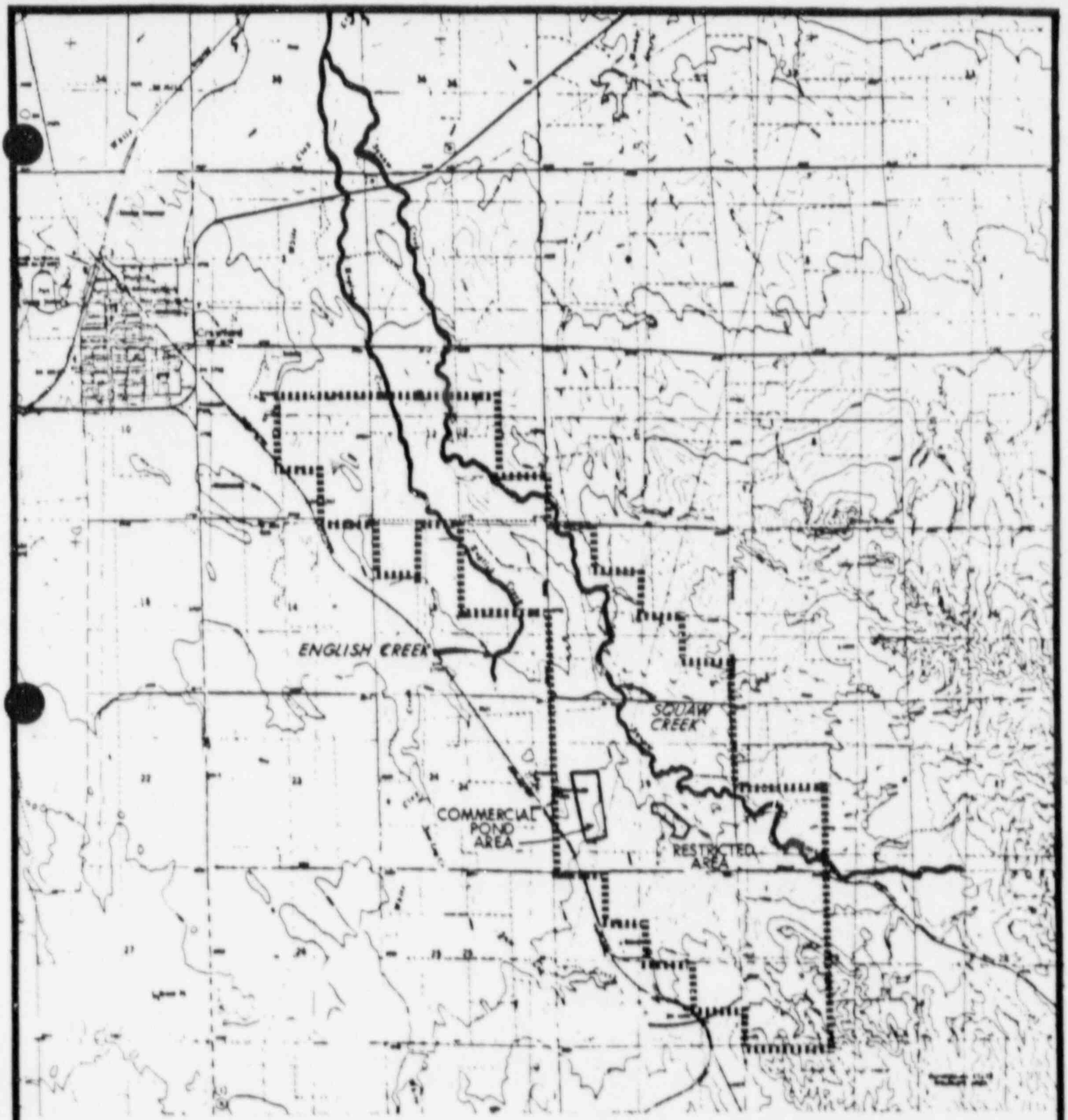
12/04/87

ERRATA PAGES

Attached please find corrected replacement pages for the Application and Supporting Environmental Report for USNRC Commercial Source Material License. Please replace the original pages with the corrected pages.

Page No.	Change
2.7(3)	Figure 2.7-1 was modified to correct the point at which English Creek originates.
2.7A(26)	Added the partial sentence "approximately 1.4% of the overall flow produced during the pumping". This partial sentence was inadvertently deleted. The defined units for Equation 6 were also corrected.
2.9(3)	Sample points on White Clay Creek and English Creek were added to Table 2.9-1. These sample points were inadvertently omitted from the original submittal.
2.9(12)	English Creek and White Clay Creek were added to the text and the sampling points identified. The regional samples from the White River were also identified in the Text.
Appendix 2.9(A) (Note: Appendix 2.9(A) is not paginated).	The data sheet describing the sampling per-periods and number of samples for the Surface Water Data Section was inadvertently omitted. The data sheet should be inserted in Appendix 2.9(A) immediately after the cover sheet entitled ***Surface Water Data***. Also in Appendix 2.9(A) in the Surface Water Data section, the data sheet for Sample Number W-2 does not have the statistical data included. The corrected page (Page 2 of 2) should replace the erroneous page (Page No. 1 of 2)
7.3(11) 7.3(12)	The dose received by the population within 80 km of the facility was changed from 1.82 person rem/year to 22.1 person rem/year. The MILDOS run inadvertently used an erroneous population and this change corrects the dose for the correct population.

Page No.	Change
	This correction also changes the continental dose from 203.4 person rem/year to 223.7 person rem/year and the percentage increase in the continental dose from 0.00012% to 0.00013% (This change is on page 7.3(12)



REV. DATE	FERRET OF NEBRASKA, INC.	
	CROW BUTTE PROJECT Dawes County, Nebraska	
	ENGLISH CREEK AND SQUAW CREEK WATERCOURSES	
	PREPARED BY: F.E.N.	
	DWN BY: JC	DATE: 8/87 FIGURE 2.7-1

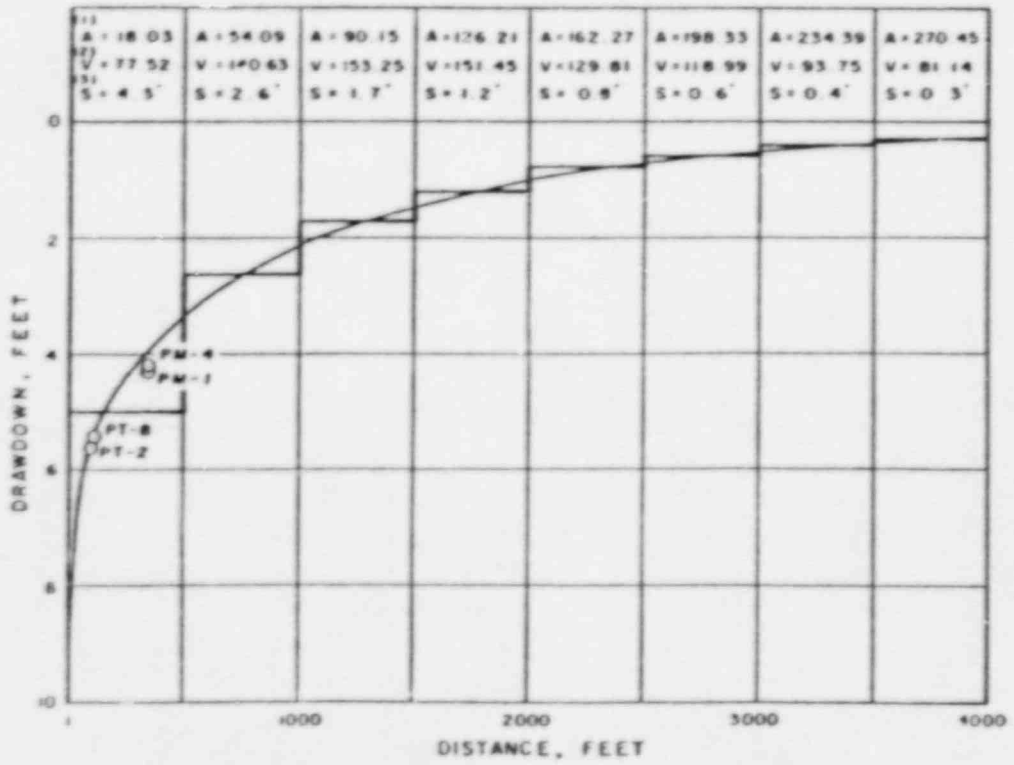
TABLE 2.7-1

COMPARISON OF MEAN MONTHLY PRECIPITATION WITH NORMAL MEAN MONTHLY DISCHARGE OF THE WHITE RIVER AT CRAWFORD, NEBRASKA

	Mean[1] Precipitation		Mean[2] Discharge	
	Inches	(cm)	cfs	(cms)
January	0.41	1.04	21.0	0.59
February	0.37	0.94	23.4	0.66
March	0.70	1.78	27.2	0.77
April	1.67	4.24	25.3	0.72
May	2.98	7.57	25.3	0.72
June	3.32	8.43	22.2	0.63
July	2.16	5.49	15.4	0.44
August	0.97	2.46	12.6	0.36
September	1.33	3.38	13.3	0.38
October	0.83	2.11	16.6	0.47
November	0.43	1.09	19.4	0.55
December	0.39	0.99	20.2	0.57

(1) U.S. Department of Commerce, 1982, Period of Record 1941-1970.

(2) U.S. Department of the Interior, 1981, Period of Record 1931-1980.



AREA AFFECTED BY PUMPING

A_s = 1154 ACRES

TOTAL LEAKAGE FROM UPPER CONFINEMENT

V_t = 947 GALLONS

(1) ACRES

(2) GALLONS

(3) FEET

SIMULATED DISTANCE DRAWDOWN CURVE AND INFLOWS FROM UPPER AQUITARD

PREPARED FOR

WYOMING FUEL COMPANY
LAKEWOOD, COLORADO

FIGURE 2.7A-8

2.7A(25) 07/29/87

The average hydraulic conductivity of the entire system was found to be almost the same as the hydraulic conductivity of the Red Clay. Furthermore, from the analysis of the aquifer/aquitard interaction from the formation consolidation standpoint, it is apparent that during the period of the pumping test, the water released from the upper aquitard is entirely from the Red Clay. Pore pressure changes at the bottom of the Red Clay did not propagate through the clay into the overlying sandy claystone over the pumping test period. Applying the theory of consolidation (Scott, 1963), the volume of water which could be liberated from the Red Clay under induced drawdown was calculated from the relationship:

(Eq. 6)

$$Q_T = \frac{2 K_v U_i}{\gamma_w \sqrt{\pi C_v}} \sqrt{t}$$

Where:

Q_T = volume of water released from the confining bed during the time t
K_v = vertical hydraulic conductivity of the confining bed
γ_w = unit weight of water
U_i = induced change in effective overburden pressure, proportional to drawdown ($s = U/\gamma_w$)
C_v = coefficient of consolidation
t = time since drawdown occurred
s = drawdown

The analysis showed that Red Clay could release one gallon of water per one foot of drawdown per acre during the 2.09 days (i.e., during the entire pumping test). Using the values of drawdown for a given distance from the pumping well presented in Figure 2.7A-8 and the volumes of water which could be released from confinement, the overall contribution from aquifer upper confinement to the flow produced during the pumping test was calculated. The results of calculations are also illustrated in Figure 2.7A-9. The volume of water released from the Red Clay during the pumping test was thus computed to be about 1,000 gallons. This constitutes approximately 1.4% of the overall flow produced during the pumping test.

The contribution from the Pierre Shale owing to its lower hydraulic conductivity (approximately one order of magnitude less than the upper confinement)(Table 2.7A-6) would be significantly smaller - about 0.06 gallon of water per foot of drawdown per acre - during the entire pumping test. Figure 2.7A-9 illustrates the relationship between volume of inflow

Background Nonradiological Characteristics (Cont'd)

	Sample Collection				Sample Analysis	
Type of Sample	Number	Location	Method	Frequency	Frequency	Type of Analysis
	Two from White Clay Creek	Upstream and downstream of Commercial Permit Area	Grab	Four times	Quarterly	Complete Table 5.7-6 list once; common ions-only other quarters
	Two from English Creek	Upstream and downstream of Commercial Permit Area	Grab	Four times	Quarterly	Complete Table 5.7-6 list once; common ions-only other quarters
	Two from Squaw Creek	One upstream one downstream of restricted area	Grab	Quarterly	Quarterly	Suspended sediment
Water Levels						
	One from each monitor well, baseline well, and selected private wells	Surrounding and within wellfield	Electric line	Monthly	Monthly	Map
Flow						
	Two from Squaw Creek	One up-stream one down-stream of restricted area	Flow Meter	Monthly through 1982; then quarterly	Monthly through 1982; then quarterly	Tabular

Background Nonradiological Characteristics (Cont'd)

	Sample Collection				Sample Analysis	
Type of Sample	Number	Location	Method	Frequency	Frequency	Type of Analysis
SOILS						
Surface						
	One each	Six locations in Section 19	Grab	Once	Once	Arsenic, Selenium
	One each	Nine locations in Commercial Permit Area	Grab	Once	Once	Arsenic, Selenium
	One each	Seven locations in Proposed Restricted Area	Grab	Once	Once	Vanadium

TABLE 2.9-5

WATER QUALITY WELLS USED FOR
PREOPERATIONAL AND OPERATIONAL DATA

Well No.	Formation	Screen Interval (ft)	Depth to Bottom of Screen Assembly(ft)
OB-1 (PT-4)	Chadron	637.1-647.1, 652.1-657.1	662.1
OB-2 (PT-6)	Chadron	652 - 667	667
Wellfield Domestic	Brule	20 - 60	60
PT-2	Chadron	641 - 656	661
PT-3	Chadron	638 - 648	653
PT-5	Chadron	638 - 653	670
PT-7	Chadron	649 - 664	669
PT-8	Chadron	653 - 668	673
PT-9	Chadron	659 - 674	680.2
PT-21	Chadron	652 - 657	660
PT-22	Chadron	652.5-657.5	662.5
PT-23	Chadron	655.5-660.5	665.5
PT-24	Chadron	647.1-652.1	654.1
PT-25	Chadron	650 - 655	659
PM-1	Chadron	649.5-669.5	674.5
PM-2	Chadron	641 - 651;661 - 671	676
PM-3	Chadron	616-626;631-641;464-656	661
PM-4	Chadron	641.5-646.5;654.5-669.5	674.5
PM-5	Chadron	648-658;668-678;683-688	693
PM-6	Brule	196 - 211	216
PM-7	Brule	89.5-94.5;99.5-104.5; 109-114;119.5-124.5	129.5
PM-8	Chadron	631-641;651-661	666
PM-9	Chadron	633-643;698-658	663
PM-10	Chadron	619-629;635-645;651-661	666
PM-11	Brule	252-267	272

Water levels were determined using battery operated instruments. Measurements were recorded together with the date and name of individual taking the readings. Values were then corrected to mean sea level (msl). Selected results are presented in Figure 2.9-3 and 2.9-4 and all results listed in Tables 2.9-6 and 2.9-7.

2.9.4 Surface Water Quality

Samples were collected from Squaw Creek, English Creek, White Clay Creek, the White River and all surface bodies of water within the commercial permit area. Table 2.9-1 outlines the sampling schedule and the parameters for analysis. This schedule was begun in 1982 and has continued into 1987. All data are presented here in Appendix 2.9(A).

Squaw Creek passes through the Crow Butte commercial permit area as it flows towards the White River. Four sampling points located on Squaw Creek are shown in Figure 2.9-1. Locations W-1, W-2 and W-3 (Not shown on Figure 2.9-1 because of the large distances involved) on the White River are also part of the commercial preoperational monitoring program. The English Creek sample points (E-1/E-2, E-3), and the White Clay Creek sample points (WC-1 and WC-2) are shown in Figure 2.9-1.

Water quality results of the sampling are included in Appendix 2.9(A). As can be seen, none of the EPA drinking water standards are exceeded in any surface water sample. Total dissolved solids are generally in the 200 to 300 mg/l range with calcium and bicarbonate being the predominant ions.

The stream and river samples were also analyzed for suspended sediment content. Sampling was initiated in 1982 and samples were taken from sites S-1, S-2, S-3 and W-2 (White River) for four quarters in 1982. Sampling continued at sites S-2 and S-3 from 1982 through 1987. Results of the suspended sediment sampling are found in Table 2.9-8. Average Squaw Creek suspended sediment ranges from 5.6 to 29.1 mg/l with site S-3 consistently higher in suspended sediments than sites S-1 and S-2.

The White River suspended sediment was an average of 74 mg/l for the year period.

Sampling Periods and Number of Samples used in the Statistical Evaluation of Water Quality Data from Streams and Impoundments in the Crow Butte Commercial Study Area

Well ID#	Description	Sampling Period	No. of Samples
I-1	Impoundment	06/82	1
I-2	Impoundment	06/82	1
I-3	Impoundment	06/82	1
I-4	Impoundment	06/82	1
I-5	Impoundment	06/82	1
I-6	Impoundment	06/82 - 05/83	2
I-7	Impoundment	06/82	1
I-8	Impoundment	06/82	1
E-1/E-2	English Creek	04/82 - 10/85	7
E-3	English Creek	04/82 - 07/84	6
WC-1	White Clay Creek	04/82 - 10/85	7
WC-2	White Clay Creek	04/82 - 10/85	8
S-1	Squaw Creek	02/82 - 10/85	11
S-2	Squaw Creek	02/82 - 04/87	19
S-3	Squaw Creek	02/82 - 04/87	19
S-4	Squaw Creek	04/82 - 07/84	6
W-1	White River	02/82 - 10/85	11
W-2	White River	02/82 - 10/82	4
W-3	White River	03/83 - 10/85	8

FERRET EXPLORATION CO OF NEBRASKA
CROW BUTTE PROJECT
WATER QUALITY REPORT

Sample Number:W-1 Sample Type: STREAM SAMPLE
Distance from Wellfield: 24000 ft. Water System: WHITE RIVER

SAMPLE SUMMARY

PARAMETER	MINIMUM	MAXIMUM	MEAN	STD.DEVIATION
All values in mg/l unless noted				
Calcium	46	57	53.045	3.698
Magnesium	6.8	8	7.54	.427
Sodium	12.7	15.9	14.21	.889
Potassium	6.1	7.8	7.13	.542
Carbonate	<1	<2	1.5	.535
Bicarbonate	214.7	235	225.66	6.053
Sulfate	<5	20	10.47	4.397
Chloride	<2	4.7	3.35	.789
Ammonia-N	0.05	0.05	.05	0
Nitrite-N	0.001	0.02	9E-03	7E-03
Nitrate-N	0.24	0.78	.49	.176
Fluoride	0.3	0.6	.499	.096
Silica(as SiO2)	50.6	59	54.218	2.436
TDS-180°C	230	302	266.455	23.183
Conductivity (umhos)	329	400	365.636	22.028
Alkalinity(as CaCO3)	173.1	201	187.855	9.166
pH (standard units)	7.74	8.05	7.914	.116
Iron Balance				
TDS Balance				
Cond. Balance				
All values in ug/l unless noted				
Aluminum	<100	<100	100	0
Arsenic	2	2	2	0
Barium	100	100	100	0
Boron	<500	<500	500	0
Cadmium	<1	<1	1	0
Chromium	<1	<1	1	0
Cobalt	<1	<1	1	0
Copper	<1	<1	1	0
Iron	50	50	50	0
Lead	<5	<5	5	0
Manganese	<100	<100	100	0
Mercury	<0.1	<0.1	.1	0
Molybdenum	<2	<2	2	0
Nickel	<2	<2	2	0
Selenium	<2	<2	2	0
Vanadium	8	8	8	0
Zinc	<2	<2	2	0
Uranium (as U)	1	6	3.636	2.063
Radium-226(pCi/l)	0.1	0.8	.4	.232

FERRET EXPLORATION CO OF NEBRASKA
CROW BUTTE PROJECT
WATER QUALITY REPORT

Sample Number:W-2
Distance from Wellfield: 27500 ft.

Sample Type: STREAM SAMPLE
Water System: WHITE RIVER

SAMPLE SUMMARY

PARAMETER	MINIMUM	MAXIMUM	MEAN	STD.DEVIATION
All values in mg/l unless noted				
Calcium	52	57	55	2.16
Magnesium	7.7	8	7.825	.126
Sodium	16	20	17.75	1.708
Potassium	6.5	7.9	7.225	.68
Carbonate	<2	<2	2	0
Bicarbonate	230	230	230	0
Sulfate	<5	16	11.5	4.655
Chloride	4	6	5	1.155
Amaonia-N	<0.05	<0.05	.05	0
Nitrite-N	0.01	0.01	.01	0
Nitrate-N	0.4	0.62	.493	.114
Fluoride	0.4	0.6	.475	.096
Silica(as SiO2)	52	56	54	1.633
TDS-180•C	230	300	270	29.439
Conductivity (µmhos)	377	420	401	19.408
Alkalinity(as CaCO3)	190	200	195	5.773
pH (standard units)	7.5	8.2	7.825	.299
Ion Balance				
TDS Balance				
Cond. Balance				
All values in µg/l unless noted				
Aluminum	<100	<100	100	0
Arsenic	2	2	2	0
Barium	<100	<100	100	0
Boron	<500	<500	500	0
Cadmium	<1	<1	1	0
Chromium	<1	<1	1	0
Cobalt	<1	<1	1	0
Copper	<1	<1	1	0
Iron	50	50	50	0
Lead	<5	<5	5	0
Manganese	<100	<100	100	0
Mercury	<0.1	<0.1	.1	0
Molybdenum	<2	<2	2	0
Nickel	<2	<2	2	0
Selenium	<2	<2	2	0
Vanadium	7	7	7	0
Zinc	<2	<2	2	0
Uranium (as U)	1	7	4.75	2.63
Radium-226(pCi/l)	0.3	0.5	.4	.1

TABLE 7.3-5

DOSE TO THE POPULATION
FROM ONE YEAR'S OPERATION
CROW BUTTE PROJECT

	Dose (person rem/yr)
	Bronchial Epithelium
Dose received by population within 80 km of the facility	22.1
Natural background for population within 80 km of the facility	24025.
Dose received by population beyond 80 km of the facility	201.6
Total continental dose	223.7
Natural background for the continental population	1.73E+08
Fraction increase in continental dose	1.17E-06

For comparison of the values listed in Table 7.3-5, the dose to the continental population as a result of natural background radiation has been estimated. This estimate is based on a North American population of 346 million and a dose to each person of 500 mrem/yr to the bronchial epithelium. The maximum radiological effect of the Crow Butte Project would be to increase the dose to the bronchial epithelium of the continental population by 0.00013 percent.

7.3.5 Exposure to Flora and Fauna

It is presumed that the flora and fauna in the area will receive no greater exposure than that calculated for humans. The predicted doses from inhalation, meat ingestion and vegetation ingestion for humans would also be similar for the omniverous mammals and as noted earlier, these doses are negligible.

The major concentration of radionuclides associated with flora will be from deposition onto the plants. Table 7.3-6 gives the ground surface concentrations for Pb-210.

The flora in the area will also receive exposure from uptake of radionuclides in the soil. The uptake fraction of radionuclides however, is only a small fraction of that found in the soil. Dressen and Marple (1979), evaluating plant uptake of radionuclides, estimated an uptake factor for lead to be 0.19.

There are no applicable limits for radiation exposure of species other than man, although it is accepted that most species are less radiosensitive than man. Therefore the radiation protection limits applicable to man are conservative for other species. Further, given that the calculated doses for humans as a result of this proposed facility, are only fractions of the natural background exposures, the magnitude of the effects on other species are expected to be even less than those for humans.