.

11.5–19' SANDY CLAY, reddish/brown, moist, plastic, clay content increasing with depth.

19–25' CLAY, brown, moist, plastic.

25–29' SANDY CLAY, brown, saturated.

29–34' SILTY SAND, brown, saturated, fine grained.

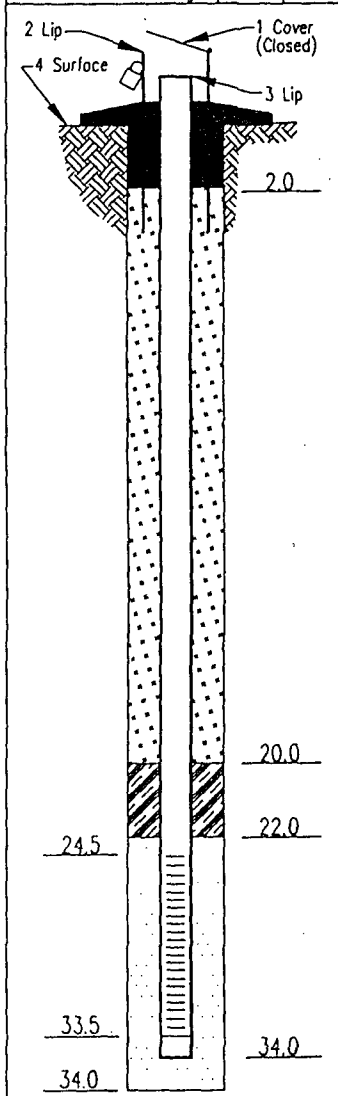
TD = 34.0'

Sample Method Symbols

RB=Recovery Barrel ☒ 5' ☐ ____

ST=Shelby Tube | SS=Split Spoon | C=Cutting

Monitoring Well	
Piezometer	X
Protective Casing	NO



Depths in Feet from Ground Surface (Not to Scale)

LOG-1

Design Specifications

Elevations: 1 3345.01 2 3344.99
(feet MSL) 3 3344.84 4 3342.10

Coordinates: X 6120.29 Y 2960.65

Bore Hole Diameter: 8"

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ ____

Casing Diameter: ☒ 2" ☐ 4" ☐ 6" ☐ ____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ ____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ ____

Sand Pack: C.S.S.I. 20/40

Bentonite Seal: ☐ 1/4" Pellets ☒ 1/2" Pellets ☐ 1/2" Chips ☐ Hole Plug ☐ ____

Grout Type: Portland/Bentonite Weight: ____

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ ____

Drilled By: Pool Environmental Lic. #: WD 1266

Logged By: PWC

Completion Date: 01/23/93

Depth First Encountered Water: 25.0' BLS

Date	D-T-W	D-T-P	Prod Thick	Field pH	Field EC
2/10/93	18.58				

Comments: ____

KWBES

EC-NP4

Project: 622093001-115 (EC-P4)
Location: Artesia, New Mexico

Sym	Samp Loc	PID (ppm)	Depth (Feet)
			2
			4
			6
			8
			10
			12
			14
			16
			18
			20
			22
			24
			26
			28
			30
			32
			34
			36
			38
			40
			42
			44
			46
			48
			50

Geologic Description

0–5' SANDY CLAY, brown, moist to dry, becoming lighter in color with decreasing moisture.

5–13' SANDY CLAY, light brown, dry to moist, showing white streaks of caliche at 10'.

13–15' CLAY, dark brown, dry to moist.

15–29' CLAYEY SAND, brown, moist, slight gray discoloration starting at 16.5', black and gray hydrocarbon staining from 17–20', thin gravel layers at 18', discoloration lessening with depth, brown clayey sand alternating with thin bands of gravel starting at 20'.

29–35' CLAYEY SILT, brown to tan, saturated.

35–38' SAND with GRAVEL, tan, saturated.

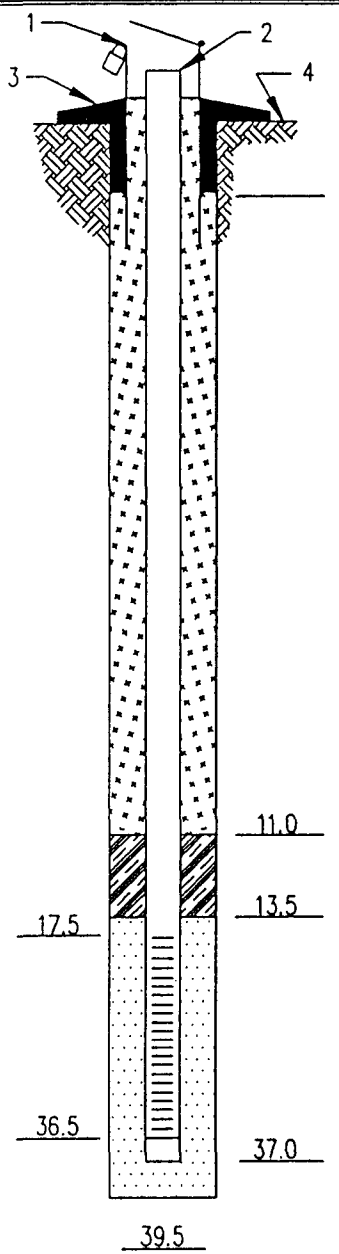
38–39.5' CLAY, brown, stiff, dry.

TD = 39.5'

NOTE: 5 foot core barrel recovery system used as sampling technique

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Monitoring Well ☒
Piezometer ☐



Depths in Feet from Ground Surface (Not to Scale)

Design Specification

Elevations: (feet MSL) 1 3358.71 2 3358.55 3 3356.41 4 3356.1

Coordinates: X 2652.58 Y 5161.82

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☒ 2" ☐ 3" ☐ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: CSSI 16-40

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ _____

Grout Type: Portland Weight: _____

Bore Hole Diameter: 8"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: PRECISION ENGINEERING

Logged By: PHILIP CADARETTE

Completion Date: FEBRUARY 12, 1992

Date	D-T-P	MSL	D-T-W	Field pH	Field EC
2/19/92	21.6	3337.0	24.8		
3/10/92	21.8	3336.8	25.1		

Comments: Concrete with 5% bentonite used to grout from seal to ground surface.

KWBES

Navajo

KWB6

Project: 622092001-237 (KWB6)
Location: ARTESIA, NEW MEXICO

Sym	Samp Loc	PID (ppm)	Depth (Feet)
			2
			4
			6
			8
			10
			12
			14
			16
			18
			20
			22
			24
			26
			28
			30
			32
			34
			36
			38
			40
			42
			44
			46
			48
			50

Geologic Description

0-2' CLAYEY SAND, brown, moist, becoming lighter colored with depth.

2-25' SANDY CLAY, brown, moist to dry, becoming lighter in color with depth to 5', thin banding of caliche nodules noted at various depths, banding becoming thicker with depth, slight gray hydrocarbon staining evident at 15', darker gray hydrocarbon staining with depth, odor increasing, 2" gravel seam, saturated at 23'.

25-28' CLAYEY SAND, dark gray, from 23-26', strong hydrocarbon odor, saturated.

28-33' SILTY SAND, brown, saturated, slight staining, decreased odor.

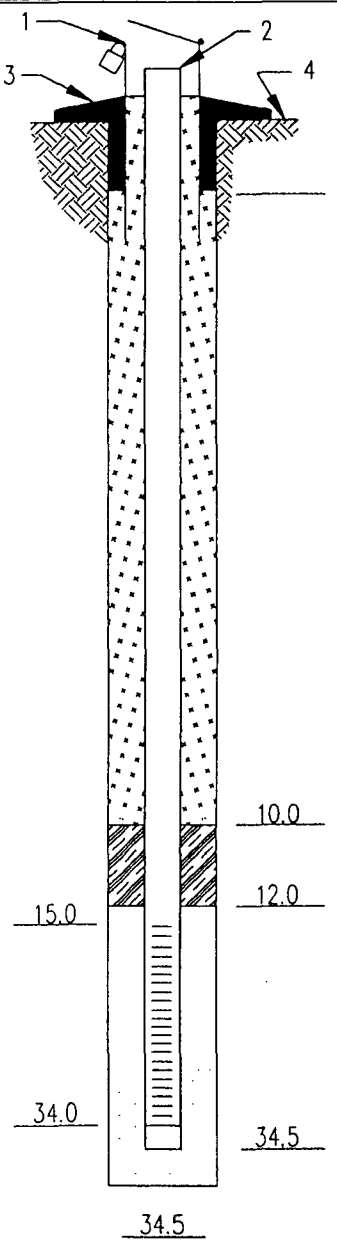
33-35' CLAYEY SAND, brown, moist.

TD = 34.5'

NOTE: 5 foot core barrel recovery system used as sampling technique

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Monitoring Well ☒
Piezometer ☐



Depths in Feet from Ground Surface (Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 3348.59 2 3348.39 3 3346.22 4 3345.8

Coordinates: X 3211.93 Y 6875.69

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☒ 2" ☐ 3" ☐ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: CSSI 16-40

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ _____

Grout Type: Portland Weight: _____

Bore Hole Diameter: 8"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: PRECISION ENGINEERING

Logged By: PHILIP CADARETTE

Completion Date: FEBRUARY 12, 1992

Date	D-T-W	MSL	Date	Field pH	Field EC
2/19/92	20.6	3327.79			
3/10/92	21.0	3327.39			

Comments: Concrete with 5% bentonite used to grout from seal to ground surface.

KWBES

Navajo Refining

KWB8

Project: 622092001-237 (KWB8)
Location: ARTESIA, NEW MEXICO

Sym	Samp Loc	PID (pr	Det (Feet)
			2
			4
			6
			8
			10
			12
			14
			16
			18
			20
			22
			24
			26
			28
			30
			32
			34
			36
			38
			40
			42
			44
			46
			48
			50

Geologic Description

0–10' SANDY CLAY, dark brown to brown, moist to slightly moist, plastic to friable.
–hydrocarbon odor apparent at 8.0'
–gray hydrocarbon staining apparent starting at 9.0'

10–12' CLAY, gray hydrocarbon staining, strong odor, occasional pockets of fine sand, moist.

12–20' SANDY CLAY, gray hydrocarbon staining, strong hydrocarbon odor, occasional pockets of fine sand, moist.
–color darkens to black from 17–19.5'
–saturated thin pebble seams at 17' and 18.5'.
–hydrocarbon staining becomes lighter at 19.5'.

20–29' CLAYEY SAND, gray hydrocarbon staining, strong odor, very moist to saturated at 25–28'.

29–32' CLAY WITH SAND, light brown, slightly moist to dry, very stiff, no hydrocarbon staining or odor.

32–45' SANDY CLAY, hydrocarbon starinin and strong odor, moist to saturated at 33 feet with thin gravel zone
–saturated from 42.5–45.0'

45–46' GRAVEL WITH SAND AND CLAY, saturated hydrocarbon staining and strong odor.

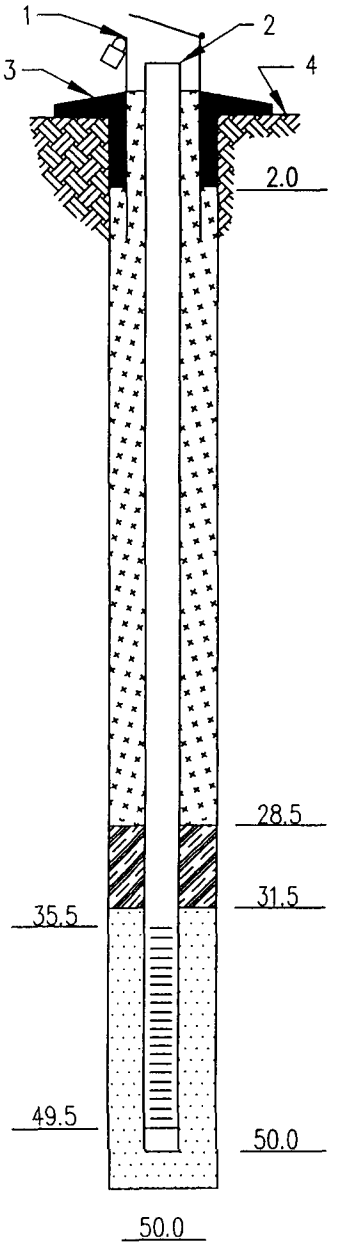
46–50' SANDY CLAY, brown, slightly moist, stiff, no hydrocarbon stain or odor.

TD = 50.0'

CME 5' core barrel recovery system

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Monit Well ☒
Piezometer



Depths in Feet from Ground Surface (Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 _____ 2 _____ 3 _____ 4 _____

Coordinates: X _____ Y _____

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☐ 2" ☐ 3" ☒ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: Colorado Silica Sand 20/40

Bentonite Seal: ☒ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☐ 1/4" Pellets ☐ _____

Grout Type: Portland/5% Bentonite Weight: _____

Bore Hole Diameter: 13.5"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: Precision Engineering

Logged By: PWC

Completion Date: 10/02/92

Date	D-T-W	MSL	Date	Field pH	Field EC

Comments: 10" PVC casing grouted in from 0–30'. After curing, well completed.

KWBES

Navajo

KWB–10

Project: Navajo 622092003–236
Location: Artesia, New Mexico

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

FIELD ENGR. LOG

Section 1. GENERAL INFORMATION

(A) Owner of well NAVAJO REFINING COMPANY Owner's Well No. 18
Street or Post Office Address Box 159
City and State Artesia, N M 88210

Well was drilled under Permit No. RA 6969 and is located in the: Observation/Monitor well

a. NW ¼ SW ¼ NW ¼ ¼ of Section 9 Township 17S Range 26 E N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor Hughes Drilling Company License No. WD 749

Address Box 199A, Route 1, Artesia, N M 88210

Drilling Began 6/8/82 Completed 6/8/82 Type tools Air rotary Size of hole 7- 7/8 in.

Elevation of land surface or casing at well is 3364 ft. Total depth of well 19 ft.

Completed well is [X] shallow [ ] artesian. Depth to water upon completion of well 10 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
16	19	3	fine anhydritic sand and red shale	NA

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
6	PVC				20		15	19

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
0	12			3	hand

Section 5. PLUGGING RECORD

Plugging Contractor _____
Address _____
Plugging Method _____
Date Well Plugged _____
Plugging approved by: _____
State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received June 22, 1982

Quad ____ FWL ____ FSL ____

File No. A-6969 Use Obs./Mo. ring Location No. 17.26.9.13111

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	2	2	Red soil
2	8	6	gyp (weathered anhy) with red shale
8	14	6	gyp white and anhydritic sand
14	19	5	Fine red shale and anhyritic sand - water @ 16'

Section 7. REMARKS AND ADDITIONAL INFORMATION

observation/monitoring well

JUN 22 3 03 PM '82

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above-described hole.

Dale Hughes
Driller

INSTRUCTIO' his form should be executed in triplicate, preferably typ en, and submitted to the appropriate district office of the State Engineer. All Sons, except Section 5, shall be answered as completely and accurate ossible when any well is drilled, repaired or deepene ien this form is used as a plugging record, only Section

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

FIELD ENGR. LOG ✓

Section 1. GENERAL INFORMATION

(A) Owner of well NAVAJO REFINING COMPANY Owner's Well No. 23

Street or Post Office Address Drawer 159

City and State Artesia, N M 88210

Well was drilled under Permit No. RA 6975 X and is located in the:

a. NE ¼ NW ¼ NW ¼ SW ¼ of Section 9 Township 17 S Range 26 E N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____

Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor S. Dale Hughes License No. WD 749

Address Route 1, Box 199 A, Artesia, N M 88210

Drilling Began 6/28/82 Completed 6/28/82 Type tools Air Rotary Size of hole 7 7/8 in.

Elevation of land surface or _____ at well is 3363 ft. Total depth of well 20 ft.

Completed well is ☒ shallow ☐ artesian. Monitor Depth to water upon completion of well 9 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
15	17	2	Anhyritic sand	na

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
6	PVC				20		15	20

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
0	7	8		3	Hand

Section 5. PLUGGING RECORD

Plugging Contractor _____

Address _____

Plugging Method _____

Date Well Plugged _____

Plugging approved by:

_____

State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received August 19, 1982

Quad _____ FWL _____ FSL _____

File No. RA-6975 x Use Observation Location No. 17.26.9.31122

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	5	5	gyp with anhydrite crystals
	10	5	" " " "
	12	2	gyp and granular anhydrite
	15	3	anhydritic sand and clay
	17	2	" " " "
	20	3	anhy sand with limestone gravel

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Dale Hughes
Driller

INSTRUCTIO' This fo— should be executed in triplicate, preferably typ ten, and submitted to the appropriate district office of the State ' er. A tions, except Section 5, shall be answered as pletely and accurat possible when any well is drilled, repaired or deepene. When this form is used as a plugging record, only Section 1(a) and Section need be completed.

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

FIELD ENGR. LOG

Section 1. GENERAL INFORMATION

(A) Owner of well NAVAJO REFINING COMPANY Owner's Well No. 24

Street or Post Office Address Drawer 159

City and State Artesia, N M 88210

Well was drilled under Permit No. RA 6975 X 2 and is located in the:

a. E ¼ SW ¼ SW ¼ NW ¼ of Section 9 Township 17 S Range 26 E N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor S. Dale Hughes License No. WD 749

Address Route 1, Box 199A, Artesia, N M 88210

Drilling Began 7/5/82 Completed 7/5/82 Type tools Air rotary Size of hole 8 in.

Elevation of land surface or _____ at well is 3362 ft. Total depth of well 19 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 8 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
16	18	2	Anhy sand	na

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
6	PVC				20		15	20

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
0	7	8		3	hand

Section 5. PLUGGING RECORD

Plugging Contractor _____

Address _____

Plugging Method _____

Date Well Plugged _____

Plugging approved by: _____
State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received August 19, 1982

Quad _____ FWL _____ FSL _____

File No. RA-6975 X 2 Use Observation Location No. 17.26.9.13322

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	5	5	gyp & gran. anhydrite
	10	5	" " " "
	16	6	gyp & clay
	18	2	anhydritic sand and gravel
	19	1	gyp and gravel

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above-described hole.

Dale Hughes
Driller

INSTRUCTI .This fo should be executed in triplicate, preferably t tten, and submitted to the appropriate district office of the State . gineer. tions, except Section 5, shall be answered a completely and accur s possible when any well is drilled, repaired or deepe.. When this form is used as a plugging record, only Section 1(a) and Sectio. need be completed.

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

FIELD ENGR. LOG

Section 1. GENERAL INFORMATION

(A) Owner of well NAVAJO REFINING COMPANY Owner's Well No. 28

Street or Post Office Address Drawer 159

City and State Artesia, N M 88210

Well was drilled under Permit No. RA 6975 X 6 and is located in the:

a. NE ¼ NE ¼ SE ¼ SW ¼ of Section 9 Township 17 S Range 28 26 E N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor S. Dale Hughes License No. WD 749

Address Route 1, Box 199 A, Artesia, N M. 88210

Drilling Began 7/7/82 Completed 7/8/82 Type tools Air Rotary Size of hole 8 in.

Elevation of land surface or _____ at well is 3361 ft. Total depth of well 30 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 10 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
10	12	2	anhydritic sand	na

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
6	PVC				30		25	30

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
0	10	8		4	hand

Section 5. PLUGGING RECORD

Plugging Contractor _____

Address _____

Plugging Method _____

Date Well Plugged _____

Plugging approved by: _____
State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received August 19, 1982

Quad _____ FWL _____ FSL _____

File No. A-6975 X 6 Use _____ Location No. 17.26.9.34223

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	5	5	gyp & red clay
	10	5	" " "
	12	2	anhydritic sand & gravel
	25	13	gyp & gravel
	30	5	gyp

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Dale Hughes
Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section 7 need be completed.

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

FIELD ENGR. LOG

Section 1. GENERAL INFORMATION

(A) Owner of well NAVAJO REFINING COMPANY Owner's Well No. 29

Street or Post Office Address Drawer 159

City and State Artesia, N M 88210

Well was drilled under Permit No. RA 6975 X 7 and is located in the:

a. NE ¼ NE ¼ SW ¼ NW ¼ of Section 9 Township 17 S Range 26 E N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in _____ County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor S. Dale Hughes License No. WD 749

Address Route 1, Box 199 A, Artesia, N M 88210

Drilling Began 7/20/82 Completed 7/21/82 Type tools Air rotary Size of hole 8 in.

Elevation of land surface or _____ at well is 3363 ft. Total depth of well 21.5 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 11 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
20	21.5	1.5	Anhydritic sand	na

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
6	PVC				22		19	22

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
0	8	8		6	hand

Section 5. PLUGGING RECORD

Plugging Contractor _____

Address _____

Plugging Method _____

Date Well Plugged _____

Plugging approved by: _____
State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received August 19, 1982 Quad _____ FWL _____ FSL _____

File No. RA-6975 X 7 Use Observation Location No. 17.26.9.13422

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	5	5	miscellaneous fill
	10	5	oil stained gyp
	15	5	gyp
	20	5	gyp
	21.5	1.5	anhydritic sand & gravel

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Dale Hunter
Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1(a) and Section 7 need be completed.

Well # 39 Navajo Refining Company - Monitor Wells

Drilling Contractor - D. Anderson, El Paso

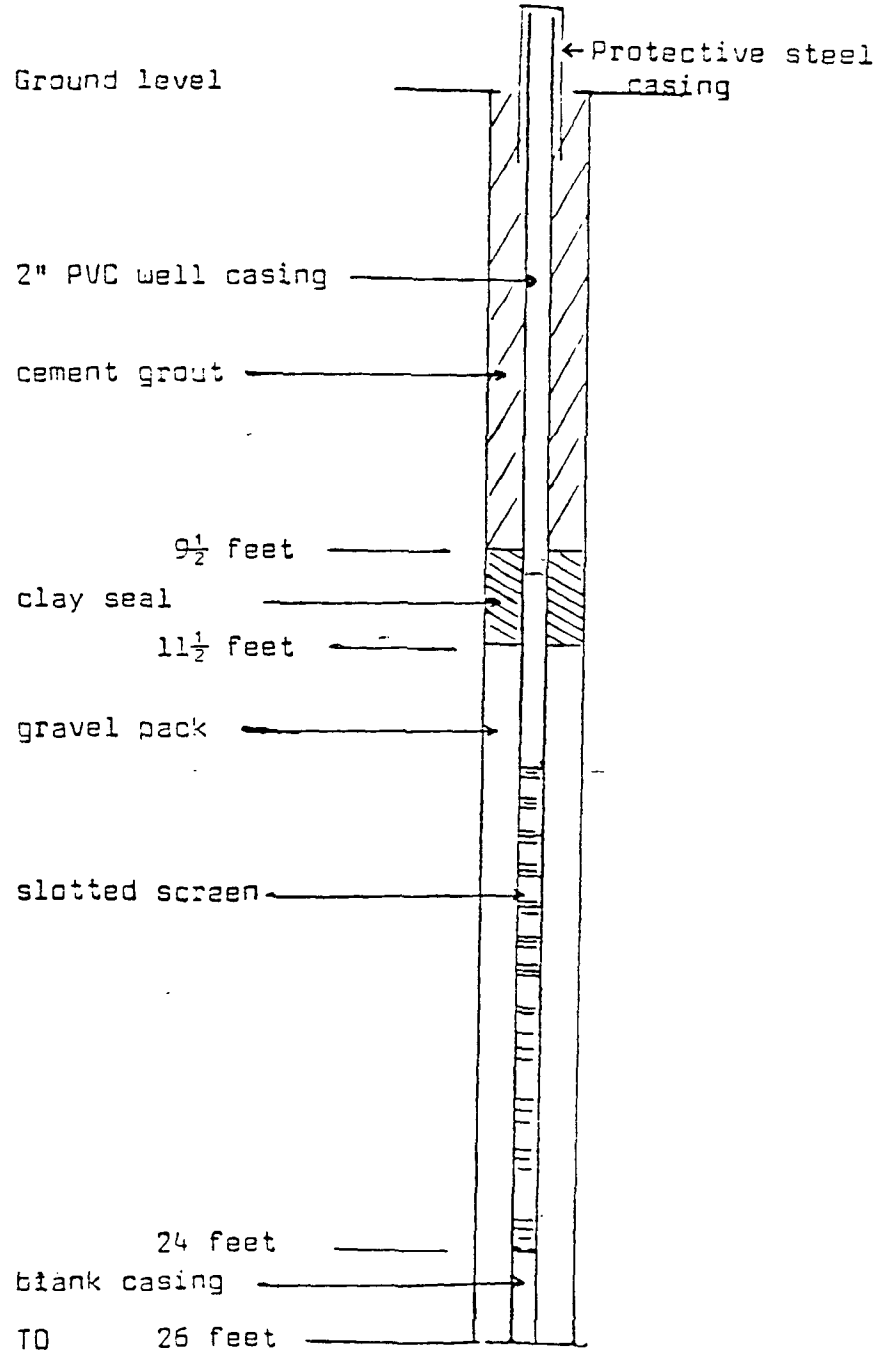
Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"

Date 6/13/84 Richard Fasio & Jim Chaney

Depth	Sample description
0 - 6	Lt. red clayey soil
7½	6.8' mixed soil with gyp pebbles. 7½' white gyp
9¼	8.7' wht gyp - soft. 9¼' gry clay & gyp
10¾	10' wht & gry gyp. 10¾ gyp laminated. odor gas dry at bottom
12¼	10.95' gry gyp. 12¼' dk gry gyp. gyp odor gas
14	gry clay with pebbles, gyp. good oil stain and odor
15½	14½ wht gyp & anhy. 15½ dk gry gyp & anhy. oil stain & odor
17	15¾ dk gry anhy saturated. 17 wht anhy, gyp, rd clay
18½	17½ gry anhy. oil stn. 18½ anhy w rd & gry shale sli odor. rd shale at bottom
20	18.8 gry anhy w anhy pebbles water 20' sdy red clay
21½	red clay & anhy mixed w pebbles - water
23	mixed rd & wht anhy w gran to gravelly material - wtr
24¾	mixed wht & rd anhy sli clay wtr
26	fine rd & wht anhy with clay dry

DETAILS OF WELL CONSTRUCTION

Well # 39 Date 6/13/84 Navajo Refining Company



Measurements from land surface

Well # 41 Navajo Refining Company - Monitor Wells

Drilling Contractor - D. Anderson, El Paso

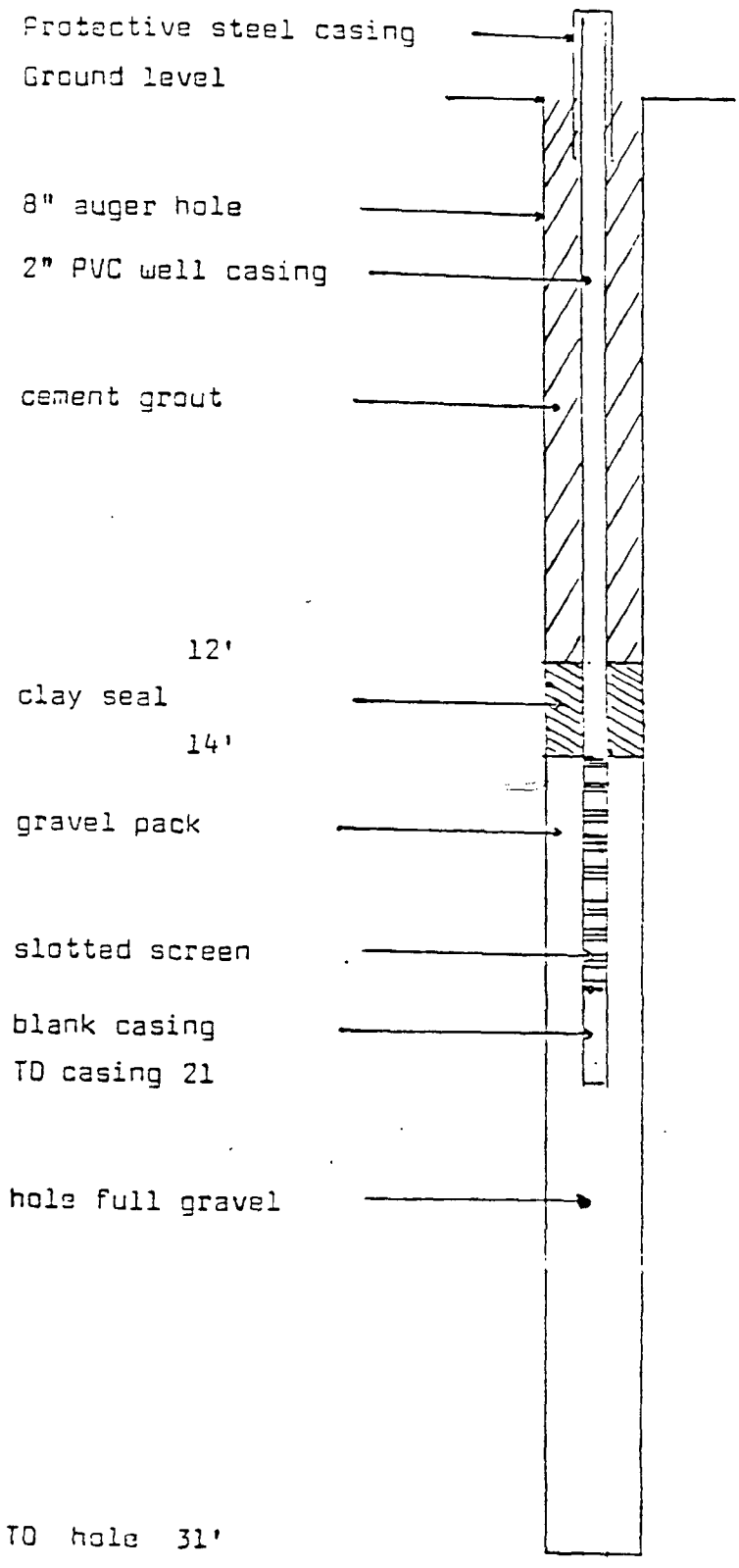
Rig - Hollow stem auger 3" diameter Split spoon core barrel 18"

Date 6/15/84 Richard Fasio & Jim Chaney

Depth	Sample description
0 - 15	Soil. Wet @ 13½' (old Eagle Draw Channel fill)
16½	Wht, tan anhy & gyp - water
18	Wht gyp & anhy (fn xln)
19½	Wht gyp with anhy pieces - gravelly
21	Wht gyp w anhy pcs
22½	Wht, gry gyp w anhy pcs - dense
24	Gry anhy & gyp - dense
25½	Gry anhy & gyp w clay - dense - what at bottom
26 - 27½	Gry sdy clay - tight Tr. red at bottom
29	Red & gry sdy clay
31	Rd sdy shale TD

DETAILS OF WELL CONSTRUCTION

Well # 41 Date 6/15/84 Navajo Refining Company



SAMPLE LOG

Well # 43 Navajo Refining Company - Monitor wells

Drilling Contractor - D. Anderson, El Paso

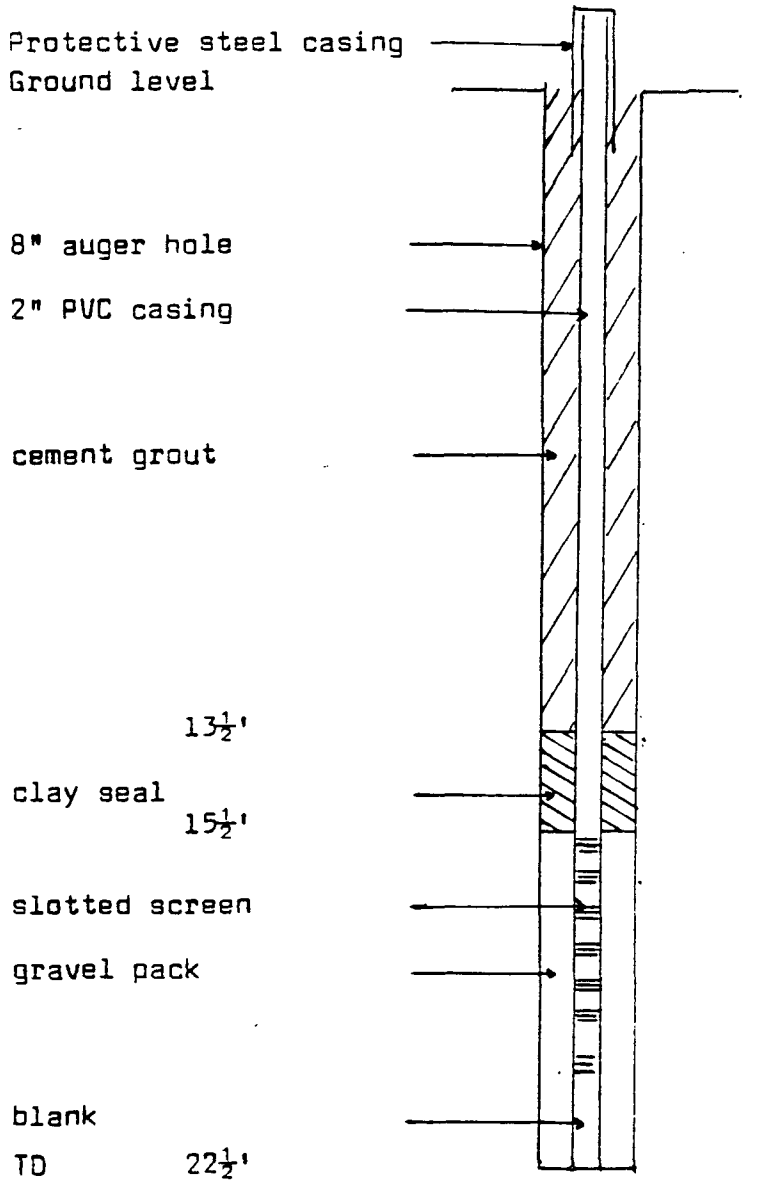
Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"

Date 7/17/84 Jim Chaney - Stroud

Depth	Sample description
0 - 4½	Soil
6	Mixed soil (red) & gyp damp
7½	Mixed red shale & gyp. Vy rd shale @ bottom
9	8.17' mixed soil & gyp. 9' gyp, pebbles, anhy, HCR odor gas
10½	Gyp w anhy pebbles - HCR odor gas. No bldg. oil
12	11¼ Gyp w lst. & anhy pebbles HCR 12' Wht gyp
13½	13 gyp w pebbles, gas stn & odor. 13½ gyp slightly wet
15	13.8 gyp & gravel - oil & water. 15' gyp, gravel, wet free water
16½	15¼ gyp & gravel, wtr. 16½ gry gyp - tight - wet
18	16¾ gyp & loose gravel, wtr. 17½ gyp w anhy & dolo pcs 18' red silty sand
19½	18.6 rd silty sand w pebbles. 19½ rd fn silty sand
22½	Drill - rd silty sand TD

DETAILS OF WELL CONSTRUCTION

Well # 43 Date 7/17/84 Navajo Refining Company



SAMPLE L33

Well # 45 Navajo Refining Company - Monitor wells

Drilling Contractor - D. Anderson, El Paso

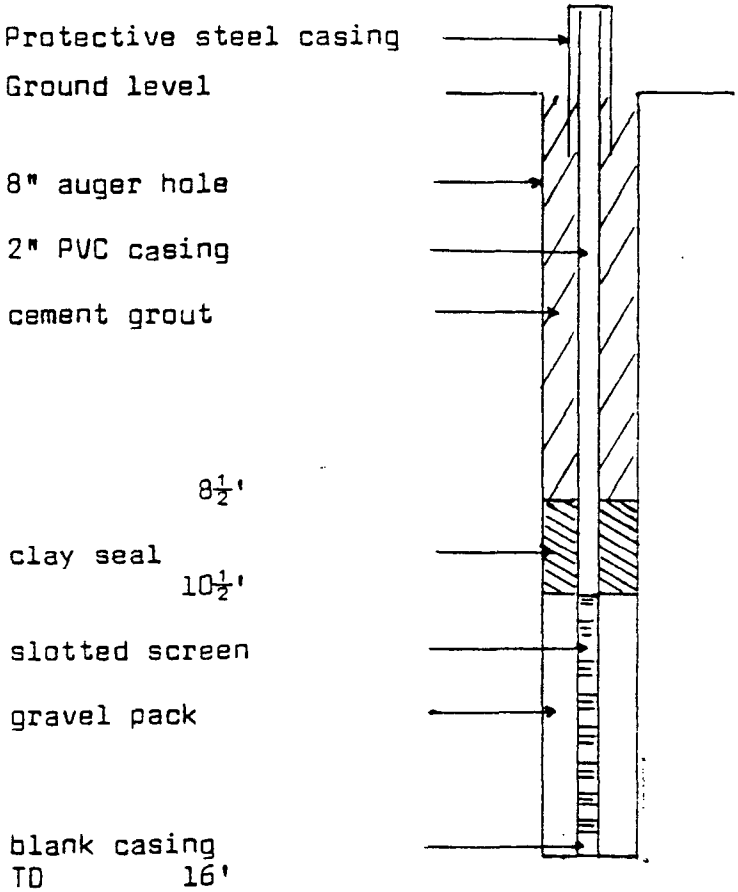
Rig - Hollow stem auger 9" diameter Split spoon core barrel 18"

Date 8/22/84 Stroud & Ledesma

Depth	Sample description
0 - 4½	Red soil dry
5	Gyp dry
6½	6.3 wht gyp - dry. 6½ gry shale - dry
8	Gry sdy shale w very lge anhy pcs - dry
9½	8.8 gry shale & gyp. 9.3 anhy gravel 9½ gry shale & anhy - dry
10	drill
11½	10.8 gry shale w anhy pcs. 11.3 anhy gravel. 11½ gry shale sli damp to dry
13	gry shale w gyp & anhy pcs - damp. Tr rd shale 11½-12.3
14½	14' gravel. 14½ gry shale w gravel streaks - water
16	14.7-15 gry shale & gravel. 15-16 drk gry shale water TD

DETAILS OF WELL CONSTRUCTION

Well # 45 Date 8/22/84 Navajo Refining Company



SAMPLE LOG

Well # 47 Navajo Refining Company - Monitor wells

Drilling Contractor - O. Anderson, El Paso

Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"

Date 8/22/84 Stroud & Ledesma

0 -	5	Dark red soil	damp
	10	Lite red soil	damp
	11½	Red shale	
	13	Orange-red shale	damp
	14	Orange-red shale	damp

T

TD

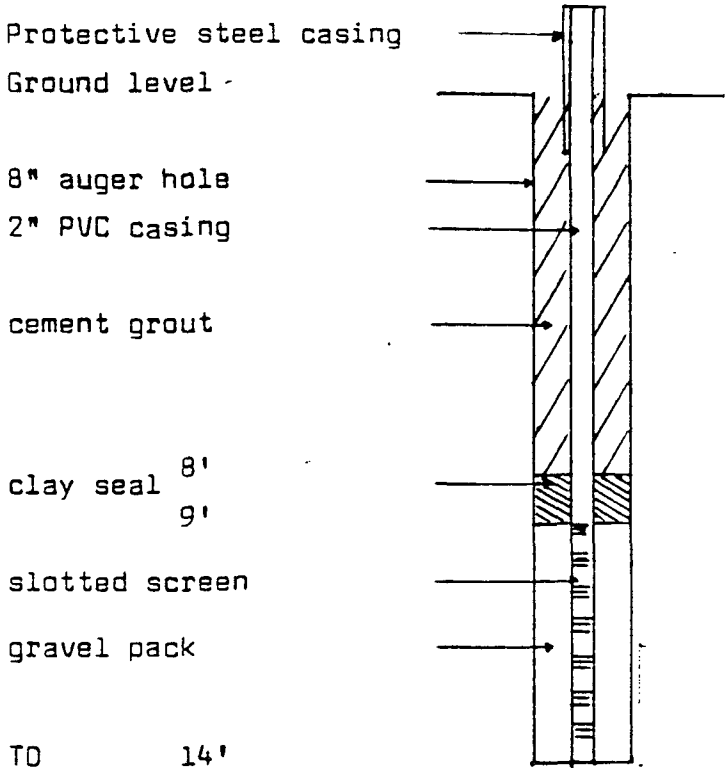
A

R

D

DETAILS OF WELL CONSTRUCTION

Well # 47 Date 8/22/84 Navajo Refining Company



Sym	Samp	Loc	PI (ppm)	Depth (Feet)
				2
				4
				6
				8
				10
				12
				14
				16
				18
				20
				22
				24
				26
				28
				30
				32
				34
				36
				38
				40
				42
				44
				46
				48
				50

Geologic Description

0-4' CLAYEY SAND, brown, moist, becoming lighter colored with depth.

4-15' SANDY CLAY, brown, moist to dry, occasional small pebbles of caliche, white bands of fine grain caliche increasing in frequency to 10', gravel content increasing with depth, 2" diameter rocks encountered at 14.5'.

15-17' GRAVEL, silty, moist.

17-20' CLAYEY SAND, brown, saturated.

20-22' SILTY SAND, brown, saturated, some gravel.

22-30' CLAYEY GRAVEL, saturated, increasing clay content with depth.

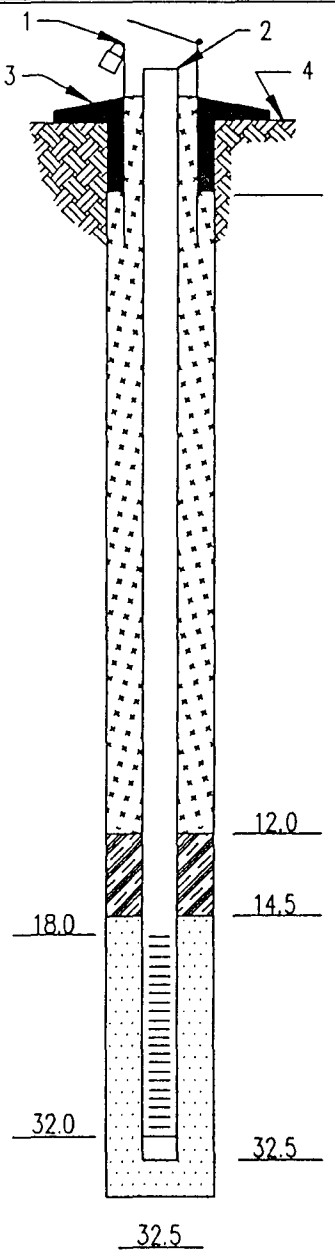
30-32.5' CLAY, brown, stiff, moist to dry.

TD = 32.5'

NOTE: 5 foot core barrel recovery system used as sampling technique

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Mon. Well ☒
Piezometer



Depths in Feet from Ground Surface (Not to Scale)

Design Specification

Elevations: (feet MSL) 1 3344.14 2 3344.00 3 3341.80 4 3341.6

Coordinates: X 3484.17 Y 8055.72

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☒ 2" ☐ 3" ☐ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: CSSI 16-40

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ _____

Grout Type: Portland Weight: _____

Bore Hole Diameter: 8"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: PRECISION ENGINEERING

Logged By: PHILIP CADARETTE

Completion Date: FEBRUARY 13, 1992

Date	D-T-W	MSL	Date	Field pH	Field EC
2/19/92	19.5	3324.5			
3/10/92	20.8	3323.2			

Comments: Concrete with 5% bentonite used to grout from seal to ground surface.

KWBES

KWB7

Project: 622092001-237 (KWB7)
Location: ARTESIA, NEW MEXICO

Sym	Samp	Loc	PID (ppm)	Depth (Feet)
				2
				4
				6
				8
				10
				12
				14
				16
				18
				20
				22
				24
				26
				28
				30
				32
				34
				36
				38
				40
				42
				44
				46
				48
				50

Geologic Description

0-22.5' SANDY CLAY, brown, dry, caliche nodules throughout, color lighter with depth, increasing sand content and caliche inclusions with depth white caliche banding starting at 10', thin gravel seam at 13', sandy clay exhibiting increasing moisture near 15'.

22.5-23' CLAYEY GRAVEL, saturated.

23-25' SILTY SAND, brown, saturated.

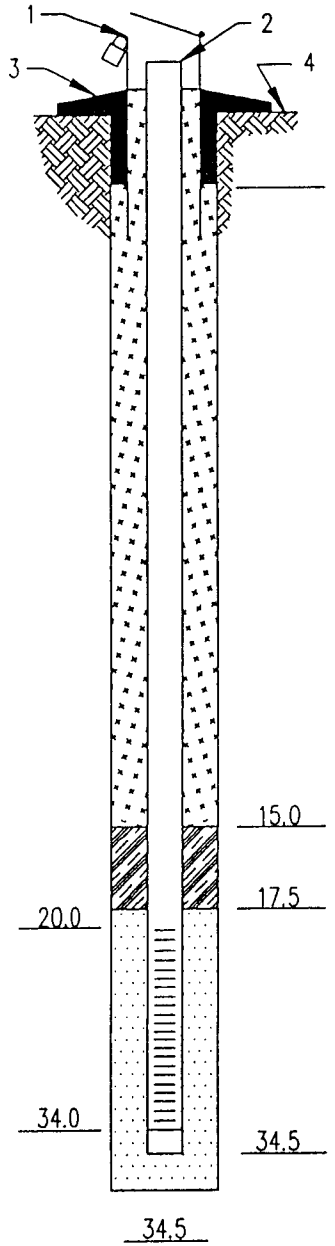
25-34.5' SANDY CLAY, brown, saturated to 26' then moist, dry near 34'.

TD = 34.5'

NOTE: 5 foot core barrel recovery system used as sampling technique

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Mon ; Well
Piezometer



Depths in Feet
from Ground Surface
(Not to Scale)

Design Specification

Elevations: (feet MSL) 1 3352.67 2 3352.53 3 3349.90 4 3349.8

Coordinates: X 1838.15 Y 6600.55

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ ____

Casing Diameter: ☒ 2" ☐ 3" ☐ 4" ☐ 6" ☐ ____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ ____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ ____

Sand Pack: CSSI 16-40

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ ____

Grout Type: Portland Weight: ____

Bore Hole Diameter: 8"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ ____

Drilled By: PRECISION ENGINEERING

Logged By: PHILIP CADARETTE

Completion Date: FEBRUARY 13, 1992

Date	D-T-W	MSL	Date	Field pH	Field EC
2/19/92	24.9	3327.6			
3/10/92	25.2	3327.3			

Comments: Concrete with 5% bentonite used to grout from seal to ground surface.

KWBES

KWB9

Project: 622092001-237 (KWB9)
Location: ARTESIA, NEW MEXICO

Sym	Samp Loc	PID (ppm)	Depth (Feet)
			2
			4
			6
			8
			10
			12
			14
			16
			18
			20
			22
			24
			26
			28
			30
			32
			34
			36
			38
			40
			42
			44
			46
			48
			50

Geologic Description

0–10' CLAYEY SAND, dark brown to brown, moist to slightly miist, plastic to stiff.
–thin caliche pebble ozne @ 9.0', dry.

10–15' CLAY, brown to white, moist, blocky, gypsum crystals appearing near 15.0'.

15–25' CLAYEY SAND, brown to white, moist, plastic.
–saturated @ 20.5' with gravel and fine tan sand seams interbedded.

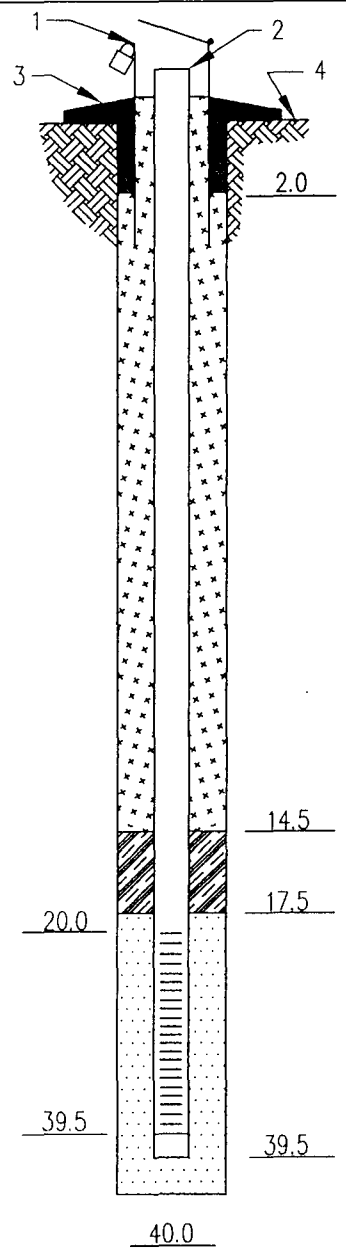
25–40' GRAVEL WITH CLAY AND SILT, saturated, gravel is calich with angular fragments up to 2" in size.

TD = 40.0'

CME 5' core barrel recovery system

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Monit: Well ☒
Piezometer



Depths in Feet
from Ground Surface
(Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 _____ 2 _____ 3 _____ 4 _____

Coordinates: X _____ Y _____

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☐ 2" ☐ 3" ☒ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: Colorado Silica Sand 20/40

Bentonite Seal: ☒ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☐ 1/4" Pellets ☐ _____

Grout Type: Portland/5% Bentonite Weight: _____

Bore Hole Diameter: 13.5"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: Precision Engineering

Logged By: PWC

Completion Date: 10/04/92

Date	D-T-W	MSL	Date	Field pH	Field EC

Comments: _____

KWBES

Navajo

KWB-11A

Project: Navajo 622092003-236
Location: Artesia, New Mexico

Sym	Samp Loc	PID (ppm)	Det (Feet)
			2
			4
			6
			8
			10
			12
			14
			16
			18
			20
			22
			24
			26
			28
			30
			32
			34
			36
			38
			40
			42
			44
			46
			48
			50

Geologic Description

0–4' SANDY CLAY, dark brown to brown, moist, plastic.

4–10' CLAYEY SAND, brown to tan, moist, plastic, occasional gypsum crystals.

10–13' SANDY CLAY, moist, plastic, thin bands of fine sand interbedded.

13–15' CLAYEY SNAD, slightly moist, stiff.

15–20' CLAY WITH GRAVEL, sand and silt brown, moist, thin saturated gravel seam @ 18.0'.

20–22' GRAVEL WITH CLAY AND SAND, saturated.

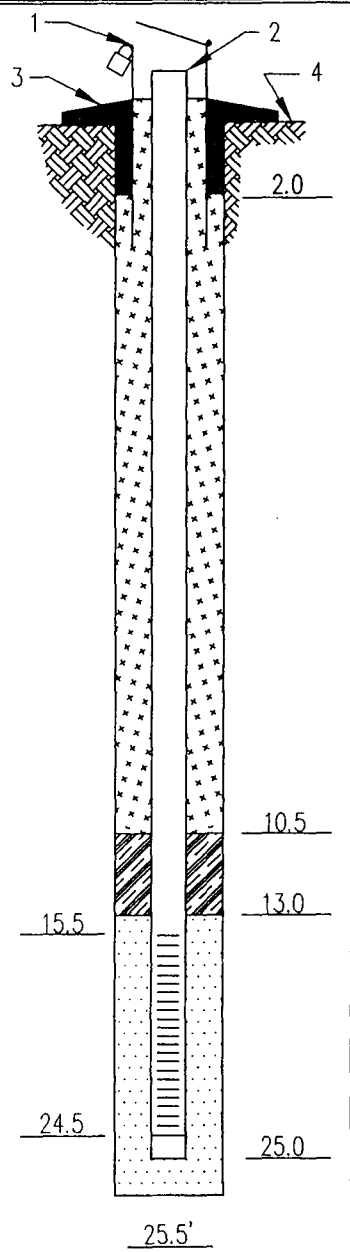
22–25' CLAY, brown, slightly moist, stiff.

TD = 25.0'

CME 5' foot core barrel recovery system

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Monitc. Well ☒
Piezometer



Depths in Feet
from Ground Surface
(Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 _____ 2 _____ 3 _____ 4 _____

Coordinates: X _____ Y _____

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☐ 2" ☐ 3" ☒ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: Colorado Silica Sand 20/40

Bentonite Seal: ☒ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☐ 1/4" Pellets ☐ _____

Grout Type: Portland/5% Bentonite Weight: _____

Bore Hole Diameter: 13.5"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: Precision Engineering

Logged By: PWC

Completion Date: 10/04/92

Date	D-T-W	MSL	Date	Field pH	Field EC

Comments: _____

KWBES

Navajo

KWB-12A

Project: Navajo 622092003-236
Location: Artesia, New Mexico

Sym	Samp Lor	P (ppi.)	Depth (Feet)
			2
			4
			6
			8
			10
			12
			14
			16
			18
			20
			22
			24
			26
			28
			30
			32
			34
			36
			38
			40
			42
			44
			46
			48
			50

Geologic Description

0–4.5' SANDY CLAY, brown, moist to dry, becoming lighter in color with decreasing moisture.

4.5–6' CLAYEY SAND, brown, moist.

6–7' SAND, fine grained, brown, moist.

7–25' SANDY CLAY, brown, moist, gray hydrocarbon staining appearing at 8', dark gray to black staining from 8–11', strong odor, staining and odor disappear from 15–16', brown color, gray stain and odor return at 16', thin pebble bed near 18', black, saturated, increasing rock content from 18–25'.

25–27' SILTY SAND, brown, odor.

27–30' SANDY CLAY, gray to brown, moist.

30–35' CLAYEY SAND, dark gray, grossly contaminated, no structure, saturated.

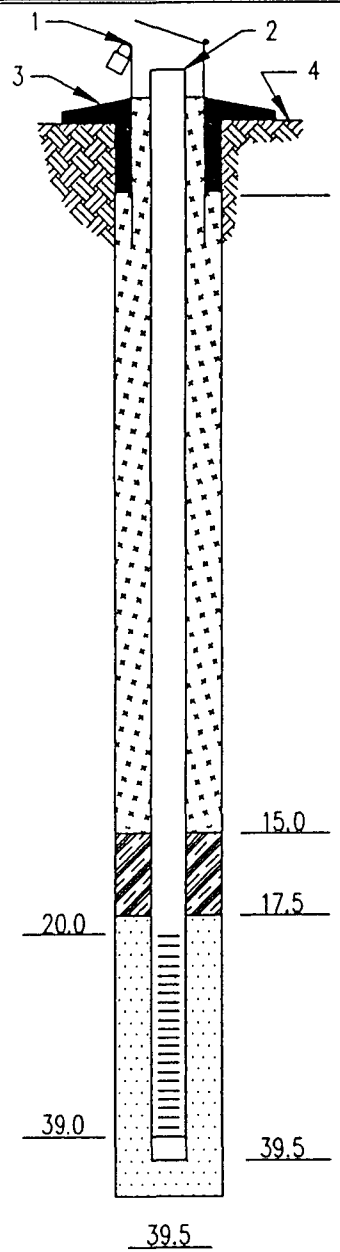
35–39.5' SANDY CLAY, brown, moist to dry.

TD = 39.5'

NOTE: 5 foot core barrel recovery system used as sampling technique

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Mo g Well ☒
Piezometer



Depths in Feet from Ground Surface (Not to Scale)

Design Specification

Elevations: (feet MSL) 1 3368.33 2 3368.12 3 3365.81 4 3365.4

Coordinates: X 2811.44 Y 3574.80

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☐ 2" ☐ 3" ☒ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: CSSI 16-40

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ _____

Grout Type: Portland Weight: _____

Bore Hole Diameter: 12"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: PRECISION ENGINEERING

Logged By: PHILIP CADARETTE

Completion Date: FEBRUARY 17, 1992

Date	D-T-P	MSL	D-T-W	Field pH	Field EC
2/19/92			24.2		
3/10/92	24.0	3344.1	26.1		

Comments: Concrete with 5% bentonite used to grout from seal to surface.

KWBES

Navajo

KWB4

Project: 622092001-237 (KWB4)
Location: ARTESIA, NEW MEXICO

Sym	Samp	Loc	PID (ppm)	Depth (Feet)
				2
				4
				6
				8
				10
				12
				14
				16
				18
				20
				22
				24
				26
				28
				30
				32
				34
				36
				38
				40
				42
				44
				46
				48
				50

Geologic Description

0–9' SANDY CLAY, brown, moist to dry, becoming lighter in color with decreasing moisture.

9–10' CLAY, brown, moist.

10–15' SANDY CLAY, brown, dry to moist, gray hydrocarbon staining starting at 14'.

15–29' CLAYEY SAND, gray staining with strong hydrocarbon smell, dry to moist.

29–31' SANDY CLAY, gray staining, strong odor, moist.

31–38' SATURATED SILT, brown, strong odor, sheen.

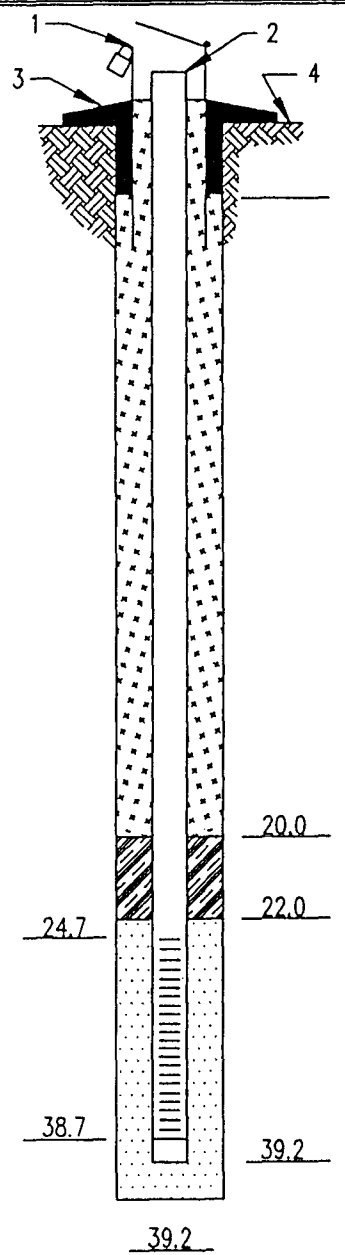
38–39.5' CLAY, brown, stiff, dry.

TD = 39.2'

NOTE: 5 foot core barrel recovery system used as sampling technique

ST=Shelby Tube | SS=Split Spoon | C=Cuttings

Mon. .g Well ☒
Piezometer



Depths in Feet from Ground Surface (Not to Scale)

Design Specifications

Elevations: (feet MSL) 1 3363.02 2 3362.87 3 3360.92 4 3360.6

Coordinates: X 2928.10 Y 4245.94

Type of Casing: ☒ PVC Sched. 40 Flush Thread ☐ Stainless Steel ☐ _____

Casing Diameter: ☒ 2" ☐ 3" ☐ 4" ☐ 6" ☐ _____

Screen Slot: ☐ 0.008 ☒ 0.010 ☐ _____

Screen Style: ☒ Machine Slot ☐ Wire Wrap ☐ _____

Sand Pack: CSSI 16-40

Bentonite Seal: ☐ 1/2" Pellets ☐ Hole Plug ☐ Slurry ☒ 1/4" Pellets ☐ _____

Grout Type: Portland Weight: _____

Bore Hole Diameter: 8"

Drill Rig: ☒ Hollow Stem ☐ Rotary ☐ _____

Drilled By: PRECISION ENGINEERING

Logged By: PHILIP CADARETTE

Completion Date: FEBRUARY 11, 1992

Date	D-T-P	MSL	D-T-W	Field pH	Field EC
2/19/92			23.1		
3/10/92	23.3	3339.6	23.4		

Comments: Concrete with 5% bentonite used to grout from seal to ground surface.

KWBES

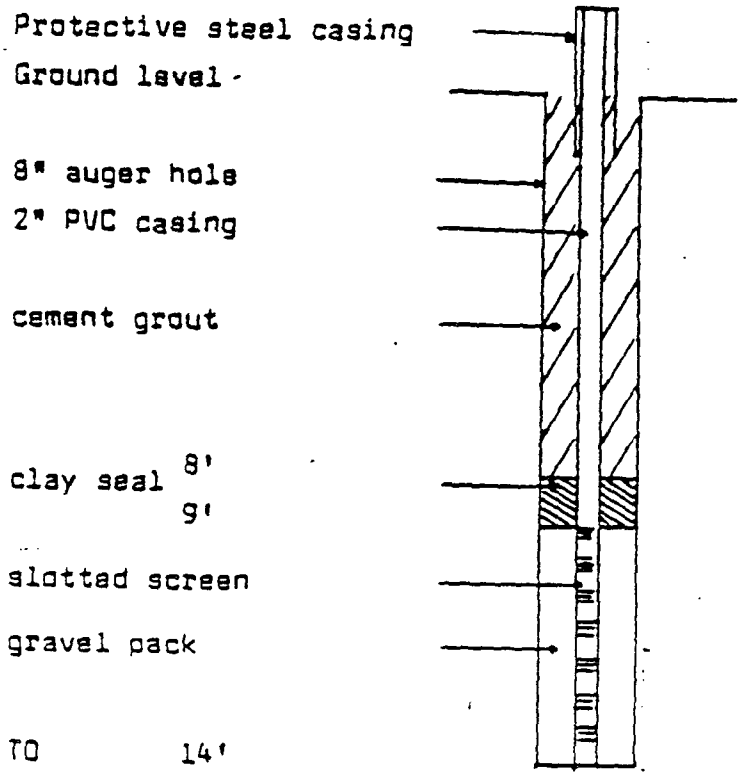
Naval

KWB5

Project: 622092001-237 (KWB5)
Location: ARTESIA, NEW MEXICO

DETAILS OF WELL CONSTRUCTION

Well # 47 Date 8/22/84 Navajo Refining Company



SAMPLE LOG

Well # 47 Navajo Refining Company - Monitor wells

Drilling Contractor - O. Anderson, El Paso

Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"

Date 8/22/84 Stroud & Ledesma

0 -	5	Dark red soil	damp
	10	Lite red soil	damp
	11½	Red shale	
	13	Orange-red shale	damp
	14	Orange-red shale	damp

TD

DRAFT

DETAILS OF WELL CONSTRUCTION

Well # 46 Date 8/22/84 Navajo Refining Company

Protective steel casing

Ground level

8" auger hole

2" PVC casing

cement grout

10'

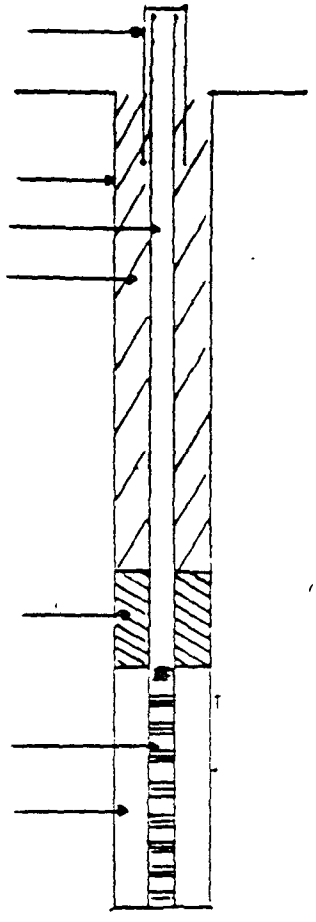
clay seal

12'

slotted screen

gravel pack

TD 17'



Well # 46 Navajo Refining Company - Monitor Wells

Drilling Contractor - O. Anderson, El Paso

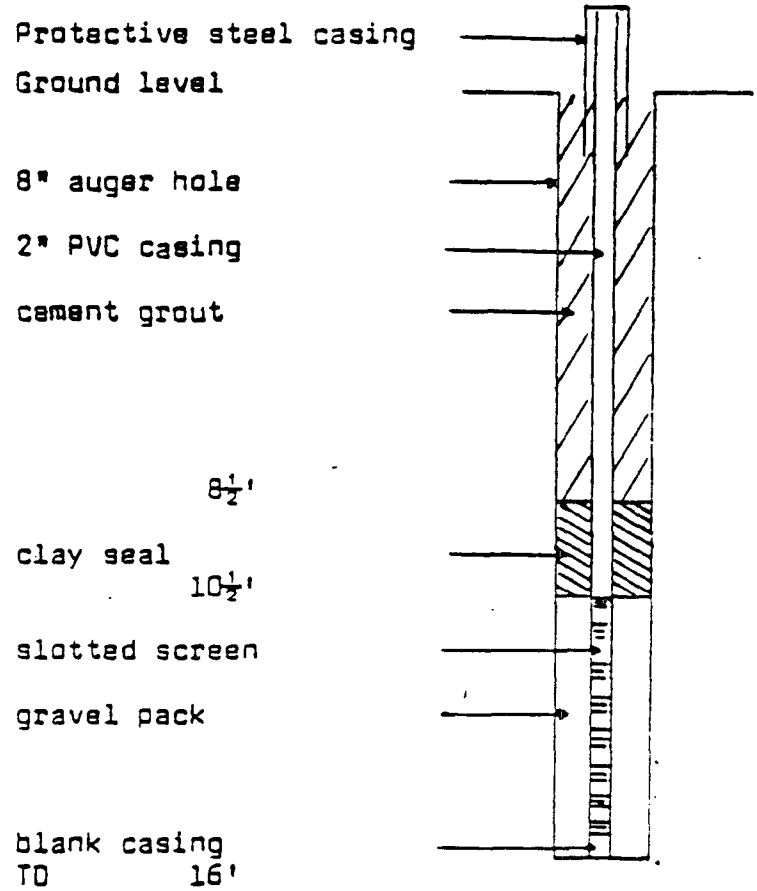
Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"

Date 8/22/84 Stroud & Ledesma

Depth	Sample description
0 - 6½	Dark red soil
8	Lite red soil & gyp dry
11	Gry clay w gyp damp
12½	gry clay, gyp, anhy pcs, tight - dry
14	Gry clay, gyp, anhy gravel water
15½	15.3 gry sdy shale 15½ Red shale
17	Fine red shale. TD

DETAILS OF WELL CONSTRUCTION

Well # 45 Date 8/22/84 Navajo Refining Company



SAMPLE LOG

Well # 45 Navajo Refining Company - Monitor Wells

Drilling Contractor - D. Anderson, El Paso

Rig - Hollow stem auger 8" diameter Split spoon core barrel 18"

Date 8/22/84 Stroud & Ledesma

Depth	Sample description
0 - 4½	Red soil dry
5	Gyp dry
6½	6.3 wht gyp - dry. 6½ gry shale - dry
8	Gry sdy shale w very lge anhy pcs - dry
9½	8.8 gry shale & gyp. 9.3 anhy gravel 9½ gry shale & anhy - dry
10	drill
11½	10.8 gry shale w anhy pcs. 11.3 anhy gravel. 11½ gry shale sli damp to dry
13	gry shale w gyp & anhy pcs - damp. Tr rd shale 11½-12.3
14½	14' gravel. 14½ gry shale w gravel streaks - water
16	14.7-15 gry shale & gravel. 15-16 drk gry shale water TD

GCL

WELL LOGGING FORM

Client NAVAJO REFINERY Well Number MW-9

___1/4___1/4___1/4___1/4 S___T___R___ State NEW MEXICO

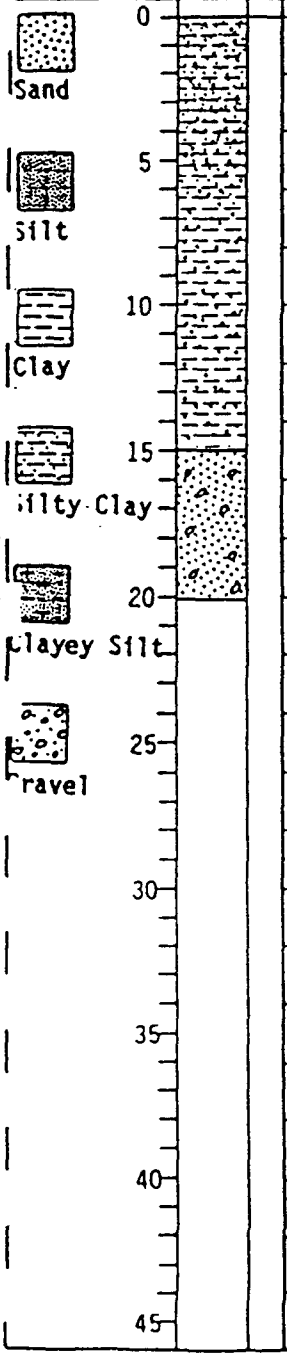
County EDDY Contractor LARRY'S DRILLING

Spud Date 6-20-86 Completion Date 6-20-86

Logs Run LITHOLOGY Logged By SELKE

Elevation _____ Spud In (Fm.) _____

Remarks Steam cleaned rig and tools prior to drilling- drilled with air rotary- no temporary casing



RUN	FROM	TO	SAMPLE DEPTH	REMARKS
				0-approx. 5' brown, silty , sandy clay
				approx. 5'-approx. 15' white to gray, sandy clay
				15-20' lt. brown, clayey sand w/ moderate amounts of fine grain gravel

State of New Mexico
ENVIRONMENT DEPARTMENT
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Telephone (505) 428-2500
Fax (505) 428-2567
www.nmenv.state.nm.us

GARY E. JOHNSON
GOVERNOR

PETER MAGGIORE
SECRETARY

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

November 6, 2001

Navajo Refining Company
501 East Main Street
P.O. Box 159
Artesia, New Mexico 88211-0159

SUBJECT: INFORMATION REQUEST – MONITORING WELL STATUS
NAVAJO REFINING COMPANY, ARTESIA REFINERY
EPA ID# NMD 048918817
HWB-NRC-99-002

Attention: Mr. Darrel Moore

The New Mexico Environment Department NMED Hazardous Waste Bureau is preparing a draft post-closure care permit for Navajo Refining Company's Artesia Refinery. The post-closure care permit includes requirements for groundwater monitoring at various locations at the Refinery. The purpose of this letter is to request information concerning the on- and off-site monitoring wells at the Refinery. NMED is requesting the following information regarding the wells located at, and in the vicinity of, the Refinery:

1. The status of the wells (existing, good condition, abandoned, damaged or otherwise unusable)
2. The purpose for the well installation (monitoring wells, recovery wells, irrigation wells, or alternate use).
3. The aquifer intersected by the well screen and the depth and length of the screened interval including whether the well is screened across the water table.
4. The details of well construction including casing type, type of filter pack, annular seals and surface completion.

The NMED is requesting the information listed above for the following wells:

MW-18	MW-23	MW-24	MW-28
MW-29	MW-39	MW-41	MW-43
MW-45	MW-47 (AH)	MW-48	MW-50
MW-52	MW-59 (AE)		
MW-E	MW-F	MW-I	MW-S
KWB-2P	KWB-4	KWB-5	KWB-6
KWB-8	KWB-10	KWB-1A	KWB-1C
KWB-2A	KWB-3A	KWB-7	KWB-9
KWB-11A	KWB-12A		
RA-302	RA-313	RA-314	RA-1227
RA1331	RA-3156	RA-3353	RA-4196
RA-4798			

Please include information on any on- or off-site wells located at the Refinery that are not included in the above listing.

Please call at (505) 428-2553 if you have questions regarding this information request.

Sincerely,

Dave Cobrain
Program Manager
Permits Management Program

DWC

cc: Bill Olson, NMOCD
~~Wayne Price~~, NMOCD
Pam Allen, NMED HWB

file: Red/Information Request Letter/11-06-01

State of New Mexico
ENVIRONMENT DEPARTMENT
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Telephone (505) 428-2500
Fax (505) 428-2567
www.nmenv.state.nm.us

GARY E. JOHNSON
GOVERNOR

JOHN D'ANTONIO, Jr.
SECRETARY

CERTIFIED MAIL
RETURN RECEIPT REQUIRED

November 5, 2002

Ms. Laurie King
New Mexico and Federal Facilities Section (6PD-N)
U.S. Environmental Protection Agency Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

RE: POST-CLOSURE CARE PERMIT
NAVAJO REFINING COMPANY, ARTESIA REFINERY
ARTESIA, NEW MEXICO

Dear Ms. King:

Please find enclosed the DRAFT Post-closure Care Permit Navajo Refining Company's Artesia Refinery. Draft Permit Attachments 1 and 2 are not included because they are part of the Permit Application. The Permit Application text will be included in the Permit Attachments when it is issued for public notice. I also have enclosed a copy of Navajo's revised Post-closure Care Permit Application Volumes I and II. Please review the enclosed documents at your earliest convenience and return them with your comments. I anticipate incorporating your comments and issuing the draft permit for public notice by December of this year. Please call me at (505) 428-2553 if you have questions regarding the post-closure care permit or permit application.

Sincerely,

Dave Cobrain
Geologist
Hazardous Waste Bureau

cc: James P. Bearzi, NMED HWB
John E. Kieling, NMED HWB
Rich Mayer, EPA Region VI
Wayne Price, NMOCD
Bill Olson, NMOCD

Track: Red/NRC/King/Cobrain/11-05-02/EPA transmittal/PCC permit

NAVAJO REFINING COMPANY

ARTESIA REFINERY

POST-CLOSURE CARE

DRAFT PERMIT:

NOVEMBER 2002

For your

Review

RESOURCE CONSERVATION AND RECOVERY ACT
POST-CLOSURE CARE PERMIT
EPA ID No. NMD 048918817

to

NAVAJO REFINING COMPANY

for the

ARTESIA REFINERY

Located in

ARTESIA, NEW MEXICO

November 2002

Prepared by the

New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East Building 1
Santa Fe, New Mexico, 87505

TABLE OF CONTENTS

APPENDICES

ATTACHMENTS

LIST OF ACRONYMS

AOC	Area of Concern
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
BGS	Below Ground Surface
BS/BSD	Blank Spike/Blank Spike Duplicate
CAMU	Corrective Action Management Unit
CEC	Cation Exchange Capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMS	Corrective Measure Study
COC	Chain of Custody
DOT	U.S. Department of Transportation
DQO	Data Quality Objectives
DRO	Diesel-range organics
EC	Emergency Coordinator
EPA	U.S. Environmental Protection Agency
GC/MS	Gas Chromatography/Mass Spectrometry
GRO	Gasoline-range organics
HWB	Hazardous Waste Bureau
HWA	New Mexico Hazardous Waste Act
LDR	Land Disposal Restrictions

LIST OF ACRONYMS (Continued)

MSDS	Material Safety Data Sheet
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NCL	North Colony Landfarm Regulated Unit
OCD	New Mexico Department of Energy, Minerals and Natural Resources Oil Conservation Division
ORO	Oil-range organics
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photo-ionization Detector
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plans
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAR	SWMU Assessment Report
SSL	Soil Screening Levels
SOP	Standard Operating Procedures
SVOCs	Semivolatile Organic Compounds
SWMU	Solid Waste Management Unit
TEL	Tetra Ethyl Lead Impoundment (Regulated Unit)

LIST OF ACRONYMS (Continued)

TMD	Three-mile Ditch
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage and Disposal Facility
VOCs	Volatile Organic Compounds
WQCC	New Mexico Water Quality Control Commission

MODULE I - GENERAL PERMIT CONDITIONS

1.1 EFFECT OF PERMIT

The Secretary of the New Mexico Environment Department (Secretary) issues this Post-Closure Care Permit (the Permit) to the Navajo Refining Company (Navajo), the owner and operator of the Artesia Refinery Facility (EPA ID Number NMD 048918817). This Permit authorizes and requires Navajo (the Permittee) to conduct closure and post-closure care at a hazardous waste surface impoundment and post-closure care at a closed hazardous waste impoundment and a closed hazardous waste land treatment unit at the Artesia Refinery. This Permit establishes the general and specific standards for these activities, pursuant to the New Mexico Hazardous Waste Act (HWA), NMSA 1978, 74-4-1 *et seq.* (Repl. Pamp. 1993) and the New Mexico Hazardous Waste Management Regulations, 20.4.1.100 NMAC *et seq.*

Compliance with this Permit during its term shall constitute compliance, for purposes of enforcement, with Subtitle C of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901 *et. seq.* and the New Mexico Hazardous Waste Act and their implementing regulations. Compliance with this Permit shall not constitute a defense to any order issued or any action brought under Sections 74-4-10, 74-4-10.1 or 74-4-13 NMSA 1978; Section 3008 of RCRA, 42 U.S.C. 6928, Section 3013 of RCRA, 42 U.S.C. 6934, Section 7002(a)(1)(b) of RCRA, 42 U.S.C. 6972(a) or Section 7003 of RCRA, 42 U.S.C. 6973, or Sections 104, 106(a) or 107 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9604, 9606(a) or 9607; or any other law providing for protection of public health or the environment. This permit does not convey any property rights or exclusive privilege, nor authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local laws or regulations pursuant to 20.4.1.900 NMAC incorporating 40 CFR 270.4 and 270.30(g).

This Permit consists of Permit Modules I through IV, Permit Appendices A through E and Permit Attachments 1 and 2. The Permittee shall comply with the post-closure care, corrective action, and other activities and standards specified in this Permit and the Permit Application.

1.2 PERMIT ACTIONS

1.2.1 Permit Modification, Suspension, and Revocation

This Permit may be modified, suspended or revoked for cause, as specified in Section 74-4-4.2 NMSA 1978 and 20.4.1.901.B and .900 NMAC (incorporating 40 CFR 270.41, 270.42, and 270.43). The filing of a request for a permit modification, suspension, or revocation, or the notification of planned changes or anticipated noncompliance on the part of the Permittee, does not stay the applicability or enforceability of any Permit condition. [20.4.1.900 NMAC incorporating 40 CFR 270.4(a) and 270.30(f)]

1.2.2 Permit Renewal

The Permittee may renew this Permit by submitting an application for a new permit at least 180 days before the expiration date of this Permit, in accordance with 20.4.1.900 NMAC (incorporating 40 CFR 270.10(h) and 270.30(b) and 40 CFR 124) and Permit Condition 1.5.3. In reviewing any

application for a Permit renewal, the Secretary shall consider improvements in the state of control and measurement technology and changes in applicable regulations. [20.4.1.900 NMAC incorporating 40 CFR 270.30(b)]

1.3 SEVERABILITY

The provisions of this Permit are severable, and if any provision of this Permit, or the application of any provision of this Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this Permit shall not be affected thereby.

1.4 DEFINITIONS

Unless otherwise expressly provided herein, the terms used in this Permit shall have the meaning set forth in the HWA, RCRA, and/or their implementing regulations.

"AOC" means any area of concern that may have a release of hazardous waste or hazardous constituents, which is not from a solid waste management unit and is suspected or determined by the Secretary to pose a potential threat to human health or the environment.

"CAMU" means a corrective action management unit defined as an area within a facility that is used only for managing remediation wastes for implementing corrective action or cleanup at the Facility [20.4.1.100 NMAC and 20.4.1.500 NMAC (incorporating 40 CFR 260.10 and 264.552)].

"Evaporation Ponds" means Evaporation Ponds 2, 3, 5, and 6 encompassing approximately 91 acres and located approximately three miles east of the Artesia Refinery process areas adjacent to the Pecos River.

"Facility" means the Artesia Refinery owned by the Navajo Refining Company and located in Township 17 South, Range 26 East, Sections 1, 2, 9, 10, 11, 12 and the southern portion of Township 17 South, Range 27 East, Section 6, Eddy County, New Mexico, EPA ID No. NMD 048918817.

"Hazardous Constituent" means any constituent identified in 20.4.1.200 NMAC (incorporating Appendix VIII of 40 CFR Part 261), any constituent identified in 20.4.1.500 NMAC (incorporating Appendix IX of 40 CFR Part 264), any constituent identified in a hazardous waste listed in 20.4.1.200 NMAC (incorporating 40 CFR part 261 Subpart D), any constituent identified in a toxicity characteristic waste in 20.4.1.200 NMAC (incorporating 40 CFR 261.24, Table 1) or any other constituent determined to be hazardous by the Secretary.

"HWA" means the New Mexico Hazardous Waste Act, NMSA 1978, 74-4-1 *et seq.* (Repl. Pamp. 1993).

"MCLs" means Maximum Contaminant Levels under the Federal Safe Drinking Water Act, 42 U.S.C. 300f *et seq.*

"North Colony Landfarm" (NCL) means the approximately 4.25 acre land treatment unit located in the northwest corner of the Refinery North Division, adjacent to the north of above ground storage tanks 834 and 838.

"OCD" means the New Mexico Department of Energy, Minerals and Natural Resources Oil Conservation Division.

"OCD standards" means the maximum allowable soil and groundwater contaminant concentrations listed in the New Mexico OCD Guidelines for Remediation of Leaks, Spills and Releases. [19.15.A NMAC through 19.15.D NMAC]

"Permittee" means the Navajo Refining Company Artesia Refinery.

"RCRA" means the Resource Conservation and Recovery Act, 42 U.S.C. 6901 *et seq.*

"Regional Administrator" means the Regional Administrator of EPA Region VI, or his or her designee or authorized representative.

"Secretary" means the Secretary of the New Mexico Environment Department (NMED) or the Secretary's designee or authorized representative.

"Solid waste management unit" or "SWMU" means any discernible unit at which solid wastes have been placed at any time, and from which the Secretary determines there may be a risk of a release of hazardous constituents, irrespective of whether the unit was intended for the management of solid or hazardous waste. Placement of solid waste includes one time and accidental events that were not remediated, as well as any unit or area at which solid waste has been routinely and systematically placed.

"Tetra-Ethyl Lead Impoundment" (TEL) means the approximately 0.9-acre land treatment unit located in the Refinery North Division adjacent to the east side of the wastewater treatment system.

"WQCC standards" means the maximum allowable ground water contaminant concentrations as listed at 20 6.2.3103 NMAC.

1.5 DUTIES AND REQUIREMENTS

1.5.1 Duty to Comply

The Permittee shall comply with all conditions in this Permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit issued pursuant to 20.4.1.900 NMAC (incorporating 40 CFR 270.61). Any permit noncompliance, except under the terms of an emergency permit, constitutes a violation of the HWA and/or RCRA and may subject the Permittee, its successors and assigns, officers, directors, employees, parents or subsidiaries, to an administrative or civil enforcement action, including civil penalties and injunctive relief, under Sections 74-4-10 or 74-10.1 NMSA 1978, or Section 3008(a) and (g) of RCRA, 42 U.S.C. 6928(a) and (g), or Section 3013 of RCRA, 42 U.S.C. 6934; to permit modification, suspension, revocation or denial under Section 74-4-4.2 NMSA 1978; to citizen suit under Section 7002(a) of RCRA, 42 U.S.C. 6972(a); to criminal

penalties under Section 74-4-11 NMSA 1978 or Section 3008(d), (e) and (f) of RCRA, 42 U.S.C. 6928(d), (e) and (f); or to some combination of the foregoing.

1.5.2 Duty to Reapply

If the Permittee will continue an activity allowed or required by this Permit after the expiration date of this Permit, the Permittee shall submit a complete application for a new Permit at least 180 days before this Permit expires, unless an extension is granted by the Secretary. [20.4.1.900 NMAC incorporating 40 CFR 270.10(h) and 270.30(b)]

1.5.3 Permit Expiration

This Permit shall be effective for ten years from its effective date. [20.4.1.900 NMAC incorporating 40 CFR 270.50(a)] This Permit and all conditions herein will remain in effect beyond the Permit's expiration date, if the Permittee has submitted a timely, complete application for renewal of this Permit 180 days prior to the expiration date of this Permit, in accordance with 20.4.1.900 NMAC (incorporating 40 CFR 270.10 and 270.13 through 270.29) and, through no fault of the Permittee, the Secretary has not issued a new Permit on or before the expiration date of this Permit. [20.4.1.900 NMAC incorporating 40 CFR 270.10(h) and 270.51]

1.5.4 Duty to Mitigate

In the event of noncompliance with this Permit, the Permittee shall take all reasonable steps to minimize releases of petroleum, hazardous waste and hazardous constituents to the environment and shall carry out such measures as are reasonable to prevent significant adverse impacts on human health or the environment. [20.4.1.900 NMAC incorporating 40 CFR 270.30(d)]

1.5.5 Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control and related appurtenances which are installed or used by the Permittee to achieve compliance with the conditions of this Permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance/quality control procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Permit. [20.4.1.900 NMAC incorporating 40 CFR 270.30(e)]

1.5.6 Duty to Provide Information

The Permittee shall furnish to the Secretary, within a reasonable time period specified by the Secretary, any relevant information which the Secretary requests to determine whether cause exists for modifying, suspending, or revoking this Permit, or to determine compliance with this Permit. The Permittee shall also furnish to the Secretary, upon request, copies of records required to be kept by this Permit pursuant to 20.4.1.500 and 20.4.1.900 NMAC incorporating 40 CFR 264.74(a) and 270.30(h). Permit condition 1.5.6 shall not be construed to limit, in any manner, the Secretary's

information gathering authority under Section 74-4-4.3 of the HWA, Section 3007(a) of RCRA, 42 U.S.C. 6927(a) or other applicable law.

1.5.7 Inspection and Entry

Pursuant to 20.4.1.900 NMAC, incorporating 40 CFR 270.30(i), the Permittee shall allow the Secretary, or authorized representatives, upon the presentation of credentials and other documents as may be required by law to:

a. Enter at reasonable times upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this Permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Permit;

c. Inspect, at reasonable times, any Facility equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and

d. Sample or monitor, at reasonable times, for the purposes of assuring Permit compliance or as otherwise authorized by the HWA or RCRA, any substances or parameters at any location. [20.4.1.900 NMAC incorporating 40 CFR 270.30(i)]

Permit Condition 1.5.7 shall not be construed to limit, in any manner, the Secretary's inspection and entry authority under Section 74-4-4.3 of the HWA, Section 3007(a) of RCRA, 42 U.S.C. 6927(a) or any other applicable law.

1.5.8 Monitoring Records

1.5.8.a Records and Information

The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart or electronic recordings for continuous monitoring instrumentation, copies of all reports and records required by this Permit, records of all data used to complete the Application for this Permit, and records from all ground-water monitoring wells and associated ground-water surface elevations for a period of at least three years from the date of the sample, measurement, report, record, certification, or Application, or until post-closure care and corrective action are approved as complete by the Secretary, whichever is later. The Secretary may extend these periods at any time, and these periods shall be automatically extended during the course of any unresolved enforcement action regarding the Facility. [20.4.1.500 and 20.4.1.900 NMAC incorporating 40 CFR 264.74(b) and 270.30(j)(2)]

1.5.8.b Monitoring Information

Records of monitoring information shall include:

i. The dates, exact place, and times of sampling or measurements;

ii. Identification of the individuals who performed the sampling or measurements;

iii. The dates analyses were performed;

iv. The chain-of-custody records and the name and address of the laboratory that performed the analyses;

v. The analytical techniques or methods used;

vi. The quality assurance/quality control procedures used; and

vii. The results of such analyses. [20.4.1.900 NMAC (incorporating 40 CFR 270.30(j)(3))]

1.5.9 Reporting Planned Changes

The Permittee shall give notice to the Secretary, as soon as possible, of any planned physical alterations or additions to the Facility, of other changes to the Facility or activities that may impact the Permittee's compliance with this Permit, or of any other instance of noncompliance with this Permit. [20.4.1.900 NMAC incorporating 40 CFR 270.30(l)(1), (2), and (10)]

1.5.10 Reporting Anticipated Noncompliance

The Permittee shall give advance notice to the Secretary of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements. [20.4.1.900 NMAC incorporating 40 CFR 270.30(l)(2)]

1.5.11 Other Information

Whenever the Permittee becomes aware that it failed to submit any relevant facts or submitted incorrect information in any document submitted to the Secretary, the Permittee shall promptly submit such facts or information in writing to the Secretary. [20.4.1.900 NMAC (incorporating 40 CFR 270.30(l)(11))]

1.5.12 Transfer of Permits

The Permittee shall not transfer this Permit to any person except after notice to the Secretary. The Secretary shall require modification or revocation and reissuance of this Permit, as specified by 20.4.1.901 and 20.4.1.900 NMAC (incorporating 40 CFR 270.40(b) and 270.41(b)(2)), to identify the new Permittee and incorporate such other requirements as may be necessary under the HWA and RCRA and implementing regulations. Before transferring ownership or operation of the Facility, the Permittee shall notify the new owner or operator in writing of the requirements of 20.4 NMAC, 40 CFR Parts 264 and 270 and this Permit. [20.4.1.500 and .900 NMAC incorporating 40 CFR 264.12(c) and 270.30(l)(3)]

1.5.13 Twenty-four Hour Reporting

1.5.13.a Oral Reporting

The Permittee shall report orally to the Secretary any noncompliance with this that may endanger human health or the environment. Such report shall be made within 24 hours from the time the Permittee becomes aware of the noncompliance and shall include:

i. Information concerning the release of any petroleum, hazardous waste or hazardous constituent that may endanger public drinking water supplies;

ii. Information concerning the release or discharge of any petroleum, hazardous waste or hazardous constituent, or of a fire or explosion at the Facility, which could threaten the environment or human health at and outside the Facility. [20.4.1.900 NMAC (incorporating 40 CFR 270.30(l)(6)(i))]

1.5.13.b Description of Occurrences

The description of the occurrence and its cause shall include:

i. Name, address, and telephone number of the Permittee and the Facility;

ii. Date, time, and type of incident;

iii. Name and quantity of materials involved;

iv. The extent of injuries, if any;

v. An assessment of actual or potential hazards to the environment and human health at and outside the Facility; and

vi. Estimated quantity and disposition of recovered material that resulted from the incident. [20.4.1.900 NMAC (incorporating 40 CFR 270.30(l)(6)(ii))]

1.5.13.c Written Notice

The Permittee also shall submit a written notice to the Secretary within five calendar days of the time the Permittee becomes aware of the noncompliance under Permit Condition 1.5.13.a. above. The written notice shall contain the following information:

i. a description of the noncompliance and its cause;

ii. the period(s) of noncompliance (including exact dates and times), and, if the noncompliance has not been corrected, the anticipated time it is expected to be corrected; and

iii. the steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance or imminent hazard and to eliminate any hazard or threat.

The Secretary may waive the five-day written notice requirement in favor of a written report within 15 days. [20.4.1.900 NMAC incorporating 40 CFR 270.30(l)(6)(iii)]

1.5.13.d Other Noncompliance

The Permittee shall report all other instances of noncompliance not otherwise required to be reported above, at the time monitoring reports are submitted. The reports shall contain the information listed in Permit Condition 1.5.13. [20.4.1.900 NMAC incorporating 40 CFR 270.30(l)(10)]

1.5.14 Other Information

Whenever the Permittee becomes aware that it failed to submit any relevant facts in the Permit Application, or submitted incorrect information in a Permit Application or in any report to the Secretary, the Permittee shall promptly notify the Secretary of such facts or information. [20.4.1.900 NMAC incorporating 40 CFR 270.30(l)(11)]

1.6 SIGNATORY REQUIREMENT

The Permittee shall sign and certify, as specified in 20.4.1.900 NMAC (incorporating 40 CFR 270.11), all applications, reports, or information submitted to the Secretary [20.4.1.900 NMAC incorporating 40 CFR 270.30(k)]. The certification, signed by a responsible official of Navajo Refining Company, shall state: "To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this report is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

1.7 REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE SECRETARY

All reports, notifications, or other submissions that are required by this Permit to be submitted to the Secretary shall be sent by certified mail or hand-delivered to:

Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East
Building 1
Santa Fe, NM 87505-6303

1.8 CONFIDENTIAL INFORMATION

The Permittee may claim confidentiality for any information submitted to or requested by the Secretary or required by this Permit, to the extent authorized by Section 74-4-4.3(D) NMSA 1978 and 20.4.1.900 NMAC incorporating 40 CFR 270.12.

1.9 DOCUMENTS TO BE MAINTAINED AT THE FACILITY

The Permittee shall maintain at the Facility, until post-closure care and corrective action are approved as complete by the Secretary, the following documents and all amendments, revisions, and modifications to these documents:

a. This Permit and its attachments;

b. Inspection schedules, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.15(b)(2) and this Permit;

c. Operating record, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.73 and this Permit;

d. Post-Closure Plan, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.118(a) and this Permit;

e. Annually-adjusted cost estimate for facility post-closure, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.144(d) and this Permit;

f. The schedule for submittal of corrective action work plans approved by the Secretary and all corrective action work plans and other documents prepared to fulfill the requirements of this Permit.

g. Groundwater monitoring and all other corrective action documents required by Permit Condition 1.5. above.

1.10 ENFORCEMENT

1.10.1 Waiver of Defenses

In any judicial action brought in New Mexico District Court for the First Judicial District under the HWA, or in the United States District Court for the District of New Mexico under RCRA (or under the HWA asserting supplemental jurisdiction under 28 U.S.C. 1367), the Permittee waives all objections and defenses it may have to the jurisdiction of either such State or federal court or to venue in either such State or federal district.

1.10.2 Admissibility of Data

In any administrative or judicial action to enforce this Permit, the Permittee waives any objection to the admissibility as evidence of any data generated pursuant to this Permit.

MODULE II - GENERAL FACILITY CONDITIONS

2.1 DESIGN AND OPERATION OF FACILITY

The Permittee shall maintain and operate the Facility to minimize the possibility of a fire, explosion, or any unplanned, sudden, or non-sudden release of hazardous waste constituents to air, soil, surface water, or groundwater that could threaten human health or the environment. [20.4.1.500 NMAC incorporating 40 CFR 264.31] The Permittee must comply with the requirements of 20.4.1.500 incorporating 40 CFR 264 Subparts AA, BB, and CC as applicable.

2.2 OFF-SITE WASTES

The Permittee shall not accept hazardous waste at the North Colony Landfarm (NCL) or Tetra-ethyl Lead Impoundment (TEL) from any off-site source. Remediation waste generated as part of corrective action activities at the Facility may be disposed at the Evaporation Ponds location in a corrective action management unit (CAMU) established pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.552. The design and siting of the CAMU shall be approved by the Secretary prior to the construction of the CAMU and placement of any waste materials in the CAMU.

2.3 SECURITY

The Permittee shall comply with the security provisions specified in 20.4.1.500 NMAC incorporating 40 CFR 264.14(b)(2) and (c) and in Permit Attachment 1 (Permit Application, Section 4.0), in order to prevent unknowing or unauthorized entry onto the NCL, TEL or Evaporation Ponds by persons or livestock.

2.4 GENERAL INSPECTION REQUIREMENTS

The Permittee shall implement the inspection schedule specified in Permit Attachment 1 (Permit Application Section 5.0). The Permittee shall remedy any deterioration or malfunction discovered by an inspection. The Permittee shall maintain records of inspections in accordance with Permit Attachment 1 (Permit Application, Section 5.0, Figures B-2 through B-4) and in accordance with 20.4.1.500 NMAC incorporating 40 CFR 264.15.

2.5 PERSONNEL TRAINING

The Permittee shall conduct personnel training, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.16. This training program shall follow the procedures included in Section 12.0 of the Permit Application. The Permittee shall maintain training documents and records, pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.16(d) and (e).

2.6 SPECIAL PROVISIONS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE

The Permittee shall take precautions to prevent accidental ignition or reaction of ignitable or reactive waste in accordance with the requirements of 20.4.1.500 NMAC incorporating 40 CFR 264.17(a).

2.7 PREPAREDNESS AND PREVENTION

2.7.1 Required Equipment

The Permittee shall maintain at the facility, at a minimum, the emergency equipment specified in Permit Attachment 2 (Permit Application, Section 7.0 and Appendices 2 and 3). [20.4.1.500 NMAC incorporating 40 CFR 264.32]

2.7.2 Testing and Maintenance of Equipment

The Permittee shall test and maintain the equipment specified in Permit Condition 2.7.1 above, as necessary, to assure its proper operation in time of emergency. [20.4.1.500 NMAC incorporating 40 CFR 264.33]

2.7.3 Access to Communications and Alarm System

The Permittee shall maintain access to the communications and alarm system specified in Permit Attachment 1 of this Permit (Permit Application, Section 7.0 and Appendices 2 and 3). [20.4.1.500 NMAC incorporating 40 CFR 264.34]

2.7.4 Arrangements with Local Authorities

The Permittee shall maintain emergency arrangements with state and local authorities, as specified in the Permit Application, Appendices 2 and 3. [20.4.1.500 NMAC incorporating 40 CFR 264.37]

2.8 CONTINGENCY PLAN

2.8.1 Implementation of Plan

The Permittee shall immediately carry out the provisions of the Contingency Plan, Permit Attachment 1 (Permit Application Section 7.0), whenever there is a fire, explosion, or release of hazardous waste or constituents that could threaten human health or the environment. The plan must cover the requirements of 20.4.1.500 NMAC incorporating 40 CFR 264.200, and 264.227(c).

2.8.2 Copies of Plan

The Permittee shall maintain copies of the contingency plan at the Facility and submit copies of the plan to local emergency response agencies in accordance with the requirements of 20.4.1.500 NMAC incorporating 40 CFR 264.53.

2.8.3 Amendments to Plan

The Permittee shall review and immediately amend, if necessary, the Contingency Plan, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.54.

2.8.4 Emergency Coordinator

A trained emergency coordinator shall be available either on the premises or on call and able to reach the Facility within a short time at all times in case of an emergency, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.55.

2.9 RECORD KEEPING AND REPORTING

In addition to the record keeping and reporting requirements specified elsewhere in this Permit, the Permittee shall comply with the following requirements:

2.9.1 Operating Record

The Permittee shall maintain at the Facility, until the end of the post-closure care period or completion of corrective action, whichever is later, a written record of waste, soil, and groundwater analyses. The written operating record shall include all waste management and other information required under 20.4.1.500 NMAC incorporating 40 CFR 264.73(b) (4), (5), (6), (8), (10), (12) and (14) and Permit Conditions 1.5.8. and 1.5.13. [20.4.1.500 NMAC incorporating 40 CFR 264.73]

2.9.2 Biennial Report

The Permittee shall comply with the biennial reporting requirements of 20.4.1.500 NMAC incorporating 40 CFR 264.75.

2.10 GENERAL CLOSURE REQUIREMENTS

2.10.1 Performance Standard

The Permittee shall close the regulated units, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.111 and in accordance with this Permit. The Permittee shall implement the Closure Plans included in Permit Attachment 2 (Permit Application Section 13.0) and pursuant to the requirements of 20.4.1.500 NMAC incorporating 40 CFR 264.112(a) and (b), 264.178, 264.197, 264.228, 264.258, 264.280, 264.310, and 264.351.

2.10.2 Amendment to Closure Plan

The Permittee shall amend the Closure Plan, pursuant to 20.4.1.500 NMAC (incorporating 40 CFR 264.112(c)), whenever necessary.

2.10.3 Notification of Closure

The Permittee shall notify the Secretary in writing at least 60 days prior to the date on which he expects to begin closure of the CAMU if it is constructed at the facility, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.112(d) and 40 CFR 264 Subpart S and amendments (67 Federal Register (FR) 2962-3029, January 22, 2002).

2.10.4 Time Allowed For Closure

After receiving the final volume of waste, the Permittee shall treat, remove from the unit or facility, or dispose of on site all hazardous waste and shall complete closure activities, in accordance with 20.4.1.500 NMAC incorporating 40 CFR 264.113 and 40 CFR 264 Subpart S and amendments (67 FR 2962-3029, January 22, 2002).

2.10.5 Disposal or Decontamination of Equipment, Structures, and Soils

The Permittee shall decontaminate and/or dispose of all contaminated equipment, structures, and soils, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.114 and Permit Attachment 2 (Permit Application Section13.0).

2.10.6 Certification of Closure

Upon completion of closure of each hazardous waste disposal unit, the Permittee shall certify that the facility has been closed in accordance with the specifications in the Closure Plan, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.115.

2.10.7 Survey Plat

The Permittee shall submit a survey plat no later than the submission of certification of closure of each hazardous waste disposal unit, pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.116.

2.11 GENERAL POST-CLOSURE REQUIREMENTS

2.11.1 Post-closure Care Period

The Permittee shall begin post-closure care for each regulated unit after completion of closure of the unit and continue for 30 years after that date. Post-closure care shall be conducted pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.117 and the Post-Closure Plan, Permit Attachment 2. The Post-Closure Plan shall meet the requirements of this Permit and be conducted in accordance with the requirements of 20.4.1.500 NMAC incorporating 40 CFR 264.118(a) and (b), 264.197, 264.228, 264.258, 264.280, and 264.310 also must be covered by the attached plan.

2.11.2 Post-Closure Security

The Permittee shall maintain security at the Facility during the post-closure care period, in accordance with the Post-closure Plan, Permit Attachment 2, and 20.4.1.500 NMAC incorporating 40 CFR 264.117(b).

2.11.3 Amendment to Post-closure Plan

The Permittee shall amend the Post-closure Plan pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.118(d), whenever necessary.

2.11.4 Post-closure Notices

2.11.5 Records

No later than 60 days after certification of closure of each hazardous waste disposal unit, the Permittee shall submit records of the type, location, and quantity of hazardous waste disposed within each cell or disposal unit, pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.119(a).

2.11.5.a Notification and Certification

Within 60 days of certification of closure of the first hazardous waste disposal unit and the last hazardous waste disposal unit, the Permittee shall do the following:

i. Record a notation on the deed to the Facility property, pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.119(b)(1).

ii. Submit to the Secretary a certification that a notation on the deed to the Facility property, pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.119(b)(2), has been recorded.

2.11.5.b Modifications to the Permit

The Permittee shall request and obtain a Permit modification prior to post-closure removal of hazardous wastes, hazardous waste residues, or contaminated soils, pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.119(c).

2.11.6 Certification of Completion of Post-closure Care

The Permittee shall certify that the post-closure care period was performed in accordance with the specifications in the Post-closure Plan and as required by 20.4.1.500 NMAC incorporating 40 CFR 264.120.

2.12 COST ESTIMATE FOR FACILITY CLOSURE AND POST-CLOSURE

2.12.1 Cost Estimates

The Permittee's most recent closure and post-closure cost estimates, prepared in accordance with 20.4.1.500 NMAC incorporating 40 CFR 264.142 and 264.144 shall be included in Permit Attachment 2 (Permit Application Sections 15.0 and 16.0).

2.12.2 Adjustments to the Cost Estimates

The Permittee must adjust the closure and post-closure cost estimates for inflation within 60 days prior to the anniversary date of the establishment of the financial instrument(s) used to comply with 20.4.1.500 NMAC incorporating 40 CFR 264.143 and 264.145 and the conditions included in this Permit. The Permittee must adjust the closure and post-closure cost estimates for inflation within 30 days after the close of the firm's fiscal year and before submission of updated information to the Secretary, as specified in 20.4.1.500 NMAC incorporating 40 CFR 264.142(b) and 264.144(b).

2.12.3 Revision of the Cost Estimates

The Permittee must revise the closure cost estimate or post-closure cost estimates whenever there is a change in the facility's Closure Plan or Post-closure Plan, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.142(c) and 264.144(c).

2.12.4 Records of Cost Estimates

The Permittee must keep at the Facility the latest closure cost estimate and post-closure cost estimates as required by 20.4.1.500 NMAC incorporating 40 CFR 264.142(d) and 264.144(d).

2.13 FINANCIAL ASSURANCE FOR FACILITY CLOSURE AND POST-CLOSURE

The Permittee shall demonstrate continuous compliance with 20.4.1.500 NMAC incorporating 40 CFR 264.143, 264.145, 264.146 by providing documentation of financial assurance, as required by 20.4.1.500 NMAC incorporating 40 CFR 264.151 or 264.149, in at least the amount of the cost estimates required by Permit Condition 2.12. Changes in financial assurance mechanisms must be approved by the Secretary pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.143 ,264.145 or 264.149.

2.14 LIABILITY REQUIREMENTS

The Permittee shall demonstrate continuous compliance with the requirement of 20.4.1.500 NMAC incorporating 40 CFR 264.147(a) to have and maintain liability coverage for sudden and accidental occurrences in the amount of at least $1 million per occurrence, with an annual aggregate of at least $2 million, exclusive of legal defense costs.

2.15 INCAPACITY OF OWNERS OR OPERATORS, GUARANTORS, OR FINANCIAL INSTITUTIONS

The Permittee shall comply with 20.4.1.500 NMAC incorporating 40 CFR 264.148, whenever necessary in the case that the owner/operator, guarantors or financial institutions become incapable of fulfilling the financial assurance obligations required by 20.4.1.500 NMAC incorporating 40 CFR 264 Subpart H.

MODULE III – POST-CLOSURE CARE

III.A. MODULE HIGHLIGHTS

This Permit implements post-closure care requirements for soil contamination left in place after closure of the following: (1) a land treatment unit (NCL) used for treatment of RCRA-regulated hazardous waste, (2) an surface impoundment (TEL) used for the storage and weathering of regulated tetra-ethyl lead- and petroleum-contaminated soils and sludges and, (3) surface impoundments (evaporation ponds) that received treated and untreated refinery wastewater.

The NCL is an approximately 4.25-acre land treatment unit located adjacent to the north of aboveground diesel storage tanks 834 and 838. The NCL received hazardous wastes (K049, K050, K051 and K052) between 1980 and 1990. The New Mexico Health Department Environmental Improvement Division (NMEID) issued Navajo a land treatment demonstration permit for the NCL in 1989. The NMEID was the predecessor to the NMED. A land treatment permit was not issued after the land treatment demonstration permit expired in 1990. Soil and groundwater beneath the NCL has been affected by possible releases from the landfarm and from petroleum release(s) from the adjacent tank farm (tanks 834 and 838) located south of the NCL.

The TEL site (tetra ethyl lead weathering impoundment site) is an approximately 0.9-acre surface impoundment used to treat oily wastes and other hazardous materials. The unit also was used historically for weathering of pipe and other materials generated in refinery tetra ethyl lead processes. The piping and other process materials were removed from the site after weathering. Nonhazardous wastes were placed in the TEL site between 1980 and 1983. Placement of waste in the TEL site was discontinued in 1983. The TEL surface impoundment was capped with crushed and compacted caliche and revegetated in 1989. Closure was approved by NMEID in June 1989. Post-closure care is in effect.

The Evaporation Ponds (surface impoundments) are located adjacent to the Pecos River approximately three miles east of the refinery. There are a total of five evaporation ponds. Pond 1 received refinery wastewater between the early 1930s and 1987 and is considered a part of solid waste management unit (SWMU) 4. Ponds 2, 3, 5, and 6 were constructed between 1966 and 1988. Pond 4 was never constructed. The combined surface area of evaporation ponds 2 through 6 is approximately 95 acres. Wastewater effluent discharged directly from the refinery to Pond 1 via an open ditch (Three-Mile Ditch [TMD]) until 1987. In 1987, discharge to Pond 1 was discontinued and Pond 1 was taken out of service. Refinery wastewater was discharged from the refinery through a wastewater conveyance pipe that replaced the TMD to Pond 2 between 1987 and 1994 and to pond 5 between 1994 and 1999. Ponds 3 and 6 received overflow from Ponds 2 and 5. Discharge to Ponds 2, 3, 5 and 6 was discontinued in September 1999. Navajo began operation of an on-site wastewater treatment system that discharges to the City of Artesia publicly owned treatment works (POTW) and to a Class I injection well owned by Navajo in October 1999. The Class I injection well operates under a discharge permit issued by the New Mexico Oil Conservation Division (OCD).

Post-closure care requirements shall remain in place at the NCL, TEL and Evaporation Ponds for 30 years after closure, unless the post-closure period is shortened or lengthened pursuant to 20.4.1.500 NMAC (incorporating 40 CFR 264.117(a)(2)). The Permittee is required to implement a

groundwater monitoring program, consisting of monitoring and sampling monitoring wells in the vicinity of these units until completion of corrective action and the demonstration of attainment of soil and groundwater cleanup standards for three years, pursuant to 20.4.1.500 NMAC (incorporating 40 CFR 264.96, 264.97 and 264.98).

3.1 UNIT IDENTIFICATION

The Permittee shall provide post-closure care for the following hazardous waste management units, subject to the terms and conditions of this permit:

North Colony Landfarm (NCL)

Tetra-ethyl Lead surface impoundment (TEL)

Evaporation Ponds 2 through 6 surface impoundments

3.2 POST-CLOSURE PROCEDURES AND USE OF PROPERTY

3.2.1 Post-Closure Care Period

The Permittee shall comply with post-closure care requirements for 30 years after completion of closure of each regulated unit, unless the Secretary approves shortening or lengthening the post-closure care period pursuant to 20.4.1.500 NMAC (incorporating 40 CFR 264.117(a)(2)) or until corrective action is completed pursuant to 20.4.1.400 NMAC (incorporating 40 CFR 264.100). Post-closure care shall be conducted in accordance with 20.4.1.500 NMAC incorporating 40 CFR Part 264, Subpart G, and the Post-closure Plan included in Permit Attachment 2 (Permit Application Volume 1 Section 13.0) and subject to the terms and conditions of this Permit. [20.4.1.500 NMAC (incorporating 40 CFR 264.117)]

The Permittee shall implement the Post-closure Plan included in Permit Attachment 2 (Permit Application Section 13.0) and in accordance with the requirements of this Permit. All post-closure care activities must be conducted in accordance with the provisions of the Post-closure Plan pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.117(d) and 264.118(b) and the requirements included in this Permit.

3.2.2 Groundwater Monitoring

The Permittee shall monitor the ground water, maintain all ground water monitoring wells and comply with all other applicable requirements of 20.4.1.500 NMAC (incorporating 40 CFR Part 264, Subpart F) during the post-closure period. [20.4.1.500 NMAC (incorporating 40 CFR 264.117(a)(1))]

3.2.3 Post-closure Care of Regulated Units

Post-closure care of regulated units shall be conducted after closure has been completed. The requirements for post-closure care at each regulated unit are listed below

3.2.3.a North Colony Landfarm Post-closure Care

The Permittee shall comply with the requirements for land treatment units at the NCL in accordance with Permit Attachment 2 (Attachment B-4 of the Permit Application) and shall:

a. maintain the integrity and effectiveness of the final vegetative cover;

b. prevent run-on and run-off from eroding or otherwise damaging the vegetative cover;

c. protect and maintain surveyed benchmarks used in complying with the surveying and record keeping requirements of 20.4.1.500 NMAC (incorporating 40 CFR 264.280 and 264.309). [20.4.1.500 NMAC (incorporating 40 CFR 264.310(b))]; and

d. conduct sampling of the treatment zone (non-native soils present in the NCL at depths above the contact with native soils) and of the native soils immediately beneath the treatment zone [20.4.1.500 NMAC (incorporating 40 CFR 264.278)] at intervals of four(4) years, nine (9) years and 19 years after the effective date of this Permit. The sampling shall consist of obtaining a minimum of 24 samples from each zone (a minimum of a total of 48 samples) during each event at locations approved by the Secretary. The soil samples shall be submitted to an analytical laboratory for chemical analysis of VOCs, SVOCs, RCRA metals, GRO, DRO and ORO by analytical methods approved by the Secretary.

3.2.3.b Tetra-ethyl Lead Surface Impoundment Post-closure Care

The Permittee shall comply with the requirements for surface impoundment units at the TEL, shall manage the TEL in accordance with Attachment B-6 of the Permit Application and shall:

a. maintain the integrity and effectiveness of the final cover, including making repairs to the cover, as necessary, to correct the effects of settling, subsidence, erosion, or other events;

b. prevent run-on and run-off from eroding or otherwise damaging the final cover;

c. protect and maintain surveyed benchmarks used in complying with the surveying and record keeping requirements of 20.4.1.500 NMAC incorporating 40 CFR 264.309; and

d. maintain and monitor the groundwater monitoring system and comply with all other applicable requirements of 20.4.1.500 NMAC incorporating 40 CFR 264 Subpart F). [20.4.1.500 NMAC incorporating 40 CFR 264.310(b)]

3.2.3.c Evaporation Ponds Post-closure Care

The Permittee shall comply with the requirements for the surface impoundments, known as the Evaporation Ponds, after closure and corrective action are completed and shall:

a. maintain the integrity and effectiveness of the final cover, including making repairs to the cover, as necessary, to correct the effects of settling, subsidence, erosion, or other events;

b. prevent run-on and run-off from eroding or otherwise damaging the final cover;

c. protect and maintain surveyed benchmarks used in complying with the surveying and record keeping requirements of 20.4.1.500 NMAC (incorporating 40 CFR 264.309); and

d. maintain and monitor the groundwater monitoring system and comply with all other applicable requirements of 20.4.1.500 NMAC incorporating 40 CFR 264 Subpart F. [20.4.1.500 NMAC (incorporating 40 CFR 264.228(b))]

3.2.3.d Corrective Action Management Units

If a corrective action management unit is constructed for the purpose of disposal of remediation waste at the Evaporation Ponds location, the Permittee shall manage CAMU, if constructed, during operation, closure and after closure is complete, in accordance with the following requirements:

a. Site and construct the CAMU in accordance with the requirements for corrective action management units outlined in 20.4.1.500 NMAC incorporating 40 CFR 264.552;

b. Maintain the integrity and effectiveness of the final cover, including making repairs to the cover, as necessary, to correct the effects of settling, subsidence, erosion, or other events;

c. Prevent run-on and run-off from eroding or otherwise damaging the final cover;

d. Protect and maintain surveyed benchmarks used in complying with the surveying and record keeping requirements of 20.4.1.500 NMAC incorporating 40 CFR 264.309; and

e. Maintain and monitor the groundwater monitoring system and comply with all other applicable requirements of 20.4.1.500 NMAC incorporating 40 CFR 264 Subpart F). [20.4.1.500 NMAC (incorporating 40 CFR 264.228(b))]

3.2.4 Security

The Permittee shall maintain security at the Facility during the post-closure care period, in accordance with the Post-closure Care Plan and all security requirements specified in this Permit and the Permit Attachment 1 (Permit Application, Part B, Section 4.0). [20.4.1.500 NMAC incorporating 40 CFR 264.117(b)]

3.2.5 Post-closure Care Maintenance

The Permittee shall not allow any use of the Facility that will disturb the integrity of the final cover or the function of the Facility's monitoring or corrective action systems during the post-closure care period. [20.4.1.500 NMAC incorporating 40 CFR 264.117(c)]

3.2.6 Inspections

The Permittee shall inspect the components, structures and equipment at the NCL, TEL and Evaporation Ponds, as appropriate in accordance with the requirements specified in Permit Condition 2.4 and Permit Attachment 1 (Permit Application Part B, Section 5.0) pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.117(a)(1)(ii).

3.3 NOTICES AND CERTIFICATION

3.3.1 Record of Land Use

No later than 60 days after this permit is issued, the Permittee shall submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary, a record of the type, location, and quantity of hazardous wastes applied to the NCL and TEL [20.4.1.500 NMAC (incorporating 40 CFR 264.119(a))].

No later than 60 days after completion of the site investigations specified in this Permit and selection of corrective measures for the Evaporation Ponds in accordance with the requirements of this Permit, the Permittee shall submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Secretary, a record of the type, location, and quantity of hazardous wastes present at the Evaporation Ponds. The Permittee shall comply with the requirements of 20.4.1.500 NMAC (incorporating 40 CFR 264.119(a)) described above upon closure of a CAMU, if a CAMU is constructed at the Evaporation Ponds site. Within 60 days after this Permit is issued, the Permittee shall:

a. Record, in accordance with 20.4.1.500 NMAC incorporating 40 CFR 264.119(b)(1), a notation on the deed to the facility property or on some other instrument that is normally examined during the title search that will in perpetuity notify any potential purchaser of the property that:

i) the land has been used to manage hazardous wastes;

ii) use of the land is restricted under 20.4.1.500 NMAC incorporating 40 CFR 264.116 and 264.119(a); and,

iii) the survey plats and records of the type, location, and quantity of hazardous wastes applied to the NCL, TEL and Evaporation Ponds at the Facility have been filed with the Secretary and the City of Artesia and Eddy County, New Mexico in accordance with 20.4.1.500 NMAC incorporating 40 CFR 264.119(b)(1)(iii).

b. Submit a certification to the Secretary, signed by the Permittee, that he or she has recorded the notations specified above, including a copy of the documents in which the notations have been placed [20.4.1.500 NMAC incorporating 40 CFR 264.119(b)(2].

3.3.2 Removal of Waste or Contaminated Soils

If the Permittee wishes to remove any hazardous waste, hazardous waste residue, or contaminated soils from the NCL, TEL or the Evaporation Ponds, then he or she shall request a modification to this Permit in accordance with the applicable requirements at 20.4.1.900 NMAC incorporating 40 CFR Parts 270 and 124. The Permittee shall demonstrate that the removal of hazardous waste will satisfy all applicable HWA and RCRA requirements for generation and transport of hazardous waste. [20.4.1.500 NMAC (incorporating 40 CFR 264.119(c))]

3.3.3 Certification of Completion of Post-closure Care

No later than 60 days after completion of the established post-closure care period for each regulated unit, the Permittee shall submit to the Secretary, by registered mail, a certification that post-closure care was performed at the specific unit in accordance with the specifications in the Post-closure Plan. The certification must be signed by the Permittee and an independent New Mexico registered professional engineer. Documentation supporting the independent, registered professional engineer's certification for each unit must be furnished to the Secretary upon request until the Secretary releases the Permittee from the financial assurance requirements for post-closure care under 20.4.1.500 NMAC incorporating 40 CFR 264.145(i). [20.4.1.500 NMAC incorporating 40 CFR 264.120]

3.4 FINANCIAL ASSURANCE

The Permittee shall maintain financial assurance and comply with all applicable requirements of 20.4.1.500 NMAC (incorporating 40 CFR Part 264, Subpart H), during the post-closure period. The Permittee shall demonstrate continuous compliance with financial assurance requirements by providing documentation of financial assurance in compliance with 20.4.1.500 NMAC (incorporating 40 CFR 264.145 and 264.151), in at least the amount of the cost estimate required by 20.4.1.500 NMAC (incorporating 40 CFR 264.144), and Permit Condition 3.4.1. Changes in financial assurance mechanisms must be approved by the Secretary pursuant to 20.4.1.500 NMAC (incorporating 40 CFR 264.145).

3.4.1 Cost Estimate for Facility Post-Closure

The Permittee's most recent closure and post-closure cost estimate for each regulated unit, prepared in accordance with 20.4.1.500 NMAC (incorporating 40 CFR 264.142 and 264.144), is included in Permit Attachment 2 (Permit Application, Part B, Sections 15 and 16 and Attachment B-8).

a. The Permittee shall adjust the post-closure cost estimates for inflation within 60 days prior to the anniversary date of the establishment of the financial instrument used to comply with 20.4.1.500 NMAC incorporating 40 CFR 264.145, and Permit Condition 3.5. If a financial test or corporate guarantee is used as the financial instrument, the cost estimate must be updated for inflation within 30 days after the end of the Permittee's fiscal year. [20.4.1.500 NMAC incorporating 40 CFR 264.144(b)]

b. The Permittee shall revise the post-closure cost estimate for each regulated unit whenever there is a change in the Facility's Post-Closure Plan for that regulated unit. [20.4.1.500 NMAC (incorporating 40 CFR 264.144(c))]

c. The Permittee shall keep in the operating record at the Facility the latest post-closure cost estimates. [20.4.1.500 NMAC (incorporating 40 CFR 264.144(d))]

d. Financial assurance funds may be released, upon approval by the Secretary, if the value of the financial assurance mechanism exceeds the remaining cost of post-closure care at a specific regulated unit. The Permittee must demonstrate to the Secretary that the value of the financial assurance mechanism exceeds the remaining cost of post-closure care, in order for the Secretary to approve a release of funds. [20.4.1.500 NMAC (incorporating 40 CFR 264.145(a)(10))]

e. The Permittee shall submit itemized bills to the Secretary when requesting reimbursement from the trustee for post-closure care under 20.4.1.500 NMAC (incorporating 40 CFR 264.145(a)(11)).

3.5 POST-CLOSURE PERMIT MODIFICATIONS

The Permittee shall request a Permit modification to authorize a change in the approved unit-specific Post-Closure Plan when a change is made in the Post-Closure Plan. This request shall be in accordance with applicable requirements of 20.4.1.900 NMAC (incorporating 40 CFR Part 270, Subpart D and 40 CFR Part 124), and must include a copy of the proposed amended unit-specific Post-closure Plan for approval by the Secretary. The Permittee shall request a Permit modification whenever changes in operating plans or Facility design affect the approved Post-closure Plans for any regulated units, or other events occur that affect the approved Post-closure Plans. The Permittee shall submit a written request for a Permit modification at least 60 days prior to the proposed change in Facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected any of the Post-Closure Plans. [20.4.1.500 NMAC (incorporating 40 CFR 264.118(d))]

3.6 INCAPACITY OF OWNERS OR OPERATORS, GUARANTORS, OR FINANCIAL INSTITUTIONS

The Permittee shall comply with 20.4.1.500 NMAC incorporating 40 CFR 264.148, in the event of bankruptcy proceedings naming the owner or operator or bankruptcy of the financial assurance issuing institution. [20.4.1.500 NMAC incorporating 40 CFR 264.148]

MODULE IV - CORRECTIVE ACTION

4.1 CORRECTIVE ACTION PROGRAM

The corrective action program that the Permittee shall follow to address the release to soil and groundwater from the Evaporation Ponds, NCL, TEL or other units, if detected, during the post-closure care period, is described in this Permit Module and in the Appendices to this Permit. Additional monitoring which is included in the Permit Application is incorporated herein by reference and made an enforceable part of this Permit. The investigation approach, sampling strategy, monitoring plan and remediation option, if applicable, for corrective action for detected soil and groundwater contamination is specific to the contaminants and release event(s) and is generally described in this Permit.

4.1.1 CORRECTIVE MEASURES

The Permittee shall implement corrective measures at the Facility, as necessary, in accordance with the requirements of this Section (4). The results of the investigations required in this Permit, and other information available to the Secretary, will be used as the basis for determining whether further investigation or corrective measures are necessary at each SWMU, AOC or other Facility site. The general procedures for implementing corrective measures are described in this Section (4).

4.2 INTERIM MEASURES

4.2.1 General

The Secretary will require interim measures, if the Secretary determines that such measures are necessary, to reduce or prevent migration of contaminants or human or environmental exposure to contaminants while long-term corrective action remedies are evaluated and implemented. Upon making such a determination, the Department will notify the Permittee.

4.2.2 Interim Measures Work Plan

Within 90 days after receiving notification from the Secretary that interim measures are required, the Permittee shall submit to the Secretary for approval an Interim Measures Work Plan that shall include an implementation schedule.

4.2.3 Approval of Interim Measures Work Plan

If the Department disapproves the Interim Measures Work Plan, the Secretary will notify the Permittee in writing of the Interim Measures Work Plan's deficiencies and specify a due date for submission of a revised Interim Measures Work Plan. Upon receipt of such notification of disapproval, the Permittee shall submit to the Secretary, within the specified timeframe, a revised Interim Measures Work Plan that corrects the deficiencies.

4.2.4 Interim Measures Implementation

The Permittee shall implement the interim measures in accordance with the approved Interim Measures Work Plan and implementation schedule.

4.2.5 Emergency Interim Measures

The Permittee may determine, during implementation of site investigation activities, that emergency interim measures are necessary to address an immediate threat of harm to human health or the environment. The Permittee shall notify the Secretary within three 3 days of discovery of the facts giving rise to the threat, and shall propose emergency interim measures to address the threat. If the Secretary approves the emergency interim measures in writing, the Permittee may implement the emergency interim measures without submitting an interim measures work plan.

4.2.6 Interim Measure Report

Within 90 days after completion of interim measures, the Permittee shall submit to the Secretary an Interim Measures Report summarizing the results of the interim measures. The report shall include copies of the results of all field screening, monitoring, sampling, analysis and other data generated as part of the interim measures implementation.

4.3 RISK ANALYSIS

4.3.1 General

The Permittee shall attain the cleanup goals outlined in Module IV of this Permit for all media at each site or unit for which the Secretary determines that corrective action is necessary to protect human health or the environment. The Permittee may propose to demonstrate to the Secretary that achievement of a cleanup goal at a particular site is technically infeasible. The Permittee shall have the burden of making such demonstration to the Secretary's satisfaction. If the Permittee proposes to demonstrate the technical infeasibility of achievement of a groundwater cleanup goal that is a WQCC standard, the applicable requirements of the WQCC Regulations, 6.2.4103.E and 4103.F NMAC, shall be followed. If the Secretary approves the technical infeasibility demonstration, the Permittee shall prepare a site-specific risk assessment for that site to identify alternate cleanup goals or, if the WQCC Regulations apply, alternate abatement standards. The risk assessment shall include both a human health risk assessment and an ecological risk assessment.

4.3.2 Risk Analysis Report

Within 90 days after receiving from the Secretary a written determination that a technical infeasibility demonstration has been approved, the Permittee shall submit to the Secretary for approval a Risk Analysis Report for that site. The Permittee shall follow the Risk Analysis Report format outlined in Appendix E.5 of this Permit.

4.3.2.a Conceptual Site Model

The risk analysis shall include information on the expected fate and transport of contaminants detected at the site or unit including a list of all sources of contamination at the site. Sources that are no longer considered to be releasing petroleum-related and hazardous constituents, but represent the point of origination for contaminants transported to other locations shall be included. The discussion of fate and transport shall address potential migration of each petroleum-related and hazardous constituent in each medium, potential breakdown products and their migration, and anticipated pathways of exposure for human and ecological receptors.

For human health risk assessments, the conceptual site model shall include residential land use as the future land use for all risk assessments. Site-specific future land use may be included, provided that written approval to consider a site-specific future land use has been obtained from the Secretary prior to inclusion in the risk assessment.

Conceptual site models presented for ecological risk assessments shall identify assessment endpoints and measurement receptors for the site. The discussion of the model shall explain how the measurement receptors for the site are protective of the wildlife receptors.

4.3.2.b Risk Screening Levels

The risk assessment shall include the actual screening values used for each contaminant for comparison to all human health and ecological risk screening levels. The Department's soil screening levels (SSLs) for residential soil shall be used to screen soil for human health. For those contaminants not appearing on the NMED's SSL table, the EPA Region 6 soil screening value adjusted to meet the NMED's target risk goal of 10^{-5} for total risk for carcinogens shall be used to screen the site for human health risks. Screening for ecological risk shall be conducted using the U.S. EPA ecological soil screening levels (ECO-SSLs), or derive a screening level using the methodology in the NMED's "Guidance for Assessing Ecological Risks Posed by Chemicals: Screening –Level Ecological Risk Assessment". If no valid toxicological studies exist for a particular receptor or contaminant, the contaminant/receptor combination shall be addressed using qualitative methods. If an approved site-specific risk scenario is used for the human health risk assessment, the Permittees shall include all toxicity information and exposure assessment equations used for the site-specific scenario as well as the sources for that information. Other regulatory levels applicable to screening the site, such as drinking water MCLs and WQCC standards, shall also be included in the risk analysis.

4.4 CORRECTIVE MEASURES STUDY

4.4.1 General

The Secretary will require corrective measures at a site if the Secretary determines, based on the Investigation Report and other information available to the Secretary, that there has been a release of petroleum-related constituents, hazardous waste or hazardous waste constituents into the environment at the site and that corrective action is necessary to protect human health or the environment. Upon making such a determination, the Secretary will notify the Permittee.

4.4.2 Corrective Measures Study Report

Within 180 days after receiving notification from the Secretary that a corrective measures study is required, the Permittee shall submit to the Secretary for approval a Corrective Measures Study Report. The Permittee shall follow the Corrective Measures Evaluation Report format outlined in Appendix E.6 of this Permit. The corrective measures study shall evaluate potential remedial alternatives and shall recommend a preferred remedy that will be protective of human health and the environment and attain the appropriate cleanup goals. The Corrective Measures Study Report shall, at a minimum, comply with Appendix E.6 of this Permit and include the following:

a. A description of the location, status, and current use of the site.

b. A description of the history of site operations and the history of releases of petroleum-related and hazardous contaminants.

c. A description of site surface conditions.

d. A description of site subsurface conditions.

e. A description of on- and off-site contamination in all affected media.

f. An identification and description of all sources of petroleum-related and hazardous contaminants.

g. An identification and description of contaminant migration pathways.

h. An identification and description of potential receptors.

i. A description of cleanup standards or other regulatory criteria.

j. An identification and description of a range of remedy alternatives.

k. Remedial alternative pilot or bench scale testing results.

l. A detailed evaluation and rating of each of the remedy alternatives, applying the criteria set forth in Appendix E.6.j and I.C.4.

m. An identification of a proposed preferred remedy or remedies.

n. Preliminary design criteria of the selected remedy or remedies.

o. A proposed schedule for implementation of the preferred remedy.

4.4.3 Cleanup Standards

The Permittee shall select corrective measures that are capable of achieving the cleanup standards and goals outlined in Module IV of this Permit or, if the cleanup standards or goals cannot be achieved, approved risk-based cleanup goals established by a risk analysis.

4.4.4 Remedy Evaluation Criteria

4.4.4.a Threshold Criteria

The Permittee shall evaluate each of the remedy alternatives for the following threshold criteria. To be selected, the remedy alternative must:

a. Be protective of human health and the environment.

b. Attain applicable media cleanup standards.

c. Control the source or sources of releases so as to reduce or eliminate, to the extent practicable, further releases of hazardous waste and hazardous constituents that may pose a threat to human health and the environment.

d. Comply with applicable standards for management of wastes.

4.4.4.b Remedial Alternative Evaluation Criteria

The Permittees shall evaluate each of the remedy alternatives for the factors described in this Section (4.4.4.b). These factors shall be balanced in proposing a preferred alternative.

4.4.4.b.i Long-Term Reliability and Effectiveness

The remedy shall be evaluated for long-term reliability and effectiveness. This factor includes consideration of the magnitude of risks that will remain after implementation of the remedy; the extent of long-term monitoring or other management that will be required after implementation of the remedy; the uncertainties associated with leaving hazardous wastes or hazardous waste constituents in place; and the potential for failure of the remedy. A remedy that reduces risks with little long-term management, and that has proven effective under similar conditions, shall be preferred.

4.4.4.b.ii Reduction of Toxicity, Mobility, or Volume

The remedy shall be evaluated for its reduction in the toxicity, mobility, and volume of petroleum-related constituents, hazardous wastes and hazardous constituents. A remedy that uses treatment to more completely and permanently reduce the toxicity, mobility, and volume of petroleum-related constituents, hazardous wastes and hazardous constituents shall be preferred.

4.4.4.b.iii Short-Term Effectiveness

The remedy shall be evaluated for its short-term effectiveness. This factor includes consideration of the short-term reduction in existing risks that the remedy would achieve; the time needed to achieve that reduction; and the short-term risks that might be posed to the community, workers, and the environment during implementation of the remedy. A remedy that quickly reduces short-term risks, without creating significant additional risks, shall be preferred.

4.4.4.b.iv Implementability

The remedy shall be evaluated for its implementability, or the difficulty of implementing the remedy. This factor includes consideration of installation and construction difficulties; operation and maintenance difficulties; difficulties with cleanup technology; permitting and approvals; and the availability of necessary equipment, services, expertise, and storage and disposal capacity. A remedy that can be implemented quickly and easily, and poses fewer and lesser difficulties, shall be preferred.

4.4.4.b.v Cost

The remedy shall be evaluated for its cost. This factor includes a consideration of both capital costs, and operation and maintenance costs. Capital costs shall include, without limitation, construction and installation costs; equipment costs; land development costs; and indirect costs including engineering costs, legal fees, permitting fees, startup and shakedown costs, and contingency allowances. Operation and maintenance costs shall include, without limitation, operating labor and materials costs; maintenance labor and materials costs, replacement costs; utilities, monitoring and reporting costs; administrative costs; indirect costs; and contingency allowances. All costs shall be calculated based on their net present value. A remedy that is less costly, but does not sacrifice protection of health and the environment, shall be preferred.

4.4.5 Approval of Corrective Measures Evaluation Report

If the Secretary disapproves the Corrective Measures Study Report, the Secretary will notify the Permittee in writing of the Corrective Measures Study's deficiencies and specify a due date for submission of a revised Corrective Measures Study Report. Upon receipt of such notification of disapproval, the Permittee shall submit to the Secretary, within the specified time, a revised Corrective Measures Study Report that corrects the deficiencies. If the Secretary approves the Corrective Measures Study Report, the Secretary will notify the Permittee in writing.

4.4.6 Statement of Basis

Upon approval of the Corrective Measures Study and remedy selection, the Secretary will select a remedy or remedies for the subject unit. The Secretary will issue a Statement of Basis for selection of the remedy, and will receive public comment on the remedy. The public comment period will extend for 60 days from the date of the public notice of the Statement of Basis. The Secretary will select a final remedy and issue a response to public comments within 90 days, or other appropriate time, after the end of the public comment period.

4.5 CORRECTIVE MEASURES IMPLEMENTATION

4.5.1 General

The Permittee shall implement the final remedy selected by the Secretary.

4.5.2 Corrective Measures Implementation Plan

Within 90 days after the Secretary's selection of a final remedy, or such other time as the Secretary determines, the Permittee shall submit to the Secretary for approval a Corrective Measures Implementation Plan outlining the design, construction, operation, maintenance, and performance monitoring for the selected remedy, and a schedule for its implementation. The Corrective Measures Implementation Plan shall, at a minimum, include the following elements:

a. A description of the selected final remedy.

b. A description of the cleanup goals and remediation system objectives.

c. An identification and description of the qualifications of all persons, consultants, and contractors that will be implementing the remedy.

d. Detailed engineering design drawings and systems specifications for all elements of the remedy.

e. A construction work plan.

f. An operation and maintenance plan.

g. The results of any remedy pilot tests.

h. A plan for monitoring the performance of the remedy, including sampling and laboratory analysis of all affected media.

i. A waste management plan.

j. A proposed schedule for submission to the Secretary of periodic progress reports.

k. A proposed schedule for implementation of the remedy.

4.5.3 Health and Safety Plan

The Permittee shall conduct all activities in accordance with the Health and Safety Plan as described in the most recent versions of Navajo Refining Company's Work Permit System (Safe Work-Hazardous Assessment, Hot Work Plan, Confined Space Entry Plan, Excavation Permit and Emergency Plan) during all construction, operation, maintenance, and monitoring activities conducted during corrective measures implementation.

4.5.4 Progress Reports

The Permittee shall submit to the Secretary progress reports in accordance with the schedule approved in the Corrective Measures Implementation Plan. The progress reports shall, at a minimum, include the following information:

a. A description of the remedy work completed during the reporting period.

b. A summary of all problems, potential problems, or delays encountered during the reporting period.

c. A description of all actions taken to eliminate or mitigate the problems, potential problems, or delays.

d. A discussion of the remedy work projected for the next reporting period, including all sampling events.

e. Copies of the results of all monitoring, including sampling and analysis, and other data generated during the reporting period.

f. Copies of all waste disposal records generated during the reporting period.

4.5.5 Remedy Completion

4.5.5.a Remedy Completion Report

Within ninety (90) days after completion of remedy, the Permittee shall submit to the Secretary a Remedy Completion Report. The report shall, at a minimum, include the following items:

a. A summary of the work completed.

b. A statement, signed by a registered professional engineer, that the remedy has been completed in full satisfaction of the terms of this Permit.

c. As-built drawings and specifications signed and stamped by a registered professional engineer.

d. Copies of the results of all monitoring, including sampling and analysis, and other data generated during the remedy implementation, if not already submitted in a progress report.

e. Copies of all waste disposal records, not already submitted in a progress report.

f. A certification, signed by a responsible official of Navajo Refining Company, stating: "To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this report is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

4.5.5.b Certification of Completion

Upon receipt of the Remedy Completion Report, the Secretary will determine whether the remedy has been completed in full satisfaction of the terms of this Permit. The Secretary may conduct an inspection of the site or unit, or request additional information from the Permittee, to make this determination. If the Secretary determines that the remedy has not been satisfactorily completed, it will notify the Permittee in writing of the actions that are necessary to complete the remedy. The Permittee shall implement such actions in accordance with the notification. If the Secretary

determines that the remedy has been satisfactorily completed, it will issue to the Permittee a written Certification of Completion of the remedy for that site or unit.

4.6 CORRECTIVE ACTION FOR REGULATED UNITS

4.6.1 North Colony Landfarm (NCL)

4.6.1.a Corrective Action for Soil

a. The Permittee shall comply with the sampling strategy for soils, consisting of a sampling program and, if necessary, further characterization, as described in this Permit Module and the Permit Appendices. The Permittee shall notify NMED if there is a statistically significant increase in concentrations of petroleum-related constituents or hazardous constituents in the soils located in the treatment zone (non-native soils present in the NCL at depths above the contact with native soils) [20.4.1.500 NMAC incorporating 40 CFR 264.278].

b. If the Permittee demonstrates attainment of soil remediation standards for land treatment units in accordance with 20.4.1.500 NMAC incorporating 40 CFR 264.271 and demonstrates that soil and groundwater quality beneath and down gradient of the NCL meets the applicable requirements for soil and groundwater cleanup in accordance with 20.4.1.500 NMAC incorporating 40 CFR 264 Subpart F, NMED soil screening guidelines, NMED TPH cleanup guidance, OCD soil cleanup guidelines outlined in 19.15 NMAC, and WQCC groundwater cleanup standards outlined in 20 6 2.3103 NMAC then the Permittee may submit a request to the Secretary to shorten the post-closure care period in accordance with 20.4.1.500 NMAC incorporating 40 CFR 264.117(a)(2)(i). The Secretary may extend the post-closure care period applicable to the NCL the Secretary determines that soil or groundwater cleanup goals have not been attained or if an extended period is necessary to protect human health and the environment. [20.4.1.500 NMAC incorporating 40 CFR 264.117(a)(2)(ii)]

4.6.1.b Corrective Action for Groundwater

The Permittee shall comply with the monitoring program for groundwater specified in this Permit Module (4); and in accordance with the requirements of 20.4.1.500 NMAC incorporating 40 CFR Part 264, Subpart F and the WQCC standards included in 20 6.2 NMAC. The Permittee shall recover phase-separated hydrocarbons, where present, beneath the NCL and both up gradient and down gradient from the subject unit.

a. General Requirements

i. Groundwater Protection Standard

(a)Hazardous Constituents. The Permittee shall monitor at the locations, frequencies, and for the hazardous constituents specified in 20.6.2.3103 NMAC and the constituents listed in 20.4.1.500 NMAC Appendix IX that are included in Appendix B of this permit [the modified Skinner List (Exhibit 3, EPA RCRA Delisting Program Guidance Manual for the Petitioner, March 23, 2000]. Groundwater sampling at and in the vicinity of the NCL will include chemical analyses for the

modified Skinner List analytes including, but not limited to, the following petroleum-related and hazardous constituents:

Benzene

Ethylbenzene

Toluene

Total Xylenes

PAHs as total Naphthalene plus monomethylnaphthalenes

Bis(2-ethylhexyl)phthalate (DEHP)

Arsenic

Lead

Chromium [20.4.1.500 NMAC (incorporating 40 CFR 264.93)

The Permittee also shall analyze groundwater samples at the NCL for DRO and for general chemistry parameters included in 20.6.2.3103 NMAC.

(b)Concentration Limits. The maximum concentrations of hazardous constituents in groundwater shall not exceed the lesser of WQCC standards or the EPA MCLs (incorporating 40 CFR Part 141) and include:

Benzene	5µg/L
Ethylbenzene	700µg/L
Toluene	750µg/L
Total Xylenes	620µg/L
PAHs [as total Naphthalene plus monomethylnaphthalenes]	30µg/L
DEHP	6µg/L
Lead	15µg/L
Arsenic	50µg/L
Chromium	50µg/L

[20.4.1.500 NMAC incorporating 40 CFR 264.94]

The EPA Region VI Human Health Medium-Specific Screening Level for Tap Water shall be considered the concentration limit in groundwater for those constituents for which a MCL or WQCC standard has not been established.

(c)Point of Compliance. The concentration limits referenced in Permit Condition 4.6.1.b(b) shall apply at and down gradient from the intercept of the uppermost aquifer and monitoring wells NCL-32, NCL-33, NCL-34 and NCL-44. [20.4.1.500 NMAC incorporating 40 CFR 264.95]

(d) The Permittee shall continue to conduct compliance monitoring until the post-closure care period is complete pursuant to 20.4.1.900 NMAC incorporating 40 CFR 264.99(b) and 270.14 (c)(7). Compliance monitoring shall continue until the groundwater protection standard as defined in 4.6.1.b.a. has been achieved for a period of three years. [20.4.1.500 NMAC incorporating 40 CFR 264.100 (f)]

(e) If the Permittee or the Secretary determines that the Compliance Monitoring Program established by this Permit no longer satisfies the requirements of RCRA, the HWA, and pursuant regulations, then the Permittee shall submit an application for a Permit modification, within 90 days of making such determination, to make any appropriate changes to the program. [20.4.1.500 NMAC (incorporating 40 CFR 264.100(h))]

ii. Groundwater Monitoring

(a) The Permittee shall maintain a ground water monitoring program to demonstrate the effectiveness of the corrective action program for groundwater and that meets the requirements of 20.4.1.500 NMAC (incorporating 40 CFR 264.97).

(b) The Permittee shall maintain groundwater monitoring wells at the locations of the compliance points and at the locations of monitoring wells NCL-49, MW-18, MW-45, MW-53, MW-54A, MW-55, MW-56 and B-3 and at all additional locations required by the Secretary. [20.4.1.500 and 900 NMAC incorporating 40 CFR 264.97 and 270.14(c)]

(c) The Permittee shall monitor the wells listed in 4.1.2.b.a.i(c) and 4.1.2.b.a.ii(b) above for the hazardous constituents on a semi-annual basis during the post-closure care period pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.93 and submit groundwater monitoring reports to the Secretary in the format described in Appendix E of this Permit. The Secretary may require groundwater monitoring at additional locations and intervals.

(d) The Permittee shall determine the groundwater flow rate and direction in the uppermost aquifer each time groundwater is sampled. [20.4.1.500 NMAC (incorporating 40 CFR 264.98)]

iii. Groundwater Surface Elevation

The Permittee shall determine the ground-water surface elevation each time groundwater is sampled at each well and at least on a semi-annual basis. [20.4.1.500 NMAC (incorporating 40 CFR 264.97(f))]

iv. Sampling and Analysis Procedures

The Permittee shall comply with the procedures specified in Appendices C and D of this Permit when obtaining and analyzing samples from the ground water monitoring wells. [20.4.1.500 NMAC incorporating 40 CFR 264.97(d) and (e)]

Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity [20.4.1.900 NMAC incorporating 40 CFR 270.30(j)(1)]. The method used to obtain a representative sample to be analyzed shall be the appropriate method from Appendix I of 40 CFR Part 261 or an equivalent method approved by the Secretary. Laboratory methods must be those specified in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846, Standard Methods of Wastewater Analysis or an equivalent method approved by the Secretary.

v. Statistical Procedures

When evaluating the monitoring results to determine the effects of corrective action measures using statistical evaluation, the Permittee shall comply with the procedures specified in 20.4.1.500 NMAC [incorporating 40 CFR 264.97(h) and 264.97(i)(1), (5) and (6)], if statistical evaluation is determined to be appropriate by the Secretary.

vi. Record Keeping and Reporting

The Permittee shall enter all monitoring, testing and analytical data obtained in the operating record. The data must include all computations, calculated means, variances, and results of the statistical tests specified in Permit Condition 4.6.1.b.a.ii(g) above. [20.4.1.500 NMAC (incorporating 40 CFR 264.97)]

The Permittee shall submit a written report to the Secretary summarizing the results of the groundwater monitoring and sampling program [20. 4.1.500 NMAC incorporating 40 CFR 264.77(c) and 264.100(g)] within 90 days after the completion of field activities for each monitoring event. The reports shall be submitted in the format described in Appendix E of this Permit.

vii. Well Replacement and Abandonment

The Permittee shall replace any groundwater monitoring well removed from service with a monitoring well located as close to the abandoned well as practicable. The Permittee shall submit the proposed location and construction specifications for the new well to the Secretary for prior approval.

The Permittee shall report the surveyed location and elevation of a new monitoring well when the well is installed.

The Permittee shall obtain approval from the Secretary to delete wells from the monitoring program. Wells deleted from the monitoring program shall be plugged and abandoned by the Permittee so as to ensure that the abandoned well will not serve to transport contaminants to the aquifer. The Permittee shall submit well plugging and abandonment specifications to the Secretary for approval prior to abandoning the well.

b. Corrective Action Program for Releases from the North Colony Landfarm

If the Permittee determines, pursuant to Permit Condition 4.6.1.a and 4.6.1.b, that there is a statistically significant increase of hazardous or regulated constituents in the soils below the treatment zone, the Permittee shall notify the Secretary of this finding in writing within seven calendar days, indicating which constituents have shown statistically significant increases. If the Permittee makes such a determination then the Permittee shall apply for a permit modification within 90 days to address corrective action to mitigate migration of hazardous or regulated constituents from the NCL. [20.4.1.500 NMAC incorporating 40 CFR 264.278 (f), (g) and (h)] The Permittee is not required to submit the permit modification required by Permit Condition 4.1. if he successfully demonstrates in writing to the Secretary, within 90 days, that a source other than the regulated unit caused the increase or that the increase resulted from an error in sampling, analysis or evaluation. If the Permittee intends to make such demonstration, the Permittee shall:

(a) Notify the Secretary in writing within seven (7) calendar days of determining a statistically significant increase below the treatment zone that he intends to make a determination under this paragraph;

(b) Within 90 days, submit a report to the Secretary demonstrating that a source other than the regulated units caused the increase or that the increase resulted from errors in sampling, analysis or evaluation;

(c) Within 90 days, submit to the Secretary an application for a permit modification to make any appropriate changes to the treatment zone monitoring program at the facility;

(d) Continue to monitor in accordance with the monitoring program established under this section. [20.4.1.500 NMAC incorporating 40 CFR 264.278(h)]; and

(e) Within 90 days, submit to the Secretary a work plan for corrective action prepared in the format described in Appendix E of this permit, to investigate and remediate the alternate source of the increase in hazardous constituents beneath or down gradient from the regulated unit.

4.6.2 Tetra Ethyl Lead Impoundment (TEL)

4.6.2.a Corrective Action for Soil

The Permittee shall identify and characterize the source of petroleum-related or hazardous constituents detected in soils and groundwater beneath and in the vicinity of the TEL. The Permittee shall submit a work plan to the Secretary to characterize soils in areas surrounding and upgradient from the TEL in order to identify the source, magnitude and extent of petroleum-related and hazardous constituents in the vicinity of the unit. The work plan shall be prepared in accordance with the format described in Appendix E of this Permit.

The Permittee shall notify NMED if there is a statistically significant increase in petroleum-related or hazardous constituents in the groundwater or soils beneath the TEL and/or upgradient or downgradient from the TEL. [20.4.1.500 NMAC incorporating 40 CFR 264 Subpart F].

If the Permittee demonstrates compliance for surface impoundments with waste residues or contaminated materials left in place after final closure in accordance with 20.4.1.500 NMAC (incorporating 40 CFR 264.228(b)) and demonstrates that soil and groundwater quality beneath, up gradient and down gradient of the TEL meets the requirements for soil and groundwater cleanup in accordance with 20.4.1.500 NMAC (incorporating 40 CFR 264 Subpart F), HWB soil cleanup guidelines, OCD soil cleanup guidelines included in 19.15 NMAC, and WQCC groundwater cleanup standards, incorporating 20.6.2.3103 NMAC, then the Permittee may submit a request to the Secretary to shorten the post-closure care period pursuant to 20.4.1.500 NMAC incorporating 40 CFR 264.117(a)(2)(i). The Secretary may extend the post-closure care period applicable to the TEL if the Secretary determines that soil and groundwater cleanup goals have not been attained or if an extended period is necessary to protect human health and the environment. [20.4.1.500 NMAC incorporating 40 CFR 264.117(a)(2)(ii)]

4.6.2.b Corrective Action for Groundwater

The Permittee shall comply with the monitoring program for groundwater specified in this Permit, 20.4.1.500 NMAC incorporating 40 CFR Part 264, Subpart F, and the WQCC standards included in 20.6.2.3103 NMAC. The Permittee shall recover phase-separated hydrocarbons, where present, beneath the unit and both up gradient and down gradient from the TEL.

a. General Requirements

i. Groundwater Protection Standard

(a) Hazardous Constituents. The Permittee shall monitor at the locations, frequencies, and for the hazardous constituents specified in 20.6.2.3103 NMAC and the constituents listed in 20.4.1.500 NMAC Appendix IX that are included in Appendix B of this permit [the modified Skinner List (Exhibit 3, EPA RCRA Delisting Program Guidance Manual for the Petitioner, March 23, 2000]. Groundwater sampling at and in the vicinity of the TEL will include chemical analyses for the modified Skinner List analytes including, but not limited to, the constituents of concern listed in Section 4.6.1.b.a.i.(a) of this Permit, GRO, DRO and the general chemistry parameters required by 20.6.2.3103 NMAC.

(b) Concentration Limits. The maximum concentrations of hazardous constituents in the groundwater shall not exceed the lesser of WQCC standards or the EPA MCLs as listed in Section 4.6.1.b.a.i.(b) of this Permit. The EPA Region VI Human Health Medium-specific Screening Level for Tap Water shall be considered the concentration limit in groundwater for those constituents for which a MCL or WQCC standard has not been established.

(c) Point of Compliance. The concentration limits included in Permit Condition 4.6.1.b.a.i.(b) shall apply at and down gradient from the intercept of the uppermost aquifer and monitoring wells TEL-1, TEL-2, and TEL-3. [20.4.1.500 NMAC (incorporating 40 CFR 264.95)]

(d) The Permittee shall continue the compliance monitoring program until the post-closure care period is complete [20.4.1.900 NMAC (incorporating 40 CFR 264.99(b) and 270.14 (c)(7))]. Compliance monitoring shall continue until the groundwater protection standard as defined in

4.6.1.b.a.i.(b) has been achieved for a period of three years. [20.4.1.500 NMAC incorporating 40 CFR 264.100 (f)]

(e) If the Permittee or the Secretary determines that the compliance monitoring program established by this Permit no longer satisfies the requirements of RCRA, the HWA, and pursuant regulations, then the Permittee shall submit an application for a Permit modification, within 90 days of the Secretary's determination, to make any appropriate changes to the program. [20.4.1.500 NMAC incorporating 40 CFR 264.100(h)]

ii. Groundwater Monitoring

(a) The Permittee shall maintain a groundwater monitoring program to demonstrate the effectiveness of the Corrective Action Program for groundwater and that meets the requirements of 20.4.1.500 NMAC incorporating 40 CFR 264.97.

(b) The Permittee shall maintain groundwater monitoring wells at the locations of the compliance points and at the locations of monitoring wells TEL-4, MW-49 and at all additional locations required by the Secretary. [20.4.1.500 and 900 NMAC incorporating 40 CFR 264.97 and 270.14(c)]

(c) The Permittee shall monitor the wells listed in 4.6.2.b.a.i(c) and 4.6.2.b.a.ii(b) above for petroleum-related and hazardous constituents on a semi-annual basis during the post-closure care period [20.4.1.500 NMAC (incorporating 40 CFR 264.93)] and submit groundwater monitoring reports to the Secretary in the format described in Appendix E of this Permit. The Secretary may require groundwater monitoring at additional locations and intervals.

(d) The Permittee shall determine the groundwater flow rate and direction in the uppermost aquifer each time groundwater is sampled or at least semi-annually. [20.4.1.500 NMAC incorporating 40 CFR 264.98]

iii. Groundwater Surface Elevation

The Permittee shall determine the ground-water surface elevation at each well each time groundwater is sampled or, at a minimum, on a semi-annual basis. [20.4.1.500 NMAC incorporating 40 CFR 264.97(f)]

iv. Sampling and Analysis Procedures

The Permittee shall comply with the procedures specified in Appendices C and D of this Permit when obtaining and analyzing samples from the groundwater monitoring wells. [20.4.1.500 NMAC incorporating 40 CFR 264.97(d) and (e)]

Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity [20.4.1.900 NMAC incorporating 40 CFR 270.30(j)(1)]. The method used to obtain a representative sample to be analyzed shall be the appropriate method from Appendix I of 40 CFR Part 261 or an equivalent method approved by the Secretary. Laboratory methods must be those specified in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846, Standard Methods of Wastewater Analysis or an equivalent method approved by the Secretary.

v. Statistical Procedures

When evaluating the monitoring results to determine the effects of corrective action measures that include statistical evaluation, the Permittee shall comply with the procedures specified at in 20.4.1.500 NMAC, incorporating 40 CFR 264.97(h) and 264.97(i)(1), (5) and (6), if statistical evaluation is determined to be appropriate by the Secretary.

vi. Record Keeping and Reporting

The Permittee shall enter all monitoring, testing and analytical data obtained in the operating record. The data must include all computations, calculated means, variances, and results of the statistical tests specified in Permit Condition 4.6.2.b.a.ii(g) above. [20.4.1.500 NMAC incorporating 40 CFR 264.97]

The Permittee shall submit a written report to the Secretary summarizing the results of the groundwater monitoring and sampling program [20. 4.1.500 NMAC (incorporating 40 CFR 264.77(c) and 264.100(g)] within 90 days after the completion of field activities for each monitoring event. The reports shall be submitted in the format described in Appendix E of this Permit.

vii. Well Replacement and Abandonment

The Permittee shall replace any groundwater monitoring well removed from service with a monitoring well located as close to the abandoned well as practicable. The Permittee shall submit the proposed location and construction specifications for the new well to the Secretary for prior approval.

The Permittee shall report the surveyed location and elevation of a new monitoring well when the well is installed.

The Permittee shall obtain approval from the Secretary to delete wells from the monitoring program. Wells deleted from the monitoring program shall be plugged and abandoned by the Permittee so as to ensure that the abandoned well will not serve to transport contaminants to the aquifer. The Permittee shall submit well plugging and abandonment specifications to the Secretary for approval prior to abandoning the well.

b. Corrective Action Program for Releases from the Tetra Ethyl Lead Impoundment

If the Permittee determines, pursuant to Permit Condition 4.6.1.a and 4.6.1.b that there is a statistically significant increase of petroleum-related or hazardous constituents in the soils below the TEL, the Permittee shall notify the Secretary of this finding in writing within seven calendar days, indicating which constituents have shown statistically significant increases. The Permittee shall apply for a permit modification, within 90 days of making the determination, to address corrective action to mitigate migration of petroleum-related or hazardous constituents from the TEL [20.4.1.500 NMAC incorporating 40 CFR 264.278 (f), (g) and (h)]. The Permittee need not submit the permit modification required by this Permit Condition if the Permittee successfully demonstrates in writing to the Secretary, within 90 days, that a source other than the regulated unit caused the increase or that the increase resulted from an error in sampling, analysis or evaluation. If the Permittee intends to make such a demonstration, the Permittee shall:

(a) Notify the Secretary in writing within seven calendar days of determining a statistically significant increase below the unit that he intends to make a determination under this paragraph;

(b) Within 90 days, submit a report to the Secretary demonstrating that a source other than the regulated units caused the increase or that the increase resulted from errors in sampling, analysis or evaluation;

(c) Within 90 days, submit to the Secretary an application for a permit modification to make any appropriate changes to the monitoring program at the facility;

(d) Continue to monitor in accordance with the monitoring program established under this section. [20.4.1.500 NMAC incorporating 40 CFR 264.278(h)]; and

(e) Within 90 days, submit to the Secretary a work plan for corrective action, prepared in the format described in Appendix E of this permit, to investigate and remediate the alternate source of the increase in hazardous and/or regulated constituents beneath or downgradient from the regulated unit.

4.6.3 Evaporation Ponds

4.6.3.a Corrective Action for Soil

a. The Permittee shall identify and characterize the source of petroleum-related or hazardous constituents detected in soils and groundwater beneath and in the vicinity of the Evaporation Ponds. The Permittee shall prepare a work plan for submittal to the Secretary to characterize soils and groundwater beneath and in areas surrounding the Evaporation Ponds and downgradient from the unit in order to identify the source, magnitude and extent of hazardous and/or other regulated constituents at and in the vicinity of the unit. The work plan shall be prepared in accordance with the format described in Appendix E of this Permit. The Permittee shall notify NMED if there is a statistically significant increase in petroleum-related or hazardous constituents in the groundwater beneath the Evaporation Ponds and/or down gradient from the Evaporation Ponds [20.4.1.500 NMAC incorporating 40 CFR 264 Subpart F]. The minimum requirements for characterization of soil and groundwater at and in the vicinity of the Evaporation Ponds are described in this Section.

b. If the Permittee demonstrates compliance for surface impoundments with waste residues or contaminated materials left in place after final closure pursuant to 20.4.1.500 NMAC, incorporating 40 CFR 264.228(b), and demonstrates that soil and groundwater quality beneath and downgradient of the Evaporation Ponds meets the requirements for soil and groundwater cleanup in accordance with 20.4.1.500 NMAC (incorporating 40 CFR 264 Subpart F), HWB soil cleanup guidelines, OCD soil cleanup guidelines included in 19.15 NMAC, and WQCC groundwater cleanup standards included in 20.6.2.3103 NMAC, then the Permittee may submit a request to the Secretary to shorten the post-closure care period in accordance with 20.4.1.500 NMAC incorporating 40 CFR 264.117(a)(2)(i). The Secretary may extend the post-closure care period applicable to the Evaporation Ponds if it is determined that soil and groundwater cleanup goals have not been attained or if an extended period is necessary to protect human health and the environment [20.4.1.500 NMAC incorporating 40 CFR 264.117(a)(2)(ii)]

4.6.3.b Corrective Action for Groundwater

The Permittee shall comply with the Detection and Compliance Monitoring Program for groundwater specified in this Permit Module and in accordance with the requirements of 20.4.1.500 NMAC, incorporating 40 CFR Part 264 Subpart F, and the WQCC standards included in 20.6.2.3103 NMAC. The Permittee shall recover phase-separated hydrocarbons, where present, beneath the unit and down gradient from the unit. The Permittee shall prepare a work plan for submittal to the Secretary to characterize soils and groundwater beneath and in areas surrounding the Evaporation Ponds and downgradient from the unit in order to identify the source, magnitude and extent of hazardous constituents at and in the vicinity of the unit. The work plan shall be prepared in accordance with the format described in Appendix E of this Permit.

a. General Requirements

i. Groundwater Protection Standard

(a) Hazardous Constituents. The Permittee shall monitor at the locations, frequencies, and for the hazardous constituents specified in 20.6.2.3103 NMAC and the constituents listed in 20.4.1.500 NMAC Appendix IX that are included in Appendix B of this permit [the modified Skinner List (Exhibit 3, EPA RCRA Delisting Program Guidance Manual for the Petitioner, March 23, 2000]. Groundwater sampling at and in the vicinity of the Evaporation Ponds will include chemical analyses for the modified Skinner List analytes including, but not limited to, the constituents of concern listed in Section 4.6.1.b.a.i.(a) of this Permit, GRO, DRO and the general chemistry parameters required by 20.6.2.3103 NMAC.

(b) Concentration Limits. The maximum concentrations of hazardous constituents in the groundwater shall not exceed the lesser of WQCC standards or the EPA MCLs as listed in Section 4.6.1.b.a.i.(b) of this Permit. The EPA Region VI Human Health Medium-specific Screening Level for Tap Water shall be considered the concentration limit in groundwater for those constituents for which a MCL or WQCC standard has not been established.

(c) Point of Compliance. The concentration limit in Permit Condition 4.6.1.b.a.i.(b) shall apply at and downgradient from the intercept of the uppermost aquifer and monitoring wells MW-2A, MW-3, MW-4A, MW-5A, MW-6A, MW-7, OCD-7A and OCD-8A. [20.4.1.500 NMAC incorporating 40 CFR 264.95] The Secretary shall modify the number and locations of the Point of Compliance monitoring wells after completion of site characterization and other corrective action activities at the Evaporation Ponds.

(d) The Permittee shall continue the compliance monitoring program until the post-closure care period is complete. [20.4.1.900 NMAC incorporating 40 CFR 264.99(b) and 270.14 (c)(7)] Compliance monitoring shall continue until the groundwater protection standard as defined in 4.6.1.b.a.i.(b) has been achieved for a period of three years. [20.4.1.500 NMAC incorporating 40 CFR 264.100 (f)]

(e) If the Permittee or the Secretary determines that the compliance monitoring program established by this Permit no longer satisfies the requirements of RCRA or the HWA, and pursuant regulations,

then the Permittee shall submit an application for a Permit modification, within 90 days of making the determination, to make any appropriate changes to the program. [20.4.1.500 NMAC incorporating 40 CFR 264.100(h)]

ii. Groundwater Monitoring

(a) The Permittee shall maintain a groundwater monitoring program to demonstrate the effectiveness of the corrective action program for groundwater and that meets the requirements of 20.4.1.500 NMAC incorporating 40 CFR 264.97.

(b) The Permittee shall maintain groundwater monitoring wells at the locations of the compliance points and at the locations of monitoring wells OCD-1, OCD-2A, OCD-3, OCD-4, OCD-6, OCD-7, MW-10, MW-11A, MW-15, MW-18A, MW-19, MW-22A and at all additional locations required by the Secretary [20.4.1.500 and 900 NMAC incorporating 40 CFR 264.97 and 270.14(c)]. The Secretary shall modify the number and location of the additional monitoring wells after completion of site characterization and other corrective action activities at the Evaporation Ponds.

(c) The Permittee shall monitor the wells listed in 4.6.3.b.a.i(c) and 4.6.3.b.a.ii(b) above for the hazardous constituents on a semi-annual basis during the post-closure care period [20.4.1.500 NMAC incorporating 40 CFR 264.93] and submit groundwater monitoring reports to the Secretary in the format described in Appendix E of this Permit Module. The Secretary shall modify the monitoring frequency after completion of site characterization and corrective action at the Evaporation Ponds. The Secretary may require groundwater monitoring at additional locations and intervals.

(d) The Permittee shall determine the groundwater flow rate and direction in the uppermost aquifer each time groundwater is sampled or, at a minimum, semi-annually [20.4.1.500 NMAC incorporating 40 CFR 264.98].

iii. Groundwater Surface Elevation

The Permittee shall determine the ground-water surface elevation at each well each time groundwater is sampled or, at a minimum, on a semi-annual basis. [20.4.1.500 NMAC incorporating 40 CFR 264.97(f)]

iv. Sampling and Analysis Procedures

The Permittee shall comply with the procedures specified in Appendices C and D of this Permit when obtaining and analyzing samples from the ground water monitoring wells [20.4.1.500 NMAC incorporating 40 CFR 264.97(d) and (e)].

Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity [20.4.1.900 NMAC incorporating 40 CFR 270.30(j)(1)]. The method used to obtain a representative sample to be analyzed shall be the appropriate method from Appendix I of 40 CFR Part 261 or an equivalent method approved by the Secretary. Laboratory methods must be those specified in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846, Standard Methods of Wastewater Analysis or an equivalent method approved by the Secretary.

v. Statistical Procedures

When evaluating the monitoring results to determine the effects of corrective action measures using statistical evaluation, the Permittee shall comply with the procedures specified at in 20.4.1.500 NMAC [incorporating 40 CFR 264.97(h) and 264.97(i)(1), (5) and (6)], if statistical evaluation is determined to be appropriate by the Secretary.

vi. Record Keeping and Reporting

The Permittee shall enter all monitoring, testing and analytical data obtained in the operating record. The data must include all computations, calculated means, variances, and results of the statistical tests specified in Permit Condition 4.6.3.b.a.ii(g) above. [20.4.1.500 NMAC incorporating 40 CFR 264.97]

The Permittee shall submit a written report to the Secretary summarizing the results of the groundwater monitoring and sampling program [20. 4.1.500 NMAC incorporating 40 CFR 264.77(c) and 264.100(g)] within 90 days after the completion of field activities for each monitoring event. The reports shall be submitted in the format described in Appendix E of this Permit.

vii. Well Replacement and Abandonment

The Permittee shall replace any groundwater monitoring well removed from service with a monitoring well located as close to the abandoned well as practicable. The Permittee shall submit the proposed location and construction specifications for the new well to the Secretary for prior approval.

The Permittee shall report the surveyed location and elevation of a new monitoring well when the well is installed.

The Permittee shall obtain approval from the Secretary to delete wells from the monitoring program. Wells deleted from the monitoring program shall be plugged and abandoned by the Permittee so as to ensure that the abandoned well will not serve to transport contaminants to the aquifer. The Permittee shall submit well plugging and abandonment specifications to the Secretary for approval prior to abandoning the well.

b. Corrective Action Program for Releases from the Evaporation Ponds

The Evaporation Ponds may be closed with residual waste left in place or with a CAMU emplaced for the management or disposal of remediation waste. The Secretary shall impose specific monitoring requirements if a CAMU is constructed at the Evaporation Ponds location. If the Permittee determines, pursuant to Permit Conditions 4.6.1 and 4.6.3 that there is a statistically significant increase of petroleum-related or hazardous constituents in the soils below the Evaporation Ponds, the Permittee shall notify the Secretary of this finding in writing, within seven calendar days of making the determination, indicating which constituents have shown statistically significant increases. The Permittee shall apply for a permit modification, within 90 days of making the determination, to address corrective action to mitigate migration of petroleum-related or hazardous constituents from the Evaporation Ponds [20.4.1.500 NMAC incorporating 40 CFR 264.278 (f), (g) and (h)]. The Permittee need not submit the permit modification required by this Permit Condition if he successfully

demonstrates in writing to the Secretary, within 90 days, that a source other than the regulated unit caused the increase or that the increase resulted from an error in sampling, analysis or evaluation. If the Permittee intends to make such demonstration, the Permittee shall:

(a) Notify the Secretary in writing within seven calendar days of determining a statistically significant increase below the unit that he intends to make a determination under this paragraph;

(b) Within 90 days, submit a report to the Secretary demonstrating that a source other than the regulated units caused the increase or that the increase resulted from errors in sampling, analysis or evaluation;

(c) Within 90 days, submit to the Secretary an application for a permit modification to make any appropriate changes to the monitoring program at the facility;

(d) Continue to monitor in accordance with the monitoring program established under this section. [20.4.1.500 NMAC incorporating 40 CFR 264.278(h)], and

(e) Within 90 days, submit to the Secretary a work plan for corrective action, prepared in the format described in Appendix E of this permit, to investigate and remediate the alternate source of the increase in hazardous constituents beneath or downgradient from the regulated unit.

c. Specific Corrective Action Requirements for Assessment of the Evaporation Ponds

Site characterization is required prior to final closure at the Evaporation Ponds to evaluate for the presence and migration of petroleum-related or hazardous constituents. The Permittee shall prepare a work plan for submittal to the Secretary to characterize soils and groundwater beneath and in areas surrounding the Evaporation Ponds and downgradient from the unit in order to identify the source, magnitude and extent of hazardous and regulated constituents. The work plan shall be prepared in accordance with the format described in Appendix E of this Permit. The work plan shall include proposed investigation locations, sampling and analytical methods and schedules and shall be approved by the Secretary prior to implementation.

The following minimum corrective action requirements shall be conducted at the Evaporation Ponds to evaluate for the presence, nature and extent of hazardous and other regulated constituents in soil and groundwater:

(i) Soil Investigation

The Permittee shall conduct subsurface soil investigations within the boundaries of each pond. Soil borings shall be advanced to minimum depths of five feet below the water table or five feet below the maximum depth of contamination as detected by field screening whichever is deeper.

At a minimum, the Permittee shall advance 15 soil borings within the boundaries of former Pond 1, 32 borings within the boundaries of Pond 2, 12 borings within the boundaries of Pond 3, 25 borings within the boundaries of Pond 5, 8 borings within the boundaries of Pond 6 and 12 borings south of the southern berms of former Ponds 1 and 2. The soil boring locations shall generally be biased

towards the pond influent outfalls and towards downgradient portions of each evaporation pond. The soil boring locations shall be approved by the Secretary prior to the start of field activities.

At a minimum, the Permittee shall collect soil samples 1) at 2-foot intervals, 2) from each boring between the ground surface and a depth of one foot BGS, 3) from the sludge or sediments directly overlying native soil, 4) from the native soil directly underlying the pond sludge or sediments, 5) from the soils located at the water table interface and 6) from the maximum depth of the boring.

The soil samples shall be submitted to an analytical laboratory for chemical analysis of one or more of the following: GRO, DRO, ORO, VOCs, SVOCs and RCRA metals.

The Permittee shall prepare a report summarizing the results of the soil investigation in the format described in Appendix E of this Permit within 150 days of the completion of field activities at the Evaporation Ponds.

(ii) Groundwater Investigation

The Permittee shall collect groundwater samples from each soil boring, described in 4.6.3.b. above, at the completion of drilling. The Permittee also shall collect groundwater samples from all monitoring wells associated with current groundwater monitoring at the Evaporation Ponds and all existing wells associated with former site investigations conducted at and in the vicinity of the unit in conjunction with the drilling activities.

At a minimum, the groundwater samples obtained from the soil borings shall be submitted to an analytical laboratory for chemical analysis for VOCs, GRO, DRO and the general chemistry parameters required by the OCD.

At a minimum, the groundwater samples obtained from the existing monitoring wells shall be submitted to an analytical laboratory for chemical analysis of one or more of the following: VOCs, GRO, DRO, RCRA metals, SVOCs and the general chemistry parameters required by 20.6.2.3103 NMAC.

The Permittee shall prepare a report summarizing the results of the groundwater investigation in the format described in Appendix E of this Permit within 150 days of the completion of field activities at the Evaporation Ponds.

The Permittee shall properly abandon the soil borings at the completion of collection of the required soil and groundwater samples. The results of the investigations will be used by the Secretary to evaluate the need for additional investigation, additional monitoring points, remedial action and/or adjustments to the groundwater monitoring locations, parameters and schedule.

4.7 CORRECTIVE ACTION FOR SWMUs

4.7.1 Applicability

The Conditions of this Part apply to:

(a) The SWMUs and AOCs identified in Appendix A of this Permit.

(b) Any additional SWMUs or AOCs discovered during the course of groundwater monitoring, field investigations, environmental audits, or other means. The terms "discover", "discovery", or "discovered" refer to the date on which the Permittee either: (1) observes evidence of a new SWMU or AOC, (2) observes evidence of a previously unidentified release of hazardous constituents to the environment, or (3) receives information which suggests the presence of a new release of petroleum-related constituents, hazardous waste or hazardous constituents to the environment.

(c) Contamination that has migrated beyond the Facility boundary. The Permittee shall implement corrective action beyond the facility boundary where necessary to protect human health and the environment unless the Permittee demonstrates to the satisfaction of the Secretary that, despite the Permittee's best efforts, as determined by the Secretary, the Permittee was unable to obtain the necessary permission to undertake such actions. The Permittee is not relieved of responsibility to clean up a release that has migrated beyond the facility boundary where off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis. Assurances of financial responsibility for completion of such off-site corrective action will be required.

4.7.2 Notification and Assessment Requirements for Existing and Newly Identified SWMUs and AOCs

The Permittee shall notify the Secretary in writing within 15 calendar days of discovery of any suspected previously unidentified SWMU or AOC. The notification shall include, at a minimum, the location of the SWMU or AOC and all available information pertaining to the nature of the release (e.g., media affected, petroleum-related or hazardous constituents released, magnitude of the release, etc.).

The Permittee shall prepare and submit to the Secretary, within 90 days of notification, a SWMU Assessment Report (SAR) for each SWMU or AOC identified under Permit Section 4.7.1 and this section (4.7.2.). At a minimum, the SAR shall provide the following information:

i. Location of the unit(s) on a topographic map of appropriate scale;

ii. Designation of type and function of the unit(s);

iii. General dimensions, capacities and structural description of the unit(s) (supply any available plans/drawings);

iv. Dates that the unit(s) was operated;

v. Specification of all wastes that have been managed and/or released at/in the unit(s) to the extent available, including any available data on petroleum-related or hazardous constituents in the wastes;

vi. All available information pertaining to any release of hazardous waste or hazardous constituents from such unit(s), including groundwater, soil, air, and surface water data;

Based on the results of the SAR, the Secretary will determine the need for further investigations at the SWMUs or AOCs covered in the SAR. The Secretary will notify the Permittee in writing of the final determination of the status of the suspected SWMU or AOC. If the Secretary determines that further investigation is needed, the Permittee shall submit a work plan for such investigation prepared in the format described in this Permit. If the Secretary determines that further investigation of a SWMU or AOC is required, the Permit will be modified pursuant to 20.4.1.901 NMAC and 40 CFR 270 Subpart D, incorporated by 20.4.1.900 NMAC.

4.7.3 Reporting Planned Changes

The Permittee shall give written notice to the Secretary as soon as possible of any planned physical alterations or additions that may impact or affect known or suspected contamination at or from SWMUs or AOCs.

4.7.4 Notification Requirements for Newly Discovered Releases from SWMUs or AOCs

The Permittee shall notify the Secretary in writing of any newly discovered release(s) of hazardous waste or hazardous constituents from a SWMU or AOC discovered during the course of groundwater monitoring, field investigations, environmental audits, or other means, within 15 days of discovery.

If the Secretary determines that further investigation of a SWMU or AOC is needed, the Permittee shall submit a work plan for such investigation prepared in the format described in this Module (4).

4.7.5 SWMU and AOC Investigations

The Permittee shall conduct site investigations, at the SWMUs and AOCs listed in Appendix A of this Permit and at all newly identified SWMUS and AOCs, to evaluate for the presence, nature and extent of hazardous and regulated constituents [20.4.1.500 NMAC incorporating 40 CFR 264.101]. The Permittee shall prepare an investigation work plan for each SWMU and AOC included in Appendix A of this Permit and any other SWMU or AOC identified by the Secretary in accordance with the format outlined in Appendix E of this Permit. Each work plan shall include all investigation, sampling and monitoring activities proposed for the subject units.

Each investigation work plan shall be submitted to the Secretary for approval. If the Secretary disapproves of a work plan, the Secretary will notify the Permittee, in writing, of the work plan's deficiencies and specify a due date for submittal of a revised work plan. Upon approval by the Secretary, the work plans, and any additions or adjustments therein, shall be incorporated herein by reference and made an enforceable part of this Permit.

The Permittee shall submit a proposed schedule for submittal of the investigation work plans for conducting site characterization activities at each SWMU and AOC listed in Appendix A of this Permit, to the Secretary for approval, within 60 days of the effective date of this Permit. The schedule for submittal of the work plans shall not extend past a maximum of four years from the effective date of this Permit. The Secretary will either approve of disapprove the schedule and order of prioritization for submittal of the work plans for the SWMUs and AOCs listed in Appendix A. If the Secretary disapproves of the schedule or order of prioritization, the Secretary will notify the

Permittee, in writing, of the schedule or prioritization deficiencies and specify a due date for submittal of a revised schedule. Upon approval by the Secretary, the schedule, and any additions or adjustments therein, shall be incorporated herein by reference and made an enforceable part of this Permit. The work plan for conducting site characterization activities at the Evaporation Ponds shall be submitted no later than 90 days after the effective date of this Permit.

4.7.6 GROUNDWATER MONITORING

The Permittee shall conduct Facility-wide groundwater monitoring in accordance with the requirements for corrective action for releases from solid waste management units and for post-closure care of regulated units [20.4.1.500 NMAC (incorporating 40 CFR Subparts F and G)] with the objective of determining whether the migration of contaminated groundwater is under control as defined in the EPA RCRA-info system CA 750 classification "Groundwater Releases Controlled" determination. The objective for the determination is required for compliance with the Government Performance Results Act of 1993 (GPRA). The groundwater monitoring program shall be conducted in accordance with the requirements described in this Permit and shall be conducted in coordination with all existing on- and off-site groundwater monitoring programs.

4.7.6.a BACKGROUND INFORMATION

Within 120 days after the effective date of this Permit, the Permittee shall submit, to the Secretary, updated site plans displaying the locations of all existing on- and off-site monitoring wells, recovery wells, piezometers, water supply wells and other wells located at the refinery, downgradient and cross-gradient from the refinery, and at and in the vicinity of the Evaporation Ponds. All existing wells located between the refinery east to the Pecos River and for the area 1,200 feet south of U.S. Highway 82 between Freeman Avenue and the Pecos River shall be presented on the appropriate site plans. The site plans shall include pertinent geographic and geologic features such as drainages, utility corridors, roads, watercourses, property boundaries, buildings, recovery trenches, oil and gas wells and other relevant structures. All available drilling logs and well construction diagrams shall be included with the submittal.

4.7.6.b GROUNDWATER MONITORING

The Permittee shall conduct on-and off-site groundwater monitoring at the Facility. The Permittee shall submit a groundwater monitoring work plan in accordance with the format described in Appendix E of this Permit within 360 days after the effective date of this Permit. The groundwater monitoring plan shall provide a description of OCD groundwater monitoring requirements as well as including the groundwater monitoring requirements described in this Section and Sections 4.6 and 4.7 of this Permit. The Secretary may adjust the due date for the submittal of the groundwater monitoring work plan based on the requirements of the work plan schedule submittal described in Section 4.7.5 above.

The work plan shall include the specific groundwater monitoring requirements outlined in Sections 4.6 and 4.7.5 of this Permit Module and shall include semi-annual monitoring and sampling of the following existing on- and off-site wells:

i.	MW-8(plant)	MW-16	MW-23(plant)	MW-24 (plant)	MW-28
	MW-29	MW-39	MW-41	MW-42	MW-43
	MW-46	MW-48	MW-50	MW-52	MW-AE
	MW-AH	KWB-2P	KWB-4	KWB-5	KWB-6
	KWB-8	KWB-10			
ii.	KWB-1A	KWB-2A(replacement)		KWB-3A	KWB-7
	KWB-9	KWB-11A	KWB-12A	MW-18(plant)	
	MW-45	MW-25	MW-26	MW-27	
iii.	RA-307	RA-313	RA-314	RA-1227	RA1331
	RA-3156	RA-3353	RA-4196	RA-4798	

Iv All additional wells installed to comply with the requirements of this Permit as required by the Secretary.

The wells shall be monitored and sampled in accordance with the methods described in Appendix C of this Permit. The groundwater samples shall be submitted to an analytical laboratory for chemical analysis of VOCs by EPA Method 8260 or other method approved by the Secretary. Samples obtained from the wells listed in Sections 4.2.6.b (i), (ii) and (iv) also shall be analyzed for RCRA metals (total metals), DRO, SVOCs (if DRO is detected) and major cations/anions on an annual basis.

APPENDIX A

NAVAJO REFINING COMPANY ARTESIA REFINERY POST-CLOSURE CARE PERMIT

SUMMARY OF SOLID WASTE MANAGEMENT UNITS AND AREAS OF CONCERN

I. SWMUs and AOCs requiring further action:

I.A SWMUs requiring further action:

4. Three Mile Ditch and Evaporation Pond 1 (Evaporation Pond 1 was formerly designated as SWMU #5);
6. NCL Container Storage Area (requirements are included in the post-closure care requirements for the North Colony Landfarm regulated unit therefore further action is not required under 20.4.1.500 NMAC incorporating 40 CFR 264.101);
16. Old API Separator;
17. Clarified Slurry Oil Tanks;
18. North API Separator;
19. South API Separator;
20. North Bundle Cleaning Pad;
21. South Bundle Cleaning Pad;
22. Main API Separator;
23. South Alkylation Unit;

I.A AOCs requiring further action:

1. Diesel Tank Farm (Tanks 834 and 838);
2. Former Diesel Storage Tanks at North Plant Process Area;
3. Southeast Tank Farm Area (Tanks 11, 12, 107, 108, 109, 114, 115, 117, 401, 402, 411, 412, 415 and 450 and Tanks 106, 110, 116, 119, 431, 432, 433 and 438);
4. Southwest Tank Farm (Tanks 111, 112, 113, 124, 128, 129, 413, 417, 418, 419 and 434);
5. Crude Tank Farm (Tanks 400, 437 and 439);

A SPECIFIC CORRECTIVE ACTION REQUIREMENTS FOR THREE MILE DITCH AND EVAPORATION POND 1 (SWMU #4)

The specific requirements for investigation of Pond 1 are included in Section 4.1.4 of this Permit. The Permittee shall identify and characterize the source of petroleum-related and hazardous constituents detected in soils and groundwater beneath and in the vicinity of the Three Mile Ditch. The Permittee shall submit to the Secretary for approval a work plan to characterize soils and groundwater beneath the Three Mile Ditch in order to identify the source, magnitude and extent of residual petroleum-related and hazardous constituents at and in the vicinity of the unit. The work plan shall be prepared in accordance with the format described in Appendix E of this Permit.

The following minimum corrective action requirements shall be conducted at the Three Mile Ditch to evaluate for the presence, nature and extent of petroleum-related and hazardous constituents in soil and groundwater at the unit.

(i) Soil Investigation

(a) The Permittee shall conduct subsurface soil investigations within the boundaries of the Three Mile Ditch. Soil borings shall be advanced to minimum depths of five (5) feet below the water table or five (5) feet below the maximum depth of contamination as detected by field screening whichever is deeper.

(b) At a minimum, the Permittee shall advance 30 soil borings at approximately 500-foot intervals along the Three Mile Ditch. The Permittee shall advance eight additional soil borings along Three Mile Ditch at locations east of Bolton Road in the vicinity of sampling points where contamination was detected during previous investigations. The soil borings shall be advanced through the ditch at each location. In addition, soil samples shall be collected from the sludge that formed the banks of the ditch at each boring location. The soil boring locations shall be approved by the Secretary prior to the start of field activities.

(c) At a minimum, the Permittee shall collect soil samples from each boring from the sludge or sediment located at the base of the ditch directly above the contact with native soils, from the native soils located directly below the base of the ditch, from the soils located at the water table interface and from the maximum depth of each boring.

(d) The soil samples shall be submitted to an analytical laboratory for chemical analysis of one or more of the following: GRO, DRO, ORO, VOCs, SVOCs and RCRA metals.

(e) The Permittee shall submit to the Secretary for approval, an investigation report summarizing the results of the investigations in the format described in Appendix E of this Permit within 150 days of the completion of field activities at the Three Mile Ditch.

(i) Groundwater Investigation

(a) The Permittee shall collect groundwater samples from each soil boring, described in B.5.a.(i).a above, at the completion of drilling. The Permittee also shall collect groundwater samples from all existing monitoring wells associated with the Three Mile Ditch in conjunction with the drilling activities. The monitoring wells include MW-1, MW-8, MW-9, MW-15, MW-16, MW-20, MW-21 and MW-25 through MW-29.

(b) At a minimum, Permittee shall submit the groundwater samples obtained from the soil borings to an analytical laboratory for chemical analysis for VOCs, GRO and DRO.

(c) At a minimum, the groundwater samples obtained from the existing monitoring wells shall be submitted to an analytical laboratory for chemical analysis of one or more of the following: VOCs, GRO, DRO, RCRA metals, SVOCs and major cations/anions.

(d) The Permittee shall prepare a report summarizing the results of the investigations in the format described in Appendix E of this Permit within 150 days of the completion of field activities at the Three Mile Ditch.

The Permittee shall properly abandon the soil borings at the completion of collection of the required soil and groundwater samples. The results of the investigations will be used by the Secretary to evaluate the need for additional investigation, additional monitoring points, remedial action and/or groundwater monitoring at the Three Mile Ditch.

APPENDIX B

NAVAJO REFINING COMPANY ARTESIA REFINERY POST-CLOSURE CARE PERMIT

CONSTITUENTS OF CONCERN FOR WASTES FROM PETROLEUM PROCESSES

Reference: Page 29, Exhibit 3, EPA RCRA Delisting Program Guidance Manual for the Petitioner, March 23, 2000

Exhibit 3

CONSTITUENTS OF CONCERN FOR WASTES FROM PETROLEUM PROCESSES

Inorganics

Antimony	Lead
Arsenic	Mercury
Barium	Nickel
Beryllium	Selenium
Cadmium	Silver
Chromium	Vanadium
Cyanide	Zinc

Organics

Acenaphthene	2,4-Dinitrotoluene
Benzene	Di-n-octyl phthalate
Benzo(a)anthracene	1,4-Dioxane
Benzo(b)fluoranthene	Ethylbenzene
Benzo(a)pyrene	Ethylene dibromide
Bis(2-ethylhexyl)phthalate	Fluoranthene
Butyl benzyl phthalate	Fluorene
Carbon disulfide	Indeno(1,2,3-cd)pyrene
Chlorobenzene	Methyl ethyl ketone
Chloroform	Naphthalene
Chrysene	Nitrobenzene
Cresols	Phenol
Dibenz(a,h)anthracene	Pyrene
Di-n-butyl phthalate	Pyridine
1,2-Dichlorobenzene	Styrene
1,4-Dichlorobenzene	Tetrachloroethylene
1,2-Dichloroethane	Toluene
1,1-Dichloroethylene	1,1,1-Trichloroethane
7,12-Dimethylbenz(a)anthracene	Trichloroethylene
2,4-Dimethylphenol	Xylenes (total)

APPENDIX C

NAVAJO REFINING COMPANY ARTESIA REFINERY POST-CLOSURE CARE PERMIT

SAMPLING METHODS AND PROCEDURES

C SAMPLING METHODS AND PROCEDURES

The methods used to conduct investigation, remediation and monitoring activities shall be sufficient to fulfill the requirements of this Permit and provide defensible data for the evaluation of site conditions, the nature and extent of contamination and contaminant migration, and for remedy selection and implementation, where necessary. The methods presented in Appendix C below are minimum requirements for environmental investigation and sampling but are not intended to include all methods that may be necessary to fulfill the requirements of this Permit. The methods for conducting investigations, corrective actions and monitoring at the Facility must be determined based on the unique conditions and contaminants that exist at each location or unit.

.C.1 INVESTIGATION, SAMPLING AND ANALYSES METHODS

C.1.a INTRODUCTION AND PURPOSE

The Investigation, Sampling and Analyses Methods section of this Permit provides minimum requirements for field investigations, sample collection, handling and screening procedures, field and laboratory sample analysis, and quality assurance (QA) procedures for samples of the medium being investigated or tested at the Facility.

The purpose of this section of the Permit is to (1) provide minimum requirements for drilling and sample collection in exploratory borings and other excavations, (2) provide minimum requirements for sampling of the target media, (3) provide minimum requirements for monitoring of groundwater and vadose zone conditions, and (4) identify minimum required screening, analytical and QA procedures that shall be implemented during field sampling activities and laboratory analyses.

The QA procedures referenced in the previous paragraph include (1) the Facility investigation data quality objectives, (2) the requirements for quality assurance/quality control (QA/QC) to be followed during field investigations and by the chemical analytical laboratories, and (3) the methodology for the review and evaluation of the field and laboratory QA/QC results and documentation.

C.2 FIELD EXPLORATION ACTIVITIES

Exploratory borings shall be advanced at locations specified in the work plans referenced in Sections 4.1. and Appendix A of this Permit and at all other locations required by the Secretary. The depths and locations of all exploratory and monitoring well borings shall be specified in the unit-specific work plans submitted to the Secretary for approval prior to the start of the respective field activities.

C.2.a Subsurface Feature/Utility Geophysical Surveys

The Permittee shall conduct surveys, where appropriate, to locate underground utilities, pipelines structures, drums, debris and other buried features in the shallow subsurface prior to the start of field exploration activities. The methods used to conduct the surveys such as magnetometer, ground penetrating radar, resistivity or other methods shall be selected based on the unique characteristics of the site and the possible or suspected underground structures. The results of the surveys shall be included in the investigation reports submitted to the Secretary.

C.2.b Drilling and Soil Sampling

C.2.b.i Drilling

Exploratory and monitoring well borings shall be drilled using the most effective, proven and practicable method for recovery of undisturbed samples and potential contaminants. The Secretary must approve the drilling methods selected for advancement of each boring prior to the start of field activities. Based on the drilling conditions, the borings shall be advanced using one of the following methods:

- Hollow-stem auger
- Direct Push Technology (DPT)
- Air rotary

Hollow-stem auger or DPT drilling methods are preferred based on the local subsurface conditions and the anticipated investigation requirements at the time of Permit issuance.

All drilling equipment shall be in good working condition and capable of performing the assigned task. Drilling rigs and equipment shall be operated by properly trained, experienced and responsible crews. The Permittee and its contractors are responsible for ensuring that imported contaminants are not introduced into the unit under investigation due to malfunctioning equipment or poor housekeeping. The drilling equipment shall be decontaminated before drilling each boring.

Exploratory borings shall be advanced to unit- and location-specific depths specified or approved by the Secretary. The Permittee shall propose drilling depths in the site-specific work plans submitted for each unit. Generally, the borings shall be advanced to the following minimum depths:

1. Five feet below the deepest detected contamination,
2. Five feet below the base of shallow structures,
3. Five feet below the shallow water table,
4. Depths specified by the Secretary based on regional or unit specific data needs.

The Secretary shall be notified as early as is practicable if conditions arise or are encountered that do not allow the advancement of borings to the depths specified by the Secretary so that alternative actions may be discussed. Precautions shall be taken to prevent the migration of contaminants between geologic, hydrologic or other identifiable zones during drilling and well installation activities.

The drilling and sampling shall be accomplished under the direction of a qualified engineer or geologist who shall maintain a detailed log of the materials and conditions encountered in each boring. Sample information and visual observations of the cuttings and core samples shall be recorded on the boring log. Known site features and/or site survey grid markers shall be used as references to locate each boring prior to surveying the location as described in Section C.2.f below. The boring locations shall be measured to the nearest foot, and locations shall be recorded on a scaled site map upon completion of each investigation. Trenching and other exploratory excavation methods shall follow the applicable general procedures outlined in this section. The particular methods proposed for use by the Permittee for subsurface explorations and sampling shall be included in the unit-specific investigation work plan submitted to the Secretary. The Secretary will include any changes or additional requirements for conducting exploratory excavation and sampling activities at the subject unit in their response to the Permittee after review of the investigation work plan.

C.2.b.ii Soil Sampling

Relatively undisturbed discrete soil samples shall be obtained during the advancement of each boring for the purpose of logging, field screening and analytical testing. Generally, the samples shall be collected at the following intervals and depths:

1. Continuously, at 2.5-foot intervals, at 5-foot intervals or as approved by the Secretary,
2. At the depth immediately below the base of the unit structures and at the fill-native soil interface,
3. At the maximum depth of each boring,
4. At the shallow water table,
5. From soil types relatively more likely to sorb or retain contaminants than the surrounding lithologies,
6. At intervals suspected of being source or contaminated zones,
7. At other intervals approved or required by the Secretary.

The sampling interval for the borings may be modified, or samples may be obtained from a specific depth, based on field observations. A decontaminated split-barrel sampler lined with brass sleeves, a continuous coring device or other method approved by the Secretary shall be used to obtain samples during the drilling of each boring.

The split barrel sampler lined with brass sleeves or a coring device is the preferred sampling method for borehole soil, rock and sediment sampling. The following procedures should be followed if a split barrel sampler is used. Upon recovery of the sample, one or more brass sleeves

shall be removed from the split barrel sampler and the open ends of the sleeves shall be covered with Teflon tape or foil and sealed with plastic caps fastened to the sleeves with tape for shipment to the analytical laboratory. If brass sleeves are not used, a portion of the sample shall be placed in precleaned, laboratory-prepared sample containers for laboratory chemical analysis. The use of an Encore® Sampler is preferred by the HWB if sample collection in brass sleeves is not used during collection of soil samples for VOC analysis. The remaining portions of the sample shall be used for logging and field screening, as described in Sections C.2.c and C.2.d below, respectively.

Discrete samples shall be collected for field screening and laboratory analyses. Homogenization of discrete samples collected for analyses other than for VOC analyses shall be performed by the analytical laboratory, if necessary. The Permittee may submit site-specific, alternative methods for homogenization of samples in the field to the Secretary for approval.

Samples to be submitted for laboratory analyses shall be selected based on: (1) the results of the field screening or mobile laboratory analyses, (2) the position of the sample relative to groundwater, suspected releases, and/or site structures or features, (3) the sample location relative to former or altered site features or structures, (4) the stratigraphy encountered in the boring and (5) the specific objectives and requirements of the project. The proposed number of samples and analytical parameters shall be included as part of the unit-specific work plan submitted to the Secretary for approval prior to the start of field investigation activities at each unit. The work plans shall allow for flexibility in modifying the project-specific tasks based on information obtained during course of the investigation. Modifications to site-specific work plan tasks shall be approved by the Secretary prior to implementation.

C.2.b.iii Surface Sampling

Surface samples shall be collected using decontaminated, hand-held stainless steel coring device, shelby tube, thin-wall sampler or other method approved by the Secretary where surface or sediment sampling is conducted without the use of the drilling methods described in Section C.2.a above. The samples shall be transferred to precleaned laboratory prepared containers for submittal to the laboratory. Samples obtained for volatiles analysis shall be collected using Encore® samplers, shelby tubes, thin-wall sampler or other method approved by the Secretary. Except in the case of the use of Encore® samplers, the ends of the samplers shall be lined with Teflon tape or aluminum foil and sealed with plastic caps fastened to the sleeves with tape for shipment to the analytical laboratory.

The physical characteristics of the sediment (such as mineralogy, ASTM or AGI classification, moisture content, texture, color, presence of stains or odors, and/or field screening results), depth where each sample was obtained, method of sample collection and other observations shall be recorded in the field log.

C.2.b.iv. Drill Cuttings (Investigation Derived Waste)

Drill cuttings, excess sample material and purge/development/decontamination fluids [investigation derived waste (IDW)] shall be contained and characterized using methods based on the boring location, boring depth, drilling method and type of contaminants suspected or encountered. An IDW management plan shall be included with the unit-specific investigation work plan submitted to the Secretary for approval prior to the start of field investigations. The Secretary shall approve the method of containment for drill cuttings prior to the start of drilling activities. Borings not completed as groundwater or vapor monitoring wells shall be properly abandoned. Borings completed as monitoring wells shall be constructed in accordance with the requirements described in Section C.2.b.v below.

C.2.b.v. Monitoring Well Construction

C.2.b.v.a Well Construction Materials

Well construction materials shall be selected based on the goals and objectives of the proposed monitoring program and the geologic conditions at the site. The materials selected shall not contribute foreign constituents, or remove constituents of concern from the groundwater. The well construction materials shall be selected based on the tensile strength, compressive strength, and collapse strength of the materials, length of time the monitoring well will be in service, and the material's resistance to chemical and microbiological corrosion.

C.2.b.v.b Well Construction Techniques

The borehole shall be bored, drilled, or augured as close to vertical as possible, and checked with a plumb bob or level. Slanted boreholes shall not be acceptable unless specified in the design. The borehole shall be of sufficient diameter so that well construction can proceed without major difficulties. To assure an adequate size, a minimum 2-inch annular space is required between the casing and the borehole wall (or the hollow-stem auger wall). The 2-inch annular space around the casing will allow the filter pack, bentonite seal, and annular grout to be placed at an acceptable thickness. Also, the 2-inch annular space will allow up to a 1.5-inch outer diameter tremie pipe to be used for placing the filter pack, bentonite seal, and grout at the specified intervals.

It may be necessary to overdrill the borehole so that any soils that have not been removed (or that have fallen into the borehole during augering or drill stem retrieval) will fall to the bottom of the borehole below the depth where the filter pack and well screen are to be placed. Normally, 2 to 5 feet is sufficient for overdrilling shallow wells. The borehole also may be overdrilled to allow for an extra space for a well sump to be installed. If the borehole is overdrilled deeper than desired, it can be backfilled to the designated depth with bentonite pellets or the sand that will be used for the filter pack.

The well casings (riser assembly) shall be secured to the well screen by flush-jointed threads and

placed into the borehole and plumbed by the use of centralizers and/or plumb bob or level. No lubricating oils or grease shall be used on casing threads. Teflon tape may be used to wrap the threads to insure a tight fit and minimize leakage. No glue of any type shall be used to secure casing joints. Teflon "O" rings also may be used to insure a tight fit and minimize leakage; however, "O" rings made of other materials are not acceptable if the well is going to be sampled for organic compound analyses. Before the well screen and casings are placed at the bottom of the borehole, at least 6 inches of filter material shall be placed at the bottom to serve as a firm footing. The string of well screen and casing should then be placed into the borehole and plumbed. Centralizers can be used to plumb a well, but centralizers shall be placed so that the placement of the filter pack, overlying bentonite seal, and annular grout will not be hindered. Centralizers placed in the wrong locations can cause bridging during material placement. If centralizers are used, they shall be placed below the well screen sections and above the bentonite annular seals. After the string of well screen and casing is plumb, the filter material shall be placed around the well screen up to the designated depth. After the filter pack has been installed, the bentonite seal shall be placed directly on top of the filter pack up to the designated depth or a minimum of 2 feet above the filter pack, whichever is greater. After the bentonite seal has hydrated for the specified time, the annular grout shall be placed into the annular space around the casing (riser assembly) up to within 2 feet of the ground surface or below the frost line, whichever is greater. A surface pad and protective steel casing (or monument if the well is flush-mounted) shall be installed to protect the well casing.

C.2.b.v.c Well Screen and Filter Pack Design

Well screens and filter packs shall be designed to accurately sample the aquifer zone that the well is intended to sample, minimize the passage of formation materials (turbidity) into the well, and ensure sufficient structural integrity to prevent the collapse of the intake structure. The selection of the well screen length depends upon the objective of the well. Piezometers and wells where only a discrete flow path is monitored are generally completed with short screens (two feet or less). While monitoring wells are usually constructed with longer screens (usually 5 to 10 feet), they shall be kept to the minimum length appropriate for intercepting a contaminant plume. Wells designed to monitor light non-aqueous phase liquids (LNAPLs) shall be constructed so that the well screen extends across the zone of seasonal high and low water table fluctuation. The screen slot size shall be selected to retain from 90 to 100 percent of the filter pack material in artificially filter packed wells, and from 50 to 100 percent of the formation material in naturally packed wells. All well screens shall be factory slotted.

A filter pack shall be used when: 1) the natural formation is poorly sorted, 2) a long screen interval is required and/or the screen spans highly stratified geologic materials of widely varying grain sizes, 3) the natural formation is uniform fine sand, silt, or clay, 4) the natural formation is thin-bedded, 5) the natural formation is poorly cemented sandstone, 6) the natural formation is highly fractured or characterized by relatively large solution channels, 7) the natural formation is shale or coal that will act as a constant source of turbidity to groundwater samples, and 8) the diameter of the borehole is significantly greater than the diameter of the screen. The use of

natural formation material as filter pack is only recommended when the natural formation materials are relatively coarse-grained, permeable, and uniform in grain size.

Filter pack materials shall consist of clean, rounded to well-rounded, hard, insoluble particles of siliceous composition (industrial grade quartz sand or glass beads). The required grain-size distribution or particle sizes of the filter pack materials shall be selected based upon a sieve analysis of the aquifer materials and/or the formation to be monitored. To select the appropriate filter pack particle size, the results of a sieve analysis of the formation materials are plotted on a grain-size distribution graph, and a grain-size distribution curve is generated. The 70 percent retained grain size value should be multiplied by a factor between 4 and 6 (4 for fine, uniform formations, and 6 for coarse, non-uniform formations). A second grain-size distribution curve is then drawn on the graph for this new value, ensuring that the uniformity coefficient does not exceed 2.5. The filter pack that shall be used will fall within the area defined by these two curves. Once the filter pack size is determined, the screen slot size shall be selected to retain at least 90 percent of the filter pack material.

The filter pack shall be installed in a manner that prevents bridging and particle-size segregation. Filter packs placed below the water table shall be installed by the tremie pipe method. Filter pack materials shall not be poured into the annular space unless the well is shallow (e.g., less than 30 feet deep) and the filter pack material can be poured continuously into the well without stopping. At least two inches of filter pack material shall be installed between the well screen and the borehole wall, and one foot of material shall extend above the top of the well screen. A minimum of 6-inches of filter pack material shall also be placed under the bottom of the well screen to provide a firm footing and an unrestricted flow under the screened area.

C.2.b.v.d Annular Sealant

The annular space between the well casing and the borehole must be properly sealed to prevent vertical migration of contamination to the groundwater. The materials used for annular sealants shall be chemically inert with respect to the highest anticipated concentration of chemical constituents expected in the groundwater at the facility. In general, the permeability of the sealing material shall be one to two orders of magnitude lower than the least permeable parts of the formation in contact with the well.

During well construction, an annular seal shall be placed on top of the filter pack. This seal shall consist of a high solids (10 to 30%) bentonite material in the form of bentonite pellets, granular bentonite, or bentonite chips. The bentonite seal shall be placed in the annulus through a tremie pipe if the well is deep (greater than 30 feet), or by pouring directly down the annulus in shallow wells (less than 30 feet). If the bentonite materials are poured directly down the annulus, a tamping device shall be used to ensure that the seal is emplaced at the proper depth and the bentonite has not bridged higher in the well casing. The bentonite seal shall be placed above the filter pack for a minimum of two feet vertical thickness. The bentonite seal shall be allowed to completely hydrate in conformance with the manufacturer's specifications prior to installing the

overlying annular grout seal. The time required for the bentonite seal to completely hydrate will differ with the materials used and the specific conditions encountered.

A grout seal shall be installed on top of the filter pack annular seal. The grout seal may consist of either a high solids (30%) bentonite grout, a neat cement grout, or a cement/bentonite grout. All grouts shall be prepared in accordance with the manufacturer's specifications. High solids (30%) bentonite grouts shall have a minimum density of 10 pounds per gallon (as measured by a mud balance) to ensure proper setup. Cement grouts shall be mixed using 6.5 to 7 gallons of water per 94-pound bag of Type I Portland cement. Bentonite (5 to 10 percent) may be added to delay the setting time and reduce the shrinkage of the grout.

C.2.b.v.e Well Development

All monitoring wells shall be developed to create an effective filter pack around the well screen, correct damage to the formation caused by drilling, remove fine particles from the formation near the borehole, and assist in restoring the natural water quality of the aquifer in the vicinity of the well. A minimum of five well volumes shall be removed from newly installed shallow monitoring wells during development. A newly constructed monitoring well shall be developed until the column of water in the well is free of visible sediment, and the pH, temperature, turbidity, and specific conductivity have stabilized. If the well is pumped dry, the water level shall be allowed to sufficiently recover before the next development period is initiated. Common methods used for developing wells include pumping and over pumping, backwashing, surging (with a surge block), bailing, jetting and airlift pumping.

These development procedures can be used, either individually or in combination, to achieve the most effective well development. However, the most favorable well development methods include pumping, over pumping, bailing, surging, or a combination of these methods. Well development methods and equipment that alter the chemical composition of the groundwater shall not be used. Development methods that involve adding water or other fluids to the well or borehole, or that use air to accomplish well development shall not be used. If water is introduced to a borehole during well drilling and completion, then a greater volume of water shall be removed from the well during development. In addition, the volume of water withdrawn from a well during development shall be recorded.

C.2.b.v.f Surface Completion

Monitoring wells may be completed either as flush-mounted wells, or as aboveground completions. A surface seal shall be installed over the grout seal and extend vertically up the well annulus to the land surface. The lower end of the surface seal shall extend a minimum of one foot below the frost line to prevent damage from frost heaving. The composition of the surface seal shall be neat cement or concrete. In aboveground completions, a three-foot wide, four-inch thick concrete surface pad shall be installed around the well at the same time the protective casing is installed. The surface pad shall be sloped so that drainage will flow away from the protective casing and off the pad. In addition, a minimum of one inch of the finished pad shall be below the surface grade or ground elevation to prevent washing and undermining by

soil erosion.

A locking protective casing shall be installed around the well casing (riser) to prevent damage or unauthorized entry. The protective casing shall be anchored in the concrete surface pad below the frost line and extend several inches above the well riser stickup. A ¼-inch weep hole shall be drilled into the protective casing just above the top of the concrete surface pad to prevent water from accumulating and freezing inside the protective casing around the well riser. A cap shall be placed on the well riser to prevent tampering or the entry of foreign materials, and a lock shall be installed on the protective casing to provide security. If the wells are located in a high traffic area, a minimum of three bumper guards consisting of steel pipes 3 to 4-inches in diameter and a minimum of 5-foot length should be installed. The bumper guards should be installed to a minimum depth of 2 feet below the ground surface in a concrete footing and extend a minimum of 3 feet above ground surface. The pipes should be filled with concrete or sand to provide additional strength.

If flush-mounted completions are used, a traffic-grade surface monument or a protective structure such as a utility vault or meter box should be installed around the well casing. In addition, measures should be taken to prevent the accumulation of surface water in the protective structure and around the well intake. These measures should include outfitting the protective structure with a steel lid or manhole cover that has a rubber seal or gasket, and ensuring that the bond between the cement surface seal and the protective structure is watertight.

C.2.c Logging of Soil Samples

Samples obtained from all exploratory borings and excavations shall be visually inspected and the soil or rock type classified in general accordance with ASTM (American Society for Testing and Materials) D2487 [Unified Soil Classification System] and D2488 and/or AGI (American Geological Institute) Methods for soil and rock classification. Detailed logs of each boring shall be completed in the field by a qualified engineer or geologist. Additional information, such as the presence of water-bearing zones and any unusual or noticeable conditions encountered during drilling shall be recorded on the logs. Field boring, test pit logs and field well construction diagrams shall be converted to the format acceptable for use in final reports submitted to the Secretary.

C.2.d Soil Sample Field Screening

Samples obtained from the borings shall be screened in the field for evidence of the presence of contaminants. Field screening results shall be recorded on the exploratory boring and excavation logs. Field screening results are used as a general guideline to determine the nature and extent of possible contamination. In addition, screening results shall be used to aid in the selection of soil samples for laboratory analysis. The Secretary recognizes that field screening alone will not detect the possible presence or full nature and extent of all contaminants of potential concern (COPCs) that may be encountered at the site.

The primary screening methods to be used shall include (1) visual examination, (2) headspace vapor screening for volatile organic compounds, and/or (3) metals screening using X-ray fluorescence. Additional screening for site- or release-specific characteristics such as pH or for specific compounds using field test kits shall be conducted where appropriate.

Visual screening includes examination of soil samples for evidence of staining caused by petroleum-related compounds or other substances that may cause staining of natural soils such as elemental sulfur or cyanide compounds.

Headspace vapor screening targets volatile organic compounds and involves placing a soil sample in a plastic sample bag or a foil sealed container allowing space for ambient air. The container shall be sealed and then shaken gently to expose the soil to the air trapped in the container. The sealed container shall be allowed to rest for a minimum of 5 minutes while vapors equilibrate. Vapors present within the sample bag's headspace will then be measured by inserting the probe of the instrument in a small opening in the bag or through the foil. The maximum value and the ambient air temperature shall be recorded on the field boring or test pit log for each sample. The monitoring instruments shall be calibrated each day to the manufacturers standard for instrument operation. A photo-ionization detector (PID) equipped with a 10.6 or higher electron volt (eV) lamp, combustible gas indicator or other instrument approved by the Secretary shall be used for VOC field screening. The limitations, precision and calibration of the instrument to be used for VOC field screening shall be included in the site-specific investigation work plan prepared for each unit.

X-ray fluorescence (XRF) may be used to screen soil samples for the presence of metals or isotopes. XRF screening requires proper sample preparation and proper instrument calibration. Sample preparation and instrument calibration procedures shall be documented in the field logs. The methods and procedures for sample preparation and calibration shall be approved by the Secretary prior to the start of field activities. Field XRF screening results for selected metals may be used in lieu of laboratory analyses upon approval by the Secretary; however, the results shall, at a minimum, be confirmed by laboratory analyses at a frequency of 20 percent (1 sample per every five analyzed by XRF analysis).

Field screening results are site- and boring-specific and the results vary with instrument type, the media screened, weather conditions, moisture content, soil type, and type of contaminant, therefore, all conditions capable of influencing the results of field screening shall be recorded on the field logs. The conditions potentially influencing field screening results shall be submitted to the Secretary as part of the site-specific investigation, remediation and/or monitoring reports.

At a minimum, samples with the greatest apparent degree of contamination, based on field observations and field screening, shall be submitted for laboratory analysis. The location of the sample relative to groundwater, stratigraphic units and/or contacts and the proximity to significant site or subsurface features or structures also shall be used as a guideline for sample selection. In addition, samples with no or low apparent contamination, based on field screening, shall be

submitted for laboratory analysis if the intention is to confirm that the base (or other depth interval) of a boring or other sample location is not contaminated.

C.2.e Soil Sample Types

Soil samples shall be obtained at the frequencies outlined in the site-specific investigation work plans for each unit submitted by the Permittee for approval by the Secretary. The samples collected shall be representative of the media and site conditions being investigated or monitored. QA/QC samples shall be collected to monitor the validity of the soil sample collection procedures. Field duplicates will be collected at a rate of 10 percent. Equipment blanks shall be collected from all sampling apparatus at a frequency of 10 percent for chemical analysis. Equipment blanks shall be collected at a frequency of one-per-day if disposable sampling equipment is used. Field blanks shall be collected at a frequency of one per day for each media (with the exception of air samples) at each unit. Reagent blanks shall be used if chemical analytical procedures requiring reagents are employed in the field as part of the investigation or monitoring program. The resulting data will provide information on the variability associated with sample collection, handling and laboratory analysis operations. The blanks and duplicates shall be submitted for laboratory analyses associated with the project-specific contaminants, data quality concerns and media being sampled.

C.2.f Sample Point and Structure Location Surveying

The horizontal coordinates and elevation of each surface sampling location, the surface coordinates and elevations of each boring or test pit, the top of each monitoring well casing, the ground surface at each monitoring well location and the locations of all other pertinent structures shall be determined by a registered New Mexico professional land surveyor in accordance with the State Plane Coordinate System (NMSA 1978 47-1-49-56 (Repl. Pamp. 1993). The surveys shall be conducted in accordance with Sections 500.1 through 500.12 of the Regulations and Rules of the Board of Registration for Professional Engineers and Surveyors Minimum Standards for Surveying in New Mexico. Horizontal positions shall be measured to the nearest 0.1-foot, and vertical elevations shall be measured to the nearest 0.01-foot. The Permittee shall prepare site map(s), certified by a registered New Mexico professional land surveyor, presenting all surveyed locations and elevations including relevant site features and structures for submittal with all associated reports to the Secretary.

C.2.g Vapor-phase Monitoring and Sampling

Vapor monitoring and sampling shall be conducted if considered necessary by the Secretary. The methods and frequency of vapor monitoring and sampling shall be outlined in the unit-specific work plans, prepared in accordance with the requirements described in Appendix E of this Permit, if required.

Vapor samples analyzed by the laboratory for percent moisture and VOCs shall be collected using SUMMA canisters or other sample collection method approved by the Secretary. The samples

shall be analyzed for VOC concentrations by EPA Method TO-14 or equivalent VOC analytical method.

Field vapor measurements and the date and time of each measurement shall be recorded on a vapor monitoring data sheet. The instruments used for field measurements shall be calibrated in accordance with the manufacturers specifications and as described in Section C.2.d and C.4 of this Module. The methods used to obtain vapor-phase field measurements and samples shall be approved by the Secretary prior to the start of air monitoring at each Facility unit where vapor-phase monitoring is conducted.

C.2.h Groundwater Monitoring

C.2.h.i Groundwater Levels

Groundwater levels shall be measured in all monitoring wells on a semi-annual basis. Groundwater levels also shall be obtained prior to purging in preparation for a sampling event. Measurement data and the date and time of each measurement shall be recorded on a site monitoring data sheet. The depth to ground water shall be measured to the nearest 0.01 foot. The depth to groundwater shall be recorded relative to the surveyed well casing rim or other surveyed datum. The method of water level measurement shall be approved by the Secretary. Groundwater levels shall be measured in all wells within 48 hours of the start of obtaining water level measurements.

C.2.i Groundwater Sampling

Groundwater samples shall initially be obtained from newly constructed monitoring wells between 10 and 30 days after the completion of well development. Groundwater monitoring and sampling shall be conducted on a semi-annual basis or other interval approved by the Secretary after the initial sampling event. All monitoring wells scheduled for sampling during a groundwater sampling event shall be sampled within 15 days of the start of the monitoring and sampling event. The Permittee shall sample all saturated zones screened to allow entry of groundwater into each monitoring well during each sampling event. All requests for variances from the groundwater sampling schedule shall be submitted to the Secretary, in writing, at least 30 days prior to the start of scheduled monitoring and sampling events. Groundwater samples shall be collected from all exploratory borings not intended to be completed as monitoring wells prior to abandonment of the borings, where practicable.

Water samples shall be analyzed for one or more of the following general chemistry parameters as required by the Secretary:

nitrate/nitrite	sulfate	chloride
dissolved CO_2	alkalinity	carbonate/bicarbonate
fluoride	manganese	calcium
ferric/ferrous iron	ammonia	potassium

phosphate
sodium
methane
total kjeldahl nitrogen (TKN)
total organic carbon (TOC)
total dissolved solids (TDS)
total suspended solids (TSS)
additional analytes as required by the Secretary

C.2.i.i Well Purging

All zones in each monitoring well shall be purged by removing groundwater prior to sampling in order to ensure that formation water is being sampled. Purge volumes shall be determined by monitoring, at a minimum, groundwater pH, specific conductance, temperature and dissolved oxygen concentrations during purging. Water samples may be obtained from the well after the measured parameters of the purge water have stabilized to within ten percent for three consecutive measurements. A minimum of one well volume shall be purged from each monitoring well prior to obtaining measurements for use in determining whether the groundwater parameters have stabilized. The groundwater quality parameters shall be measured using instruments approved by the Secretary. The volume of groundwater purged, the instruments used and the readings obtained at each interval shall be recorded on the field monitoring log. Well purging also shall be conducted in accordance with the NMED HWB Draft Position Paper "Use of Micropurging and Low-flow Sampling Techniques for Compliance Groundwater Monitoring" (October 2001). The Permittee may submit, to the Secretary for approval, a written request for a variance from the described methods of well purging for individual wells no later than 90 days prior to scheduled sampling activities. The Secretary will respond to the request, in writing, within 60 days of receipt of the variance request.

C.2.i.ii Groundwater Sample Collection

Groundwater samples shall be obtained from each well after a sufficient amount of water has been removed from the well casing to ensure that the sample is representative of formation water. Groundwater samples shall be obtained using methods approved by the Secretary within 24 hours of the completion of well purging. Sample collection methods shall be documented in the field monitoring reports. The samples shall be transferred to the appropriate, clean, laboratory-prepared containers provided by the analytical laboratory. Sample handling and chain-of-custody procedures are described in Sections C.2.j and C.6.b below. Decontamination procedures shall be established for reusable water sampling equipment as described in Section C.3.

All purged groundwater and decontamination water shall be temporarily stored at satellite accumulation areas or transfer stations in labeled 55-gallon drums or other containers approved by the Secretary until proper characterization and disposal can be arranged. The methods for disposal of purge/decontamination water shall be approved by the Secretary prior to removal from the temporary storage area. Disposable materials shall be handled as described in Section C.5 of this Permit.

Groundwater samples intended for metals analysis shall be submitted to the laboratory as total metals samples. Groundwater samples also may be obtained for dissolved metals analysis and shall be filtered using disposable in-line filters with a mesh size approved by the Secretary.

C.2.i.iii Groundwater Sample Types

Field duplicates, field blanks, equipment rinseate blanks, reagent blanks, if necessary, and trip blanks shall be obtained for quality assurance during ground water and surface water sampling activities. The samples shall be handled as described in Section C.2.j below.

Field duplicate surface water and groundwater samples shall be obtained at a frequency of ten percent. At a minimum, one duplicate sample per sampling event shall always be obtained.

Field blanks shall be obtained at a minimum frequency of one per day per site or unit. Field blanks shall be generated by filling sample containers in the field with deionized water and submitting the samples with the groundwater samples to the analytical laboratory for the appropriate analyses.

Equipment rinseate blanks shall be obtained for chemical analysis at the rate of ten percent or a minimum of one rinseate blank per sampling day. Equipment rinseate blanks shall be collected at a rate of one per sampling day if disposable sampling apparatus is used. Rinseate samples shall be generated by rinsing deionized water through unused or decontaminated sampling equipment. The rinseate sample then shall be placed in the appropriate sample container and submitted with the groundwater samples to the analytical laboratory for the appropriate analyses.

Reagent blanks shall be obtained at a frequency of twenty percent or a minimum of one per day per unit if chemical analyses requiring the use of chemical reagents is conducted in the field during water sampling activities.

Trip blanks shall accompany laboratory sample bottles and shipping and storage containers intended for VOC analyses. Trip blanks shall consist of a sample of analyte-free deionized water prepared by the laboratory and placed in an appropriate sample container. The trip blank shall be prepared by the analytical laboratory prior to the sampling event and shall be kept with the shipping containers and placed with other water samples obtained from the site each day. Trip blanks shall be analyzed at a frequency of one for each shipping container of samples.

C.2.j Sample Handling

At a minimum, the following procedures shall be used at all times when collecting samples during investigation, corrective action and monitoring activities.

1. Neoprene, nitrile or other protective gloves shall be worn when collecting samples. New disposable gloves shall be used to collect each sample.
2. All samples collected of each media for chemical analysis shall be transferred into clean sample containers supplied by the project analytical laboratory with the exception of soil or

sediment samples obtained in brass sleeves or in Encore® samplers. Upon recovery of the sample collected using split barrel samplers with brass sleeves, the brass sleeves shall be removed from the split barrel sampler and the open ends of the sleeves shall be lined with Teflon tape or foil and sealed with plastic caps. The caps shall be fastened to the sleeve with tape for storage and shipment to the analytical laboratory. The sample depth and the top of the sample shall be clearly marked. Sample container volumes and preservation methods shall be in accordance with EPA SW-846 and established industry practices for use by accredited analytical laboratories. Sufficient sample volume shall be obtained for the laboratory to complete the method-specific QC analyses on a laboratory-batch basis.

3. Sample labels and documentation shall be completed for each sample following procedures approved by the Secretary. Immediately after the samples are collected, they shall be stored in a cooler with ice or other appropriate storage method until they are delivered to the analytical laboratory. Standard chain-of-custody procedures, as described in Section C.6.b below, shall be followed for all samples collected. All samples shall be submitted to the laboratory soon enough to allow the laboratory to conduct the analyses within the method holding times. At a minimum, all samples shall be submitted to the laboratory within 48 hours after their collection.

Shipment procedures will include the following:

1. Individual sample containers shall be packed to prevent breakage and transported in a sealed cooler with ice or other suitable coolant or other EPA or industry-wide accepted method. The drainage hole at the bottom of the cooler shall be sealed and secured in case of sample container leakage. Temperature blanks shall be included with each shipping container.
2. Each cooler or other container shall be delivered directly to the analytical laboratory.
3. Glass bottles shall be separated in the shipping container by cushioning material to prevent breakage.
4. Plastic containers shall be protected from possible puncture during shipping using cushioning material.
5. The chain-of-custody form and sample request form shall be shipped inside the sealed storage container to be delivered to the laboratory.
6. Chain-of-custody seals shall be used to seal the sample shipping container in conformance with EPA protocol.
7. Signed and dated chain-of-custody seals shall be applied to each cooler prior to transport of samples from the site.

C.2.k <u>In-situ Testing</u>

In-situ permeability tests, remediation system pilot tests and other tests conducted to evaluate site and subsurface conditions shall be designed to accommodate specific site conditions and to achieve the test objectives. The testing methods shall be approved by the Secretary prior to implementation. The tests shall be conducted in order to appropriately represent site conditions and in accordance with USGS, ASTM or other methods generally accepted by the industry. Detailed logs of all relevant site conditions and measurements shall be maintained during the

testing events. A summary of the general test results, including unexpected or unusual test results and equipment failures or testing limitations shall be reported to the Secretary within 30 days of completion of the test. The summary shall be presented in a format acceptable to the Secretary and in general accordance with the report formats outlined in Appendix E of this Permit. A formal report summarizing the results of each test shall be submitted to the Secretary within 120 days of completion of each test.

C.3 DECONTAMINATION PROCEDURES

The objective of the decontamination procedures is to minimize the potential for cross-contamination. A designated decontamination area shall be established for decontamination of drilling equipment, reusable sampling equipment and well materials. The drilling rig shall be decontaminated prior to entering the site or unit. Drilling equipment or other exploration equipment that may come in contact with the borehole shall be decontaminated by steam cleaning, by hot-water pressure washing or by other method approved by the Secretary prior to advancing each new exploratory boring of excavation.

Sampling or measurement equipment, including but not limited to, stainless steel sampling tools, split-barrel or core samplers, well developing or purging equipment, groundwater quality measurement instruments and water level measurement instruments, shall be decontaminated in accordance with the following procedures or other methods approved by the Secretary before each sampling attempt or measurement.

1. Brush equipment with a wire or other suitable brush, if necessary or practicable, to remove large particulate matter.
2. Rinse with potable tap water.
3. Wash with nonphosphate detergent or other detergent approved by the Secretary (examples include Liquinox,™ Alconox™ or Fantastik™) followed by a tap water rinse.
4. Rinse with 0.1 M nitric acid (to remove trace metals, if necessary) followed by a tap water rinse.
5. Rinse with methanol (to remove organic compounds, if necessary) followed by a tap water rinse.
6. Rinse with potable tap water.
7. Double rinse with deionized water

All decontamination solutions shall be collected and stored temporarily as described in Section C.5 below. Decontamination procedures and the cleaning agents used shall be documented in the daily field log.

C.4 FIELD EQUIPMENT CALIBRATION PROCEDURES

Field equipment requiring calibration shall be calibrated to known standards, in accordance with the manufacturers' recommended schedules and procedures. At a minimum, calibration checks shall be conducted daily, or at other intervals approved by the Secretary, and the instruments shall

be recalibrated, if necessary. Calibration measurements shall be recorded in the daily field logs. If field equipment becomes inoperable, its use shall be discontinued until the necessary repairs are made. In the interim, a properly calibrated replacement instrument shall be used.

C.5 COLLECTION AND MANAGEMENT OF INVESTIGATION DERIVED WASTE

Investigation Derived Waste (IDW) includes general refuse, drill cuttings, excess sample material, water (decontamination, development and purge) and disposable equipment generated during the course of investigation, corrective action or monitoring activities. All IDW shall be properly characterized and disposed of in accordance with all federal, state and local rules and regulations for storage, labeling, handling, transport and disposal of waste. The Permittee shall include an IDW management and disposal plan as part of the unit-specific work plans submitted to the Secretary. The IDW management and disposal plan must be submitted prior to disposal of any IDW produced during investigation, corrective action or monitoring activities. The Permittee may submit a request to the Secretary to dispose of IDW on a case-by-case basis prior to submittal of the IDW management and disposal plan.

All water generated during sampling and decontamination activities shall be temporarily stored at satellite accumulation areas or transfer stations in labeled 55-gallon drums or other containers approved by the Secretary until proper characterization and disposal can be arranged. The IDW may be characterized for disposal based on the known and/or suspected contaminants potentially present in the waste. The methods for waste characterization and disposal of IDW shall be approved by the Secretary prior to removal from the temporary storage area. Purge/decontamination water generated during investigation and monitoring activities at the Facility may be disposed in the refinery wastewater collection system upstream of the refinery wastewater treatment system.

C.6 DOCUMENTATION OF FIELD ACTIVITIES

C.6.a General

Daily field activities, including observations and field procedures, shall be recorded on appropriate forms. The original field forms shall be maintained at the Facility. Copies of the completed forms shall be maintained in a bound and sequentially numbered field file for reference during field activities. Indelible ink shall be used to record all field activities. Photographic documentation of field activities shall be performed, as appropriate. The daily record of field activities shall include the following:

1. Site or unit designation.
2. Date.
3. Time of arrival and departure.
4. Field investigation team members including subcontractors and visitors.
5. Weather conditions.
6. Daily activities and times conducted.

7. Observations.
8. Record of samples collected with sample designations and locations specified.
9. Photographic log.
10. Field monitoring data, including health and safety monitoring.
11. Equipment used and calibration records, if appropriate.
12. List of additional data sheets and maps completed.
13. An inventory of the waste generated and the method of storage or disposal.
14. Signature of personnel completing the field record.

C.6.b Sample Custody

All samples collected for analysis shall be recorded in the field report or data sheets. Chain-of-custody forms shall be completed at the end of each sampling day, prior to the transfer of samples off site, and shall accompany the samples during shipment to the laboratory. A signed and dated custody seal shall be affixed to the lid of the shipping container. Upon receipt of the samples at the laboratory, the custody seals will be broken, the chain-of-custody form shall be signed as received by the laboratory and the conditions of the samples shall be recorded on the form. The original chain-of-custody form shall remain with the laboratory and copies shall be returned to the relinquishing party. The Permittee shall maintain copies of all chain-of-custody forms generated as part of sampling activities. Copies of the chain-of-custody records shall be included with all draft and final laboratory reports submitted to the Secretary for review.

APPENDIX D

NAVAJO REFINING COMPANY ARTESIA REFINERY POST-CLOSURE CARE PERMIT

CHEMICAL ANALYTICAL PROCEDURES

D. CHEMICAL ANALYSES

The Permittee shall use the most recent standard EPA and industry-accepted analytical methods for chemical analyses for target analytes as the testing methods for each media sampled. Chemical analyses shall be performed in accordance with the most recent EPA standard analytical methodologies and extraction methods.

The Permittee shall submit a list of target analytes and analytical methods to the Secretary for approval as part of each site-specific investigation, corrective action and/or monitoring work plan. The detection limits for each method shall be less than applicable background, screening and regulatory cleanup levels. Analyses conducted with detection limits that are greater than applicable background, screening and regulatory cleanup levels shall be considered data quality exceptions and the reasons for the elevated detection limits shall be reported to the Secretary.

D.1 LABORATORY QA/QC REQUIREMENTS

The following requirements for laboratory QA/QC procedures shall be considered the minimum QA/QC standards for the laboratories employed by the Facility that provide analytical services for environmental investigation, corrective action and monitoring activities conducted at the Facility. The Permittee shall provide the names of the contract analytical laboratories and copies of the laboratory quality assurance manuals to the Secretary within 180 days of awarding a contract for analytical services to any contract laboratory.

D.1.a Quality Assurance Procedures

Contract analytical laboratories shall maintain internal quality assurance programs in accordance with EPA and industry-wide accepted practices and procedures. At a minimum, the laboratories shall use a combination of standards, blanks, surrogates, duplicates, matrix spike/matrix spike duplicate (MS/MSD), blank spike/blank spike duplicate (BS/BSD) and laboratory control samples to demonstrate analytical QA/QC. The laboratories shall establish control limits for individual chemicals or groups of chemicals based on the long-term performance of the test methods. In addition, the laboratories shall establish internal QA/QC that meets EPA's laboratory certification requirements. The specific procedures to be completed are identified in the following subsections.

D.1.b Equipment Calibration Procedures and Frequency

The laboratories' equipment calibration procedures, calibration frequency and calibration standards shall be in accordance with the EPA test methodology requirements and documented in laboratories' quality assurance and SOP manuals. All instruments and equipment used by the laboratory shall be operated, calibrated and maintained according to manufacturers' guidelines and recommendations. Operation, calibration and maintenance shall be performed by personnel who have been properly trained in these procedures. A routine schedule and record of instrument calibration and maintenance shall be kept on file at the laboratory.

D.1.c Laboratory QA/QC Samples

Analytical procedures shall be evaluated by analyzing reagent or method blanks, surrogates, matrix spike/matrix spike duplicates (MS/MSDs), blank spike/blank spike duplicates (BS/BSDs) and/or laboratory duplicates, as appropriate for each method. The laboratory QA/QC samples and frequency of analysis to be completed shall be documented in the cited EPA test methodologies. At a minimum, the laboratory shall analyze laboratory blanks, MS/MSDs, BS/BSDs and laboratory duplicates at a frequency of one in twenty for all batch runs requiring EPA test methods and a frequency of one in ten for non-EPA test methods. Laboratory batch QA/QC samples shall be project specific.

D.1.d Laboratory Deliverables

The analytical data package shall be prepared in accordance with EPA-established Level III analytical support protocol. The following shall be provided in the laboratory reports submitted either electronically or in hard (paper) copy for this project.

1. Transmittal letter, including information about the receipt of samples, the testing methodology performed, any deviations from the required procedures, any problems encountered in the analysis of the samples, any data quality exceptions, and any corrective actions taken by the laboratory relative to the quality of the data contained in the report.
2. Sample analytical results, including sampling date, date of sample extraction or preparation, date of sample analysis, dilution factors and test method identification; soil sample results in consistent units (milligrams per kilogram or micrograms per kilogram) in dry-weight basis, water sample results in consistent units (milligrams per liter or micrograms per liter), vapor sample results in consistent units (parts per million or ppmv) and detection limits for undetected analytes. Results shall be reported for all field samples, including field duplicates and blanks, submitted for analysis.
3. Method blank results, including reporting limits for undetected analytes.
4. Surrogate recovery results and corresponding control limits for samples and method blanks (organic analyses only).
5. MS/MSD and/or BS/BSD spike concentrations, percent recoveries, relative percent differences (RPDs) and corresponding control limits.
6. Laboratory duplicate results for inorganic analyses, including relative percent differences and corresponding control limits.
7. Sample chain-of-custody documentation.
8. Holding times and conditions.
9. Conformance with required analytical protocol(s).
10. Instrument calibration.
11. Blanks.
12. Detection/quantitation limits.
13. Recoveries of surrogates and/or matrix spikes (MS/MSDs).
14. Variability for duplicate analyses.
15. Completeness.

16. Data report formats.
17. The following data deliverables for organic compounds shall be requested of the laboratory:
    - A cover letter referencing the procedure used and discussing any analytical problems, deviations and modifications; including signature from authority representative certifying to the quality and authenticity of data as reported,
    - Report of sample collection, extraction and analysis dates, including sample holding conditions,
    - Tabulated results for samples in units as specified, including data qualification in conformance with EPA protocol, including definition of data descriptor codes,
    - Reconstructed ion chromatograms for gas chromatograph/ mass spectrometry (GC/MS) analyses for each sample and standard calibration,
    - Selected ion chromatograms and mass spectra of detected target analytes (GC/MS) for each sample and calibration with associated library/reference spectra,
    - Gas chromatograph/electron capture device (GC/ECD) and/or gas chromatograph/flame ionization detector (GC/FID) chromatograms for each sample and standard calibration,
    - Raw data quantification reports for each sample and calibrations, including areas and retention times for analytes, surrogates and internal standards,
    - A calibration data summary reporting calibration range used and a measure of linearity [include decafluorotriphenylphosphine (DFTPP) and p-bromofluorobenzene (BFB) spectra and compliance with tuning criteria for GC/MS],
    - Final extract volumes (and dilutions required), sample size, wet-to-dry weight ratios, and instrument practical detection/quantitation limit for each analyte,
    - Analyte concentrations with reporting units identified, including data qualification in conformance with the contract laboratory protocol statement of work (CLP SOW) (include definition of data descriptor codes),
    - Quantification of analytes in all blank analyses, as well as identification of method blank associated with each sample,
    - Recovery assessments and a replicate sample summary [includes all surrogate spike recovery data with spike levels/concentrations for each sample and all MS/MSD results (recoveries and spike amounts)],
    - Report of tentatively identified compounds with comparison of mass spectra to library/reference spectra.
18. The following data deliverables for inorganic compounds shall be requested of the laboratory:
    - A cover letter referencing the procedure used and discussing any analytical problems, deviations and modifications; including signature from authority representative certifying to the quality and authenticity of data as reported,
    - Report of sample collection, digestion and analysis dates, with sample holding conditions,
    - Tabulated results for samples in units as specified; including data qualification in conformance with the CLP SOW, including definition of data descriptor codes,
    - Results of all method QA/QC checks including inductively coupled plasma (ICP) Interference Check Sample and ICP serial dilution results,

- Tabulation of instrument and method practical detection/quantitation limits,
- Raw data quantification report for each sample,
- A calibration data summary reporting calibration range used and a measure of linearity, where appropriate,
- Final digestate volumes (and dilutions required), sample size, and wet-to-dry weight ratios,
- Quantification of analytes in all blank analyses, as well as identification of method blanks associated with each sample,
- Recovery assessments and a replicate sample summary (includes post-digestate spike analysis, all MS data [including spike concentrations] for each sample, if accomplished, all MS results [recoveries and spike amounts] and laboratory control sample analytical results).

The Permittee shall present summary tables of these data in the formats described in Appendix E of this Permit. The raw analytical data, including calibration curves, instrument calibration data, data calculation work sheets, and other laboratory support data for samples from this project, shall be compiled and kept on file at the Facility for reference. The Permittee shall make the data available to the Secretary upon request.

D.2 REVIEW OF FIELD AND LABORATORY QA/QC DATA

The sample data, field and laboratory QA/QC results shall be evaluated for acceptability with respect to the data quality objectives (DQOs). Each group of samples shall be compared with the DQOs and evaluated using data validation guidelines contained in the following EPA guidance documents: *Guidance Document for the Assessment of RCRA Environmental Data Quality, National Functional Guidelines for Organic Data Review*, and *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses.*

The laboratory shall notify the Permittee's project manager of data quality exceptions within 24 hours in order to allow for sample re-analysis, if possible. The Permittee's project manager shall contact the HWB within 24 hours of receipt of laboratory notification of data quality exceptions in order to discuss the implications and determine whether the data will still be considered acceptable or if sample re-analysis or re-sampling is necessary. The Permittee's project manager shall summarize the results of the discussion with the HWB project leader regarding the data quality exceptions in a memorandum. The memorandum shall be submitted to the HWB by fax or electronic mail within three working days of the conclusion of the data quality discussion.

D.3 BLANKS, FIELD DUPLICATES, REPORTING LIMITS AND HOLDING TIMES

D.3.a Blanks

The analytical results of field blanks and field rinseate blanks shall be reviewed to evaluate the adequacy of the field handling and equipment decontamination procedures and the possibility of cross-contamination caused by decontamination of sampling equipment. The analytical results of

trip blanks shall be reviewed to evaluate the possibility for contamination resulting from the laboratory-prepared sample containers or the sample transport containers. The analytical results of laboratory blanks shall be reviewed to evaluate the possibility of contamination caused by the analytical procedures. If contaminants are detected in field or laboratory blanks, the sample data shall be qualified, as appropriate.

D.3.b Field Duplicates

Field duplicates shall consist of two samples either split from the same sample device or collected sequentially. Field duplicate samples shall be collected at a minimum frequency of ten percent of the total number of samples submitted for analysis. RPDs for field duplicates shall be calculated. A precision of not less than 80 percent for duplicates shall be considered acceptable for soil sampling conducted at the Facility. The analytical DQO for precision shall be used for water duplicates.

D.3.c Method Reporting Limits

Method reporting limits for sample analyses for each media shall be established at the lowest level practicable for the method and analyte concentrations and shall not exceed soil, groundwater or vapor emissions background levels, cleanup standards and screening levels. Detection limits that exceed established soil, groundwater or air emissions cleanup standards, screening levels or background levels and are reported as "not detected" shall be considered data quality exceptions and an explanation for the exceedance and its acceptability for use shall be provided.

D.3.d Holding Times

The sampling, extraction and analysis dates shall be reviewed to confirm that extraction and analyses were completed within the recommended holding times as specified by EPA protocol. Appropriate data qualifiers shall be noted if holding times are exceeded.

D.4 REPRESENTATIVENESS AND COMPARABILITY

D.4.a Representativeness

Representativeness is a qualitative parameter related to the degree to which the sample data represent the specific characteristics of concern. Procedures shall be implemented to assure representative samples, such as repeated measurements of the same parameter at the same location over several distinct sampling events. Any procedures or variations that may affect the collection or analysis of representative samples shall be noted and the data qualified, as appropriate.

D.4.a Comparability

Comparability is a qualitative parameter related to whether similar sample data can be compared. To assure comparability, analytical results shall be reported in appropriate units for comparison

with other data (past studies, comparable sites, screening levels and cleanup standards), and standard collection and analytical procedures shall be implemented. Any procedure or variation that may affect comparability shall be noted, and the data shall be qualified, as appropriate.

D.5 LABORATORY REPORTING, DOCUMENTATION, DATA REDUCTION AND CORRECTIVE ACTION

Upon receipt of each laboratory data package, data shall be evaluated against the criteria outlined in the previous sections. Any deviation from the established criteria shall be noted, and the data will be qualified, as appropriate. A full review and discussion of analytical data QA/QC and all data qualifiers shall be submitted as appendices or attachments to reports prepared in accordance with Appendix E of this Permit. Data validation procedures for all samples shall include checking the following, when appropriate:

1. Holding times,
2. Detection limits,
3. Field equipment rinseate blanks,
4. Field blanks,
5. Field Duplicates,
6. Trip blanks,
7. Reagent blanks,
8. Laboratory duplicates,
9. Laboratory blanks,
10. Laboratory matrix spikes,
11. Laboratory matrix spike duplicates,
12. Laboratory blank spikes,
13. Laboratory blank spike duplicates, and
14. Surrogate recoveries.

If significant quality assurance problems are encountered, corrective action shall be implemented as appropriate. All corrective action shall be defensible, and the corrected data shall be qualified.

APPENDIX E

NAVAJO REFINING COMPANY ARTESIA REFINERY POST-CLOSURE CARE PERMIT

REPORTING REQUIREMENTS

E REPORTING REQUIREMENTS

E.1 GENERAL

This Appendix provides the general reporting requirements and report formats for corrective action activities required under this Permit. This Appendix is not intended to provide reporting requirements for every potential corrective action conducted at the Facility; therefore, the formats for all types of reports are not presented below. The described formats include the general reporting requirements and formats for site-specific investigation work plans, investigation reports, routine monitoring reports, risk assessments and corrective measures evaluations. The reports shall generally be considered equal to RFI work plans, RFI reports, periodic monitoring reports, risk assessments and CMS reports, respectively for the purposes of RCRA compliance and NMED oversight fee assessments.

The reporting requirements listed in this section do not include all subsections that may be necessary to complete each type of report listed. Additional subsections may be needed to address additional site-specific issues or information collected during corrective action or monitoring activities not listed below. Individual reports may be tailored to unit-specific conditions or requirements; however, variations to the general report format and the formats for reports not listed in this section must submitted in outline form to the Secretary for approval prior to submittal. The Secretary will approve or disapprove, in writing, the proposed report outline within 60 days of receipt of the outline. If the Secretary disapproves the report outline, the Secretary will notify the Permittee, in writing, of the outline's deficiencies and will specify a date for submittal of a revised report outline. All reports submitted by the Permittee shall follow the general approach and limitations for data presentation described in this section.

E.2 INVESTIGATION WORK PLAN

The format listed below fulfills the requirements of the Secretary for the preparation of a work plan for unit-specific or aggregate unit site investigation or corrective action activities at the Facility. This section provides a general outline for work plans. The minimum requirements for describing proposed activities within each subsection when preparing work plans for Facility site investigations are included. All research, locations, depths and methods of exploration, field procedures, analytical analyses, data collection methods and schedules shall be included in each work plan. In general, interpretation of data acquired during previous investigations shall be presented only in the Background sections of the work plans. At a minimum, detections of contaminants encountered during previous investigations shall be presented in the work plan in table format with an accompanying site plan showing sample locations. The other text sections of the work plans shall be reserved for presentation of anticipated site-specific activities and procedures relevant to the project. The general work plan outline is provided below.

E.2.a TITLE PAGE

The title page shall include the type of document, Facility name and SWMU, AOC and/or unit name(s) and the submittal date. A signature block providing spaces for the name, title and organization of the preparer and the responsible Facility representative shall be provided on the title page.

E.2.b EXECUTIVE SUMMARY

This section shall provide a brief summary of the purpose and scope of the investigation to be conducted at the subject site. The Facility name and SWMU, AOC and/or unit name(s) and location shall be included in the executive summary.

E.2.c TABLE OF CONTENTS

The table of contents shall list all text sections and subsections, tables, figures and appendices or attachments included in the work plan. The corresponding page numbers for the titles of each unit of the report shall be included in the table of contents.

E.2.d INTRODUCTION

This section shall include the Facility name, unit name and location and unit status (active operations, closed, corrective action, etc.). General information on the current site usage and status shall be included in this section. A brief description of the purpose of the investigation and the type of site investigation to be conducted shall be provided in this section.

E.2.e BACKGROUND

Relevant background information shall be provided in this section. This section shall briefly summarize historical site uses including the locations of current and former site structures and features (a labeled figure shall be included in the document showing the locations of current and former site structures and features). The locations of pertinent subsurface features such as pipelines, underground tanks, utility lines and other subsurface structures shall be included in the background summary and labeled on the site plan.

This section shall identify potential receptors, including groundwater, and include a brief summary of the type and characteristics of the waste or contaminants and the known and possible source(s), release history and extent of contamination. This section shall include brief summaries of the results of previous investigations including references to pertinent figures, data summary tables and text in previous reports. References to previous reports shall include page, table and figure numbers for referenced information. Summary data tables and site plans showing relevant investigation locations shall be included in the Tables and Figures sections of the document, respectively.

E.2.f SITE CONDITIONS

E.2.f.i Surface Conditions

This subsection shall provide a brief, detailed description of current site topography, features and structures including a description of drainages, vegetation, erosional features and current site uses. In addition, descriptions of features located in surrounding sites that may have an impact on the subject site regarding sediment transport, surface water runoff or contaminant fate and transport shall be included in this subsection.

E.2.f.ii Subsurface Conditions

A detailed description of the site conditions observed during previous subsurface investigations shall be included in this section including relevant soil horizon, stratigraphic, groundwater and other relevant information. A site plan showing the locations of all borings and excavations drilled or excavated during previous investigations shall be included in the Figures section of the work plan. A brief description of the anticipated stratigraphic units that may be encountered during the investigation may be included in this subsection if no previous investigations have been conducted at the site.

E.2.g SCOPE OF SERVICES

This section shall provide a list of all anticipated activities to be performed during the investigation including, but not limited to, background information research, health and safety requirements that may affect or limit the completion of tasks, drilling, test pit or other excavations, well construction, field data collection, survey data collection, chemical analytical testing, aquifer testing, remediation system pilot testing, investigation derived waste (IDW) storage and/or disposal and reporting.

E.2.h INVESTIGATION METHODS

This section shall provide a list of all anticipated locations and methods for conducting the activities to be performed during the investigation. This subsection shall include but is not limited to, research methods, health and safety practices that may affect the completion of tasks, drilling, test pit or other excavation methods, sampling intervals and methods, well construction methods, field data collection methods, geophysical and land survey methods, field screening methods, chemical analytical testing, materials testing, aquifer testing and pilot testing and other proposed investigation and testing methods. This information may also be summarized in table format, if appropriate.

E.2.i MONITORING AND SAMPLING PROGRAM

This section shall outline the anticipated monitoring and sampling program to be conducted after the initial investigation activities are completed, if applicable. This section shall provide a description of the anticipated groundwater, ambient air, subsurface vapor, remediation system, engineering controls and/or other monitoring and sampling programs to be implemented at the unit.

E.2.j SCHEDULE

This section shall provide the anticipated schedule for completion of field investigation, pilot testing and monitoring and sampling activities. In addition this section shall provide a schedule for submittal of reports and data to the Secretary including a schedule for submitting all status reports and preliminary data, if required.

E.2.k TABLES

The following summary tables may be included in the investigation work plans, if previous investigations have been conducted at the unit. Data presented in the tables shall include information on dates of data collection, analytical methods, detection limits and significant data quality exceptions. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections.

1. Summaries of regulatory criteria, background and/or applicable cleanup levels (may be included in the analytical data tables instead of as separate tables).
2. Summaries of historical field survey location data.
3. Summaries of historical field screening and field parameter measurements of soil, sediment, groundwater, surface water and/or air quality data.
4. Summaries of historical soil, sediment, groundwater and/or surface water laboratory analytical data. The tables shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
5. Summaries of historical groundwater elevation and depth to groundwater data. The table shall include the monitoring well depths and the screened intervals in each well.
6. Summaries of historical groundwater laboratory analytical data. The analytical data tables shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
7. Summary of historical air sample screening and chemical analytical data. The data tables shall include the screening instruments used, laboratory analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
8. Summary of historical pilot testing data, if applicable, including units of measurement and types of instruments used to obtain measurements.

E.2.l FIGURES

The following figures shall be included with each investigation work plan for each unit including presentation of data where previous investigations have been conducted. All figures must include a scale and north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms and qualifiers.

1. Vicinity map showing topography and the general location of the subject site relative to surrounding features or properties.
2. Unit site plan that presents pertinent site features and structures, underground utilities, well locations and remediation system location(s) and details. Off-site well locations and other relevant features shall be included on the site plan, if practical. Additional site plans may be required to present the locations of relevant off-site well locations, structures and features.
3. Figures showing historical and proposed soil boring or excavation locations and sampling locations.
4. Figures presenting historical soil sample field screening and laboratory analytical data, if applicable.
5. Figures presenting the locations of all existing and proposed borings and vapor monitoring well locations.
6. Figures showing all existing and proposed wells and piezometers and presenting historical groundwater elevation data and indicating groundwater flow direction(s).
7. Figure(s) presenting historical groundwater laboratory analytical data, if applicable. The chemical analytical data corresponding to each sampling location can be presented in tabular form on the figure or as an isoconcentration map.
8. Figures presenting historical and proposed surface water sample locations and field measurement data, if applicable.
9. Figure(s) presenting historical surface water laboratory analytical data, if applicable.
10. Figures showing historical and proposed air sampling locations and presenting historical air quality data, if applicable.
11. Figures presenting historical pilot testing locations and data, if applicable, including site plans and/or graphic data presentation.
12. Figures presenting geologic cross-sections based on outcrop and borehole data acquired during previous investigations, if applicable.

E.2.m APPENDICES

An IDW management plan shall be included as an appendix to the investigation work plan. Additional appendices may be necessary to present additional data or documentation not listed above.

E.3 INVESTIGATION REPORT

The format listed below fulfills the requirements acceptable to the Secretary for the reporting of site investigations at the Facility. This section provides a general outline for site investigation

reports and also lists the minimum requirements for reporting within each subsection when preparing site investigation reports for Facility units. All data, collected during each site investigation event in the reporting period, shall be included in the reports. In general, interpretation of data shall be presented only in the Background, Conclusions and Recommendations sections of the reports. The other text sections of the reports shall be reserved for presentation of facts and data without interpretation or qualifications. The general report outline is provided below.

E.3.a TITLE PAGE

The title page shall include the type of document, the Facility name and SWMU, AOC, and/or unit name(s) and the submittal date. A signature block providing spaces for the name, title and organization of the preparer and the responsible Facility representative shall be provided on the title page.

E.3.b EXECUTIVE SUMMARY

This section shall provide a brief summary of the purpose, scope and results of the investigation conducted at the subject site during the reporting period. The Facility name and SWMU, AOC and/or unit name(s) and location shall be included in the executive summary. In addition, this section shall include a brief summary of conclusions based on the investigation data collected and recommendations for future investigation, monitoring, remedial action or site closure.

E.3.c TABLE OF CONTENTS

The table of contents shall list all text sections and subsections, tables, figures and appendices or attachments included in the report. The corresponding page numbers for the titles of each unit of the report shall be included in the table of contents.

E.3.d INTRODUCTION

This section shall include the Facility name, unit name and location and unit status (active operations, closed, corrective action, etc.). General information on the site usage and status shall be included in this section. A brief description of the purpose of the investigation, the type of site investigation conducted and the type of results presented in the report also shall be provided in this section.

E.3.e BACKGROUND

Relevant background information shall be provided in this section. This section shall briefly summarize historical site uses including the locations of current and former site structures and features (a labeled figure shall be included in the document showing the locations of current and former site structures and features). The locations of subsurface features such as pipelines, underground tanks, utility lines and other subsurface structures shall be included in the

background summary and labeled on the site plan. In addition, this section shall include a brief summary of the possible sources, release history, known extent of contamination and the results of previous investigations including references to previous reports. The references to previous reports shall include page, table and figure numbers for referenced information. A site plan, showing relevant investigation locations, and summary data tables shall be included in the Figures and Tables sections of the document, respectively.

E.3.f SCOPE OF SERVICES

This section shall provide a summary listing of all activities actually performed during the investigation event including, but not limited to, background information research, implemented health and safety measures that affected or limited the completion of tasks, drilling, test pit or other excavation methods, well construction methods, field data collection, survey data collection, chemical analytical testing, aquifer testing, remediation system pilot testing, and IDW storage and/or disposal.

E.3.g FIELD INVESTIGATION RESULTS

This section shall provide a summary of the procedures used and the results of all field investigation activities conducted at the site including, but not limited to, the dates that investigation activities were conducted, the type and purpose of field investigation activities performed, field screening measurements, logging and sampling results, pilot test results, construction details and conditions observed. Field observations or conditions that altered the planned work or may have influenced the results of sampling, testing and logging shall be reported in this section. Tables summarizing all pertinent sampling, testing and screening results shall be prepared in a format approved by the Secretary. The tables shall be presented in the Tables section of the reports. At a minimum, the following subsections shall be included, where appropriate.

E.3.g.i Surface Conditions

This subsection shall provide a description of current site topography, features and structures including a description of drainages, vegetation, erosional features and current site uses. In addition, descriptions of features located in surrounding sites that may have an impact on the subject site regarding sediment transport, surface water runoff or contaminant transport shall be included in this subsection.

E.3.g.ii Exploratory Drilling or Excavation Investigations

This subsection shall describe the locations, methods and depths of subsurface explorations including the types of equipment used, the logging procedures and the soil or rock classification system used to describe the observed materials, exploration equipment decontamination procedures and conditions encountered that may have affected or limited the investigation.

A description of the site conditions observed during subsurface investigation activities shall be included in this section including soil horizon and stratigraphic information. Site plans showing the locations of all borings and excavations shall be included in the Figures section of the report. Boring, test pit and excavation logs for all exploratory borings and excavations shall be presented in an Appendix or Attachment to the report.

E.3.g.iii Subsurface Conditions

This subsection shall provide a description of known subsurface lithology and structures based on observations made during the current and previous subsurface investigations and including interpretation of geophysical logs and as-built drawings of man-made structures, if applicable. A description of the known locations of pipelines and utility lines and observed geologic structures shall also be included in this subsection. A site plan showing boring and/or excavation locations and the locations of site above- and below-ground structures shall be included in the Figures section of the report. In addition, cross sections shall be constructed, if appropriate, to provide additional visual presentation of site or regional subsurface conditions.

E.3.g.iv Monitoring Well Construction, Exploratory Boring or Excavation Abandonment

The methods and details of monitoring well construction and the methods used to abandon or backfill exploratory borings and excavations shall be described in this section. The description shall include the dates of well construction, boring abandonment or excavation backfilling. In addition, well construction diagrams shall be included in the Appendix or Attachment with the associated boring logs for monitoring well borings.

E.3.g.v Groundwater Conditions

This subsection shall describe groundwater conditions observed beneath the subject site and relate subsurface groundwater conditions to regional groundwater conditions. A description of the depths to water, aquifer thickness and groundwater flow directions shall be included in this section for each water bearing zone as appropriate to the investigation. Figures showing well locations and the appropriate site, surrounding area and regional groundwater elevations and flow directions for each hydrologic zone shall be included in the Figures section of the report.

E.3.g.vi Surface Water Conditions

This subsection shall describe surface water runoff, drainage, surface water sediment transport and contaminant transport in surface water as suspended load and/or as dissolved phase in surface water via natural and man-made drainages, if applicable. A description of contaminant fate and transport shall be included, if appropriate.

E.3.g.vii Surface Air and Subsurface Vapor Conditions

This subsection shall provide a description of air and vapor monitoring and sampling methods used during the site investigation, if conducted, and provide a description of observations made during the site investigation regarding subsurface flow pathways and the subsurface air flow regime.

E.3.g.viii Materials Testing Results

Materials testing results such as core permeability testing, grain size analysis or other materials testing results shall be reported in this subsection. Sample collection methods, locations and depths also shall be included. Corresponding summary tables shall be included in the Tables section of the report.

E.3.g.ix Pilot Testing Results

Pilot testing is typically conducted after initial subsurface investigations are completed and the need for additional investigation or remediation has been evaluated. Pilot testing, including aquifer testing and remediation system pilot testing shall be addressed through separate work plans and pilot test reports. The format for pilot test work plans and reports shall be approved by the Secretary prior to submittal.

E.3.h REGULATORY CRITERIA

This section shall provide information regarding applicable cleanup standards, screening levels and/or risk-based cleanup goals for each pertinent media at the subject unit. The appropriate cleanup levels for each unit within the subject site shall be included if site-specific levels have been established at separate facility locations. A table summarizing the applicable cleanup standards or inclusion of applicable cleanup standards in the data tables shall be included in the Tables section of the document. Risk-based evaluation procedures, if used to calculate cleanup levels, shall be presented in a separate document. If cleanup levels calculated in a risk evaluation are employed, the risk evaluation document shall be referenced including pertinent page numbers for referenced information.

E.3.i SITE CONTAMINATION

This section shall provide a description of sampling intervals and methods for detection of surface and subsurface contamination in soils, sediments, groundwater , surface water and vapor-phase contamination as appropriate to the scope of the investigation. Factual information only shall be included in this Section. Interpretation of the data shall be reserved for the Summary and Conclusions Section of the reports.

E.3.i.i Soil and Sediment Sampling

This subsection shall briefly describe the dates, locations and methods of sample collection, sampling intervals, methods for sample logging, screening and laboratory sample selection methods including the sample depths for samples submitted for laboratory analyses. A site plan showing the sample locations shall be included in the Figures section of the report.

E.3.i.ii Soil Sample Field Screening Results

This subsection shall describe the field screening methods used during the investigation and the field screening results. Field screening results also shall be presented in summary tables in the Tables section of the document. The limitations of field screening instrumentation and any conditions that influenced the results of field screening shall be discussed in this subsection.

E.3.i.iii Soil Sampling Chemical Analytical Results

This subsection shall briefly summarize the laboratory analyses conducted, the analytical methods and the analytical results and provide a comparison of the data to cleanup standards or established cleanup levels for the site. The laboratory results also shall be presented in summary tables in the Tables section of the document. Field conditions and sample collection methods that could potentially affect the analytical results shall be described in this section. If appropriate, soil analytical data shall be presented with sample locations on a site plan and included in the Figures section of the report.

E.3.i.iv Groundwater Sampling

This subsection shall briefly describe the dates, locations, depths and methods of sample collection and methods for sample logging, screening and laboratory sample selection methods. A map showing the locations of all site and surrounding area well locations shall be included in the Figures section of the report.

E.3.i.v Groundwater General Chemistry

This subsection shall describe the results of measurement of field purging parameters and field analytical measurements. Field parameter measurements and field analytical results also shall be presented in summary tables in the Tables section of the document. The limitations of field measurement instrumentation and any conditions that may have influenced the results of the field measurements shall be discussed in this subsection. If appropriate, relevant water chemistry concentrations shall be presented in data tables or as isoconcentration contours on a site plan included in the Figures section of the report.

E.3.i.vi Groundwater Chemical Analytical Results

This section shall summarize groundwater chemical analytical methods and analytical results, and provide a comparison of the data to the cleanup standards or established cleanup levels for the site. The rational or purpose for altering or modifying the groundwater sampling program

outlined in the site investigation work plan also shall be provided in this section. Field conditions that may have affected the analytical results during sample collection shall be described in this section. Tables summarizing the groundwater laboratory, field and QA/QC chemical analytical data, applicable cleanup levels and modifications to the groundwater sampling program shall be provided in the Tables section of the report. If appropriate, relevant analytical data concentrations shall be presented in data tables or as isoconcentration contours on a site plan included in the Figures section of the report.

E.3.i.vii Air and/or Subsurface Vapor Sampling

This subsection shall briefly describe the dates, locations, depths and methods of sample collection and methods for sample logging and laboratory sample selection methods. A site plan showing the locations of all air sampling locations shall be provided in the Figures section of the report.

E.3.i.viii Air and/or Subsurface Vapor Field Screening Results

This subsection shall describe the field screening methods used for ambient air and/or subsurface vapors during the investigation and the field screening results. Field screening results also shall be presented in summary tables in the Tables section of the document. The locations of ambient air and/or subsurface vapor screening sample collection shall be presented on a site plan included in the Figures section of the report. The limitations of field screening instrumentation and any conditions that influenced the results of field screening shall be discussed in this subsection.

E.3.i.ix Air and/or Subsurface Vapor Laboratory Analytical Results

This section shall list air sampling laboratory analytical methods and analytical results and provide a comparison of the data to emissions standards or established cleanup or emissions levels for the site, if applicable. The rational or purpose for altering or modifying the air monitoring or sampling program outlined in the site investigation work plan also shall be provided in this section. Field conditions that may have affected the analytical results during sample collection shall be described in this section. Tables summarizing the air sample laboratory, field and QA/QC chemical analytical data, applicable cleanup levels or emissions standards and modifications to the air sampling program shall be provided in the Tables section of the report. If appropriate, relevant concentrations shall be presented in data tables or as isoconcentration contours on a map included in the Figures section of the report.

E.3.j CONCLUSIONS

This section shall provide a brief summary of the investigation activities and a discussion and conclusions with regard to the results of the investigation conducted at the site. In addition, this section shall provide a comparison of the results to applicable cleanup levels and relevant historical investigation results and chemical analytical data. Potential receptors, including groundwater, shall be identified and discussed and the need for further investigation, corrective

measures and/or a risk analyses shall be included in this section. An explanation shall be provided with regard to data gaps. If appropriate, a risk analysis may be included as an Appendix in an investigation report; however, the risk analysis shall be presented in the Risk Analysis format included in Appendix E, Section E.5 of this Permit. References to the risk analysis shall be presented only in the Summary and Conclusions section of the Investigation Report.

E.3.k RECOMMENDATIONS

Recommendations and explanations regarding future investigation, monitoring, corrective measures, risk analyses or site closure shall be included in this section. A corresponding schedule for further action regarding the unit also shall be provided.

E.3.l TABLES

The following summary tables shall be included in each investigation report as appropriate. Data presented in the tables shall include the current data including information on dates of data collection, analytical methods, detection limits and significant data quality exceptions. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections.

1. Summaries of regulatory criteria, background and/or the applicable cleanup levels (this information may be included in the analytical data tables instead of as separate tables).
2. Summaries of field survey location data. Separate tables shall be prepared for well locations and individual media sampling locations except where the locations are the same for more than one media.
3. Summaries of field screening and field parameter measurements of soil, sediments, groundwater, surface water and/or air quality data.
4. Summaries of soil laboratory analytical data shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
5. Summaries of groundwater elevation and depth to groundwater data. The table shall include the monitoring well depths and the screened intervals in each well.
6. Summary of groundwater laboratory analytical data. The analytical data tables shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
7. Summary of surface water laboratory analytical data. The analytical data tables shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
8. Summary of air sample screening and chemical analytical data. The data tables shall include the screening instruments used, laboratory analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
9. Summary of pilot testing data, if applicable, including units of measurement and types of instruments used to obtain measurements.
10. Summary of materials testing data, if applicable.

E.3.m FIGURES

The following figures shall be included with each investigation report as appropriate. All figures must include a scale and north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms and qualifiers.

1. Vicinity map showing topography and the general location of the subject site relative to surrounding features or properties.
2. Unit site plan that presents pertinent site features and structures, underground utilities, well locations and remediation system location(s) and details. Off-site well locations and other relevant features shall be included on the site plan if practical. Additional site plans may be required to present the locations of relevant off-site well locations, structures and features.
3. Figure(s) showing boring or excavation locations and sampling locations.
4. Figure(s) presenting soil sample field screening and laboratory analytical data.
5. Figure(s) displaying the locations of all newly installed and existing wells and borings.
6. Figure(s) presenting monitoring well and piezometer locations, groundwater elevation data and indicating groundwater flow direction(s).
7. Figure(s) presenting groundwater laboratory analytical data including past data, if applicable. The chemical analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
8. Figure(s) displaying surface water sample locations and field measurement data including past data, if applicable.
9. Figure(s) presenting surface water laboratory analytical data including past data, if applicable. The laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure.
10. Figure(s) showing air or subsurface vapor sampling locations and presenting air quality data. The field screening or laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
11. Figure(s) presenting geologic cross-sections based on outcrop and borehole data.
12. Figure(s) presenting pilot testing locations and data, where applicable, including site plans or graphic data presentation.

E.3.n APPENDICES

Investigation reports shall include the following appendices. Additional appendices may be necessary to present data or documentation not listed below.

E.3.n.i FIELD METHODS

Detailed descriptions of the methods used to acquire field measurements of each media that was surveyed or tested during the investigation shall be included in this section. Methods include, but are not limited to, exploratory drilling or excavation methods, the methods and types of instruments used to obtain field screening, field analytical or field parameter measurements, instrument calibration procedures, sampling methods for each media investigated,

decontamination procedures, sample handling procedures, geophysical methods, documentation procedures and field conditions that affected procedural or sample testing results. Methods of measuring and sampling during pilot testing shall be reported in this section, if applicable. Investigation derived waste storage and disposal methods also shall be presented as a subsection of this appendix. Copies of IDW disposal documentation shall be provided in a separate appendix.

E.3.n.ii BORING/TEST PIT LOGS AND WELL CONSTRUCTION DIAGRAMS

Boring logs, test pit or other excavation logs and well construction details shall be presented in this appendix. In addition, a key(s) to symbols and soil or rock classification system shall be included in this section.

E.3.n.iii CHEMICAL ANALYTICAL PROGRAM

Chemical analytical methods, a summary of data quality objectives and data quality review procedures shall be reported in this appendix. A summary of data quality exceptions and their effect on the acceptability of the field and laboratory analytical data with regard to the investigation and the site status shall be included in this appendix along with references to case narratives provided in the laboratory reports.

E.3.n.iv CHEMICAL ANALYTICAL REPORTS

This section shall include all laboratory chemical analytical data generated for the reporting period. The reports must include all chain-of-custody records and QA/QC results provided by the laboratory. The laboratory reports may be provided electronically in a format approved by the Secretary and shall be in the form of a final laboratory report. Laboratory report data tables may be submitted in Microsoft Excel format. Hard (paper) copies of the chain-of-custody forms shall be submitted with the reports regardless of whether the final laboratory report is submitted electronically or in hard copy.

E.3.n.v OTHER APPENDICES

Other appendices containing additional information shall be added as appropriate.

E.4 PERIODIC MONITORING REPORT

The format listed below fulfills the requirements acceptable to the Secretary for the reporting of periodic groundwater, vapor and/or remediation system monitoring at the Facility. This document provides a general outline for monitoring reports and also lists the minimum requirements for reporting within each subsection when preparing routine monitoring reports for specific units and for Facility-wide monitoring. All data, collected during each monitoring and sampling event in the reporting period, shall be included in the reports. In general, interpretation of data shall be presented only in the Background, Conclusions and Recommendations sections

of the reports. The other text sections of the reports shall be reserved for presentation of facts and data without interpretation or qualifications. The general report outline is provided below.

E.4.a TITLE PAGE

The title page shall include type of document, the Facility name and SWMU, AOC, site and/or unit name(s) (if the report is for unit specific monitoring) and the submittal date. A signature block providing spaces for the name, title and organization of the preparer and the responsible Facility representative shall be provided on the title page.

E.4.b EXECUTIVE SUMMARY

This section shall provide a brief summary of the purpose, scope and results of the monitoring conducted at the subject site during the reporting period. The Facility, SWMU, AOC and/or unit name(s) and location shall be included in the executive summary. In addition, the Executive Summary shall include a brief summary of conclusions based on the monitoring data collected.

E.4.c TABLE OF CONTENTS

The table of contents shall list all text sections and subsections, tables, figures and appendices or attachments included in the report. The corresponding page numbers for the titles of each unit of the report shall be included in the table of contents.

E.4.d INTRODUCTION

This section shall include the Facility name, unit name and location and unit status (active operations, closed, corrective action, etc.). General information on the site usage and status shall be included in this section. A brief description of the purpose of the monitoring, type of monitoring conducted and the type of results presented in the report also shall be provided in this section.

E.4.e SCOPE OF SERVICES

This section shall provide a summary of all activities actually performed during the monitoring event or reporting period including field data collection, chemical testing, remediation system monitoring, if applicable, and purge/decontamination water storage and/or disposal.

E.4.f REGULATORY CRITERIA

This section shall provide information regarding applicable cleanup standards, screening levels and/or risk-based cleanup goals for the subject facility. The appropriate cleanup levels for each unit within the subject facility shall be included if site-specific levels have been established at separate facility locations. A table summarizing the applicable cleanup standards or inclusion of applicable cleanup standards in the data tables may be substituted for this section. Risk-based

evaluation procedures, if used to calculate cleanup levels, must either be included as an attachment or referenced. The specific document and page numbers must be included for all referenced materials.

E.4.g MONITORING RESULTS

This section shall provide a summary of the results of monitoring conducted at the site including, but not limited to, the dates that monitoring was conducted, the measured depths to groundwater, direction(s) of groundwater flow, field air and/or water quality measurements, static pressures, field measurements and a comparison to previous monitoring results. Field observations or conditions that may influence the results of monitoring shall be reported in this section. Tables summarizing vapor monitoring parameters, groundwater elevation/depth to groundwater measurements and other field measurements may be substituted for this section. The tables shall include all information required in section E.4.k below.

E.4.h CHEMICAL ANALYTICAL DATA

This section shall summarize the dates of vapor and/or groundwater sampling, chemical analytical methods and analytical results, and provide a comparison of the data to previous results and the cleanup standards or established cleanup levels for the site. The rational or purpose for altering or modifying the sampling program shall be provided in this section. A table summarizing the laboratory and QA/QC analytical data, applicable cleanup levels and modifications to the vapor and/or groundwater sampling program may be substituted for this section. The tables shall include all information required in section E.4.k below.

E.4.i REMEDIATION SYSTEM MONITORING

This section shall summarize remediation system capabilities, performance data, monitoring data, treatment system discharge sampling requirements and system influent and effluent sample chemical analytical results. The dates of operation, system failures and modifications made to the remediation system during the reporting period shall be included in this section. A summary table may be substituted for this section. The tables shall include all information required in section E.4.k below.

E.4.j SUMMARY

This section shall provide a discussion and conclusions with regard to the results of the monitoring conducted at the site. In addition, this section shall provide a comparison of the results to applicable cleanup levels and relevant historical monitoring and chemical analytical data. An explanation shall be provided with regard to data gaps. A discussion of remediation system performance, monitoring results, modifications, if applicable, and compliance with discharge requirements shall be provided in this section. Recommendations and explanations regarding future monitoring, remedial action or site closure also shall be included in this section.

E.4.k TABLES

The following summary tables shall be included in each monitoring report. Data presented in the tables shall include the current data plus data from the three previous monitoring events or, if data from less than three monitoring events is available, data acquired during previous subsurface investigations and vapor, groundwater and/or remediation system monitoring. The dates of data collection shall be included in the tables. Summary tables may be substituted for portions of the text. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections.

1. Summary of regulatory criteria (a Regulatory Criteria text section can be substituted for this table or the applicable cleanup levels can be included in the analytical data tables).
2. Summary of groundwater elevation and depth to groundwater data. The table shall include the monitoring well depths and the screened intervals in each well.
3. Summary of field measurements of surface water quality data, if applicable.
4. Summary of field measurements of field vapor monitoring data (must include historical vapor monitoring data as described above), if applicable.
5. Summary of field measurements of groundwater quality data (must include historical water quality data as described above).
6. Summary of vapor sample chemical analytical data, if applicable (must include historical vapor sample chemical analytical data as described above)
7. Summary of surface water chemical analytical data, if applicable (must include historical surface water chemical analytical data as described above).
8. Summary of groundwater chemical analytical data (must include historical groundwater chemical analytical data as described above).
9. Summary of remediation system monitoring data, if applicable (must include historical remediation system monitoring data as described above).

E.4.l FIGURES

All figures must include a scale and north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms and qualifiers. The following figures shall be included with each monitoring report where applicable:

1. Vicinity map showing topography and the general location of the subject site relative to surrounding features or properties.
2. Facility site plan that presents pertinent site features and structures, well and piezometer locations and remediation system location(s) and features. Off-site well locations and pertinent features shall be included on the site plan if practical. Additional site plans may be required to present the locations of relevant off-site well locations, structures and features.
3. Figure presenting the locations of, piezometer, monitoring and other well locations, groundwater elevation data and indicating groundwater flow direction(s).

4. Figure(s) presenting groundwater chemical analytical data for the current monitoring event. The chemical analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
5. Figure(s) presenting surface water sampling locations and chemical analytical data for the current monitoring period.
6. Figure(s) presenting vapor sampling locations and chemical analytical data for the current monitoring event. The chemical analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
7. Figures presenting geologic cross-sections based on outcrop and borehole data, if applicable.

E.4.m APPENDICES

Monitoring reports shall include the appendices listed in this section (E.4.m) below. Additional appendices may be necessary to present data or documentation not listed below.

E.4.m.i FIELD METHODS

The methods used to acquire field measurements, groundwater elevations, vapor and water quality data, vapor and water samples, and remediation system data shall be included in this section. Methods include, but are not limited to, the methods and types of instruments used to measure depths to water, air or headspace parameters, and water quality parameters. In addition, decontamination, well purging and well sampling techniques and sample handling procedures shall be provided in this Appendix. Methods of measuring and sampling remediation systems shall be reported in this section, if applicable. Purge and decontamination water storage and disposal methods also shall be presented in this appendix. Copies of purge and decontamination water disposal documentation shall be provided in a separate appendix.

E.4.m.ii CHEMICAL ANALYTICAL PROGRAM

Chemical analytical methods, a summary of data quality objectives and data quality review procedures shall be reported in this Appendix. A summary of data quality exceptions and their effect on the acceptability of the chemical analytical data with regard to the monitoring event and the site status shall be included in this appendix along with references to case narratives provided in the laboratory reports.

E.4.m.iii CHEMICAL ANALYTICAL REPORTS

This appendix shall include all laboratory chemical analytical data generated for the reporting period. The data may be submitted electronically on a compact disc in Microsoft Excel format. The reports shall include all chain-of-custody records and QA/QC results provided by the laboratory. Hard (paper) copies of all chain-of-custody records shall be submitted as part of this appendix.

E.5 RISK ANALYSIS REPORT

The format listed below fulfills the requirements acceptable to the Secretary for the preparation of a risk assessment report for sites requiring corrective action at the Facility. This section provides a general outline for risk assessments and also lists the minimum requirements for describing risk assessment elements within each subsection when preparing these documents for Facility sites. In general, interpretation of data shall be presented only in the Background, Site Conceptual Model and Conclusions and Recommendations sections of the reports. The other text sections of the Risk Analysis document shall be reserved for presentation of sampling results from all investigations, conceptual and mathematical elements of the risk assessment, and presentations of toxicity information and screening values used in the risk assessment. Sections E.5.h and subsequent sections should be presented in separate sections for the human health and ecological risk assessments, but the general risk assessment outline applicable to both sections is provided below.

E.5.a TITLE PAGE

The title page shall include the type of document, Facility name and SWMU, AOC, site and/or unit name(s) and the submittal date. A signature block providing spaces for the name, title and organization of the preparer and the responsible Facility representative shall be provided on the title page.

E.5.b EXECUTIVE SUMMARY

This section shall provide a brief summary of the purpose and scope of the risk assessment for the subject site. The Executive Summary also shall briefly summarize the conclusions of the risk assessment. The Facility name and SWMU, AOC and/or unit name(s) and location shall be included in the executive summary.

E.5.c TABLE OF CONTENTS

The table of contents shall list all text sections and subsections, tables, figures and appendices or attachments included in the risk assessment. The corresponding page numbers for the titles of each unit of the report shall be included in the table of contents.

E.5.d INTRODUCTION

This section shall include the Facility name, unit name and location and unit status (active operations, closed, corrective action, etc.). General information on the current site usage and status shall be included in this section.

E.5.e BACKGROUND

Relevant background information shall be provided in this section. This section shall briefly

summarize historical site uses including the locations of current and former site structures and features. A labeled figure shall be included in the document showing the locations of current and former site structures and features.

E.5.e.i Site Description

This subsection shall provide a description of current site topography, features and structures including a description of drainages, erosional features, current site uses and other data relevant to assessing risk at the site. Depth to groundwater and direction of groundwater flow shall be included in this section. The presence and location of surface water bodies such as springs or wetlands shall be noted in this section. Photos of the site may be incorporated into this section if desired. Ecological features of the site should be described here, including type and amount of vegetative cover, observed and expected wildlife receptors, and level of disturbance of the site. A topographical map of the site and vicinity of the site showing habitat types, boundaries of each habitat, and any surface water features shall be included in the Figures section of the document.

E.5.e.ii Sampling Results

This section shall include a summary of the release history, known and possible sources of contamination, and the vertical and lateral extent of contamination present in each media. This section shall include summaries of sampling results of all investigations including site plans (included in the Figures section of the document) showing locations of detected contaminants. This section shall reference pertinent figures, data summary tables and references in previous reports. References to previous reports shall include page, table and figure numbers for referenced information. Summaries of sampling data for each constituent shall include the maximum value detected, the detection limit, the 95% UCL of the mean value detected (if applicable to the data set) and whether that 95% UCL of the mean was calculated based on a normal or lognormal distribution. Background values used for comparison to inorganic constituents at the site shall be presented in this subsection. The table of background values should appear in the Tables section of the document and include actual values used as well as the origin of the values (facility-wide, site-specific, UCL, UTL). This section shall also include a discussion of how "non-detect" sample results were handled in the averaging of data.

E.5.f SITE CONCEPTUAL MODEL

This section shall include information on the expected fate and transport of contaminants detected at the site and shall provide a list of all sources of contamination at the unit. Sources that are no longer considered to be ongoing but represent the point of origination for contaminants transported to other locations shall be included. The discussion of fate and transport shall address potential migration of each contaminant in each media, potential degradation products and their migration, and anticipated pathways of exposure for human or ecological receptors. Diagrammatic representations of the site conceptual model shall appear in the Figures section of the document.

For human health risk assessments, the conceptual site model shall include residential land use as the future land use for all risk assessments. In addition, site specific future land use may be included provided that written approval to consider a site-specific future land use has been obtained from NMED prior to inclusion of the anticipated land use in the risk assessment. If a site-specific future land use scenario appears in the risk assessment, all values for exposure parameters and the source of those values shall be included in table format and presented in the Tables section of the document.

Conceptual site models presented for ecological risk assessments shall identify assessment endpoints and measurement receptors for the site. The discussion of the model shall explain how the measurement receptors for the site are protective of the wildlife receptors identified in section E.5.e.h.i.

E.5.g RISK SCREENING LEVELS

This section shall present the actual screening values used for each contaminant for comparison to all human health and ecological risk screening levels. NMED soil screening levels for residential soil shall be used to screen soil for human health. For those contaminants not appearing on the NMED SSL table, the EPA Region 6 soil screening value adjusted to meet the NMED risk goal of 10^{-5} for total risk for carcinogens shall be used to screen the site for human health risks. If the NMED database does not contain a screening value for the receptor or contaminant of concern, the Facility shall use USEPA ECO-SSLs or derive a screening level using the methodology in the NMED *Guidance for Assessing Ecological Risks Posed by Chemicals: Screening -Level Ecological Risk Assessment*. If no valid toxicological studies exist for the receptor or contaminant of concern, the contaminant/receptor combination shall be addressed using qualitative methods. If an approved site-specific risk scenario is used for the human health risk assessment, this section shall include all toxicity information and exposure assessment equations used for the site-specific scenario as well as the sources for that information. Other regulatory levels applicable to screening the site, such as drinking water MCLs, shall also be included in this section.

E.5.h RISK ASSESSMENT RESULTS

All risk values, HQs, and HIs for human health under projected future residential scenario and site-specific scenario, if applicable, shall be presented in this section. For ecological receptors, the HQ for each contaminant for each receptor, as well as the HI for each receptor shall be presented in this section.

E.5.h.i Uncertainty Analysis

This section shall include discussion of both qualitative and quantitative uncertainty in the risk assessment and estimate the potential impact of the various uncertainties.

E.5.i CONCLUSIONS AND RECOMMENDATIONS

This section shall include the interpretation of the results of the risk assessment and any recommendations for future disposition of the site. This section may include additional information and considerations that the facility believes are relevant to the analysis of the site.

E.5.j TABLES

Data presented in the summary tables shall include information on detection limits and significant data quality exceptions. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections. The following summary tables shall be included in the risk assessment, as appropriate:

1. Background values used for comparison to inorganic constituents at the site. Table shall include actual values used as well as the origin of the values (facility-wide, site-specific, UCL, UTL, or max).
2. Summaries of sampling data shall include, for each constituent, the maximum value detected, the 95% UCL of the mean value detected (if applicable to the data set) and whether the 95% UCL of the mean was calculated based on a normal or lognormal distribution.
3. Table of all screening values used and the sources of those values.
4. For human health, all risk values, hazard quotients (HQs), and hazard indices (HIs) under projected future residential scenario.
5. For human health, all risk values, HQs, HIs under approved additional site-specific future land use scenario.
6. For ecological receptors, the HQ for each contaminant for each receptor, as well as the HI for each receptor.

E.5.k FIGURES

All figures must include a scale and north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms and qualifiers. The following figures shall be included with the risk assessment for each unit, as appropriate:

1. Vicinity map showing topography and the general location of the subject site relative to surrounding features or properties.
2. For human health risk assessments, unit site plan that presents pertinent site features and structures, underground utilities, well locations and remediation system location(s) and details. Off-site well locations and other relevant features shall be included on the site plan if practical. Additional site plans may be required to present the locations of relevant off-site well locations, structures and features.
3. For ecological risk assessments, a topographical map of the site and vicinity of the site showing habitat types, boundaries of each habitat, and any surface water features.
4. Conceptual site model diagrams for both human health and ecological risk assessments

E.5.1 APPENDICES

Appendices may be included to present additional relevant information for the risk analysis such as the results of statistical analyses of data sets and comparisons of data, ecological checklists for the site, full sets of results of all sampling investigations at the site or other data as appropriate.

E.6 CORRECTIVE MEASURES EVALUATION

The format listed below fulfills the requirements acceptable to the Secretary for the preparation of a corrective measures evaluation for sites requiring corrective action. This section provides a general outline for corrective measures evaluations and also lists the minimum requirements for describing corrective measures evaluations within each subsection when preparing these documents for Facility sites. All investigation summaries, site condition descriptions, corrective action goals, corrective action options, remedial options selection criteria and schedules shall be included in the corrective measures evaluations. In general, interpretation of historical investigation data shall be presented only in the Background sections of the corrective measures evaluations; however, at a minimum, detections of contaminants encountered during previous site investigations shall be presented in the corrective measures evaluations in table format with an accompanying site plan showing sample locations. The other text sections of the corrective measures evaluations shall be reserved for presentation of corrective action-related information regarding anticipated or potential site-specific corrective action options and methods relevant to the project. The general corrective measures evaluation outline is provided below.

E.6.a TITLE PAGE

The title page shall include the type of document, Facility name and SWMU, AOC, site and/or unit name(s) and the submittal date. A signature block providing spaces for the name, title and organization of the preparer and the responsible Facility representative shall be provided on the title page.

E.6.b EXECUTIVE SUMMARY

This section shall provide a brief summary of the purpose and scope of the corrective measures evaluation to be conducted at the subject site. The Executive Summary also shall briefly summarize the conclusions of the evaluation. The Facility and SWMU, AOC and/or unit name(s) and location shall be included in the executive summary.

E.6.c TABLE OF CONTENTS

The table of contents shall list all text sections and subsections, tables, figures and appendices or attachments included in the corrective measures evaluation. The corresponding page numbers for the titles of each unit of the report shall be included in the table of contents.

E.6.d INTRODUCTION

This section shall include the Facility name, unit location and unit status (active operations, closed, corrective action, etc.). General information on the current site usage and status shall be included in this section. A brief description of the purpose of the corrective measures evaluation and the corrective action objectives for the project also shall be provided in this section.

E.6.e BACKGROUND

Pertinent background information shall be provided in this section. This section shall briefly summarize historical site including the locations of current and former site structures and features. A labeled figure shall be included in the document showing the locations of current and former site structures and features. The locations of subsurface features such as pipelines, underground tanks, utility lines and other subsurface structures shall be included in the background summary and labeled on the site plan.

This section shall include contaminant and/or waste characteristics and a brief summary of the release history, known and possible sources of contamination and the vertical and lateral extent of contamination present in each media. This section shall include brief summaries of results of previous investigations including references to pertinent figures, data summary tables and text in previous reports. References to previous reports shall include page, table and figure numbers for referenced information. Summary tables and site plans showing relevant investigation locations shall be referenced and included in the Tables and Figures sections of the document, respectively.

E.6.f SITE CONDITIONS

E.6.f.i Surface Conditions

This subsection shall provide a description of current and historic site topography, features and structures including a description of drainages, vegetation, erosional features and current site uses. This subsection also shall include a description of those features that could potentially influence corrective action option selection or implementation such as structures, wetlands or other features that may affect remedial activities. In addition, descriptions of features located in surrounding sites that may have an effect on the subject site regarding sediment transport, surface water runoff or contaminant transport shall be included in this subsection. A site plan displaying the locations of all pertinent surface features and structures shall be included in the Figures section of the corrective measures evaluation.

E.6.f.ii Subsurface Conditions

A description of the site conditions observed during previous subsurface investigations shall be included in this section including but not limited to, relevant soil horizon and stratigraphic information, groundwater conditions, fracture data and subsurface vapor information. A site

plan displaying the locations of all borings and excavations drilled or excavated during previous investigations shall be included in the Figures section of the corrective measures evaluation.

E.6.g POTENTIAL RECEPTORS

E.6.g.i Sources

This subsection shall provide a list of all sources of contamination at the subject site where corrective measures are to be considered or required. Sources that are no longer considered to be ongoing but represent the point of origination for contaminants transported to other locations shall be included in this subsection.

E.6.g.ii Pathways

This subsection shall provide a description of potential migration pathways that could result in either acute or chronic exposures to contaminants such as utility trenches, paleochannels, surface exposures, surface drainages, stratigraphic units, fractures, structures and other features. The migration pathways for each contaminant and each media shall be tied to the potential receptors for each pathway. A discussion of contaminant characteristics relating to fate and transport of regulated substances through each pathway also shall be included in this subsection.

E.6.g.iii Receptors

This subsection shall provide a listing and description of all anticipated potential receptors that could possibly be affected by the contamination present at the site. Potential receptors shall include human and ecological receptors, groundwater and also features such as pathways that could divert or accelerate the transport of contamination to human receptors, ecological receptors and/or groundwater.

E.6.h REGULATORY CRITERIA

This section shall provide information regarding applicable cleanup standards, risk-based screening levels and/or risk-based cleanup goals for each media at the subject site. The appropriate cleanup levels for each unit within the subject site shall be included if site-specific levels have been established at separate facility locations. A table summarizing the applicable cleanup standards or inclusion of applicable cleanup standards in the summary data tables providing the results of previous investigations shall be included in the Tables section of the document. Risk-based evaluation procedures, if used to calculate cleanup levels, shall be presented in a separate document. If cleanup levels, calculated in a risk evaluation are employed, the risk evaluation document shall be referenced including pertinent page numbers for referenced information.

E.6.i IDENTIFICATION OF CORRECTIVE MEASURES OPTIONS

This section shall identify and describe potential corrective measures for source control, pathway control and receptor control. Corrective action options shall include the range of available options including but not limited to, no action alternative, institutional controls, engineering controls, in situ and/or on-site remediation alternatives, complete removal and any other combination of alternatives that would potentially achieve cleanup goals.

E.6.j EVALUATION OF CORRECTIVE MEASURES OPTIONS

This section shall provide an evaluation of the corrective measures options identified in Section E.6.i above. The evaluation shall be based on the applicability, technical feasibility, effectiveness, implementability, impacts to human health and the environment, and cost of each option. A table summarizing the corrective measures alternatives and the criteria listed below shall be included in the Tables section of this document. The general basis for evaluation of corrective measures options is defined below.

E.6.j.i Applicability

Applicability addresses the overall suitability for the corrective action option for containment or remediation of the contaminant(s) in the subject media(s) with regard to protection of human health and the environment.

E.6.j.ii Technical Feasibility

Technical Feasibility describes the reliability/uncertainty in designing, constructing and operating a specific remedial alternative. The description shall include an evaluation of historical application of the remedial alternative including performance, reliability and minimization of hazards.

E.6.j.iii Effectiveness

Effectiveness assesses the ability of the corrective measure to mitigate the measured or potential impact of contamination in a media under the current and projected site conditions. The assessment also shall include the anticipated duration for the technology to attain regulatory compliance. In general, all corrective measures described in Section E.6.i above will have the ability to mitigate the impacts of contamination at the site or unit but not all remedial options will be equally effective at achieving the desired cleanup goals to the degree and within the same time frame as other options.

E.6.j.iv Implementability

Implementability characterizes the degree of difficulty involved during the installation,

construction and operation of the corrective measure. Operation and maintenance of the alternative shall be addressed in this subsection.

E.6.j.v Human Health and Ecological Protectiveness

This category evaluates the short-term (remedy installation-related) and long-term (remedy operation-related) hazards to human health and the environment of implementing the corrective measure. The assessment shall include whether the technology will create a hazard or increase existing hazards and the possible methods of hazard reduction.

E.6.j.vi Cost

This subsection shall discuss the anticipated cost of implementing the corrective measure. The costs shall be divided into (1) capital costs involved with construction, installation, pilot testing, evaluation, permitting and reporting of the effectiveness of the alternative and (2) continuing costs associated with operating, maintaining, monitoring, testing and reporting on the use and effectiveness of the technology.

E.6.k SELECTION OF CORRECTIVE MEASURES

The Permittee shall provide a justification in this section for the recommendation of the preferred corrective measure(s) at the site or unit. The recommendation shall be based upon the ability of the remedial alternative to: (1) achieve cleanup objectives in a timely manner, (2) protect human and ecological receptors, (3) control or eliminate the source(s) of contamination, (4) control migration of released contaminants and (5) manage remediation waste in accordance with State and Federal regulations. The justification shall include the supporting rational for the remedy selection based on the factors listed in Section E.6.j and a discussion of short- and long-term objectives for the site or unit. The benefits and possible hazards of each preferred potential corrective measure alternative shall be included in this section.

E.6.l DESIGN CRITERIA TO MEET CLEANUP OBJECTIVES

The Permittee shall present descriptions of the preliminary design for the recommended corrective measures alternatives in this section. The description shall include appropriate preliminary plans and specifications to effectively illustrate the technology and the anticipated implementation of the remedial option at the subject area. The preliminary design shall discuss the design life of the alternative and provide engineering calculations for proposed remediation systems.

E.6.m SCHEDULE

This section shall provide a proposed schedule for completion of remedy-related activities such as bench tests, pilot testing, construction, installation, remedial excavation, cap construction, installation of monitoring points and other remedial actions. The anticipated duration of

corrective action operations and the schedule for conducting monitoring and sampling activities also shall be presented. In addition this section shall provide a schedule for submittal of reports and data to the Secretary including a schedule for submitting all status reports and preliminary data.

E.6.n TABLES

Data presented in the summary tables shall include information on dates of sample collection, analytical methods, detection limits and significant data quality exceptions. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections. The following summary tables shall be included in the corrective measures evaluations, as appropriate:

1. Summaries of regulatory criteria, background and/or the applicable cleanup standards.
2. Summaries of historical field survey location data.
3. Summaries of historical field screening and field parameter measurements for individual media.
4. Summaries of historical soil, sediment, groundwater and/or surface water laboratory analytical data. The summary tables shall include the analytical methods, detection limits and significant data quality exceptions that could influence interpretation of the data.
5. Summaries of historical groundwater elevation and depth to groundwater data. The table shall include the monitoring well depths and the screened intervals in each well.
6. Summary of historical air sample screening and chemical analytical data. The data tables shall include the screening instruments used, laboratory analytical methods, detection limits and significant data quality exceptions that would influence interpretation of the data.
7. Summary of historical pilot testing data, if applicable, including units of measurement and types of instruments used to obtain measurements.
8. Summary of the corrective measures alternatives and evaluation criteria.
9. Schedule for installation, construction, implementation and reporting of selected corrective measures.

E.6.o FIGURES

All figures must include a scale and north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms and qualifiers. The following figures shall be included with each corrective measures evaluation for each unit, as appropriate:

1. Vicinity map showing topography and the general location of the subject site relative to surrounding features or properties.
2. Unit site plan that presents pertinent site features and structures, underground utilities, well locations and remediation system location(s) and details. Off-site well locations and other relevant features shall be included on the site plan if practical. Additional site plans may be required to present the locations of relevant off-site well locations, structures and features.
3. Figures showing historical soil boring or excavation locations and sampling locations.

4. Figures presenting historical soil sample field screening and laboratory analytical data, if appropriate.
5. Figures showing all existing wells including vapor monitoring wells and piezometers, presenting historical groundwater elevation data and indicating groundwater flow direction(s).
6. Figure(s) presenting historical groundwater laboratory analytical data including past data, if applicable. The chemical analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
7. Figures presenting historical surface water sample locations and analytical data including past data, if applicable. The laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure.
8. Figures showing historical air sampling locations and presenting air quality data. The field screening or laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map.
9. Figures presenting historical pilot testing locations and data, where applicable, including site plans or graphic data presentation.
10. Figures presenting geologic cross-sections based on outcrop and borehole data if applicable.
11. Figures presenting the locations of existing and proposed remediation systems.
12. Figures presenting existing remedial system design and construction details.
13. Figures presenting preliminary design and construction details for preferred corrective measures.

E.6.p APPENDICES

The management plan for waste generated as a result of construction, installation or operation of remedial systems or activities plan shall be included as an appendix to the corrective measures evaluation. Corrective measures evaluations shall include additional appendices presenting relevant additional data such as pilot testing or investigation data, remediation system design specifications, system performance data or cost analyses as necessary.

ATTACHMENT 1

NAVAJO REFINING COMPANY ARTESIA REFINERY
RCRA PART B POST-CLOSURE PERMIT APPLICATION
SECTIONS 4.0 THROUGH 9.0, APPENDIX 2 AND APPENDIX 3

ATTACHMENT 2

RCRA PART B POST-CLOSURE PERMIT APPLICATION
NAVAJO REFINING COMPANY ARTESIA REFINERY
RCRA PART B POST-CLOSURE PERMIT APPLICATION
SECTIONS 13.0, 15.0, 16.0, ATTACHMENTS B-4 THROUGH B-6 AND B-8