

Table 3.3-2 Representative Stratigraphic Section – Marsland Expansion Area

Elevation (ft amsl)	Average Depth (ft bgs)	Group	Formation & Member (Schultz and Stout 1955)		Formation and Member (Revised)		References (Revised)	Formation & Member (USGS)			
Varying 4150 -4,380	15 - 135	Arikaree Group	Monroe Creek Formation		Upper Harrison Beds		Swinehart et al. (1985)	Arikaree Group	Harrison Sandstone		
					Monroe Creek-Harrison Formation				Monroe Creek Sandstone		
			Gering Formation		Gering Formation				Gering Formation		
Varying 4,140 -4.020	135 - 285	White River Group	Brule Formation	Whitney Member		Brule Formation	"Brown Siltstones"	LaGarry (1998)	Brule Formation	Whitney Member	
				Orella Member	Orella D		Whitney Member			Orella Member	
					Orella C		Orella Member				
					Orella B						
					Orella A	Big Cottonwood Creek Member	Terry (1998) Terry and LaGarry (1998)	Chadron Formation	Chadron Formation		
4,020 – 3,890	285 – 650		Upper Chadron	Chadron C	Chadron Formation					Peanut Creek Member	Terry (1998) Terry and LaGarry (1998)
			Upper/Middle Chadron	Chadron B							
3,890 – 3,380	650 -925		Middle Chadron	Chadron A	Chamberlain Pass Formation					Upper Interior Paleosol	Terry (1998)
3,380 -3,180	925 – 1,025		Upper Interior Paleosol			Channel Sandstone	Terry (1998) Terry and LaGarry (1998)				
			basal sandstone of the Chadron Formation								
3,180 – 3,130	1,025 - ? (Bottom not seen in logs)	Montana Group	Pierre Shale	Interior Paleosol		Pierre Shale	Yellow Mounds Paleosol	Retallack (1983) Terry (1998)	Pierre Shale		
				Pierre Shale			Pierre Shale	Terry (1998) Terry and LaGarry (1998)			

Notes:

- 1) The Shultz and Stout conventions for Formation & Member are utilized throughout this document for consistency with historical permitting, with the exception of the Red Clay Horizon, which is referred to as the Upper Interior Paleosol.
- 2) Topsoil, colluvial and alluvial deposits are not shown, but are Quaternary in age and range in thickness from 0 to 30 ft-bgs.
- 3) The terms “Arikaree Group”, “Arikaree Formation”, and “Arikaree Sandstone” are accepted usages by USGS in Nebraska.
- 4) The terms “Gering Formation” and “Gering Sandstone” are both accepted usages by USGS in Nebraska.
- 5) Subdivisions of the Chadron Formation are not formally recognized by USGS in Nebraska.
- 6) ft amsl = feet above mean sea level; ft bgs = feet below ground surface.
- 7) Elevations are representative averages for MEA only, and based on Log M-1252.

Table 3.3-3 Marsland Expansion Area Coring Summary

Boring ID Date Completed	Latitude Longitude (deg min sec)	Core Interval (feet bgs)	Core Barrel Type	Geologic Unit	Dominant Observed Lithologies	Core Runs Collected
Borings Completed in 2011						
M-1454C 3/23/2011	42 30 45.96736 -103 15 39.46470	600-605	Randolf	Upper Chadron	Siltstone	Run 1
		910-915	Randolf	Middle Chadron	Siltstone	Run 2
		1051-1056	Randolf	Basal Sandstone ¹	Sandstone	Run 3
		1056-1061	Randolf	Pierre Shale	Shale	Run 4
M-1624C 3/28/2011	42 30 02.24164 -103 14 49.32652	580-585	Randolf	Upper Chadron	Siltstone	Run 1
		860-865	Randolf	Middle Chadron	Siltstone	Run 2
		1020-1025	Randolf	Basal Sandstone ¹	Sandstone	Run 3
		1025-1030	Randolf	Basal Sandstone ¹	Sandstone	Run 4
		1035-1040	Randolf	Pierre Shale	Shale	Run 5
Borings Completed in 2013						
M-2169C 8/12/2013	42 32 11.26329 -103 15 53.03808	110-115	Randolf	Arikaree	Silt	Run 1
		155-160	Randolf	Arikaree	Sandstone	Run 2
		355-360	Randolf	Brule	Sandstone	Run 3
		370-380	Christensen	Brule	Siltstone/Mudstone	Run 4
		600-610	Christensen	Upper Chadron	Mudstone	Run 5
		1103-1113	Christensen	Basal Sandstone ¹	Sandstone	Run 6
		1130-1140	Christensen	Pierre Shale	Shale	Run 7
M-533C 8/12/2013	42 30 44.61003 -103 15 38.52320	60-70	Christensen	Arikaree	Sandstone/Siltstone	Run 1
		297-307	Christensen	Brule	Sandstone/Siltstone/Mudstone	Run 3
		1038-1043	Randolf	Basal Sandstone ¹	Sandstone	Run
		1043-1053	Christensen	Basal Sandstone ¹ / Pierre Shale	Sandstone/Shale	Run 5
M-1956C 8/20/2013	42 29 39.82221 -103 14 27.90156	42-52	Christensen	Arikaree	Sandstone	Run 1
		72-82	Christensen	Arikaree	Siltstone	Run 3
		193-203	Christensen	Brule	Sandstone/Siltstone/Mudstone	Run 4
		425-435	Christensen	Brule	Mudstone/Siltstone	Run 5
		1004-1014	Christensen	Basal Sandstone ¹ / Pierre Shale	Sandstone/Shale	Run 6

Table 3.3-3 Marsland Expansion Area Coring Summary

Boring ID Date Completed	Latitude Longitude (deg min sec)	Core Interval (feet bgs)	Core Barrel Type	Geologic Unit	Dominant Observed Lithologies	Core Runs Collected
Borings Completed in 2013 (continued)						
M-1912C 8/15/2013	42 29 07.30429 -103 14 02.26635	63-73	Christensen	Arikaree	Sandstone	Run 1
		128-138	Christensen	Arikaree	Siltstone	Run 2
		255-265	Christensen	Brule	Sandstone/Siltstone/Mudstone	Run 3
		965-975	Christensen	Basal Sandstone ¹ / Pierre Shale	Sandstone/Shale	Run 4
M-1635C 8/23/2013	42 28 23.73852 -103 13 32.61933	70-80	Christensen	Arikaree	Sandstone/Siltstone	Run 1
		197-207	Christensen	Brule	Sandstone/Siltstone/Mudstone	Run 2
		530-540	Christensen	Upper Chadron	Siltstone/Mudstone	Run 3
		960-965	Randolf	Basal Sandstone ¹	Sandstone	Run 4
		965-975	Christensen	Basal Sandstone ¹	Sandstone	Run 5
		985-995	Christensen	Pierre Shale	Shale	Run 6

Notes:¹ Basal Sandstone of the Chadron Formation

Table 3.4-3 Active, Inactive and Abandoned Water Supply Wells in the Marsland Expansion Area and 2.25-Mile Area of Review

Well No.	Estimated Depth (ft)	Formation	Well Use	Well Status
ACTIVE AND INACTIVE WELLS				
Wells Located Within License Boundary (13 active and 2 inactive)				
700	180–200	Brule	Livestock	Active
701	180–200	Brule	Livestock	Inactive
705	Unknown	Arikaree	Livestock	Active
720	240	Arikaree/Brule	Other ^c	Active
721	360	Arikaree/Brule	Other ^c	Active
722	160	Brule	Livestock	Active
727	180	Arikaree/Brule	Livestock	Active
728	260	Brule	Livestock	Active
730	Unknown	Unknown ^a	Domestic	Active
731	180	Brule	Livestock	Active
733	Unknown	Unknown ^a	Livestock	Active
744	80	Arikaree	Livestock	Active
747	225	Arikaree/Brule	Livestock	Active
787	130	Brule	Livestock	Inactive
788	130–140	Arikaree	Livestock	Active
Wells Located Within 1 Km Radius of License Boundary (25 active and 7 inactive)				
702	180–200	Brule	Livestock	Active
703	280	Brule	Domestic/Livestock	Active
704	Unknown	Unknown ^a	Livestock	Active
707	Unknown	Unknown ^a	Livestock	Active
719	160	Brule	Livestock	Active
723	220	Brule	Domestic/Livestock	Active
724	Unknown	Unknown ^a	Domestic/Livestock	Inactive
725	240	Brule	Livestock	Active
729	Unknown	Unknown ^a	Livestock	Inactive
732	280	Brule	Agricultural	Active
735	375	Brule ^b	Livestock	Active
736	200	Brule ^b	Agricultural	Active
739	60	Arikaree	Livestock/Garden	Active
740	110	Brule	Agricultural	Active
741	190	Brule	Agricultural	Active
743	140	Brule ^b	Livestock	Active
745	140 ^c	Brule	Livestock	Active
746	Unknown	Unknown ^a	Livestock	Active
748	Unknown	Unknown ^a	Livestock	Active
749	Unknown	Unknown ^a	Livestock	Inactive
750	Unknown	Unknown ^a	Livestock	Active
752	200–300	Brule	Domestic/Livestock	Active
753	200–300	Brule	Domestic/Livestock	Active
754	200–300	Brule	Livestock	Active
755	200–300	Brule	Livestock	Active

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Table 3.4-3 Active, Inactive and Abandoned Water Supply Wells in the Marsland Expansion Area and 2.25-Mile Area of Review

Well No.	Estimated Depth (ft)	Formation	Well Use	Well Status
756	200-300	Brule	Livestock	<u>In</u> active
759	200-300	Brule	Livestock	Active
777	60	Arikaree	Domestic/Garden	Active
778	60	Arikaree	<u>Livestock</u>	<u>In</u> active
802	180-200	Brule	Livestock	Active
834	300	Brule	Domestic/Livestock	Inactive
843	300	Brule ^b	Livestock	<u>In</u> active
Wells Located Between 1 and 2 Km Radius (18 active and 6 inactive)				
706	Unknown	Unknown ^a	Livestock	Active
714	135	Brule ^b	Domestic/Livestock	Active
715	135	Arikaree	Agricultural	Active
716	135	Brule	Agricultural	<u>In</u> active
734	300	Brule ^b	Livestock	Active
737	340	Brule ^b	Agricultural	<u>A</u> ctive
742	60	Arikaree ^b	Livestock	Active
760	Unknown	Unknown ^a	Agricultural	Active
▼	▼	▼	▼	▼
▼	▼	▼	▼	▼
790	Unknown	Unknown ^a	Livestock	<u>In</u> active
794	300	Arikaree/Brule ^b	Domestic/Livestock	Active
795	350	Arikaree/Brule ^b	Domestic/Livestock	Active
796	350	Arikaree/Brule ^b	Domestic/Livestock	<u>In</u> active
799	250	Brule	Livestock	Active
809	300	Brule	Livestock	Active
810	>300	Unknown ^a	Domestic/Livestock	Active
811	>300	Unknown ^a	Domestic/Livestock	Active
815	140	Brule	Domestic	Active
816	140	Brule	Livestock	<u>In</u> active
817	160	Brule	Livestock	<u>In</u> active
821	160	Brule ^b	Livestock	Active
835	300	Brule	Livestock	Inactive
836	220	Brule	Livestock	Active
841	220	Brule ^b	Livestock	Active
845	Unknown	Unknown ^a	Domestic/Livestock	Active
Wells Located Between 2 Km Radius and AOR Boundary (54 active, 8 inactive and 1 unknown)				
708	Unknown	Unknown ^a	Livestock	Active
709	Unknown	Unknown ^a	Livestock	Active
710	Unknown	Unknown ^a	Livestock	Active
711	Unknown	Unknown ^a	Livestock	Active
712	Unknown	Unknown ^a	Livestock	Active
713	Unknown	Unknown ^a	Livestock	Active
717	160	Arikaree/Brule	Livestock	Active
738	260	Arikaree/Brule ^b	Livestock	Active

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Deleted: Unknown

Deleted: Unknown^a

Deleted: Livestock

Deleted: Active

Deleted: 774

Deleted: 200-300

Deleted: Arikaree/Brule^b

Deleted: Domestic/Livestock

Deleted: Active

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Table 3.4-3 Active, Inactive and Abandoned Water Supply Wells in the Marsland Expansion Area and 2.25-Mile Area of Review

Well No.	Estimated Depth (ft)	Formation	Well Use	Well Status
751	Unknown	Unknown ^a	Livestock	Active
762	200–300	Arikaree/Brule ^b	Livestock	Active
763	200–300	Arikaree/Brule ^b	Livestock	Active
764	200–300	Arikaree/Brule ^b	Livestock	Active
765	200–300	Arikaree/Brule ^b	Livestock	Active
767	200–300	Arikaree/Brule ^b	Livestock	Active
768	200–300	Arikaree/Brule ^b	Domestic	Active
769	200–300	Arikaree/Brule ^b	Livestock	Active
771	200–300	Arikaree/Brule ^b	Livestock	Active
772	200–300	Arikaree/Brule ^b	Livestock	Active
773	200–300	Arikaree/Brule ^b	Livestock	Active
775	220	Arikaree/Brule ^b	Livestock	Active
776	200–300	Arikaree/Brule ^b	Livestock	Active
781	60	Arikaree/Brule	Livestock	Active
782	100	Brule ^b	Agricultural	Active
783	70	Arikaree/Brule ^b	Domestic	Active
784	40–60	Arikaree/Brule ^b	Livestock	Inactive
785	140	Arikaree/Brule ^b	Livestock	Inactive
786	140	Arikaree/Brule ^b	Livestock	Inactive
791	Unknown	Unknown ^a	Livestock	Active
792	Unknown	Unknown ^a	Livestock	Active
793	300	Arikaree/Brule ^b	Livestock	Active
798	200	Brule	Livestock	Active
800	Unknown	Unknown ^a	Livestock	Active
801	220	Arikaree/Brule ^b	Domestic/Garden	Active
803	Unknown	Unknown ^a	Livestock	Active
804	Deep	Unknown ^a	Domestic/Livestock	Active
805	Shallow	Unknown ^a	Livestock	Inactive
806	Unknown	Unknown ^a	Livestock	Inactive
808	160	Arikaree/Brule ^b	Domestic/Livestock	Active
812	260	Unknown ^a	Domestic/Livestock	Active
813	280	Unknown ^a	Livestock	Active
814	Unknown	Unknown ^a	CBR Exploration	Inactive
818	140	Arikaree/Brule ^b	Livestock	Active
819	140	Arikaree/Brule ^b	Livestock	Active
822	140	Brule ^b	Livestock	Active
823	100	Arikaree/Brule ^b	Livestock	Active
827	Unknown	Unknown ^a	Livestock	Active
828	160	Arikaree/Brule ^b	Domestic	Active
837	300	Brule ^b	Livestock	Active
838	300	Arikaree/Brule ^b	Livestock	Active
839	300	Arikaree/Brule ^b	Livestock	Active
840	300	Arikaree/Brule ^b	Livestock	Active
842	300	Arikaree/Brule ^b	Livestock	Active

Table 3.4-3 Active, Inactive and Abandoned Water Supply Wells in the Marsland Expansion Area and 2.25-Mile Area of Review

Well No.	Estimated Depth (ft)	Formation	Well Use	Well Status
846	Unknown	Unknown ^a	Livestock	Active
849	Unknown	Unknown ^a	Livestock	Active
850	200	Arikaree/Brule ^b	Agricultural	Active
851	140	Arikaree/Brule ^b	Agricultural	Active
853	150	Arikaree/Brule ^b	Agricultural	Active
856	Unknown	Unknown ^a	Unknown	Unknown
857	40–50	Arikaree/Brule ^b	Domestic/Agricultural	Inactive
858	200	Arikaree/Brule ^b	Agricultural	Active
859	120	Arikaree/Brule ^b	Domestic	Inactive
861	40	Arikaree/Brule ^b	Domestic/Livestock/ Agricultural	Active
862	155	Arikaree/Brule ^b	Domestic/Agricultural	Active
ABANDONED WELLS				
Wells Located Within License Boundary				
726A	300	Brule	Unknown	Abandoned
Wells Located Within 1 Km Radius of License Boundary				
868A	Unknown	Unknown ^a	Unknown	Abandoned
869A	Unknown	Unknown ^a	Unknown	Abandoned
Wells Located Between 1 and 2 Km Radius				
867A	Unknown	Unknown ^a	Unknown	Abandoned

^a Information provided by well owner and information from nearby wells are insufficient to make a definitive determination of aquifer utilized. However, discussions with land owners and known completion depths of private water wells in the area suggest that these wells are completed within the Arikaree Formation or the Brule Formation.

^b Information provided by well owner and information from nearby wells indicate that one or more aquifer is utilized, but cannot be specifically determined. Assigned formation based on available information.

^c CBR driller water supply.