From:	Goetze, Phillip, EMNRD
To:	Ernest Padilla
Cc:	Murphy, Kathleen A, EMNRD; Powell, Brandon, EMNRD; Rose-Coss, Dylan H, EMNRD; Thompson, Joseph, EMNRD
Subject:	Denial of Empire"s Protest of C-108 Application for the Northeast Drinkard Unit Well No. 604
Date:	Friday, January 28, 2022 4:07:30 PM
Attachments:	Empire"s Protest of Apache"s C-108 Application for NEDU Well No. 604.pdf OCD Protest Letter 120121.pdf C-108 Cover_NEDU#604.pdf

RE: Northeast Drinkard Unit Well No. 604 (30-025-06591); Application pBL2130553631

Mr. Padilla:

Reference is made to the attached e-mail regarding Empire's protest of the application for conversion of an existing well within the Northeast Drinkard Unit to an injection well. I have made two attempts to obtain clarification in the matter in order to determine the validity of the protest but have not received any response from your client. Therefore, I have made a finding that Empire's protest is not pertinent to the content of Apache's application and that the OCD shall continue with administrative processing of the application. Should Empire feel the need to continue to oppose any administrative order approved as a result of this application, then they have the ability to initiate a case by filing for a hearing under 19.15.4 NMAC. Thank you for the assistance and contact me with any questions in this matter. PRG

Phillip R. Goetze
UIC Group
New Mexico Oil Conservation Division
Albuquerque Office
5200 Oakland Avenue NE, Suite 100
Direct: 505.660.8274
Email: phillip.goetze@state.nm.us

PERMITS WEST
PROVIDING PERMITS for LAND USERS
37 Verano Loop, Santa Fe, New Mexico 87508 505-466-8120

EXHIBIT K

NM Oil Conservation Division
1220 S. St. Francis Dr.
Santa Fe, NM 87505

Re: Geology Statement
Apache Corporation
Northeast Drinkard Unit #604
Section 15, T. 21S, R. 37E
Lea County, New Mexico

To whom it may concern:

Publicly available geologic and engineering data related to the proposed well have been thoroughly reviewed, and no evidence for open faults or any other hydrologic connection between the proposed Tubb/Drinkard injection zone and any underground sources of drinking water has been found. Please see the attached seismic risk assessment for additional information.

Sincerely,

Cory Walk

Cory Walk
Geologist

EXHIBIT K

Seismic Risk Assessment

Apache Corporation

Northeast Drinkard Unit #604

Section 15, Township 21 South, Range 37 East

Lea County, New Mexico

Cory Walk, M.S.

Cory Walk

Geologist

Permits West Inc.

October 28, 2021

EXHIBIT K

GENERAL INFORMATION

Northeast Drinkard Unit #604 is located in the NW ¼, section 15, T21S, R37E, about 2 miles north of Eunice, NM in the Central Basin Platform of the greater Permian Basin. Apache Corporation proposes to convert this existing oil well to a water injection well. The proposed injection zone is within the Tubb and Drinkard members of the Yeso Formation through a cased hole from 6,420'-6,650' below ground surface. The Tubb and Drinkard are primarily carbonate reservoirs with the Tubb also containing some dolomitic sandstone intervals. This report assesses any potential concerns relating to induced seismicity along deep penetrating Precambrian faults or the connection between the injection zone and known underground potable water sources.

SEISMIC RISK ASSESSMENT

Historical Seismicity

Searching the USGS earthquake catalog resulted in no (0) earthquakes above a magnitude 2.5 within 6 miles (9.7 km) of the proposed injection site since 1970 (Fig 1). According to this dataset, the nearest historical earthquake occurred June 2, 2001 about 10.1 miles (~16.2 km) south and had a magnitude of 3.3.

Basement Faults and Subsurface Conditions

A structure contour map (Fig. 1) of the Precambrian basement shows the Northeast Drinkard Unit #604 is approximately 2.4 miles from the nearest basement-penetrating fault inferred by Ewing et al (1990) and about 62 miles from the nearest surface fault.

Snee and Zoback (2018) state, "In the western part of Eddy County, New Mexico, S_{Hmax} is ~north–south (consistent with the state of stress in the Rio Grande Rift; Zoback and Zoback, 1980) but rotates to ~east-northeast–west-southwest in southern Lea County, New Mexico, and the northernmost parts of Culberson and Reeves counties, Texas." Around the Northeast Drinkard Unit #604 site, Snee and Zoback indicate a **S_{Hmax} direction of N075°E and an A_ϕ of 0.81, indicating a normal/strike-slip faulting stress regime**.

Induced seismicity is a growing concern of deep injection wells. Snee and Zoback (2018) show that due to its orientation, the nearest Precambrian fault has a low probability of slipping (Fig. 2). Also, the proposed injection zone is much shallower in the Tubb and Drinkard members of the Yeso Formation and therefore would not affect the deep Precambrian faults. The vertical (approx. 1500') and horizontal (2.4 miles) separation between the proposed SWD injection zone and any deep Precambrian faults is large enough to infer that there is no immediate concern or potential of induced seismicity as a result from this injection well.

GROUNDWATER SOURCES

Three principal aquifers are used for potable groundwater in southern Lea County; these geologic units include the Triassic Santa Rosa formation, Tertiary Ogallala formation, and Quaternary alluvium. Nicholson and Clebsch (1961) state, "Potable ground water is not available below the Permian and Triassic unconformity but, because this boundary is not easily defined, the top of the Rustler anhydrite formation is

EXHIBIT K

regarded as the effective lower limit of 'potable' ground water." Around the Northeast Drinkard Unit #604 well, the top of a thick anhydrite unit interpreted to represent the Rustler Formation lies at a depth of ~1570 feet bgs.

STRATIGRAPHY

A thick permeability barrier (Rustler Anhydrite and Salado Fm; 1500+ ft thick) exists above the targeted Tubb/Drinkard injection zone. Well data indicates ~4,850 ft of rock separating the top of the injection zone from the previously stated lower limit of potable water at the top of the Rustler anhydrite formation.

CONCLUDING STATEMENT

All available geologic and engineering data evaluated around the Northeast Drinkard Unit #604 well show no potential structural or stratigraphic connection between the Tubb/Drinkard injection zone and any subsurface potable water sources. The shallow injection zone, spatial location and orientation of nearby faults also removes any major concern of inducing seismic activity.

EXHIBIT K

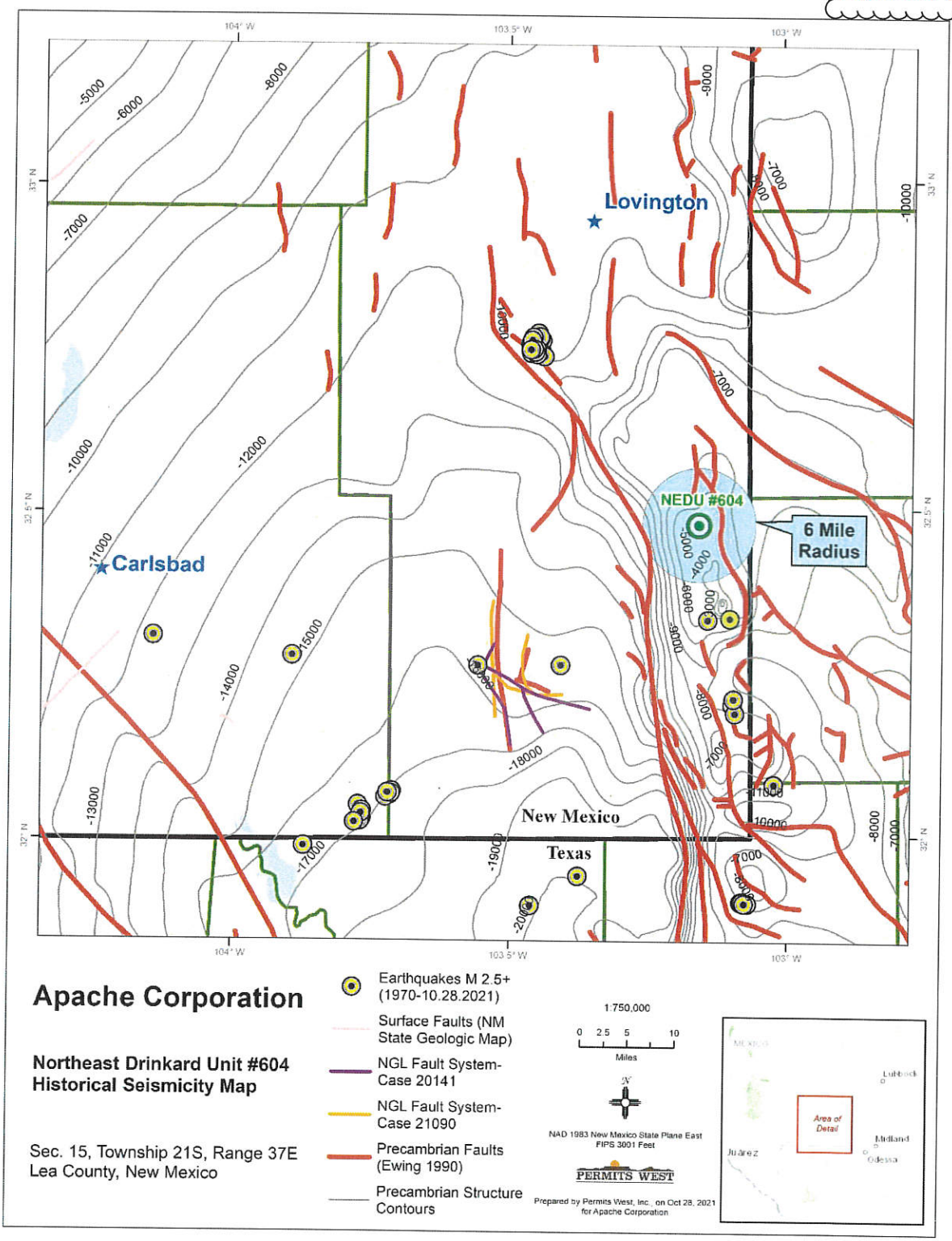

Figure 1. Structural contour map of the Precambrian basement in feet below sea level. Red lines represent the locations of Precambrian basement-penetrating faults (Ewing et al., 1990). The Northeast Drinkard Unit #604 well lies ~2.4 miles west of the closest deeply penetrating fault, ~62 miles from the nearest surface fault and ~10.1 miles from the closest historic earthquake.

EXHIBIT K

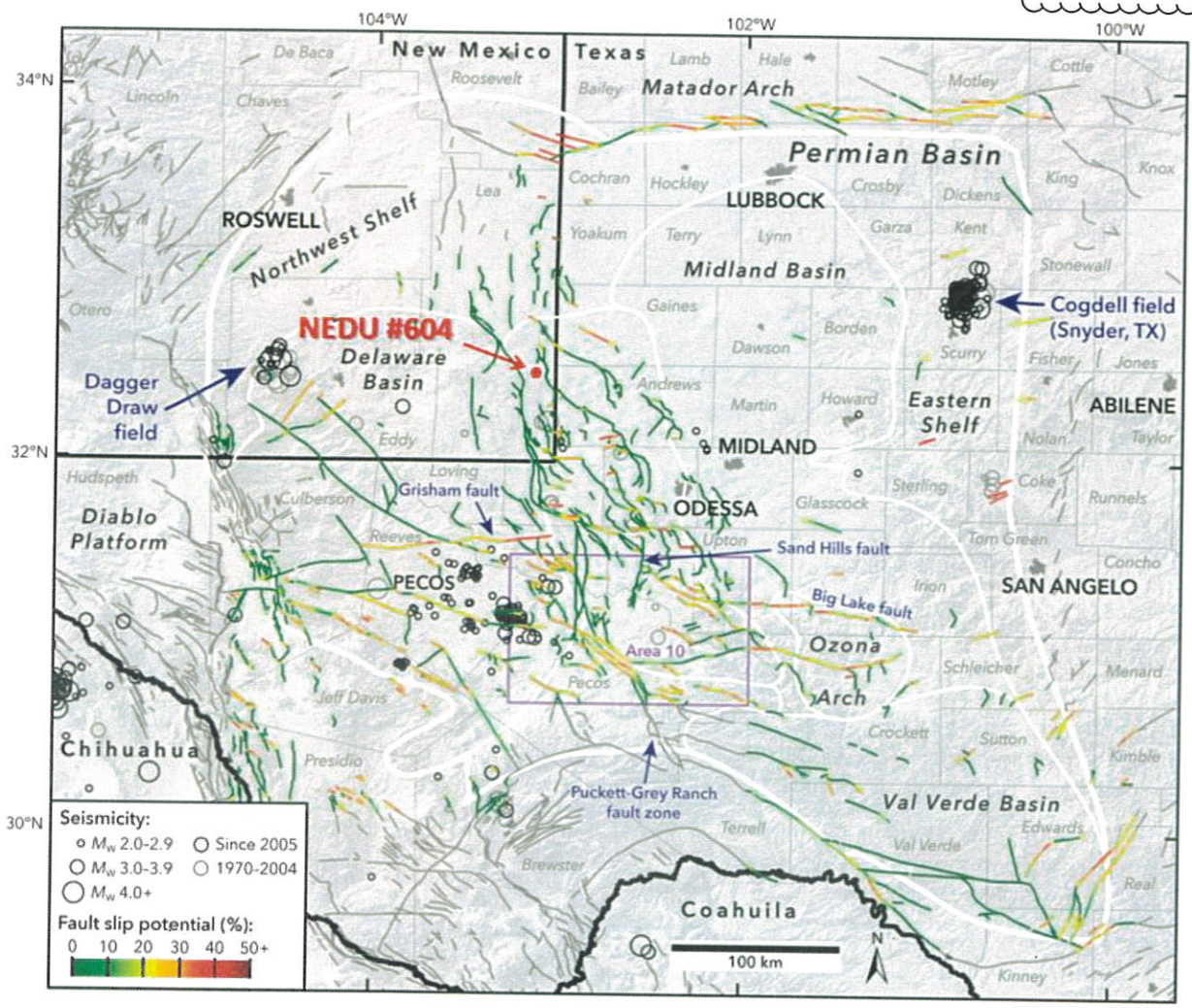

Figure 2. Modified from Snee and Zoback (2018). The nearest deep Precambrian fault lies ~2.4 miles east of the proposed SWD well and has a low probability (0%) of slip. Also, the proposed injection zone is much shallower in the Tubb and Drinkard and therefore removes any major concern of inducing seismicity on any known fault.

EXHIBIT K

References Cited

Ewing, T. E., 1990, The tectonic map of Texas: Austin, Bureau of Economic Geology, The University of Texas at Austin.

Geologic Map of New Mexico, New Mexico Bureau of Geology and Mineral Resources, 2003, Scale 1:500,000.

Nicholson, A., Jr., and Clebsch, A., Jr., 1961, Geology and ground-water conditions in southern Lea County, New Mexico: New Mexico Bureau of Mines and Mineral Resources, Ground-Water Report 6, 123 pp., 2 plates.

Snee, J.-E.L., Zoback, M.D., 2018, State of stress in the Permian Basin, Texas and New Mexico: Implications for induced seismicity: Leading Edge, v. 37, p. 127–134.

pBL 2130553-631

FORM C-108 Technical Review Summary [Prepared by reviewer and included with application; V17]

DATE RECORD: First Rec: 11-1-21 **Admin Complete:** ✓ **or Suspended:** _____ Add. Request/Reply: _____

ORDER TYPE: WFX Number: 1044 Order Date: SWD 1987 Legacy Permits/Orders: case 4231 R-8540/41 WF 1987-

Well No. 604 Well Name(s): Northeast Drinkard Unit

API : 30-0 25-06591 Spud Date: 1963 New or Old (EPA): ____ (*UIC Class II Primacy 03/07/1982*)

Footages 2310 FNL 990 FWL Lot ___ or Unit E Sec 15 Tsp 21S Rge 37E County Lea

Latitude: 32.479859 Longitude 103.1562042 Pool: Eunice; BLI-Tu-Dr, N Pool No.: 22900

Operator: Apache OGRID: 873 Contact: B Wood Email: brianna.wood@apachecorp.com

COMPLIANCE RULE 5.9: Total Wells: 2978 Inactive: 3 **Fincl Assur:** ✓ Compl. Order? ☐ **IS 5.9 OK?** ✓ **Date:** 2-2-2022

WELL FILE REVIEWED ☐ Current Status: active oil

WELL DIAGRAMS: NEW: Proposed ○ or **RE-ENTER:** Before Conv. ◉ After Conv. ○ Logs in Imaging: ✓ 1951

Planned Rehab Work to Well: Active oil → Injector

TOC = 2920

Well Construction Details	Sizes (In) Borehole / Pipe	Setting Depths (ft)		Cement Sx or Cf	Cement Top and Determination Method
Planned ☐ or Existing ☒ **Surface**	12.5 → 13.3	334	Stage Tool	350	CTS
Planned ☐ or Existing ☒ **Interm/Prod**	12.2 → 8.62	2835		500	CTS
Planned ☐ or Existing ☐ **Interm/Prod**					
Planned ☐ or Existing ☒ **Prod/Liner**	7.8 → 5.5	4550		400	C
Planned ☐ or Existing ☒ **Liner**	4.5	6750		perf 6420-6650 248, CTS	
Planned ☐ or Existing ☐ **OH / PERF**	6420	6650	Inj Length		

Injection Lithostratigraphic Units:	Depths (ft)	Injection or Confining Units	Tops
Adjacent Unit: Litho ☐ Struc ☐ Por. ☐			
Confining Unit: Litho ☐ Struc ☐ Por. ☐			
Proposed Inj Interval TOP:			
Proposed Inj Interval BOTTOM:			
Confining Unit: Litho ☐ Struc ☐ Por. ☐			
Adjacent Unit: Litho ☐ Struc ☐ Por. ☐			

Completion/Operation Details:

Drilled TD 8193 PBTD 6673

NEW TD _____ NEW PBTD _____

NEW Open Hole ○ NEW Perfs ◉

Tubing Size 2.375 in. Inter Coated? ✓

Proposed Packer Depth 6390 ft

Min. Packer Depth _____ (100-ft limit)

Proposed Max. Surface Press. 1284 psi

Admin. Inj. Press. 1284 (0.2 psi per ft)

AOR: Hydrologic and Geologic Information

POTASH: R-111-P ☐ *Noticed?* ☐ **BLM Sec Ord** ☐ **WIPP** ☐ *Noticed?* ☐ **Salt/Salado** T: ___ B: ___ **NW: Cliff House fm** ___

USDW: Aquifer(s) _____ Max Depth _____ **HYDRO AFFIRM STATEMENT By Qualified Person** ☐

NMOSE Basin: _____ **CAPITAN REEF:** thru ☐ adj ☐ NA ☐ **No. GW Wells in 1-Mile Radius?** _____ FW Analysis? _____

Disposal Fluid: Formation Source(s) Blb, Tubb, Drink Analysis? ✓ EXH On Lease ✓ Operator Only ○ Commercial ○

Disposal Interval: Inject Rate (Avg/Max BWPD): 2000 Protectable Waters? ___ Source: _____ System: Closed ☐ or Open ☐

HC Potential: Producing Interval? yes Formerly Producing? yes Method: Logs ☑ DST ☐ P&A ☐ Other _____ 2-Mi Radius Pool Map ☐

AOR Wells: 1/2-M ✓ or ONE-M ___ **RADIUS MAP/WELL LIST: Total Penetrating Wells:** 53 [AOR Hor: ___ AOR SWDs: ___]

Penetrating Wells: No. Active Wells 35 No. Corrective? ___ on which well(s)? 35 o/g, 9 inj, 7 P&A, 2 SWD Diagrams? ✓

Penetrating Wells: No. P&A Wells 7 No. Corrective? ___ on which well(s)? No Diagrams? ✓

Induced-Seismicity Risk Assess: analysis submitted Yes historical/catalog review ☐ fault-slip model ☐ **probability** _____

NOTICE: 1/2-M ☐ or ONE-M ☐ : Newspaper Date _____ **Mineral Owner*** _____ Surface Owner _____ N. Date _____

RULE 26.7(A): Identified Tracts? ☐ **Affected Persons*:** _____ N. Date _____

*** new definition as of 12/28/2018** [any the mineral estate of United States or state of New Mexico; SWD operators within the notice radius]

Order Conditions: **Issues:** _____

Additional COAs: _____