MINERALOGICAL CORRELATION OF SURFICIAL SEDIMENT FROM AREA DRAINAGES WITH SELECTED SEDIMENTARY INTERBEDS AT THE IDAHO NATIONAL ENGINEERING LABORATORY, IDAHO

by

Roy C. Bartholomay

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 90-4147

Prepared in cooperation with the

U.S. DEPARTMENT OF ENERGY

Idaho Falls, Idaho
August 1990

U.S. DEPARTMENT OF THE INTERIOR

MANUEL LUJAN, JR., Secretary

U.S. Geological Survey

Dallas L. Peck, Director

For additional information
write to:

U.S. Geological Survey
INEL, MS 4148
P.O. Box 2230
Idaho Falls, ID 83403

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FACTORS FOR CONVERTING INCH-POUND UNITS TO METRIC (SI) UNITS

For readers who prefer to use International System (SI) units, rather than inch-pound terms, the following conversion factors are provided.

Multiply inch-pound units	By	To obtain SI units
acre-foot (acre-ft)	1,233	cubic meter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
square mile (mi^2)	2.590	square kilometer

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Sea Level Datum of 1929."

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ABSTRACT

The U.S. Geological Survey's project office at the Idaho National Engineering Laboratory, in cooperation with the U.S. Department of Energy, used mineralogical data to correlate surficial sediment samples from the Big Lost River, Little Lost River, and Birch Creek drainages with selected sedimentary interbed core samples taken from test holes at the RWMC (Radioactive Waste Management Complex), TRA (Test Reactors Area), ICPP (Idaho Chemical Processing Plant), and TAN (Test Area North). Correlating the mineralogy of a particular present-day drainage area with a particular sedimentary interbed provides information on historical source of sediment for interbeds in and near the INEL.

Mineralogical data indicate that surficial sediment samples from the Big Lost River drainage contained a larger amount of feldspar and pyroxene and a smaller amount of calcite and dolomite than samples from the Little Lost River and Birch Creek drainages. Mineralogical data from sedimentary interbeds at the RWMC, TRA, and ICPP correlate with surficial sediment of the present-day Big Lost River drainage. Mineralogical data from a sedimentary interbed at TAN correlate with surficial sediment of the present-day Birch Creek drainage.

INTRODUCTION

The INEL (Idaho National Engineering Laboratory) includes about 890 mi^2 of the eastern Snake River Plain in southeastern Idaho (fig. 1). The INEL was established in 1949 as a site for building and testing various types of nuclear facilities. Operation of nuclear reactors and associated activities generates radioactive liquid and solid wastes that require disposal.

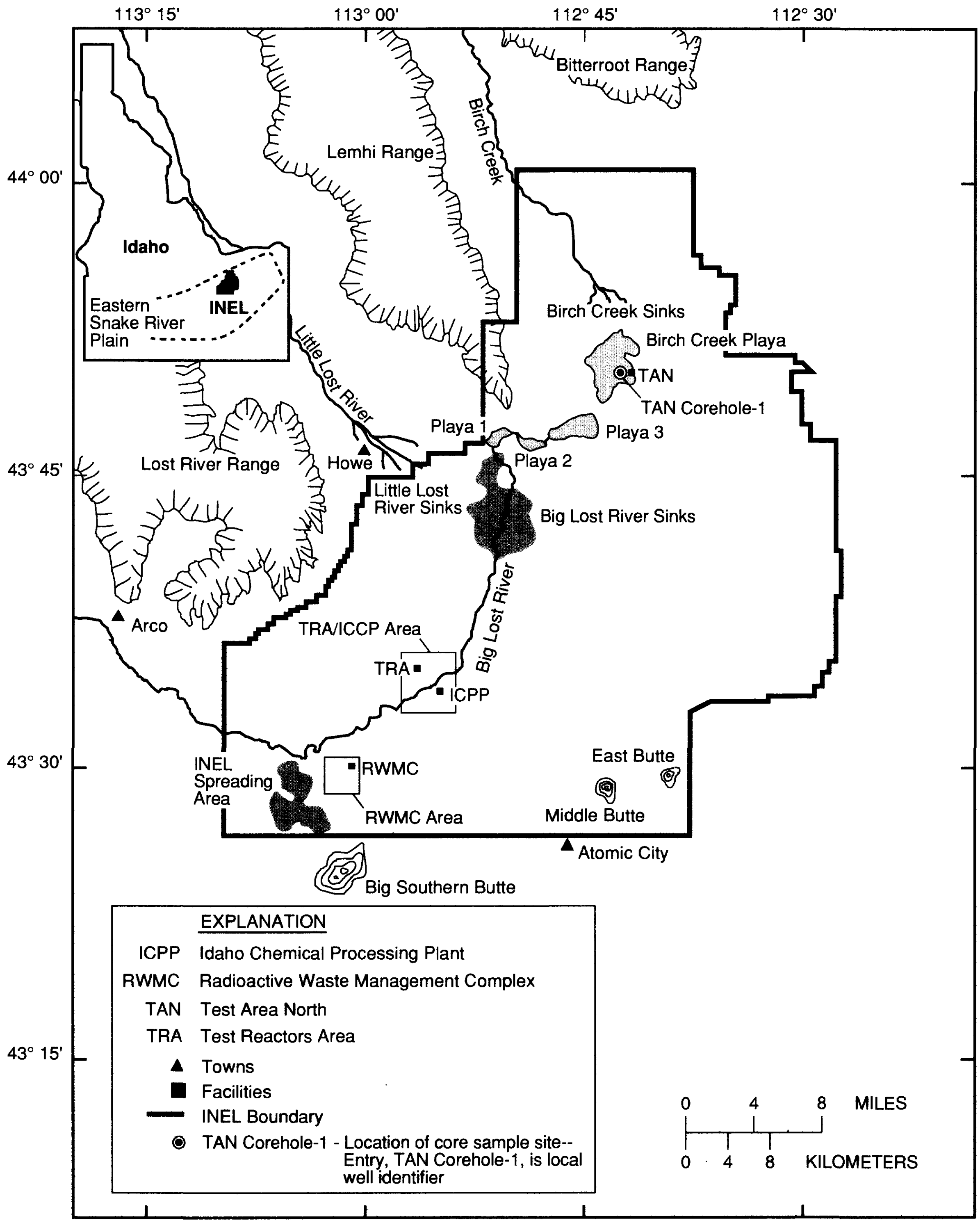

Figure 1.--Locations of the Idaho National Engineering Laboratory, selected facilities, and core sample sites.

Aqueous chemical and low-level radioactive wastes generated at the INEL were discharged to ponds and wells from 1952 to 1983. Since 1983, most of the aqueous wastes have been discharged to unlined infiltration ponds. Many of the waste constituents enter the Snake River Plain aquifer indirectly following percolation through the unsaturated zone (Pittman and others, 1988, p. 2); however, the movement of some constituents, including some radionuclides, may be retarded by minerals in the unsaturated zone.

In 1949, the U.S. Atomic Energy Commission--now the U.S. Department of Energy--requested the U.S. Geological Survey to investigate the geohydrologic conditions at the INEL and adjacent areas prior to the development of reactor operations. Ongoing research by the U.S. Geological Survey at the INEL involves investigation of the migration of radioactive elements contained in low-level radioactive waste, hydrologic and geologic factors affecting waste movement, and geochemical factors that influence the chemical composition of the waste. Identification of the mineralogy of the Snake River Plain is needed to aid in the study of the hydrology and geochemistry of subsurface waste disposal.

Purpose and Scope

This report describes the results of a mineralogical correlation between surficial sediment from the Big Lost River, Little Lost River, and Birch Creek drainage basins and sedimentary deposits interbedded with basalt flows underlying the INEL. Sediment source areas for sedimentary interbeds are probably from drainage areas similar to the present day Big Lost River, Little Lost River, and Birch Creek. Because the mineralogies of the present day source areas differ (Bartholomay and others, 1989; Bartholomay and Knobel, 1989), a correlation between mineralogies of surficial sediments of the area's drainages and sedimentary interbeds may provide information about historical depositional patterns and, therefore, help explain the historical source of sediment deposition in the subsurface in and near the INEL. The correlations are based on mineralogical data from 43 surficial sediment samples and 105 sedimentary interbed samples.

Previous Investigations

Previously published mineralogical data were used to correlate surficial sediment deposits with selected sedimentary interbeds. Mineralogical data for surficial sediment from the Big Lost River drainage were presented by Bartholomay and others (1989, table 8, p. 23). Mineralogic data for surficial sediment from the Little Lost River and Birch Creek drainages were presented by Bartholomay and Knobel (1989, tables 4-5, p. 17-18). Mineralogical data for sedimentary interbeds at the RWMC (Radioactive Waste Management Complex), TRA (Test Reactors Area), and ICPP (Idaho Chemical Processing Plant) were presented by Barraclough and others (1976, table A-V, p. 123-124), Rightmire (1984, table 5, p. 17), Rightmire and Lewis (1987, table 7, p. 35), and Bartholomay and others (1989, table 11, p. 30). Mineralogical data for a sedimentary interbed 400 ft below land surface at TAN (Test Area North) are presented in this report. Quantitative X-ray diffraction analysis was used to determine the mineralogy of all sediment samples discussed in this report. A modification of the method described by Diebold and others (1963) and Schultz (1964) was used to obtain the relative mineral percentages.

Geohydrologic Setting

The eastern Snake River Plain is a northeast-trending structural basin about 200 mi long and 50 to 70 mi wide. The plain is underlain by a layered sequence of basaltic lava flows and cinder beds interbedded with eolian, fluvial, and lacustrine sedimentary deposits. The thickness of individual flows generally ranges from 10 to 50 ft and the average thickness may be from 20 to 25 ft (Mundorff and others, 1964, p. 143). The sedimentary deposits consist mainly of beds of sand, silt, and clay with lesser amounts of gravel. Locally, rhyolitic lava flows and tuffs are exposed at land surface or occur at depth. The basaltic lava flows and interbedded sedimentary deposits combine to form the Snake River Plain aquifer, which is the main source of water on the plain. The altitude of the water table for the Snake River Plain aquifer in July 1985 and July 1978 ranged from about 4,580 ft in the northern part of the INEL to about 4,430 ft in the southern part

(Pittman and others, 1988, fig. 9; Barraclough and others, 1981, fig. 7). The corresponding depths to water below land surface ranged from about 200 ft in the northern end of the INEL to as much as 1,000 ft in the southern end (Barraclough and others, 1981, fig. 8). The INEL obtains its entire water supply from the Snake River Plain aquifer.

Much of the northern part of the INEL is in a topographically closed depression that includes the Big Lost River Sinks; Little Lost River Sinks; Birch Creek Sinks; Big Lost River playas 1, 2, and 3; and Birch Creek playa. The Big Lost River, Little Lost River, and Birch Creek terminate in the Birch Creek playa (Robertson and others, 1974, p. 8) (fig. 1). The INEL also contains several other small, isolated closed basins. Except for years with above-normal runoff, flow from the Little Lost River and Birch Creek is diverted for irrigation and power generation and does not reach the playas. Surface water at the INEL principally is derived from flow in the Big Lost River, most of which ultimately recharges the Snake River Plain aquifer. Data from May and November 1985 seepage runs on the Big Lost River near the ICPP (fig. 1) indicate that the river loses from 1.1 to 3.8 (acre-ft/day)/mi depending on the amount of flow in the channel (Mann and others, 1988, p. 17).

Acknowledgments

The author gratefully acknowledges the ISU (Idaho State University) Department of Geology--Dr. Paul K. Link, Chairman--for providing X-ray diffraction equipment, laboratory space, and computer support. Special thanks are due to Dr. Charles W. Blount and Dr. William R. Hackett of the ISU Department of Geology for helping with computer software, demonstrating the proper use of the X-ray equipment, aiding in the modifications used for the sample preparation, and providing discussions on applying the theory of X-ray diffraction to unknown mineral identification.

MINERALOGY OF SURFICIAL SEDIMENT

A summary of the quantitative bulk mineralogy for surficial sediment from the Big Lost River, Little Lost River, and Birch Creek drainages, categorized by selected geomorphic features, is given in table 1. The summary is from mineralogical data published by Bartholomay and others (1989, table 8, p. 23) and Bartholomay and Knobel (1989, tables 4-5, p. 17-18).

The quantitative bulk mineral analyses for the Big Lost River, Little Lost River, and Birch Creek channel deposits (table 1) show that the percentages of total feldspar (plagioclase and potassium feldspar) and pyroxene decrease and the percentage of calcite increases from the Big Lost River with mean percentages of 37, 11, and 3, respectively; to the Little Lost River, with mean percentages of 30, 4, and 15, respectively; to Birch Creek with mean percentages of 15, 1, and 29, respectively. The Little Lost River sediment contained a larger mean percentage (9 percent) of dolomite relative to Birch Creek and the Big Lost River with mean percentages of 4 and 0, respectively (table 1). Detrital mica was present in samples from the Big Lost River and Little Lost River, but not in Birch Creek. A ternary diagram showing the relation between the amounts of quartz, total feldspar, and carbonates for the 21 samples from the channel deposits of the three streams is provided in figure 2.

The mean percentages of total clay minerals plus detrital mica present in the channel deposits are as follows: 10 percent detrital mica and total clay minerals for 11 samples from the Big Lost River, 8 percent detrital mica and total clay minerals for 5 samples from the Little Lost River, and 7 percent total clay minerals for 5 samples from Birch Creek (table 1). The mean percentages of detrital mica and total clay minerals for samples other than channel deposits are as follows: 19 percent for 8 samples from overbank deposits, 23 percent for 6 samples from the INEL spreading areas, and 27 percent for 8 samples from the sinks and playas. The 21 samples from channel deposits have a smaller mean percentage (9 percent) of detrital mica and total clay minerals than the 22 samples from other types of deposits (23 percent). A ternary diagram showing the relation between total clay

Table 1.--Summary of statistical parameters for bulk mineralogy of surficial sediment from the Big Lost River, Little Lost River, and Birch Creek drainages, categorized by selected geomorphic features

[Units are percentage mineral abundance and are derived from Bartholomay and others (1989, table 8, p. 23) and Bartholomay and Knobel (1989, tables 4-5, p. 17-18). Birch Creek channel deposits: No detrital mica was found in these samples.]

Mineral	Minimum	Maximum	Median	Mean	Sample size
		[Big Lost River channel deposits]			
Quartz	32	45	38	38	11
Plagioclase feldspar	16	30	23	24	11
Potassium feldspar	6	18	12	13	11
Calcite	0	6	3	3	11
Pyroxene	8	14	12	11	11
Dolomite	0	3	0	0	11
Detrital mica plus total clay minerals	8	14	10	10	11
		[Little Lost River channel deposits]			
Quartz	27	40	32	34	5
Plagioclase feldspar	12	24	18	18	5
Potassium feldspar	11	15	12	12	5
Calcite	5	26	13	15	5
Pyroxene	0	12	0	4	5
Dolomite	7	11	10	9	5
Detrital mica plus total clay minerals	0	15	5	8	5
		[Birch Creek channel deposits]			
Quartz	33	54	52	45	5
Plagioclase feldspar	6	8	6	7	5
Potassium feldspar	4	10	9	8	5
Calcite	22	37	26	29	5
Pyroxene	0	6	0	1	5
Dolomite	2	6	4	4	5
Total clay minerals	0	16	7	7	5
		[Overbank deposits]			
Quartz	24	37	32.5	32	8
Plagioclase feldspar	7	19	14.5	14	8
Potassium feldspar	8	15	11.5	11	8
Calcite	3	25	10.5	12	8
Pyroxene	0	10	6	5	8
Dolomite	3	14	6	7	8
Detrital mica plus total clay minerals	14	27	18.5	19	8
		[INEL spreading area deposits]			
Quartz	23	44	34	35	6
Plagioclase feldspar	10	16	14.5	14	6
Potassium feldspar	11	16	13	14	6
Calcite	0	21	3	5	6
Pyroxene	0	12	10	8	6
Dolomite	0	3	0.5	1	6
Detrital mica plus total clay minerals	14	28	25.5	23	6
		[Sinks and playas]			
Quartz	21	38	26.5	27	8
Plagioclase feldspar	6	21	12	12	8
Potassium feldspar	6	19	11	12	8
Calcite	0	30	15.5	16	8
Pyroxene	0	11	0	2	8
Dolomite	0	9	4.5	4	8
Detrital mica plus total clay minerals	16	42	26	27	8
		[All samples except channel deposits]			
Quartz	21	44	31	31	22
Plagioclase feldspar	6	21	14	13	22
Potassium feldspar	6	19	12	12	22
Calcite	0	30	10.5	12	22
Pyroxene	0	12	5.5	5	22
Dolomite	0	14	4	4	22
Detrital mica plus total clay minerals	14	42	21	23	22

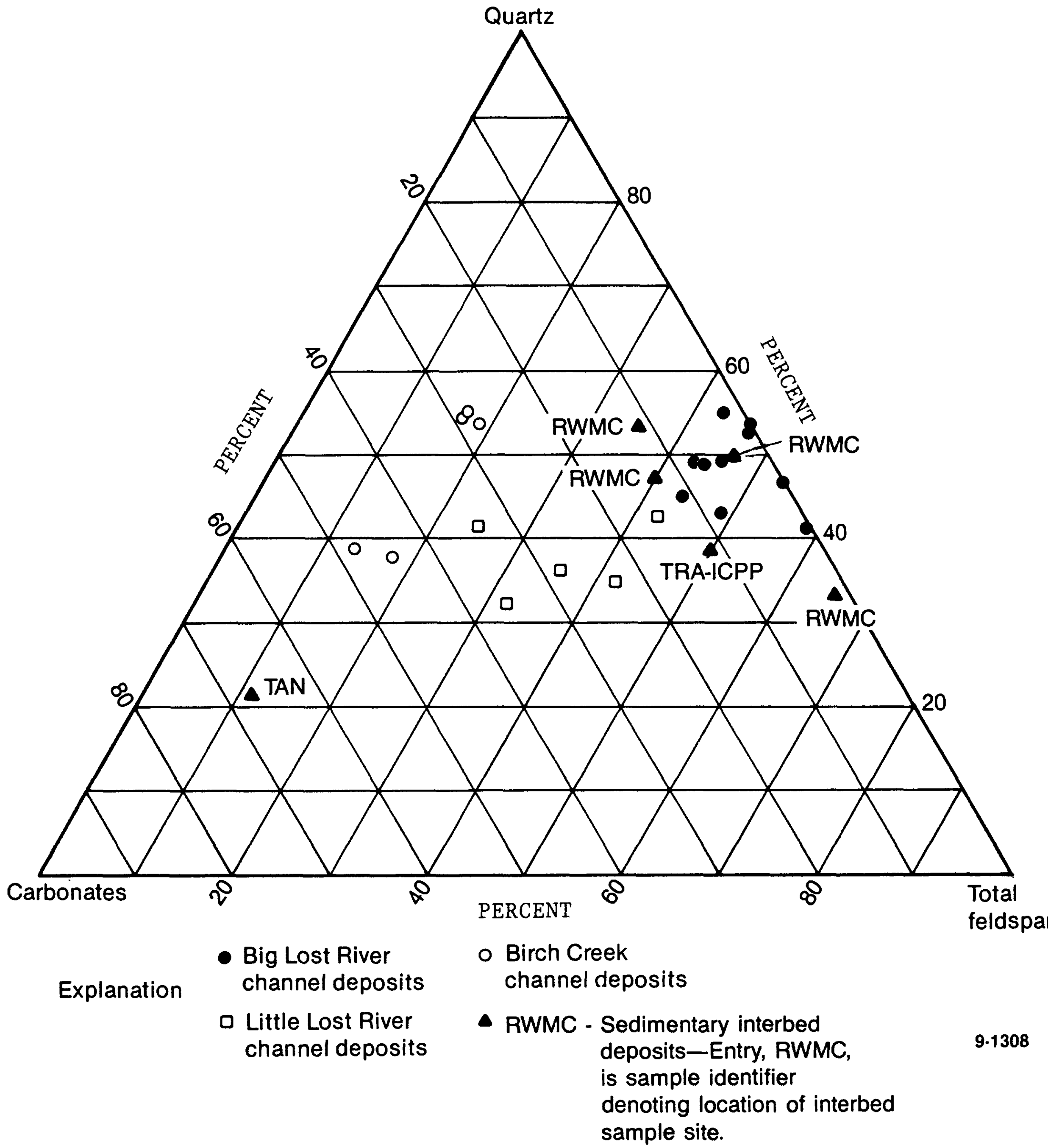

Figure 2.--The relation between quartz, total feldspar, and carbonates for channel deposits from the Big Lost River, Little Lost River, and Birch Creek, and average values for selected sedimentary interbeds.

minerals plus mica, total feldspar, and carbonates for the 43 samples of surficial sediment from the Big Lost River, Little Lost River, and Birch Creek drainages is in figure 3.

MINERALOGY OF SELECTED SEDIMENTARY INTERBEDS

Because analyses of the mineralogies of the three drainage systems (Big Lost River, Little Lost River, and Birch Creek) indicate differences, a similar analysis may be used at the INEL to correlate sedimentary interbeds and the different surficial deposits. The bulk and clay mineralogy of samples collected from a sediment core of TAN Corehole-1 is given in table 2. The location of TAN Corehole-1 is shown in figure 1. A statistical summary of the mineralogy of selected interbeds at the RWMC, TRA, ICPP, and TAN is shown in table 3. The mineralogical data used for this summary were taken from Barraclough and others (1976, table A-V, p. 123-124), Rightmire (1984, table 5, p. 17), Rightmire and Lewis (1987, table 7, p. 35), Bartholomay and others (1989, table 11, p. 30), and table 2 of this report. Locations of test holes from which the sedimentary interbed samples were taken are shown in figures 4 and 5.

Table 2.--Mineralogy of bulk and clay samples by X-ray diffraction analysis for a sedimentary interbed from TAN Corehole-1

[Symbols: ND indicates not detected. -----3----- number is sum of percents for plagioclase and potassium feldspar. Sample identifier: sandy-404 name indicates type of sediment and number indicates depth below land surface in feet. Bulk analyses: quantitative analysis. Clay analyses: dom indicates mineral is dominant, maj indicates mineral is major in abundance, min indicates mineral is present in a minor amount, tr indicates mineral is present in a trace amount, poss indicates mineral is possibly present.]

Sample identi-fier	Date received	Bulk analyses (in percent mineral abundance)								
		Quartz	Plagio-clase feldspar	Potas-sium feldspar	Calcite	Pyroxene	Dolomite	Detrital mica	Total clay minerals
sandy-404	11/03/89	19	-----3-----		60	0	0	0	18
baked-404	11/03/89	23	-----5-----		60	0	0	0	12
sandy-406	11/03/89	18	6	6	51	0	8	0	11
sandy-408	11/03/89	15	6	6	42	0	9	0	21
rubbly-409	11/03/89	18	6	6	47	0	12	0	10

Sample identi-fier	Date received	Clay analyses (qualitative analysis)						
		Illite	Smectite	Kaolinite	Mixed layer	Chlorite	Quartz	Dolomite	Calcite
sandy-404	11/03/89	dom	min	min	min	ND	tr	ND	maj
baked-404	11/03/89	dom	maj	tr	maj	poss	tr	ND	maj
sandy-406	11/03/89	dom	maj	tr	maj	tr	tr	tr	maj
sandy-408	11/03/89	dom	maj	tr	maj	ND	tr	tr	maj
rubbly-409	11/03/89	dom	maj	tr	maj	tr	tr	tr	maj

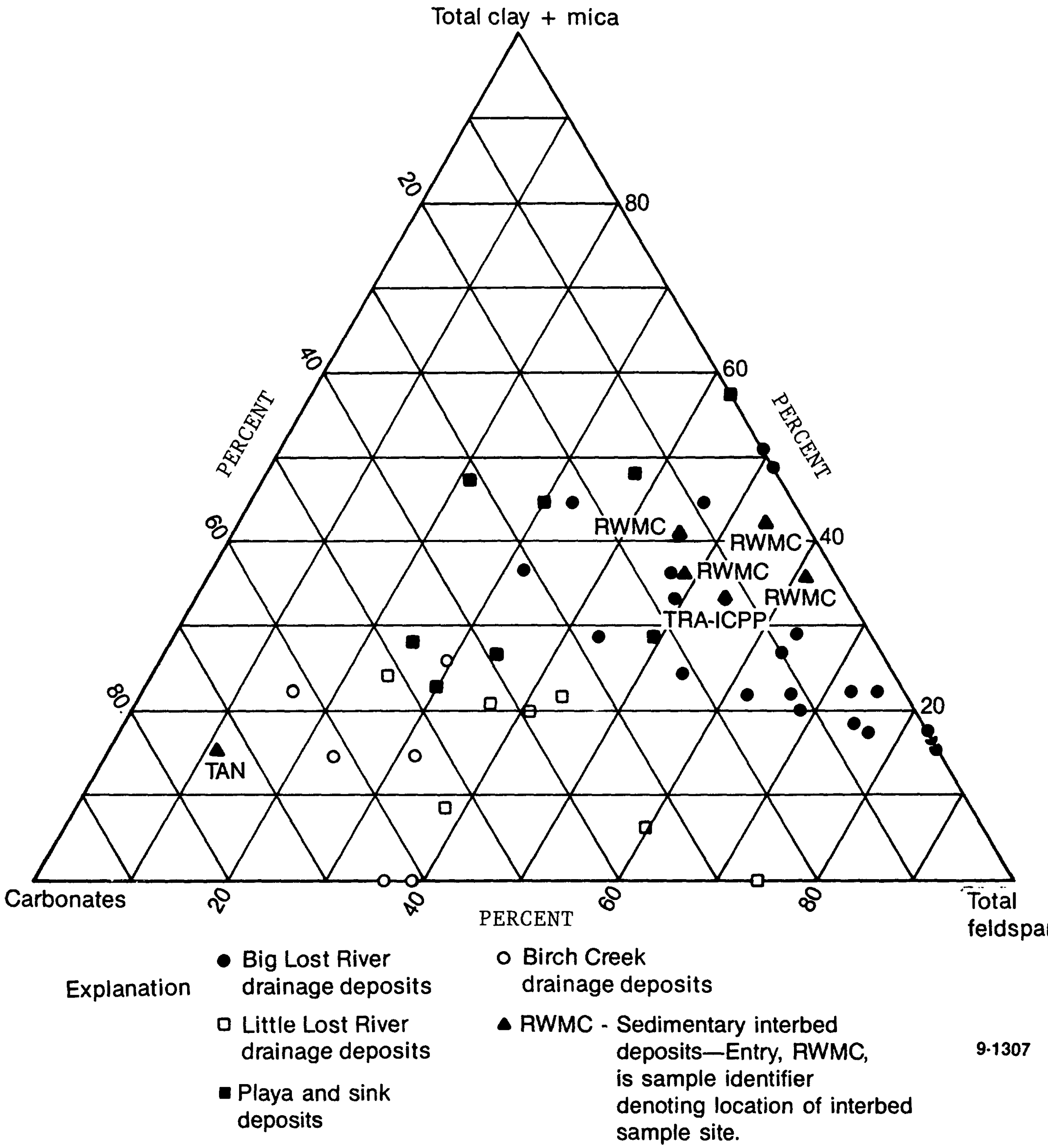

Figure 3.--The relation between total clay minerals plus mica, total feldspar, and carbonates for surficial deposits at the Idaho National Engineering Laboratory and average values for selected sedimentary interbeds.

Table 3.--Summary of statistical parameters for bulk mineralogy of selected sedimentary interbeds at the Idaho National Engineering Laboratory, Idaho

[Units are percent mineral abundance. Perched-water test holes: Includes eight samples from an interbed about 110 feet below land surface, and two samples about 220 feet below land surface. Olivine and hematite are present in one sample. Sediment interbeds in RWMC are classified according to Anderson and Lewis (1989, p. 15-17). Interbed A-B, RWMC area: Highest reported values were used for statistics for potassium feldspar. Interbed B-C, RWMC area: Same header note for interbed A-B applies for potassium feldspar; all five samples in Rightmire and Lewis (1987) had olivine present but not in percent abundance; clay minerals were called layered silicates in Rightmire and Lewis (1987). Interbed C-D, RWMC area: Same header notes from interbed B-C apply for potassium feldspar and clay minerals; only one sample contained olivine; dolomite was not analyzed for in Rightmire (1984) possibly present in 2 samples. Deeper interbeds, RWMC area: Includes samples from interbeds D-E, E-F, F-FG, F-G, FG-G, and G-I. Total feldspar: Statistics calculated from the sum of plagioclase and potassium feldspar. -- indicates mineral was not identified.]

Mineral	Minimum	Maximum	Median	Mean	Sample size
		[Interbed A-B, RWMC area]			
Quartz	26	54	34.5	36	8
Total feldspar	14	44	21	23	8
Calcite	0	36	0	7	8
Pyroxene	4	11	9	8	8
Dolomite	--	--	--	--	--
Olivine	--	--	--	--	--
Total clay minerals	5	30	19	18	8
		[Interbed B-C, RWMC area]			
Quartz	2	60	29	28	32
Total feldspar	10	64	24.5	26	32
Calcite	0	13	0	2	32
Pyroxene	0	26	9	11	32
Dolomite	--	--	--	--	--
Olivine	0	13	0	2	32
Total clay minerals	0	60	16.5	20	32
		[Interbed C-D, RWMC area]			
Quartz	0	51	28	27	39
Total feldspar	11	49	22	23	39
Calcite	0	54	2	7	39
Pyroxene	0	29	9	10	39
Dolomite	0	poss	0	0	32
Olivine	0	15	0	0	39
Total clay minerals	0	46	20	21	39
		[Deeper interbeds, RWMC area]			
Quartz	2	32	16	16	11
Total feldspar	22	40	29	30	11
Calcite	0	6	0	1	11
Pyroxene	6	29	23	19	11
Dolomite	--	--	--	--	--
Olivine	0	18	0	6	11
Total clay minerals	10	36	16	18	11
		[Perched-water test holes,TRA-ICPP area]			
Quartz	18	39	27	26	10
Total feldspar	26	42	32	32	10
Calcite	0	28	5.5	7	10
Pyroxene	0	41	9	12	10
Dolomite	--	--	--	--	--
Olivine	0	10	0	1	10
Total clay minerals	0	42	16:5	19	10
		[TAN Corehole-1, TAN area]			
Quartz	15	23	18	19	5
Total feldspar	3	12	12	9	5
Calcite	42	60	51	52	5
Pyroxene	0	0	0	0	5
Dolomite	0	12	8	6	5
Olivine	--	--	--	--	--
Total clay minerals	10	21	12	14	5

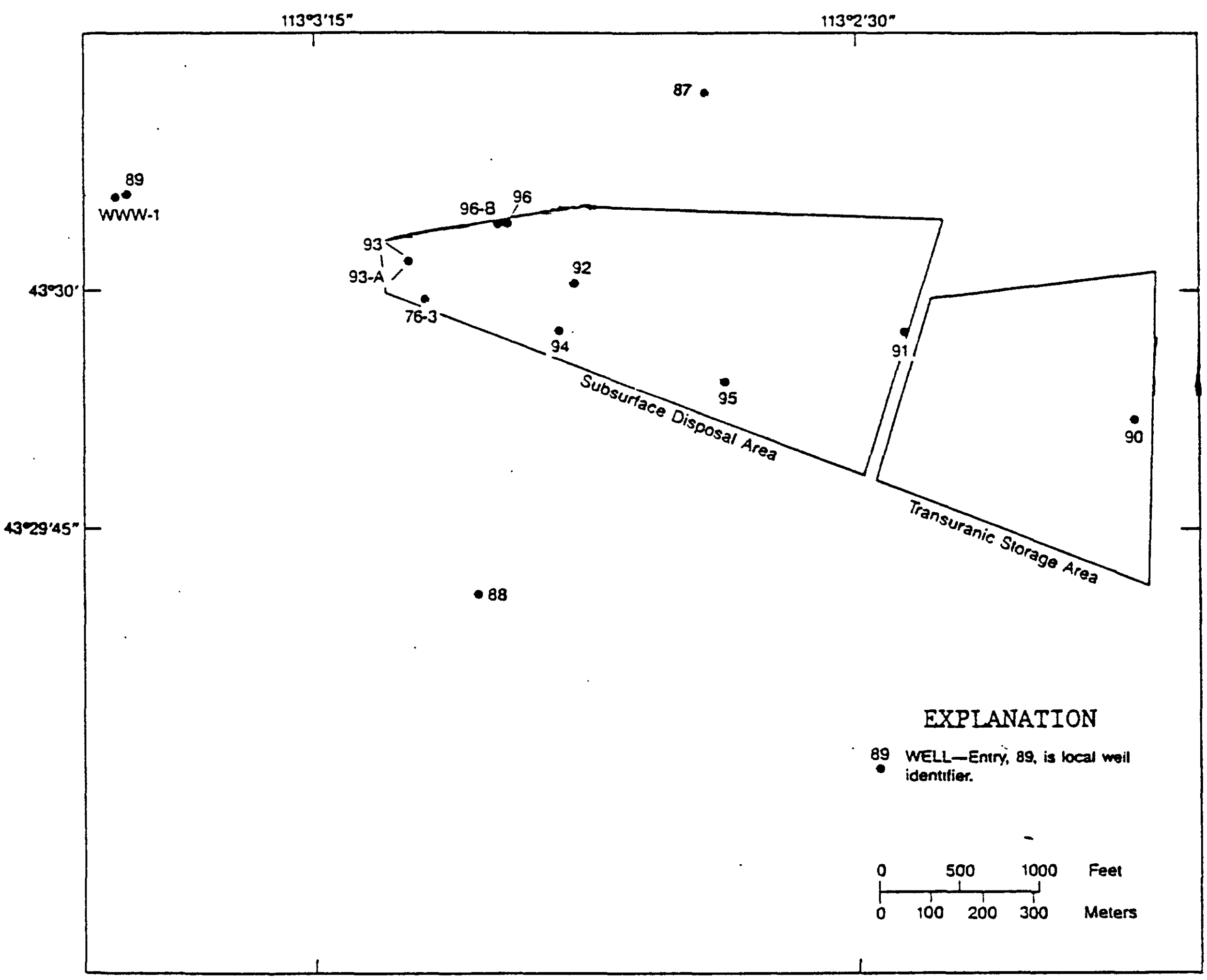

Figure 4.--Location of test holes sampled at the Radioactive Waste Management Complex (location of RWMC is shown in figure 1).

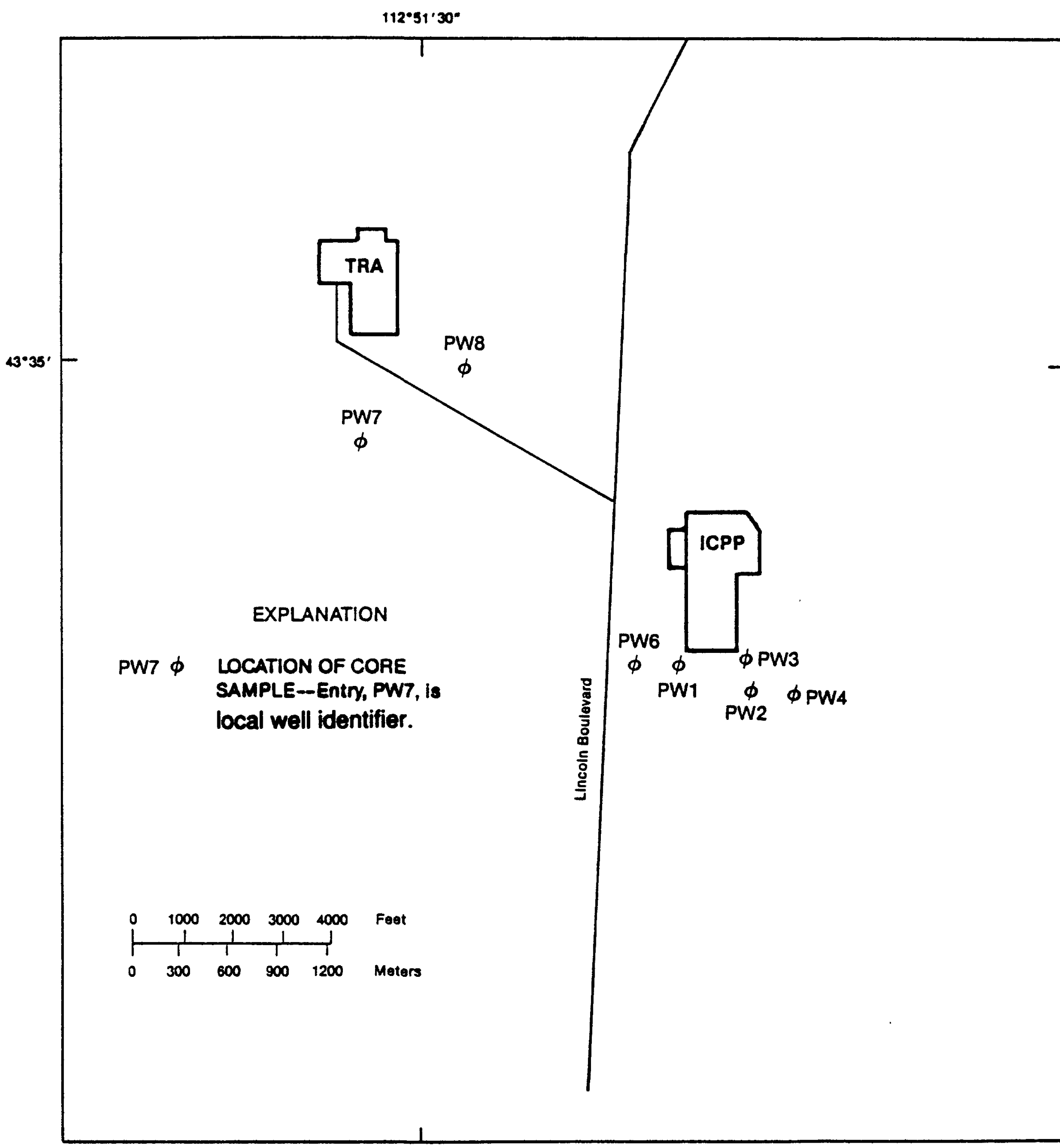

Figure 5.--Location of test holes sampled in the perched-water zone in the vicinity of the Test Reactors Area and the Idaho Chemical Processing Plant (location of the TRA and ICPP are shown in figure 1).

Statistical parameters for quantitative bulk mineral analyses for the sedimentary interbeds (table 3) show that quartz, total feldspar, pyroxene, and total clay minerals were relatively abundant in the interbeds at the RWMC, TRA, and ICPP. For example, interbeds in test holes at TRA and ICPP have respective mean and median mineral percentages of 26 and 27 for quartz; 32 and 32 for total feldspar; 12 and 9 for pyroxene; and 19 and 16.5 for total clay minerals. Interbed A-B at the RWMC has respective mean and median mineral percentages of 36 and 34.5 for quartz; 23 and 21 for total feldspar; 8 and 9 for pyroxene; and 18 and 19 for total clay minerals. Interbed B-C at the RWMC has respective mean and median mineral percentages of 28 and 29 for quartz; 26 and 24.5 for total feldspar; 11 and 9 for pyroxene; and 20 and 16.5 for total clay minerals. Interbed C-D at the RWMC has respective mean and median mineral percentages of 27 and 28 for quartz, 23 and 22 for total feldspar; 10 and 9 for pyroxene; and 21 and 20 for total clay minerals. The respective mean and median mineral percentages for samples from deeper interbeds at the RWMC are 16 and 16 for quartz, 30 and 29 for total feldspar, 19 and 23 for pyroxene, and 18 and 16 for total clay minerals.

Samples from a sedimentary interbed at TAN do not contain any pyroxene and have less abundant total feldspar with mean and median percentages of 9 and 12, respectively, than do interbed samples from the RWMC, TRA, and ICPP.

Overall, carbonates (calcite and dolomite) are not abundant in samples from sedimentary interbeds at the RWMC, TRA, and ICPP, but are abundant in samples from an interbed at TAN. For example, the respective mean and median mineral percentages of calcite are 7 and 5.5 for TRA and ICPP interbed samples, 7 and 0 for samples from interbed A-B at the RWMC, 2 and 0 for samples from interbed B-C at the RWMC, 7 and 2 for samples from interbed C-D at the RWMC, and 1 and 0 for deeper interbed samples at the RWMC. Dolomite is possibly present in two samples from interbed C-D, but was not found in any of the other samples from the RWMC, TRA and ICPP. Conversely, the respective mean and median mineral percentages of calcite are 52 and 51, and of dolomite 6 and 8, for sedimentary interbed samples from TAN.

CORRELATION OF SURFICIAL AND INTERBED SEDIMENT

Because the mineralogies of the present day source areas for the Big Lost River, Little Lost River, and Birch Creek drainages differ, a mineralogical comparison of sediment from the present day drainages and sedimentary interbeds below the INEL may aid in correlating historical source areas with the interbeds. Some factors that need consideration when comparing the mineralogy between present day drainage deposits and sedimentary interbeds include: (1) Drainage patterns could have changed considerably if basalt flows altered their flowpath; (2) significant climate changes could have affected the rates of deposition, mineral alteration, and carbonate accumulation; (3) changes in wind direction and velocity could have resulted in sediment input from sources other than the water-deposited sediment source; and (4) rivers carrying sediment from other source areas could have terminated in the same basin, yielding a mixed mineralogy. The plot of the percentages of total clay minerals plus mica, total feldspar, and carbonates for sediment from playas and sinks on figure 3 indicates a mixture of sediment from the Big Lost River and Birch Creek.

The small amount of calcite and dolomite in the sedimentary interbeds from the RWMC, TRA, and ICPP, along with the relatively high amount of feldspar and pyroxene, indicate that the sedimentary interbeds are from a source area containing sediment similar to that from the present day Big Lost River drainage. The large amount of calcite and dolomite and the relatively small amount of feldspar and pyroxene in the TAN sedimentary interbed indicate that the TAN interbed is from a source area containing sediment similar to that from the present day Birch Creek drainage. A plot of the average percentages of quartz, total feldspar, and carbonates of the sedimentary interbeds on figure 2 shows that the sedimentary interbeds at the RWMC, TRA, and ICPP are similar to the Big Lost River channel deposits, and the TAN sedimentary interbed is similar to the Birch Creek channel deposits. This suggests that the present day drainage patterns of the streams may be similar to historical patterns.

A plot of the average percentages of total clay minerals plus mica, total feldspar, and carbonates of the sedimentary interbeds (fig. 3) indicates that the interbeds at the RWMC, TRA, and ICPP are similar to the Big Lost River channel, overbank, and spreading area deposits, and that the TAN interbed is similar to the Birch Creek channel and overbank deposits. Similarities indicate that most of the sedimentary interbeds analyzed at the RWMC, TRA, and ICPP may be flood plain deposits of an early river containing sediments similar to the present day Big Lost River deposits and that the sedimentary interbed analyzed at TAN may be a flood plain deposit of an early river containing sediments similar to the present day Birch Creek deposits.

CONCLUSIONS

Recognizing different trends in the mineralogy of sediment from present day drainage basins can be useful in determining the source of the sedimentary interbeds. The mineralogy of surficial sediment in the Big Lost River, Little Lost River, and Birch Creek drainages and the mineralogy of selected sedimentary interbeds at the RWMC, TRA, ICPP, and TAN at the INEL were compared to relate the sedimentary interbeds to historical drainage areas.

The following conclusions are drawn from information presented in this report: (1) The source area contributes to the mineralogy found in each drainage area. Large amounts of feldspars and pyroxenes in samples from the Big Lost River drainage reflect the relative abundance of volcanic rocks in the source area. Large amounts of calcite and dolomite in samples from the Little Lost River and Birch Creek drainages reflect the abundance of limestone and dolostone in the source areas. The mineralogy of samples from the Big Lost River playas and the Birch Creek playa indicates sediment input from both the Big Lost River and Birch Creek drainages. (2) The mineralogies of sedimentary interbeds in the RWMC, TRA, and ICPP correlate with surficial deposits of the Big Lost River drainage. The mineralogy of sedimentary interbeds at TAN correlates with surficial deposits of the Birch Creek drainage. These correlations suggest that the sedimentary interbeds probably were deposited in a depositional basin similar to the present day basin.

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