

On January 14, 2022, staff of the Railroad Commission of Texas (RRC) established the Stanton Seismic Response Area (SRA) in response to increasing seismic activity in that part of the Midland Basin. The Stanton SRA was established with the following goal: *No more 3.5M+ earthquakes after 18 months from the date of a response action implementation.* Further RRC action will be conditioned on progress towards this goal. RRC staff understand the best available data indicate that deep injection is the primary driver of seismic activity in the Stanton SRA.

The RRC definition of the Stanton SRA (Figure 1) was based on:

- TexNet and USGS catalogs of earthquakes as of 01/14/2022.
- A 10.83 km radial area around the 3.0M+ earthquakes (area shapefile can be downloaded here: <https://www.rrc.texas.gov/oil-and-gas/applications-and-permits/injection-storage-permits/oil-and-gas-waste-disposal/injection-disposal-permit-procedures/seismicity-review/seismicity-response/#StantonResponse>). See Table 1: SRA Event Catalog.
- The RRC may redefine the areal extent of the SRA based on the frequency and magnitude of earthquake activity.

Given the current seismicity issues and the RRC request to develop a targeted, data-based plan to reduce seismicity, the Stanton Seismicity Response Group (SSRG) was formed. This group includes all industry operators affected by the Stanton SRA. The SSRG proposes the following operator-led response plan (OLRP) to address seismicity within the Stanton SRA. The objective of the OLRP is to reduce the occurrence of high-magnitude seismicity such that recurrence of 3.5 magnitude events is decreasing once full implementation of curtailments is achieved on November 15, 2022. Previous activity indicates a multi-month lag time between injection volume increases and seismicity increases. The potential lag time between reductions in injection volumes and reductions in seismicity is uncertain. The SSRG proposes a two-tiered OLRP approach based on depth of the disposal zone, data collection efforts, contingency responses for future seismicity, and scheduled checkpoint updates with RRC staff. Table 4 is a timeline of OLRP checkpoints and quarterly meetings.

DEFINITIONS

1. **Shallow SWD well:** A disposal well permitted and completed above the base of the Wolfcamp Formation
2. **Deep SWD well:** A disposal well permitted and completed below the base of the Wolfcamp Formation
3. **3.0M+ and 3.5M+:** TexNet earthquake catalog event of magnitude equal to or greater than 3.0 or 3.5, respectively
4. **Seismogenic fault (Figure 2):** A line connecting the cluster of 3.5M+ events in the western portion of the Stanton SRA and the single 3.5M+ event in the eastern portion of the Stanton SRA, which approximately corresponds to a subsurface fault imaged in 3D seismic data and interpreted by multiple operators
5. **Inner OLRP boundary (Figure 2):** A 2 km radius around the seismogenic fault
6. **Intermediate OLRP boundary (Figure 2):** A 4.54 km radius around the seismogenic fault
7. **Outer OLRP boundary (Figure 2):** A 9.08 km radius around the seismogenic fault
8. **SRA boundary (Figures 1 & 2):** A 10.83-km radius around 3.0M+ earthquakes, as defined by the RRC

9. **Baseline rate:** The average daily rate for a well during its maximum month of total injection prior to 2022 (used to compare volume reductions in subsequent parts of this document).
10. **OLRP Effective Date:** May 15, 2022

DEEP OLRP

The deep OLRP focuses on what has been determined to be the primary causal factor of seismicity within the Stanton SRA. It aims to reduce deep SWD volumes from wells within the SRA, and to understand any impact they may have on seismicity.

Response Actions:

Participating operators of permitted and active deep SWD wells in the Stanton SRA agree to limit injection rate as follows:

1. Deep disposal will be eliminated within the inner OLRP boundary by 11/15/2022 (1 well, 24,902 bbl/d volume reduction from its baseline rate)
2. Deep disposal will be reduced to a volume ceiling of 10,000 bbl/day in all wells between the inner and intermediate OLRP boundaries by 11/15/2022 (3 wells, 55,193 bbl/d total volume reduction from their individual baseline rates)
3. Deep disposal will be reduced to a volume ceiling of 20,000 bbl/day in all wells between the intermediate and outer OLRP boundaries by 11/15/2022 (7 wells, 73,738 bbl/d total volume reduction from their individual baseline rates)
4. Deep SWD wells outside outer OLRP boundary will be unchanged
5. Based on the above well-specific curtailments, a community volume target of 170,000 bbl/day will be achieved within the OLRP by 11/15/2022, which is a decrease from a peak monthly rate for the community of wells within the OLRP of 254,000 bbl/d, achieved in October 2021
6. Based on the above well-specific curtailments, participating deep SWD operators are responsible for achieving their own base volume reductions as follows:
 - a. **Birch Operations:** monthly average of 10,000 bbl/d for one deep SWD well in the OLRP
 - b. **Crownquest Operating:** monthly average of 60,000 bbl/d for 3 deep SWD wells in the OLRP
 - c. **Diamondback:** monthly average of 20,000 bbl/d for 1 deep SWD well in the OLRP
 - d. **XTO:** monthly average of 30,000 bbl/d for 3 deep SWD wells in the OLRP
 - e. **Gravity:** monthly average of 10,000 bbl/d for 1 deep SWD well in the OLRP
 - f. **SM Energy:** monthly average of 20,000 bbl/d for 1 deep SWD well in the OLRP
 - g. **Stonehill:** monthly average of 20,000 bbl/d for 1 deep SWD well in the OLRP
7. Reduction targets will be evaluated at a monthly resolution, allowing for fluxing of disposal volumes on a daily or weekly basis

Participating operators of existing deep SWD wells that have been permitted but are not in service (not drilled or not completed for or currently capable of injection) will not begin or return to fluid injection.

Deep OLRP Wells:

Table 2 is a list of the permitted deep SWD wells and their operators that are participating Stanton OLRP.

Additional Deep OLRP Elements:

Figure 3 is a decision tree that outlines actions to be taken in various scenarios as the deep OLRP is implemented.

1. If TexNet records a 3.5M+ event within the intermediate OLRP boundary before full implementation of curtailments on November 15, 2022, then the SSRG will meet within 48 hours of notification and consider accelerated timing for full curtailment implementation.
2. If TexNet records a 3.5M+ event within the intermediate OLRP boundary after full curtailment implementation on November 15, 2022, then the SSRG will meet within 48 hours of notification and use available data to determine next steps:
 - a. If it is determined that the seismicity occurred too soon after a previous seismic event or curtailment action, then no further response will be recommended.
 - b. Otherwise, additional curtailment of deep disposal will be recommended to the RRC and implemented if accepted (this includes, an expansion of the OLRP to include SWD wells not currently participating, implementation of a 20,000 bbl/d ceiling for wells between the outer OLRP boundary and the outer SRA boundary, and/or an additional 5,000 bbl/d reduction of wells within the intermediate and/or outer OLRP boundary).
3. If no 3.5M+ events occur within the intermediate OLRP boundary for an extended period of time after full curtailment implementation (i.e., May 15, 2024), then the SSRG will meet and use available data to consider incremental disposal volume increases:
 - a. If it is determined that not enough time has transpired since the last seismic event or curtailment action, then no increase will be recommended.
 - b. Otherwise, an increase will be recommended to the RCC and implemented if accepted.
4. The OLRP monitoring and response process in Steps 2 and 3 will continue in perpetuity until the RRC notifies otherwise.

SHALLOW OLRP

Since the best available data indicates that deep injection is the primary driver of seismic activity in the Stanton SRA, the Stanton OLRP focuses primarily on deep SWD well curtailment. The shallow component of the Stanton OLRP focuses on ensuring that proximal, shallow SWD wells do not exceed a specified injection volume ceiling while the deep OLRP is implemented.

Response Actions:

Participating operators of existing shallow SWD permits in the Stanton SRA agree to limit the injection rate as follows:

1. Disposal volumes of all shallow SWD wells within the OLRP boundary will be limited to 30,000 bbl/day or to their maximum permitted disposal volume, whichever is the lesser of the two, by 11/15/2022
2. Existing shallow SWD permits will not have their maximum daily injection volume increased, nor will existing SWD permit conditions be exceeded
3. Operators of shallow SWD permits within the SRA that have not been drilled or completed will give RRC staff 30 days' notice before drilling or completion operations begin

Shallow OLRP Wells:

Table 3 is a list of the permitted shallow SWD wells and their operators that are participating in the Stanton OLRP.

Additional Shallow OLRP Elements:

Since the best available data indicates that deep injection is the primary driver of seismic activity in the Stanton SRA, subsequent seismic activity (3.5M+ event within the intermediate OLRP boundary) will trigger actions per the deep OLRP decision tree (Figure 3), and not trigger further curtailments in shallow disposal rates.

ELEMENTS COMMON TO SHALLOW AND DEEP OLRPS

1. Operators of SWD wells within the Stanton SRA will continue to report daily pressure and volume data on a monthly basis to the RRC via the TexNet reporting tool (<https://injection.texnet.beg.utexas.edu/>)
2. The Stanton Seismicity Response Group will encourage operators of unconventional development wells within intermediate OLRP boundary to participate in voluntarily providing information to the FracX website (<https://www.pdswdx.com/>).
3. Shallow and deep SWD well operators shall meet with RRC staff on a quarterly basis, and more frequently if necessary, to assess the seismic and industry activity in the SRA, including checkpoint updates on plan performance, impacts, and data analysis.
4. All earthquake magnitudes and locations are based on the TexNet Earthquake Catalog (<https://www.beg.utexas.edu/texnet-cisr/texnet/earthquake-catalog>)

RRC ELEMENTS

1. RRC staff supports the implementation of the industry OLRP for the Stanton SRA as a plan to achieve the RRC's stated goal
2. For deep SWD wells:
 - a. RRC staff will not administratively approve new deep disposal permit applications within the Stanton SRA for 18 months after final curtailments are achieved (18 months after 5/15/2022 being 11/15/2023)
 - b. After 11/15/2023, RRC staff will consider new deep SWD well permit applications within the SRA in a manner that is consistent with current RRC permitting guidelines.
3. For shallow SWD wells, RRC staff will consider new permit applications within the SRA, including changes to existing permits, in a manner that is consistent with current RRC permitting guidelines
4. RRC Reserves the right to take regulatory action pursuant to 16 Texas Administrative Code §3.9(6)(A)(vi) and §3.46(d)(1)(F)

ATTACHMENTS

Figure 1: RRC Stanton Seismic Response Area (SRA) Map

Figure 2: Deep OLRP Boundaries

Figure 3: Deep OLRP Decision Tree

Table 1: SRA Event Catalog

Table 2: Permitted Deep SWD Wells Participating in OLRP

Table 3: Permitted Shallow SWD Wells Participating in OLRP

Table 4: OLRP Timeline

Figure 1: RRC Stanton Seismic Response Area (SRA) Map

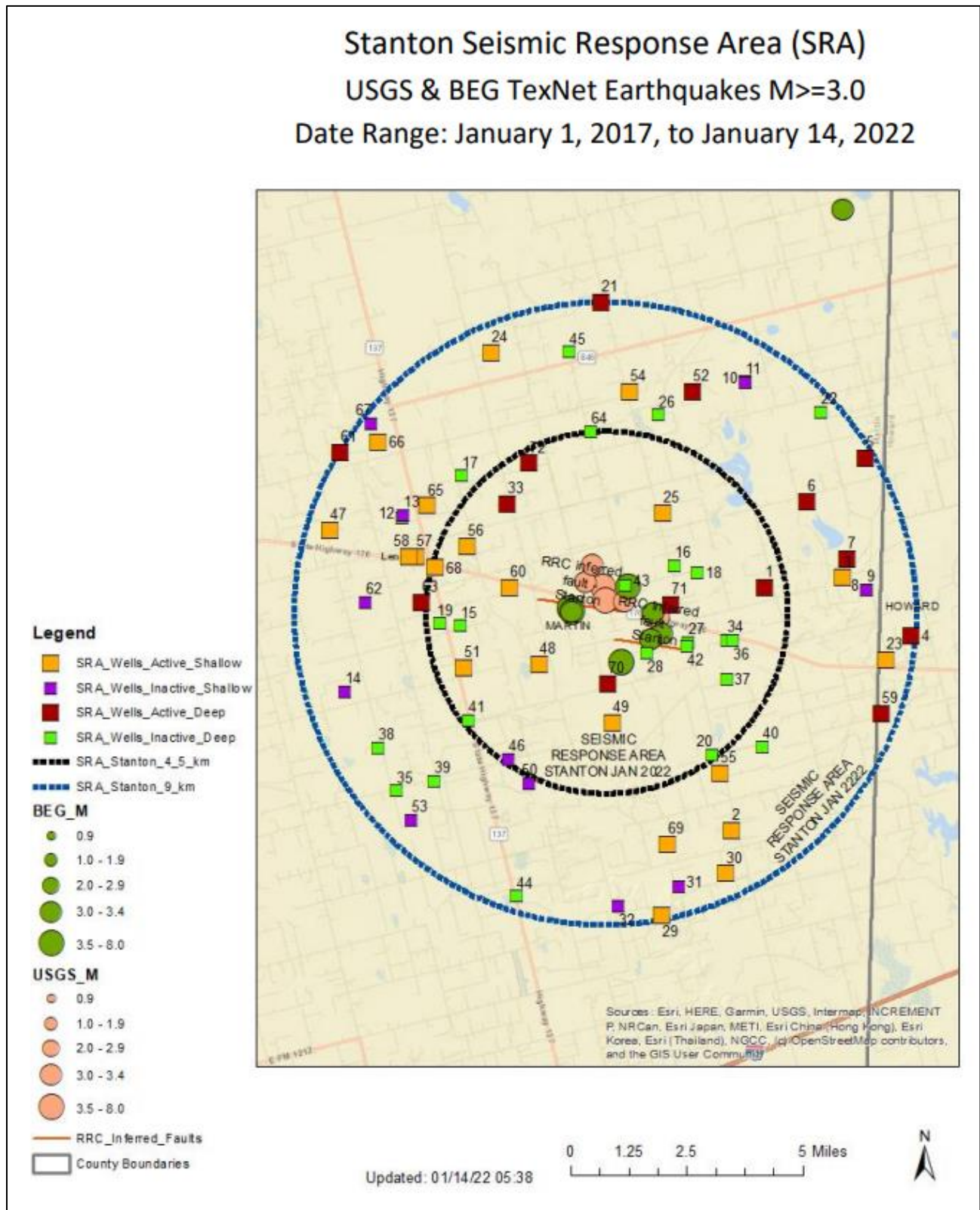


Figure 2: Deep OLRP Boundaries

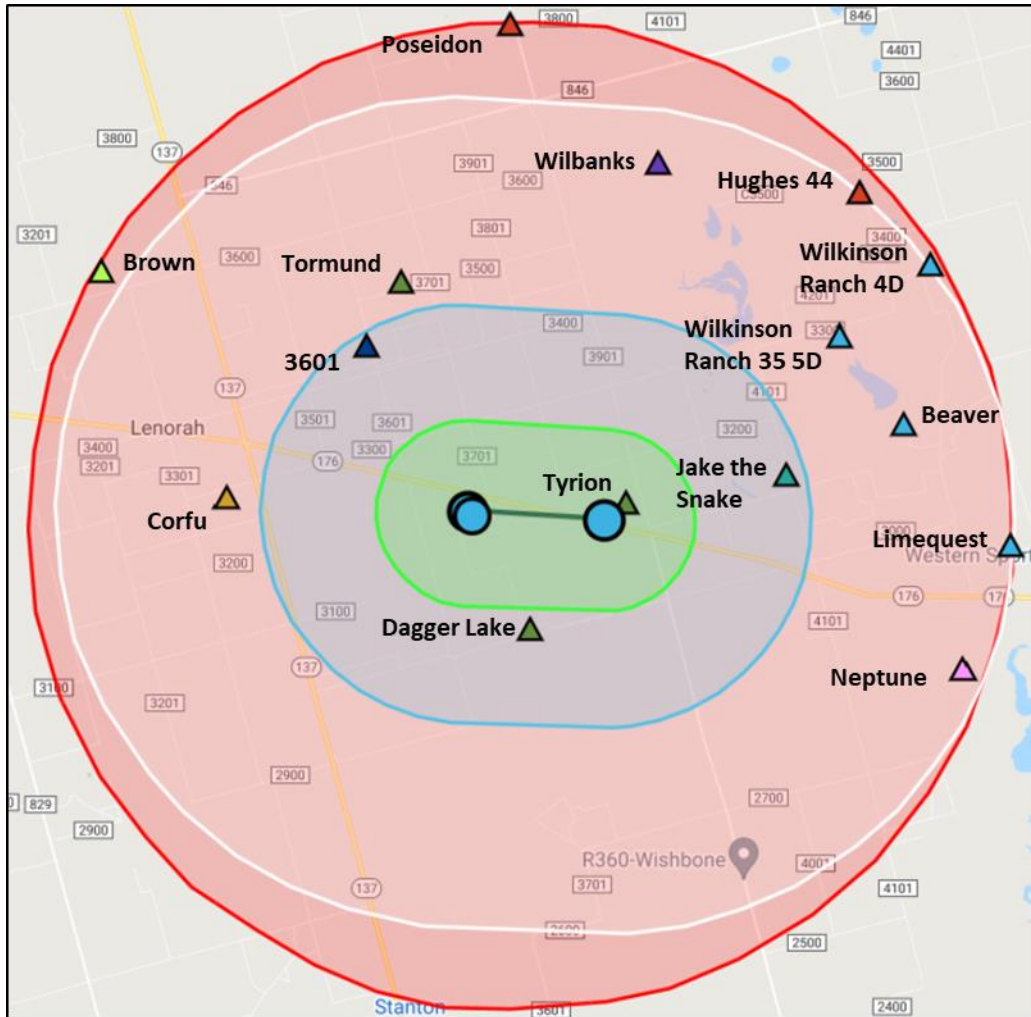


Figure 2 Map Elements: Outer SRA boundary (red), inner OLRP boundary (green), intermediate OLRP boundary (blue), outer OLRP boundary (white), 3.5M+ TexNet events (blue circles), inferred seismogenic fault (black line between seismic events), deep SWD wells (annotated triangles, colored by operator).

Figure 3: Deep OLRP Decision Tree

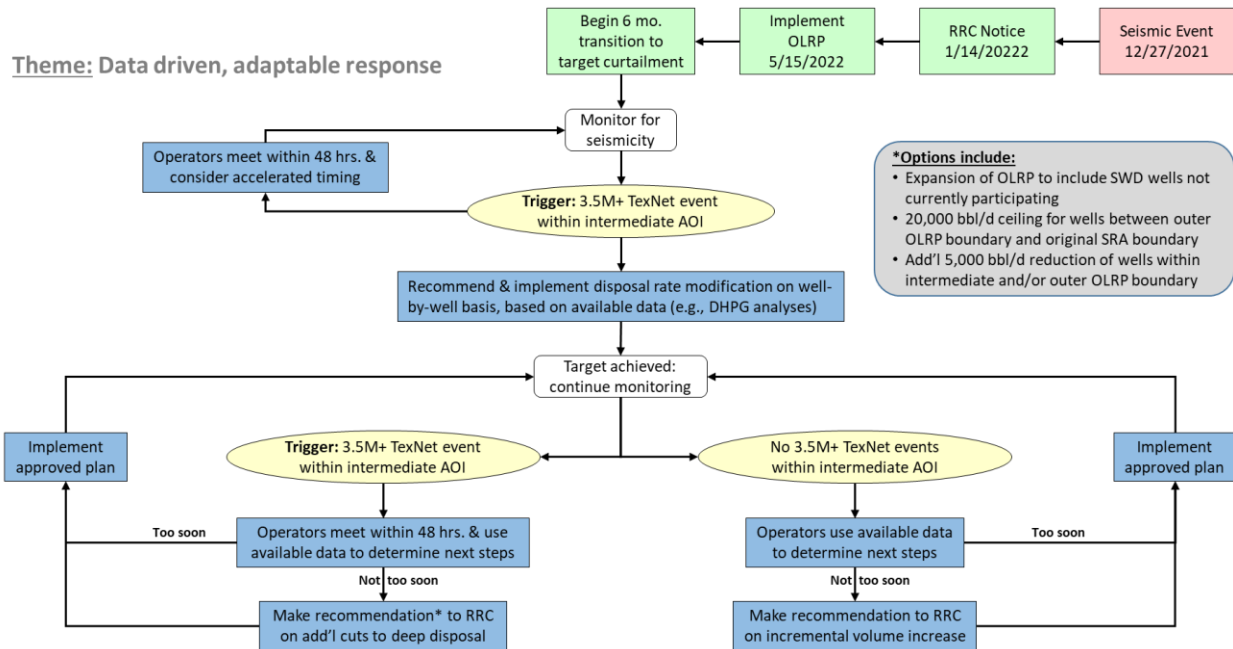


Table 1: SRA Earthquake Catalog

EventID	Origin Date	Origin Time	Magnitude	Latitude (WGS84)	Longitude (WGS84)
texnet2021zjsk	12/28/2021	1:55:43	4.56	32.2861	-101.7741
texnet2021ecyi	2/28/2021	12:42:21	3.05	32.2787	-101.7763
texnet2021deyk	2/15/2021	9:28:44	3.49	32.2714	-101.787
texnet2021abbd	1/1/2021	13:42:29	3.52	32.287	-101.8052
texnet2021aacu	1/1/2021	1:23:23	3.27	32.2806	-101.772
texnet2020zslr	12/31/2020	20:44:19	4.24	32.2879	-101.8063
texnet2020zsiq	12/31/2020	19:12:33	3.65	32.2879	-101.8063
texnet2020zsgz	12/31/2020	18:21:33	3.33	32.287	-101.8052

Table 2: Permitted Deep SWD Wells Participating in OLRP

Index No.	Operator	Operator No.	Lease Name	Well No.	UIC No.	Permitted Daily Average Injection Volume (bbl)	Daily Rate of Max Month (bbl)	OLRP Maximum Daily Injection Rate (bbl)
1	Birch Operations, Inc.	71331	JAKE THE SNAKE SWD	1	121032	80000	45681	10000
4	Crownquest Operating, LLC	191554	LIMEQUEST 6 SWD	1D	115144	30000	30264	20000
5	Crownquest Operating, LLC	191554	WILKINSON RANCH	4D	117290	25000	2602	N/A
6	Crownquest Operating, LLC	191554	WILKINSON RANCH 35	5D	120326	50000	36701	20000
7	Crownquest Operating, LLC	191554	BEAVER SWD	1D	122913	50000	43793	20000
8	Pioneer / Parsley / D3 Operating	518310	MIMS 3 SWD	1	117675	35000	0	0
10	Diamondback E&P / Rattler Midstream Op.	217012	WILBANKS 45	1D	122260	80000	0	0
12	Lagoon Water Midstream / Double Drop SWD	224831	BISON SWD	1	119866	35000	0	0
15	Echo Valley Petroleum Services, LLC	240735	BARBARY SWD	1	117694	30000	0	0
16	Echo Valley Petroleum Services, LLC	240735	TUR SWD	1	118062	30000	0	0
17	Echo Valley Petroleum Services, LLC	240735	CYPRIAN SWD	1	119014	40000	0	0
18	Echo Valley Petroleum Services, LLC	240735	TUR #2 SWD	1	119489	50000	0	0
19	Echo Valley Petroleum Services, LLC	240735	IBEX SWD	1	122484	50000	0	0
20	Echo Valley Petroleum Services, LLC	240735	DWARF BLUE SWD	1	124314	50000	0	0
21	Endeavor / Environmental Disposal Systems	253112	POSEIDON SWD	1	119435	30000	26571	N/A
22	Endeavor / Environmental Disposal Systems	253112	HUGHES 44 SWD	1	123924	24500	20357	N/A
26	Endeavor / Environmental Disposal Systems	253105	ALLRED 17 SWD	1	124599	24500	0	0
27	Fortress / FED Operating	278632	NEANDER SWD 9	1	124415	45000	0	0
28	Fortress / FED Operating	278632	NEANDER SWD 9	2	124416	45000	0	0
33	Gravity / On Point Oilfield Operations LLC	622908	3601 SWD	1	115449	25000	17576	10000
34	Overflow Energy, LLC	628574	SMILEY SWD	1	116548	30000	0	0
35	MCM Energy Partners / Palo Verde Midstream	637409	BENSON	1	119898	40000	0	0
36	MCM Energy Partners / Palo Verde Midstream	637409	EDWARDS	1	119900	40000	0	0
37	MCM Energy Partners / Palo Verde Midstream	637409	CORPREW	1	119906	40000	0	0
38	MCM Energy Partners / Palo Verde Midstream	637409	ODIASE	1	119920	40000	0	0
39	MCM Energy Partners / Palo Verde Midstream	637409	SORRELS	1	120156	40000	0	0
40	MCM Energy Partners / Palo Verde Midstream	637409	AGAVE	1	122798	40000	0	0
41	MCM Energy Partners / Palo Verde Midstream	637409	CHOLLA	1	122812	40000	0	0
42	MCM Energy Partners / Palo Verde Midstream	637409	MOONEY	1	124255	40000	0	0
43	MCM Energy Partners / Palo Verde Midstream	637409	FRANCES	1	124256	40000	0	0
44	MCM Energy Partners / Palo Verde Midstream	637409	MINZEY	1	124261	40000	0	N/A
45	MCM Energy Partners / Palo Verde Midstream	637409	COTTON	1	124336	40000	0	0
52	Diamondback E&P / Rattler Midstream Op.	694704	WILBANKS 16	6D	115277	40000	16087	20000
59	SM Energy Company	788997	NEPTUNE SWD	1	116121	35000	26121	20000
61	Solaris Water Midstream, LLC (Aris)	801148	BROWN SWD	1	115114	40000	24223	N/A
63	StoneHill Martin, LLC	823798	CORFU SWD	1	118204	50000	35563	20000
64	Tejas Permitting / Commodore Midstream	841313	TEJAS ALLRED SWD	1	119156	30000	0	0
70	XTO Energy Inc.	945936	DAGGER LAKE SWD	08SD	117943	25000	21937	10000
71	XTO Energy Inc.	945936	TYRION SWD	04SD	118813	40000	24902	0
72	XTO Energy Inc.	945936	TORMUND SWD	20SD	119874	40000	25210	20000

Table 3: Permitted Shallow SWD Wells Participating in OLRP

Index No.	Operator	Operator No.	Lease Name	Well No.	UIC No.	Permitted Daily Average Injection Volume (bbl)	OLRP Maximum Daily Injection Rate (bbl)
2	Clear Water Inc.	159643	3033 SWD	1	102543	7000	7000
3	Crownquest Operating, LLC	191554	WILKINSON RANCH	2D	105497	10000	10000
9	Pioneer / Parsley / D3 Operating	518310	MIMS 3 SWD	1	117852	25000	25000
11	Diamondback E&P / Rattler Midstream Op.	217012	WILBANKS 45	2D	122487	40000	30000
13	Lagoon Water Midstream / Double Drop SWC	224831	BISON II SWD	1	124838	10000	10000
14	Lagoon Water Midstream / Double Drop SWC	224831	KEYHOLE SWD	1	124880	10000	10000
23	Endeavor / Environmental Disposal Systems	253105	ALLAR	1D	84813	6000	6000
24	Endeavor / Environmental Disposal Systems	253105	BROWN SWD	1	97873	10000	10000
25	Endeavor / Environmental Disposal Systems	253105	THEODORE WELLS SWD	1	99117	6000	6000
29	Mid-States / Wishbone Water	566121	WISHBONE	431D	115647	30000	30000
30	Mid-States / Wishbone Water	566121	WISHBONE 40	1D	116518	30000	30000
31	Mid-States / Wishbone Water	566121	WISHBONE 41	2D	118113	30000	30000
32	Mid-States / Wishbone Water	566121	WISHBONE 42	1D	118518	30000	30000
46	Pioneer / Parsley / D3 Operating	642652	WADDELL 14	1D	121020	20000	20000
47	Pioneer / Parsley / D3 Operating	665748	FOREMAN, MAYME A SWD	1D	19972	6000	6000
48	Pioneer / Parsley / D3 Operating	665748	WADDELL 12	1D	116192	20000	20000
49	Pioneer / Parsley / D3 Operating	665748	WADDELL 18	2D	116771	30000	30000
50	Pioneer / Parsley / D3 Operating	665748	STRAIN 23	1	120802	20000	20000
51	Rains Energy, LLC	688845	FREDA'S SWD	1	112545	25000	25000
53	Diamondback E&P / Rattler Midstream Op.	694704	CORIANDER 21	1D	124996	20000	20000
54	Ruger Properties, LLC	734092	SULPHUR DRAW SWD	1	115872	25000	25000
55	Ruger Properties, LLC	734092	WHITE SWD	1	122547	30000	30000
56	Scout Energy Management LLC	760218	GASKINS	38W	107452	20000	20000
57	Select Agua Libre Midstream, LLC	765601	LENORAH	1D	20183	5000	5000
58	Select Agua Libre Midstream, LLC	765601	LENORAH	2D	99052	8000	8000
60	Solaris Water Midstream, LLC (Aris)	801148	ROBERTSON ROJO SWD	1	110946	30000	30000
62	Solaris Water Midstream, LLC (Aris)	801148	BOYLAN SWD	1	116629	25000	25000
65	Trinity Enviro SWD I, L.L.C.	869989	DEWEY	1	99242	10000	10000
66	Velocity Water Solutions, LP	884481	RUBY SWD	1	117805	20000	20000
67	Velocity Water Solutions, LP	884481	RUBY SWD	2	118215	20000	20000
68	Water Energy Services, LLC / Key	458534	MCCLAIN,G.B.	1D	58958	15000	15000
69	Watusi Energy LLC	902551	QUAIL SWD	2	117210	30000	30000

Table 4: OLRP Timeline

Date	Milestones*
May 15, 2022	OLRP initiation
August 15, 2022	1 st quarterly update to RRC - incorporate new data (e.g., pulse pressure tests)
November 15, 2022	2 nd quarterly update to RRC – full shallow & deep implementation checkpoint
February 15, 2023	3 rd quarterly update to RRC
May 15, 2023	4 th quarterly update to RRC
August 15, 2023	5 th quarterly update to RRC
November 15, 2023	6 th update to RRC – consider lifting deep disposal permit/drilling moratorium
May 15, 2024	7 th update to RRC - consider reduced curtailments if no 3.5M+ in inner AOI
Ongoing	Continue monitoring and meet with RRC as appropriate