STATE OF WYOMING
DEPARTMENT OF ENVIRONMENTAL QUALITY
UNDERGROUND INJECTION CONTROL PERMIT ISSUED UNDER
WYOMING WATER QUALITY RULES AND REGULATIONS
CHAPTER 16

CLASS V INJECTION WELL (AREA PERMIT)

(X) New
() Modified

Permit Number **11-207**
UIC Facility Number WYS-005-00586
State Subclass 5F2

In compliance with the Wyoming Environmental Quality act (W.S. 35-11-101 through 1104, specifically 301(a)(i) through 301 (a)(iv), Laws 1973, Ch. 250, Section 1) and Wyoming Water Quality Rules and Regulations, Chapter 16.

Applicant: Patriot Energy Resources, LLC
Attn: Brian J. Cree
P.O. Box 7070
Gillette, WY 82717
(307) 686-9488

Patriot Energy Resources, LLC, hereafter referred to as the Permittee, is authorized to operate 300 (three hundred) injection wells located in Townships 52 and 53, Ranges 72, 73 and 74 of the 6th Principal Meridian, Campbell County (referred to as the "Rough Draw Area") for the restoration or enhancement of microbial conversion of hydrocarbon substrates to methane gas from coal according to the procedures and conditions of application 11-207, including the requirements and other conditions of this permit. This permit shall become effective on the date of issuance and is valid for ten (10) years.

John Wagner, Administrator
Water Quality Division
Herschler Building, 122 West 25th Street
Cheyenne, WY 82002
(307)-777-7781

Date

John V. Corra, Director
Department of Environmental Quality
Herschler Building, 122 West 25th Street
Cheyenne, WY 82002

Date

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A. Discharge Zone

The injection zones include the Anderson, Canyon, Lower Canyon and Wall coal seams. Project wells are identified in **Tables 1A and 1B** as follows:

Table 1A (Perforated Zones - Phase I)

Well Name	Perforated Zones (Feet)	Porosity (%)	Coal Thickness (Feet)	Maximum Injection Rate (bbls/day)[1,2]	Maximum Surface Injection Pressure (psig)[1]	Coal Seam
Landeck 24B2-323	754-778	2%	35.2	2000	15 psig	Wall
Landeck 32C-323*	411-489	2%	78	2000	15 psig	Canyon
Landeck 41C-323	425-498	2%	71	2000	15 psig	Canyon
Bowen 12C-3233	480-496	2%	19	2000	15 psig	Canyon
Bowen 12WA-3233	965-988	2%	33	2000	15 psig	Wall
Bowen 21C-623	558-582	2%	26	2000	15 psig	Canyon
Bowen 21LC-623*	756-770	2%	21	2000	15 psig	Lower Canyon
Bowen 23C-3133	624-634	2%	10	400	15 psig	Canyon
Bowen 23LC-3133*	753-782	2%	30	2000	15 psig	Lower Canyon
Bowen 43C-3133	562-577	2%	17	2000	15 psig	Canyon
Bowen 43LC-3133*	696-725	2%	34	2000	15 psig	Lower Canyon
Bulkley 14-2534	717-756	2%	47	400	15 psig	Wall
Butcher 12LC-423*	486-516	2%	37	2000	15 psig	Lower Canyon
Butcher 14A-2933*	462-485	2%	29	2000	15 psig	Anderson
Butcher 14C-3033	523-546	2%	18	400	15 psig	Canyon
Butcher 14C-3133*	757-797	2%	51	400	15 psig	Canyon
Butcher 14LC-2933	605-629	2%	26	2000	15 psig	Lower Canyon
Butcher 14LC-3033	646-665	2%	23	400	15 psig	Lower Canyon
Butcher 14LC-3133*	928-958	2%	34	400	15 psig	Lower Canyon
Butcher 21C-3133	525-545	2%	24	2000	15 psig	Canyon
Butcher 21C-3233	409-422	2%	17	2000	15 psig	Canyon
Butcher 21LC-3133	651-684	2%	32	2000	15 psig	Lower Canyon
Butcher 21LC-3233*	566.5-596	2%	29.5	2000	15 psig	Lower Canyon
Butcher 23A-3033*	522-539	2%	21	400	15 psig	Anderson
Butcher 23C-2933	372-386	2%	18	400	15 psig	Canyon
Butcher 23C-3233	496-529	2%	33	2000	15 psig	Canyon
Butcher 23C-523**	403-434	2%	35	2000	15 psig	Canyon

Well Name	Perforated Zones (Feet)	Porosity (%)	Coal Thickness (Feet)	Maximum Injection Rate (bbls/day)[1,2]	Maximum Surface Injection Pressure (psig)[1]	Coal Seam
Butcher 23LC-2933	546-564	2%	23	400	15 psig	Lower Canyon
Butcher 23LC-3033*	624-645	2%	24.2	400	15 psig	Lower Canyon
Butcher 23LC-3233	631-644	2%	15	2000	15 psig	Lower Canyon
Butcher 23WA-523	880-904	2%	28	2000	15 psig	Wall
Butcher 31C-523*	349-373	2%	29	2000	15 psig	Canyon
Butcher 31LC-523	517.5-552.5	2%	34	2000	15 psig	Lower Canyon
Butcher 32LC-3133	727-756	2%	32	2000	15 psig	Lower Canyon
Butcher 34C-3033	521-538	2%	21	2000	15 psig	Canyon
Butcher 34C-3233	363-394	2%	32	2000	15 psig	Canyon
Butcher 34LC-3033	628-650	2%	23	2000	15 psig	Lower Canyon
Butcher 34WA-3233	834-858	2%	27	2000	15 psig	Wall
Butcher 41LC-2833	360-388	2%	33	2000	15 psig	Lower Canyon
Butcher 41LC-3133	626-650	2%	23	2000	15 psig	Lower Canyon
Butcher 42C-523*	380-409	2%	34	2000	15 psig	Canyon
Butcher 42WA-523	782-801	2%	27	2000	15 psig	Wall
Butcher 43C-3033*	453-468	2%	19	400	15 psig	Canyon
Butcher 43LC-3033	587-611	2%	26.5	400	15 psig	Lower Canyon
Butcher Fed 21LC-523*	540-567	2%	32	2000	15psig	Lower Canyon
Butcher State 41C-2833	221-251	2%	29	2000	15 psig	Canyon
Hall 11C-123*	296-358	2%	67.2	2000	15 psig	Canyon
Hall 11C-2533*	274-328	2%	59	400	15 psig	Canyon
Hall 11C-3533*	435-503	2%	67	2000	15 psig	Canyon
Hall 12A-3533**	123-145	2%	25	2000	15 psig	Anderson
Hall 12WA-3533*	806-817	2%	15	2000	15 psig	Wall
Hall 13C-123*	306-366	2%	65.2	400	15 psig	Canyon
Hall 13C-3533	446-519	2%	78	2000	15 psig	Canyon
Hall 14A-3533	151-178	2%	29	2000	15 psig	Anderson
Hall 14C-123*	397-453	2%	59.8	400	15 psig	Canyon
Hall 14C-2633	412-481	2%	69	2000	15 psig	Canyon
Hall 14WA-3533*	782-806	2%	25	2000	15 psig	Wall
Hall 22C-123**	291-342	2%	56.2	400	15 psig	Canyon
Hall 22C-2533	325-385	2%	64	2000	15 psig	Canyon

Well Name	Perforated Zones (Feet)	Porosity (%)	Coal Thickness (Feet)	Maximum Injection Rate (bbls/day)[1,2]	Maximum Surface Injection Pressure (psig)[1]	Coal Seam
Hall 24C-2433	341-396	2%	58	400	15 psig	Canyon
Hall 32WA-1123	786-801	2%	23	400	15 psig	Wall
Hall 41C-3433*	405-476	2%	75	2000	15 psig	Canyon
Hall 42C-3533	279-346	2%	66	2000	15 psig	Canyon
Hall 43C-223*	335-386	2%	56.2	2000	15 psig	Canyon
Hall 43WA-223	704-722	2%	20	400	15 psig	Wall
Hall 44C-2633	258-315	2%	60	2000	15 psig	Canyon
Hall 44C-3533*	318-386	2%	74	2000	15 psig	Canyon
Hall Fed 11C-2633	319-380	2%	68	400	15 psig	Canyon
Hall Fed 13C-2533*	315-378	2%	65	2000	15 psig	Canyon
Hall Fed 13C-2633	354-418	2%	70	2000	15 psig	Canyon
Hall Fed 21C-3433**	308-335	2%	34	2000	15 psig	Canyon
Hall Fed 21LC-3433*	437-467	2%	37	2000	15 psig	Lower Canyon
Hall Fed 22C-3533*	376-449	2%	84	2000	15 psig	Canyon
Hall Fed 24C-2533*	314-367	2%	54.2	2000	15 psig	Canyon
Hall Fed 24C-2633	339-396	2%	65	2000	15 psig	Canyon
Hall Fed 31C-3533	293-362	2%	72	2000	15 psig	Canyon
Hall Fed 32C2-2633*	245-305	2%	63	2000	15 psig	Canyon
Hall Fed 33C-3533*	338-402	2%	69	2000	15 psig	Canyon
Hall Fed 42C-2633*	321-381	2%	64	2000	15 psig	Canyon
Hensley 12C-2833*	343-358	2%	18	400	15 psig	Canyon
Hensley 12LC-2833	477-505	2%	33	400	15 psig	Lower Canyon
Hensley 12WA-2833	790-814	2%	28.5	400	15 psig	Wall
Hensley 13LC-2833*	486-516	2%	34	2000	15 psig	Lower Canyon
Hensley 14C-2233	203-228	2%	31.2	400	15 psig	Canyon
Hensley 14LC-2233*	339-374	2%	39	400	15 psig	Lower Canyon
Hensley 21C-3333**	277-306	2%	33	2000	15 psig	Canyon
Hensley 21WA-3333	773-795	2%	26	2000	15 psig	Wall
Hensley 23C-2733	324-351	2%	31	2000	15 psig	Canyon
Hensley 23LC-2233	300-326	2%	28	400	15 psig	Lower Canyon
Hensley 23LC-2733	464-492	2%	33	2000	15 psig	Lower Canyon
Hensley 23LC-2833	464-495	2%	36	2000	15 psig	Lower Canyon
Hensley 34C-2133*	194-207	2%	18	400	15 psig	Canyon
Hensley 34C2-2833	240-272	2%	32	2000	15 psig	Canyon
Hensley 34C-2733**	383-405	2%	26	2000	15 psig	Canyon

Well Name	Perforated Zones (Feet)	Porosity (%)	Coal Thickness (Feet)	Maximum Injection Rate (bbls/day)[1,2]	Maximum Surface Injection Pressure (psig)[1]	Coal Seam
Hensley 34LC-2133	340-370	2%	30	400	15 psig	Lower Canyon
Hensley 34LC-2833*	418-445	2%	30.5	2000	15 psig	Lower Canyon
Hensley Trust 32C-2733	277-303	2%	29	2000	15 psig	Canyon
Hinkes 21C-1123*	385-453	2%	73	2000	15 psig	Canyon
Landeck 12A-223	140-168	2%	30	2000	15 psig	Anderson
Landeck 12C-223	419-486	2%	71.2	2000	15 psig	Canyon
Landeck 12WA-223*	754-768	2%	23	2000	15 psig	Wall
Landeck 14A-223**	173-208	2%	38	2000	15 psig	Anderson
Landeck 14C-223*	421-482	2%	66	2000	15 psig	Canyon
Landeck 14WA-223	774-799	2%	25	2000	15 psig	Wall
Landeck 21C-323	459-529	2%	68	2000	15 psig	Canyon
Landeck 21C-423**	331-362	2%	37	2000	15 psig	Canyon
Landeck 21LC-423*	472-505.5	2%	33	2000	15 psig	Lower Canyon
Landeck 21WA-423	792-807	2%	19	2000	15 psig	Wall
Landeck 23C-223	429-493	2%	63	2000	15 psig	Canyon
Landeck 23C-323	198.4-224.4	2%	41	2000	15 psig	Canyon
Landeck 23C-3433*	327-357	2%	36	2000	15 psig	Canyon
Landeck 23C-423*	434-476	2%	45	2000	15 psig	Canyon
Landeck 23WA-323	749-770	2%	51	2000	15 psig	Wall
Landeck 23WA-3433	455-487	2%	31	2000	15 psig	Wall
Landeck 23WA-423*	805-830	2%	25	2000	15 psig	Wall
Landeck 32A-323*	154-187	2%	29	2000	15 psig	Anderson
Landeck 32A-3433**	148-160	2%	18	2000	15 psig	Anderson
Landeck 32C-3433	425-475	2%	52	2000	15 psig	Canyon
Landeck 32WA-323	766-785	2%	23	2000	15 psig	Wall
Landeck 32WA-3433	775-794	2%	24	2000	15 psig	Wall
Landeck 34A-323**	121-150	2%	34	2000	15 psig	Anderson
Landeck 34C-323	390-486	2%	96	2000	15 psig	Canyon
Landeck 34WA-323*	711-729	2%	20	2000	15 psig	Wall
Landeck 43A-323**	149-179	2%	30	2000	15 psig	Anderson
Landeck 43C-323	427-496	2%	69	2000	15 psig	Canyon
Landeck 43C-3433	424-493	2%	81	2000	15 psig	Canyon
Landeck 43WA2-323	765-784	2%	21	2000	15 psig	Wall
Landeck 43WA-423*	788-808	2%	25	2000	15 psig	Wall
Landeck 44WA-3433	774-792	2%	22	2000	15 psig	Wall
Landeck Fed 14C-323	452-514	2%	63	2000	15 psig	Canyon
Landeck Fed 21C-223*	424-497	2%	71	2000	15 psig	Canyon

Well Name	Perforated Zones (Feet)	Porosity (%)	Coal Thickness (Feet)	Maximum Injection Rate (bbls/day)[1,2]	Maximum Surface Injection Pressure (psig)[1]	Coal Seam
Landeck State 42B-423*	815-837	2%	26	2000	15 psig	Wall
Landeck 21WA-423*	760-791	2%	32	2000	15 psig	Wall
Lindquist 12A-3333	313-347	2%	39	2000	15 psig	Anderson
Lindquist 12C-523	452-498	2%	29	2000	15 psig	Canyon
Lindquist 12LC-3333	492-518	2%	31	2000	15 psig	Lower Canyon
Lindquist 12LC-523	614-639	2%	28	2000	15 psig	Lower Canyon
Lindquist 12WA-3333	800-823	2%	24	2000	15 psig	Wall
Lindquist 14C-3333*	370-399	2%	34	2000	15 psig	Canyon
Lindquist 14LC-3233	610-638	2%	33	2000	15 psig	Lower Canyon
Lindquist 14LC-3333	540-566	2%	30	2000	15 psig	Lower Canyon
Lindquist 14WA-3233*	941-962	2%	18	2000	15 psig	Wall
Lindquist 14WA-3333	827-851	2%	27	2000	15 psig	Wall
Lindquist 32C-3233*	365-383	2%	22	2000	15 psig	Canyon
Lindquist 32LC-3233*	566.5-596	2%	31	2000	15 psig	Lower Canyon
Lindquist 34C-3133	540-562	2%	28	2000	15 psig	Canyon
Lindquist 34LC-3133	711-730	2%	28	2000	15 psig	Lower Canyon
Lindquist 41LC-623*	479-498	2%	31	2000	15 psig	Lower Canyon
Lindquist 43C-3233*	343-381	2%	43	2000	15 psig	Canyon
Lindquist 43LC-3233*	506-537	2%	30	2000	15 psig	Lower Canyon
Lynde 11C-3032*	216-246	2%	34	400	15 psig	Canyon
Lynde 12C-3032**	181-240	2%	63.2	2000	15 psig	Canyon
Lynde 13C-3032**	257-317	2%	59	2000	15 psig	Canyon
Lynde 14C-3032**	241-296	2%	59.2	400	15 psig	Canyon
Lynde 21C-3032**	175-193	2%	22	400	15 psig	Canyon
Lynde 22C-3032**	164-194	2%	34	400	15 psig	Canyon
Lynde 23C-3032**	175-229	2%	59	400	15 psig	Canyon
Lynde 24C2-3032**	166-218	2%	59	400	15 psig	Canyon
Lynde 31C-2533*	331-393	2%	66	400	15 psig	Canyon
Lynde 32C-2533	362-422	2%	64	2000	15 psig	Canyon
Lynde 33C-2533	335-394	2%	63	2000	15 psig	Canyon
Lynde 34C-2533*	357-414	2%	61	2000	15 psig	Canyon
Lynde 41C-2533**	230-279	2%	56	400	15 psig	Canyon
Lynde 42C-2533**	295-361	2%	66	2000	15 psig	Canyon

Well Name	Perforated Zones (Feet)	Porosity (%)	Coal Thickness (Feet)	Maximum Injection Rate (bbls/day)[1,2]	Maximum Surface Injection Pressure (psig)[1]	Coal Seam
Lynde 43C-2533*	337-397	2%	65	2000	15 psig	Canyon
Lynde 44C-2533**	284-338	2%	58	400	15 psig	Canyon
Reile 23C-3333	291-336	2%	49	2000	15 psig	Canyon
Reile 23LC-3333	464-484	2%	21	2000	15 psig	Lower Canyon
Reile 34C-3333**	307-326	2%	19	2000	15 psig	Canyon
Reile 34LC-3333	447-468	2%	22	2000	15 psig	Lower Canyon
Scott 12C-3433*	256-288	2%	37	2000	15 psig	Canyon
Scott 12LC-3433*	427-455	2%	34	2000	15 psig	Lower Canyon
Scott 12WA-3433	704-721	2%	19	2000	15 psig	Wall
Scott 14A-3433	109-130	2%	23	2000	15 psig	Anderson
Scott 14C-3433	327-360	2%	37	2000	15 psig	Canyon
Scott 14LC-3433	461-489	2%	33	2000	15 psig	Lower Canyon
Scott 14WA-3433	737-754	2%	22	2000	15 psig	Wall
Scott 31LC-3233	516-537	2%	26	2000	15 psig	Lower Canyon
Scott 32C-3333**	276-302	2%	23	2000	15 psig	Canyon
Scott 32LC-2933*	473-497	2%	25	400	15 psig	Lower Canyon
Scott 32LC-3333	448-475	2%	27	2000	15 psig	Lower Canyon
Scott 32WA-3333	782-803	2%	23	2000	15 psig	Wall
Scott 34LC-2933	518-540	2%	25	2000	15 psig	Lower Canyon
Scott 41A-3233	336-365	2%	33.7	2000	15 psig	Anderson
Scott 41C-3333	251-276	2%	32	2000	15 psig	Canyon
Scott 41WA-3233	837-858	2%	34	2000	15 psig	Wall
Scott 41WA-3333	718-739	2%	26	2000	15 psig	Wall
Scott 43A-2933	371-384	2%	17	2000	15 psig	Anderson
Scott 43C-2833*	239-269	2%	35	2000	15 psig	Canyon
Scott 43C-3333**	266-297	2%	35	2000	15 psig	Canyon
Scott 43LC-2833	438-459	2%	22	2000	15 psig	Lower Canyon
Scott 43LC-2933	511-539	2%	29	2000	15 psig	Lower Canyon
Scott 43WA-3333*	714-732	2%	21	2000	15 psig	Wall
Scott Fed 12C-2733	314-348	2%	40	2000	15 psig	Canyon
Scott Fed 14C-2733*	285-310	2%	30	2000	15 psig	Canyon
Scott Fed 14C-2833**	297-325	2%	33	2000	15 psig	Canyon

Well Name	Perforated Zones (Feet)	Porosity (%)	Coal Thickness (Feet)	Maximum Injection Rate (bbls/day)[1,2]	Maximum Surface Injection Pressure (psig)[1]	Coal Seam
Scott Fed 14LC-2733*	442-476	2%	34	2000	15 psig	Lower Canyon
Scott Fed 14LC-2833*	466-494	2%	28	2000	15 psig	Lower Canyon
State 11C-3633**	274-329	2%	60	2000	15 psig	Canyon
State 21C-2733	263-294	2%	34	400	15 psig	Canyon
State 21LC-2733	379-412	2%	33	400	15 psig	Lower Canyon
State 22C-3633**	352-403	2%	56	2000	15 psig	Canyon
State 24C-3533*	392-462	2%	74	2000	15 psig	Canyon
State 24C-3633*	351-408	2%	62	2000	15 psig	Canyon
State 31C-3633**	249-302	2%	59	2000	15 psig	Canyon
State 42C-3633**	254-300	2%	52	400	15 psig	Canyon
State Bulkley 12A-3634	293-318	2%	25	400	15 psig	Anderson
State Bulkley 12LC-3634	762-780	2%	22	400	15 psig	Lower Canyon
State Bulkley 14LC-3634	825-844	2%	22	400	15 psig	Lower Canyon
State Bulkley 21LC-3634*	722-740	2%	22	400	15 psig	Lower Canyon
State Bulkley 21WA-3634*	1117-1136	2%	22	400	15 psig	Wall
State Bulkley 23LC-3634	774-791	2%	21	400	15 psig	Lower Canyon
State Bulkley 23WA-3634*	1154-1171	2%	30	400	15 psig	Wall
State Bulkley 32LC-3634	765-782	2%	21	2000	15 psig	Lower Canyon
State Bulkley 32WA-3634	1122-1149	2%	25	2000	15 psig	Wall
State Bulkley 34LC-3634*	843-860	2%	21	400	15 psig	Lower Canyon
State Bulkley 34WA-3634	1226-1247	2%	23	400	15 psig	Wall
State Bulkley 41LC-3634	751-770	2%	37	2000	15 psig	Lower Canyon
State Bulkley 41WA-3634*	1138-1150	2%	22	2000	15 psig	Wall
State Bulkley 43LC-3634	890-912	2%	35	400	15 psig	Lower Canyon
State Bulkley 43WA-3634	1245-1264	2%	23	2000	15 psig	Wall

Well Name	Perforated Zones (Feet)	Porosity (%)	Coal Thickness (Feet)	Maximum Injection Rate (bbls/day)[1,2]	Maximum Surface Injection Pressure (psig)[1]	Coal Seam
Twenty Mile 12A-623	556-572	2%	16	400	15 psig	Anderson
Twenty Mile 12LC2-623	996-1017	2%	28	400	15 psig	Lower Canyon
Twenty Mile 14C-523	473-503	2%	33	2000	15 psig	Canyon
Twenty Mile 14C-623	735-754	2%	20	400	15 psig	Canyon
Twenty Mile 14LC-523	584-611	2%	30	2000	15 psig	Lower Canyon
Twenty Mile 14LC-623*	913-925	2%	11	400	15 psig	Lower Canyon
Twenty Mile 23LC-623	781-806	2%	28	400	15 psig	Lower Canyon
Twenty Mile 32A-623*	511-540	2%	30	2000	15 psig	Anderson
Twenty Mile 32LC-623	694-734	2%	38	2000	15 psig	Lower Canyon
Twenty Mile 34C-623	614-632	2%	22	2000	15 psig	Canyon
Twenty Mile 34LC-623*	765-795	2%	32	2000	15 psig	Lower Canyon
Twenty Mile 43A-623*	496-513	2%	23	2000	15 psig	Anderson
Twenty Mile 43WA-623	981-1001	2%	24	2000	15 psig	Wall

Table 1B (Perforated Zones - Phase II)

Well Name	Perforated Zones (Feet)	Porosity (%)	Coal Thickness (Feet)	Maximum Injection Rate (bbls/day)[1,2]	Maximum Surface Injection Pressure (psig)[1]	Coal Seam
Harris Fed 21C-823*	448-478	2%	35	2000	15 psig	Canyon
Hinkes 12A-1123*	194-228	2%	37	2000	15 psig	Anderson
Hinkes 12C-1123	361-425	2%	61	2000	15 psig	Canyon
Hinkes 14A-1123**	158-190	2%	34	2000	15 psig	Anderson
Hinkes 14C-1123	407-458	2%	54.2	2000	15 psig	Canyon
Hinkes 23A-1123	245-281	2%	44	2000	15 psig	Anderson
Hinkes 23WA-1123	727-749	2%	25	2000	15 psig	Wall
Hinkes 32WA-1023	779-800	2%	22	2000	15 psig	Wall
Hinkes 34C-1023	415-478	2%	66.2	2000	15 psig	Canyon
Hinkes 34WA-1023	802-823	2%	21	2000	15 psig	Wall
Hinkes 41A-1023**	121-150	2%	32	2000	15 psig	Anderson
Hinkes 41C-1023	416-488	2%	71	2000	15 psig	Canyon
Hinkes 43A-1023*	144-206	2%	66.5	2000	15 psig	Anderson

Well Name	Perforated Zones (Feet)	Porosity (%)	Coal Thickness (Feet)	Maximum Injection Rate (bbls/day)[1,2]	Maximum Surface Injection Pressure (psig)[1]	Coal Seam
Hinkes 43C-1023*	386-444	2%	60.2	2000	15 psig	Canyon
Landeck 12C-1023	534-610	2%	76	2000	15 psig	Canyon
Landeck 12WA-1023*	859-880	2%	58	2000	15 psig	Wall
Landeck 14C-423	497-550	2%	57	2000	15 psig	Canyon
Landeck 14WA-1023*	1022-1046	2%	29	2000	15 psig	Wall
Landeck 14WA-423*	820-850	2%	36	2000	15 psig	Wall
Landeck 21C-1023	399-471	2%	75.2	2000	15 psig	Canyon
Landeck 21WA-1023	732-750	2%	17	2000	15 psig	Wall
Landeck 23C-1023	506-579	2%	71	2000	15 psig	Canyon
Landeck 23WA-1023*	828-851	2%	30	2000	15 psig	Wall
Landeck 34WA-423	809-833	2%	30	2000	15 psig	Wall
ST 12C-1623	587-652	2%	66.5	400	15 psig	Canyon
ST 22A-1623*	321-362	2%	40	2000	15 psig	Anderson
ST 23A-1623	333.5-370.5	2%	42.5	2000	15 psig	Anderson
ST 23C-1623	601-670	2%	74	2000	15 psig	Canyon
ST 24A-1623	348-387	2%	38.5	400	15 psig	Anderson
ST 32A-1623	383-425	2%	44	2000	15 psig	Anderson
ST 32C-1623	653-713	2%	61	2000	15 psig	Canyon
ST 33A2-1623	432-460	2%	54	2000	15 psig	Anderson
ST 34C-1623	687-750	2%	65	400	15 psig	Canyon
ST 41A-1623	360-395	2%	49	2000	15 psig	Anderson
ST 42A-1623	425-467	2%	42	2000	15 psig	Anderson
ST 43C-1623	746-802	2%	54	2000	15 psig	Canyon
Taylor 32C-823	540-604	2%	67	2000	15 psig	Canyon
Taylor 34C-823*	526-600	2%	76	400	15 psig	Canyon
Taylor 34C-923	640-714	2%	74	2000	15 psig	Canyon
Taylor 43WA-823	858-878	2%	24	400	15 psig	Wall
Harris Federal 12C-823	560-598	2%	38	2000	15 psig	Canyon
Taylor Fed 21LC-823	553-579	2%	29	2000	15 psig	Lower Canyon
Taylor Fed 23WA-823	875-897	2%	29	400	15 psig	Wall
Triton 43C-2323*	596-656	2%	60	400	15 psig	Canyon
Twenty Mile 12C2-1423**	515-575	2%	60	2000	15 psig	Canyon
Twenty Mile 14C-1423*	488-553	2%	65	2000	15 psig	Canyon
Twenty Mile 21C-1523*	500-569	2%	68	2000	15 psig	Canyon
Twenty Mile 21C-2323	580-630	2%	55	2000	15 psig	Canyon
Twenty Mile 21WA-923	884-904	2%	28	2000	15 psig	Wall

Well Name	Perforated Zones (Feet)	Porosity (%)	Coal Thickness (Feet)	Maximum Injection Rate (bbls/day)[1,2]	Maximum Surface Injection Pressure (psig)[1]	Coal Seam
Twenty Mile 24C-923	622-690	2%	65	2000	15 psig	Canyon
Twenty Mile 32A-2223**	274-303	2%	35	400	15 psig	Anderson
Twenty Mile 32C-1523	493-559	2%	63	2000	15 psig	Canyon
Twenty Mile 32C-923	545-595	2%	49	2000	15 psig	Canyon
Twenty Mile 32WA-1423*	774-793	2%	35	400	15 psig	Wall
Twenty Mile 34WA-1123	770-788	2%	21	400	15 psig	Wall
Twenty Mile 41A-1523**	176-206	2%	32	2000	15 psig	Anderson
Twenty Mile 41A-2223**	205-245	2%	45	2000	15 psig	Anderson
Twenty Mile 41C-1523	433-493	2%	59.5	2000	15 psig	Canyon
Twenty Mile 41C-2223	478-532	2%	59	2000	15 psig	Canyon
Twenty Mile 41C-723	565-595	2%	34	2000	15 psig	Canyon
Twenty Mile 41LC-723	660-680	2%	20	2000	15 psig	Lower Canyon
Twenty Mile 43A-1523**	194-223	2%	30	2000	15 psig	Anderson
Twenty Mile 43C-1523*	478-530	2%	62	2000	15 psig	Canyon
Twenty Mile Fed 14C-2323	553-617	2%	67	400	15 psig	Canyon
Twenty Mile Fed 34C-2223	636-695	2%	63	400	15 psig	Canyon
Twenty Mile Fed 43C-2223*	522-580	2%	55	2000	15 psig	Canyon

[1] Maximum limits are not to be exceeded during any injection period. Additional perforation zones may be extended within the Anderson, Canyon, Lower Canyon and Wall coal seams.

[2] Well injection rates are limited to 400 bbls/day for wells located near the periphery of the area of review to prevent injection effects from extending beyond the area of review.

During the baseline groundwater characterization phase, it was not possible to sample every well at this facility due to the following:

*Well down due to mechanical issues (pump failure, etc. – 9~~0~~7 wells).
**Dry well (36 wells).

B. Injection/Production Well Locations and Area of Review

The Phase I injection/production wells authorized by this permit are identified in **Table 2** as follows:

Table 2 (Phase I Injection/Production Wells - Public Land Survey Locations)

Well Name	Quarter/Quarter	Section	Township	Range
Landeck 24B2-323	SESW	3	52N	73W
Landeck 32C-323	SWNE	3	52N	73W
Landeck 41C-323	NENE	3	52N	73W
Bowen 12C-3233	SWNW	32	53N	73W
Bowen 12WA-3233	SWNW	32	53N	73W
Bowen 21C-623	NENW	6	52N	73W
Bowen 21LC-623	NENW	6	52N	73W
Bowen 23C-3133	NESW	31	53N	73W
Bowen 23LC-3133	NESW	31	53N	73W
Bowen 43C-3133	NESE	31	53N	73W
Bowen 43LC-3133	NESE	31	53N	73W
Bulkley 14-2534	SWSW	25	53N	74W
Butcher Federal12LC-423	SWNW	4	52N	73W
Butcher 14A-2933	SWSW	29	53N	73W
Butcher 14C-3033	SWSW	30	53N	73W
Butcher 14C-3133	SWSW	31	53N	73W
Butcher 14LC-2933	SWSW	29	53N	73W
Butcher 14LC-3033	SWSW	30	53N	73W
Butcher 14LC-3133	SWSW	31	53N	73W
Butcher 21C-3133	NENW	31	53N	73W
Butcher 21C-3233	NENW	32	53N	73W
Butcher 21LC-3133	NENW	31	53N	73W
Butcher 21LC-3233	NENW	32	53N	73W
Butcher 23A-3033	NESW	30	53N	73W
Butcher 23C-2933	NESW	29	53N	73W
Butcher 23C-3233	NESW	32	53N	73W
Butcher 23C-523	NESW	5	52N	73W
Butcher 23LC-2933	NESW	29	53N	73W
Butcher 23LC-3033	NESW	30	53N	73W
Butcher 23LC-3233	NESW	32	53N	73W
Butcher 23WA-523	NESW	5	52N	73W
Butcher 31C-523	NWNE	5	52N	73W
Butcher 31LC-523	NWNE	5	52N	73W
Butcher 32LC-3133	SWNE	31	53N	73W
Butcher 34C-3033	SWSE	30	53N	73W
Butcher 34C-3233	SWSE	32	53N	73W
Butcher 34LC-3033	SWSE	30	53N	73W
Butcher 34WA-3233	SWSE	32	53N	73W
Butcher 41LC-2833	NENE	28	53N	73W
Butcher 41LC-3133	NENE	31	53N	73W
Butcher 42C-523	SENE	5	52N	73W

Well Name	Quarter/Quarter	Section	Township	Range
Butcher 42WA-523	SENE	5	52N	73W
Butcher 43C-3033	NESE	30	53N	73W
Butcher 43LC-3033	NESE	30	53N	73W
Butcher Fed 21LC-523	NENW	5	52N	73W
Butcher State 41C-2833	NENE	28	53N	73W
Hall 11C-123	NWNW	1	52N	73W
Hall 11C-2533	NWNW	25	53N	73W
Hall 11C-3533	NWNW	35	53N	73W
Hall 12A-3533	SWNW	35	53N	73W
Hall 12WA-3533	SWNW	35	53N	73W
Hall 13C-123	NWSW	1	52N	73W
Hall 13C-3533	NWSW	35	53N	73W
Hall 14A-3533	SWSW	35	53N	73W
Hall 14C-123	SWSW	1	52N	73W
Hall 14C-2633	SWSW	26	53N	73W
Hall 14WA-3533	SWSW	35	53N	73W
Hall 22C-123	SENW	1	52N	73W
Hall 22C-2533	SENW	25	53N	73W
Hall 24C-2433	SESW	24	53N	73W
Hall 32WA-1123	SWNE	11	52N	73W
Hall 41C-3433	NENE	34	53N	73W
Hall 42C-3533	SENE	35	53N	73W
Hall 43C-223	NESE	2	52N	73W
Hall 43WA-223	NESE	2	52N	73W
Hall 44C-2633	SESE	26	53N	73W
Hall 44C-3533	SESE	35	53N	73W
Hall Fed 11C-2633	NWNW	26	53N	73W
Hall Fed 13C-2533	NWSW	25	53N	73W
Hall Fed 13C-2633	NWSW	26	53N	73W
Hall Fed 21C-3433	NENW	34	53N	73W
Hall Fed 21LC-3433	NENW	34	53N	73W
Hall Fed 22C-3533	SENW	35	53N	73W
Hall Fed 24C-2533	SESW	25	53N	73W
Hall Fed 24C-2633	SESW	26	53N	73W
Hall Fed 31C-3533	NWNE	35	53N	73W
Hall Fed 32C2-2633	SWNE	26	53N	73W
Hall Fed 33C-3533	NWSE	35	53N	73W
Hall Fed 42C-2633	SENE	26	53N	73W
Hensley 12C-2833	SWNW	28	53N	73W
Hensley 12LC-2833	SWNW	28	53N	73W
Hensley 12WA-2833	SWNW	28	53N	73W
Hensley Federal 13LC-2833	NWSW	28	53N	73W
Hensley 14C-2233	SWSW	22	53N	73W
Hensley 14LC-2233	SWSW	22	53N	73W
Hensley 21C-3333	NENW	33	53N	73W
Hensley 21WA-3333	NENW	33	53N	73W

Well Name	Quarter/Quarter	Section	Township	Range
Hensley 23C-2733	NESW	27	53N	73W
Hensley 23LC-2233	NESW	22	53N	73W
Hensley 23LC-2733	NESW	27	53N	73W
Hensley 23LC-2833	NESW	28	53N	73W
Hensley 34C-2133	SWSE	21	53N	73W
Hensley 34C2-2833	SWSE	28	53N	73W
Hensley 34C-2733	SWSE	27	53N	73W
Hensley 34LC-2133	SWSE	21	53N	73W
Hensley 34LC-2833	SWSE	28	53N	73W
Hensley Trust 32C-2733	SWNE	27	53N	73W
Hinkes 21C-1123	NENW	11	52N	73W
Landeck 12A-223	SWNW	2	52N	73W
Landeck 12C-223	SWNW	2	52N	73W
Landeck 12WA-223	SWNW	2	52N	73W
Landeck 14A-223	SWSW	2	52N	73W
Landeck 14C-223	SWSW	2	52N	73W
Landeck 14WA-223	SWSW	2	52N	73W
Landeck 21C-323	NENW	3	52N	73W
Landeck 21C-423	NENW	4	52N	73W
Landeck 21LC-423	NENW	4	52N	73W
Landeck 21WA-423	NENW	3	52N	73W
Landeck 23C-223	NESW	2	52N	73W
Landeck 23C-323	NESW	3	52N	73W
Landeck 23C-3433	NESW	34	53N	73W
Landeck 23C-423	NESW	4	52N	73W
Landeck 23WA-323	NESW	3	52N	73W
Landeck 23WA-3433	NESW	34	53N	73W
Landeck 23WA-423	NESW	4	52N	73W
Landeck 32A-323	SWNE	3	52N	73W
Landeck 32A-3433	SWNE	34	53N	73W
Landeck 32C-3433	SWNE	34	53N	73W
Landeck 32WA-323	SWNE	3	52N	73W
Landeck 32WA-3433	SWNE	34	53N	73W
Landeck 34A-323	SWSE	3	52N	73W
Landeck 34C-323	SWSE	3	52N	73W
Landeck 34WA-323	SWSE	3	52N	73W
Landeck 43A-323	NESE	3	52N	73W
Landeck 43C-323	NESE	3	52N	73W
Landeck 43C-3433	NESE	34	53N	73W
Landeck 43WA2-323	NESE	3	52N	73W
Landeck 43WA-423	NESE	4	52N	73W
Landeck 44WA-3433	SESE	34	53N	73W
Landeck Fed 14C-323	SWSW	3	52N	73W
Landeck Fed 21C-223	NENW	2	52N	73W
Landeck State 42B-423	SENE	4	52N	73W
Landeck21WA-423	NENW	4	52N	73W

Well Name	Quarter/Quarter	Section	Township	Range
Lindquist 12A-3333	SWNW	33	53N	73W
Lindquist 12C-523	SWNW	5	52N	73W
Lindquist 12LC-3333	SWNW	33	53N	73W
Lindquist 12LC-523	SWNW	5	52N	73W
Lindquist 12WA-3333	SWNW	33	53N	73W
Lindquist 14C-3333	SWSW	33	53N	73W
Lindquist 14LC-3233	SWSW	32	53N	73W
Lindquist 14LC-3333	SWSW	33	53N	73W
Lindquist 14WA-3233	SWSW	32	53N	73W
Lindquist 14WA-3333	SWSW	33	53N	73W
Lindquist 32C-3233	SWNE	32	53N	73W
Lindquist 32LC-3233	SWNE	32	53N	73W
Lindquist 34C-3133	SWSE	31	53N	73W
Lindquist 34LC-3133	SWSE	31	53N	73W
Lindquist 41LC-623	NENE	6	52N	73W
Lindquist 43C-3233	NESE	32	53N	73W
Lindquist 43LC-3233	NESE	32	53N	73W
Lynde 11C-3032	NWNW	30	53N	72W
Lynde 12C-3032	SWNW	30	53N	72W
Lynde 13C-3032	NWSW	30	53N	72W
Lynde 14C-3032	SWSW	30	53N	72W
Lynde 21C-3032	NENW	30	53N	72W
Lynde 22C-3032	SENW	30	53N	72W
Lynde 23C-3032	NESW	30	53N	72W
Lynde 24C2-3032	SESW	30	53N	72W
Lynde 31C-2533	NWNE	25	53N	73W
Lynde 32C-2533	SWNE	25	53N	73W
Lynde 33C-2533	NWSE	25	53N	73W
Lynde 34C-2533	SWSE	25	53N	73W
Lynde 41C-2533	NENE	25	53N	73W
Lynde 42C-2533	SENE	25	53N	73W
Lynde 43C-2533	NESE	25	53N	73W
Lynde 44C-2533	SESE	25	53N	73W
Reile 23C-3333	NESW	33	53N	73W
Reile 23LC-3333	NESW	33	53N	73W
Reile 34C-3333	SWSE	33	53N	73W
Reile 34LC-3333	SWSE	33	53N	73W
Scott 12C-3433	SWNW	34	53N	73W
Scott 12LC-3433	SWNW	34	53N	73W
Scott 12WA-3433	SWNW	34	53N	73W
Scott 14A-3433	SWSW	34	53N	73W
Scott 14C-3433	SWSW	34	53N	73W
Scott 14LC-3433	SWSW	34	53N	73W
Scott 14WA-3433	SWSW	34	53N	73W
Scott 31LC-3233	NWNE	32	53N	73W
Scott 32C-3333	SWNE	33	53N	73W

Well Name	Quarter/Quarter	Section	Township	Range
Scott 32LC-2933	SWNE	29	53N	73W
Scott 32LC-3333	SWNE	33	53N	73W
Scott 32WA-3333	SWNE	33	53N	73W
Scott 34LC-2933	SWSE	29	53N	73W
Scott 41A-3233	NENE	32	53N	73W
Scott 41C-3333	NENE	33	53N	73W
Scott 41WA-3233	NENE	32	53N	73W
Scott 41WA-3333	NENE	33	53N	73W
Scott 43A-2933	NESE	29	53N	73W
Scott 43C-2833	NESE	28	53N	73W
Scott 43C-3333	NESE	33	53N	73W
Scott 43LC-2833	NESE	28	53N	73W
Scott 43LC-2933	NESE	29	53N	73W
Scott 43WA-3333	NESE	33	53N	73W
Scott Fed 12C-2733	SWNW	27	53N	73W
Scott Fed 14C-2733	SWSW	27	53N	73W
Scott Fed 14C-2833	SWSW	28	53N	73W
Scott Fed 14LC-2733	SWSW	27	53N	73W
Scott Fed 14LC-2833	SWSW	28	53N	73W
State 11C-3633	NWNW	36	53N	73W
State 21C-2733	NENW	27	53N	73W
State 21LC-2733	NENW	27	53N	73W
State 22C-3633	SENW	36	53N	73W
Hall Federal 24C-3533	SESW	35	53N	73W
State 24C-3633	SESW	36	53N	73W
State 31C-3633	NWNE	36	53N	73W
State 42C-3633	SENE	36	53N	73W
State Bulkley 12A-3634	SWNW	36	53N	74W
State Bulkley 12LC-3634	SWNW	36	53N	74W
State Bulkley 14LC-3634	SWSW	36	53N	74W
State Bulkley 21LC-3634	NENW	36	53N	74W
State Bulkley 21WA-3634	NENW	36	53N	74W
State Bulkley 23LC-3634	NESW	36	53N	74W
State Bulkley 23WA-3634	NESW	36	53N	74W
State Bulkley 32LC-3634	SWNE	36	53N	74W
State Bulkley 32WA-3634	SWNE	36	53N	74W
State Bulkley 34LC-3634	SWSE	36	53N	74W
State Bulkley 34WA-3634	SWSE	36	53N	74W
State Bulkley 41LC-3634	NENE	36	53N	74W
State Bulkley 41WA-3634	NENE	36	53N	74W
State Bulkley 43LC-3634	NESE	36	53N	74W
State Bulkley 43WA-3634	NESE	36	53N	74W
Twenty Mile 12A-623	SWNW	6	52N	73W
Twenty Mile 12LC2-623	SWNW	6	52N	73W
Twenty Mile 14C-523	SWSW	5	52N	73W
Twenty Mile 14C-623	SWSW	6	52N	73W

Well Name	Quarter/Quarter	Section	Township	Range
Twenty Mile 14LC-523	SWSW	5	52N	73W
Twenty Mile 14LC-623	SWSW	6	52N	73W
Twenty Mile 23LC-623	NESW	6	52N	73W
Twenty Mile 32A-623	SWNE	6	52N	73W
Twenty Mile 32LC-623	SWNE	6	52N	73W
Twenty Mile 34C-623	SWSE	6	52N	73W
Twenty Mile 34LC-623	SWSE	6	52N	73W
Twenty Mile 43A-623	NESE	6	52N	73W
Twenty Mile 43WA-623	NESE	6	52N	73W

The Phase II injection/production wells authorized by this permit are identified in **Table 3** as follows:

Table 3 (Phase II Injection/Production Wells - Public Land Survey Locations)

Well Name	Quarter/Quarter	Section	Township	Range
Harris Fed 21C-823	NENW	8	52N	73W
Hinkes 12A-1123	SWNW	11	52N	73W
Hinkes 12C-1123	SWNW	11	52N	73W
Hinkes 14A-1123	SWSW	11	52N	73W
Hinkes 14C-1123	SWSW	11	52N	73W
Hinkes 23A-1123	NESW	11	52N	73W
Hinkes 23WA-1123	NESW	11	52N	73W
Hinkes 32WA-1023	SWNE	10	52N	73W
Hinkes 34C-1023	SWSE	10	52N	73W
Hinkes 34WA-1023	SWSE	10	52N	73W
Hinkes 41A-1023	NENE	10	52N	73W
Hinkes 41C-1023	NENE	10	52N	73W
Hinkes 43A-1023	NESE	10	52N	73W
Hinkes 43C-1023	NESE	10	52N	73W
Landeck 12C-1023	SWNW	10	52N	73W
Landeck 12WA-1023	SWNW	10	52N	73W
Landeck 14C-423	SWSW	4	52N	73W
Landeck 14WA-1023	SWSW	10	52N	73W
Landeck 14WA-423	SWSW	4	52N	73W
Landeck 21C-1023	NENW	10	52N	73W
Landeck 21WA-1023	NENW	10	52N	73W
Landeck 23C-1023	NESW	10	52N	73W
Landeck 23WA-1023	NESW	10	52N	73W
Landeck 34WA-423	SWSE	4	52N	73W
ST 12C-1623	SWNW	16	52N	73W
ST 22A-1623	SENW	16	52N	73W
ST 23A-1623	NESW	16	52N	73W
ST 23C-1623	NESW	16	52N	73W

Well Name	Quarter/Quarter	Section	Township	Range
ST 24A-1623	SESW	16	52N	73W
ST 32A-1623	SWNE	16	52N	73W
ST 32C-1623	SWNE	16	52N	73W
ST 33A2-1623	NWSE	16	52N	73W
ST 34C-1623	SWSE	16	52N	73W
ST 41A-1623	NENE	16	52N	73W
ST 42A-1623	SENE	16	52N	73W
ST 43C-1623	NESE	16	52N	73W
Taylor 32C-823	SWNE	8	52N	73W
Taylor 34C-823	SWSE	8	52N	73W
Taylor 34C-923	SWSE	9	52N	73W
Taylor 43WA-823	NESE	8	52N	73W
Harris Fed 12C-823	SWNW	8	52N	73W
Taylor Fed 21LC-823	NENW	8	52N	73W
Taylor Fed 23WA-823	NESW	8	52N	73W
Triton 43C-2323	NESE	23	52N	73W
Twenty Mile 12C2-1423	SWNW	14	52N	73W
Twenty Mile 14C-1423	SWSW	14	52N	73W
Twenty Mile 21C-1523	NENW	15	52N	73W
Twenty Mile 21C-2323	NENW	23	52N	73W
Twenty Mile 21WA-923	NENW	9	52N	73W
Twenty Mile 24C-923	SESW	9	52N	73W
Twenty Mile 32A-2223	SWNE	22	52N	73W
Twenty Mile 32C-1523	SWNE	15	52N	73W
Twenty Mile 32C-923	SWNE	9	52N	73W
Twenty Mile 32WA-1423	SWNE	14	52N	73W
Twenty Mile 34WA-1123	SWSE	11	52N	73W
Twenty Mile 41A-1523	NENE	15	52N	73W
Twenty Mile 41A-2223	NENE	22	52N	73W
Twenty Mile 41C-1523	NENE	15	52N	73W
Twenty Mile 41C-2223	NENE	22	52N	73W
Twenty Mile 41C-723	NENE	7	52N	73W
Twenty Mile 41LC-723	NENE	7	52N	73W
Twenty Mile 43A-1523	NESE	15	52N	73W
Twenty Mile 43C-1523	NESE	15	52N	73W
Twenty Mile Fed 14C-2323	SWSW	23	52N	73W
Twenty Mile Fed 34C-2223	SWSE	22	52N	73W
Twenty Mile Fed 43C-2223	NESE	22	52N	73W

Table 4 (Area of Review - Public Land Survey Locations)

Section (¼, ¼)	Section	Township	Range
SWNE, NW¼, SW¼, and NWSE	1	52N	73W
All	2	52N	73W
All	3	52N	73W
All	4	52N	73W
All	5	52N	73W
All	6	52N	73W
NE¼, NW¼, NESW, NWSW, SESW, and SE¼	7	52N	73W
All	8	52N	73W
All	9	52N	73W
All	10	52N	73W
All	11	52N	73W
NWNW, SWNW, NWSW, and SWSW	12	52N	73W
All	14	52N	73W
All	15	52N	73W
All	16	52N	73W
NENE, NWNE, SENE, NENW, NESE, and SESE	17	52N	73W
NENE	20	52N	73W
NENE, NWNE, NENW, and NWNW	21	52N	73W
NE¼, NENW, NWNW, SENW, NESW, SESW, and SE¼	22	52N	73W
All	23	52N	73W
SWNW and NWSW	24	52N	73W
NWNE and NWNW	26	52N	73W
NENE, NWNE, and NENW	27	52N	73W
NE¼, NENW, NWNW, and SE¼	1	52N	74W
NENE and NWNE	2	52N	74W
NWNW, NWNE, and SENE	12	52N	74W
SWSW, SESW, and SWSE	19	53N	72W
NWNE, SWNE, NW¼, SW¼, NWSE, and SWSE	30	53N	72W
NWNE, NENW, NWNW, SWNW, and NWSW	31	53N	72W
SESW, SWSE, and SESE	20	53N	73W
SWNE, SENE, NESW, SWSW, SESW, and SE¼	21	53N	73W
SWNE, SWNW, SENW, SW¼, NWSE, SWSE, and SESE	22	53N	73W
SWSW, SESW, SWSE, and SESE	23	53N	73W
SW¼, NWSE, SWSE, and SESE	24	53N	73W
All	25	53N	73W
All	26	53N	73W
All	27	53N	73W
All	28	53N	73W
All	29	53N	73W

Section (¼, ¼)	Section	Township	Range
All	30	53N	73W
All	31	53N	73W
All	32	53N	73W
All	33	53N	73W
All	34	53N	73W
All	35	53N	73W
All	36	53N	73W
SESE	24	53N	74W
NE¼, SWNW, SENW, SW¼, and SE¼	25	53N	74W
SWNE, SENE, SESW, and SE¼	26	53N	74W
NE¼, NENW, SENW, NESW, SESW, and SE¼	35	53N	74W
All	36	53N	74W

C. Domestic Use Water Supply Wells Within the Area of Review

Table 5 (State Engineer Office (SEO) Domestic Use Wells Within Project Area - Public Land Survey Locations)

Well Name	Quarter/Quarter	Section	Township	Range
P149408W	SENW	23	52N	73W
P149409W	SWNW	24	52N	73W
P170382W	SENE	33	53N	73W
P177990W	SESE	29	53N	73W
P10236P	SESW	4	52N	73W
P103580W	SENW	14	52N	73W
P115517W	NENW	31	53N	72W
P138462W	NENE	8	52N	73W
P157156W	NENW	4	52N	73W
P166520W	NESW	4	52N	73W
P170664W	SWNW	33	53N	73W
P179243W	SWSE	14	52N	73W
P181995W	NENW	26	52N	73W
P28854W	SENE	29	53N	73W
P57369W	NWNE	26	52N	73W
P66546W	NESW	33	53N	73W
P77545W	SWSE	19	53N	72W
P8543P	NWNW	14	52N	73W
P92989W	SWNW	33	53N	73W
P190997W	NESW	33	53N	73W
P193332W	SWSE	33	53N	73W

Note: The domestic use wells identified in **Table 5** are permitted and authorized by the State Engineer's Office (SEO).

D. Groundwater Classification

The groundwater in the Anderson, Canyon, Lower Canyon and Wall coal seams of the Fort Union Formation are classified as Class I (Domestic) by use according to *Wyoming Water Quality Rules and Regulations, Chapter 8*. This classification is assigned because there are several permitted domestic wells within the immediate vicinity utilizing groundwater from the Anderson, Canyon, Lower Canyon and Wall coal seams and Fort Union sand units immediately above and below the coal seams. Since the groundwater is classified as Class I, the water quality of groundwater within the Anderson, Canyon, Lower Canyon and Wall coal seams shall not exceed the permit limits established in **Table 6.**

E. Authorized Operations

There are 300 wells at this facility, which are completed into four different coal seams – the Wall, Anderson, Canyon, and Lower Canyon. Initially, the Permittee is authorized to operate wells located in the northern portion of the project, identified as "Phase I" wells in **Table 2** of the permit. "Phase II" are wells in the southern portion of the project as identified in **Table 3**. Wells that are removed as injectors from this facility may remain as producing coal bed methane wells. Individual wells may alternate between periods of injection and periods of production.

The Administrator must be able to determine that Phase I groundwater quality has not been nor will be polluted due to operation under the permit before commencement of Phase II will be authorized.

Under no circumstances may the Permittee begin operations of Phase II of the Rough Draw Project without express written consent from the Administrator.

After the cessation of Phase II operation, the Permittee shall perform post-injection monitoring and reporting for the remainder of the permit term. Should the first year of post-injection monitoring and reporting reveal no statistically significant change to groundwater water quality as determined by the Administrator, the permittee may petition the Administrator to reduce post-injection monitoring, modify the monitoring schedule, or to renew the permit.

This permit is valid for ten (10) years. Injection may occur only during the first five (5) years of the permit.

An amendment mixture comprised of vitamins and minerals, multi-nutrients, cell vitality enhancers and produced water (i.e. "injectate") will be added periodically. The amendment mixture is designed to support and encourage native microbes to produce methane.

The amendments shall only consist of those vitamins and minerals, multi-nutrients, and cell vitality enhancers as confidentially identified and provided to the Department, and only in concentrations or volumes equal to or less than those confidentially identified and provided to the Department as a requirement of the permit application.

The Permittee shall report all amendments added to the amendment mixture, the amounts or volumes added, determine their concentrations within the injectate, and sample the injectate.

The Permittee may not add any other chemical compound, microorganisms, anti-scalants, biocides, algaecides, tracers, or other amendments to the injectate without applying for a modification to this permit and obtaining authorization from the Administrator.

~~The Permittee may petition the Administrator to include coal bed methane produced water from coal seams other than the Anderson, Canyon, Lower Canyon and Wall into the injectate from this facility, but may not do so without written authorization from the Administrator.~~

Produced water from the four coal seams may be mixed, amended, and re-injected into one or more of the four coal seams in accordance with the requirements of this permit.

The Permittee shall sample groundwater produced from the coal seams. Within five (5) calendar days of receipt of sample data that exceeds an **Upper Prediction Limit** (UP~~P~~TL, see Section I), or exceeds an **Upper Tolerance Limit** (UT~~P~~PL, see Section I~~1~~) in more than 5% of samples collected during one quarter from an individual coal seam and/or project phase, as appropriate (see Table 6), the Permittee shall collect a confirmatory sample from each well that exceeded a UTL or UPL established in the permit. Once the confirmatory sample is collected, the permittee shall discontinue use ~~of~~ of the well or wells until such well(s) are in compliance, as evidenced by subsequent sampling and analysis to be established by the Administrator.

Should a well be shut in due to UTL or UPL exceedances be re-worked or otherwise altered in an attempt to meet UTL or UPL permit limits, the well may be brought back on-line and pumped only as long as necessary to collect a representative sample.

The Permittee is authorized to inject at a "maximum sustainable total water production" rate of 2.268 million gallons per day (MGD)~~MGD~~ over the entire (Phase I and Phase II) project area. For operation and maintenance considerations, such as conducting mechanical integrity tests or well workovers, the Permittee may inject more than the indicated maximum injection rate indicated on **Tables 1A** and **1B** on a temporary basis with prior written approval from the Administrator.

The Permittee is authorized to inject at the maximum surface pressures as indicated in **Tables 1A** and **1B**.

Wells covered under this permit may not be removed from the requirements of the permit without prior approval from the Department. The Permittee shall notify the Administrator thirty (30) days in advance of any planned alteration, conversion, or abandonment of the wells covered by this permit.

The Permittee shall notify the Administrator in writing at the earliest opportunity, and verbally no less than 48 (forty-eight) hours prior to conducting workovers on any well Listed in **Tables 2 or 3** of this permit so that a joint field inspection may be coordinated between both parties.

An approved **Sampling and Analysis Plan (SAP)** that describes all injectate and groundwater sampling locations, sampling frequency, sampling constituents and parameters, equipment and procedures associated with sample collection, laboratory analysis, equipment decontamination, Quality Assurance/Quality Control, sample custody, data reporting, etc. from all sampled wells is required prior to authorization to inject.

The Permittee shall conduct an injection pressure falloff test for at least one injection well per public land survey section (640 acres). All wells are not required to conduct pressure falloff tests because

the injectate will not be injected at pressures higher than hydrostatic. Thus, there is no need to determine the fracture gradient for each well since there is no concern for fracturing of the formations under hydrostatic pressures.

Under no circumstances may the Permittee modify any requirements of this permit without express written approval from the Administrator.

F. Hazardous Waste

This permit does not allow for the injection of any hazardous waste as defined in 40 CFR 261.3 and in Wyoming Solid Waste Management Rules and Regulations, Chapter 2. Injection of any substance defined as a hazardous waste, whether hazardous by listing or by characteristic is a violation of this permit.

G. Proper Operation and Maintenance

The Permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit. The Permittee shall operate and maintain all facilities and systems of treatment and control which are installed or used by the Permittee to achieve compliance with the conditions of the permit. Proper operation and maintenance includes mechanical integrity of the wells, effective performance, adequate funding, Permittee staffing and training, and laboratory and process controls, including appropriate quality assurance 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.

The injection wells covered by this permit shall meet all construction requirements outlined in Wyoming Water Quality Rules and Regulations, Chapter 16, Section 10(p) with the exception of water disinfection, conducting pressure fall-off curves for each well, and pressure testing all well casings to 700 psi (per CBM General Permits 5C5-1, 5C5-2, 5C5-3).

The Permittee is required to operate in accordance with statements, representations and procedures presented in the complete permit application and supporting documents as accepted and approved by the Administrator. Any modifications which will result in a violation of permit conditions shall be reported by submission of a new or amended permit application and shall not be implemented until a new or modified permit has been issued. Injection into a well may not begin until construction is complete and the permit is approved.

H. Entry and Inspection

The Permittee shall allow the Administrator (upon presentation of credentials and during normal working hours) to enter the premises where a regulated facility is located, or where records are kept under the conditions of this permit and inspect and photograph the discharge and related facilities, review and copy reports and records required by this permit, collect fluid samples for analysis, measure and record water levels, and perform any other function authorized by law or regulation.

I. Environmental Monitoring Program for Groundwaters of the State

Groundwater within the project area is classified as Class I by use, however, baseline water quality for Iron, Manganese, Total Dissolved Solids (TDS), and Sulfide all exceed Class I standards.

Therefore, these constituents must be protected to their baseline concentrations, rather than their respective Class I standard. For these constituents, the baseline concentrations, and therefore permit limits for these constituents were established by calculating **Upper Tolerance Limits (UTLs)** set at 95% confidence and 95% coverage. For those constituents whose baseline concentrations do not exceed their respective Class I standards, their respective Class I standards becomes the UTL.

The following formula was used to calculate the UTL:

$$UTL = x + Ks$$

UTL is the upper tolerance limit, "x" is the arithmetic mean of the data, "s" the standard deviation of the data, and "*K"* is a variable factor that is dependent upon the number of samples in the data set. There were 167 independent baseline analyses submitted in the permit application.

UTL values are constituent specific, and may be coal seam and/or Phase specific, as described in **Table 6**.

Upper Prediction Limits (UPLs) have also been established in the permit in **Table 6**. The UPL is calculated with the same equation as the UTL. However the K factor is different and based upon the number of constituents to be analyzed, the length of the permit, the frequency of monitoring, the number of baseline samples, and the number of wells sampled. UPL values are constituent specific, and may be coal seam and/or Phase specific, as described in **Table 6**.

UTL and **UPL** limits are established for groundwater samples collected from ~~injection, production, and idle~~baseline samples collected from ~~-~~ wells listed in either **Table 2** or **Table 3** of this permit.

~~**UTL** l~~Limits ~~may~~ also apply to the injectate (See Section J.4.).

a. General Requirements:

1. The Permittee shall use electronic data deliverable (EDD) reporting when required by the Administrator.

2. Records of monitoring information shall include:

   i. The date, exact place, and time of sampling or measurements;
   ii. The initials or name(s) of the individual(s) who performed the sampling or measurements;
   iii. The date(s) analyses were performed;
   iv. The time(s) analyses were initiated;
   v. The initials or name(s) of the individual(s) who performed the analyses;
   vi. References and written procedures for the analytical techniques or methods used;
   vii. The results of such analyses, including the bench sheets, laboratory reports, instrument readouts, computer disks or tapes, etc., used to determine these results.

3. Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit or the approved Sampling and Analysis Plan.

4. All samples reported to the Administrator shall be unfiltered unless filtered samples are specified for the given analysis; turbidity should not exceed 20 NTUs. Samples shall be collected such that they are representative of produced water without further treatment. Sampling frequency may be reduced with the Administrator's approval. The constituents shall be analyzed by the methods listed in **Table 6**.

5. The Permittee shall report any noncompliance which may endanger health or the environment to the Administrator of the Water Quality Division within twenty-four (24) hours from the time the Permittee becomes aware of the circumstances. The report shall include:

   i. Any monitoring or other information which indicates that any contaminant may cause an endangerment to a usable groundwater of the state;

   ii. Any noncompliance with a permit condition or malfunction of the discharge (injection) system which may cause fluid migration into or between usable ground waters of the state;

   iii. A written submission shall be provided to the Administrator of the Water Quality Division within five (5) days of the time the Permittee becomes aware of the circumstances. This written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

6. The Permittee shall report all instances of noncompliance not reported otherwise, at the time monitoring reports are submitted.

7. The Permittee shall notify the Administrator in writing at the earliest opportunity, and verbally no less than 48 (forty-eight) hours prior to conducting the mechanical integrity tests for each injection well.

8. Sample collection of groundwater shall be of such frequency and of such variety (season, time, location, depth, etc.) to properly describe the groundwater, and shall be accomplished by the methods and procedures described in the U. S. Environmental Protection Agency manual RCRA Groundwater Monitoring Technical Enforcement Guidance Document, September, 1986, unless alternate methods and procedures are approved by the Administrator.

~~7.~~9. Analysis of all samples shall be accomplished pursuant to Chapter 8, Water Quality Rules and Regulations, Sections 7 and 8.

b. Groundwater Monitoring Requirements:

1. Groundwater samples from a statistically significant, spatially distributed number of Phase I and Phase II wells shall be collected by the permittee in order to identify a statistically significant change in water quality within each coal seam. ~~At a~~

~~minimum,~~ T~~t~~wenty (20) wells[1] shall be sampled each quarter from producing and/or idle wells from each of the four (4) coal seams during each project phase (i.e. eighty (80) samples total each quarter from Phase I), unless there are fewer than twenty wells per coal seam and/or phase; in which case 100% of the wells in the coal seam and/or phase shall be sampled. Samples shall be collected according to the schedule established in **Table 6** and for all constituents and parameters listed in **Table 6**. Quarterly sampling shall not occur at the same wells each quarter, unless the wells sampled in the previous quarter are the only wells active during the present quarter. Samples shall also be as widely distributed spatially as possible each quarter. Sampling results shall be reported quarterly and in the annual water quality report described in Part I.c. of this permit. Failure to perform and report analyses in accordance with the prescribed schedule and method is a violation of this permit.

[1]Minimum sample size needed to adequately account for variability in natural groundwater quality, as per *EPA Unified Guidance "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities",* March, 2009. (EPA 530/R-09-007)

2. The **Upper Tolerance Limits (UTLs)** established in **Table 6** shall not be exceeded for any constituent in more than 5% of samples (excluding QA/QC samples) taken from an individual coal seam and/or project phase, as appropriate (see Table 6) during any single sampling event. Should more than 5% of samples (excluding QA/QC samples) taken during any single sampling event (monitoring period) exceed any UTL value, it is a violation of this permit and shall require notification under Section I.a. of this permit.~~,~~ Refer to Section E. of this permit. ~~and the Permittee shall discontinue use of those wells within five (5) calendar days of receipt of sample data for those wells.~~ The WDEQ recognizes that exceedance of UTL values in more than 5% (five percent) of samples collected during one quarter (excluding QA/QC samples) may represent a statistical change in water quality, however, the WDEQ may consider any single exceedance of a UTL to be a violation of the permit.

3. The **Upper Prediction Limits (UPLs)** established in **Table 6** shall not be exceeded in any single sample. Any exceedance of a UP~~T~~L value is a violation of this permit and shall require notification under Section I.a. of this permit. Refer to Section E of this permit.~~Within five (5) calendar days of receipt of sample data that exceeds a UPL, the Permittee shall discontinue use of that well, or wells.~~

4. Should the permittee obtain additional baseline data in addition to the permit application data that was originally utilized in establishing background concentrations, injectate limitations, and produced water limitations for this facility, the permittee may petition the UIC Program to modify the UTL values established in **Table 6**. Permit modifications of this type will require an additional public notice process if the proposed UTL values are less stringent than those originally established.

5. The permittee may, once two years' worth of sampling data have been collected and reported, petition the Administrator to reduce the frequency of monitoring for any routinely-monitored constituent, or to remove any constituent from the list of routinely-monitored constituents for this facility. Under no circumstances may the permittee reduce monitoring for any constituent, or discontinue monitoring for any

constituent without modification of this permit and the Administrator's express written consent.

Table 6: (Injectate and Groundwater Sampling Schedule)

Sampling Schedule	Constituent Analyzed	EPA Analytical Method	Coal Seam(s) and Phase(s)	Groundwater Permit limit or UTL	Injectate Permit limit ~~or UTL~~	Ground-water UPL
Quarterly (grab) Jan 1 – Mar 31 Apr 1 – Jun 30 Jul 1 – Sep 30 Oct 1 – Dec 31	Alkalinity (Dissolved Inorganic Carbon)	A2320 B	All	NA	NA	NA
	Ammonia	350.1, 350.2, 350.3	Anderson I, Wall I & II	1.01[2]	~~1.01~~[2]NA	1.2~~01~~[3]
			Anderson II, ~~Canyon I,~~ Lower Canyon I & II	1.25~~43~~[2]	~~1.43~~[2]NA	1.51~~93~~[3]
			Canyon II	1.56[2]	~~1.56~~[2]NA	1.72[3]
			Canyon I	1.74[2]	NA	2.43[2]
	Bicarbonate	A2320 B	All	NA	NA	NA
	Calcium	200.7	All	NA	NA	NA
	Carbonate	A2320 B	All	NA	NA	NA
	Chloride	300	All	250[1]	250[1]	250[1]
	Conductivity	Field	All	NA	NA	NA
	Carbon 13 Isotope	Varies	All	NA	NA	NA
	Iron	200.7, 200.9	Lower Canyon I & II	0.74[2]	~~0.74~~[2]NA	0.94[3]
			Canyon I & Wall I & II~~I~~	1.14[2]	~~1.1~~[2]NA	1.92~~68~~[3]
			Anderson I & II~~, Wall I & II~~	1.74~~2~~[2]	~~1.2~~[2]NA	2.69~~1.9~~[3]
			Canyon II	0.95[2]	NA	1.17[2]
	Magnesium	200.7	All	NA	NA	NA
	Manganese	200.7, 200.8, 200.9	Lower Canyon I & II	0.06~~5~~[2]	~~0.05~~[2]NA	0.08~~6~~[3]
			Canyon I & II, Wall I & II	0.07[2]	~~0.07~~[2]NA	0.08[3]
			Anderson I & II	0.09~~8~~[2]	~~0.08~~[2]NA	0.1~~2~~[3]

Sampling Schedule	Constituent Analyzed	EPA Analytical Method	Coal Seam(s) and Phase(s)	Groundwater Permit limit or UTL	Injectate Permit limit ~~or UTL~~	Ground-water UPL
Quarterly (grab) Jan 1 – Mar 31 Apr 1 – Jun 30 Jul 1 – Sep 30 Oct 1 – Dec 31	Nickel	200.7, 200.8, 200.9	All	~~0.01[2]~~0.7[4]	0.7[4]~~0.01[2]~~	0.02[3]
	Nitrate	300	All	10	10	10[1]
	Nitrite	300	All	1[1]	1[1]	1[1]
	pH	Field	All	>6.5 & <8.5[1]	>6.5 & <8.5[1]	>6.5 & <8.5[1]
	Potassium	200.7	All	NA	NA	NA
	Residual Sodium Carbonate	Calculation	All	NA	NA	NA
	Sodium	200.7	All	NA	NA	NA
	Sulfate	300	All	250[1]	250[1]	250[1]
	Hydrogen Sulfide	A4500 S-D	All	~~0.12[2]~~0.21[3]	0.21[3]~~12[2]~~	0.21[3]
	Total Dissolved Solids	A2540 C	Wall I & II	835[2]	1600[1]	1022[3]
			Anderson I & II, Canyon I & II, Lower Canyon I & II	108~~32~~[2]	1600[1]	121~~74~~[3]
	Total Organic Carbon	A5310C	All	NA	NA	NA
	Turbidity	Field	All	NA	NA	NA
	Zinc	200.7, 200.8	All	5[1]	5[1]	5[1]
	Injection Volume	Flow meter	NA	NA	see **Tables 1A and 1B** (barrels/day /well)	NA
	Injection Pressure	Gauge	NA	NA	15 psig	NA
	Produced Water Volume	Flow meter	NA	Report (barrels/day/well)	NA	NA

[1]Limit based on *Wyoming Water Quality Rules and Regulations, Chapter 8, Table I.*
[2]Limit based on upper tolerance limit calculation.

[3]Limit based on upper prediction limit calculation.
[4] Limit based on EPA's Drinking Water Equivalent Level

All chemical concentrations in this permit are expressed in mg/L unless otherwise noted. pH is always expressed in standard units.

65. All samples collected to meet groundwater monitoring requirements shall be analyzed by an independent, third-party EPA certified laboratory.

c. Groundwater monitoring reporting requirements:

1. The results (laboratory results) of groundwater monitoring shall be reported quarterly in the UIC GEM database, and copies of laboratory reports uploaded to GEM within forty-five (45) days of the sample date.

2. The Permittee shall provide two (2) annual water quality summary reports to the Administrator, one hard copy and one in a digital format. The reports shall be separate and specific from the SEO-permitted domestic use wells and injectate reports described in Part I.e. and Part J.b. of the permit. The reports shall contain the following minimum information:

i. well names;
ii. name of coal seam sampled;
iii. API numbers;
iv. ¼ ¼, Section, Township, Range location of each production well;
v. water quality sample date;
vi. water quality analysis date;
vii. detection limits;
viii. EPA methods;
ix. water quality analytes (sorted alphabetically);
x. water quality results (mg/L), including copies of the laboratory reports;
xi. produced water volumes;
xii. injection rates and volumes;
xiii. dates describing when wells were injecting, producing, or idle;
xiv. permit limits; and
xv. laboratory reports and data sheets.

3. Reports shall include explanations of permit compliance or non-compliance, including an analysis of the percentage of wells sampled (excluding QA/QC samples) that exceed UTLs for each constituent.

4. Should a UTL or UPL value be exceeded, the report shall also describe the reporting mechanisms that were undertaken, and the permittee's investigation into the causes of the exceedances and efforts to prevent such exceedances in the future.

5. Reports shall include time-series graphs of analyte concentrations on the X-axis and sample dates on the Y-axis with plots of permit limits superimposed on the X-axis.

6. Reports shall include test data and analysis of all pressure falloff and MIT tests completed

during the reporting period. Other report formats may be submitted with prior approval from the Administrator.

7. If a well is dry at the time of sampling, the permittee shall report the well as dry.

d. SEO-permitted domestic water well monitoring requirements:

1. All owners of SEO-permitted domestic use wells within the area of review, and outside of the area of review but within ½ (one-half) mile of an injection or production well shall be notified by the permittee within thirty (30) days of issuance of this permit, and offered the opportunity to have the permittee or the permittee's representative collect and complete laboratory analyses of ground water samples from the owner's well.

2. Within thirty (30) days of receipt of written request from the well owner(s), the Permittee shall collect an initial sample from the owner's well for laboratory analysis, and semi-annually thereafter, in accordance with **Table 7.**

Table 7 (Domestic Use Well Monitoring Schedule)

Sampling Schedule	Constituent Analyzed	EPA Analytical Method
Semiannual (grab)	Alkalinity (Dissolved Inorganic Carbon)	A2320 B
Jan 1 – June 30	Ammonia	350.1, 350.2, 350.3
Jul 1 – Dec 31	Arsenic	200.7, 200.8, 200.9
	Bicarbonate	A2320 B
	Calcium	200.7
	Carbon 13 Isotope	Varies
	Carbonate	A2320 B
	Chloride	300.0
	Conductivity	Field
	Iron	200.7, 200.9
	Magnesium	200.7
	Manganese	200.7, 200.8, 200.9
	Nickel	200.7, 200.8, 200.9
	Nitrate	300.0
	Nitrite	300.0
	pH	Field
	Potassium	200.7
	Residual Sodium Carbonate	Calculation
	Selenium	200.7, 200.8, 200.9
	Sodium	200.7
	Sulfate	300.0
	Hydrogen Sulfide	A4500 S-D
	Total Dissolved Solids	300.0
	Total Organic Carbon	5310C
	Turbidity	Field
	Zinc	200.7, 200.8

3. Owners of SEO-permitted domestic wells may request in writing to not participate in groundwater sampling and analysis, or to discontinue groundwater sampling or analysis. In the event that an owner of an SEO-permitted domestic well denies access to an SEO-permitted domestic well at any time, the permittee will notify the Administrator and provide documentation that access to an SEO-permitted domestic well has been denied.

4. Samples from all owners of SEO-permitted domestic wells who have opted to participate in the groundwater sampling will be collected over the duration of the permit.

5. All samples collected from domestic use water supply wells shall be analyzed by an independent, third-party EPA certified laboratory.

6. Owners of domestic use water supply wells in the area of review permitted by the SEO after the date of issuance of this permit will be afforded the same opportunity for sample collection and analysis as existing well owners described in this section.

e. SEO-permitted domestic water well reporting requirements:

1. The results of SEO-permitted domestic well sampling (laboratory results) shall be reported quarterly in the UIC GEM database, copies of laboratory reports uploaded to GEM, and copies of laboratory reports provided to the well owner(s) within forty-five (45) days of the sample date.

2. The Permittee shall provide two (2) annual water quality summary reports to the Administrator~~-~~, one~~in both~~ hard copy and one in a digital format~~s~~.

3. The reports shall be separate and specific from the groundwater monitoring and injectate reports described in Part I.c. and Part J.b. of the permit. The reports shall include the following:

i. A list of all SEO-permitted water supply wells that were sampled during the semiannual reporting period.

ii. Contact information for each of the SEO-permitted well owners, including SEO-permitted well owner name, address, and telephone number.

iii. The results of water quality analyses, including:

A. water quality sample date;
B. water quality analysis date;
C. detection limits;
D. EPA methods;
E. water quality analytes (sorted alphabetically); and
F. water quality results (mg/L), including copies of the laboratory reports.

iv. Well information, including:

A. well depths, ~~(~~if available publicly~~to be collected if none exist)~~;
B. SEO permit number;

C. well name;
D. ¼ ¼, Section, Township, Range;
E. completed formation and/or perforated intervals, if available publicly; and
F. water levels, if available publicly ~~at the time of sample collection~~.

v. Other information, including copies of all written documentation described in this section:

A. landowner notification letters;
B. landowner responses;
C. laboratory reports;
D. denial of access to any well; and
E. requests for cessation of sample collection from landowners.

vi. Analysis of sampling results, including:

A. A comparison of the current semiannual reporting period's results to previous results for each SEO-permitted well sampled.

B. If a well that has been previously sampled was not sampled during the current semiannual reporting period, a description of why the well was not sampled.

4. The Permittee shall immediately notify the Administrator of potential water quality issues presented by a valid State Engineer Office (SEO) domestic use water well permit holder within the area of review **(Table 5)** or within ½ (one-half) mile of an injection or production well listed in either **Table 2 or Table 3** of this permit.

5. The Permittee shall immediately notify the Administrator and SEO water well permit holder of potential water quality issues encountered with any SEO-permitted domestic use water well.

~~4.~~

J. Requirements for Monitoring the Discharge

"Injectate" is a mixture of amendments consisting of vitamins and minerals, multi-nutrients, cell vitality enhancers, and produced water. For the purposes of this permit, "injectate" does not refer to amendments that have not been diluted with produced water.

a. Injectate sampling requirements:

1. The Permittee shall meter volumes of all injectate emplaced into each well.

2. For the purposes of this permit, a "batch" is defined as the quantity of material prepared or required for one operation, as in "mixing a batch of cement."

3. The permittee must report the specific vitamins and minerals, multi-nutrients, cell vitality enhancers, and produced water used to make up each injectate batch, the amounts or volumes of each amendment, the concentration of each amendment in the injectate, and the

rate of injectate injection into the well.

~~2.~~ Due to the nature of some of the amendments, it is acceptable to calculate concentrations based upon known volume or weight of these amendments per unit volume of "make-up" or produced water and report these values to the Administrator. The permittee is required to describe how each amendment's concentration in the injectate was determined.

4. Mixing of amendments and produced water occurs at this facility over a period of time from amendments that are delivered to the wellhead in a tank. The amendments in the tank are gradually added, via pump, to produced water collected from other wells at the facility.

The injectate sampling required by this permit shall occur at a sample withdrawal port located downstream of the injection port, and is to be representative of the amendments and produced water.

Injectate sampling shall occur once per quarter as long as injection is occurring at an individual well from a single tank of amendments, and each time a new tank of amendments is delivered to a wellhead.

For example, if well "A" has been injecting from a single tank of amendments for 6 months, two quarterly samples, at a minimum, must be collected, analyzed, and reported to the Administrator. If, in the sixth month, a new tank of amendments is delivered to the wellhead, a second sample, representing the new tank of amendments, should be collected, analyzed, and reported to the Administrator for that quarter (monitoring period). ~~t~~

~~3.~~ The Permittee is required to sample each batch of injectate for all constituents listed in **Table 6**. Sample results and laboratory reports shall be reported and uploaded quarterly into the UIC GEM database within forty-five (45) days of the sample date, and in the annual water quality report described in Part J.b. of this permit.

~~4.~~ 5. Injectate quality shall not exceed **injectate** limits established in **Table 6** during any single sampling event at the point of injection for any constituent.

6~~5~~. For injectate that is mixed in batches and emplaced into multiple wells at the same time, only one injectate sample per batch is required to be collected and analyzed for all constituents listed in **Table 6.** In such cases, the Permittee must report which wells received which injectate batch in the quarterly report for that monitoring period, and in the annual water quality report.

7~~6~~. All samples reported to the Administrator shall be unfiltered unless filtered samples are specified for the given analysis; turbidity shall not exceed 20 NTUs unless otherwise approved by the Administrator. Samples shall be collected such that they are representative of injectate without further treatment.

8~~7~~. All samples collected to meet injectate sampling requirements shall be analyzed by an independent, third-party EPA certified laboratory.

b. Injectate reporting requirements:

1. The results (laboratory results) of injectate sampling shall be reported quarterly in the UIC GEM database, and copies of laboratory reports and analyses uploaded to GEM within thirty~~forty-five~~ (30~~45~~) days of the sample date.

~~2. Amendment reports shall be reported at least thirty (30) days prior to the commencement of injection acitvities.~~

2. The Permittee shall provide two (2) annual water quality summary reports to the Administrator, one hard copy and one in a digital format. Amendment reports will be held confidential by the Administrator. The reports shall be separate and specific from the SEO-permitted domestic use wells and groundwater reports described in Part I.c. and Part I.e. of the permit.

~~3.~~

~~4~~5. The reports shall contain the following minimum information:

i. injection well names;
ii. name of coal seam being injected into;
iii. API numbers;
iv. ¼ ¼, Section, Township, Range location of each injection well;
v. injectate quality sample date;
vi. injectate quality analysis date;
vii. detection limits;
viii. EPA methods;
ix. injectate quality analytes (sorted alphabetically);
x. injectate quality results (mg/L);
xi. injection volumes;
xii. injection pressures;
xiii. injection rates;
xiii. beginning and end dates of all well nutrient restorations;
xiv. injectate batch makeup information as described in Part J. a. 2 of this permit, and;
xvi. permit limits.

K. Test Procedures

All samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity and in accordance with an approved Sampling and Analysis Plan. All required analyses shall be conducted in compliance with Wyoming Water Quality Rules and Regulations, Chapter 8, Section 7.

L. Records and Reports

The Permittee shall furnish to the Administrator within a specified time any information which the Administrator may request relating to the operation of the facility, including copies of records required to be kept by this permit. The Permittee shall retain copies of all records and reports required by this permit for a period of three (3) years following permanent well abandonment. After that time, those records shall be delivered to the Administrator for disposal or archive at his discretion. Reports of compliance or noncompliance with, and any progress reports on, interim and

final requirements contained in any compliance schedule shall be submitted no later than thirty (30) days following each schedule date.

Confirmed noncompliance resulting in the migration of injected fluid into any zone outside the permitted receiver shall be reported to the Administrator within twenty-four (24) hours, and a written submission (via certified mail) shall be provided within five (5) days of the time the Permittee becomes aware of the excursion. The written submission shall contain: a description of the noncompliance; the period of noncompliance, including exact dates and times, and if the noncompliance has not been controlled, the anticipated time it is expected to continue; and a list of the steps taken or planned to reduce, eliminate, and prevent the recurrence of the noncompliance.

Confirmed noncompliance not already reported under this section shall be reported at the time monitoring reports are submitted. The reports shall contain the same information as required by the paragraph above.

M. Permit Actions

This permit is issued for a period of ten (10) years. If the Permittee wishes to continue injection after the expiration date of this permit, he shall apply to the Administrator and obtain a new permit prior to the expiration date of this permit. An expired permit continues in effect until a new permit is issued or the permit is terminated by the Administrator. It shall not be a defense for the Permittee in an enforcement action that it would be necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit. The filing of a request by the Permittee, or at the instigation of the Administrator, for permit modification, revocation, termination, or notification of planned changes or anticipated noncompliance shall not stay any condition of this permit.

After notice and opportunity for a hearing, a permit may be modified, suspended or revoked in whole or part during its term for cause which includes, but is not limited to any of the following:

1. Violation of this permit;

2. Obtaining a permit by misrepresentation of facts in the application; or

3. Failure of the tubing, casing, cement, or confining layers.

This permit will be reviewed at least once every five (5) years, and may be reviewed more frequently. A permit may be modified at any time as may be required, including for conformity with changes in regulations or standards which occur after the permit was issued. A permit may be modified in whole or part in order to apply more or less stringent standards; or prohibitions for toxic or other substances present in the Permittees' discharge as may be ordered by the Environmental Quality Council.

N. Mechanical Integrity

Mechanical integrity shall be maintained continuously.

This facility is different from most CBM injection facilities in that the injectate and the formation water are the same. In addition, the Permittee does not plan to inject above a surface pressure of 15 psig. Many of the proposed injection wells are pre-existing CBM production wells originally

permitted by the Wyoming Oil and Gas Conservation Commission, and were not constructed to handle high-pressure re-injection. Most of the injection wells in this project are not strictly injection wells, and may rotate through several cycles of production and injection in their lifetimes. The existing wells are rated to handle a maximum injection pressure of 300 psig, which is below the 700 psig routinely required for mechanical integrity testing of wells permitted via General Permits in the Powder River Basin. Finally, the Anderson, Wall, Canyon, and Lower Canyon coal seams (receiving formations) may have been significantly dewatered during the past 10-15 years from CBM production in the project area. As a result, reservoir pressures in the Anderson, Wall, Canyon, and Lower Canyon are approximately 25 psig, which allows for the injection of large volumes of water under gravity flow and hydrostatic pressures.

The following Part I mechanical integrity tests are required for each injection well on a five (5) year basis, as long as injection is occurring during the life of this permit (once in 2011 and once in 2016) as follows:

1. The Permittee may not exceed 15 psig (measured at the surface) injection pressure in the wellbores (unless for testing purposes). The Permittee shall pressure test the casing before injection and at least once every five (5) years. The casing shall be pressure tested up to an indicated surface pressure of 100 psig and held for 30 minutes. A passing test shall show that there is less than 10% pressure loss after 30 minutes at 100 psig. The Administrator may eliminate the requirement for pressure testing if he/she determines wireline methods are deemed adequate.

O. Abandonment or Conversion to Water Wells

General Requirements:

1. The Permittee shall notify the Administrator at least seven (7) days before conversion or abandonment of the facility.

2. An abandonment report, detailing the compliance with abandonment procedures outlined in the original application for coverage under this permit, or describing any deviations from the original plan, shall be submitted as soon as practicable after abandonment. The abandonment shall include reclamation of the well site.

3. In no case shall the abandonment procedure be less stringent than that required at the time of abandonment by the Wyoming Oil and Gas Conservation Commission for the abandonment of producing oil wells.

4. Injection wells covered by this permit shall be permanently abandoned or converted to another use within three (3) years after the date when coal bed methane water was last injected unless those wells are converted to water wells.

5. Wells which are to be converted to another use shall be covered by an approved Wyoming State Engineer Office's permit to document that it has been converted to a water well. A copy of this permit shall be submitted to the Administrator as evidence that the well has been converted.

P. Duties of the Permittee

The Permittee shall give advance notice to the Administrator as soon as possible of any planned physical alteration or additions, other than authorized operation and maintenance, to the permitted facility and receive authorization prior to implementing the proposed alternation or addition. The Permittee shall furnish the Administrator within a reasonable time any information which the Administrator may request to determine whether cause exists for modifying, revoking, or reissuing, or terminating this permit, or to determine compliance with this permit; and to furnish to the Administrator upon request, copies of records required to be kept by this permit. Any modification which may result in a violation of a permit condition shall be reported to the Administrator, and any modification that will result in a violation of any permit conditions shall be reported to the Administrator through the submission of a new or amended permit application. The Permittee shall report all instances where he becomes aware that he failed to submit any relevant facts in the permit application, or where he submitted incorrect information in a permit application or in any report to the Administrator, and shall promptly submit such facts or information.

Q. Signatories Requirement

All reports filed in conjunction with this permit shall contain the following certification:

"I certify, under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, 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."

All reports required by this permit and other requested information shall be signed as follows:

<u>For a corporation</u> – by a principal executive officer of at least the level of vice-president;

<u>For a partnership or sole proprietorship</u> – by a general partner or the proprietor, respectively;

<u>For a municipality, state, federal, or other public agency</u> – by either a principal executive officer or ranking elected official; or

<u>By a duly authorized representative for any of the above.</u>

A person is a duly authorized representative only if:

1. The authorization is made in writing by one of the prescribed principals;

2. The authorization specifies either an individual or position having responsibility for the overall operation of the regulated facility or activity; and

3. The written authorization is submitted to the Administrator.

If an authorization is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization must be submitted to the Administrator prior to or together with any reports or information, to be signed by the new authorized representative.

R. Noncompliance

The Permittee shall comply with all conditions of the permit. Any permit noncompliance constitutes a violation of Wyoming Water Quality Rules and Regulations, Chapter 16 and is grounds for enforcement action, permit termination, revocation, or modification. Noncompliance resulting in a violation shall be reported to the Administrator orally within twenty-four (24) hours, and a written submission shall be provided within five (5) days of the time the Permittee becomes aware of the violation. The written report shall contain the sections specified in Section K of this permit. Any permit noncompliance constitutes a violation of this permit.

The filing of any request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

S. Permit Transfer

Any transfer of this permit shall be accomplished by the submission of the proper forms for permit transfer to the Administrator. Transfer of this permit must first be approved by the Administrator and the Director. No transfer shall be approved unless the proposed Permittee agrees to bring any and all noncompliance issues into compliance with this permit. The Permittee is alone responsible for the operation of the facility covered by this permit. Sale of the facility and subsequent operation of this facility by another is a violation of this permit unless a transfer of this permit has first been accomplished.

T. Property Rights

This permit does not convey any property rights of any sort or any exclusive privilege. This permit does not authorize injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations.

U. Severability

Nothing in this permit shall be construed to preclude the institution of any legal action or to relieve the Permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation.

END OF PERMIT