

**Table 6.1-18 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) - 2004**

Parameter	Unit	Jan 12	Feb 2	Feb 29	Apr 5	Apr 19	May 2	May 17	Jun 7	Jun 21	July 6	Jul 19	Reporting Limit
<b>Major Ions</b>													
Calcium, Dissolved	mg/L	51.3	ND	ND	55.6	ND	ND	ND	ND	ND	43.1	ND	0.15
Chloride, Total	mg/L	5.2	4.59	5.08	5.44	5.29	4.92	4.33	4.32	4.06	3.92	4.30	1
Magnesium, Dissolved as Mg	mg/L	9.3	ND	ND	11	ND	ND	ND	ND	ND	8.07	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	<0.05	<0.05	<0.05	<0.05	0.060	<0.05	<0.05	1.05	<0.05	<0.05	<0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	1.36	1.28	0.606	0.469	0.679	0.908	1.03	0.882	0.896	0.964	0.963	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.5	<0.5	0.603	0.528	<0.5	0.635	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
Phosphorus, Total	mg/L	<0.04	<0.04	0.073	0.045	<0.04	0.13	<0.04	<0.04	<0.04	0.053	<0.04	0.04
Sodium, Dissolved	mg/L	24.3	ND	ND	ND	ND	ND	ND	ND	ND	24.5	ND	0.15
<b>Physical Properties</b>													
Specific Conductance	µmhos/cm @25°C	408	408	345	377	364	359	314	345	364	348	336	N/A
Alkalinity	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Chemical Oxygen Demand (COD)	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12
Dissolved Oxygen, Field	mg/L	9.32	8.64	6.1	9.09	9.55	8.98	9.15	8.93	9.48	8.39	8.22	N/A
pH, Field	s.u.	8.05	7.59	7.8	8.15	8.26	8.48	8.43	8.35	8.3	8.19	8.11	N/A
Suspended Solids, Total (TSS)	mg/L	10.5	8.5	33	11.5	5	<5	5.5	<5	<5	23	19	5
Temperature, Water (Field)	°C	4.7	0.82	0.69	10.17	10.23	15.23	12.61	16.13	13.79	17	19.21	N/A
Turbidity, Lab	NTU	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Turbidity, Field	NTU	5.6	11.5	41.7	10.4	4.3	3.8	3.2	8.5	85.4	21.4	20.9	N/A
<b>Metals, Dissolved</b>													
Arsenic, Dissolved	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	<10	ND	10
Cadmium, Dissolved	µg/L	<1	ND	ND	<1	ND	ND	ND	ND	ND	<1	ND	1
Chromium, Dissolved	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	<10	ND	10
Copper, Dissolved	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	<10	ND	10
Lead, Dissolved	µg/L	<5	ND	ND	<5	ND	ND	ND	ND	ND	<5	ND	5
Mercury, Dissolved as Hg	µg/L	<1	ND	ND	<1	ND	ND	ND	ND	ND	<1	ND	1
Nickel, Dissolved	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	<10	ND	10
Selenium, Total	µg/L	<5	ND	ND	<5	ND	ND	ND	ND	ND	<5	ND	5
Silver, Dissolved	µg/L	<1	ND	ND	<1	ND	ND	ND	ND	ND	<1	ND	1
Zinc, Dissolved	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	<10	ND	10
<b>Stream Flow</b>													
Gage Height	inches	ND	ND	3.5	3.38	3.27	3.22	ND	3.08	3.11	3.12	3.08	N/A
Stream Discharge	cfs	18.7	19.3	40	29.4	21.3	18.1	11.12	10.3	12.1	12.6	10.7	N/A

**Table 6.1-18 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) - 2004**

Parameter	Concentration	Aug 1	Aug 16	Sept 6	Sept 20	Oct 4	Nov 2	Dec 6	Reporting Limit
<b>Major Ions</b>									
	Suspended								
Calcium, Dissolved	mg/L	ND	ND	ND	ND	53	ND	ND	0.15
Chloride, Total	mg/L	4.24	4.64	6.52	5.25	4.82	5.34	5.13	1
Magnesium, Dissolved as Mg	mg/L	ND	ND	ND	ND	8.86	ND	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	<0.05	<0.05	0.054	<0.05	0.070	<0.05	0.212	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	0.962	0.927	0.920	0.837	0.790	0.896	1.10	0.05
Nitrogen as N, Total Kjeldahl	mg/L	0.678	0.770	1.13	<0.5	<0.5	<0.5	<0.5	0.5
Phosphorus, Total	mg/L	0.061	0.074	0.119	<0.04	<0.04	<0.04	<0.04	0.04
Sodium, Dissolved	mg/L	ND	ND	ND	ND	25	ND	ND	0.15
<b>Physical Properties</b>									
Specific Conductance	µmhos/cm @25°C	331	356	382	387	357	383	421	N/A
Alkalinity	mg/L	ND	ND	ND	ND	ND	ND	ND	N/A
Chemical Oxygen Demand (COD)	mg/L	ND	ND	ND	ND	ND	ND	ND	12
Dissolved Oxygen, Field	mg/L	7.17	8.42	8.83	8.14	9.27	10.22	10.55	N/A
pH, Field	s.u.	8.18	7.96	7.09	7.17	8.03	8.05	7.77	N/A
Suspended Solids, Total (TSS)	mg/L	25	36	61.5	20	25.5	9	6.5	5
Temperature, Water (Field)	°C	26.45	16.45	14.98	16.46	10.21	3.96	1.67	N/A
Turbidity, Lab	NTU	ND	ND	ND	ND	ND	ND	4.23	N/A
Turbidity, Field	NTU	17.7	207	94.1	14.8	23.3	15.2	ND	N/A
<b>Metals, Dissolved</b>									
Arsenic, Dissolved	µg/L	ND	ND	ND	ND	<10	ND	ND	10
Cadmium, Dissolved	µg/L	ND	ND	ND	ND	<1	ND	ND	1
Chromium, Dissolved	µg/L	ND	ND	ND	ND	<10	ND	ND	10
Copper, Dissolved	µg/L	ND	ND	ND	ND	<10	ND	ND	10
Lead, Dissolved	µg/L	ND	ND	ND	ND	<5	ND	ND	5
Mercury, Dissolved as Hg	µg/L	ND	ND	ND	ND	<1	ND	ND	1
Nickel, Dissolved	µg/L	ND	ND	ND	ND	<10	ND	ND	10
Selenium, Total	µg/L	ND	ND	ND	ND	<5	ND	ND	5
Silver, Dissolved	µg/L	ND	ND	ND	ND	<1	ND	ND	1
Zinc, Dissolved	µg/L	ND	ND	ND	ND	<10	ND	ND	10
<b>Stream Flow</b>									
Gage Height	inches	3.05	3.12	3.22	3.18	3.21	3.22	3.23	N/A
Stream Discharge	cfs	9.44	12.6	18.1	15.8	17.5	16.9	18.7	N/A

**Notes:**  
cfs = cubic feet per second  
µg/L = micrograms per liter  
mg/L = milligrams per Liter  
NTU = Nephelometric Turbidity Units  
s.u. = standard unit  
µmhos/cm = micromhos per centimeter  
< = less than  
NA = No data  
N/A = not applicable  
ND = not detected  
NDEQ = Nebraska Department of Environmental Quality  
Source: Ihrie 2013a

**Table 6.1-19 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) - 2005**

Parameter	Concentration	Jan 10	Feb 7	Mar 7	Apr 4	Apr 18	May 1	May 16	Jun 6	Jun 20	July 11	Jul 25	Reporting Limit
<b>Major Ions</b>													
	Suspended												
Calcium	mg/L	49.8	ND	ND	52.3	ND	ND	ND	ND	ND	50.4	ND	0.15
Chloride, Total	mg/L	4.76	4.44	4.69	5.24	5.1	6.4	4.94	5.22	7.21	5.46	4.58	1
Magnesium, Dissolved as Mg	mg/L	9.14	ND	ND	10.7	ND	ND	ND	ND	ND	9.7	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	<0.05	0.064	<0.05	<0.05	<0.05	0.173	<0.05	<0.05	0.089	<0.05	<0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	1.279	0.670	0.431	0.393	0.427	0.330	0.297	0.323	0.194	0.658	0.917	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.5	<0.5	<0.5	<0.5	0.637	0.680	0.672	0.804	1.102	0.598	<0.5	0.5
Phosphorus, Total as P	mg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.047	0.054	0.708	<0.04	<0.04	0.04
Sodium, Dissolved	mg/L	23.8	ND	ND	26.1	ND	ND	ND	ND	ND	24.4		
<b>Physical Properties</b>													
Dissolved Oxygen, Field	mg/L	9.39	8.93	7.37	7.28	5.39	5.1	9.13	9.17	8.42	8.35	7.64	N/A
pH, Field	s.u.	7.81	7.84	7.5	8.12	8.21	8.26	8.24	8.06	8.33	8.14	7.94	N/A
Total Suspended Solids (TSS)	mg/L	7.0	10.5	8	5	<5	5	12.5	21	19.5	24	20	5
Specific Conductance, Field	µmhos/cm @25°C	360	381	404	416	428	470	432	454	347	340	368	N/A
Temperature, Field (Celsius)	°C	2.01	0.24	4.41	9.39	13.28	9.43	14.86	16.87	18.92	21.25	21.25	N/A
Turbidity, Lab	NTU	ND	ND	14.8	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Turbidity, Field	NTU	8	59.4	14.8	2.3	2.7	2.5	7.7	11.8	7.8	17.1	18.3	N/A
<b>Metals, Dissolved</b>													
Arsenic	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	<10	ND	10
Cadmium	µg/L	<1	ND	ND	<1	ND	ND	ND	ND	ND	<1	ND	1
Chromium	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	<10	ND	10
Copper	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	<10	ND	10
Lead	µg/L	<5	ND	ND	<5	ND	ND	ND	ND	ND	<5	ND	5
Mercury	µg/L	<1	ND	ND	<1	ND	ND	ND	ND	ND	<1	ND	1
Nickel	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	<10	ND	10
Mercury	µg/L	<1	ND	ND	<1	ND	ND	ND	ND	ND	<1	ND	1
Selenium	µg/L	<5	ND	ND	<5	ND	ND	ND	ND	ND	<5	ND	5
Silver	Ug/L	<1	ND	ND	<1	ND	ND	ND	ND	ND	<1	ND	1
Zinc	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	<10	ND	10
<b>Stream Flow</b>													
Gage height	inches	3.2	3.37	3.51	3.79	3.69	3.97	3.78	3.73	ND	ND	3.1	N/A
Stream discharge	cfs	16.9	28.6	40.6	58.6	50.9	68.1	56.2	53.2	0.351	16.3	11.6	N/A

**Table 6.1-19 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) - 2005**

Parameter	Concentration	Aug 8	Aug 22	Sept 11	Sept 26	Oct 11	Nov 07	Dec 5	Reporting Limit
<b>Major Ions</b>									
	Suspended								
Calcium	mg/L	ND	ND	ND	ND	49.3	ND	ND	0.15
Chloride, Total	mg/L	4.30	5.28	5.26	4.91	6.79	4.49	4.95	1
Magnesium, Dissolved as Mg	mg/L	ND	ND	ND	ND	9.17	ND	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	0.071	<0.05	<0.05	0.075	0.102	0.078	0.058	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	0.961	0.560	0.785	0.976	0.925	0.907	1.266	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.5	1.206	<0.5	<0.5	<0.5	1.130	<0.5	0.5
Phosphorus, Total as P	mg/L	<0.04	0.047	0.050	0.048	<0.04	0.052	<0.04	0.04
Sodium, Dissolved	mg/L	ND	ND	ND	ND	26.2	ND	ND	5
<b>Physical Properties</b>									
Dissolved Oxygen, Field	mg/L	7.98	7.9	8	9.1	9.32	10.15	10.57	N/A
pH, Field	s.u.	8.19	8.18	8	8.08	8.1	8.05	8.27	N/A
Total Suspended Solids, TSS	mg/L	21	40.5	30.5	27.5	21	17	6	5
Specific Conductance, Field	µmhos/cm @25°C	367	409	353	389	413	402	418	N/A
Temperature, Field (Celsius),	°C	18.41	17.97	22.47	10.16	9.04	6.35	-0.25	N/A
Turbidity, Lab	NTU	ND	ND	43.9	ND	ND	ND	ND	N/A
Turbidity, Field	NTU	15.5	24.6	26.1	28.8	19.4	15.5	11.4	N/A
<b>Metals, Dissolved</b>									
Arsenic	µg/L	ND	ND	ND	ND	<10	ND	ND	10
Cadmium	µg/L	ND	ND	ND	ND	<1	ND	ND	1
Chromium	µg/L	ND	ND	ND	ND	<10	ND	ND	10
Copper	µg/L	ND	ND	ND	ND	<10	ND	ND	10
Lead	µg/L	ND	ND	ND	ND	<5	ND	ND	5
Mercury	µg/L	ND	ND	ND	ND	<1	ND	ND	1
Nickel	µg/L	ND	ND	ND	ND	<10	ND	ND	10
Selenium	µg/L	ND	ND	ND	ND	<5	ND	ND	5
Silver	Ug/L	ND	ND	ND	ND	<1	ND	ND	1
Zinc	µg/L	ND	ND	ND	ND	<10	ND	ND	10
<b>Stream Flow</b>									
Gage height	inches	3.1	3.2	3.2	3.21	3.27	3.27	4.0	N/A
Stream discharge	cfs	11.6	16.9	16.9	17.5	21.3	21	70	N/A

**Notes:**  
cfs = cubic feet per second  
µg/L = micrograms per liter  
mg/L = milligrams per Liter  
NTU = Nephelometric Turbidity Units  
s.u. = standard unit  
umhos/cm = micromhos per centimeter  
< = less than  
NA = No data  
N/A = not applicable  
ND = not detected  
NDEQ = Nebraska Department of Environmental Quality  
Source: Ihrie 2013a

**Table 6.1-20 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) - 2006**

Parameter	Unit	Jan 9	Feb 6	Mar 8	Apr 3	Apr 17	May 1	May 15	Jun 5	Jun 20	July 10	Aug 8	Reporting Limit
<b>Major Ions, Suspended</b>													
Calcium	mg/L	50.5	ND	ND	56.3	ND	ND	ND	ND	ND	44.8	ND	1
Chloride, Total	mg/L	4.90	4.50	14.83	6.31	5.17	5.30	3.61	3.75	3.42	4.09	4.14	1
Magnesium, Dissolved as Mg	mg/L	9.3	ND	ND	11.3	ND	ND	ND	ND	ND	8.09	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	<0.05	<0.05	0.065	0.195	0.053	0.091	<0.05	0.154	0.071	<0.05	0.058	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	1.005	1.063	0.379	0.257	0.301	0.165	0.468	0.544	1.012	0.997	1.012	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.50	<0.50	<0.50	0.581	0.652	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.5
Phosphorus, Total as P	mg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.05	0.045	0.04
Sodium, Dissolved	mg/L	24.4	ND	ND	34.3	ND	ND	ND	ND	ND	23.27	ND	5
<b>Physical Properties</b>													
Dissolved Oxygen, Field	mg/L	10.3	11.0	8.9	8.71	7.49	8.88	7.69	6.86	6.09	5.37	4.78	N/A
pH, Field	s.u.	7.48	7.94	8.01	7.83	8.05	8.08	8.18	8.24	8.39	7.98	8.22	N/A
Total Suspended Solids, TSS	mg/L	5	6	9	9.0	12.0	8.5	15.5	10.0	20.0	28.5	32.5	5
Specific Conductance, Field	µmhos/cm @ 25°C	359	361	394	407	439	423	405	360	345	329	362	N/A
Temperature, Field (Celsius)	°C	1.47	1.68	5.75	7	13.66	12.96	13.7	16.62	17.47	16.36	19.51	N/A
Turbidity, Field	NTU	6	14.2	7.7	6.3	6.8	5.3	ND	18.1	30	41.2	35.1	N/A
Turbidity, Lab	NTU	ND	ND	ND	ND	ND	ND	10.1	ND	ND	ND	ND	N/A
<b>Metals, Dissolved</b>													
Arsenic	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	<10	ND	10
Cadmium	µg/L	<1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chromium	µg/L	<10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Copper	µg/L	<10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Lead	µg/L	<5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Mercury	µg/L	<1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Mercury	µg/L	<1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Nickel	µg/L	<10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Selenium	µg/L	<5	ND	ND	<5	ND	ND	ND	ND	ND	<5	ND	5
Silver	µg/L	<1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Zinc	µg/L	<10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
<b>Stream Flow</b>													
Gage Height	inches	4.21	3.94	4.31	4.34	4.11	4.12	3.68	3.23	3.15	3.13	3.09	N/A
Stream discharge	cfs	85	66.2	92.5	94.8	ND	77.7	50.3	18.7	14.1	0.3	11.2	N/A

**Table 6.1-20 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) - 2006**

Parameter	Unit	Aug 21	Sept 11	Sept 25	Oct 2	Nov 6	Dec 4	Reporting Limit
<b>Major Ions, Suspended</b>								
Calcium	mg/L	ND	ND	ND	47.5	ND	ND	0.15
Chloride	mg/L	4.25	4.49	3.84	4.09	4.41	5.14	1
Magnesium, Dissolved as Mg	mg/L	ND	ND	ND	8.2	ND	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	0.050	0.064	0.081	<0.05	0.099	<0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N) (mg/L)	mg/L	1.130	1.153	1.30	1.220	1.166	1.376	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.50	0.664	<0.50	0.86	<0.50	<0.50	0.5
Phosphorus, Total as P	mg/L	<0.04	0.092	<0.04	<0.04	<0.04	<0.04	0.04
Sodium, Dissolved	mg/L	ND	ND	ND	24.05	ND	ND	5
<b>Physical Properties</b>								
Dissolved Oxygen	mg/L	8.1	8.62	9.36	8.61	9.69	11.18	N/A
pH	s.u.	7.83	7.93	7.82	7.88	7.87	7.96	N/A
Total Suspended Solids, TSS	mg/L	30.5	25	31.5	32.5	31	7.0	5
Specific Conductance	µmhos/cm @ 25°C	357	340	363	355	390	404	N/A
Temperature, Celsius	°C	16.27	13.51	10.04	11.37	5.06	1.16	N/A
Turbidity, Field	NTU	27.2	28.5	30	25.9	28.5	24.8	N/A
Turbidity, Lab	NTU	ND	ND	ND	ND	ND	ND	
<b>Metals, Dissolved</b>								
Arsenic	µg/L	ND	ND	ND	<1	ND	ND	10
Cadmium	µg/L	ND	ND	ND	ND	ND	ND	1
Chromium	µg/L	ND	ND	ND	ND	ND	ND	10
Copper	µg/L	ND	ND	ND	ND	ND	ND	10
Lead	µg/L	ND	ND	ND	ND	ND	ND	5
Mercury	µg/L	ND	ND	ND	ND	ND	ND	1
Nickel	µg/L	ND	ND	ND	ND	ND	ND	10
Mercury	µg/L	ND	ND	ND	ND	ND	ND	1
Selenium	µg/L	ND	ND	ND	<5	ND	ND	5
Silver	µg/L	ND	ND	ND	ND	ND	ND	1
Zinc	µg/L	ND	ND	ND	ND	ND	ND	10
<b>Stream Flow</b>								
Gage Height	inches	3.1	3.14	3.14	3.11	3.22	3.24	N/A
Stream discharge	cfs	11.6	13.6	13.6	12.1	18.1	19.3	N/A

**Notes:**

cfs = cubic feet per second  
µg/L = micrograms per liter  
mg/L = milligrams per Liter  
NTU = Nephelometric Turbidity Units  
s.u. = standard unit  
µmhos/cm = micromhos per centimeter  
< = less than  
NA = No data  
N/A = not applicable  
ND = not detected  
NDEQ = Nebraska Department of Environmental Quality  
Source: Ihrie 2013a

**Table 6.1-21 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) - 2007**

Parameter	Concentration	Jan 8	Feb 5	Mar 5	Apr 2	Apr 16	May 7	May 21	Jun 4	Jun 11	Jul 9	Reporting Limit
<b>Major Ions, Suspended</b>												
Calcium	mg/L	55.17	ND	ND	53.61	ND	ND	ND	ND	ND	ND	0.15
Chloride, Total	mg/L	4.98	ND	4.79	5.95	5.13	4.80	4.26	4.10	3.77	4.64	1
Magnesium, Dissolved as Mg	mg/L	9.51	ND	ND	10.63	ND	ND	ND	ND	ND	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	0.10	<0.05	<0.05	0.05	<0.05	0.07	ND	<0.05	0.05	0.06	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	1.37	1.58	0.85	0.23	0.36	0.46	0.56	0.80	0.84	0.67	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.5	<0.5	<0.5	<0.5	0.534	0.508	<0.5	<0.5	<0.5	0.77	0.5
Phosphorus, Total as P	mg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.050	0.217	<0.04	0.057	0.04
Sodium, Dissolved	mg/L	25.44	ND	ND	28.34	ND	ND	ND	ND	ND	ND	0.15
<b>Physical Properties</b>												
Dissolved Oxygen, Field	mg/L	9.8	9.5	9.6	9.6	9.1	ND	7.1	8.1	8.2	6.2	N/A
pH, Field	s.u.	7.73	7.3	7.2	7.75	7.95	ND	9.92	7.81	8.14	7.61	N/A
Total Suspended Solids, TSS	mg/L	<5	<5	<5	<5	<5	<5	<5	5	<5	25.5	5
Specific Conductance	µmhos/cm @ 25°C	385	372	338	416	419	ND	362	374	371	368	N/A
Temperature, Water (Field)	°C	1.5	0.2	1.0	8.6	9.5	ND	15.1	14.4	17.2	18.9	N/A
Turbidity, Field	NTU	8.2	23.5	29.9	0.9	14.3	ND	37.8	14.6	25.3	63.3	N/A
<b>Metals, Dissolved</b>												
Arsenic	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	ND	10
Cadmium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chromium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Copper	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Lead	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Mercury	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Nickel	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Selenium	µg/L	<5	ND	ND	<5	ND	ND	ND	ND	ND	ND	5
Zinc	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
<b>Stream Flow</b>												
Gage Height		3.88	4.63	5.25	5.56	4.49	ND	4.86	4.09	4.85	3.98	N/A
Stream Discharge		62.4	117.8	172.1	201.6	194.8	ND	137.1	76.3	136.3	68.7	N/A

**Table 6.1-21 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) - 2007**

Parameter	Concentration	Jul 23	Aug 6	Aug 20	Sept 10	Sept 24	Oct 1	Nov 5	Dec 3	Reporting Limit
<b>Major Ions, Suspended</b>										
Calcium	mg/L	ND	48.84	ND	ND	ND	45.21	ND	ND	0.15
Chloride	mg/L	3.65	3.92	4.03	3.81	3.63	3.83	4.22	4.21	1
Magnesium, Dissolved as Mg	mg/L	ND	8.35	ND	ND	ND	7.94	ND	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	0.23	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	<0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	0.88	0.93	0.96	1.12	1.08	1.12	1.21	1.38	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
Phosphorus, Total as P	mg/L	<0.04	<0.04	0.056	<0.04	0.053	<0.04	<0.04	<0.04	0.04
Sodium, Dissolved	mg/L	23.87	ND	ND	ND	ND	22.32	ND	ND	0.15
<b>Physical Properties</b>										
Dissolved Oxygen, Field	mg/L	6.6	7.0	7.3	8.5	7.9	9.0	8.3	8.5	N/A
pH, Field	s.u.	7.74	7.76	7.84	7.38	7.66	7.38	7.36	7.63	N/A
Total Suspended Solids, TSS	mg/L	33.0	26.5	25.5	18.0	24.0	18.5	13.5	9.0	5
Specific Conductance	µmhos/cm @ 25°C	369	364	356	356	342	341	340	349	N/A
Temperature, Water (Field)	°C	19.7	19.6	18.4	11.6	12.9	10.6	5.5	2.0	N/A
Turbidity, Field	NTU	37.5	22.9	15.7	21.7	42.1	30.9	28.6	--	N/A
<b>Metals, Dissolved</b>										
Arsenic	µg/L	<10	ND	<10	ND	ND	<10	ND	ND	10
Cadmium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	1
Chromium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	10
Copper	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	10
Lead	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	5
Mercury	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	1
Nickel	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	10
Selenium	µg/L	<5	ND	<5	ND	ND	<5	ND	ND	5
Zinc	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	10
<b>Stream Flow</b>										
Gage Height	inches	3.68	3.53	3.72	3.09	3.00	3.04	3.04	10.7	N/A
Stream Discharge	cfs	50.3	41.7	37.2	11.2	7.5	9.0	9.0	10.7	N/A

**Notes:**

cfs = cubic feet per second  
µg/L = micrograms per liter  
mg/L = milligrams per liter  
NTU = Nephelometric Turbidity Units  
s.u. = standard unit  
µmhos/cm = micromhos per centimeter  
< = less than  
NA = No data  
N/A = not applicable  
ND = not detected  
NDEQ – Nebraska Department of Environmental Quality  
Source: Ihrie 2013a



**Table 6.1-22 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir - 2008**

Parameter	Concentration	Jan 7	Feb 4	Mar 3	Apr 7	May 5	May 12	May 19	May 27	Jun 2	Jun 9	Reporting Limit
<b>Major Ions, Suspended</b>												
Calcium	mg/L	42.82	ND	ND	52.23	ND	ND	ND	ND	ND	ND	0.15
Chloride, Total	mg/L	4.47	3.95	5.01	5.12	4.81	6.59	4.81	4.41	6.33	4.54	1
Magnesium, Dissolved as Mg	mg/L	8.33	ND	ND	10.39	ND	ND	ND	ND	ND	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	0.09	0.14	0.07	<0.05	0.08	<0.05	0.08	<0.05	0.06	<0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	1.34	1.4	0.64	0.31	0.72	0.3	0.44	0.53	0.51	0.36	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.5	<0.5	0.77	0.53	<0.5	0.8	0.69	0.53	0.97	0.69	0.5
Phosphorus, Total as P	mg/L	<0.04	<0.04	0.06	0.04	<0.04	0.05	0.06	<0.04	0.06	0.06	0.04
Sodium, Dissolved	mg/L	24.56	ND	ND	26.53	ND	ND	ND	ND	ND	ND	0.15
<b>Physical Properties</b>												
Dissolved Oxygen, Field	mg/L	11.43	11.23	11.71	9.63	9.39	9.38	8.44	9.78	8.25	9.38	N/A
pH, Field	s.u.	8.58	8.46	8.42	7.88	8.15	8.26	8.12	8.07	8.13	8.38	N/A
Total Suspended Solids, TSS	mg/L	17	6	37.5	16	6.5	27.5	22	14	38	14.5	5
Specific Conductance	µmhos/cm @ 25°C	396	328	334	395	356	410	100	374	471	464	N/A
Temperature, Water (Field)	°C	1.52	1.64	2.32	5	10.5	11.97	15.14	10.3	14.8	14.47	N/A
Turbidity, Field	NTU	ND	ND	ND	ND	13.6	10.6	9.2	11.3	27.7	13.2	N/A
<b>Metals, Dissolved</b>												
Arsenic	µg/L	<10	ND	ND	<10	ND	ND	ND	ND	ND	ND	10
Cadmium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chromium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Copper	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Lead	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Mercury	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Nickel	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Selenium	µg/L	<5	ND	ND	<5	ND	ND	ND	ND	ND	ND	5
Zinc	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
<b>Stream Flow</b>												
Gage Height	inches	3.12	3.09	3.51	3.53	3.28	3.36	3.19	3.22	3.20	3.2	N/A
Stream Discharge	cfs	12.6	11.2	40.6	41.7	78.2	27.8	16.3	18.1	16.9	16.9	N/A

**Table 6.1-22 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir - 2008**

Parameter	Concentration	Jun 16	Jun 23	Jun 30	Jul 7	Jul 14	Jul 21	Jul 28	Aug 4	Aug 11	Aug 18	Reporting Limit
<b>Major Ions, Suspended</b>												
Calcium	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.15
Chloride, Total	mg/L	4.15	4.52	4.08	4.3	ND	ND	ND	ND	3.46	3.58	1
Magnesium, Dissolved as Mg	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	0.09	0.07	<0.05	<0.05	<0.05	ND	ND	ND	<0.05	0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	0.54	0.3	0.59	0.7	0.82	ND	ND	ND	ND	0.91	0.05
Nitrogen as N, Total Kjeldahl	mg/L	0.64	1.41	0.55	0.62	<0.5	ND	ND	ND	0.62	<0.5	0.5
Phosphorus, Total as P	mg/L	0.07	0.17	0.04	0.05	<0.04	ND	ND	ND	0.05	<0.04	0.04
Sodium, Dissolved	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.15
<b>Physical Properties</b>												
Dissolved Oxygen, Field	mg/L	8.91	8.53	8.45	8.10	8.23	7.71	7.69	7.84	8.14	8.50	N/A
pH, Field	s.u.	8.11	8.21	8.36	8.07	8.14	8.19	7.99	8.19	7.92	8.07	N/A
Total Suspended Solids, TSS	mg/L	30.5	177	38	45	26	ND	ND	ND	ND	41.5	5
Specific Conductance	µmhos/cm @ 25°C	539	503	489	393	391	378	458	456	490	502	N/A
Temperature, Water (Field)	°C	14.47	19.0	16.82	18.21	16.68	18.56	18.6	18.2	18.1	15.5	N/A
Turbidity, Lab, Field	NTU	13.3	117	83.8	39.6	48.2	34	34.5	39.7	32.7	28.7	N/A
<b>Metals, Dissolved</b>												
Arsenic	µg/L	ND	ND	<10	ND	ND	ND	ND	ND	ND	ND	10
Cadmium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chromium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Copper	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Lead	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Mercury	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Nickel	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Selenium	µg/L	ND	ND	<5	ND	ND	<5	ND	ND	ND	ND	5
Zinc	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
<b>Stream Flow</b>												
Gage Height	inches	3.11	3.14	3.11	3.11	2.99	3.1	3.05	2.87	2.77	2.81	N/A
Stream Discharge	cfs	12.1	13.6	12.1	12.1	7.24	11.6	9.44	4.42	2.54	3.24	N/A

**Table 6.1-22 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir - 2008**

Parameter	Concentration	Aug 25	Sept 1	Sept 8	Sept 15	Sept 22	Sept 29	Oct 6	Nov 3	Dec 01	Reporting Limit
<b>Major Ions, Suspended</b>											
Calcium	mg/L	ND	ND	ND	ND	ND	ND	44.43	ND	ND	0.15
Chloride	mg/L	4.31	4.32	5.19	4.75	ND	4.96	4.64	4.67	5.32	1
Magnesium, Dissolved as Mg	mg/L	ND	ND	ND	ND	ND	ND	7.91	ND	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	<0.05	0.08	<0.05	<0.05	ND	0.05	0.07	0.13	<0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	1.04	1.25	0.91	0.89	ND	0.98	1.01	1.06	1.01	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.5	<0.5	<0.5	<0.5	ND	<0.5	<0.5	<0.5	<0.5	0.5
Phosphorus, Total as P	mg/L	0.04	0.04	<0.04	0.04	ND	0.04	0.13	0.06	<0.04	0.04
Sodium, Dissolved	mg/L	ND	ND	ND	ND	ND	ND	23.87	ND	ND	0.15
<b>Physical Properties</b>											
Dissolved Oxygen, Field	mg/L	8.34	8.32	9.03	9.12	ND	9.17	8.92	6.29	ND	N/A
pH, Field	s.u.	7.79	8.14	8.17	8.37	ND	7.98	8.15	8.11	8.01	N/A
Total Suspended Solids, TSS	mg/L	35	14.5	23.5	15.5	ND	21.5	15.5	10	5.5	5
Specific Conductance	Umhos/cm @ 25°C	349	343	348	366	ND	363	352	359	374	N/A
Temperature, Water (Field)	°C	17.79	15.7	10.4	11	ND	10.5	12.2	8.7	1.48	N/A
Turbidity, Field	NTU	21.6	19	20.6	15.5	ND	35.4	122	9.5	5.3	N/A
<b>Metals, Dissolved</b>											
Arsenic	µg/L	ND	ND	ND	ND	ND	ND	5.41	ND	ND	10
Cadmium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chromium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Copper	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Lead	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Mercury	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Nickel	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Selenium	µg/L	ND	ND	ND	ND	ND	ND	<5	ND	ND	5
Zinc	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
<b>Stream Flow</b>											
Gage Height	inches	2.76	3.49	3.78	3.5	ND	3.58	3.08	3.12	3.19	N/A
Stream Discharge	cfs	2.38	39	56.2	40	ND	41.7	10.7	14.7	16.3	N/A

**Notes:**  
cfs = cubic feet per second  
µg/L = micrograms per liter  
mg/L = milligrams per liter  
NTU = Nephelometric Turbidity Units  
s.u. = standard unit  
umhos/cm = micromhos per centimeter  
< = less than  
ND = No data  
N/A = not applicable  
ND = not detected  
NDEQ = Nebraska Department of Environmental Quality  
Source: Ihrie 2013a

**Table 6.1-23 NDEQ Water Quality Data for the Niobrara River Above Box Butte Reservoir - 2009**

Parameter	Concentration	Jan 5	Feb 2	Mar 2	Apr 6	Apr 7	May 4	Jun 2	Reporting Limit
<b>Major Ions, Suspended</b>									
Calcium	mg/L	48.96	ND	ND	ND	46.68	ND	ND	0.15
Chloride, Total	mg/L	4.56	4.30	4.41	ND	6.34	5.96	4.21	1
Magnesium, Dissolved	mg/L	8.60	ND	ND	ND	11.54	ND	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	<0.05	0.08	<0.05	ND	<0.05	<0.05	<0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	1.50	1.05	0.44	ND	0.41	0.16	0.39	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.5	<0.5	<0.5	ND	0.83	0.63	<0.5	0.5
Phosphorus, Total as P	mg/L	<0.04	<0.04	0.04	ND	<0.04	0.05	0.26	0.04
Sodium, Dissolved	mg/L	25.71	ND	ND	ND	40.55	ND	ND	ND
<b>Physical Properties</b>									
Dissolved Oxygen, Field	mg/L	ND	ND	6.85	3.34	ND	5.40	ND	N/A
pH, Field	s.u.	7.81	8.02	8.01	8.09	ND	ND	8.87	N/A
Total Suspended Solids, TSS	mg/L	8.5	8	<5	ND	18.5	<5	14.5	5
Specific Conductance	µmhos/cm @ 25°C	395	371	378	428	ND	465	409	N/A
Temperature, Water (Field)	°C	-0.22	0.44	3.01	-0.24	ND	9.68	13.65	N/A
Turbidity, Field	NTU	4.2	36.8	6.1	60	ND	2.7	10.6	N/A
<b>Metals, Dissolved</b>									
Arsenic	µg/L	5.69	ND	ND	ND	<10	ND	ND	10
Cadmium	µg/L	ND	ND	ND	ND	ND	ND	ND	1
Chromium	µg/L	ND	ND	ND	ND	ND	ND	ND	10
Copper	µg/L	ND	ND	ND	ND	ND	ND	ND	10
Lead	µg/L	ND	ND	ND	ND	ND	ND	ND	5
Mercury	µg/L	ND	ND	ND	ND	ND	ND	ND	1
Nickel	µg/L	ND	ND	ND	ND	ND	ND	ND	10
Selenium	µg/L	<5	ND	ND	ND	ND	ND	ND	5
Zinc	µg/L	ND	ND	ND	ND	ND	ND	ND	10
<b>Stream Flow</b>									
Gage Height	inches	4.03	3.29	3.57	ND	ND	4.04	3.65	N/A
Stream Discharge	cfs	72.1	22.6	43.9	ND	ND	72.8	48.5	N/A

**Table 6.1-23 NDEQ Water Quality Data for the Niobrara River Above Box Butte Reservoir - 2009**

Parameter	Concentration	Jul 21	Aug 10	Sept 8	Oct 5	Nov 2	Nov 3	Dec 7	Reporting Limit
<b>Major Ions, Suspended</b>									
Calcium	mg/L	53.07	ND	ND	ND	ND	ND	ND	0.15
Chloride, Total	mg/L	3.99	4.13	4.92	6.10	ND	7.35	5.57	1
Magnesium, Dissolved	mg/L	11.27	ND	ND	ND	ND	ND	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	0.08	<0.05	<0.05	<0.05	ND	<0.05	<0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	0.60	0.58	0.84	0.78	ND	0.34	0.87	0.05
Nitrogen as N, Total Kjeldahl	mg/L	1.03	0.75	<0.5	<0.5	ND	<0.5	<0.5	0.5
Phosphorus, Total as P	mg/L	0.08	0.10	0.05	0.05	ND	<0.04	<0.04	0.04
Sodium, Dissolved	mg/L	29.44	ND	ND	ND	ND	ND	ND	ND
<b>Physical Properties</b>									
Dissolved Oxygen, Field	mg/L	8.12	8.33	8.83	9.81	11.10	ND	11.94	N/A
pH, Field	s.u.	8.24	8.18	8.18	8.86	8.42	ND	8.23	N/A
Total Suspended Solids, TSS	mg/L	52	51.5	28	28.5	ND	22	12	5
Specific Conductance	µmhos/cm @ 25°C	431	383	363	377	424	ND	433	N/A
Temperature, Water (Field)	°C	17.8	16.58	17.53	7.84	5.51	ND	-0.25	N/A
Turbidity, Field	NTU	21.8	24.9	24.1	16.6	14.3	ND	34	N/A
<b>Metals, Dissolved</b>									
Arsenic	µg/L	7.26	ND	ND	ND	ND	ND	ND	10
Cadmium	µg/L	ND	ND	ND	ND	ND	ND	ND	1
Chromium	µg/L	ND	ND	ND	ND	ND	ND	ND	10
Copper	µg/L	ND	ND	ND	ND	ND	ND	ND	10
Lead	µg/L	ND	ND	ND	ND	ND	ND	ND	5
Mercury	µg/L	ND	ND	ND	ND	ND	ND	ND	1
Nickel	µg/L	ND	ND	ND	ND	ND	ND	ND	10
Selenium	µg/L	<5	ND	ND	ND	ND	ND	ND	5
Zinc	µg/L	ND	ND	ND	ND	ND	ND	ND	10
<b>Stream Flow</b>									
Gage Height	inches	3.31	3.36	3.14	3.32	3.47	ND	4.12	N/A
Stream Discharge	cfs	24.0	27.8	13.6	24.8	37.2	ND	78.5	N/A

Source: Ihrle 2013a; Ihrle 2011. cfs = cubic feet per second µg/L = micrograms per liter mg/L = milligrams per Liter NTU = Nephelometric Turbidity Units s.u. = standard unit  
 umhos/cm = micromhos per centimeter < = less than NA = No data N/A = not applicable ND = not detected NDEQ = Nebraska Department of Environmental Quality

**Table 6.1-24 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) – 2010**

Constituent	Unit	Jan 4	Feb 1	Mar 1	Apr 5	May 3	Jun 7	Jul 19	Aug 3	Sept 7	Oct 11	Nov 1	Dec 6	RL
<b>Major Ions</b>														
Calcium, Dissolved	mg/L	53.75	ND	ND	52	ND	ND	48.1	ND	ND	43.2	ND	ND	0.15
Chloride, Total	mg/L	5.35	5.44	5.15	5.98	6.15	4.27	3.97	5.01	4.13	4.73	5.23	5.78	1.0
Magnesium, Dissolved	mg/L	10.12	ND	ND	<0.15	ND	ND	<0.15	ND	ND	8.0	ND		0.15
Nitrogen, Total Ammonia as N	mg/L	<0.05	<0.05	0.196	<0.05	<0.05	0.0879	<0.05	<0.05	0.068	<0.05	<0.05	<0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	1.392	1.323	0.725	0.205	0.226	0.329	1.09	1.2	1.07	1.09	0.961	1.4	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.50	<0.50	1.734	0.607	0.778	1.02	1.15	1.08	<0.50	<0.50	0.518	<0.50	0.5
Phosphorus, Total	mg/L	<0.04	<0.04	0.201	<0.04	<0.04	0.074	0.179	0.183	<0.04	0.065	0.077	<0.04	0.04
Sodium, Dissolved	mg/L	26.97	ND	ND	25.8	ND	ND	25.3	ND	ND	22.3	ND	ND	0.15
<b>Physical Properties</b>														
Specific Conductance	µmhos/cm @25°C	385	385	297	458	353	ND	414	408	337	379	395	410	N/A
Alkalinity	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Chemical Oxygen Demand (COD)	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12
Dissolved Oxygen, Field	mg/L	12.14	9.97	9.56	10.48	10.83	ND	7.11	7.8	ND	11.47	11.31	11.21	N/A
pH, Field	s.u.	8.45	8.43	8.57	8.25	8.26	ND	8.19	8.27	8.46	8.59	8.65	8.43	N/A
Suspended Solids, Total (TSS)	mg/L	21	18	32	10	15	41.5	129	114	30	23.5	55.5	38.5	5
Temperature, Water (Field)	°C	0.96	0.82	1.62	5.72	10.92	ND	18.63	20.16	11.66	10.76	7.77	1.39	N/A
Turbidity, Lab	NTU	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Turbidity, Field	NTU	233	19.9	26.2	9.5	40.3	ND	ND	ND	ND	24.2	44	24.9	N/A
<b>Metals, Dissolved</b>														
Arsenic, Dissolved	µg/L	<10	ND	ND	4.98	ND	ND	7.19	ND	ND	5.47	ND	ND	10
Cadmium, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chromium, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Copper, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Lead, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Mercury, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Nickel, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Selenium, Total	µg/L	<5	ND	ND	<5	ND	ND	<5	ND	ND	<5	ND	ND	5
Silver, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Zinc, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10

**Table 6.1-24 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) – 2010**

Constituent	Unit	Jan 4	Feb 1	Mar 1	Apr 5	May 3	Jun 7	Jul 19	Aug 3	Sept 7	Oct 11	Nov 1	Dec 6	RL
<b>Stream Flow</b>														
Gage Height	inches	3.42	3.46	3.95	4.05	2.29	3.71	3.25	3.11	3.11	3.17	3.38	3.41	N/A
Stream Discharge	cfs	32.7	36.2	66.8	73.5	24.2	52	20	12.1	12.1	15.2	29.4	31.9	N/A

cfs = cubic feet per second

µg/L = micrograms per liter

mg/L = milligrams per Liter

NTU = Nephelometric Turbidity Units

s.u. = standard unit

umhos/cm = micromhos per centimeter

< = less than

NA = No data

N/A = not applicable

ND = not detected

NDEQ = Nebraska Department of Environmental Quality

RL = reporting limit

Source: Ihrie 2013a

**Table 6.1-25 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) – 2011**

Constituent	Unit	Jan 3	Feb 14	Mar 6	Apr 11	May 3	Jun 6	Jul 18	Aug 1	Sept 6	Oct 3	Nov 7	Dec 5	RL
<b>Major Ions</b>														
Calcium, Dissolved	mg/L	49.2	ND	ND	49.6	ND	ND	45.6	ND	ND	46.5	ND	ND	0.15
Chloride, Total	mg/L	4.88	4.95	4.75	5.63	4.57	5.2	4.96	4.74	4.0	4.43	4.89	5.14	1.0
Magnesium, Dissolved	mg/L	9.2	ND	ND	9.67	ND	ND	8.26	ND	ND	8.0	ND	ND	0.15
Nitrogen, Total Ammonia as N	mg/L	0.070	0.066	0.094	<0.05	<0.05	<0.05	0.086	<0.05	<0.05	0.068	<0.05	<0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	1.5	1.34	0.276	0.43	0.351	0.27	1.16	1.07	1.16	1.18	1.09	1.34	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.50	0.732	0.89	<0.50	<0.50	0.884	2.17	0.571	<0.50	<0.50	<0.50	<0.50	0.5
Phosphorus, Total	mg/L	<0.04	0.099	0.081	0.041	<0.04	0.071	0.45	0.090	0.045	0.048	<0.04	0.163	0.04
Sodium, Dissolved	mg/L	24	ND	ND	21.4	ND	ND	23.1	ND	ND	24.4	ND	ND	0.15
<b>Physical Properties</b>														
Specific Conductance	µmhos/cm @25°C	388	405	347	441	437	501	401	396	388	358	435	528	N/A
Alkalinity	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Chemical Oxygen Demand (COD)	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12
Dissolved Oxygen, Field	mg/L	8.94	10.94	12.78	12.62	13.06	7.61	6.9	10.31	10.2	10.24	12.43	12.92	N/A
pH, Field	s.u.	8.32	8.53	8.18	8.0	8.48	8.31	8.3	8.23	8.32	8.23	9.04	8.54	N/A
Suspended Solids, Total (TSS)	mg/L	11.5	77	59	36.5	16.5	49.5	297	61	34	36.3	32.5	57.5	5
Temperature, Water (Field)	°C	0.06	3.1	1.66	8.25	10.79	20.37	24.79	20.71	15.89	14.02	3.36	-0.26	N/A
Turbidity, Lab	NTU	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A
Turbidity, Field	NTU	17.5	34.6	29.4	20.7	12.1	36.5	193	61.4	29.9	36.9	22.9	12.6	N/A
<b>Metals, Dissolved</b>														
Arsenic, Dissolved	µg/L	5.81	ND	ND	6.46	ND	ND	7.33	ND	ND	5.57	ND	ND	10
Cadmium, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chromium, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Copper, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Lead, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Mercury, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Nickel, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Selenium, Total	µg/L	<5	ND	ND	<5	ND	ND	<5	ND	ND	<5	ND	ND	5
Silver, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Zinc, Dissolved	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10



**Table 6.1-25 NDEQ Water Quality Data for Niobrara River Above Box Butte Reservoir (SNI4NIOBR402) – 2011**

Constituent	Unit	Jan 3	Feb 14	Mar 6	Apr 11	May 3	Jun 6	Jul 18	Aug 1	Sept 6	Oct 3	Nov 7	Dec 5	RL
<b>Stream Flow</b>														
Gage Height	inches	4.42	3.49	4.17	3.8	3.8	3.93	3.3	3.1	3.14	3.14	3.3	3.72	N/A
Stream Discharge	cfs	101	39	82.1	57.5	57.5	65.5	23.3	11.7	13.6	13.6	23.3	52.6	N/A

cfs = cubic feet per second

µg/L = micrograms per liter

mg/L = milligrams per Liter

NTU = Nephelometric Turbidity Units

s.u. = standard unit

µmhos/cm = micromhos per centimeter

< = less than

NA = No data

N/A = not applicable

ND = not detected

NDEQ = Nebraska Department of Environmental Quality

RL = reporting limit

Source: Ihrie 2013a

**Table 6.1-26 Summary of NDEQ Non-Radiological Water Quality Data for Niobrara River Above Box Butte Reservoir 2003 - 2011**

Constituent	Unit	Average Value	Minimum Value	Maximum Value	Total Observations	Number of Values Less Than RL	RL
<b>Major Ions</b>							
Calcium, Dissolved	mg/L	49.95	42.82	58.2	36	0	0.15
Chloride	mg/L	4.83	3.46	7.35	131	0	1.0
Magnesium, Dissolved	mg/L	8.92	<0.15	11.54	35	1	0.15
Nitrogen, Total Ammonia as N	mg/L	0.06	<0.05 <sup>a</sup>	1.05	150	90	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	0.85	0.16	1.58	146	0	0.05
Nitrogen as N, Total Kjeldahl	mg/L	0.44	0.5 <sup>a</sup>	2.17	151	100	0.5
Phosphorus, Total	mg/L	0.05	<0.04 <sup>a</sup>	0.71	152	78	0.04
Sodium, Dissolved	mg/L	25.5	21.4	40.6	35	0	0.15
<b>Physical Properties</b>							
Alkalinity	mg/L	184	162	212	13	--	--
Dissolved Oxygen	mg/L	8.85	3.34	12.9	139	--	--
Chemical Oxygen Demand (COD)	mg/L	7.9	<12 <sup>a</sup>	20.3	12	9	12
pH	s.u.	8.09	7.1	9.92	211	--	--
Specific Conductance	µmhos/cm @25°C	386	100	539	151	--	--
Suspended Solids, Total (TSS)	mg/L	24.7	<5 <sup>a</sup>	297	150	14	5.0
Temperature	°C	11.13	-0.26	29.0	142	--	--
Turbidity, Field	NTU	27.7	0.2	233	139	--	--
<b>Metals, Dissolved</b>							
Arsenic, Dissolved <sup>b</sup>	µg/L	5.93	<10 <sup>a</sup>	7.33	39	29	10
Cadmium, Dissolved	µg/L	<1	<1	<1	16	16	1
Chromium, Dissolved	µg/L	<10	<10	<10	16	16	10
Copper, Dissolved	µg/L	<10	<10	<10	16	16	10
Lead, Dissolved	µg/L	<5	<5	<5	16	16	5
Mercury, Dissolved as Hg	µg/L	<1	<1	<1	16	16	1
Nickel, Dissolved	µg/L	<10	<10	<10	16	16	10
Selenium, Total	µg/L	<5	<5	<5	39	39	5
Silver, Dissolved	µg/L	<1	<1	<1	16	16	1
Zinc, Dissolved	µg/L	<10	<10	<10	16	16	10
<b>Stream Flow</b>							
Gage Height	inches	3.5	2.3	10.7	144	--	--
Stream Discharge	cfs	36.3	0.35	201.6	142	--	--

Source: Ihrle 2013a      RL = Reporting Limit      cfs = cubic feet per second      µg/L = micrograms per Liter      mg/L = milligrams per Liter      NTU = Nephelometric Turbidity Units  
s.u. = standard unit      µmhos/cm = micromhos per centimeter      < = less than      NDEQ = Nebraska Department of Environmental Quality

<sup>a</sup> Value of one-half of Less Than Reporting Limit used for calculating average values.

<sup>b</sup> Arsenic values were below the RL of 10 µg/L for 2002 – 2007, with detected values for years 2008 through 2011.

**Table 6.1-27 NDEQ Water Quality Data for Niobrara River Below Box Butte Reservoir - 2008**

Parameter	Concentration	May 12	May 19	May 27	Jun 2	Jun 9	Jun16	Jun 23	Jun 30	Jul 7	Jul 14	Aug 11	Aug 18	Aug 25	Sept 1	Sept 8	Sept 15	Sept 29	Reporting Limit
<b>Major Ions, Suspended</b>																			
Calcium	mg/L																		0.15
Chloride	mg/L	5.66	--	3.53	3.63	4.11	3.61	3.63	3.8	3.97	--	4.09	3.28	4.31	4.56	4.06	4.16	4.47	1
Magnesium, Dissolved	mg/L	ND	ND	ND	ND	ND	ND	ND	ND		--								1
Nitrogen, Total Ammonia as N	mg/L	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	0.16	<0.05	<0.05	<0.05	0.05
Nitrogen, Total (Nitrate + Nitrite as N)	mg/L	<0.05	0.57	0.51	0.4	0.42	0.37	0.3	0.39	0.36	<0.05	--	0.9	0.93	0.91	0.7	0.85	0.82	0.05
Nitrogen as N, Total Kjeldahl	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.51	<0.5	0.7	<0.5	0.73	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
Phosphorus, Total as P	mg/L	<0.04	0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.05	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.04
Sodium, Dissolved	mg/L	ND	ND	ND	ND	ND	ND	ND	ND										
<b>Physical Properties</b>																			
Dissolved Oxygen, Field	mg/L	9.04	7.21	10.57	8.71	10.07	8.69	8.77	9.22	7.75	7.13	--	--	--	--	--	--	--	N/A
pH, Field	s.u.	8.04	8.05	8.15	8.17	8.33	-8.13	8.19	8.3	8.03	8.31	--	--	--	--	--	--	--	N/A
Total Suspended Solids, TSS	mg/L	5	<5	<5	8	<5	<5	6.5	<5	5.5	27.5	--	6.0	5.0	5.0	<5	<5	<5	5
Specific Conductance	µmhos/cm @ 25°C	408	312	325	357	380	440	431	434	360	348	--	--	--	--	--	--	--	N/A
Temperature, Water (Field)	°C	9.82	13.97	9.09	14.99	13.45	14.89	18.88	16.23	18.48	20.2	--	--	--	--	--	--	--	N/A
Turbidity, Field	NTU	1.0	4.5	4.5	9.8	2.6	39.1	17.1	5.9	55.9	20.4	--	--	--	--	--	--	--	N/A
<b>Metals, Dissolved</b>																			
Arsenic	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	10
Cadmium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	1
Chromium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	10
Copper	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	10
Lead	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	5
Mercury	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	1
Nickel	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	10
Selenium	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	5
Zinc	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	10
<b>Stream Flow</b>																			
Gage Height	inches	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND								
Stream Discharge	cfs	0.9	0.9	1	1	1	0.9	0.9	0.9	0.9	127								

Notes:  
cfs = cubic feet per second  
µg/L = micrograms per liter  
mg/L = milligrams per Liter  
NTU = Nephelometric Turbidity Units  
s.u. = standard unit  
µmhos/cm = micromhos per centimeter  
< = less than  
NA = No data  
N/A = not applicable  
ND = not detected  
NDEQ = Nebraska Department of Environmental Quality  
Source: Ihrie 2013a

**Table 6.1-28 Summary of NDEQ Water Quality for Niobrara River Below Box Butte Reservoir 2008**

Parameter	Minimum	Maximum
	mg/L	
Chloride	3.28	5.66
Nitrogen, Total Ammonia as N <sup>a</sup>	<0.05	0.16
Nitrogen, Total (Nitrate + Nitrite as N) <sup>b</sup>	<0.05	0.93
Nitrogen as N, Total Kjeldahl	<0.05	0.73
Phosphorus, Total <sup>c</sup>	<0.04	0.05
Suspended Solids, Total (TSS) <sup>d</sup>	<5.0	27.5

<sup>a</sup> 15 of 17 measurements <0.05 mg/L

<sup>b</sup> 14 of 17 measurements <0.05 mg/L

<sup>c</sup> 15 of 17 measurements below <0.04 mg/L

<sup>d</sup> 15 of 16 measurements below 8.0 mg/L

mg/L = milligrams per liter

NDEQ = Nebraska Department of Environmental Quality

**Table 6.1-29 Niobrara River Dissolved Radiological Water Quality Baseline Data  
Collected by Crow Butte**

Radionuclide	Sampling Locations			
	N1 (Niobrara River West Side)		N2 (Niobrara River East Side)	
	RESULTS	RL	RESULTS	RL
	pCi/l			
<b>January 2011</b>				
Lead 210	<0.8 U	0.8	<0.8 U	0.8
Lead 210 MDC	0.8	--	0.8	--
Lead 210 precision (±)	0.5	--	0.5	--
Polonium 210	<0.7 U	0.7	<0.7 U	0.7
Polonium 210 MDC	0.7	--	0.7	--
Polonium 210 precision (±)	0.5	--	0.4	--
Radium 226	1.3	0.16	1.3	0.14
Radium 226 MDC	0.16	--	0.14	--
Radium 226 precision (±)	0.25	--	0.24	--
Thorium 230	<0.2 U	0.2	<0.1 U	0.1
Thorium 230 MDC	0.2	--	0.1	--
Thorium 230 precision (±)	0.1	--	0.05	--
Uranium Activity (uCi/ml)	5.9E-09	2.0E-10	5.1E-09	2.0E-10
Uranium (metal) (mg/l)	8.7E-03	3.0E-04	7.6E-03	3.0E-04
<b>February 2011</b>				
Lead 210	<1 U	1.2	<1 U	1.2
Lead 210 MDC	1.2	--	1.2	--
Lead 210 precision (±)	0.7	--	0.7	--
Polonium 210	0.8	0.5	<1 U	0.9
Polonium 210 MDC	0.5	--	0.9	--
Polonium 210 precision (±)	0.6	--	0.3	--
Radium 226	1.3	0.09	0.46	0.11
Radium 226 MDC	0.09	--	0.11	--
Radium 226 precision (±)	0.2	--	0.14	--
Thorium 230	<0.2 U	0.2	<0.2 U	0.2
Thorium 230 MDC	0.2	--	0.2	--
Thorium 230 precision (±)	0.08	--	0.07	--
Uranium Activity (uCi/ml)	5.4E-09	2.0E-10	4.9E-09	2.0E-10
Uranium (metal) (mg/l)	7.9E-03	3.0E-04	7.3E-03	3.0E-04
<b>March 2011</b>				
Lead 210	<0.9 U	0.9	<0.9 U	0.9
Lead 210 MDC	0.9	--	0.9	--
Lead 210 precision (±)	0.5	--	0.5	--
Polonium 210	<0.6 U	0.6	<0.6 U	0.6
Polonium 210 MDC	0.6	--	0.6	--
Polonium 210 precision (±)	0.3	--	0.4	--
Radium 226	0.56	0.12	1	0.12

**Table 6.1-29 Niobrara River Dissolved Radiological Water Quality Baseline Data  
Collected by Crow Butte**

Radionuclide	Sampling Locations			
	N1 (Niobrara River West Side)		N2 (Niobrara River East Side)	
	RESULTS	RL	RESULTS	RL
	pCi/l			
Radium 226 MDC	0.12	--	0.12	--
Radium 226 precision (±)	0.15	--	0.19	--
Thorium 230	<0.3 U	0.3	<0.1 U	0.1
Thorium 230 MDC	0.3	--	0.1	--
Thorium 230 precision (±)	0.1	--	0.07	--
Uranium Activity (uCi/ml)	5.0E-09	2.0E-10	5.4E-09	2.0E-10
Uranium (metal) (mg/l)	7.4E-03	3.0E-04	8.0E-03	3.0E-04
<b>April 2011</b>				
Lead 210	<1.6	1.6	<0.8	0.8
Lead 210 MDC	1.6	--	0.8	--
Lead 210 precision (±)	1	--	0.5	--
Polonium 210	<0.6 U	0.6	<0.6 U	0.6
Polonium 210 MDC	0.5	--	0.6	--
Polonium 210 precision (±)	0.4	--	0.3	--
Radium 226	0.2	0.1	<0.1	0.1
Radium 226 MDC	0.1	--	0.1	--
Radium 226 precision (±)	0.09	--	0.04	--
Thorium 230	<0.2	0.2	<0.8	0.8
Thorium 230 MDC	0.2	--	0.8	--
Thorium 230 precision (±)	0.1	--	0.4	--
Uranium Activity (uCi/ml)	7.0E-09	2.0E-10	5.9E-09	2.0E-10
Uranium (metal) (mg/l)	1.04E-02	3.0E-04	8.8E-03	3.0E-04
<b>May 2011</b>				
Lead 210	<1.2 U	1.2	<1.2 U	1.2
Lead 210 MDC	1.2	--	1.2	--
Lead 210 precision (±)	0.7	--	0.7	--
Polonium 210	<0.6 U	0.6	<0.6 U	0.6
Polonium 210 MDC	0.6	--	0.6	--
Polonium 210 precision (±)	0.4	--	0.3	--
Radium 226	0.3	0.1	<0.2 U	0.2
Radium 226 MDC	0.1	--	0.2	--
Radium 226 precision (±)	0.1	--	0.08	--
Thorium 230	<0.2 U	0.2	<0.2 U	0.2
Thorium 230 MDC	0.2	--	0.2	--
Thorium 230 precision (±)	0.1	--	0.1	--
Uranium Activity (uCi/ml)	5.8E-09	2.0E-10	5.0E-09	2.0E-10
Uranium (metal) (mg/l)	8.5E-03	3.0E-04	7.3E-03	3.0E-04

**Table 6.1-29 Niobrara River Dissolved Radiological Water Quality Baseline Data  
Collected by Crow Butte**

Radionuclide	Sampling Locations			
	N1 (Niobrara River West Side)		N2 (Niobrara River East Side)	
	RESULTS	RL	RESULTS	RL
	pCi/l			
<b>June 2011</b>				
Lead 210	<1.1 U	1.1	<1.1 U	1.1
Lead 210 MDC	1.1	--	1.1	--
Lead 210 precision (±)	0.6	--	0.7	--
Polonium 210	<0.4 U	0.4	<0.4 U	0.4
Polonium 210 MDC	0.4	--	0.4	--
Polonium 210 precision (±)	0.2	--	0.2	--
Radium 226	0.27	0.15	0.17	0.16
Radium 226 MDC	0.15	--	0.16	--
Radium 226 precision (±)	0.13	--	0.12	--
Thorium 230	<0.1 U	0.1	<0.3 U	0.3
Thorium 230 MDC	0.1	--	0.3	--
Thorium 230 precision (±)	0.04	--	0.2	--
Uranium Activity (uCi/ml)	1.2E-09	2.0E-10	3.3E-09	2.0E-10
Uranium (metal) (mg/l)	6.3E-03	3.0E-04	4.8E-03	3.0E-04
<b>July 2011</b>				
Lead 210	<0.8 U	0.8	<0.8 U	0.8
Lead 210 MDC	0.8		0.8	
Lead 210 precision (±)	0.5		0.5	
Polonium 210	<0.7U	0.7	<0.8 U	0.8
Polonium 210 MDC	0.7		0.8	
Polonium 210 precision (±)	0.4		0.6	
Radium 226	<0.1 U	0.1	<0.1 U	0.1
Radium 226 MDC	0.1		0.1	
Radium 226 precision (±)	0.05		0.07	
Thorium 230	<0.1 U	0.1	<0.4 U	0.4
Thorium 230 MDC	0.1		0.4	
Thorium 230 precision (±)	0.08		0.2	
Uranium Activity (uCi/ml)	4.8E-09	2.0E-10	3.6E-09	2.0E-10
Uranium (metal) (mg/l)	7.1E-03	3.0E-04	5.3E-03	3.0E-04
<b>August 2011</b>				
Lead 210	<0.6 U	0.6	<0.6 U	0.6
Lead 210 MDC	0.6		0.6	
Lead 210 precision (±)	0.4		0.4	
Polonium 210	<0.4 U	0.4	<0.6 U	0.6
Polonium 210 MDC	0.4		0.6	
Polonium 210 precision (±)	0.2		0.2	
Radium 226	0.52	0.15	<0.14 U	0.14

**Table 6.1-29 Niobrara River Dissolved Radiological Water Quality Baseline Data  
Collected by Crow Butte**

Radionuclide	Sampling Locations			
	N1 (Niobrara River West Side)		N2 (Niobrara River East Side)	
	RESULTS	RL	RESULTS	RL
	pCi/l			
Radium 226 MDC	0.15		0.14	
Radium 226 precision (±)	0.15		0.1	
Thorium 230	<0.2 U	0.2	<0.2 U	0.2
Thorium 230 MDC	0.2		0.2	
Thorium 230 precision (±)	0.07		0.08	
Uranium Activity (uCi/ml)	2.4E-10	2.0E-10	5.2E-09	2.0E-10
Uranium (metal) (mg/l)	4.0E-04	3.0E-04	7.7E-03	3.0E-04
<b>September 2011</b>				
Lead 210	<0.7 U	0.7	<0.7 U	0.7
Lead 210 MDC	0.7		0.7	
Lead 210 precision (±)	0.4		0.4	
Polonium 210	<0.4 U	0.4	<0.6 U	0.6
Polonium 210 MDC	0.4		0.6	
Polonium 210 precision (±)	0.2		0.5	
Radium 226	0.52	0.15	<0.14 U	0.14
Radium 226 MDC	0.2		0.2	
Radium 226 precision (±)	0.2		0.1	
Thorium 230	<0.2 U	0.2	<0.2 U	0.2
Thorium 230 MDC	0.2		0.2	
Thorium 230 precision (±)	0.07		0.06	
Uranium Activity (uCi/ml)	5.0E-09	2.0E-10	4.5E-09	2.0E-10
Uranium (metal) (mg/l)	7.3E-03	3.0E-04	6.6E-03	3.0E-04
<b>October 2011</b>				
Lead 210	<0.8 U	0.8	<0.8 U	0.8
Lead 210 MDC	0.8		0.8	
Lead 210 precision (±)	0.5		0.5	
Polonium 210	<0.9 U	0.9	3.2	0.6
Polonium 210 MDC	0.9		0.6	
Polonium 210 precision (±)	0.5		1.3	
Radium 226	1	0.1	0.1	0.09
Radium 226 MDC	0.1		0.09	
Radium 226 precision (±)	0.2		0.07	
Thorium 230	<0.3 U	0.3	<0.1 U	0.1
Thorium 230 MDC	0.3		0.1	
Thorium 230 precision (±)	0.1		0.07	
Uranium Activity (uCi/ml)	6.8E-09	2.0E-10	6.1E-09	2.0E-10
Uranium (metal) (mg/l)	1.0E-02	3.0E-04	9.0E-03	3.0E-04



**Table 6.1-29 Niobrara River Dissolved Radiological Water Quality Baseline Data  
Collected by Crow Butte**

Radionuclide	Sampling Locations			
	N1 (Niobrara River West Side)		N2 (Niobrara River East Side)	
	RESULTS	RL	RESULTS	RL
	pCi/l			
<b>November 2011</b>				
Lead 210	<1.0 U	1	<1.0 U	1
Lead 210 MDC	1		1	
Lead 210 precision (±)	0.7		0.7	
Polonium 210	<0.5 U	0.5	4.6	0.5
Polonium 210 MDC	0.5		0.5	
Polonium 210 precision (±)	0.3		1.6	
Radium 226	1.2	0.1	0.2	0.1
Radium 226 MDC	0.1		0.1	
Radium 226 precision (±)	0.2		0.1	
Thorium 230	<0.2 U	0.2	<0.2 U	0.2
Thorium 230 MDC	0.2		0.2	
Thorium 230 precision (±)	0.08		0.09	
Uranium Activity (uCi/ml)	6.1E-09	2.0E-10	5.0E-09	2.0E-10
Uranium (metal) (mg/l)	9.0E-03	3.0E-04	7.5E-03	3.0E-04
<b>January 2012</b>				
Lead 210	<0.9 U	0.9	<0.9 U	0.9
Lead 210 MDC	0.9		0.9	
Lead 210 precision (±)	0.5		0.5	
Polonium 210	0.8	0.6	<0.6 U	0.6
Polonium 210 MDC	0.6		0.6	
Polonium 210 precision (±)	0.7		0.4	
Radium 226	1.7	0.1	0.2	0.1
Radium 226 MDC	0.1		0.1	
Radium 226 precision (±)	0.3		0.1	
Thorium 230	<0.1 U	0.1	<0.2 U	0.2
Thorium 230 MDC	0.1		0.2	
Thorium 230 precision (±)	0.06		0.06	
Uranium Activity (uCi/ml)	1.2E-09	2.0E-10	<2.0E-10	2.0E-10
Uranium (metal) (mg/l)	1.8E-03	3.0E-04	<3.0E-04	3.0E-04

**Table 6.1-29 Niobrara River Dissolved Radiological Water Quality Baseline Data  
Collected by Crow Butte**

Radionuclide	Sampling Locations			
	N1 (Niobrara River West Side)		N2 (Niobrara River East Side)	
	RESULTS	RL	RESULTS	RL
	pCi/l			
<b>February 2012</b>				
Lead 210	< 1.0 U	1	50	1
Lead 210 MDC	1		1	
Lead 210 precision (±)	NA		2.2	
Polonium 210	< 1.0 U	1	< 1.0 U	1
Polonium 210 MDC	1		1	
Polonium 210 precision (±)	NA		NA	
Radium 226	< 0.2 U	0.2	< 0.2 U	0.2
Radium 226 MDC	0.2		0.2	
Radium 226 precision (±)	NA		NA	
Thorium 230	< 0.2 U	0.2	< 0.2 U	0.2
Thorium 230 MDC	0.2		0.2	
Thorium 230 precision (±)	NA		NA	
Uranium Activity (uCi/ml)	4.3E+00	2.00E-01	4.6E+00	2.00E-01
Uranium (metal) (mg/l)	6.4E-03	3.0E-04	6.8E-03	3.0E-04
<b>March 2012</b>				
Lead 210	1.7	1	< 1.0 U	1
Lead 210 MDC	1		1	
Lead 210 precision (±)	0.6		NA	
Polonium 210	< 1.0 U	1	< 1.0 U	1
Polonium 210 MDC	1		1	
Polonium 210 precision (±)	NA		NA	
Radium 226	< 0.2 U	0.2	< 0.2 U	0.2
Radium 226 MDC	0.2		0.2	
Radium 226 precision (±)	NA		NA	
Thorium 230	< 0.2 U	0.2	< 0.2 U	0.2
Thorium 230 MDC	0.2		0.2	
Thorium 230 precision (±)	NA		NA	
Uranium Activity (uCi/ml)	4.4E+00	2.00E-01	4.9E+00	2.00E-01
Uranium (metal) (mg/l)	6.5E-03	3.0E-04	7.2E-03	3.0E-04

**Notes:**

MDC = minimum detectable concentration

mg/l = milligrams per liter

pCi/l = picoCuries per liter

RL = reporting limit

U = Not detected at minimum detectable concentration

uCi/l = microCuries per liter

NA = Not Applicable, not detected below the RL