# 8. GEOCHEMISTRY OF SEDIMENTS IN THE ARGO ABYSSAL PLAIN AT SITE 765: A CONTINENTAL MARGIN REFERENCE SECTION FOR SEDIMENT RECYCLING IN SUBDUCTION ZONES<sup>1</sup>

Terry Plank<sup>2</sup> and John N. Ludden<sup>3</sup>

## ABSTRACT

Drilling at Site 765 in the Argo Abyssal Plain sampled sediments and oceanic crust adjacent to the Australian margin. Some day, this site will be consumed in the Java Trench. An intensive analytical program was conducted to establish this site as a geochemical reference section for crustal recycling calculations. About 150 sediment samples from Site 765 were analyzed for major and trace elements. Downhole trends in the sediment analyses agree well with trends in sediment mineralogy, as well as in Al and K logs. The primary signal in the geochemical variability is dilution of a detrital component by both biogenic silica and calcium carbonate. Although significant variations in the nonbiogenic component occur through time, its overall character is similar to nearby Canning Basin shales, which are typical of average post-Archean Australian shales (PAAS). The bulk composition of the hole is calculated using core descriptions to weight the analyses appropriately. However, a remarkably accurate estimate of the bulk composition of the hole can be made simply from PAAS and the average calcium carbonate and aluminum contents of the hole. Most elements can be estimated within 30% in this way. This means that estimating the bulk composition of other sections dominated by detrital and biogenic components may require little analytical effort: calcium carbonate contents, average Al contents, and average shale values can be taken from core descriptions, geochemical logs, and the literature, respectively. Some of the geochemical systematics developed at Site 765 can be extrapolated along the entire Sunda Trench. However, results are general, and Site 765 should serve as a useful reference for estimating the compositions of other continental margin sections approaching trenches around the world (e.g., outboard of the Lesser Antilles, Aegean, and Eolian arcs).

## INTRODUCTION

The extent to which the continental crust is recycled back into the mantle via sediment subduction is crucial to our understanding of how Earth's mantle and crust evolved. Primarily, two lines of evidence support sediment subduction. One is based on seismic surveys and drilling that show an absence of accreted sediments in some forearcs (e.g., in the Marianas: Hussong, Uyeda, et al., 1982; Guatemala: Moore, Backman, et al., 1982; and Peru: Warsi et al., 1983). Even where well-developed accretionary wedges occur, often evidence indicates that some sediment is also being subducted beneath décollement structures in the wedge (as in the Lesser Antilles: Westbrook et al., 1988) or in grabens developed in the bending plate (as for the Nazca Plate approaching the Peru-Chile Trench: Schweller et al., 1981). Thus, ample geophysical evidence exists to show that sediment is subducted, at least beneath some forearcs.

A second line of evidence for sediment subduction comes from the isotope  $^{10}$ Be. An isotope strongly enriched in soils and marine clays,  $^{10}$ Be is found in measurable quantities in arc volcanics, but not in volcanics from other tectonic settings (Tera et al., 1986). This means that some surface sediments are taken as far as the site of arc magma genesis (~120 km deep). The factors that lead to sediment subduction in some situations, and not others, are still poorly understood (a modern twist on an old soliloquy provides a recent discussion of the various models; Von Huene, 1986).

The issue of how much sediment gets subducted to great depths remains open. Arc magmas incorporate some quantity of sediment and provide our best means for estimating the fluxes involved. However, these calculations require knowledge of the geochemical characteristics of both the influx (sediment and crust approaching trenches) and the output (arc volcanics). Although a fairly comprehensive global data base exists of the geochemical composition of arc volcanics, a method has yet to be developed for estimating the composition of the diverse sediment sections approaching trenches. A considerable amount of geochemical data exist for marine sediments. Most chemical analyses of sediments, however, consist of a few elements specific to oceanographic problems, and not necessarily solid earth ones. These data provide a first-order understanding of the systematics of sediment compositions, but do not constrain well what compositions are appropriate for individual subduction zones. Estimates of sediment compositions outboard of trenches usually are based on analyses of a few surface sediments, whole-ocean averages, or average "pelagic sediment." These estimates need to be refined. For example, elements that are used as tracers for sediment influxes to arc magma sources (e.g., K<sub>2</sub>O; Karig and Kay, 1980) may vary considerably in "pelagic sediments," on the order of all igneous rocks on the face of Earth. This is because sediments represent mixtures of biogenic carbonate or silica, which are devoid of most trace elements, and continental detritus or Fe-Mn oxides, which are rich in many trace metals. Thus, although ratios of certain elements and isotopic compositions of sediments are fairly well constrained, the actual element abundances may vary enormously. Ultimately, it is concentration data, not element or isotopic ratios, that are necessary for answering the question of how much?

Here, we discuss the geochemistry of the sedimentary section of Site 765, drilled during Leg 123 in the Argo Abyssal Plain, south of Java. These sediments may someday be consumed in the Sunda Trench. Full characterization of potential crustal fluxes into the Sunda Trench should include other sedimentary components that may be added to Site 765 as it drifts northward: volcanic ash derived from the arc itself and clastic material derived from

<sup>&</sup>lt;sup>1</sup> Gradstein, F. M., Ludden, J. N., et al., 1992. *Proc. ODP, Sci. Results*, 123: College Station, TX (Ocean Drilling Program).

<sup>&</sup>lt;sup>2</sup>Lamont-Doherty Geological Observatory and Department of Geological Sciences of Columbia University, Palisades, NY 10964, U.S.A.
<sup>3</sup>Department de Géological University of March 100 Constraints

<sup>&</sup>lt;sup>3</sup> Département de Géologie, Université de Montréal, C.P. 6128 Succ. A, Montréal, Québec, H3C 3J7, Canada.

the Ganges-Brahmaputra river system via the Nicobar Fan. In addition to sedimentary components, the chemical additions to the basaltic substrate via seawater alteration constitutes another crustal component. Gillis et al. (this volume) present some preliminary conclusions regarding the geochemical fluxes involved during alteration of the basaltic crust at Site 765.

Although the data presented here have obvious bearing on problems specific to the Sunda Arc as well as to the sedimentological history of the Australian margin, the thrust of this study is more general: to provide a reference data set for sediment subduction globally. Indeed, Site 765 represents an end-member of sorts. The site is situated adjacent to a passive margin, and so represents the crust first formed when an ocean basin opens, and the last consumed when an ocean basin disappears down a subduction zone. The sediments that have accumulated at Site 765 are dominated by detrital material derived from the Australian continent. Thus, Site 765 should serve as a reference site for other subduction zones proximal to continental sediment sources (e.g., the Lesser Antilles, the American, and the Eolian/Aegean arcs). We hope to provide here a methodology for constraining sediment influx to this class of subduction zones, and in doing so, to begin to answer the question of how much?

First, we present a geochemical stratigraphy of Site 765 sediments, attempt to tie the geochemical variability to the lithologic variability, and briefly speculate about the provenance of the sediments. Next, we devise a method for estimating the bulk composition of the entire sediment section. Finally, we discuss the relevance of this site to sedimentary sections globally, as well as regionally along the Sunda Arc.

## GEOLOGIC BACKGROUND

Site 765 is situated in the Argo Abyssal Plain, a triangular region of some of the oldest crust of the Indian Ocean, sandwiched between the northwestern margin of Australia and the Java Trench (see Fig. 1). The crust drilled at Site 765 represents the first oceanic crust formed during rifting of the Australian margin in the Earliest Cretaceous. This site is now only 500 km away from being consumed at the Sunda Trench, south of Java. The sedimentary section that has accumulated is thin for a passive margin sequence owing to the arid climate and low relief of western Australia. Although several active and explosive volcanoes are located on Java and the Lesser Sunda Islands, Site 765 has yet to enter the region of extensive ash falls determined by Ninkovich (1979). Thus, the ultimate source of much of the sediment at Site 765 is the Pilbara and Kimberly blocks of northwestern Australia craton, which are Archean to Proterozoic in age (Fig. 1). Although Site 765 is at abyssal depths, sedimentation rates have been higher than typical abyssal rates (see Ludden, Gradstein, et al., 1990), especially during the Neogene (averaging 27 m/m.y.) due to the continual supply of material from the Australian Shelf and Exmouth Plateau via turbidity flows. Even though well below the calcite compensation depth, the hole has a high carbonate content owing to the rapid influx and burial of pelagic carbonates from the Australian margin.

At Site 765, roughly 950 m of sediment was cored above the basaltic basement. The sedimentary section can be divided in two, corresponding grossly to the Cenozoic and Cretaceous sections. The Cenozoic section is dominated by calcareous turbidites, prob-



Figure 1. Location map of Site 765 with simplified geology of northwestern Australia. Water depth contours in meters.

ably originating on the Exmouth Plateau and fed by the Swan Canyon (Fig. 1). Although calcareous sequences also occur throughout the Cretaceous section, this lower section is dominated by pelagic clays. Within this simple division, however, tremendous lithologic diversity is represented by foraminiferal sands, nannofossil oozes, radiolarites, Mn-rich horizons, and red, green, and black clays.

## SAMPLING AND ANALYTICAL DETAILS

Our sampling strategy was to take one 40-cm<sup>3</sup> sample at each core that was representative of a dominant lithology in that core. Thus, we have a fairly evenly spaced sampling every 10 m or so down the entire 930-m section. Some sections of cores were subsampled (three individual turbidite units and red and green clay units in the lower half of the hole), and several samples were taken in adjacent intervals to assess variability at the centimeter scale. Samples were powdered and homogenized by first baking to 110°C, then pulverizing in either a tungsten carbide shatterbox or an alumina ball-mill.

About 70 samples were analyzed on board the *Resolution* using X-ray fluorescence (XRF) for all the major elements and for Rb, Sr, Ba, Y, Zr, Nb, V, Cr, Ni, Cu, and Zn (Table 1). Another 70 samples were analyzed at Lamont-Doherty (LDGO) by direct-current plasma emission spectrometry (DCP) for all the major elements and for Sr, Ba, Y, Zr, V, Cr, Ni, Cu, Zn, and Sc (Table 1). Forty samples were selected for additional instrumental neutron activation analysis (INAA) at the Université de Montréal, for REE, U, Th, Sc, Cr, Hf, Ta, W, Co, As, Sb, Ba, and Cs (Table 2). The major- and trace-element analyses for these same samples or for adjacent intervals are presented in Table 1. Details of the XRF and INAA procedures are given in Ludden, Gradstein, et al. (1990) and in Francis and Ludden (1990), respectively. Analysis of sediment samples by DCP required new procedures, which are described below.

Different routines were set up for running clay- and carbonaterich samples by DCP. The clay-rich samples (with 10% CaO) proved as straightforward to analyze as igneous rocks, and procedures were followed similar to those outlined in Klein et al. (1991). For each batch of clay samples (usually 10 unknowns), the USGS standards SCO-1 and QLO, as well as an in-house Aleutian andesite standard, LUM-37, were used to establish the calibration curves.

The analysis of carbonate-rich samples (>10% CaO) required some modifications to our routine method. Preliminary shipboard work revealed a problem in alkali loss upon ignition. We overcame this problem on board the ship by analyzing the alkali elements (K, Na, and Rb) on unignited powder pellets, although these measurements are inherently less accurate for K and Na, which are normally analyzed on fused glass disks. A new procedure had to be developed for the DCP method as well, because samples typically are fused and dissolved after ignition. However, comparison with analyses by total HF-HClO4 dissolution indicated that alkali loss occurred only during ignition of samples (30 min at 1000°C), not during LiBO2 fusion. In the most carbonaterich samples, some K was lost during the standard 15-min fusion at 1050°C; times were then reduced to 5 min, which seemed sufficient for fusion without alkali loss. Thus, carbonate samples were fused and dissolved without first oxidizing or devolatilizing. Total volatile loss on ignition (LOI) was determined for separate splits.

Significant Ca interferences or enhancements occurred on the Al line and on all the trace-element lines of our multi-element cassettes (the specific wavelengths used for each element are available upon request). With the exceptions of Sc, Y, and Zr, however, the Ca interferences are linear and easily corrected by running a pure CaO standard during each run. Calibration curves

for each batch of unknowns were constructed using pure CaO, LUM-37, and mixtures of the two in the proportions 1:1 and 1:3. These CaO-andesite mixtures provided us both with standards that closely resembled the unknowns and with dependable values for the trace elements, which is important because few well-characterized carbonate standards exist. Sc, Y, and Zr have large Ca interferences and are matrix sensitive (Ca enhances and Si suppresses). As a consequence, the standards do not form good calibration curves, and the Sc, Y, and Zr data are not accurate (10%-20% relative). More recent tests have shown that matrix problems are reduced by using a factor of 2 greater dilution (1:500) and a greater flux to sample ratio (10:1). With this procedure, standards form acceptable lines, and thus the Sc, Y, and Zr data are more accurate (5%), but because of the greater dilution, the peak-to-background ratios suffer, and the data are less precise (10%).

XRF analyses were presented in Ludden, Gradstein, et al. (1990), but have been reproduced here (Table 1) because an additional normalization factor was applied. In addition, K<sub>2</sub>O was re-run for the powder pellets by XRF at the Université de Montréal, and these newer analyses are reported here. On board the ship, the standard SCO-1 was run with every batch of samples; the precision based on these replicates is good (generally better than 2% relative for the major elements and 4% for the trace elements; see Table 21 in Ludden, Gradstein, et al., 1990). The DCP data are similarly precise, based on analysis of an Indian Ocean brown clay sample (IOBC) that was used to monitor drift during 10 different runs (Table 3). The Na<sub>2</sub>O and MnO values determined by DCP are more precise than the XRF determinations, while the Zr and Y XRF values are preferred because of the matrix problems with the DCP mentioned above.

Although both methods are precise, the agreement between the two varies for different elements. Powders analyzed using both XRF and DCP show consistent discrepancies. These differences are almost always of the same direction and magnitude as the differences between the accepted values for SCO-1 (Govindaraju, 1989) and those determined by XRF. Thus, normalization factors were applied to the XRF data based on the DCP duplicates and the accepted SCO-1 values (see Table 3 for the original XRF average for SCO-1, the Govindaraju values, and the values after normalization). The XRF Ce values and the DCP Sc values were also adjusted to agree with the more precise INAA values. Thus, the data presented in Table 1 show minimal analytical biases (all elements generally agree among methods to 5% relative).

Analyses of adjacent samples, where one was powdered in the ball mill and one was powdered in the shatterbox, indicate contamination of a few elements by the tungsten carbide shatterbox (2–4 ppm Co, 0.3–0.4 ppm Ta, and 35–60 ppm W). Aluminum contamination caused by powdering in the alumina ball mill, however, was negligible. The powdering method is listed along with the INAA analyses in Table 2.

### **GEOCHEMICAL VARIABILITY**

The simplest way to estimate the bulk composition of a sedimentary section might be to sample continuously down the core, analyze the samples, and then average them. This is impractical for a section that is almost 1 km long, such as was cored at Site 765. This is certainly an impractical method for estimating the flux of material entering oceanic trenches globally. Because our sampling and analytical efforts were intensive for Site 765, we can estimate fairly accurately its bulk composition simply by averaging the analyses reported in Tables 1 and 2. However, our aim was not only to calculate the bulk composition of Site 765 sediments, but also to develop a less analytically intensive method for estimating sections elsewhere. One advantage to working with DSDP/ODP cores is the wealth of lithological and mineralogical Table 1. Analyses of major and trace elements in Site 765 sediments.

Table 1 (continued).

123-765B Depth: Color: Lithology: Method:	1H-4, 48-50 4.98 Lt ol gray Cc. ooze XRF	2H-3, 94-106 13.24 Lt ol gray Cc. ooze XRF	2H-3, 123-135 13.53 Ol gray Clay XRF	2H-3, 145-150 13.75 Ol gray Clay DCP	2H-4, 7-19 13.87 Ol gray Clay XRF	2H-4, 31-43 14.11 Lt olive Cc. ooze XRF	2H-4, 91-103 14.71 Lt olive Cc. ooze XRF	2H-4, 131-143 15.11 Ol gray Clay XRF	2H-6, 138-140 18.18 Ol gray Clay XRF	2H-6, 140-142 18.20 Ol gray Clay DCP	123-765B Depth: Color: Lithology: Method:	11H-2, 40-44 97.90 Lt ol gray Cc. ooze XRF	12H-4, 44-48 110.54 Lt ol gray Cc. ooze XRF	12H-6, 105-110 114.15 Ol gray Clay XRF	13H-2, 138-143 118.08 Lt ol gray Cc. ooze XRF	14H-4, 83-87 130.13 L1 ol gray Cc. ooze XRF	15H-2, 76-88 136.76 Lt ol gray Cc. sand XRF	15H-2, 88-100 136.88 Ol gray Clay XRF	15H-2, 115-127 137.15 Lt ol gray Cc. ooze XRF	15H-3, 1-13 137.51 Lt gr yel Cc. ooze XRF	15H-3, 20-32 137.70 Lt ol gray Cc. sand XRF
SiO2 TiO2	22.71 .301	23.80 .295	54.26 .725	59.13 .742	54.15 .695	14.76	8.74 .097	57.50 .781	56.68 .746	56.89 .738	SiO2 TiO2	23.07	16.17	56.42 .967	20.29	20.93	22.80	54.56 .971	18.50	21.20	14.82
AI2O3	6.69 2.54	5.78	15.02	16.16	4 86	4.34	1.61	15.92	15.38	15.78	FeO	2.39	4.99	6.93	2.50	2.73	2.48	7.51	2.41	2.46	1.25
MnO	.198	.515	.330	.112	.131	.379	.265	.125	.163	.181	MnO	.103	.150	.048	.102	.095	.067	.039	.149	.130	.094
MgO	2.01	1,53	3.50	2.98	2.99	1.57	.73	3.15	3.52	3.37	MgO	1.88	1.32	3.64	1.79	1.65	1.68	3.60	1.48	1.44	.92
CaO Na2O	30.97	32.39	2.21	.63	3.63	39.29	46.80	.97	4 23	.57	Na2O	33.40	39.98	1.26	34.49	.34.36	34.17	1.89	36.00	34.84	41.79
K20	1.26	.98	2.65	2.76	2.47	.78	.37	2.48	2.53	2.81	K20	1.34	.85	3.07	1.23	1.37	1.17	3.18	1.31	1.25	.70
P205	.164	.152	.166	.140	.155	.187	.064	.106	.127	.144	P205	.187	.158	.171	.201	.137	.156	.159	.109	.159	.111
LOI CaCO3	32.5	32.21	11.5	9.47	12.5	36.77	40.33	9.75	10.52	9.93	CaCO3	30.1 61.89	69.81	7.8	60.89	62.31	30.59	8.26	32.73 63.47	31.7 59.64	73.22
C (Org)	.63	.51	.82		.98	.74	.13	.67	.72		C (Org)	.15	.04	.27	.31	.12	.30	.29	.05	.24	.08
Nb Zr	4.7	4.9	10.3 135.2	143.0	9.8 139.9	3.4 43.5	1.3 34.0	10.9 152.8	10.5 143.0	141.2	Nb Zr	4.7 80.0	4.1 62.2	13.8 208.9	5.1 74.7	5.6 70.4	4.4 88.0	13.5 199.2	4.5 66.1	4.6 88.9	2.9 68.6
Y	17.2	20.9	26.2	28.5	27.1	16.7	6.8	25.1	25.2	26.3	Y	19.0	16.0	32.2	15.1	14.2	17.7	30.1	17.2	19.8	12.8
Sr	1954	1171	204	143	244	1609	1117	154	152	153	Sr	1229	1336	206	1506	1342	2024	214	1403	1192	1042
Hb Zo	51.3	41.3	113.7	85.3	104.2	54.3	25.4	109.6	107.9	427	Zn	60.2	35.1	125.7	51.5	48.4	45.8	117.3	46.4	43.4	24.9
Cu	98.7	110.2	261.8	283.6	223.3	89.9	41.0	303.6	250.8	193.4	Cu	58.0	48.6	101.2	52.8	54.4	70.5	260.3	37.2	44.6	57.8
Ni	47	95	130	152	133	42	29	97	143	173	Ni	36	26	56	47	24	36	63	18	19	17
Cr V	43.3	34.5	132	145	114	33.5	0.0	120	101	85.0	v	44.0	42	113.3	49.5	47.0	63	125.0	44	46	31.0
Ce	22.2	22.5	46.2	140	56.4	5.8	3.7	53.9	50.3		Ce	20.1	14.1	65.3	25.5	23.0	20.7	66.2	22.5	20.2	12.7
Ba Sc	671	1033	1383	1295 15.6	1328	791	301	1099	1262	1314 17.7	Ba Sc	597	546	820	378	513	289	748	687	557	316
123-765B	3H-1.	4H-3,	4H-6.	4H-6.	5H-7,	7H-3.	8H-6.	9H-6.	10H-3.	10H-5.	123-765B	15H-3,	15H-5,	15H-5,	15H-5,	15H-7,	16H-1,	16H-1,	16H-1,	16H-1,	17H-5,
123-765B	3H-1, 33-35	4H-3, 145-150	4H-6, 20-22	4H-6, 23-30	5H-7, 40-42	7H-3, 38-43	8H-6, 85-90	9H-6, 104-105	10H-3, 145-150	10H-5, 89-95	123-765B	15H-3, 32-44	15H-5, 23-27	15H-5, 49-54	15H-5, 116-121	15H-7, 52-56	16H-1, 42-46	16H-1, 42-46	16H-1, 42-46	16H-1, 42-46	17H-5, 63-65
123-765B Depth:	3H-1, 33-35 19.13	4H-3, 145-150 32.95	4H-6, 20-22 36.20	4H-6, 23-30 36.23	5H-7, 40-42 47.50	7H-3, 38-43 60.78	8H-6, 85-90 75.45	9H-6, 104-105 85.34	10H-3, 145-150 90.85	10H-5, 89-95 93.29	123-765B Depth:	15H-3, 32-44 137.82	15H-5, 23-27 140.73	15H-5, 49-54 140.99	15H-5, 116-121 141.66	15H-7, 52-56 144.02	16H-1, 42-46 144.62	16H-1, 42-46 144.62	16H-1, 42-46 144.62	16H-1, 42-46 144.62	17H-5, 63-65 160.53
123-765B Depth: Color: Lithology:	3H-1, 33-35 19.13 Lt olive Cc. ooze	4H-3, 145-150 32.95	4H-6, 20-22 36.20 Red gray Clay	4H-6, 23-30 36.23 Red gray Clay	5H-7, 40-42 47.50 Lt olive Cc. sand	7H-3, 38-43 60.78 Lt ol gray Cc. ooze	8H-6, 85-90 75.45 Lt ol gray Cc. ooze	9H-6, 104-105 85.34 Gr gray Cc. ooze	10H-3, 145-150 90.85	10H-5, 89-95 93.29 Lt gy blue Clay	123-765B Depth: Color: Lithology:	15H-3, 32-44 137.82 Gy olive Clay	15H-5, 23-27 140.73 Gr gray Cc. clay	15H-5, 49-54 140.99 Lt ol gray Cc. ooze	15H-5, 116-121 141.66 Lt gr gray Cc. ooze	15H-7, 52-56 144.02 Lt ol gray Cc. sand	16H-1, 42-46 144.62 Lt ol gray Cc. sand	16H-1, 42-46 144.62 Lt ol gray Cc. sand	16H-1, 42-46 144.62 Lt ol gray Cc. sand	16H-1, 42-46 144.62 Lt ol gray Cc. sand	17H-5, 63-65 160.53 Lt ol gray Cc. sand
123-765B Depth: Color: Lithology: Method:	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF	4H-3, 145-150 32.95 DCP	4H-6, 20-22 36.20 Red gray Clay XRF	4H-6, 23-30 36.23 Red gray Clay DCP	5H-7, 40-42 47.50 Lt olive Cc. sand XRF	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF	9H-6, 104-105 85.34 Gr gray Cc. ooze XRF	10H-3, 145-150 90.85 DCP	10H-5, 89-95 93.29 Lt gy blue Clay DCP	123-765B Depth: Color: Lithology: Method:	15H-3, 32-44 137.82 Gy olive Clay XRF	15H-5, 23-27 140.73 Gr gray Cc. clay XRF	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF
123-7658 Depth: Color: Lithology: Method: SiO2 TiO2	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 203	4H-3, 145-150 32.95 DCP 41.99 538	4H-6, 20-22 36.20 Red gray Clay XRF 56.28	4H-6, 23-30 36.23 Red gray Clay DCP 56.97 704	5H-7, 40-42 47.50 Lt olive Cc. sand XRF 14.25	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 227	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 403	9H-6, 104-105 85.34 Gr gray Cc. ooze XRF 23.16 251	10H-3, 145-150 90.85 DCP 22.43	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18	123-765B Depth: Color: Lithology: Method: SiO2 TiO2	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 971	15H-5, 23-27 140.73 Gr gray Cc. clay XRF 35.56	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 359	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 341	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 334	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 343	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 330	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 340	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 200
123-765B Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 .203 4.40	4H-3, 145-150 32.95 DCP 41.99 .538 11.16	4H-6, 20-22 36.20 Red gray Clay XRF 56.28 .739 14.78	4H-6, 23-30 36.23 Red gray Clay DCP 56.97 .704 14.88	5H-7, 40-42 47,50 Lt olive Cc. sand XRF 14,25 .153 2,95	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32	10H-3, 145-150 90.85 DCP 22.43 .337 6.04	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86	123-765B Depth: Color: Lithology: Method: SiO2 TiO2 AI2O3	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07	15H-5, 23-27 140.73 Gr gray Cc. clay XRF 35.56 .596 11.82	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 6.66	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73
123-7658 Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 .203 4.40 1.56	4H-3, 145-150 32.95 DCP 41.99 .538 11.16 3.57	4H-6, 20-22 36.20 Red gray Clay XRF 56.28 .739 14.78 5.45	4H-6, 23-30 36.23 Red gray Clay DCP 56.97 .704 14.88 6.35	5H-7, 40-42 47.50 Lt olive Cc. sand XRF 14.25 .153 2.95 1.24	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22	9H-6, 104-105 85.34 Gr gray Cc. ooze XRF 23.16 .351 7.32 2.67	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47	123-7658 Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07 7.45	15H-5, 23-27 140.73 Gr gray Cc. clay XRF 35.56 .596 11.82 4.72	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 6.66 2.43	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 .203 4.40 1.56 .345	4H-3, 145-150 32.95 DCP 41.99 .538 11.16 3.57 .100 2.05	4H-6, 20-22 36.20 Red gray Clay XRF 56.28 .739 14.78 5.45 1.217 2.28	4H-6, 23-30 36.23 Red gray DCP 56.97 .704 14.88 6.35 .265 3 30	5H-7, 40-42 47,50 Lt olive Cc. sand XRF 14,25 .153 2.95 1.24 .080	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 .118	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46	9H-6, 104-105 85.34 Gr gray Cc. ooze XRF 23.16 .351 7.32 2.67 .118 2.51	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98	123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MaO	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07 7.45 .039 4.07	15H-5, 23-27 140.73 Gr gray Cc. clay XRF 35.56 .596 11.82 4.72 .051 2 59	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1 64	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1 44	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 5.66 2.43 .082	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1 29	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43 .080 1 26	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50 .084	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048
123-7658 Depth: Color: Lithology: Method: TiO2 TiO2 Al2O3 FeO MnO MgO CaO	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 .203 4.40 1.56 .345 1.14 40.16	4H-3, 145-150 32.95 DCP 41.99 .538 11.16 3.57 .100 2.05 16.79	4H-6, 20-22 36.20 Red gray Clay XRF 56.28 .739 14.78 5.45 5.45 1.217 3.28 .83	4H-6, 23-30 36.23 Red gray DCP 56.97 .704 14.88 6.35 .265 3.30 .67	5H-7, 40-42 47,50 Lt olive Cc. sand XRF 14.25 .153 2.95 1.24 .080 1.10 41.55	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 .118 1.75 39.40	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46 26.46	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36	123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07 7.45 .039 4.07 .59	15H-5, 23-27 140.73 Gr gray Cc. clay XRF 35.56 .596 11.82 4.72 .051 2.59 20.68	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 6.66 2.43 .082 1.43 32.62	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43 .080 1.26 31.98	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50 .084 1.32 32.84	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 .203 4.40 1.56 .345 1.14 40.16 .02	4H-3, 145-150 32.95 DCP 41.99 .538 11.16 3.57 .100 2.05 16.79 1.67	4H-6, 20-22 36.20 Red gray Clay XRF 56.28 .739 14.78 5.45 1.217 3.28 .83 3.75	4H-6, 23-30 36.23 Red gray DCP 56.97 .704 14.88 6.35 .265 3.30 .67 3.61	5H-7, 40-42 47.50 Lt olive Cc. sand XRF 14.25 153 2.95 1.24 .080 1.10 41.55 .09	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 .118 1.75 39.40 .44	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46 26.46 1.40	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36 2.07	123-7658 Depth: Color: Lithology: Method: TiO2 Ai2O3 FeO MnO MgO CaO Na2O	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07 7.45 .039 4.07 .59 1.78	15H-5, 23-27 140.73 Gr gray Cc. clay XRF 35.56 .596 11.82 4.72 .051 2.59 20.68 .566	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30 .62	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 6.66 2.43 .082 1.43 32.62 .46	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25 1.09	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43 .080 1.26 31.98 1.10	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50 .084 1.32 32.84 1.10	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O R2O5	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 .203 4.40 1.56 .345 1.14 40.16 .02 .75 .134	4H-3, 145-150 32.95 DCP 41.99 .538 11.16 3.57 1.00 2.05 16.79 1.67 1.87	4H-6, 20-22 36.20 Red gray Clay XRF 56:28 .739 14.78 5.45 1.217 3.28 .83 3.75 2.42	4H-6, 23-30 36.23 Red gray DCP 56.97 .704 14.88 6.35 .265 3.30 .67 3.61 2.70	5H-7, 40-42 47,50 Lt olive Cc. sand XRF 14,25 1,53 2,95 1,24 .080 1,10 41,55 .09 .62 066	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 1.75 39.40 .44 .85	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46 26.46 1.40 1.31 142	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36 2.07 3.29 138	123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O R2O P2O5	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07 7,45 .039 4.07 .59 1.78 3.45 53.89	15H-5, 23-27 140.73 Gr gray Cc. clay XRF 35.56 .596 11.82 4.72 .051 2.59 20.68 .56 .56 .56 .52 2.52	15H-5, 49-54 140.99 Ltol gray Cc. coze XRF	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65 1.29 113	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30 .62 1.31	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 6.66 2.43 .082 1.43 32.62 .46 1.23 106	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25 1.09 1.15	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43 .080 1.26 31.98 1.10 1.15 1.00	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50 .084 1.32 32.84 1.10 1.15 100	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50 .95 071
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O R2O5 EOI LOI	3H-1, 33-35 19.13 Lt alive Cc. ooze XRF 14.28 .203 4.40 1.56 .345 1.14 40.16 .02 .75 .134 37.00	4H-3, 145-150 32.95 41.99 .538 11.16 3.57 .100 2.05 16.79 1.67 1.87 .120 19.14	4H-6, 20-22 36:20 Red gray XRF 56:28 739 14:78 5.45 1.217 3.28 83 3.75 2.42 .105 11.15	4H-6, 23-30 36.23 Red gray DCP 56.97 .704 14.88 6.35 .265 3.30 .67 3.61 2.70 .115 10.45	5H-7, 40-42 47.50 Lt olive Cc. sand XRF 14.25 .153 2.95 1.24 .080 1.10 41.55 .09 .62 .066 37.90	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 3.118 1.75 39.40 .44 .85 .176 35.60	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46 26.46 1.40 1.31 .142 27.25	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23 1.08 1.23 3.166 3.65	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94 1.13 .143 31.13	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .044 3.98 2.07 3.29 .138 7.73	123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07 7,45 .039 4.07 .59 1.78 3.45 .139 8.56	15H-5, 23-27 140,73 Gr gray Cc. clay XRF 35,56 .596 11.82 4,72 .051 2.59 20,68 .56 2.52 2.52 112 20,80	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65 1.29 .113 30.60	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30 .62 1.31 .123 29.80	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 6.66 2.43 .082 1.43 32.62 .46 1.23 .106 29.50	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25 1.09 1.15 .113 30.26	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43 .080 1.26 31.98 1.10 1.15 .100 29.50	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50 .084 1.32 32.84 1.10 1.15 .100 30.26	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50 .95 .071 24.20
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MaO MaO CaO Na2O K2O P2O5 LOI CaCO3	3H-1, 33-35 19.13 Lt alive Cc. ooze XRF 14.28 .203 4.40 1.56 .345 1.14 40.16 .02 .75 .134 37.00 70.64	4H-3, 145-150 32.95 0CP 41.99 .538 11.16 3.57 .100 2.05 16.79 1.67 1.87 .120 19.14	4H-6, 20-22 36:20 Red gray XRF 56:28 739 14:78 5.45 1.217 3.28 83 3.75 2.42 .105 11.15 2.42	4H-6, 23-30 36.23 Red gray DCP 56.97 .704 14.88 6.35 .265 3.30 .67 3.61 2.70 .115 10.45	5H-7, 40-42 47.50 Lt olive Cc. sand XRF 14.25 .153 2.95 1.24 .080 1.10 41.55 .09 .62 .066 37.90 74.47	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 .118 1.75 39.40 .44 .85 .176 35.60 70.31	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46 26.46 26.46 1.40 1.31 .142 27.25 46.90	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23 1.08 1.23 55.31	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94 1.13 .143 31.13	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 6.47 .044 3.98 2.07 3.29 .138 7.73	123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O R2O5 LOI CaCO3	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07 7,45 .039 4.07 .59 1.78 3.45 .139 8.56 1.17	15H-5, 23-27 140,73 Gr gray Cc. clay XRF 35,56 .596 11,82 4,72 .051 2,59 20,68 .56 2,52 .112 20,80 36,49	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 0.084 1.64 32.88 .65 1.29 .113 30.60 58.48	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30 .62 1.31 .123 29.80 57.48	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 6.66 2.43 .082 1.43 32.62 .46 1.23 .106 29.50 57.23	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25 5.1.09 1.15 .113 30.26	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43 .080 1.26 31.98 1.10 1.15 .100 29.50	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50 .084 1.32 32.84 1.10 1.15 .100 30.26	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50 .95 .071 24.20 51.98
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O F2O5 LOI CaCO3 C (Org)	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 .203 4.40 1.56 .345 1.14 40.16 .02 .75 .134 37.00 70.64 .22	4H-3, 145-150 32.95 41.99 .538 11.16 3.57 .100 2.05 16.79 1.67 1.87 .120	4H-6, 20-22 36:20 Red gray XRF 56:28 7.39 14:78 5.45 1.217 3.28 83 3.75 2.42 .105 11.15 2.42 .91	4H-6, 23-30 36.23 Red gray DCP 56,97 .704 14.88 6.35 .265 3.30 .67 3.61 2.70 .115 10.45	5H-7, 40-42 47,50 Lt olive Cc. sand XRF 14,25 .153 2,95 1,24 .080 1,10 41,55 .09 .62 .066 37,90 74,47 .13	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 .118 1.75 39.40 .44 .85 .176 35.60 70.31 .58	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46 26.46 1.40 1.31 1.42 27.25 46.90 .29	9H-6, 104-105 85.34 Gr gray Cc. 0020 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23 1.86 30.65 55.31 .66	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94 1.13 .143 31.13	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36 2.07 3.29 .138 7.73	123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org)	15H-3, 32-44 137.82 Gy dive Clay XRF 53.89 .971 19.07 7.45 .039 4.07 .59 1.78 3.45 .139 8.56 1.17 .29	15H-5, 23-27 140,73 Gr gray Cc. clay XRF 35,56 .596 11,82 4,72 .051 2,59 20,68 56 2,52 .112 20,80 36,49 .31	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF 58.81 .19	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65 1.29 .113 30.60 58.48 .11	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30 .62 1.31 1.23 29.80 57.48 .13	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 6.66 2.43 32.62 .43 32.62 .43 1.43 32.62 .46 1.23 1.06 29.50 57.23 .13	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25 1.09 1.15 .113 30.26	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43 .080 1.26 31.98 1.10 1.15 .100 29.50	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50 .084 1.32 32.84 1.10 1.15 .100 30.26	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50 .95 .071 24.20 51.98 .08
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O P2O5 LOI CaCO3 C (Org) Nb D	3H-1, 33-35 19.13 Lt dive Cc. coze XRF 14.28 .203 4.40 1.56 .345 1.14 40.16 .02 .75 .134 37.00 70.64 .22	4H-3, 145-150 32.95 DCP 41.99 .538 11.16 3.57 .100 2.05 16.79 1.67 1.87 1.20 19.14	4H-6, 20-22 36.20 Red gray XRF 56.28 .739 14.78 5.45 1.217 3.28 .83 3.75 2.42 .105 11.15 2.42 .91	4H-6, 23-30 36.23 Red gray DCP 56,97 .704 14.88 6.35 .265 3.30 .67 3.61 2.70 .115 10.45	5H-7, 40-42 47,50 Lt olive Cc. sand XRF 14,25 1,153 2,95 1,24 .080 1,10 41,55 .090 74,47 .13 2,95 .066	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 .118 1.75 39.40 .44 .85 .176 35.60 70.31 .58 3.7	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46 26.46 26.46 2.645 2.65 2.65 2.65 2.65 2.65 2.65 2.65 2.6	9H-6, 104-105 85.34 Gr gray Cc. 0026 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23 1.86 30.65 55.31 .66	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94 1.13 31.13	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36 2.07 3.29 .138 7.73	123-7658 Depth: Color: Lithology: Method: TiO2 Ai2O3 FeO MnO MgO CaO Na2O K2O CaCO3 C (Org) Nb No CaCO3 C (Org) Nb	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07 7.45 .039 4.07 7.45 1.39 8.56 1.17 .29 13.1	15H-5, 23-27 140,73 Gr gray Cc. clay XRF 35,56 .596 11,82 4,72 .051 12,59 20,68 .56 2,52 .112 20,80 36,49 .31 8,1	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF 58.81 .19 5.5	15H-5, 116-121 141.66 Lt gr gray Cc. 002e XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65 1.29 .113 30.60 58.48 .11 5.9	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30 .62 1.31 1.23 29.80 57.48 .13	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 2.43 .082 1.43 32.62 .46 2.43 1.43 32.62 2.43 1.43 32.62 2.43 1.43 32.65 29.50 57.23 .13	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25 1.09 1.15 .113 30.26	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43 .080 1.26 31.98 1.10 1.15 1.00 29.50	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50 .084 1.32 32.84 1.10 1.15 .100 30.26	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50 .95 .071 24.20 51.98 .08 .08 .08 .08 .08 .071
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Y	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 .203 4.40 1.56 .345 1.14 40.16 .02 .75 .134 37.00 70.64 .22 3.3 38.5 15.5	4H-3, 145-150 32.95 41.99 .538 11.16 3.57 .100 2.05 16.79 1.67 1.87 .120 19.14	4H-6, 20-22 36.20 Red gray XRF 56.28 .739 14.78 5.45 1.217 3.28 .83 3.75 2.42 .105 11.15 2.42 .91 10.2 150.4 30.8	4H-6, 23-30 36.23 Red gray DCP 56,97 .704 14.88 6.35 .265 3.30 .67 3.61 2.70 .115 10.45	5H-7, 40-42 47,50 Lt olive Cc. sand XRF 14.25 1.24 .080 1.10 41.55 .09 .62 .066 37,90 74.47 .13 2,5 44.7 9,9	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 .118 1.75 39.40 .44 .85 .176 35.60 70.31 .58 3.7 46.9	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46 26.46 1.40 1.31 1.42 27.25 46.90 .29 6.2 80.9 20.7	9H-6, 104-105 85.34 Gr gray Cc. 0026 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23 1.86 30.65 55.31 .66 51 19.0	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94 1.13 .143 31.13 99.7 20.2	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36 2.07 3.29 .138 7.73	123-7658 Depth: Color: Lithology: Method: TiO2 A1203 FeO MnO MgO CaO Na20 K20 CaC03 C (Org) Nb Zr Y	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07 7.45 .039 4.07 7.45 1.39 8.56 1.17 .29 13.1 190.4 28.3	15H-5, 23-27 140,73 Gr gray Cc. clay XRF 35,56 .596 11.82 4,72 .051 2,59 20,68 .56 2,52 11/2 20,80 36,49 .31 8,1 115,8 19,6	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF 58.81 .19 5.5 70.9 15.8	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65 1.29 .113 30.60 58.48 .11 5.9 7.3.6	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30 .62 1.31 1.23 29.80 57.48 .13 5.5 96.9 16.0	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 6.66 2.43 32.62 .43 32.62 .46 1.23 1.06 29.50 57.23 .13 5.5 94.0 15.2	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25 1.09 1.15 .113 30.26	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43 .080 1.26 31.98 1.10 1.15 1.00 29.50	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 340 6.76 6.76 2.50 .084 1.32 32.84 1.10 1.15 100 30.26	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50 .95 .071 24.20 51.98 .08 .08 .12 .08 .071 24.20 51.98 .08 .071 24.20 51.98 .08 .071 24.20 .071 24.20 .071 24.20 .071 24.20 .071 24.20 .071 24.20 .071 24.20 .071 24.20 .071 24.20 .071 24.20 .071 24.20 .071 .071 .071 .071 .071 .071 .071 .07
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 .203 4.40 1.56 .345 1.14 40.16 .02 .75 .134 37.00 70.64 .22 3.3 38.5 15.55 15.55	4H-3, 145-150 32.95 41.99 .538 11.16 3.57 .100 2.05 16.79 1.67 1.87 .120 19.14	4H-6, 20-22 36:20 Red gray XRF 56:28 .739 14:78 5.45 1.217 3.28 83 3.75 2.42 .105 11.15 2.42 .91 10.2 150.4 30.8 8171	4H-6, 23-30 36.23 Red gray DCP 56,97 .704 14.88 6.35 .265 3.30 .67 3.61 2.70 .115 10.45	5H-7, 40-42 47,50 Lt olive Cc. sand XRF 14,25 .153 2,95 1,24 .080 1,10 41,55 .09 .62 .066 37,90 74,47 .13 2,5 44,7 9,9 9,9 9,9	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 .118 1.75 39.40 .44 .85 1.766 35.60 70.31 .58 3.7 46.9 14.3 3.1967	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46 26.46 1.40 1.31 1.42 27.25 46.90 .29 6.2 80.9 20.7 998	9H-6, 104-105 85.34 Gr gray Cc. 0020 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23 1.86 30.65 55.31 .66 5.1 62.1 19.0 1330	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94 1.13 .143 31.13 99.7 20.2 21142	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36 2.07 3.29 .138 7.73 198.5 33.1 160	123-7658 Depth: Color: Lithology: Method: TiO2 Ai2O3 FeO MnO MgO CaO Na2O K2O CaCO3 C (Org) Nb Zr Y Sr	15H-3, 32-44 137.82 Gy dive Clay XRF 53.89 .971 19.07 7.45 .039 4.07 .59 1.78 3.45 1.19 8.56 1.17 .29 13.1 190.4 28.3 3222	15H-5, 23-27 140,73 Gr gray Cc. clay XRF 35,56 .596 11,82 4,72 .051 2,59 20,68 56 2,52 .112 20,80 36,49 .31 8,1 115,8 19,66 1128	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF 58.81 .19 5.5 70.9 15.8 1325	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65 1.29 1.13 30.60 58.48 .11 5.9 7.3.6 1.44, 1.54 1.15 1.12 1.12 1.12 1.12 1.12 1.12 1.12	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.055 2.53 .074 1.44 32.30 .62 1.31 1.23 29.80 57.48 .13 5.5 96.9 916.0 1143	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 6.66 2.43 32.62 .43 32.62 .43 1.43 32.62 .46 29.50 57.23 .13 5.5 94.0 15.2 1130	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25 1.09 1.15 .113 30.26 97.66 15.66 1107	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43 .080 1.26 31.98 1.10 1.15 .100 29.50 94.8 15.9 1106	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50 .084 1.32 32.84 1.10 1.15 .100 30.26	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50 .95 .071 24.20 51.98 .08 4.1 112.8 .08 4.1
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O Na2O Na2O Na2O CaCO3 C (Org) Nb Zr Y Sr Rb	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 2.03 4.40 1.56 3.45 1.14 40.16 3.45 1.14 40.16 3.45 1.14 40.16 3.45 1.14 40.16 3.35 1.134 37.00 70.64 22 3.3 38.5 15.5 15.5 15.5 15.5	4H-3, 145-150 32.95 DCP 538 11.16 3.57 1.00 2.05 16.79 1.67 1.87 1.20 19.14	4H-6, 20-22 36,20 Red gray Clay XRF 56,28 7,399 14,78 5,45 1,217 3,26 8,33 3,75 2,42 1,05 11,15 2,42 2,42 1,05 11,15 2,42 1,05 11,15 2,42 1,05 11,15 2,42 1,05 11,05 11,15 2,42 1,05 11,15 2,42 1,05 1,05 1,05 1,05 1,05 1,05 1,05 1,05	4H-6, 23-30 36.23 Red gray DCP 56,97 .704 14.88 6.35 .265 3.30 .67 3.61 2.70 .115 10.45	5H-7, 40-42 47,50 Lt olive Cc. sand XRF 14,25 1,24 0,80 1,10 41,55 0,066 37,90 74,47 .13 2,5 44,7 9,9 9,1022 22,0	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 .118 1.75 39.40 .44 .85 .176 35.60 70.31 .58 3.7 46.9 14.3 1967 31.4	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46 26.46 1.40 1.31 1.42 27.25 46.90 .29 6.2 80.9 20.7 998 6.1 90.9	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23 1.86 55.31 .66 51.1 62.1 19.0 1330 33.2	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94 1.13 .143 31.13 99.7 20.7 21142	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 889 18.86 6.47 .044 3.98 .36 2.07 3.29 .138 7.73 198.5 33.1 160	123-7658 Depth: Color: Lithology: Method: TiO2 Ai2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07 7,45 .039 4.07 .59 4.07 .59 1.78 3.45 1.139 8.566 1.17 .29 13.1 190.4 222 13.1 190.4 222 147.8	15H-5, 23-27 140.73 Gr gray XRF 35.566 5.566 11.82 4.72 0.051 2.59 20.68 5.56 2.52 .112 20.80 36.49 .31 115.8 8.1 115.8 8.1 115.8 8.1 115.8 1128 99.2 71 =	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF 58.81 .19 5.5 70.9 15.8 1325 57.7	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65 1.29 .113 30.60 58.48 .11 5.9 7.3.6 1.44 1.29 .133 30.60 58.48 .11 5.9 7.3.6 1.44 .129 .133 .133 .129 .133 .134 .129 .133 .133 .134 .134 .135 .135 .135 .129 .133 .133 .136 .135 .135 .135 .135 .144 .144 .154 .155 .129 .133 .130 .135 .135 .137 .136 .136 .137 .137 .136 .137 .136 .136 .137 .137 .136 .136 .136 .137 .136 .136 .137 .136 .137 .136 .136 .136 .136 .136 .136 .136 .136 .136 .136 .136 .136 .136 .137 .136 .136 .136 .136 .136 .136 .136 .136 .137 .136 .136 .137 .136 .136 .137 .136 .136 .137 .136 .136 .136 .137 .136 .137 .136	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.55 2.53 .074 1.44 32.30 .62 1.31 1.23 29.80 57.48 .13 5.5 96.9 916.0 1143 49.2	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 .334 6.66 2.43 .082 1.43 32.62 .46 2.9.50 57.23 .13 5.5 94.0 15.2 1130 46.7	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 32.25 1.09 32.25 1.09 32.25 1.15 .113 30.26 97.66 1106	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .3300 6.73 2.43 .0800 1.26 31.98 1.10 29.50 94.8 15.9 1106	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50 .084 1.32 32.84 1.10 30.26 99.0 15.6 1106	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50 .95 .071 24.20 51.98 .08 4.1 112.8 .08 4.1 112.8 7.9 782 26.4 4.0 5
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O Na2O Na2O Na2O CO(0g) Nb Zr Y Sr Rb Zn CaO	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 .203 4.40 1.56 .345 .114 40.16 .02 .75 .134 37.00 70.64 .22 3.3 38.5 15.5 15.5 1381 28.7 43.1 28.7	4H-3, 145-150 32.95 DCP 5.38 11.16 3.57 1.67 1.87 1.20 19.14 150.9 531 90.5 231.2	4H-6, 20-22 36,200 Red gray Clay XRF 56,28 7,739 14,78 5,45 1,217 3,26 8,83 3,75 2,42 1,05 11,15 2,42 2,24 2,91 10,2 150,4 30,8 1711 100,6 142,0 192,6	4H-6, 23-30 36.23 Red gray DCP 56.97 .704 14.88 6.35 .265 3.300 .67 3.61 12.70 .115 10.45	5H-7, 40-42 47,50 Lt dive Cc. sand XRF 14,25 1,24 2,95 1,24 0,680 37,90 74,47 .13 2,5 44,7 9,9 1022 22,0 29,9 46,7	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 1.75 39.40 .44 .85 .176 35.60 70.31 .58 3.7 46.9 14.3 1967 31.4 44.7 51.7	8H-6, 85-90 75.45 Lt ol gray Cc. ooze XRF 28.55 .403 8.70 3.22 .122 2.46 26.46 26.46 26.46 26.46 26.46 27.25 46.90 .29 6.2 80.9 20.7 998 61.9 81.3 102.3	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23 .186 30.65 55.31 .66 51.1 62.1 19.0 1330 53.2 73.9 73.9 74.0	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94 1.13 .143 31.13 99.7 20.2 1142 51.2 60.3	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36 2.07 3.29 .138 7.73 198.5 33.1 160 118.8 172.7	123-7658 Depth: Color: Lithology: Method: TiO2 TiO2 Ai2O3 FeO MnO Ma2O Ma2O Na2O Na2O Na2O Na2O Na2O Na2O Na2O N	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 .971 19.07 7,45 .039 4.07 .59 1.78 3.45 1.17 .29 1.78 8.56 1.17 .29 13.1 190.4 28.3 222 147.8 140.7 324.9	15H-5, 23-27 140.73 Gr gray XRF 35.56 5.596 11.82 4.72 0.051 1.82 4.72 0.051 1.82 4.72 0.051 1.82 4.72 0.051 1.82 4.72 0.051 1.82 4.72 0.051 1.82 4.72 0.051 1.82 4.72 0.051 1.82 4.72 0.051 1.82 4.72 0.051 1.82 1.82 1.82 1.82 1.82 1.82 1.82 1.8	15H-5, 49-54 140.99 Lt ol gray Cc. coze XRF 58.81 .19 5.5 70.9 15.8 1325 57.7 53.9 42.6	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65 1.29 .113 30.60 58.48 .11 5.9 7.3.6 14.8 1306 55.9 51.5 64.5	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 .144 32.30 .62 1.31 1.123 29.80 57.48 .13 55.5 96.9 1143 49.2 47.0 64.4	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 25.16 2.5.34 4.6.66 2.43 .082 .082 .082 .082 .042 .043 .043 .043 .043 .043 .043 .043 .043	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 32.25 1.09 32.25 1.09 32.25 1.09 32.25 1.13 30.26 97.6 15.6 1107 49.0	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .3300 6.73 2.43 0.800 0.800 1.26 31.98 1.100 29.50 94.8 15.9 1106 45.3 47.3	16H-1, 42-46 144.62 Lt ol gray Cc. sand 0CP 24.45 .340 6.76 2.50 .084 1.32 32.84 1.10 30.26 99.0 1.5.6 1106 115.6	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50 .95 .071 24.20 51.98 .08 4.1 112.8 .08 4.1 112.8 .08 50.5 50.5 50.1
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO Ma2O Ma2O Na2O Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb Zn Cu	3H-1, 33-35 19,13 Lt olive Cc. ooze XRF 14.28 2003 4,40 1.56 3.45 1.14 40,16 .02 .75 1.134 37,00 70,64 .22 3.3 38,5 15,5 1381 128,7 43,1 62,1 31	4H-3, 145-150 32.95 DCP 41.99 .538 11.16 3.57 .100 2.05 16.79 1.67 1.87 .120 19.14 150.9 17.9 531 90.5 231.2 231.2 143	4H-6, 20-22 36.20 Red gray Clay XRF 56.28 7.39 14.78 5.45 1.217 3.28 8 83 3.75 2.42 .105 11.15 2.42 .91 10.2 150.4 30.8 171 100.6 142.0 192.6 153.6	4H-6, 23-30 36,23 Red gray DCP 56,97 .704 14,88 6,35 .265 3,300 .67 3,61 2,70 .115 10,45 145,3 28,7 163 44,8 385,2 324	5H-7, 40-42 47,50 Lt alive Cc. sand XRF 14,25 1,24 .080 1,10 41,55 .09 62 .066 37,90 74,47 .13 2,55 44,7 9,9 1022 22,00 29,9 46,7 20	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 1.75 39.40 .44 .85 .176 35.60 70.31 .58 3.7 46.9 14.3 1967 31.4 44.7 51.7 29	8H-6, 85-90 75,45 Lt ol gray Cc. ooze XRF 28,55 .403 8,70 3,22 .122 2,46 26,46 26,46 26,46 26,46 26,46 26,46 26,46 26,46 26,46 26,46 26,46 26,46 26,46 26,46 26,46 1,31 .142 27,25 46,90 .29 20,7 998 80,9 20,7 998 91,31 10,23 10,23 52 2	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23 .186 30.65 55.31 .66 55.31 19.00 1330 73.9 73.9 73.9 74.0 39	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94 1.43 31.13 99.7 20.2 1142 51.2 6.03 30	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36 2.07 3.29 .138 7.73 198.5 33.1 160 118.8 172.7 95	123-7658 Depth: Color: Lithology: Method: TiO2 TiO2 AI2O3 FeO MnO Na2O Na2O Na2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb Zn Cu	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 9.971 19.07 7.45 0.039 4.07 5.9 1.78 3.45 1.17 2.9 13.1 190.4 28.3 222 147.8 140.7 32429 8.66	15H-5, 23-27 140.73 Gr gray Cc. clay XRF 35.56 5.596 11.82 4.72 .051 1.82 4.72 20.68 5.56 2.52 2.0.80 36.49 36.49 31 115.8 19.6 1128 99.2 71.5 33.6 35.6	15H-6, 49-54 140,99 Lt ol gray Cc. ooze XRF 58.81 .19 5.5 70.9 15.8 1325 57.7 53.9 42.6 22	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65 1.29 .113 30.60 58.48 .111 5.9 73.6 1.4.8 1306 55.9 51.5 64.5 26	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30 .62 1.31 1.123 29.80 57.48 .13 5.5 96.9 16.0 1143 49.2 47.0 64.4 40.2	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 2.43 .082 .43 .082 .43 32.62 .46 1.23 .32.62 .46 29.50 57.23 .13 5.5 94.0 15.2 1130 46.7 45.6 6.1.4 21.10 29.50 29.50 27.50	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25 1.09 32.25 1.09 3.15 .113 30.26 97.6 15.6 1107 49.0 49.4 425	16H-1, 42:46 144.62 Lt ol gray Cc. sand DCP 24.20 .300 6.73 2.43 .080 1.26 31.98 1.100 1.15 .100 29.50 94.8 15.9 1106 45.3 47.3 2.43 .000 29.50	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 .340 6.76 2.50 .084 1.32 32.84 1.10 30.26 99.0 1.15 6.1106 47.4 48.9 25	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50 .95 .071 24.20 51.98 .08 4.1 112.8 7.92 7.82 26.4 19.8 50.1 29
123-7658 Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO Ma2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb Zn Cu U Ni C	3H-1, 33-35 19.13 Lt olive Cc. ooze XRF 14.28 2003 4.40 1.56 .02 .02 .134 40.16 .02 .75 .134 37.00 70.64 .22 .33 38.5 15.5 15.5 15.5 15.5 15.5 15.5 15.5 1	4H-3, 145-150 32.95 DCP 41.99 .538 11.16 3.57 .100 2.05 16.79 1.67 1.87 .120 19.14 150.9 17.9 531 90.5 231.2 2433 56.8	4H-6, 20-22 36.20 Red gray Clay XRF 56.28 .739 14.78 5.45 1.217 3.28 8.83 3.75 2.42 .105 11.15 2.42 .105 11.15 2.42 .105 11.15 2.42 .91 10.2 150.4 30.8 30.8 171 100.6 142.0 192.6 142.0 30.8 37.76	4H-6, 23-30 36,23 Red gray DCP 56,97 .704 14,88 6.35 .265 3.30 .67 3.61 2.70 .115 10.45 145.3 28,7 163 44.8 385.2 324 47,11	5H-7, 40-42 47,50 Lt alive Cc. sand XRF 14,25 1,24 .080 1,10 41,55 .09 62 .066 37,90 74,47 .13 2,55 44,7 9,9 1022 22,0 29,9 46,7 20 29,9 16,9	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 1.78 39.40 .44 .85 .176 35.60 70.31 .58 3.7 46.9 14.3 1967 31.4 44.7 51.7 29 38.6	8H-6, 85-90 75,45 Lt ol gray Cc. ooze XRF 28,55 .403 8,70 3,22 .122 2,46 26,46 26,46 26,46 26,46 26,46 1,40 1,31 .142 27,25 46,90 .29 9,80,9 20,7 9,98 6,22 80,9 9,98 1,3 102,3 52 49,88	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23 .186 30.65 55.31 .186 30.65 55.51 19.0 1330 53.2 73.9 74.0 39 51.6	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94 1.13 31.13 99.7 20.2 1142 51.2 6.03 300 33.4	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36 2.07 3.29 .138 7.73 198.5 33.1 160 118.8 172.7 95 116.6	123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb Zn Cu U Ni	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 9.971 19.07 7.45 .039 4.07 .59 1.78 3.45 .139 8.56 1.17 .29 13.1 190.4 28.3 222 147.8 140.7 324.9 866 127.3	15H-5, 23-27 140,73 Gr gray Cc. clay XRF 35.56 5.596 11.82 4.72 20.68 5.506 2.52 20.68 5.56 2.52 20.68 3.56 2.52 2.112 20.80 3.64 3.11 115.8 19.6 112.8 19.6 115.8 19.6 115.8 3.6 5.5 5.5 5.5 5.5 5.5 5.5 5.5 5.5 5.5 5	15H-6, 49-54 140,99 Lt ol gray Cc. ooze XRF 58.81 .19 5.5 70.9 15.8 1325 57.7 53.9 42.6 22 51.7	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 .163 .2.80 .084 .122 .113 30.60 58.48 .111 5.99 51.5 64.5 266 45.6	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30 .62 1.31 1.123 29.80 57.48 .13 5,55 96.9 16.0 1143 49.2 47.0 64.4 25 42,7	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 2.43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .143 .082 .143 .027 .456 .666 .2,43 .106 .29,50 .13 .13 .13 .152 .152 .152 .152 .152 .152 .153 .152 .153 .152 .153 .152 .153 .153 .155 .153 .155 .153 .155 .155	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .043 6.77 2.49 .083 1.29 32.25 1.09 32.25 1.09 3.15 .113 30.26 97.6 15.6 1107 49.0 49.4 25 43.6	16H-1, 42:46 144.62 Lt ol gray Cc. sand DCP 24.20 3300 6.73 2.43 .080 1.26 31.98 1.10 1.15 .100 29.50 94.8 15.9 1106 45.3 47.3 20 38.6	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 29.45 .50 .95 .071 24.20 51.98 .08 4.1 112.8 7.92 782 26.4 19.8 50.1 29.92 26.4
123-7658 Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO CaO Na2O K2O P2O5 LO1 CaCO3 C (Org) Nb Zr Y Sr Rb Zn Cu U Ni Cor SiO2 TiO2 Al2O3 Na2O Na2O Na2O K2O P2O5 LO1 CaCO3 C (Org) Nb CaO SiO2 C (Org) Nb CaO SiO2 C (Org) SiO2 C (Org) Nb CaO SiO2 C (Org) SiO2 C (Org) SiO2 C (Org) SiO2 CaO SiO2 CAO SiO2 CaO SiO2 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO CAO SiO3 CAO SiO3 CAO SiO3 CAO CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO SiO3 CAO CAO SiO3 CAO SiO3 CAO Si SiO3 CAO Si SiO3 CAO SiO	3H-1, 33-35 19,13 Lt olive Cc. ooze XRF 14.28 203 4,40 1.56 .345 1.14 40,16 .02 .75 .134 40,16 .02 .75 .134 37,00 70,64 .22 3.3 38,5 15,5 15,5 15,5 1381 28,7 43,1 311 31,8 39 26 26	4H-3, 145-150 32.95 DCP 41.99 .538 11.16 3.57 .100 2.05 16.79 1.67 1.87 .120 19.14 150.9 17.9 531 90.5 231.2 143 56.8 118	4H-6, 20-22 36.20 Red gray Clay XRF 56.28 .739 14.78 5.45 1.217 3.28 .83 3.75 2.42 .105 11.15 2.42 .105 11.15 2.42 .101 10.2 150.4 30.8 171 100.6 142.0 192.6 142.0 192.6 142.0 192.6 143.0 192.6 143.0 192.6 143.0 192.6 143.0 192.6 143.0 192.6 143.0 192.6 143.0 192.6 143.0 192.6 143.0 192.6 143.0 192.6 143.0 192.6 143.0 192.6 193.0 193.	4H-6, 23-30 36,23 Red gray DCP 56,97 .704 14,88 6,35 .265 3,300 .67 3,61 2,70 .115 10,45 145,3 28,7 163 44,8 385,2 324 47,1,1 209	5H-7, 40-42 47,50 Lt alive Cc. sand XRF 14,25 1,24 .080 1,10 41,55 .09 62 .066 37,90 74,47 .13 2,55 44,7 9,9 1022 22,00 29,9 46,7 20 29,9 26 16,9 26	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 1.18 1.75 39.40 .44 .85 .176 35.60 70.31 .58 3.7 4.69 14.3 1967 31.4 44.7 51.7 29 38.6 41 15.7 20 38.6 41 41 41 41 41 41 41 41 41 41	8H-6, 85-90 75,45 Lt ol gray Cc. ooze XRF 28,55 .403 8,70 3,22 .122 2,46 26,46 26,46 26,46 26,46 26,46 1,40 1,31 1,142 27,25 46,90 20,7 998 61,9 20,7 998 61,9 81,3 102,3 52 49,8 65 24,45	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 1.23 .186 30.65 55.31 162.1 19.0 1330 53.2 73.9 74.0 39 51.6 60 60	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .143 31.13 99.7 20.2 1142 51.2 6.03 300 33.4 42	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36 2.07 3.29 .138 7.73 198.5 33.1 160 118.8 172.7 95 116.6 142	123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb Zn Cu U Ni CaO Na2O Na2O Na2O Na2O Na2O Na2O Na2O Na	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 9.71 19.07 7.45 .039 4.07 .59 1.78 3.45 1.139 8.56 1.17 .29 13.11 190.4 28.3 222 147.8 140.7 324.9 86 127.3 134	15H-5, 23-27 140,73 Gr gray Cc. clay XRF 35,566 5,566 11,82 4,72 20,68 .566 2,52 2,012 20,68 .566 2,52 2,112 20,80 36,49 31 115,8 19,6 1128 99,2 71,5 33,6 6 35 73,9 8 5 43,4	15H-5, 49-54 140.99 Lt ol gray Cc. ooze XRF 58.81 .19 5.5 70.9 15.8 1325 57.7 53.9 42.6 22 51.7 56 22 51.7	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65 1.29 .113 30.60 58.48 .111 5.99 51.5 64.5 266 45.6 56 33.0	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30 .62 1.31 .123 29.80 57.48 .13 5.5 96.9 16.0 1143 49.2 47.0 64.4 25 42.7 51 26.7	16H-1, 42-46 144,62 Lt ol gray Cc. sand XRF 25.16 2.43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .44 .666 .66 .2,43 .082 .143 .082 .43 .082 .44 .625 .46 .666 .2,43 .32,62 .46 .655 .46 .455 .46 .455 .455 .455 .4	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25 1.09 32.25 1.09 32.25 1.09 32.25 1.13 30.26 97.6 15.6 1107 49.0 49.4 25 43.6 56	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 3300 6.73 2.43 .080 1.26 31.98 1.10 1.15 .100 29.50 94.8 15.9 1106 45.3 47.3 200 38.6 46	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.45 	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 48 29.45 .50 .95 .071 24.20 51.98 .08 4.1 112.8 7.99 782 26.4 19.8 50.1 29 9.2 27 71 55
123-7658 Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO CaO Na2O K2O P2O5 LO1 CaCO3 C (Org) Nb Zr Y Sr Rb Zn Cu U Ni Cu Cu Sn Cu Sn Cu Sn Cu Sn Cu Sn Cu Sn Cu Sn Sn Cu Sn Sn Sn Sn Sn Sn Sn Sn Sn Sn Sn Sn Sn	3H-1, 33-35 19,13 Lt olive Cc. ooze XRF 14.28 .203 4.40 1.56 .345 1.14 40,16 .02 .75 .134 40,16 .02 .75 .134 37,00 70,64 2.2 .2 .3 .3 .3 .3.8,5 15,5 1381 28,7 .4 .3,1 31,8 .3 .3 .3 .3 .3 .3 .5 .5 .15,5 .1381 28,7 .4 .3 .3 .3 .3 .3 .5 .5 .15,5 .1381 .2 .5 .15,5 .1381 .2 .5 .15,5 .1381 .2 .5 .1381 .2 .15,5 .1381 .2 .15,5 .1381 .2 .15,5 .1381 .2 .15,5 .1381 .2 .15,5 .1381 .2 .15,5 .1381 .2 .15,5 .1381 .2 .1381 .2 .1381 .2 .2 .1381 .2 .1 .1 .1 .1 .1 .1 .1 .1 .1 .1 .1 .1 .1	4H-3, 145-150 32.95 DCP 41.99 .538 11.16 3.57 .100 2.05 16.79 1.67 1.87 .120 19.14 150.9 17.9 531 90.5 231.2 143 56.8 118 750	4H-6, 20-22 36.20 Red gray Clay XRF 56.28 .739 14.78 5.45 1.217 3.28 .83 3.75 2.42 .105 11.15 2.42 .105 11.15 2.42 .105 11.15 2.42 .105 11.15 2.42 .105 11.15 2.5,45 11.00 10.2 150,4 30.8 171 100,6 142,0 192,6 110,0 155,3 77,6 110 55,3 1609	4H-6, 23-30 36,23 Red gray DCP 56,97 .704 14,88 6,35 .265 3,300 .67 3,61 2,700 .115 10,45 10,45 10,45 145,3 28,7 163 44,8 385,2 324 711 209	5H-7, 40-42 47,50 Lt dive Cc. sand XRF 14,25 1,24 .080 1,10 41,55 .09 62 .086 37,90 74,47 .13 2,5 44,7 44,7 22,0 22,0 22,9 9 46,7 20 29,9 46,7 20 20 20 20 20 20 20 20 20 20 20 20 20	7H-3, 38-43 60.78 Lt ol gray Cc. ooze XRF 15.25 .227 4.56 1.63 .118 1.75 39.40 .44 .855 .176 35.60 70.31 .58 3.7 46.9 14.3 1967 31.4 44.7 51.7 29 38.6 41.6 41.6 44.7 51.7 5	8H-6, 85-90 75,45 Lt ol gray Cc. ooze XRF 28,55 .403 8.70 3.22 .122 2.466 26.46 1.40 1.31 1.31 1.42 27,25 46,90 20,7 998 61.9 20,7 998 61.9 20,7 998 61.3 102.3 10.3 10.3 10.3 10.3 10.3 10.3 10.3 10	9H-6, 104-105 85.34 Gr gray Cc. 0028 XRF 23.16 .351 7.32 2.67 .118 2.51 30.73 1.08 2.51 30.73 1.08 30.65 55.31 62.1 19.0 1330 53.2 73.9 74.0 39 51.6 60 19.3 758	10H-3, 145-150 90.85 DCP 22.43 .337 6.04 2.22 .184 1.47 34.74 .94 1.43 31.13 31.13 99.7 20.2 1142 51.2 60.3 300 33.4 42 689	10H-5, 89-95 93.29 Lt gy blue Clay DCP 56.18 .889 18.86 6.47 .044 3.98 .36 2.07 3.29 .138 7.73 198.5 33.1 160 118.8 172.7 95 116.6 142 699	123-7658 Depth: Color: Lithology: Method: TiO2 Ai2O3 FeO MnO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Rb Zn Cu V V Ce Ba	15H-3, 32-44 137.82 Gy olive Clay XRF 53.89 971 19.07 7,45 .039 4.07 7,45 .139 8.56 1.178 8.56 1.179 8.56 1.179 8.56 1.179 8.56 1.179 8.56 1.179 8.52 1.190.4 28.3 222 147.8 140.7 324.9 86 127.3 134 6.9.8 810	15H-5, 23-27 140.73 Gr gray Cc. clay XRF 35.56 5.56 5.56 11.82 4.72 20.68 5.56 2.52 2.12 20.80 36.49 20.68 5.56 2.52 2.112 20.80 36.49 20.68 5.56 5.56 2.52 2.112 20.80 36.49 2.55 2.512 2.112 3.1123 3.112 3.1123	15H-6, 49-54 140.99 Lt ol gray Cc. ooze XRF 58.81 .19 5.5 57.7 53.9 42.6 22 51.7 56 22.5 56 33	15H-5, 116-121 141.66 Lt gr gray Cc. ooze XRF 21.69 .359 7.91 2.80 .084 1.64 32.88 .65 1.29 .113 30.60 58.48 .111 5.9 7.3.6 1.4.8 1306 55.9 51.5 64.5 266 45.6 56 33.0 591	15H-7, 52-56 144.02 Lt ol gray Cc. sand XRF 24.42 .341 7.05 2.53 .074 1.44 32.30 .62 1.31 .123 29.80 57.48 .13 5.5 96.9 16.0 1143 49.2 47.0 64.4 255 42.7 51 26.7	16H-1, 42-46 144.62 Lt ol gray Cc. sand XRF 25.16 2.43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .43 .082 .44 .55 .55 .55 .55 .54 .02 .133 .1130 .125 .133 .125 .155 .55 .55 .55 .55 .55 .55 .55 .55	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.44 .343 6.77 2.49 .083 1.29 32.25 1.09 32.25 1.09 32.25 1.09 32.25 1.13 30.26 97.66 15.66 1107 49.0 49.4 25 243.6 56 56	16H-1, 42-46 144.62 Lt ol gray Cc. sand DCP 24.20 .330 6.73 2.43 .080 1.26 31.98 1.10 1.15 .100 29.50 94.8 15.9 1106 45.3 47.3 20 38.6 46 432	16H-1, 42-46 144.62 L1 ol gray Cc. sand DCP 24.45 2.50 .084 1.32 32.84 1.32 32.84 1.10 1.15 .100 30.26 99.0 15.6 1106 47.4 48.9 25 248.9 60 430	17H-5, 63-65 160.53 Lt ol gray Cc. sand XRF 39.75 .200 2.73 1.62 .048 .48 29.45 .50 .95 .071 24.20 51.98 .08 4.1 112.8 7.9 782 26.4 19.8 50.1 29.2 26.4 19.8 50.1 29.2 275 15.5 251

Table 1 (continued).

Table 1 (continued).

123-765B	18H-1,	18H-3,	19X-3,	20X-2,	21X-2,	21X-3,	22X-1,	23X-2,	24X-4,	26X-1,	123-765B	36X-2,	37X-CC,	39X-1,	39X-1,						
	13-19	145-150	20-26	125-129	145-150	64-70	94-97	91-97	77-83	69-73		81-86	19-25	20-26	86-91		- C				
Depth:	163.73	168.10	176.50	185.75	195.65	196.34	203.34	214.51	227.07	241.89	Depth:	340.21	350.70	366.90	367.56						
Color:	Gy olive	Lt ol gray	Lt brown	Yel gray		Gy green	Ol gray	Lt ol gray	OI gray	Lt ol gray	Color:	Lt olive	Lt gr gray	Gy olive							
Lithology:	Clay	Cc. ooze	Cc. sand	Cc. ooze		Clay	Cc. sand	Cc. ooze	Clay	Cc. sand	Lithology:	Chalk	Chalk	Dol. day							
Method:	DCP	DCP	DCP	XRF	DCP	DCP	XRF	DCP	DCP	XRF	Method:	DCP	DCP	DCP	DCP						
			10000		1.000			10000000		1.000	000000	121210	110000000000000000000000000000000000000	1.1042.012420	10110-001						
SiO2	52.18	15.68	15.77	14.43	8.01	52.69	18.13	14.26	47.16	6.68	SiO2	5.51	11.57	41.60	3.07						
TiO2	.922	.287	.132	.234	.130	.873	.179	.240	.697	.062	.TiO2	.108	.214	.539	.041						
A1203	19.64	5.77	2.28	4.33	2.50	16.54	1.94	4.59	14.05	.69	AI2O3	2.01	3.89	10.57	.41						
FeO	6.59	2.00	1.56	1.69	1.31	5.47	1.65	1.50	4.30	.22	FeO	.63	1.31	3.35	.16						
MnO	.035	.051	.053	.042	.064	.027	.029	.037	.024	.019	MnO	.026	.017	.033	.022						
MgO	3.39	1.11	.68	1.68	1.69	5.75	1.94	2.79	7.68	1.12	MgO	2.07	2.94	9.15	2.20						
CaO	2.27	39.39	43.28	40.97	45.65	2.66	41.10	39.71	6.93	49.87	CaO	48.87	41.71	12.25	50.77						
Na2O	1.77	.71	1.07	.13	.53	1.98	.17	.91	1.56	.08	Na2O	.62	.68	1.28	.33						
K20	2.97	.83	.56	.67	.40	2.54	.41	.70	2.19	.19	K2O	.30	.47	1.16	.08						
P205	.198	.122	.105	.123	.110	.287	.143	.091	.137	.064	P205	.062	.054	.178	.022						
LOI	10.04	34.4	35.17	35.7	39.27	11.18	34.3	36.74	15.27	41	LOI	41.25	37.87	19.89	43						
CaCO3				74.72			73.80			91.96	CaCO3										
C (Org)				.00			.07			.00	C (Org)										
IND 7	100 7	CC C	00.1	3.3	07.0	1045	2.3	10.5	150.1	1.0	ND		40.0								
25	196.7	66.5	80.1	55.2	27.9	184.5	93.2	49.5	150.1	38.7	Zr	26.3	43.3	141.2	36.1						
Y	34.3	12.2	9.1	1.1	8.2	33.8	6.1	9.0	21.6	2.1	Y	6.6	7.8	29.2	4.0						
Sr	327	1564	11/9	2086	1801	399	2565	2194	541	1624	Sr	3233	3671	903	2593						
Hb				25.4	05.5		13.3			5.4	Rb				.0						
20	103.7	38.2	38.6	31.6	25.5	11.3	13.5	25.9	51.3	4.9	20	15.9	24.9	59.7	6.9						
Cu	170.1	25.1	55.9	160.0	12.8	109.0	30.5	13.9	14.2	25.7	Cu	13.1	21.1	38.9	1.2						
N	135	19	36	25	10	63	23	13	35	1	NI	3	10	54	2						
Cr	145.5	38.6	20.3	41.0	24.9	120.9	21.7	47.9	114.7	.0	Cr	24.1	49.2	93.7	12.9						
V	133	38	21	39	27	121	16	33	115	3	V	14	34	97	12						
Ce	570	077	170	20.0	105		10.2			1.5	Ce	100			.0						
Ва	5/9	2//	178	151	185	511	93	143	202	/5	Ва	133	145	236	26						
SC	21.1	4.0	2.1		2.4	19.0		5.4	18.6		Sc	2.8	5.3	13.2							
123-765B	26X-3	278.1	288.1	298.2	30X-1	318.3	328.2	338.2	348.00	358.2	123,7650	28.2	38.1	48.3	58.3	6B-1	78.2	88.2	108.3	118.1	118.1
123-765B	26X-3,	27X-1,	28X-1,	29X-2,	30X-1,	31X-3,	32X-2,	33X-2,	34X-CC,	35X-2,	123-765C	2R-2,	3R-1, 131-133	4R-3,	5R-3, 45-49	6R-1,	7R-2,	8R-2,	10R-3,	11R-1, 84-88	11R-1, 91-93
123-765B	26X-3, 72-77 244 92	27X-1, 41-46 251 31	28X-1, 34-38 260.94	29X-2, 21-25 271.91	30X-1, 86-92 280.76	31X-3, 140-150 294.00	32X-2, 126-129 302.06	33X-2, 71-73	34X-CC, 17-23	35X-2, 37-42	123-765C	2R-2, 90-99	3R-1, 131-133 370.61	4R-3, 140-150 383.40	5R-3, 45-49	6R-1, 143-149 399 73	7R-2, 27-32	8R-2, 114-120 420.34	10R-3, 140-150	11R-1, 84-88 446 84	11R-1, 91-93
123-765B Depth: Color:	26X-3, 72-77 244.92 Lt olive	27X-1, 41-46 251.31 Gr gray	28X-1, 34-38 260.94	29X-2, 21-25 271.91 Ol gray	30X-1, 86-92 280.76	31X-3, 140-150 294.00	32X-2, 126-129 302.06	33X-2, 71-73 311.21	34X-CC, 17-23 321.90	35X-2, 37-42 330.17 Br gray	123-765C Depth: Color:	2R-2, 90-99 362.00	3R-1, 131-133 370.61 Br black	4R-3, 140-150 383.40	5R-3, 45-49 392.05	6R-1, 143-149 399.73 Ol grav	7R-2, 27-32 409.77 Gy green	8R-2, 114-120 420.34 Olive	10R-3, 140-150 440.90	11R-1, 84-88 446.84 Ol gray	11R-1, 91-93 446.91
123-765B Depth: Color:	26X-3, 72-77 244.92 Lt olive	27X-1, 41-46 251.31 Gr gray	28X-1, 34-38 260.94 Lt olive	29X-2, 21-25 271.91 Ol gray	30X-1, 86-92 280.76 Lt gr gray Chalk	31X-3, 140-150 294.00	32X-2, 126-129 302.06 Lt gr gray	33X-2, 71-73 311.21 Lt gr gray Chalk	34X-CC, 17-23 321.90 Ol gray	35X-2, 37-42 330.17 Br gray	123-765C Depth: Color:	2R-2, 90-99 362.00 Lt ol gray Chalk	3R-1, 131-133 370.61 Br black Dol. clay	4R-3, 140-150 383.40	5R-3, 45-49 392.05 Lt gr gray	6R-1, 143-149 399.73 Ol gray Chalk	7R-2, 27-32 409.77 Gy green	8R-2, 114-120 420.34 Olive	10R-3, 140-150 440.90	11R-1, 84-88 446.84 Ol gray	11R-1, 91-93 446.91 Lt ol gray Chalk
123-765B Depth: Color: Lithology: Method:	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF	29X-2, 21-25 271.91 Ol gray Cc. sand DCP	30X-1, 86-92 280.76 Lt gr gray Chalk DCP	31X-3, 140-150 294.00	32X-2, 126-129 302.06 Lt gr gray Cc. sand XBF	33X-2, 71-73 311.21 Lt gr gray Chalk XBF	34X-CC, 17-23 321.90 Ol gray Cc. sand	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP	123-765C Depth: Color: Lithology: Method	2R-2, 90-99 362.00 Lt ol gray Chalk DCP	3R-1, 131-133 370.61 Br black Dol. clay DCP	4R-3, 140-150 383.40 DCP	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP	6R-1, 143-149 399.73 Ol gray Chalk DCP	7R-2, 27-32 409.77 Gy green Clay DCP	8R-2, 114-120 420.34 Olive Cc. ooze DCP	10R-3, 140-150 440.90	11R-1, 84-88 446.84 Ol gray Cc. clay XBF	11R-1, 91-93 446.91 Lt ol gray Chalk DCP
123-765B Depth: Color: Lithology: Method:	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF	29X-2, 21-25 271.91 Ol gray Cc. sand DCP	30X-1, 86-92 280.76 Lt gr gray Chalk DCP	31X-3, 140-150 294.00 DCP	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF	33X-2, 71-73 311.21 Lt gr gray Chalk XRF	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP	123-765C Depth: Color: Lithology: Method:	2R-2, 90-99 362.00 Lt ol gray Chalk DCP	3R-1, 131-133 370.61 Br black Dol. clay DCP	4R-3, 140-150 383.40 DCP	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP	6R-1, 143-149 399.73 Ol gray Chalk DCP	7R-2, 27-32 409.77 Gy green Clay DCP	8R-2, 114-120 420.34 Olive Cc. coze DCP	10R-3, 140-150 440.90 DCP	11R-1, 84-88 446.84 Ol gray Cc. clay XRF	11 R-1, 91-93 446.91 Lt ol gray Chalk DCP
123-765B Depth: Color: Lithology: Method: SiO2	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF 18.65	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78	30X-1, 86-92 280.76 Lt gr gray Chalk DCP 12.99	31X-3, 140-150 294.00 DCP 10.71	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56	123-765C Depth: Color: Lithology: Method: SiO2	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77	4R-3, 140-150 383.40 DCP 13.50	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46	7R-2, 27-32 409.77 Gy green Clay DCP 51.09	8R-2, 114-120 420.34 Olive Cc. ooze DCP 30.45	10R-3, 140-150 440.90 DCP 27.04	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63
123-765B Depth: Color: Lithology: Method: SiO2 TiO2	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF 18.65 .303	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 .105	30X-1, 86-92 280.76 L1 gr gray Chalk DCP 12.99 .175	31X-3, 140-150 294.00 DCP 10.71 .192	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181	123-765C Depth: Color: Lithology: Method: SiO2 TiO2	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 ,100	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730	4R-3, 140-150 383.40 DCP 13.50 .152	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810	8R-2, 114-120 420.34 Olive Cc. ooze DCP 30.45 .466	10R-3, 140-150 440.90 DCP 27.04 .283	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162
123-765B Depth: Color: Lithology: Method: SiO2 TiO2 AI2O3	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF 18.65 .303 5.60	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153 2.93	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 .105 1.50	30X-1, 86-92 280.76 L1 gr gray Chalk DCP 12.99 .175 3.84	31X-3, 140-150 294.00 DCP 10.71 .192 3.66	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 147 2.06	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 .100 1.89	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75	4R-3, 140-150 383.40 DCP 13.50 .152 3.15	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256 4.95	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810 17.07	8R-2, 114-120 420.34 Olive Cc. ooze DCP 30.45 .466 9.88	10R-3, 140-150 440.90 DCP 27.04 .283 6.61	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162 3.13
123-765B Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF 18.65 .303 5.60 1.64	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153 2.93 .96	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 .105 1.50 .45	30X-1, 86-92 280.76 L1 gr gray Chalk DCP 12.99 .175 3.84 1.35	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05	33X-2, 71-73 311.21 Lt gr gray Chaik XRF 17.24 .286 5.98 1.81	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20 1.22	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256 4.95 1.52	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810 17.07 4.82	8R-2, 114-120 420.34 Olive Cc. ooze DCP 30.45 .466 9.88 3.18	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162 3.13 1,11
123-765B Depth; Color; Lithology; Method: SiO2 TiO2 AI2O3 FeO MnO	26X-3, 72-77 244.92 Lt olive Cc. 002e XRF 18.65 .303 5.60 1.64 .021	27X-1, 41-46 251.31 Gr gray Cc. 002e XRF 13.75 .225 4.27 1.26 .021	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153 2.93 .96 .033	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 .105 1.50 .45 .028	30X-1, 86-92 280.76 Lt gr gray Chalk DCP 12.99 .175 3.84 1.35 .027	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 036	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05 0.012	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20 1.22 020	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MoO	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 .061	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044	8R-2, 114-120 420.34 Olive Cc. ooze DCP 30.45 .466 9.88 3.18 .038	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 .050	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162 3.13 1.11 086
123-765B Depth; Color; Lithology; Method: SiO2 TiO2 Al2O3 FeO MnO MgO	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF 18.65 .303 5.60 1.64 .021 2.97	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 .021 2.96	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153 2.93 .96 .033 2.39	29X-2, 21-25 271.91 OI gray Cc. sand DCP 12.78 .105 1.50 .45 .028 1.39	30X-1, 86-92 280.76 L1 gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 3.87	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05 .012 2.92	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 1.22 .020 2.31	123-765C Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 .061 2.88	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50	5H-3, 45-49 392,05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044 6.59	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 .050 4.33	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162 3.13 1.11 .086 1.73
123-765B Depth: Color: Lithology: Method: SiO2 TiO2 Ai2O3 FeO MnO MgO CaO	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153 2.93 .96 .033 2.39 44.39	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 .105 1.50 .45 .028 1.39 45.07	30X-1, 86-92 280.76 L1 gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 3.87 38.73	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05 .012 2.92 41.47	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20 1.22 .020 2.31 42.11	123-765C Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 .061 2.88 44.49	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 3.9,93	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62	8R-2, 114-120 420.34 Olive Cc. ooze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11	111R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 .050 4.33 18.21	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162 3.13 1.11 .086 1.73 45.88
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O	26X-3, 72-77 244.92 Lt olive Cc. 002e XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 .33	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153 2.93 .96 .033 2.39 44.39 .19	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 .105 1.50 .45 .028 1.39 45.07 .50	30X-1, 86-92 280.76 L1 gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 3.87 38.73 38.73 .80	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05 .012 2.92 41.47 .25	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 3.25	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 51 .014 .84 26.96 .40	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MoO MgO CaO Na2O	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 .061 2.88 44.49 .57	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 39.93 .52	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57	6R-1, 143-149 399,73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70	111R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 .050 4.33 18.21 1.03	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 1.62 3.13 1.11 .086 1.73 45.88 .41
123-765B Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 .33 .73	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153 2.93 .96 .033 2.39 44.39 .19 .46	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 .105 1.50 .45 .028 1.39 45.07 .50 .31	30X-1, 86-92 280,76 Lt gr gray Chalk DCP 12,99 .175 3,84 1.35 .027 3,87 38,73 .80 .51	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05 5 .012 2.92 41.47 .25 .49	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .40 .76	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52	123-765C Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 .061 2.88 44.49 .57 .21	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 39.93 .52 28	5R-3, 45-49 392.05 Lt gray Cc. silt DCP 17.67 .256 4.95 1.52 3.85 36.41 .57 ,52	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 85	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 .050 4.33 18.21 1.03 1.45	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162 3.13 1.11 .086 1.73 45.88 .41 .35
123-765B Depth: Color; Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO CaO Na2O K2O R2O5 P2O5	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF 18.65 .003 5.60 1.64 .021 2.97 36.22 .32 .99 .079	27X-1, 41-46 251.31 Gr gray Cc. 002e XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 40.24 33 .73 .106	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153 2.93 .96 .033 2.39 44.39 .19 .46 .095	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.50 .45 .028 1.39 45.07 .50 .31	30X-1, 86-92 280.76 Lt gr gray DCP 12.99 .175 3.84 1.35 .027 38.73 .80 .51	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05 .012 2.92 2.92 41.47 .25 .49 .075	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 .070	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .40 .76 .054	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52 079	123-765C Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O P2O5	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 .061 2.88 44.49 .57 .21 .050	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 1.81	4R-3, 140-150 383.40 DCP 13.50 .152 3.152 .79 .040 3.50 39.93 .52 .28 .052	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108	8R-2, 114-120 420.34 Olive Cc. ooze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 620 12.50 4.11 .050 4.33 18.21 1.03 1.45	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162 3.13 1.11 .866 1.73 45.88 .41 .35 .041
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI	26X-3, 72-77 244.92 Ltolive Cc. coze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 .079 33.20	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 .33 .106 36.10	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 153 2.93 2.39 4.39 4.39 .19 .46 .095 38.20	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 .105 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85	30X-1, 86-92 280.76 Ll gr gray DCP 12.99 .175 3.84 1.35 .027 38.73 .80 51 .092 36.92	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 2.73 43.21 .52 .54 .073 38.26	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05 .012 2.92 41.74 .25 .075 .41.74	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 .070 34.00	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .40 .76 .054 23.87	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52 .079 37.61	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI	2R-2, 90-99 362.00 Lt ol gray DCP 7.38 .100 1.89 .061 2.88 44.49 .57 .21 .050 .050 .050 .050 .050 .050 .057 .057	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 .181	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 3.93 .52 .28 .052 37.58	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93	6R-1, 143-149 399.73 Ol gray DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00	7R-2, 27-32 409.77 Gy great DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.33 18.21 1.03 1.45 .157 20.60	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162 3.13 1.11 .086 .1.73 45.88 .41 .35 .041 38.22
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O Na2O Na2O K2O P2O5 LOI CaCO3	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 .079 33.20 68.89	27X-1, 41-46 251.31 Gr gray Cc. oogr 13.75 .225 4.27 1.26 .021 2.96 40.24 .33 .73 .106 36.10 74.89	28X-1, 34-38 260,94 Lt olive Cc. ooze XRF 10,20 1,53 2,93 2,39 44,39 .19 .46 .095 38,20 80,88	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85	30X-1, 86-92 280.76 Lt gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 3.87 38.73 .80 .51 .092 36.92	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26	32X-2, 126-129 302.06 Lt gr gray Cc. san (2007) 1.154 2.92 1.05 .012 2.92 41.47 .25 .49 .075 41.74 82.22	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 .070 34.00 68.81	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .40 .76 .054 23.87	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 1.22 0.20 2.31 42.11 .77 .52 0.79 37.61	123-765C Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O Na2O Na2O Na2O Na2O Na2O LOI CaCO3	2R-2, 90-99 362.00 Lt ol gray DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77	3R-1, 131-133 370.61 Br black Dol, clay DCP 49.77 .730 13.75 3.64 0.300 9.56 4.43 1.09 1.39 .181 15.44	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 39.93 .52 .28 .052 37.58	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84	11R-1, 84-88 446.84 Ol gray Cc. clay 12.50 4.11 .050 4.33 18.21 1.03 1.45 .157 20.60 32.90	11R-1, 91-93 446.91 Lt ol gray DCP 9.63 .162 3.13 1.11 .086 1.73 45.88 .41 .35 .041 38.22
123-765B Depth: Color; Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O R2O5 LO1 CaCO3 C (Org)	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 .079 33.20 68.89 .13	27X-1, 41-46 251.31 Gr gray Cc. oogr XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 .33 .73 .106 36.10 74.89 .26	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153 2.93 .96 .033 2.39 44.39 .19 .46 .095 38.20 80.88 2.25	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 .105 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85	30X-1, 86-92 280.76 Lt gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 3.87 3.8.73 .80 .51 .092 36.92	31X-3, 140-150 294.00 DCP 10.71 1.192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26	32X-2, 126-129 302.06 Lt gr gray Cc. sanf 1.54 2.92 1.05 .012 2.92 41.47 .25 .49 .075 41.74 82.22 .13	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 0.70 34.00 68.81 .01	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .40 .76 .054 23.87	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52 .079 37.61	123-765C Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O R2O5 LOI CaCO3 C (Org)	2R-2, 90-99 362:00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 .181 15.44	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 39.93 .52 .28 .052 37.58	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 3.85 36.41 .57 52 .059 33.93	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 37 .056 38.00	7R-2, 27-32 409-77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 53 .043 28.84	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 .050 4.33 18.21 1.03 1.45 .157 20.60 32.90 .31	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9,63 1.62 3,13 1.11 .086 1.73 45.88 .41 .35 .041 38.22
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org)	26X-3, 72-77 244.92 Ltolive Cc. coze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 0.79 33.20 68.89 .13	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 .33 .73 .106 36.10 74.89 .26	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 153 2.93 .96 .033 2.39 44.39 .19 .46 .095 38.20 80.88 .25	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85	30X-1, 86-92 280.76 L1 gr gray DCP 12.99 .175 3.84 1.35 .027 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.8	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 1.154 2.92 1.05 0.012 2.92 41.47 .25 .49 0.075 41.74 82.22 .13	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 0.070 34.00 68.81 .01	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .40 .76 .054 23.87	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52 .079 37.61	123-765C Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O R2O5 P2O5 LOI CaCO3 C (Org)	2R-2, 90-99 362:00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 .061 2.88 44.49 .57 .21 .050 41.77	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 .181 15.44	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.903 .52 .28 .052 37.58	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 3.6.41 .57 .52 .059 33.93	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00	7R-2, 27-32 409.77 Gy great Clay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84	11R-1, 84-88 446,84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.13 1.050 4.33 18.21 1.03 1.45 .157 20.60 32.90 .31	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9,63 .162 3.13 1.11 .086 1.73 45.88 .41 .35 .041 38.22
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb	26X-3, 72-77 244.92 Ltolive Cc. coze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 .079 33.20 68.89 .13 4.1	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 33 .73 .106 36.10 36.10 74.89 .26 2.8	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10,20 153 2.93 .96 .033 2.39 44.39 .19 .46 .095 38.20 88.25 1.8	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.05 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85	30X-1, 86-92 280.76 Lt gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.8	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 1.54 2.92 1.05 0.12 2.92 41.74 41.74 82.22 1.3 2.3	33X-2, 71-73 311.21 Li gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 .070 34.00 68.81 .01	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .40 .76 .054 23.87	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52 .079 37.61	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MoO MgO CaOO P2O5 LOI CaCO3 C (Org) Nb	2R-2, 90-99 362.00 Lt ol gray DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 .181 15.44	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 3.93 .52 .28 .052 37.58	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00	7R-2, 27-32 409.77 Gy greay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 .050 4.33 18.21 1.03 1.45 .157 20.60 32.90 .31 9.2	11R-1, 91-93 446.91 LI ol gray Chalk DCP 9.63 1.62 3.13 1.62 3.13 1.11 0.866 1.73 45.88 .41 .35 .041 38.22
123-765B Depth: Color: Lithology: Method: SiO2 TiO2 AI2O3 FeO MnO MgO CaO Na2O Na2O N2O P2O5 LOI CaCO3 C (Org) Nb Zr	26X-3, 72-77 244.92 Lt olive Cc. ooze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 .079 33.20 68.89 .13 4.1 4.63	27X-1, 41-46 251.31 Gr gray Cc. ooc XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 .33 .73 .106 36.10 74.89 .26 2.8 47.0	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153 2.93 .96 .033 2.39 44.39 .19 .46 .095 38.20 80.88 80.88 .25	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.05 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85	30X-1, 86-92 280.76 Lt gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 3.87 38.73 .80 .51 .092 36.92 36.92	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 43.21 .52 .54 40.5	32X-2, 126-129 302.06 Lt gr gray Cc. san (2007) 1.154 2.92 1.05 0.012 2.92 41.47 .25 .49 0.075 41.74 82.22 .13 2.3 3.8.1	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 .070 34.00 68.81 .01	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .40 .76 .054 23.87 96.5	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 1.22 020 2.31 42.11 .77 .52 079 37.61	123-765C Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O P2O5 LO1 CaCO3 C (Org) Nb Zr	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77	3R-1, 131-133 370.61 Br black Dol, clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 .181 15.44	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 39.93 .52 .28 .052 37.58 31.9	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44	8R-2, 114-120 420.34 Olive Cc. ooze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84	11R-1, 84-88 446.84 Ol gray Cc. clay 12.50 4.11 0.50 4.33 18.21 1.03 1.45 .157 20.60 32.90 .31 9.2 122.1	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 1.62 3.13 1.11 .086 6.1.73 45.88 .041 38.22 39.5
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Cr	26X-3, 72-77 244.92 Lt olive Cc. 002e XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 0.79 33.20 68.89 .13 4.1 4.63 8.3	27X-1, 41-46 251.31 Gr gray Cc. coze XRF 13.75 .225 4.27 1.26 0.021 2.96 40.24 .33 .73 .106 36.10 74.89 .26 2.8 4.0 40.0 5.3	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 153 2.93 .96 .033 2.39 44.39 .19 .46 .095 38.20 80.88 .25 38.25 1.8 34.5 5.22	29X-2, 21-25 271.91 0CP 12.78 1.05 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85 90.2 6.6	30X-1, 86-92 280.76 Lt gr gray DCP 12.99 .175 3.84 1.35 .027 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.8	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26 40.5 7.4	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 1.54 2.92 1.05 0.012 2.92 41.47 .25 41.74 82.22 1.3 8.1 3.5 5	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 0.070 34.00 68.81 .01 4.0 60.3 8.3 8.3	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .054 23.87 96.5 6.5	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52 079 37.61	123-765C Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb D Zr Y	2R-2, 90-99 362:00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 .061 2.88 44.49 .57 .21 .050 41.77 33.66 7.8	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 .181 15.44	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 3.93 .52 .28 .052 37.58	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00 50.9 8.8	7R-2, 27-32 409.77 Gy great 2002 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84 60.3 9.0	11R-1, 84-88 446,84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 .050 4.33 18.21 1.03 1.45 .157 20.60 32.90 .31 9.2 122.1	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162 3.13 1.11 .086 1.73 45.88 .41 .35 .041 38.22 39.5 7.8
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MnO MnO MgO CaO P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr	26X-3, 72-77 244.92 Ltolive Cc. ooze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 .079 33.20 68.89 .13 4.1 4.6.3 8.3 2729	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 .33 .106 36.10 74.89 .26 2.8 47.0 6.3 284	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 153 2.93 .96 .033 2.39 44.39 .19 .46 .095 38.20 80.88 .25 1.8 34.5 5.2 3252	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85 90.2 6.6 1625	30X-1, 86-92 280.76 Ll gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.8	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 2.73 43.21 .52 .54 .073 38.26 40.5 7.4 2759	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05 .012 2.92 41.74 82.92 41.74 82.22 .13 2.3 38.1 5.5 3186	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 .070 34.00 68.81 .01 4.0 60.3 8.3 2405	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .51 .014 84 26.96 .054 23.87 96.5 6.5 1049	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52 .079 37.61	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MgO CaO P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr	2R-2, 90-99 362.00 Lt ol gray DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77 33.6 7.8 2794	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 0.30 9.56 4.43 1.09 1.39 .181 15.44 166.1 27.3 422	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 3.93 .52 .28 .052 37.58 31.9 6.9 2498	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 57 .52 .059 33.93 3.93	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00 50.9 8.8 3630	7R-2, 27-32 409.77 Gy greay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20 100.2 13.1 2486	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84 60.3 9.0 9.0 9.50	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 .050 4.33 18.21 1.03 1.45 .157 20.60 32.90 .31 9.2 122.1 21.2 1 21.4 702	11R-1, 91-93 446.91 LI ol gray Chalk DCP 9.63 1.62 3.13 1.62 3.13 1.11 0.866 1.73 45.88 .41 38.22 39.5 7.8 1098
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb	26X-3, 72-77 244.92 Lt olive Cc. 002e XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 .079 33.20 68.89 .13 4.1 46.3 8.3 22729 40.5	27X-1, 41-46 251.31 Gr gray Cc. oc2re XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 .33 .73 .106 36.10 74.89 .26 2.8 47.0 6.3 2846 30.3	28X-1, 34-38 260,94 Lt olive Cc. ooze XRF 10,20 1,53 2,93 2,39 44,39 .19 .46 .095 38,20 80,88 .25 1,8 34,5 5,2 3252 16,9	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85 90.2 6.6 1625	30X-1, 86-92 280.76 Lt gr gray Chalk DCP 12.99 175 3.84 1.35 .027 3.87 38.73 .80 .51 .092 36.92 41.1 8.5 2657	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26 40.5 7.4 2759	32X-2, 126-129 302.06 Lt gr gray Cc. san (2007) 1.154 2.92 1.05 0.12 2.92 41.47 2.92 41.47 2.92 41.47 2.92 41.47 82.22 .13 38.1 5.5 3186 18.8 18.6	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 .070 34.00 68.81 .01 4.0 60.3 8.3 2405 42.5	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .40 .76 .054 23.87 96.5 6.5 1049	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 1.22 0.20 2.31 42.11 .77 .52 0.79 37.61 63.7 9.7 2600	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Y r Rb	2R-2, 90-99 362.00 Lt ol gray DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77 33.6 7.8 2794	3R-1, 131-133 370.61 Br black Dol, clay DCP 49.77 .730 13.75 3.64 0.30 9.56 4.43 1.09 1.39 1.39 1.39 1.81 15.44	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 39.93 .52 .28 .052 37.58 31.9 6.9 2498	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93 69.2 10.0 1683	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00 50.9 8.8 3630	7R-2, 27-32 409.77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20 100.2 13.1 2486	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84 60.3 9.0 1950	11R-1, 84-88 446.84 Ol gray Cc. clay 12.50 4.11 0.50 4.33 18.21 1.03 1.45 1.57 20.60 32.90 3.31 9.2 122.1 21.4 702 64.4	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 1.62 3.13 1.11 .086 6 1.73 45.88 .041 38.22 39.5 7.8 1098
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Rb Zr	26X-3, 72-77 244.92 Lt olive Cc. 002e XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 0.79 33.20 68.89 .13 4.1 4.1 4.1 4.1 4.5 2729 40.5 29.2	27X-1, 41-46 251.31 Gr gray Cc. coze XRF 13.75 .225 4.27 1.26 0.021 2.96 40.24 40.24 40.24 3.33 .73 .106 36.10 74.89 .26 2.8 4.26 3.6.3 3.6.3 2846 3.0.3 3.6.3 3.6.3 3.6.3	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 153 2.93 .96 .033 2.39 44.39 .19 .46 .095 38.20 80.88 .25 38.25 38.25 1.8 34.55.2 32522 16.9 19.6.6	29X-2, 21-25 271.91 0CP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85 90.2 6.6 1625 23.6	30X-1, 86-92 280.76 Lt gr gray DCP 12.99 .175 3.84 1.35 .027 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.8	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26 40.5 7.4 2759 25.9	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05 .012 2.92 41.47 .25 .41.74 82.22 .13 8.1.74 82.22 .13 8.13 8.1 3.8,1 1.8,8 18.8 18.8	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 0.070 34.00 68.81 .01 4.0 68.3 2405 42.5 32.6	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .054 23.87 96.5 6.5 1049 19.4	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52 079 37.61 63.7 9.7 2600 23.5	123-765C Depth: Color: Lithology: Method: TiO2 A12O3 FeO MnO MgO CaO Na2O K2O CaO P2O5 LOI CaCO3 C (Org) Nb D Zr Rb Zr	2R-2, 90-99 362:00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77 33.66 7.8 2794 16.8	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 1.81 15.44 166.1 27.3 422 74.6	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 39.93 .52 .28 .052 37.58 31.9 6.9 2498 26.3	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93 33.93	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 0.566 38.00 50.9 8.8 3630 22.1	7R-2, 27-32 409-77 Gy great 2002 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44 179.2 2.7.6 447 104.4	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20 100.2 13.1 2486 67.7	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84 60.3 9.0 1950 47.5	11R-1, 84-88 446,84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 1.050 4.33 18.21 1.03 1.45 .157 20.60 32.90 .31 9.2 122.1 4 702 64.4 94.8	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162 3.13 1.11 .086 1.73 45.88 .41 .35 .041 38.22 39.5 7.8 1098 25.2
123-765B Depth: Color: Lithology: Method: SiO2 TiO2 AI2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Y Sr Rb Zn Cu	26X-3, 72-77 244.92 Ltolive Cc. coze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 .079 33.20 68.89 .13 4.1 4.6 33.2729 40.5 29.2 39.3	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 .33 .106 36.10 74.89 .26 2.8 47.0 6.3 2846 30.3 36.8 33.68 33.68	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 153 2.93 2.93 9.96 .033 2.39 44.39 .19 .46 .095 38.20 80.88 80.88 25 1.8 34.5 5.22 3252 16.9 19.6 49.5	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85 90.2 6.6 6 1625 23.6 7.7	30X-1, 86-92 280.76 Ll gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.8	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26 40.5 7.4 2759 25.9 39.7	32X-2, 126-129 302.06 Ll gr gray Cc. sand XRF 8.91 .154 2.92 1.05 .012 2.92 41.74 82.22 .13 2.3 38.1 5.55 3186 18.8 18.5	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 .070 34.00 68.81 .01 4.0 60.3 8.33 2405 42.5 32.6 32.6 32.6	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .51 .51 .65 .54 23.87 96.5 6.5 51049 19.4 9.8	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52 .079 37.61 63.7 9.7 2600 23.5 77.6	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO MgO CaO P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb Zn Cu	2R-2, 90-99 362:00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77 33.6 7.8 2794 16.8 32.0	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 .181 15.44 166.1 27.3 422 74.6 55.9	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 39.93 28 .052 37.58 31.9 6.9 2498 2498 26.3 9.6	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93 69.2 10.0 1683 39.7 24.0	6R-1, 143-149 399,73 Ol gray Chalk DCP 11.46 .162 2.69 .33 .037 2.19 43.55 .79 .37 .056 38.00 50.9 8.88 3630 22.1 25.0	7R-2, 27-32 409,77 Gy grean DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44 179.2 27.6 447 104.4 221.0	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20 100.2 13.1 2486 67.7 13.6	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84 60.3 9.0 9.0 1950 47.5 17.2	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.33 18.21 1.03 1.45 .157 20.60 32.90 .31 9.2 122.1 21.4 702 64.4 94.8 119.9	11R-1, 91-93 446.91 Ll ol gray Chalk DCP 9.63 1.62 3.13 3.15 3.55 8.63 1.62 3.13 3.55 8.63 1.62 3.13 3.55 8.63 1.62 3.55 3.55 3.55 7.8 1.09 5.57 7.8 1.09 5.57 7.57 7.57 7.57 7.57 7.57 7.57 7.5
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Y Sr Rb Zn Cu	26X-3, 72-77 244.92 Ltolive Cc. 002e XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 .079 33.20 68.89 .13 4.1 46.3 8.3 2729 40.5 29.2 33.3 12	27X-1, 41-46 251.31 Gr gray Cc. coze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 3.3 .73 .106 36.10 74.89 .26 2.8 47.0 6.3 2846 30.3 36.8 33.4 10	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 1.53 2.93 .96 .033 2.39 44.39 .46 .095 38.20 80.28 .34.5 5.2 3252 1.8 34.5 5.2 3252 16.9 19.6 49.5 7	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85 90.2 6.6 1625 23.6 7.7 2	30X-1, 86-92 280.76 Ll gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.8	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 2.73 43.21 .52 .54 .073 38.26 40.5 7.4 2759 25.9 39.7 13	32X-2, 126-129 302.06 Lt gray Cc. sand XRF 8.91 1.54 2.92 1.05 0.12 2.92 41.47 .25 .49 0.075 41.74 82.22 .13 38.1 5.5 3186 18.8 18.5 40.7 11	33X-2, 71-73 311.21 Ll gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 .070 34.00 68.81 .01 4.0 60.3 8.3 2405 42.5 32.6 32.6 32.6 33.43 13	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 84 26.96 .054 23.87 96.5 6.5 1049 19.4 9.8 3	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52 .079 37.61 63.7 9.7 2600 23.5 77.6 20	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MgO CaOO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb Zn Cu	2R-2, 90-99 362.00 Lt ol gray DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77 33.6 7.8 2794 16.8 32.0 13	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 0.30 9.56 4.43 1.09 1.39 .181 15.44 166.1 27.3 422 74.6 55.9 44	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 39.93 .52 .28 .052 37.58 31.9 6.9 2498 26.3 9.6	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93 69.2 10.0 1683 39.7 24.0 19	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 1.62 2.69 .83 0.37 2.19 43.55 .79 .37 .056 38.00 50.9 8.8 3630 22.1 25.0 15	7R-2, 27-32 409.77 Gy grean DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44 179.2 27.6 447 104.4 221.0 74	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20 100.2 13.1 2486 67.7 13.6 28	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84 60.3 9.0 1950 47.5 17.2 21	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 .050 4.33 18.21 1.050 4.33 18.21 1.45 .157 20.60 32.90 32.90 32.90 3.31 9.2 122.1 21.4 702 64.4 94.8 119.9 60	11R-1, 91-93 446.91 LI ol gray Chalk DCP 9.63 1.62 3.13 1.62 3.13 1.62 3.13 45.88 4.41 38.22 39.5 7.8 1098 25.2 10.1
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Rb Ry Sr Rb Ch Zn Cu Cu	26X-3, 72-77 244.92 Lt olive Cc. 002e XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 0.79 33.20 68.89 .13 4.1 4.1 4.1 4.5 29.2 29.3 33.27 29.9 33.20 68.89 .13 2729 40.5 29.2 29.3 12 52.9 52.9	27X-1, 41-46 251.31 Gr gray Cc. coze XRF 13.75 .225 4.27 1.26 0.021 2.96 40.24 40.24 40.24 3.33 .73 .106 36.10 74.89 .26 2.8 4.27 .26 36.10 74.89 .26 3.3 3.6.8 3.8,4 3.3 3.6.8 3.8,4 10 4.10 4.10 4.10 4.10 4.10 4.10 4.10	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 153 2.93 .96 .033 2.99 .43.99 .43.99 .44.39 .45 .38.20 80.88 .25 38.20 80.88 .25 38.25 1.8 34.5 5.2 32522 16.9 19.6 49.5 7 24.9 24.9	29X-2, 21-25 271.91 0CP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85 90.2 6.6 1625 23.6 7.7 2 11.8	30X-1, 86-92 280,76 Lt gr gray DCP 12.99 .175 3.84 1.35 .027 38.73 .80 .51 .092 36.92 36.92 41.1 8.5 2657 25.3 12.2 11 36.9	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26 40.5 7.4 2759 25.9 39.7 13 33.6	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05 .012 2.92 41.47 .25 .41.74 82.22 .13 3.8.1 3.8.1 3.8.1 3.8.1 3.8.1 3.8.1 3.8.1 3.8.1 1.8.8 18.5 5.5 3186 18.8 18.5 40.7 11 2.4.8	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 0.070 34.00 68.81 .01 4.0 68.81 .01 4.0 68.3 2405 42.5 32.6 34.3 13 47.4	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .054 23.87 96.5 6.5 1049 19.4 9.8 3 13.2	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 2.31 42.11 .77 .52 079 37.61 63.7 9.7 2600 23.5 77.6 20 34.4	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O CaO P2O5 LOI CaCO3 C (Org) Nb D Zr Rb Rb Zr C Sr Rb Ch CaC Sr C C V Sr C Sr C V Sr C V Sr C V V Sr C V V Sr C V V V V V V V V V V V V V V V V V V	2R-2, 90-99 362:00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77 33.66 7.8 2794 16.8 32.0 13 28.8	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 1.81 15.44 166.1 27.3 422 74.6 55.9 44 129.6	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 39.93 .52 .28 .052 37.58 31.9 6.9 2498 26.3 9.6 9 9.38.7	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93 33.93 69.2 10.0 1683 39.7 24.0 19 49.3	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00 50.9 8.8 3630 22.1 25.0 15 43.6	7R-2, 27-32 409,77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44 179.2 2.7.6 447 104.4 221.0 74 139.1	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20 100.2 13.1 2486 67.7 13.6 87.4	10R-3, 140-150 440.90 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84 60.3 9.0 1950 47.5 17.2 21 59.0	11R-1, 84-88 446,84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 1.050 4.33 18.21 1.03 1.45 .157 20.60 32.90 .31 9.2 122.1 4 702 64.4 94.8 119.9 60 88.1	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 1.62 3.173 3.162 3.162 3.162 3.162 3.173 3.162 3.162 3.162 3.173 3.162 3.162 3.173 3.162 3.162 3.173 3.162 3.162 3.162 3.162 3.162 3.162 3.173 3.162 3.162 3.162 3.173 3.162 3.162 3.173 3.162 3.173 3.162 3.173 3.1
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Rb Zr Rb Zr Rb Zr Rb Zr Cu	26X-3, 72-77 244.92 Ltolive Cc. coze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .99 .079 33.20 68.89 .13 4.1 46.3 8.33 2729 40.5 29.2 39.3 12 52.9 45	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 .33 .73 .106 36.10 74.89 .26 2.8 47.0 5.3 2846 30.3 368 38.4 10 41.9 300	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 153 2.93 2.93 2.93 4.39 4.39 4.39 4.39 4.39 4.39 5.05 38.20 80.88 34.5 5.22 3252 16.9 19.6 19.6 19.6 19.6 7 24.9 20	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85 23.66 1625 23.66 7.7 2 11.8 10	30X-1, 86-92 280,76 Ll gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.8	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26 40.5 7.4 2759 25.9 39.7 13 33.6 334	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 1.154 2.92 1.05 0.012 2.92 41.74 82.22 .13 2.3 38.1 5.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 3186 18.8 3186 18.8 3186 18.8 3186 18.8 3186 18.8 3186 18.8 3186 18.8 3186 18.8 3186 18.8 3186 18.8 3186 18.8 3186 3186 3186 3186 3186 3186 3186 318	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 286 5.98 1.81 .028 2.73 36.53 .25 1.08 0.70 34.00 68.81 .01 4.0 68.81 .01 4.0 68.3 2405 42.5 32.6 34.3 3 43 44.4 44.6 44.6 44.6 44.6 44	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .44 26.96 .51 .014 .40 .76 .054 23.87 .054 23.87 .054 23.87 .054 23.87 .054 23.87 .054 23.87 .054 23.87 .054 23.87 .054 23.87 .054 23.87 .054 .054 .054 .054 .054 .054 .054 .054	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 .77 .52 .079 37.61 63.7 9.7 2600 23.5 77.6 20 34.4 27	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 AI2O3 FeO MnO MgO CaO P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb Zn Rb Zn Ni Cu	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 100 1.89 .61 .061 2.88 44.49 .57 .21 .050 41.77 33.66 7.8 2794 16.8 32.0 13 28.8 31	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 .181 15.44 166.1 27.3 422 74.6 55.9 44 129.6 139	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 3.52 .28 .052 37.58 31.9 6.9 2498 26.3 9.6 9 38.7 36.9 9 38.7 36	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93 33.93 69.2 10.0 1683 39.7 24.0 19 49.3 46	6R-1, 143-149 399,73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00 50.9 8.88 3630 22.1 25.0 15 43.6 38	7R-2, 27-32 409,77 Gy great DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44 179.2 27.6 447 104.4 221.0 74 139.1 152	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20 100.2 13.1 2486 67.7 13.6 28 87.4 87	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84 60.3 9.0 1950 47.5 17.2 21 59.0 57	11R-1, 84-88 446,84 Ol gray Cc. clay XRF 36,94 .620 12,50 4,33 18,21 1.050 4,33 18,21 1.050 32,9	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 .162 3.13 1.11 0.86 1.73 45.88 .41 38.22 39.5 7.8 1098 25.2 10.1 15 30.6 29
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Y Sr Rb Zn Cu Ca Co CaC Co Co Co CaC Co Co Co Co Co Co Co Co Co C	26X-3, 72-77 244.92 Ltolive Cc. 002e XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 .079 33.20 68.89 .13 4.1 46.3 8.3 2729 40.5 29.2 39.2 3.222 40.5 29.2 39.2 3.222 40.5 29.2 3.229 40.5 29.2 3.229 45 23.6	27X-1, 41-46 251.31 Gr gray Cc. coze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 33 .73 .106 36.10 36.10 74.89 .26 2.8 47.0 6.3 284 47.0 6.3 284 47.0 6.3 284 47.0 5.3 284 47.0 5.3 284 47.0 5.3 284 47.0 5.3 284 47.0 5.3 284 47.0 30.3 36.8 33.4 4 10 9 41.9 30 30.3 30.4 30.4 30.3 30.4 30.4 30.3 30.4 30.4	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 153 2.93 .96 .033 2.39 44.39 .19 .46 .095 38.20 80.88 2.5 5.2 3252 5.2 3252 1.8 34.5 5.2 3252 5.7 7 24.9 19.6 49.5 7 24.9 20 3.2	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85 90.2 6.6 1625 23.6 7.7 2 11.8 10	30X-1, 86-92 280.76 Ll gr gray Chalk DCP 12.99 1.75 3.84 1.35 .027 3.87 3.87 3.87 3.87 3.87 3.87 3.87 3.8	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 2.73 43.21 .52 .54 .073 38.26 40.5 7.4 2759 25.9 39.7 13 33.6 34	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 1.54 2.92 1.05 .012 2.92 41.74 82.92 41.74 82.22 1.3 38.1 5.5 3186 18.8 18.5 40.7 11 24.8 23 9.6	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 .070 34.00 68.81 .01 4.0 60.3 8.3 2405 32.6 32.6 32.6 32.6 32.6 32.6 32.6 32.6	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 84 26.96 .40 .054 23.87 96.5 6.5 1049 19.4 9.4 9.4 9.4 9.1 21.00 .10 .10 .10 .10 .10 .10 .10 .10 .10	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 1.22 .020 2.31 42.11 42.11 .52 .020 2.31 42.11 .52 .079 37.61 63.7 9.7 2600 23.5 77.6 20 34.4 27	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MgO CaOO Na2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Y Sr Rb Zn Cu Ni Cr CaC NgO CaCO CaCO CaC	2R-2, 90-99 362.00 Lt ol gray DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77 33.6 7.8 2794 16.8 32.0 13 28.8 31	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 0.30 9.56 4.43 1.09 1.39 1.39 1.39 1.81 15.44 166.1 27.3 422 74.6 55.9 44 4129.6 139	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 3.93 .52 2.28 .052 37.58 31.9 6.9 2498 26.3 9.6 9 38.7 36	5R-3, 45-49 392.05 Lt gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 57 .52 .059 33.93 69.2 10.0 1683 39.7 24.0 19 49.3 46	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00 50.9 8.8 3630 22.1 25.09 8.8 3630 22.1 25.15 43.6 38	7R-2, 27-32 409,77 Gy greay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44 179.2 27.6 447 104.4 221.0 74 139.1 152	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20 100.2 13.1 2486 67.7 13.6 28 87.4 87	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84 60.3 9.0 1950 47.5 17.2 21 59.0 57	11R-1, 84-88 446.84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 .050 4.33 18.21 1.03 1.45 .157 20.60 32.90 .31 9.2 122.1 21.4 702 64.4 94.8 119.9 60 98.1 9.2 92 49.4	11R-1, 91-93 446.91 LI ol gray Chalk DCP 9.63 1.62 3.13 1.11 0.866 1.73 45.88 .41 38.22 39.5 7.8 1098 25.2 10.1 15 30.6 29
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Rb Zr Cu W Sr Rb Cz Cu CaC Cu CaC Cu CaC Cu CaC Cu CaC Cu Cu Cu Cu Cu Cu Cu Cu Cu Cu Cu Cu Cu	26X-3, 72-77 244.92 Lt olive Cc. 002e XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .32 .99 0.79 33.20 68.89 .13 4.1 4.1 4.1 4.6 8.3 2729 40.5 29.2 39.3 12 52.9 29.2 39.3 12 52.9 25.2 9 45 52.6 129	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 0.021 2.96 40.24 40.24 40.24 3.33 .73 .106 36.10 74.89 .26 2.8 40.00 74.89 .26 2.8 4.27 1.06 36.10 74.89 .26 3.3 3.6.8 3.8,4 10 41.9 3.0 14.9 110	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 .153 2.93 .96 .033 2.39 44.39 .19 .46 .095 38.20 80.88 2.25 38.20 80.88 .25 34.55 .2 3252 16.9 19.6 49.5 7 24.9 20 20 20 21 24	29X-2, 21-25 271.91 DCP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85 90.2 6.6 1625 23.6 7.7 2 11.8 10	30X-1, 86-92 280,76 L1 gr gray Chalk DCP 12.99 .175 3.84 1.35 .027 38.73 .80 .51 .092 36.92 36.92 36.92 41.1 8.5 2657 25.3 12.2 11 36.9 34	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26 40.5 7.4 2759 25.9 39.7 13 33.6 34 136	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 8.91 .154 2.92 1.05 0.012 2.92 41.47 .25 41.74 82.22 .13 3.8.1 3.8.1 3.8.1 1.8.8 18.5 5.5 3186 18.8 18.5 40.7 11 2.4.8 2.3 3.8.1 1.2.4 2.4.8 2.3 3.8.1 1.2.5 3.1.6 2.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 5.5 3.1.6 3.5 3.5 4.1.7 4.1.7 4.2.3 3.5 3.1.6 3.5 3.5 3.5 3.5 3.5 3.5 3.5 3.5 3.5 3.5	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 .070 34.00 68.81 .01 4.0 68.81 .01 4.0 68.81 .01 4.0 5.32.65 32.65 32.65 32.65 34.3 13 47.4 46 15.8 15.8	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .054 .40 .76 .054 23.87 96.5 6.5 1049 19.4 9.8 3 13.2 16 16	35X-2, 37-42 330.17 Br gray Cc. siltst. DCP 12.56 .181 3.20 2.31 42.11 .77 .52 079 37.61 63.7 9.7 2600 23.5 77.6 20 34.4 27 168	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O CaO3 C (Org) Nb CaCO3 C (Org) Nb Zr CaCO3 C (Org) Nb Zr CaCO3 C (Org) Nb CaCO3 C (Org) Nb CaCO3 C C CaCO3 C C CaCO3 C C C C C CaCO3 C C C C C C C C C C C C C C C C C C	2R-2, 90-99 362.00 Lt ol gray Chalk DCP 7.38 .100 1.89 .61 2.88 44.49 .57 .21 .050 41.77 33.66 7.8 2794 16.8 32.0 13 28.8 31 28.8 31	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 1.81 15.44 166.1 27.3 422 74.6 55.9 44 129.6 139	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 39.93 .52 .28 .052 37.58 31.9 6.9 2498 26.3 9.6 9 38.7 36	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93 33.93 69.2 10.0 1683 39.7 24.0 19 49.3 46 171	6R-1, 143-149 399.73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00 50.9 8.8 3630 22.1 25.0 15 43.6 38	7R-2, 27-32 409-77 Gy green Clay DCP 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44 179.2 27.6 447 104.4 221.0 74 139.1 152	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20 100.2 13.1 2486 67.7 13.6 28 87.4 .87 .87 .87 .87 .87 .87 .87 .87	10R-3, 140-150 440.90 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84 60.3 9.0 1950 47.5 17.2 21 59.0 57 66	11R-1, 84-88 446,84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.11 1.05 1.620 4.13 1.050 4.13 1.03 1.45 1.57 20.60 32.90 .31 9.2 122.1 4 702 64.4 94.8 119.9 60 98.1 92 92,49.4 150	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 1.62 3.1
123-765B Depth: Color: Lithology: Method: TiO2 AI2O3 FeO MnO MgO CaO R2O P2O5 LOI CaCO3 C (Org) Nb Zr Rb Zn CaCO3 C (Org) Nb Zr Sr Rb Zn Cu V Ce Ba Sc	26X-3, 72-77 244.92 Ltolive Cc. coze XRF 18.65 .303 5.60 1.64 .021 2.97 36.22 .99 0.79 33.20 68.89 .13 4.1 46.3 8.33 2729 40.5 29.2 39.3 12 52.9 33.2 20.2 29.3 31.2 20.9 33.2 20.0 20.0 20.0 20.0 20.0 20.0 20.0	27X-1, 41-46 251.31 Gr gray Cc. ooze XRF 13.75 .225 4.27 1.26 .021 2.96 40.24 .33 .73 .106 36.10 74.89 .26 2.88 47.0 6.3 32846 30.3 36.8 38.4 10 41.9 300 14.9 30 0 14.9 110	28X-1, 34-38 260.94 Lt olive Cc. ooze XRF 10.20 153 2.93 .96 .033 2.39 4.39 .46 .033 2.39 4.39 .46 .095 38.20 80.88 .25 .05 .25 .25 .23 252 16.9 19.69 19.69 19.69 19.69 19.57 7 24.9 24.9 24.9 24.9 24.9 24.9 24.9 24.9	29X-2, 21-25 271.91 Ol gray Cc. sand DCP 12.78 1.50 .45 .028 1.39 45.07 .50 .31 .059 37.85 23.66 1625 23.66 7.7 2 11.8 10 90.2 4.50 7.7 2 11.8 10 90.2 2.56 50 7.7 2 1.8 10 90 2 1.8 1.8 1.8 1.8 1.05 1.50 .50 .50 .50 .50 .50 .50 .50 .50 .50	30X-1, 86-92 280,76 L1 gr gray Chalk 1,25 3,84 1,35 .027 3,87 3,87 3,87 3,87 3,87 3,87 3,87 3,8	31X-3, 140-150 294.00 DCP 10.71 .192 3.66 1.08 .036 2.73 43.21 .52 .54 .073 38.26 40.5 7.4 2759 25.9 39.7 13 33.6 34 4 136 2.7	32X-2, 126-129 302.06 Lt gr gray Cc. sand XRF 1.154 2.92 1.05 0.12 2.92 41.74 82.22 .13 38.1 5.55 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 18.8 18.5 3186 11.7 41.7 4 17.4 4 17.4 4 17.4 4 17.4 4 17.4 4 17.4 4 17.4 4 17.4 4 17.4 4 17.4 4 17.4 4 17.4 4 17.4 3186 18.5 18.5 18.5 18.5 18.5 18.5 18.5 18.5	33X-2, 71-73 311.21 Lt gr gray Chalk XRF 17.24 .286 5.98 1.81 .028 2.73 36.53 .25 1.08 0.70 34.00 68.81 .01 4.0 60.3 8.3 2405 42.5 32.6 34.3 13 47.4 46 15.8 163	34X-CC, 17-23 321.90 Ol gray Cc. sand DCP 44.92 .147 2.06 .51 .014 .84 26.96 .504 23.87 96.5 6.55 1049 19.4 9.8 3 13.2 16 174 1.4	35X-2, 37-42 330.17 Br gray Cc. siltst, DCP 12.56 .181 3.20 2.31 42.11 .77 .52 .079 37.61 63.7 9.7 2600 23.5 77.6 20 34.4 27 168 4.5	123-765C Depth: Color: Lithology: Method: SiO2 TiO2 AI2O3 FeO MnO MgO CaO P2O5 LOI CaCO3 C (Org) Nb Zr Rb Zr Rb Zr Rb Zr Rb Zr Rb Zr Culor Na2O Na2O P2O5 LOI CaCO3 C (Org) Nb Zr Rb Zr Zr Rb Zr Zr Zr Zr Zr Zr Zr Zr Zr Zr	2R-2, 90-99 362:00 Lt ol gray Chalk DCP 7.38 100 1.89 61 0.61 2.88 44.49 .57 .21 0.500 41.77 33.66 7.8 2794 16.8 32.0 13 28.8 31 113 552	3R-1, 131-133 370.61 Br black Dol. clay DCP 49.77 .730 13.75 3.64 .030 9.56 4.43 1.09 1.39 .181 15.44 166.1 27.3 422 74.6 55.9 44 129.6 139 114	4R-3, 140-150 383.40 DCP 13.50 .152 3.15 .79 .040 3.50 3.52 .28 .052 37.58 31.9 6.9 2498 26.3 9.6 9 38.7 36 9 38.7 36	5R-3, 45-49 392.05 L1 gr gray Cc. silt DCP 17.67 .256 4.95 1.52 .052 3.85 36.41 .57 .52 .059 33.93 3.93 69.2 10.0 1683 39.7 24.0 19 49.3 46 171 5.0	6R-1, 143-149 399,73 Ol gray Chalk DCP 11.46 .162 2.69 .83 .037 2.19 43.55 .79 .37 .056 38.00 50.9 8.88 3630 22.11 25.0 15 43.6 38 90 53.5	7R-2, 27-32 409,77 Gy great 2002 51.09 .810 17.07 4.82 .044 6.59 3.62 1.40 2.02 .108 12.44 179.2 27.6 447 104.4 221.0 74 139.1 152 199 18.0	8R-2, 114-120 420.34 Olive Cc. coze DCP 30.45 .466 9.88 3.18 .038 4.25 22.54 1.11 .85 .039 27.20 100.2 13.1 2486 67.7 13.6 28 87.4 87 81 10.1	10R-3, 140-150 440.90 DCP 27.04 .283 6.61 2.12 .056 5.47 27.11 .70 .53 .043 28.84 60.3 9.0 1950 47.5 17.2 21 59.0 57 66 5.0	11R-1, 84-88 446,84 Ol gray Cc. clay XRF 36.94 .620 12.50 4.13 1.050 4.33 18.21 1.050 32.90 .31 9.2 122.1 21.45 .157 20.60 32.90 .31 9.2 122.1 21.45 122.1 21.45 .157 20.60 32.90 .31 9.2 122.1 21.45 .157 20.64 .4 94.4 94.4 160	11R-1, 91-93 446.91 Lt ol gray Chalk DCP 9.63 1.62 3.13 1.62 3.13 1.62 3.13 1.62 3.13 1.62 3.162 3.13 1.62 3.162 3

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Table 1 (continued).

Table 1 (continued).

T. PLANK, J. N. LUDDEN

Depth: Color: Lithology: Method:	11R-1, 93-96 446.93 Lt ol gray Chalk DCP	11R-1, 96-97 446.96 Lt ol gray Chalk DCP	11R-1, 97-100 446.97 Lt ol gray Cc. ooze XRF	11R-1, 119-123 447.19 Lt ol gray Cc. ooze XRF	11R-1, 133-137 447.33 Lt ol gray Cc. sand XRF	11R-4, 61-64 451.11 Gy blue Clay XRF	11R-4, 61-64 451.11 Gy blue Clay DCP	13R-2, 61-64 466.71 Gy olive Clay XRF	14R-1, 97-104 475.07 Yel brown Clay DCP	15R-1, 86-104 484.56 Bl gr gray 0 DCP	123-765C Depth: Color: Lithology: Method:	25R-3, 106-111 583.06 Br gray Clay XRF	25R-3, 106-111 583.06 Br gray Clay DCP	26R-4, 22-28 593.02 Brown Clay XRF	26R-4, 42-51 593.22 Br gray Clay DCP	27R-2, 34-40 599.34 Br gray Clayst. XRF	28R-1, 55-58 607.55 Br gray Clayst. ( XRF	28R-3, 45-53 610.45 Gy green ( Cc. Clayst XRF	29R-3, 76-80 620.16 Gy blue/gr Clayst. XRF	29R-5, 2-6 622.42 Lt brown Clay DCP	29R-5, 26-30 622.66 Lt brown Clay DCP
SiO2 TiO2 Al2O3 FeO MnO CaO Na2O K2O P2O5 LOI CaCO3 C (Org)	9.23 .158 2.99 1.09 .096 1.68 46.38 .38 .34 .042 38.37	8.97 .156 2.86 1.02 .101 1.66 47.22 .36 .32 .040 38.5	9.83 .158 3.00 1.13 .093 1.73 45.40 .17 .40 .051 38.04 81.80 .00	11.17 .159 2.54 .99 .106 1.84 44.72 .20 .37 .081 37.82 80.72 .09	11.44 .112 .73 .097 1.46 46.97 .12 .31 .051 37.4 83.80 .04	55.39 .977 18.52 5.77 .067 5.82 .41 1.29 1.94 .200 9.62 1.08 .18	55.19 .998 18.83 5.84 .061 5.72 .40 1.35 1.95 .222 9.43	54.53 .905 18.54 8.54 .049 2.96 1.54 1.72 2.14 .097 8.99 4.08 .00	52.18 919 20.83 8.74 .103 3.83 .42 1.70 2.13 .148 9	60.99 .964 18.26 5.58 .034 2.30 .59 1.45 2.19 .243 7.4	SiO2 TiO2 AI2O3 FeO MnO MgO CaO R2O5 LOI CaCO3 C (Org)	56.24 .962 16.70 7.66 1.138 3.24 .98 1.76 3.52 .357 7.46 .50 .03	56.58 .958 16.76 7.70 1.181 3.36 .98 1.70 3.74 .353 6.69	55.50 1.002 15.06 7.35 .106 3.71 3.43 1.63 3.51 .276 8.43 4.83 .02	56.80 1.058 16.92 7.72 1.077 3.59 1.68 3.66 .111 6.8	57.16 1.036 16.60 7.34 1.898 3.17 .52 4.06 .131 6.36 .25 .01	58.06 .976 17.18 7.56 .866 2.84 .47 1.77 4.10 .099 6.08 .17 .01	45.78 .712 12.19 5.80 .108 2.53 13.20 1.69 3.00 .109 14.88 22.24 .11	56.62 .841 16.22 5.88 .106 2.70 3.54 2.15 3.93 .106 7.9 5.33 .06	57.94 1.114 15.95 8.69 .119 3.49 .59 1.98 4.11 .117 5.9	58.01 .964 16.72 8.10 .131 3.28 .64 2.09 4.14 .115 5.8
Nb Zr Y sr Rb Cu Nir Cr Ba Sc	36.9 6.8 1069 25.7 9.7 13 29.0 26 97 3.4	36.8 6.5 1066 23.2 9.6 13 29.5 28 105 3.3	2.4 37.3 6.1 1068 13.2 20.1 23.0 13 28.8 26 10.0 114	2.7 49.7 7.5 1585 12.3 19.4 39.9 14 20.4 30 11.0 105	1.6 43.2 4.1 1426 8.5 10.4 26.5 9 13.0 20 9.4 116	15.1 199.5 37.6 93.4 160.4 313.6 101 135.3 148 83.9 164	181.8 34.6 362 148.4 320.2 109 118.0 152 154 18.0	10.5 156.7 18.3 452 92.0 126.7 70.6 56 104.1 139 52.7 226	174.4 30.0 334 151.6 146.1 113 135.6 106 132 16.9	188.1 45.0 313 141.1 116.0 45 120.3 181 442 16.4	Nb Zr Y Sr Rb Zo ∂ N Cr V Ce Ba Sc	15.4 175.3 71.7 176 108.8 165.4 183.1 136 78.7 134 153.8 2235	175.7 70.4 181 165.1 202.1 138 83.5 147 2090 23.2	14.1 176.6 59.1 147 100.4 127.2 79 81.4 93 98.2 204	170.3 26.8 145 128.6 143.1 99 72.9 121 1651 22.5	14.4 169.1 225.1 229 109.7 135.7 151.5 102 60.9 127 132.4 2610	13.4 157.0 19.3 169 115.8 165.0 142.3 95 74.8 136 122.3 871	10.1 115.7 23.7 289 86.8 116.1 49.6 70 55.7 87 69.6 1834	11.8 142.3 21.3 172 120.0 149.5 257.2 81 71.1 132 89.3 539	172.6 28.7 129 123.5 82.4 92 96.9 108 221 21.8	163.4 28.8 148 128.4 130.9 85 82.7 104 218 22.1
123-765C	17R-2, 66-68	19R-1, 21-27	20R-1,	22R-2,	23R-4,	24R-1,	24R-1,	24R-4,	25R-1, 92-97	25R-2,	123-765C	29R-5,	29R-5,	30R-2,	30R-2,	30R-3, 76-83	30R-4,	32R-1,	33R-2,	34R-3,	35R-3,
Color: Lithology: Method:	504.56 Lt brown Cc. ooze XRF	521.50 Lt gr gray Silty ooze DCP	531.57 Yel brown Clay DCP	551.88 Gy olive Clay XRF	564.82 Gy orange Chalk DCP	570.22 Gy brown Clay XRF	570.22 Gy brown Clay DCP	574.51 Br gray Clay XRF	579.92 Lt brown Cc. ooze DCP	581.42 Br gray Clay XRF	Depth; Color: Lithology; Method;	623.10 Lt brown Clay DCP	623.64 Lt brown Cc. clay DCP	627.56 Gy brown Clayst. XRF	627.56 Gy brown Clayst. DCP	629.66 Brown Clayst. DCP	631.38 Brown Clayst. XRF	645.40 Yel brown Clayst. DCP	657.37 Gr gray Clay DCP	668.55 Lt brown C Cc. clay DCP	677.34 677.34 By blue/gr Clayst. XRF
Lithology: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org)	504.56 Lt brown Cc. 0025 XRF 25.48 .454 .454 .9.39 3.61 .248 1.04 30.37 .72 .94 .084 27.68 54.23 .00	521.50 Lt gr gray Silty ooze DCP 24.64 .231 5.87 2.62 .361 1.40 32.88 .93 .94 .104 30.03	531.57 Yel brown Clay DCP 62.30 .4399 11.92 8.33 .119 3.69 .93 2.73 2.61 .283 6.66	62:24 62:24 .601 14:49 5.43 .059 3.87 1.82 2.28 2.141 6.94 2.42 .141 6.94 2.42 .04	564.82 Gy orange Chalk DCP 16.45 .217 5.48 2.36 .133 .88 38.98 .51 .611 .811 .071 34.11	570.22 Gy brown Clay XRF 57.27 1.018 15.70 9.17 0.89 3.72 .67 1.42 3.78 2.85 6.87 .33 .03	570.22 Gy brown Clay DCP 57.16 1.016 1.5.56 9.18 .095 3.82 .66 1.58 3.90 .287 6.74	574,511 Br gray Clay XRF 55,54 .940 15,23 7,38 1.698 4,46 .97 1.82 3,54 .354 .339 8.07 .67 .00	579.92 Lt brown Cc. ooze DCP 10.26 .166 3.52 1.45 .169 	581.42 Br gray Clay XRF 55.72 1.055 16.10 8.99 525 3.82 .85 1.65 3.70 .295 7.30 .42 .03	Depth: Color: Lithology: Method: TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org)	623.10 Lt brown Clay DCP 58.99 .884 17.34 7.20 .127 .64 2.17 4.25 .102 5.60	55.04 .791 16.81 6.57 .166 2.60 3.89 2.11 3.91 .120 8.00	59.79 9.968 17.51 7.09 1.542 2.95 .79 2.24 3.84 1.23 3.15 .67 .03	627.56 Gy brown Clayst. DCP 57.82 .937 17.13 6.85 1.536 2.89 .78 2.03 3.84 .122 6.07	529.66 629.66 Brown Clayst. DCP 59.21 .873 17.63 6.55 .199 2.58 .70 2.40 3.86 .099 5.90	631.38 Brown Clayst. XRF 59.08 .878 16.98 7.29 .148 2.62 .71 2.32 3.66 .098 6.21 .17 .05	645.40 Yel brown Clayst. DCP 63.32 .849 14.04 6.14 .104 2.90 .68 2.54 3.61 .097 5.71	627.37 Gr gray Clay DCP 62.66 .706 14.12 7.31 .100 2.73 .83 2.57 2.56 .105 6.30	668.55 Lt brown C Cc. clay DCP 61.99 .276 5.17 2.07 .501 1.05 12.41 1.05 12.41 1.05 .085 13.97	24-23 677.34 3y blue/gr Clayst. XRF 68.61 7.40 12.71 4.83 0.40 2.86 6.68 1.85 2.13 .132 5.41 .33 .13

Table 1 (continued).

Table 1 (continued).

123-765C Depth: Color: Lithology: Method:	35R-3, 86-90 677.96 Black Siltst. ( XRF	37R-3, 40-43 696.40 Ol gray Cc. Clayst XRF	39R-3, 101-105 715.71 Ol gray Clayst. XRF	39R-3, 140-150 716.10 DCP	40R-3, 104-109 724.94 Br black Clayst. XRF	42R-2, 41-43 741.71 Gy green Clayst. XRF	44R-2, 38-42 760.38 Ol gray Clayst. DCP	44R-2, 73-77 760.73 Ol gray Clayst. DCP	44R-2, 95-99 760.95 Ol gray Clayst. DCP	44R-2, 119-123 761.19 Ol gray Clayst. DCP	123-765C Depth: Color: Lithology: Method:	58R-4, 67-71 896.37 Brown Clayst. XRF	59R-4, 39-45 902.79 Gy red Clayst. DCP	60R-5, 120-123 914.70 Brown Ash DCP	60R-5, 120-123 917.00 Brown Ash XRF	61R-4, 92-94 922.32 Brown Ash XRF	61R-5, 81-85 923.71 Gy brown Cc.Clayst XRF	61R-5, 81-85 923.71 Gy brown Cc.Clayst DCP	62R-3, 73-79 930.13 Gy brown Clayst. DCP	62R-3, 80-84 930.20 Gy brown Clayst. XRF	62R-4, 19-21 931.09 Gy brown Clayst. DCP
SiO2 TiO2 Al2O3	80.64 .282 4.88	43.10 .480 7.57	65.71 .831 12.44	52.63 .552 9.14	66.79 .799 11.58	75.27 .551 9.41	64.74 .835 13.22	67.24 .764 12.80	65.31 .672 12.69	67.25 .730 12.94	SiO2 TiO2 Al2O3	74.20 .543 8.69	69.68 .537 12.08	62.84 .235 19.15		56.30 .865 13.58	45.56 .687 8.35	44.92 .680 8.39	65.81 .814 10.90	65.65 .829 10.46	60.25 .814 10.48
FeO MnO MgO	1.72 .019 .89	4.57 .577 1.92	7.22 .180 2.95	5.06 .279 2.17	7.90 .050 3.05	4.90 .141 1.92	7.49 .293 2.69	6.70 .060 2.51	6.52 1.505 2.33	6.53 .066 2.44	FeO MnO MgO	5.87 .212 2.48	5.54 .043 2.85	1.11 .108 5.89		4.24 .113 4.03	6.95 1.627 2.23	6.88 1.557 1.90	7.98 2.257 2.60	8.00 2.325 2.70	14.46 .092 2.92
CaO Na2O K2O P2O5	2.91 1.16 .74	19.66 1.18 1.45	1.07 1.75 2.49	11.44 1.40 1.82	.70 1.58 2.19	.58 1.24 1.66	.69 1.58 2.68	.46 1.53 2.54	.67 1.53 2.24	.49 1.55 2.51	CaO Na2O K2O P2O5	1.22 1.55	1.39 1.83 1.81	1.45 2.37 .56 075		6.28 1.65 2.12	15.35 .81 2.28	15.52 .92 2.40	.76 1.22 3.06	.86 1.17 3.11	1.20 1.19 3.37
LOI CaCO3 C (Org)	6.7 4.66 .67	19.35 34.65 .04	5.19 1.00 .04	13.51	5.24 .50 .22	4.23 .58 .15	5.6	5.3	6.4	5.4	LOI CaCO3 C (Org)	4.41 .33 .01	5	6.22		10.67 9.58 .02	16.05 27.32 .00	18.33	4,43	4.66 .50 .00	4.80
Nb Zr Y	3.2 .0 11.2	7.0 85.9 30.1	11.3 126.7 28.8	95.9 25.9	12.5 138.4 21.7	7.4 100.4 20.2	138.3 31.2	123.0 20.7	117.9 24.6	120.9 19.7	Nb Zr Y	11.0 111.3 31.9	84.8 21.4	168.0 8.6	10.7 182.7 7.8	90.6 432.6 48.3	9.7 127.6 30.6	138.7 31.4	142.2 30.4	13.8 179.7 44.0	143.0 55.4
Sr Rb Zn	88 31.3 42.8	249 47.2 99.4	138 76.8 126.1	198 105.8	98 69.4 102.6	117 61.4 77.3	100 186.4	88 83.1	99 84.3	94 89.0	Sr Rb Zn	143 48.8 114.2	71.8	136	150 6.7 191.7	138 46.8 230.7	130 54.7 102.2	92.1	139 160.9	139 83.3 137.1	123.6
Ni Cr	35.0 18 40.3	104.2 70 34.2	119.0 73 45.2	121.9 70 50.1	242.1 71 44.9	81.1 30 38.3	210.8 97 61.7	183.1 38 59.0	126.2 63 55.3	176.8 37 59.3	Ni Cr	58 22.7	39 31.9	225 18.6	215 13.3	100	141.4 74 16.7	67 24.7	176.1 145 39.6	108.4 114 24.2	150 38.0
Ce Ba Sc	42 12.4 389	63.6 3560	111.0 613	2223	72.8 153	60.8 1927	145 418 17.0	486 15.4	130 818	136 741	Ce Ba Sc	96.3 3870	2845 12.8	350 7.3	17.0 241	178.4	81.4 207	223 14.3	1883 16.3	86.7 1492	135 16.4
00									1 - 1 - 1 - 1 - 1	1.0.0											
123-765C	44R-4,	45R-2,	47R-5,	50R-1,	51R-1,	52R-2,	53R-1,	54R-3,	55R-4,	57R-1,	Ovidas is ut	e/ : clomon		hbrow link	(III) dask (d				han the	hingh (bi)	
123-765C Depth: Color:	44R-4, 55-59 763.55 Ol gray	45R-2, 70-75 770.40 Dusky red	47R-5, 46-55 793.86 Gy brown	50R-1, 110-113 816.70 Brown	51R-1, 84-86 825.84 Dk gray	52R-2, 110-118 837.10 Gy olive	53R-1, 66-72 844.76 Brown	54R-3, 140-150 857.90 Pink gray	55R-4, 2-8 867.52 Br gray	57R-1, 111-117 882.81 Brown	Oxides in wt yellow (yell),	%; element calcareou	s in ppm. A s (cc), clay:	Abbrev: ligh stone (clays	t (lt), dark (d st), siltstone	lk), olive (d (siltst), de	ol), gray (gy plomitic (do	), green (gr I), radiolaria	), brown (br in (rad),	), black (bl)	
123-765C Depth: Color: Lithology: Method:	44R-4, 55-59 763.55 Ol gray Clayst. XRF	45R-2, 70-75 770.40 Dusky red Clayst. XRF	47R-5, 46-55 793.86 Gy brown Clayst. DCP	50R-1, 110-113 816.70 Brown Clayst. XRF	51R-1, 84-86 825.84 Dk gray Clayst. XRF	52R-2, 110-118 837.10 Gy olive Clayst. R DCP	53R-1, 66-72 844.76 Brown ad clayst DCP	54R-3, 140-150 857.90 Pink gray Rad ooze R DCP	55R-4, 2-8 867.52 Br gray lad clayst DCP	57R-1, 111-117 882.81 Brown Clayst. DCP	Oxides in wt . yellow (yell),	%; element calcareou	s in ppm. A s (cc), clay:	Abbrev: ligh stone (clays	t (It), dark (d st), siltstone	lk), olive (d (siltst), da	ol), gray (gy olomitic (do	), green (gr I), radiolaria	), brown (br an (rad).	), black (bl)	
123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3	44R-4, 55-59 763.55 Ol gray Clayst. XRF 69.14 .700 12.09	45R-2, 70-75 770.40 Dusky red Clayst. XRF 71.91 .670 10.95	47R-5, 46-55 793.86 Gy brown Clayst. DCP 69.02 .973 11.84	50R-1, 110-113 816.70 Brown Clayst, XRF 70.15 .759 9.34	51R-1, 84-86 825.84 Dk gray Clayst, XRF 74.89 .774 9.05	52R-2, 110-118 837.10 Gy olive Clayst. R DCP 71.44 .524 8,77	53R-1, 66-72 844.76 Brown ad clayst DCP 73.39 .554 8.58	54R-3, 140-150 857.90 Pink gray Rad ooze R DCP 81.08 .315 5.18	55R-4, 2-8 867.52 Br gray lad clayst DCP 59.86 393 7.19	57R-1, 111-117 882.81 Brown Clayst. DCP 72.49 .515 9.03	Oxides in wt	%; element calcareou	s in ppm. A s (cc), clay:	Abbrev: ligh stone (clays	t (It), dark (d st), siltstone	lk), olive ( (siltst), d	ol), gray (gy olomitic (do	), green (gr i), radiolaria	), brown (br in (rad).	), black (bl)	
123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO	44R-4, 55-59 763.55 Ol gray Clayst. XRF 69.14 .700 12.09 6.55 .140 2.25	45R-2, 70-75 770.40 Dusky red Clayst. XRF 71.91 .670 10.95 5.83 .040 2 19	47R-5, 46-55 793.86 Gy brown Clayst. DCP 69.02 .973 11.84 6.09 .051 2.69	50R-1, 110-113 816.70 Brown Clayst. XRF 70.15 .759 9.34 8.42 .080 2.63	51R-1, 84-86 825.84 Dk gray Clays1. XRF 74.89 .774 9.05 5.02 .060 2.35	52R-2, 110-118 837.10 Gy dive Clayst. R DCP 71.44 .524 8.77 5.67 1.389 2.38	53R-1, 66-72 844.76 Brown ad clayst DCP 73.39 .554 8.58 6.59 .203 2.45	54R-3, 140-150 87.90 Pink gray Rad coze R DCP 81.08 .315 5.18 3.21 .052 1.26	55R-4, 2-8 867.52 Br gray ad clayst DCP 59.86 .393 7.19 2.42 1.536	57R-1, 111-117 882.81 Brown Clayst. DCP 72.49 .515 9.03 6.00 .644 2.50	Oxides in wt	%; element calcareou	s in ppm. <i>A</i> s (cc), clay:	Abbrev: ligh stone (clays	t (it), dark (d st), siltstone	lk), olive (( (siltst), d	ol), gray (gy olomitic (do	r), green (gr I), radiolaria	), brown (br in (rad).	), black (bl)	
123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO MgO CaO Na2O K2O	44R-4, 55-59 763,55 Ol gray 1 Clayst, XRF 69,14 .700 12,09 6,55 .140 2,25 .64 1,42 2,18	45R-2, 70-75 770.40 Dusky red Clayst. XRF 71.91 .670 10.95 5.83 .040 2.19 .65 1.35	47R-5, 46-55 793.86 Gy brown Clayst. DCP 69.02 .973 11.84 6.09 .051 2.69 .75 1.37 2.21	50R-1, 110-113 816.70 Brown Clayst. XRF 70.15 .759 9.34 8.42 .080 2.63 62 1.31	51R-1, 84-86 825.84 Dk gray Clayst, XRF 74.89 .774 9.05 5.02 060 2.35 56 1.24	52R-2, 110-118 837.10 Gy olive Clayst. R DCP 71.44 .524 8.77 5.67 1.389 2.38 1.02 1.14 2.20	53R-1, 66-72 844.76 Brown ad clayst DCP 73.39 .554 8.58 6.59 .203 2.45 .75 1.16	54R-3, 140-150 857.90 Pink gray Rad coze R DCP 81.08 .315 5.18 3.21 .052 1.36 .49 .94	55R-4, 2-8 867.52 Br gray lad clayst DCP 59.86 .393 7.19 2.42 1.536 2.07 11.70 .99	57R-1, 111-117 882.81 Brown Clayst, DCP 72.49 .515 9.03 6.00 .644 2.50 1.04 1.23 1.62	Oxides in wt	%; element	s in ppm. A	Abbrev: ligh stone (clays	t (It), dark (d st), siltstone	lk), olive ((	ol), gray (gy olomitic (do	), green (gr i), radiolaria	), brown (b/	), black (bl)	
123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO MgO CaO Na2O Na2O Na2O K2O P2O5 LO1	44R-4, 55-59 763.55 Ol gray Clayst. XRF 69.14 .700 12.09 6.55 .140 2.25 .64 1.42 2.18 .089 4.80	45R-2, 70-75 770.40 Dusky red Clayst. XRF 71.91 .670 10.95 5.83 .040 2.19 .65 1.35 1.35 1.91 .154 4.34	47R-5, 46-55 793.86 Gy brown Clayst. DCP 69.02 .973 11.84 6.09 .051 2.69 2.75 1.37 2.21 .108 4.90	50R-1, 110-113 815.70 Brown Clayst. XRF 70.15 .759 9.34 8.42 .080 2.63 .62 1.31 1.95 .099 4.64	51R-1, 84-86 825.84 Dk gray Clayst. XRF 74.89 .774.89 .774.89 .055 5.02 .060 2.355 .56 1.24 1.96 .100 4.00	52R-2, 110-118 837.10 Gy olive Clayst. R DCP 71.44 .524 8.77 5.67 1.389 2.38 1.02 1.14 2.20 2.70 5.20	53R-1, 66-72 844.76 Brown ad clayst DCP 73.39 .554 8.58 6.59 .203 2.03 2.75 1.16 1.97 .156 4.20	54R-3, 140-150 857.90 Pink gray Rad coze R DCP 81.08 .315 5.18 3.21 .052 1.36 .49 .94 1.16 .115 3.74	55R-4, 2-8 8 667.52 Br gray lad clayst DCP 59.86 	57R-1, 111-117 882.81 Brown Clayst. DCP 72.49 .515 9.03 6.00 .644 2.50 1.04 1.23 1.63 2.12 4.70	Oxides in wt	%; elementa calcareou	s in ppm. <i>I</i> s (cc), clays	\bbrev: ligh	t (it), dark (d	lk), olive ((	ol), gray (gy olomitic (do	), green (gr i), radiolaria	), brown (bi	), black (bl)	
123-765C Depth: Color: Lithology: Method: SiO2 TiO2 Al2O3 FeO MnO MgO CaO Na2O Na2O Na2O K2O P2O5 LOI CaCO3 C (Org)	44R-4, 55-59 763.55 Ol gray Clayst. XRF 69.14 .700 12.09 6.55 .140 2.25 .64 1.42 2.18 .089 4.80 1.08 2.29	45R-2, 70-75 770.40 Dusky red Clayst. XRF 71.91 .670 10.95 5.83 .040 2.19 .65 1.35 1.91 .154 4.34 .67 .09	47R-5, 46-55 793.86 Gy brown Clayst. DCP 69.02 .973 11.84 6.09 .051 2.69 .75 1.37 2.21 .108 4.90	50R-1, 110-113 815.70 Brown Clayst. XRF 70.15 .759 9.34 8.42 .080 2.63 .62 1.31 1.95 .099 4.64 .58 .01	51R-1, 84-86 825.84 Dk gray Clayst. XRF 74.89 .774 9.05 5.02 .060 2.35 5.02 .060 2.35 5.02 .356 1.24 1.96 .100 4.00 .42 .18	52R-2, 110-118 837.10 Gy olive Clayst. R DCP 71.44 8.77 5.67 1.389 2.38 1.02 1.14 2.20 .270 5.20	53R-1, 66-72 844.76 Brown ad clayst DCP 73.39 .554 8.58 6.59 .203 2.45 .75 1.16 1.97 .156 4.20	54R-3, 140-150 857.90 Pink gray Rad coze R DCP 81.08 .315 5.18 3.21 .052 1.36 .49 .94 1.16 .115 3.74	55R-4, 2-8 8 667.52 Br gray lad clayst DCP 59.86 	57R-1, 111-117 882.81 Brown Clayst. DCP 72.49 .515 9.03 6.00 .644 2.50 1.04 1.23 1.63 2.12 4.70	Oxides in wt	%; elementa calcareou	s in ppm. <i>I</i> s (cc), clays	Abbrev: ligh	t (it), dark (d	Ik), olive ((	ol), gray (gy olomitic (do	), green (gr i), radiolaria	), brown (bi	), black (bl)	
123-765C Depth: Color: Lithology: Method: SiO2 TiO2 AI2O3 FeO MnO MgO CaO Na2O N2O5 LOI CaCO3 C (Org) Nb Zr Y Sc	44R-4, 55-59 763.55 Ol gray J Clayst, XRF 69.14 .700 12.09 6.55 .140 2.25 .64 1.42 2.18 .089 4.80 1.08 4.80 1.08 136.2 17.6	45R-2, 70-75 770.40 Dusky red Clayst. XRF 71.91 .670 10.95 5.83 040 2.19 .65 1.91 .154 4.34 4.34 4.34 4.34 9.09 9.9 9.22.5 27.2 2122 2122	47R-5, 46-55 793.86 Gy brown Clayst. DCP 69.02 .973 11.84 6.09 .051 1.37 2.21 1.08 4.90	50R-1, 110-113 816.70 Brown Clayst. XRF 70.15 .759 9.34 8.42 .080 2.63 .62 1.31 1.95 .099 4.64 .58 .01 11.3 126.7 25.1	51R-1, 84-86 825.84 Dk gray Clayst. XRF 74.89 .774 9.05 5.02 .060 0. 000 2.35 .56 1.24 1.96 .100 4.00 4.00 4.02 4.18 10.4 97.2 21.4	52R-2, 110-118 837.10 Gy olive Clayst, R DCP 71.44 524 8.77 5.67 1.389 2.38 1.02 1.14 2.20 2.270 5.20	101.9 53R-1, 66-72 844.76 Brown ad clayst DCP 73.39 .554 8.58 6.59 .203 2.45 .75 1.16 1.97 .156 4.20 101.9 26.5 101.9 26.5	54R-3, 140-150 857.90 Pink gray Rad coze R DCP 81.08 .315 5.18 3.21 .052 1.36 .49 .94 1.16 .115 3.74 61.7 18.2 000	55R-4, 2-8 8 667.52 Br gray lad clayst DCP 59.86 3.93 7.19 2.42 1.536 2.07 11.70 .99 1.07 .174 12.60	578-1, 111-117 882.81 Brown Clayst. DCP 72.49 515 9.03 6.00 .644 2.50 1.04 1.23 1.63 2.212 4.70	Oxides in wt	%; element calcareou	s in ppm. A	Abbrev: ligh stone (clays	t (II), dark (d	ik), olive ((	ol), gray (gy olomitic (do	), green (gr	), brown (bi	), black (bl)	
123-765C Depth: Color: Lithology: Method: SiO2 TiO2 AI2O3 FeO MnO MgO CaO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb Zn Color: Color: Nb Color: Nb Color: Nb Color: Nb Color: Nb Color: Nb Color: Nb Color: Nb Color: Nb Color: Nb Color: Nb Color: Nb Color: Color: Nb Color: Color: Nb Color: Col	44R-4, 55-59 763.55 Ol gray J Clayst Clayst XRF 69.14 700 12.09 6.55 .140 2.25 .140 1.089 1.080 1.089 1.089 1.089 1.089 1.089 1.088 1.0888 1.0888 1.0888 1.08888 1.08888 1.088888 1.088888 1.088888888 1.08888888888	45R-2, 70-75 770.40 Dusky red Clayst. XRF 71.91 .670 10.95 5.83 .040 .219 .65 1.95 1.91 .154 4.34 4.34 67 .09 9.9 9.9 9.22.5 27.2 2122 265.1 55.6	47R-5, 46-55 793.86 Gy brown Clayst. DCP 69.02 .973 11.84 6.09 .051 1.37 2.21 1.08 4.90 122.1 22.6 95 98.5	50R-1, 110-113 816.70 Brown Clayst. XRF 70.15 .759 9.34 8.42 0.080 2.63 .62 1.31 1.95 0.099 4.64 .58 .01 11.3 126.7 25.1 91 94.4 90.8	51R-1, 84-86 825.84 Dk gray Clayst. XRF 74.89 .774.89 .774.89 .774.89 .700 .060 .060 .2.35 .56 1.24 1.96 .100 4.00 .42 .18 10.4 97.2 21.4 76 54.1 74.1	52R-2, 110-118 837.10 Gy olive Clayst, R DCP 71.44 524 8.77 5.67 1.389 2.38 1.02 1.14 2.20 2.70 5.20 81.7 28.9 127 5.65	10.0 53R-1, 66-72 844.76 Brown ad clayst DCP 7.39 .554 8.58 6.59 .203 2.45 .75 1.16 1.97 .156 4.20 101.9 26.5 113 80.5	54R-3, 140-150 857.90 Pink gray Rad coze R DCP 81.08 .315 5.18 3.21 .052 1.36 .49 .94 1.16 .115 3.74 61.7 18.2 238 66.8	558.4, 2-8 867.52 Br gray 1000 59.86 3.93 7.19 2.42 1.536 2.07 11.70 .99 1.07 .174 12.60	57R-1, 111-117 882.81 Brown Clayst. DCP 72.49 .515 9.03 6.00 .644 2.50 1.04 1.23 1.63 2.12 4.70 134.6 37.7 190 88.6	Oxides in wt	%; element calcareou	s în ppm. A	Abbrev: ligh stone (clays	t (it), dark (d	lk), olive ( (siltst), d	ol), gray (gy olomitic (do	), green (gr	), brown (bi	), black (bl)	
123-765C Depth: Color: Lithology: Method: SiO2 TiO2 AI2O3 FeO MnO MgO CaO Na2O P2O5 LOI CaCO3 C (Org) Nb Zr Y Sr Rb Zn Cu	44R-4, 55-59 763.55 Ol gray J Clayst Clayst .XRF 69.14 .700 12.09 6.55 .140 2.25 .64 1.42 2.18 .089 4.80 1.08 1.08 1.08 1.36.2 17.6 98 71.2 110.8 136.2 17.6 98 71.2 110.8 136.2 17.6 98 71.2 10.8	45R-2, 70-75 770.40 Dusky red Clayst. XRF 71.91 .670 10.95 5.83 .040 .219 .65 1.35 1.91 .154 4.34 .67 .09 9.9 9.22.5 27.2 27.2 27.2 265.1 55.6 200.6 43 35.6 200.6 43	47R-5, 46-55 793.86 Gy brown Clayst. DCP 69.02 .973 11.84 6.09 .051 2.69 .75 1.37 2.21 .108 4.90 122.1 22.6 95 98.5 613.2 50 46.3	50R-1, 110-113 816.70 Brown Clayst, XRF 70.15 .759 9.34 8.42 0.080 2.63 .62 1.31 1.95 .099 4.64 .58 0.01 11.3 126.7 25.1 91.9 14.64 .58 8.01 11.3 126.7 25.1 91.3 126.7 25.1 93.4 90.8 87.7 91.3 126.7 91.3 126.7 91.3 126.7 91.3 126.7 91.3 126.7 91.3 126.7 91.3 126.7 91.3 126.7 91.3 126.7 91.3 126.7 91.3 126.7 91.3 127.7 91.7 91.7 91.3 127.7 91.7 91.7 91.7 91.7 91.7 91.7 91.7 9	51R-1, 84-86 825.84 Dk gray Clayst. XRF 74.89 774 9.05 5.02 660 2.35 56 1.24 1.96 100 4.00 4.00 4.00 4.02 18 10.4 97.2 21.4 76.54.1 74.1 11.19 34 29.5 5.54.1 74.1 11.19 34	52R-2, 110-118 837.10 Gy olive Clayst, R DCP 71.44 524 8.77 5.67 1.389 2.38 1.02 1.14 2.20 .270 5.20 81.7 28.9 127 57.6 79.6 101 36.8	10.5 53R-1, 66-72 844.76 Brown ad clayst DCP 73.39 .554 8.58 6.59 .203 2.45 .75 1.16 1.97 .564 4.20 101.9 26.5 113 80.5 12.9 53.31.9 .53 .54 .75 .55 .75 .1.16 .55 .25 .75 .1.16 .55 .25 .25 .25 .25 .25 .25 .25	54R-3, 140-150 857.90 Pink gray Rad coze R DCP 81.08 .315 5.18 3.21 .052 1.36 .49 .94 1.16 .115 3.74 61.7 18.2 238 66.8 109.4 63 25.2	558.4, 2-8 867.52 Br gray lad clayst DCP 59.86 3.93 7.19 2.42 1.536 2.07 11.70 .99 1.07 .174 12.60 130.7 42.2 274 99.9 805.9 805.9 88 26.3	578-1, 111-117 882.81 Brown Clayst. DCP 72.49 .515 9.03 6.04 4.250 1.04 1.23 .63 .212 4.70 134.6 37.7 190 88.6 85.3 52 26.1	Oxides in wt	%; element calcareou	s în ppm. A	Abbrev: ligh stone (clays	t (it), dark (d	lk), olive ( (siltst), d	ol), gray (gy olomitic (do	), green (gr i), radiolaria	), brown (bi	), black (bl)	
123-765C Color: Lithology: Method: SiO2 TiO2 AI2O3 FeO MnO MgO CaOO Na2O K2O P2O5 LOI CaCO3 C (Org) Nb Zr Rb Zn Rb Zn Rb Zn Rb Zn C V Ce Ba Sc	44R-4, 55-59 763.55 Ol gray Clayst. XRF 69.14 .700 12.09 6.55 .140 2.25 .140 2.25 .140 2.25 .140 2.28 .089 1.08 1.08 1.08 1.08 1.08 1.08 1.08 1.08	45R-2, 70-75 770.40 Dusky red Clayst, XRF 71.91 .670 10.95 5.83 .040 2.19 .65 1.35 1.91 .154 4.34 4.34 4.34 4.34 4.34 5.2 27.2 122 65.1 55.6 200.6 43 56.2 200.6 43 56.2 200.6	47R-5, 46-55 793.86 Gy brown Clayst 0,051 2,69 .051 2,69 .051 1.37 2,21 .108 4.90 122.1 2,26 95 98.5 613.2 50 46.3 1.49 510 14.4	50R-1, 110-113 816.70 Brown Claystr 70.15 .759 9.34 8.42 .080 2.63 .62 1.31 1.95 .099 4.64 4.58 .01 11.3 126.7 25.1 91 54.4 90.8 87.7 43 33.55 665 78.8 1257	51R-1, 84-86 825.84 Dk gray Clayst, XRF 74.89 .774 9.05 5.02 .060 2.35 .56 .124 1.96 .124 1.96 .100 4.00 4.00 4.00 4.00 4.00 4.00 4.00	52R-2, 110-118 837.10 Gy olive Clayst, R DCP 71.44 .524 8.77 5.67 2.38 1.02 1.14 2.20 .270 5.20 81.7 2.89 1.27 5.20 81.7 2.89 1.27 5.20 5.20	101.9 53R-1, 66-72 844.76 Brown ad clayst DCP 73.39 .554 8.58 6.59 .203 2.45 .75 1.16 1.97 .156 4.20 101.9 26.5 113 80.5 113 80.5 127.9 53 31.9 4.9 2688 15.6	54R-3, 140-150 857.90 Pink gray Rad ooze R DCP 81.08 .315 5.18 3.21 .052 1.36 .49 .94 1.16 .115 3.74 61.7 18.2 238 66.8 109.4 63 25.2 238 66.8 109.4 63 25.2 25.2 20 8	55R-4, 2-8 867.52 Br gray tiad class DCP 59.86 .393 7.19 2.42 1.536 2.07 11.70 .99 1.07 .174 12.60 130.7 42.2 274 99.9 805.9 88 26.3 130 5185 9.6	578-1, 111-117 862.81 Brown Clayst 72.49 .515 9.03 6.00 .644 2.50 1.04 2.50 1.04 1.23 1.63 .212 4.70 134.6 37.7 190 88.6 85.3 52 26.1 55 5961 11.4	Oxides in wt	%; element calcareou	s în ppm. A	Abbrev: ligh stone (clays	t (II), dark (d	lk), olive ( (siltst), d	ol), gray (gy olomitic (do	), green (gr I), radiolaria	), brown (bi	), black (bl)	

123-765B       3H-1-35       4H-6-23       9H-6-98       10H-5-89       16H-1-42       16
Depth:         19.15         36.23         85.28         93.29         144.62         144.62         144.62         144.62         144.62         144.62         144.62         144.70         160.46         163.73         Depth:         203.28         241.83         260.88         366           Color:         Lt olive         Red gray         Grgray         Lt gy blue         Lt ol gray         Lt
Color:         Lt olive         Red gray         Gr gray         Lt ol gray
Lithology:       Cc. ooze       Clay       Cc. sand       Cc. sand       Cc. sand       Cc. sand       Cc. sand       Cc. sand       Clay       Lithology:       Cc. sand       Cc. sand       Cc. sand       Clay       Lithology:       Cc. sand       Cc. sand       Clay       Lithology:       Cc. sand       Cc. sand       Clay       Lithology:       Cc. sand       Cc. sand       Cc. sand       Clay       Lithology:       Cc. sand       Cc. sand       Cc. sand       Cc. sand       Cc. sand       Clay       Lithology:       Cc. sand       Cc. sand       Cc. sand       Clay       Lithology:       Cc. sand       Clay       Lithology:       Cc. sand       C
Powder:         AI         AI         AI         AI         WC         WC         WC         AI         AI </td
La       13.7       30.0       19.5       36.7       17.6       17.8       <
Ce       19.7       63.2       30.8       67.2       30.7       30.7       30.7       30.8       15.1       73.7       Ce       12.9       6.1       12.7       4         Nd       11.4       26.9       16.0       27.9       13.2       13.2       13.2       13.4       6.6       31.5       Nd       6.3       2.0       5.3       19         Sm       2.34       5.57       3.22       6.29       2.78       2.78       2.78       2.93       1.30       6.78       Sm       1.16       .50       1.11       4.         Eu       .522       1.259       .707       1.303       .582       .582       .582       .550       .280       1.376       Eu       .258       .117       .265       .7         Tb       .393       .882       .468       .835       .461       .461       .461       .404       .206       .902       Tb       .207       .090       .176       .5         Vb       1.42       .70       1.90       .159       .159       .158       .78       .301       .76       .207       .090       .176       .5         Vb       .448       .76       .159<
Nd         11.4         26.9         16.0         27.9         13.2         13.2         13.2         13.4         6.6         31.5         Nd         6.3         2.0         5.3         11           Sm         2.34         5.57         3.22         6.29         2.78         2.78         2.78         2.93         1.30         6.78         Sm         1.16         .50         1.11         4.           Eu         .522         1.259         .707         1.303         .582         .582         .582         .550         .280         1.376         Eu         .258         .117         .265         .7           Tb         .393         .882         .468         .835         .461         .461         .461         .404         .206         .902         Tb         .207         .090         .176         .5           Vb         .142         .270         1.90         .159         .159         .158         .78         .301         Yb         .76         .207         .090         .176         .5
Sm       2.34       5.57       3.22       6.29       2.78       2.78       2.78       2.93       1.30       6.78       Sm       1.16       .50       1.11       4.         Eu       .522       1.259       .707       1.303       .582       .582       .582       .550       .280       1.376       Eu       .258       .117       .265       .7         Tb       .393       .882       .468       .835       .461       .461       .461       .404       .206       .902       Tb       .207       .090       .176       .5         Vb       .142       .270       .100       .233       .150       .159       .159       .158       .78       .310       Vb       .207       .090       .176       .5
Eu         .522         1.259         .707         1.303         .582         .582         .582         .550         .280         1.376         Eu         .258         .117         .265         .7           Tb         .393         .882         .468         .835         .461         .461         .461         .404         .206         .902         Tb         .090         .176         .5           Vb         .142         .270         .190         .232         .159         .159         .158         .78         .310         Vb         .207         .090         .176         .5
Tb .393 .882 .468 .835 .461 .461 .461 .461 .404 .206 .902 Tb .207 .090 .176 .5
Vb 142 2.70 100 2.22 150 150 150 150 158 78 3.10 Vb 75 20 56 1
10 1.42 2.79 1.90 3.23 1.33 1.33 1.33 1.33 1.30 .70 3.10 10 .75 .29 .30 1.
Lu .239 .426 .282 .466 .245 .245 .245 .245 .255 .141 .566 Lu .114 .048 .095 .2
Cs 1.93 6.15 3.65 7.84 3.00 3.00 3.00 3.00 3.10 1.23 7.79 Cs .68 .44 1.44 4.
Ba 842 1212 719 681 427 427 427 427 468 197 553 Ba 140 92 16 2
Sc 5.10 16.78 8.74 20.21 7.41 7.41 7.41 7.41 7.58 3.08 20.29 Sc 2.10 .83 3.15 11.
Ht 1.45 4.49 2.21 5.01 2.94 2.94 2.94 2.94 2.71 1.87 5.98 Ht 2.78 1.00 1.13 3.
Ta .297 .767 .442 .931 .883 .883 .883 .883 .483 .210 1.160 Ta .218 .097 .207 .6
W 1.21 3.19 2.21 3.73 65.57 65.57 65.57 65.57 6.98 .61 9.38 W 1.00 .61 .86 2.
Cr 31.7 73.7 53.8 105.8 42.1 42.1 42.1 42.1 41.2 21.9 119.4 Cr 20.2 8.7 34.9 93
Co 6.36 48.68 9.13 23.62 10.76 10.76 10.76 10.76 6.72 5.98 14.96 Co 2.74 .55 2.16 9.
As 2.19 16.94 2.92 3.48 2.69 2.69 2.69 2.69 3.45 4.12 5.09 As 3.54 .46 1.05 3.
Sb .566 10.387 .817 .769 .437 .437 .437 .437 .426 .797 .682 Sb .436 .063 .201 .6
Th 3.77 10.81 6.05 13.57 6.47 6.47 6.47 6.47 6.39 3.14 16.87 Th 2.45 1.33 2.60 7.
U 1.52 1.61 3.14 1.83 1.37 1.37 1.37 1.37 1.53 1.72 2.16 U 2.22 1.00 1.76 1.

# Table 2 (continued).

123-765C	2R-2-90	7R-2-27	11R-1-84	11R-1-88	11R-1-133	11R-4-61	11R-4-61	14R-1-97	17R-2-60	22R-2-28	23R-4-62
Depth:	362.00	409.77	446.84	446.88	447.33	451.11	451.11	475.07	504.50	551.88	564.82
Color:	Lt ol gray	Gy green	OI gray	Lt ol gray	Lt ol gray	Gy blue	Gy blue	Yel brown	Lt brown	Gy olive	Gy orange
Lithology:	Chalk	Clay	Cc. clay	Chalk	Cc. sand	Clay	Clay	Clay	Cc. ooze	Clay	Chalk
Powder:	AI	AI	WC	AI	WC	WC	WC	AI	AI	WC	AI
La	4.9	31.1	26.2	11.4	5.4	39.4	39.4	32.1	16.7	22.4	17.2
Ce	7.1	64.6	50.2	21.9	8.6	81.1	81.1	72.7	30.5	50.0	30.4
Nd	4.1	26.3	21.5	7.7	4.0	31.9	31.9	22.5	11.0	18.8	12.3
Sm	.78	5.57	4.51	1.75	.84	6.94	6.94	5.20	2.50	4.38	2.70
Eu	.196	.989	.916	.377	.201	1.450	1.450	1.008	.515	.877	.519
Tb	.142	.702	.686	.262	.150	.996	.996	.654	.367	.620	.380
Yb	.48	2.51	2.23	1.10	.52	3.47	3.47	2.92	1.53	2.50	1.40
Lu	.058	.409	.319	.185	.063	.567	.567	.509	.260	.335	.197
Cs	.70	7.10	5.55	1.78	.58	7.99	7.99	8.70	3.79	4.91	1.96
Ba	117	243	204	112	126	164	164	171	206	477	1138
Sc	2.14	15.40	12.32	4.19	1.60	18.33	18.33	18.29	8.48	12.94	4.86
Hf	.70	4.96	3.82	1.35	1.24	5.69	5.69	5.24	2.48	3.63	1.32
Та	.148	.855	.787	.257	.997	1.193	1.193	.916	.498	.917	.324
W	.13	2.63	10.86	2.69	145.84	13.32	13.32	4.33	2.17	24.85	1.35
Cr	27.3	140.0	96.2	34.8	16.7	119.6	119.6	138.8	58.1	92.5	26.6
Co	2.41	21.69	15.68	7.16	19.64	43.75	43.75	23.37	11.41	163.78	8.68
As	.73	4.46	2.84	3.53	1.87	4.20	4.20	12.43	9.11	1.52	5.24
Sb	.126	1.177	1.253	.350	.194	1.548	1.548	1.024	.551	.448	.317
Th	1.31	11.22	8.15	2.80	1.62	11.02	11.02	9.53	5.16	11.90	5.12
U	1.10	1.92	1.92	1.54	1.61	1.74	1.74	1.49	.70	1.12	.36

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Table 2 (continued).

		the second se	statement of the second statem	the second s	the second se	the second s	statement of the local division of the local	And in case of the local division of the loc	the second	and the second se	and the second se
123-765C	25R-1-92	25R-3-106	25R-3-106	26R-4-22	26R-4-42	27R-2-34	28R-3-45	30R-4-98	35R-3-24	35R-3-86	37R-3-40
Depth:	579.92	583.06	583.06	593.02	593.22	599.34	610.45	631.38	677.34	677.96	696.40
Color:	Lt brown	Br gray	Br gray	Brown	Br gray	Br gray	Gy green	Brown	Gy blue/gr	Black	OI gray
Lithology:	Cc. ooze	Clay	Clay	Clay	Clay	Clayst.	CcClayst	Clayst.	Clayst.	Siltst.	CcClayst
Powder:	AI	WC	WC	WC	AI	WC	WC	WC	WC	WC	WC
	14 A. C.										
La	22.2	65.4	65.4	50.1	29.2	30.6	30.2	31.7	44.3	11.3	30.0
Ce	19.1	157.5	157.5	101.1	156.0	131.2	77.3	96.5	122.7	19.6	76.2
Nd	17.5	59.1	59.1	48.7	23.1	24.1	24.8	25.5	34.3	9.7	27.8
Sm	3.82	13.64	13.64	11.24	5.56	6.04	5.80	5.59	8.42	1.88	6.18
Eu	.883	2.844	2.844	2.320	1.087	1.152	1.155	1.172	1.375	.520	1.289
Tb	.514	1.766	1.766	1.618	.652	.730	.698	.677	.939	.328	.826
Yb	2.19	5.10	5.10	4.69	2.65	2.80	2.51	2.20	2.46	1.17	2.64
Lu	.330	.810	.810	.733	.342	.392	.387	.365	.324	.195	.434
Cs	1.39	6.32	6.32	5.57	5.43	6.33	5.08	7.46	4.73	2.06	2.92
Ba	3138	2149	2149	222	1505	2375	1865	243	1032	363	3578
Sc	5.39	22.75	22.75	23.24	23.70	22.76	16.80	20.39	19.30	6.18	13.32
Hf	.95	5.35	5.35	5.29	4.73	5.19	3.54	4.33	4.04	1.19	2.66
Та	.173	1.231	1.231	.934	.861	1.080	.783	.969	.995	.290	.636
w	.63	13.29	13.29	12.21	5.14	8.92	4.83	16.62	5.50	7.62	12.56
Cr	17.5	81.0	81.0	84.5	69.3	66.6	63.9	70.4	64.1	37.1	39.5
Co	7.75	78.51	78.51	17.07	37.25	51.62	20.22	26.33	35.58	9.94	28.82
As	.97	6.37	6.37	4.52	5.59	5.87	1.26	8.21	39.67	16.53	1.55
Sb	.123	.725	.725	.521	.678	.624	.690	.417	1.020	.405	.425
Th	1.70	12.32	12.32	11.22	9.78	9.93	8.69	11.55	13.08	3.66	6.46
U	.25	1.07	1.07	.79	.96	.97	.79	.92	2.17	1.48	.50

### Table 2 (continued).

123-765C	39R-3-101	44R-4-55	45R-2-70	50R-1-110	58R-4-67	61R-5-81	62R-3-73	62R-3-80	62R-3-80
Depth:	715.71	763.55	770.40	816.70	896.37	923.71	930.13	930.20	930.20
Color:	OI gray	Ol gray	Dusky red	Brown	Brown	Gy brown	Gy brown	Gy brown	Gy brown
Lithology:	Clayst.	Clayst.	Clayst.	Clayst.	Clayst.	CcClayst	Clayst.	Clayst.	Clayst.
Powder:	WC	WC	WC	ŴĊ	WC	ŴĊ	AI	ŴC	WC
La	36.9	27.4	31.4	35.3	38.3	41.9	43.0	54.2	54.2
Ce	117.8	69.9	77.7	88.7	113.6	78.3	84.5	94.2	94.2
Nd	32.6	23.3	29.0	31.7	31.2	34.7	37.0	47.2	47.2
Sm	8.14	5.07	6.57	7.06	6.65	8.11	8.56	10.81	10.81
Eu	1.452	1.058	1.304	1.452	1.460	1.771	1.734	2.248	2.248
Tb	.938	.620	.866	.920	.893	1.083	1.156	1.482	1.482
Yb	2.67	1.92	2.69	2.72	2.79	3.29	3.55	4.40	4.40
Lu	.379	.317	.437	.430	.460	.476	.504	.634	.634
Cs	4.26	4.04	3.79	2.92	2.56	3.08	5.24	5.12	5.12
Ba	691	507	1921	1287	4155	227	2175	1473	1473
Sc	18.31	15.09	15.21	15.46	15.10	17.39	16.37	16.67	16.67
Hf	3.86	3.91	3.54	3.75	3.26	4.39	4.85	5.42	5.42
Та	.995	.918	.866	.931	.856	.891	.911	1.179	1.179
w	13.62	28.09	19.51	17.09	29.05	49.12	4.74	40.43	40.43
Cr	51.7	54.0	55.3	44.5	33.3	27.3	33.5	34.5	34.5
Co	36.44	31.38	15.58	22.53	32.46	25.73	27.97	29.71	29.71
As	2.90	15.39	5.03	8.36	15.42	16.87	13.39	13.88	13.88
Sb	.679	.567	.927	.770	1.060	.649	.817	.945	.945
Th	9.78	8.53	9.28	6.81	7.56	7.62	9.89	10.22	10.22
U	.80	.91	1.34	.65	.53	.55	.99	1.13	1.13

All elements in ppm. See Table 1 for major and trace element analyses for samples or adjacent intervals. Powdering method: tungsten carbide shatterbox (WC), alumina ball mill (Al). Other abbreviations as in Table 1.

Table 3. Precision and accuracy of DCP and XRF analyses.

	IOBC DCP n = 10	% st dev	SCO-1 XRF	SCO-1 Accepted Values	SCO-1 New
SiO <sub>2</sub>	52.33	.27	68.22	68.74	68.22
TiO <sub>2</sub>	.864	1.67	.750	.688	.685
Al2O3	18.71	.77	15.18	14.97	15.18
FeO	11.61	.72	5.72	5.63	5.61
MnO	2.08	1.42	.060	.058	.062
MgO	3.38	1.04	2.98	3.01	2.89
CaO	2.03	1.86	2.80	2.87	2.71
Na <sub>2</sub> O	4.09	1.39	.950	.990	1.049
K20	2.93	2.22	3.00	3.03	3.00
P205	1.17	2.86	.210	.226	.239
LOI	9.65	3.34			
Total	99.19				
Nb			13.0	11.2	11.3
Zr	187	4.64	176	163	166
Y	174	4.44	24.0	26.6	22.8
Sr	204	1.24	164	178	177
Rb			115	114	115
Zn	74	4.61	107	105	107
Cu	266	8.04	27.0	29.3	30.5
Ni	368	1.20	34.0	27.6	28.1
Cr	89	2.23	64.0	69.5	74.2
V	207	2.72	144	134	134
Ce			57.0	63.3	51.2
Ba	358	1.48	543	582	613
Sc	24	2.12			

Oxides in wt%; elements in ppm.

data that are routinely reported (smear slides, XRD analyses, visual core descriptions, etc.). If geochemical variability can be tied to lithologic variability, then potentially accurate estimates of sediment sections might be made, based only on published core descriptions and a few chemical analyses. Thus, an important first step is to examine the relationship between the geochemical and the lithological variations in Site 765 sediments.

### Dilution

The first-order control for variability of almost all the elements analyzed in Site 765 sediments is dilution by calcium carbonate

(cc) (Ludden, Gradstein, et al., 1990). An element such as Al, for instance, is quantitatively diluted by cc. Figure 2 shows that as cc varies from 0 to 100 wt%, Al2O3 varies from about 20 to 0 wt%. Cc is present in Site 765 sediments largely as nannoplankton and foraminifer skeletons that were transported to the site via turbidity flows. A typical calcareous turbidite consists of a foraminiferal sand at the base (almost 100% cc), and a long interval of featureless olive nannofossil ooze that grades upward to a white nannofossil ooze that is often bioturbated (see Dumoulin et al., this volume). Intervals between turbidites typically consist of green clay, with essentially no cc. Because the cc content may vary from 0% to almost 100% in a single turbidite sequence (including the clay-rich interval), the entire compositional range of the hole for an element such as Al can be observed on the centimeter to meter scale of a single graded sequence. Calcareous lithologies are much less common in the Cretaceous section, and so a first-order depth variation in most elements is lower concentrations in the Cenozoic section from dilution by calcareous turbidites and an increase with depth from the predominance of clay-rich lithologies.

A few elements (Sr, U, Ba, and P) do not show cc dilution relationships because they take part in the biologic cycles of the oceans. For example, U and Sr are taken into the carbonate shells of marine organisms. Ba and P are often enriched below zones of high biological productivity (Schmitz, 1987; Toyoda et al., 1990, and references therein). Mn exhibits a complex distribution that is not related to cc dilution, but may reflect post-burial mobility from its redox chemistry (Compton, this volume).

Although a large part of the variation in most element concentrations results from cc dilution, significant variation at low cc contents also exists. Examination of just the low cc samples shows another dilution effect caused by silica (Fig. 2). Thus, almost all of the Al<sub>2</sub>O<sub>3</sub> variation in Site 765 sediments may be explained by dilution of an end-member with about 20% Al<sub>2</sub>O<sub>3</sub>, by cc and silica. The excess silica reflects either radiolarian-rich intervals or detrital quartz. Figures 3A and 3C show good agreement between SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> (which is insensitive to cc dilution) and radiolarian abundances in the sediments. The scattered high Si<sub>2</sub>O/Al<sub>2</sub>O<sub>3</sub> values in the upper 500 m of the section mark coarsegrained bases of turbidites, where detrital quartz and heavy minerals may concentrate (Zr and Ti also may be enriched in these



Figure 2. Al<sub>2</sub>O<sub>3</sub> vs. CaCO<sub>3</sub>, and Al<sub>2</sub>O<sub>3</sub> vs. SiO<sub>2</sub> for a subset of low carbonate samples (<6 wt% CaO) that exhibit dilution effects on Site 765 sediments.



Figure 3. Dependence of SiO<sub>2</sub> and Ba on radiolarian abundances at Site 765. A. SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> (wt% ratio) of sediments vs. depth. Open triangles represent turbidite bases enriched in detrital quartz. **B.** Ba contents of sediments vs. depth. C. Radiolarian abundances in sediments vs. depth (from Table 9 in Ludden, Gradstein, et al., 1990). All three variables are high in the upper 100 m and lower 600 m of Site 765.

intervals). Sediments having high abundances of siliceous fossils often have high Ba contents (Schmitz, 1987, and references therein). The highest Ba contents in Site 765 sediments (up to 10,000 ppm) occur in the radiolarian-rich interval between 800 and 900 mbsf, and a rough correspondence exists between Ba and radiolarian distributions (Figs. 3B and 3C).

Although the largest control on concentrations of elements in Site 765 sediments is cc and silica dilution, some elements vary significantly even after removing the effects of dilution. Most of the dilution signal can be removed by normalizing element concentrations to Al, because Al is quantitatively diluted by cc and silica. In addition, Al is associated almost exclusively with the detrital phase in sediments; thus elements that form constant ratios with Al are diagnostic of the composition of the detrital phase. In a later section, we will discuss the provenance of the detrital phase in Site 765 sediments. First, however, we will discuss those elements that do not form constant ratios with Al, but instead reflect changes in sediment mineralogy or lithology down the hole.

## Mg, Cr, and Sr in Diagenetic Clays and Carbonates

Figures 4 and 5 show anomalously high MgO/Al<sub>2</sub>O<sub>3</sub>, Cr/Al<sub>2</sub>O<sub>3</sub> and Sr values in the interval between 200–400 mbsf. This interval contains an unusual mineral association: aragonite, dolomite, and the magnesian clay minerals, palygorskite and sepiolite (Compton and Locker, this volume). Because of the intimate intergrowths of



Figure 4. Enrichment of Mg and Cr in magnesian clay minerals at 200 to 400 mbsf at Site 765. A. MgO/Al<sub>2</sub>O<sub>3</sub> (wt% ratio) in sediments. B. Cr (ppm)/Al<sub>2</sub>O<sub>3</sub> (wt%) in sediments. C. Proportion of magnesian clays (palygorskite, sepiolite, and I/S/C) relative to total clays, as estimated by Compton and Locker (this volume).



Figure 5. A. Sr contents of Site 765 sediments. B. Aragonite abundances from Compton and Locker (this volume). Sr is enriched in aragonite relative to clays and calcite.

dolomite and fragile palygorskite fibers, Compton and Locker (this volume) favor a diagenetic origin for the magnesian clay minerals. The bulk composition of the sediments reflects this mineral association: Sr is high because aragonite is enriched in Sr over calcite (Figs. 5A, 5B); MgO is high because of the presence of dolomite and the magnesian clays (Figs. 4A, 4C). Compton and Locker (this volume) suggest that diffusion from seawater supplies the Mg required to form the diagenetic dolomite and clay minerals. The high Cr/Al<sub>2</sub>O<sub>3</sub> values (Fig. 4B) are less easily explained; either the source of the sediments in this interval was enriched in Cr, or the diagenetic reactions that led to the formation of the magnesian clays favored Cr enrichment. We are unaware of any published accounts of Cr-rich varieties of palygorskite or sepiolite.

## **Potassium and Clay Minerals**

 $K_2O/Al_2O_3$  varies by more than a factor of two in Site 765 sediments (Fig. 6A), and variations in this ratio appear to reflect variations in the clay mineralogy (after Compton and Locker, this volume). The  $K_2O$  content of the bulk sediments varies roughly with the percentage of illite (a high K clay mineral) relative to the K-barren clay minerals, kaolinite and smectite (Figs. 6A, 6B). The low  $K_2O/Al_2O_3$  values around 400 m reflect dominance of kaolinite, while the peak around 600 m reflects high illite and K-feldspar contents.

### Iron, Manganese, and Cretaceous Clays

Both FeO/Al<sub>2</sub>O<sub>3</sub> and Mn/Al<sub>2</sub>O<sub>3</sub> increase dramatically at about 600 mbsf (Figs. 7A, 7B), which corresponds roughly with the Cretaceous/Tertiary boundary. The Cretaceous section at Site 765



Figure 6. Dependence of K<sub>2</sub>O content of Site 765 sediments on clay mineralogy. **A.** K<sub>2</sub>O/Al<sub>2</sub>O<sub>3</sub> (wt% ratio) of sediments. **B.** Proportion of illite relative to sum of illite, kaolinite, and smectite (I/S <10%) from Compton and Locker (this volume).

is characterized by a decrease in abundance of cc turbidites, a decrease in sedimentation rate, an increase in amount of pelagic clay, and an increase in (volcanogenic) smectite (Ludden, Gradstein, et al., 1990). Several of these factors may have led to an increase in the Fe and Mn contents of these sediments. The smectite that dominates the lower 600 m is Fe-rich and Al-poor relative to the detrital illite and kaolinite that dominate the upper 600 m (Compton and Locker, this volume). Thus, the increase in abundance of smectite in the lower section is partly responsible for the increase in FeO/Al<sub>2</sub>O<sub>3</sub>. The slower sedimentation rates in the Cretaceous section, in part reflecting a decrease in rapidly deposited turbidite sequences, favors enrichment and preservation of the Fe-Mn oxyhydroxides that constantly rain onto the seafloor. Thus, Cretaceous sediments have a higher hydrogenous component and higher Fe and Mn contents. Finally, FeO and MnO are anomalously high in the clays immediately overlying the basaltic basement (Figs. 7A, 7B), suggesting a ridge hydrothermal origin for some of the Fe and Mn.

#### **REE Abundances, Patterns, and Ce Anomalies**

Like Fe and Mn, the rare earth elements (REE) increase dramatically in the lower 600 m (Fig. 8A). A higher hydrogenous component in Cretaceous sediments might have led to higher REE contents because Fe-Mn oxyhydroxide flocs scavenge REEs from the water column (Aplin, 1984, and references therein) and may enrich underlying sediments. However, Sm correlates well with



Figure 7. Increasing FeO and Mn in the lower 600 m of Site 765. A. FeO/Al<sub>2</sub>O<sub>3</sub> (wt% ratio) in sediments. B. Mn (ppm)/Al<sub>2</sub>O<sub>3</sub> (wt%) in sediments.

 $P_2O_5$  in Site 765 clays, and the correlation is similar to that of recent Pacific pelagic clays (Fig. 9). One might thus speculate that phosphate phases, such as fish teeth and bones, exert a dominant control on abundances of the REEs in Site 765 sediments, similar to what has been suggested for recent Pacific pelagic sediments (Toyoda et al., 1990). Low sedimentation rates and high biological activity may have led to higher biogenic phosphate contents in pelagic clays (Toyoda et al., 1990).

The chondrite- or shale-normalized REE patterns also exhibit differences between Cenozoic and Cretaceous samples (Figs. 10A and 10B). The REE patterns of the Cretaceous sediments are typically enriched in the middle REEs, producing concave downward shale-normalized REE patterns (Fig. 10B) and high Sm/Yb contents (Fig. 8B). The hydrogenous and phosphate phases, as well as the volcanic source of the smectites in the Cretaceous sediments, may all contribute different REE patterns, and Sm/Yb does not correlate simply with any of these components.

Ce anomalies form in the marine environment as a result of the contrasting behavior of oxidized Ce<sup>4+</sup> relative to the other dominantly trivalent REEs. Fe-Mn flocs preferentially scavenge Ce<sup>4+</sup> from seawater, which leads to positive Ce anomalies in Mn nodules and hydrogenous Fe-Mn crusts and a negative anomaly in seawater (Elderfield and Greaves, 1981, and references therein). Site 765 sediments exhibit both positive and negative Ce anomalies, with positive anomalies more common in Cretaceous sediments (Fig. 8C). The magnitude of the Ce anomaly is consistent within three different sediment types (Fig. 11). First, samples having the largest positive Ce anomalies are high in Mn, reflecting



Figure 8. Variations in the REEs with depth at Site 765. Dashed line indicates approximate position of the Cretaceous/Tertiary boundary. A. Sm (ppm)/Al<sub>2</sub>O<sub>3</sub> (wt%) is higher in Cretaceous sediments. B. Sm/Yb (ppm ratio) shows greater heavy REE-depletion in Cretaceous sediments. C. Ce anomaly reflects Ce deviation from La and Nd in chondrite-normalized patterns and may be calculated from  $[3Ce_n/(2Lan = n + Nd_n)]$ , where *n* indicates chondrite-normalized concentrations. Ce anomalies are generally negative (<1.0) in Cenozoic samples and are more commonly positive (>1.0) in Cretaceous sediments.

a significant hydrogenous component that has scavenged REEs from seawater. Second, cc-rich sediments have negative Ce anomalies. Foraminifer tests, although almost devoid of REEs themselves, may become coated by an authigenic Fe-Mn oxide phase rich in REEs (Palmer, 1985). These oxide phases have been



Figure 9. Sm and  $P_2O_5$  in recent Pacific pelagic clays (from Toyoda et al., 1990) and Site 765 clays (<6.0 wt% CaO).

shown to possess negative Ce anomalies inherited from bottom water (Palmer, 1985). Finally, clay-rich samples have Ce anomalies that depend upon their  $P_2O_5$  contents, showing a relationship identical to recent Pacific pelagic sediments (Toyoda et al., 1990). Phosphate phases (such as fish teeth) may have large negative Ce anomalies (Elderfield and Pagett, 1986, and references therein), and so increasing amounts of phosphate may lead to larger negative Ce anomalies.

This analysis of the REEs in Site 765 sediments suggests that downhole variations in abundances of REEs and their patterns are dependent upon downhole variations in phosphate, Mn, and cc phases. In general, phases enriched in REEs (clay, phosphate, and Mn) dominate the Cretaceous, while REE-poor cc dominates the Cenozoic sediments (see Fig. 75 in Ludden, Gradstein, et al., 1990). In detail, however, distribution of the Mn and phosphate phases may be complex (Figs. 7B, 12). Nonetheless, high P2O5 contents are typical of the 450- to 600-m interval (Fig. 12). This interval is distinguished by the lowest sedimentation rates in the hole (1-2 m/m.y.), where fish debris may not be overwhelmed by other influxes. Even so, the P2O5 contents in this interval require less than 1% apatite (with about 40% P2O5), which may explain why fish debris was not identified in sediment smear slides. Because fish-bone apatite may contain on the order of 100 times the REE contents of shales (Elderfield and Pagett, 1986; Staudigel et al., 1985/86; Toyoda et al., 1990), this seemingly trivial amount becomes significant.

Although minor phases and lithologies may be important for affecting downhole variations in certain elements, the aim of this study is to characterize the *average* composition of Site 765 sediments. In this regard, the most volumetrically significant control on element concentrations in Site 765 sediments is dilution of a shalelike phase with cc. For example, although subtle differences in REE patterns may reflect different mineral phases, all Site 765 sediments, and in fact all marine sediments, have REE patterns remarkably similar to average shale. This justifies the practice of normalizing REE to average shales. Although K<sub>2</sub>O/Al<sub>2</sub>O<sub>3</sub> varies with clay mineralogy (Figs. 6A, 6B), the average value is similar to average shale (around 0.2 for Australian shales; Taylor and McLennan, 1985). In the following section, we



Figure 10. REE patterns in selected Site 765 sediments. Gd has been interpolated between Tb and Sm to illustrate Eu anomalies better. Closed circles indicate Cenozoic sediments; open circles represent Cretaceous sediments. A. Chondrite-normalized patterns (to values in Taylor and Gorton, 1977). B. Shale-normalized patterns (to PAAS in Taylor and McLennan, 1985).



Figure 11. Ce anomalies in Site 765 clays, carbonates (>20% CaO), and Mn-rich clays. Carbonates have negative Ce anomalies; Mn-rich clays have positive anomalies. Other Site 765 clays exhibit a similar relationship between Ce anomaly and P<sub>2</sub>O<sub>5</sub> content as recent Pacific pelagic clays (Toyoda et al., 1990).



Figure 12. Variation in P2O5 content of Site 765 sediments with depth.

discuss the provenance of this shalelike detrital phase in Site 765 sediments.

### **Provenance of Detrital Phase**

Site 765 lies oceanward of the northwestern shelf of Australia, and thus the likely source of Site 765 sediments is northwestern Australia. A considerable data base for the sedimentary masses on the Australian continent has been developed over past decades by researchers from the Australian National University as a way of estimating the composition of this exposed continental crust (reviewed in Taylor and McLennan, 1985). Special attention has been paid to the Archean and Archean/Proterozoic boundary sedimentary sequences; thus, a fair amount of data exists for samples from the Precambrian Pilbara Block of western Australia (see Fig. 1). A more direct source for Site 765 sediments might be the Phanerozoic rocks of Canning Basin, but these have been ultimately derived from the Archean and Proterozoic blocks of western and central Australia, too (BMR Paleogeographic Group, 1990).

Figures 13A through 13D show Al<sub>2</sub>O<sub>3</sub> variation diagrams for Site 765 sediments, along with sediment data from the Canning Basin (Nance and Taylor, 1976), the Pilbara Block (McLennan, 1981; McLennan et al., 1983), and the post-Archean Australian Shale (PAAS) average from Taylor and McLennan (1985). The Pilbara Block sediments include both Archean shales from the George and Whim Creek groups, as well as early Proterozoic sediments from the Hamersley Basin. The Archean shales from the George and Whim Creek groups are too depleted in TiO2 and Th, and too enriched in Ni and Cr, to be an appropriate source for the Site 765 sediments (Figs. 13A-13D). Furthermore, the Archean shales lack an Eu-anomaly, which is a ubiquitous feature in Site 765 REE patterns (Fig. 10A), and indeed, is the hallmark of post-Archean sediments (Taylor and McLennan, 1985). These characteristics of the George and Whim Creek shales are common to most Archean shales and preclude much of a pure Archean component in the Site 765 sediments. On the other hand, an average of three Canning Basin shales (Paleozoic) provides a good fit with the detrital end-member for Site 765 sediments (Figs. 13A-13D) and makes sense geographically (see Fig. 1) as a source for river or wind influxes to the Exmouth Plateau and Argo Abyssal Plain. The Canning Basin average is near the PAAS composite itself, which is similar to post-Archean shales elsewhere, owing to the remarkable mixing efficiency of sedimentary processes (Taylor and McLennan, 1985). The early Proterozoic Hamersley Basin sediments lie compositionally between the Paleozoic Canning Basin shales and the Archean Pilbara shales, but like the Archean shales, are too Cr-enriched and TiO2-depleted to be a suitable end-member for Site 765 sediments. Thus, despite significant exposures of Archean rocks in their presumed source, Site 765 sediments are compositionally like post-Archean shales. The ancient age of the source of Site 765 sediments should be reflected, however, in their compositions of Pb and Nd isotopes. Future isotopic work using these samples should help constrain the mean age of the source of Site 765 sediments.

For elements that increase down the hole (e.g., REEs, Fe), the Cenozoic values are more representative of a purely detrital component having a composition near PAAS, which is consistent with the Cenozoic section being dominated by turbidites that quantitatively deliver continental detrital material to the marine environment. The Cretaceous sediments may be enriched over PAAS because of additional hydrogenous, volcanic, hydrothermal, or phosphate contributions, as discussed above.

The proximity of active volcanoes of Java and the Lesser Sunda Islands (Bali, Lombok, Sumbawa, etc.) raises the issue of the extent to which arc andesites contributed to the youngest Site 765 sediments. Ninkovich (1979) demonstrated that Lesser Sunda ash falls extend to only 200 km south of the Sunda Trench. Site 765 lies far south of this zone, and indeed, no prominent ash fall layers were cored in the Cenozoic section. However, it is possible that a disseminated ash component contributed to Site 765 sediments. Figure 14 shows the K<sub>2</sub>O and Cr contents of Site 765 sediments, modern Indonesian volcanics, and post-Archean shales. During differentiation of arc magmas, elements incompatible in the fractionating mineral assemblage (such as K) increase dramatically, while compatible elements (Cr) decrease dramatically. Thus, although arc andesites have high K2O abundances, they are strongly depleted in Cr, unlike marine clays and terrigenous shales that are enriched in both. These systematics apply to the compatible element Ni as well, but Ni may be further enriched in marine sediments from a hydrogenous (Fe-Mn oxide) contribution. The high Cr/K2O contents throughout the Cenozoic section



Figure 13. Selected elements vs.  $Al_2O_3$  in Site 765 sediments (open triangles = Cretaceous, closed triangles = Cenozoic), average shales from the Phanerozoic Canning basin (CB), the early Proterozoic Hamersley Basin (HB), and the Archean Pilbara Block (AP), and average post-Archean Australian shale (PAAS). **A.** TiO<sub>2</sub> vs.  $Al_2O_3$ . **B.** Sm vs.  $Al_2O_3$ . **C.** Th vs.  $Al_2O_3$ . **D.** Cr vs.  $Al_2O_3$ . Data are from Taylor and McLennan (1985); Nance and Taylor (1976); McLennan et al. (1983); McLennan (1981); and Tables 1 and 2.



Figure 14. K<sub>2</sub>O vs. Cr for Site 765 sediments (triangles), the Canning Basin average and PAAS (as in Fig. 13), and andesites from Java and Lesser Sunda (Merbabu volcano, Java, and Batur volcano, Bali). Data for andesites from Whitford (1975) and Wheller and Varne (1986). Open triangles = anomalously high Cr sediments in the 200- to 400-m interval at Site 765 (Fig. 4B).

rules out much andesitic ash in Site 765 sediments. As Site 765 approaches the Sunda Trench, however, ash may have contributed significantly to the upper sedimentary section, and subduction of this material leads to interesting speculations about the extent of cannibalism at arcs (Ben Othman et al., 1989).

## CALCULATING A BULK COMPOSITION FOR SITE 765 SEDIMENTS

Estimating the bulk composition of Site 765 sediments might be as simple as averaging the analyses in Tables 1 and 2. However, this estimate is only as accurate as each sample is representative. Because cc dilution accounts for most of the geochemical variability in Site 765 sediments, this estimate may be refined by taking into account cc variations. Cc contents are linked to macroscopic lithologies (foraminifer sands and nannofossil oozes); thus, published core descriptions provide, in effect, continuous downhole cc estimates. To determine the bulk composition of the site, we estimated the cc content of each 10-m interval (each core) from visual core descriptions, used our analyses to determine the composition of the noncarbonate fraction, and then diluted this composition by the estimated cc content. Details of these calculations are presented next.

The data reported here represent spot analyses that must be weighted by the length of the interval that they represent. For example, some sampled clay units are only centimeters thick, while some sampled nannofossil ooze units are meters long. To determine the weighting factors, the relative proportions of carbonate-rich lithologies were estimated for each of the 103 cores from the barrel sheets in Ludden, Gradstein, et al. (1990). Because a sediment described as "nannofossil ooze" is not pure calcite, shipboard CaCO<sub>3</sub> analyses were used to calculate the pure cc fraction for each core. The rest of the core was considered "non-carbonate." Figure 15 presents the downhole variation in this value. This "noncarbonate" factor is simply a way to quantify and smooth lithologic variations downhole. Moreover, because most of the geochemical variability is directly linked to carbonate content, this value links lithologic and geochemical data.

The data in Table 1 were normalized to a carbonate-free, dry basis (by normalizing by a sum that does not include CaO nor the



Figure 15. Downhole variation in percentage of noncarbonate per core at Site 765. This value has been estimated from CaCO<sub>3</sub> contents and core descriptions in Ludden, Gradstein, et al. (1990). See text for details.

LOI) and averaged for each core. These values were then "diluted" by multiplying by the noncarbonate percentages in Figure 15 to obtain average compositions for each core.

The method of weighting concentrations by the average noncarbonate content is inappropriate for those elements that are contained within carbonate (i.e., Sr), or that do not indicate carbonate dilution relationships (Ba, Mn, P, As, and U). For these elements, individual samples were assumed to be representative of each core. Where more than one analysis per core existed, values were averaged, and where no samples from a core were analyzed, values were interpolated. This method is limited by the extent to which sampling was representative of the dominant lithologies. Because Sr is contained in appreciable amounts in both carbonate (usually >1000 ppm) and clay-rich (usually <200 ppm) units, both clay and carbonate Sr contents were estimated for each core by interpolation of actual measurements, and these values were weighted by the average carbonate content of each core.

### **Geochemical Logs**

These average core compositions provide a smoothed downhole data set that can be compared with geochemical logs. The natural gamma-ray tool (for K, Th, and U), aluminum activation clay tool (for Al), and the gamma-ray spectroscopy tool (for Si, Fe, Ti, and Ca) were run through casing in Hole 765D; the hole was then drilled to set a reentry cone for sampling basement (see also Pratson and Broglia, this volume). Logging through casing decreases the quality of the data because it reduces the signal and adds another factor that must be removed when processing the logs. To smooth these logging data, we applied a five-point running average.

Although logs from the gamma-ray spectroscopy tool proved to have too poor quality to use, the Al<sub>2</sub>O<sub>3</sub> and K<sub>2</sub>O logs, acquired using two different tools, seem to agree with each other, as well as with the basic lithologic core descriptions. Figure 16 shows K<sub>2</sub>O and Al<sub>2</sub>O<sub>3</sub> from the logging data for the hole (the upper 170 m was not logged), compared with the weighted averages calculated from our analyses of the core samples. Despite simplification and smoothing of the logging data, the trends agree remarkably well with the "ground truth" analytical data. Both exhibit low values in the 200- to 400-m interval, characterized by low clay content, a peak around 600 m, and lower values deeper in the hole. The average  $K_2O$  content of the hole calculated from the logs is 1.5 wt%, while the average calculated from our sediment analyses is 1.6%. The Al<sub>2</sub>O<sub>3</sub> log in the interval between 200 and 400 m is about 6 wt% too high, and this may have resulted from a processing artifact, where the highly attenuated signal in this interval may have been overcompensated (Pratson and Broglia, pers. comm., 1990). However, average Al<sub>2</sub>O<sub>3</sub> contents calculated for the lower 500 m agree well with the estimate from the weighted core analyses (10.6 vs. 11.1 wt%, from the logs and analyses, respectively).

#### **Bulk Composition of Site 765 Sediments**

A grand average for the entire 930-m section was calculated from the core-by-core averages, and this estimate of bulk composition of the hole is presented in Table 4. Separate compositions are presented for the Cenozoic and Cretaceous sections.

Even though significant differences exist between the Cenozoic and Cretaceous sediments, as discussed previously, the primary difference between the two sections is simply their different cc contents. For example, while Sm/Yb increases significantly from 1.9 for the Cenozoic section to 2.4 in the Cretaceous section, Sm concentration itself more than doubles as cc decreases from mean values of 60% to 10%. Thus, dilution is still the dominant signal.

A surprisingly accurate bulk composition for Site 765 sediments may be obtained simply by multiplying an average shale composition (such as PAAS) by the average noncarbonate content of the hole (60%). Table 4 presents the results of these calculations; most elements may be estimated within 30%. Sr can be well approximated by assuming 1500 ppm in the carbonate fraction and PAAS values in the clay fraction. A better fit can be obtained for elements such as K, Nb, Zr, Rb, and Th by taking advantage of their roughly constant and upper crustal-ratios to Al. Along with Al, all these elements are higher in the estimate based simply on PAAS and the carbonate content. By assuming PAAS element/Al2O3 ratios and by multiplying by the mean Al2O3 content of the Site 765 sediments, better matches for these elements can be obtained. Elements having poor fits include MnO, Cu, and Ni (due to hydrogenous oxides), MgO (due to the diagenetic minerals of the 200- to 400-m interval), Ba (due to radiolarian concentrations) and Cs. Cs/Al2O3 is virtually constant in Site 765 sediments, but much lower than PAAS.

The success of the PAAS estimate for most elements suggests that even though extra hydrogenous, volcanic, phosphate, and hydrothermal phases contribute to the Cretaceous sediments, its composition is still dominated by average shales. By assuming an average shale composition (PAAS), a relatively accurate estimate of the bulk composition of the hole can be made without relying on any chemical analyses: the carbonate dilution factor can be estimated from visual core descriptions, and average Al or K contents, which constrain crustal ratios, can be determined from geochemical logs.

## SITE 765 AS A REFERENCE SECTION

Marine sediments are largely mixtures of four components: biogenic, detrital, hydrogenous, and hydrothermal (Dymond, 1981; Leinan, 1987). The hydrothermal component is only important near an active ridge-crest hydrothermal system, although disseminated components may be far reaching (1000 km, Barrett, 1987). The hydrogenous component, associated with Fe-Mn oxides, dominates only when the other components are absent, such as is typical for the South Pacific, much of which is below the CCD and far removed from regions of high biologic productivity and terrigenous sources. Site 765 represents the other end-member. Near a continental margin, the site is dominated by biogenic



Figure 16. Downhole logs for K<sub>2</sub>O and Al<sub>2</sub>O<sub>3</sub> (from Pratson and Broglia, this volume) compared with weighted analyses of core samples. See text for details of weighting and data processing. Downhole K<sub>2</sub>O variations from the two methods agree remarkably well. Al<sub>2</sub>O<sub>3</sub> content agrees well in sediments below 400 mbsf.

and detrital material. This leads directly to the success of the simple calculation based on PAAS and cc content to describe the bulk composition of Site 765. The large biogenic influx means that variations in the other components are overwhelmed by simple quantitative dilution. However, proximity to a continent also means that the detrital component is relatively constant as well, owing to the remarkable homogeneity of mature upper crustal material. Indeed, McLennan et al. (1990), in a survey of deep-sea turbidites, found that passive margin turbidites typically sample average, old, upper crustal material. These two factors, dilution because of biogenic components and average crustal detritus, should make calculating sedimentary columns adjacent to continents elsewhere just as simple. Results from Site 765 suggest that accurate estimates may be made with little analytical effort. Continental margin sections exist outboard of other arcs than Indonesia (the Antilles, Chile, Alaska, Cascades, Mediterranean) and thus make up a significant portion of potentially subducted material. In contrast, sedimentary sections in the middle of the Pacific, such as outboard of the Tonga Arc, have been starved of biogenic and detrital components and may require a completely different way to calculate bulk compositions. Future research will be dedicated to establishing another reference section in the central South Pacific.

Although much of the variation in a sedimentary section proximal to a continental margin will reduce simply to dilution of average crustal shales by biogenic material, this still leads to some interesting systematics for elements that are important tracers of crustal recycling:

1. Alkali elements (K, Rb, Cs). These elements are entirely coupled to the detrital component and will be quantitatively diluted by biogenic material. Their ratios may be similar to average crustal shales, although K may vary with clay mineralogy (Fig. 6). Deeply weathered source regions may contribute more kaolinite-rich clays, leading to lower K/Al than average shales. McLennan et al. (1990) also suggested that the alkali elements may fractionate from each other during weathering, with low K/Cs contents characteristic of highly weathered sources.

2. Alkaline earth elements (Sr, Ba). In contrast, these elements have little to do with the detrital component, and thus important fractionations in alkali/alkaline earth elements occur in the marine environment. Sr substitutes for Ca in marine carbonates and may be present in concentrations up to 3000 ppm in some aragonites. Nonetheless, we have shown that the average Sr content of a sedimentary section such as that at Site 765 can be well estimated simply by assuming average cc and shale values. Although Ba

Table 4. Bulk composition of Site 765 sediments.

	26.8				100	nom A	% ditt
	26.8						
SiO <sub>2</sub>		65.6	42.5	64.2	39,66		-7
TiO <sub>2</sub>	.37	.70	.50	1.02	.63	.47	-7
AlaOa	7.4	11.2	8.9	19.3	11,93	8,90	0
FeO	2.8	6.0	4 1	6.6	4 10		0
MnO	.11	.46	.25	.11	.07		-73
MgO	2.9	2.6	2.7	2.2	1.39		-49
CaO	32.2	5.5	21.4	1.3	21.39	(from cc)	0
Na <sub>2</sub> O	.9	1.4	1.1	1.2	.76	100000000000000000000000000000000000000	-30
K <sub>2</sub> O	1.3	2.2	1.6	3.8	2.34	1.74	6
PoOr	13	14	14	16	10		-26
total cc	57.5	9.8	38.2	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
Nb	5.4	10.4	7.4	19.4	12.0	8.9	21
Zr	93	125	106	215	133	99	-7
Y	17	29	21	28	17		-20
Sr	1285	274	871	204	699	(from cc)	-20
Rb	48	72	58	163	101	75	31
Zn	56	95	72	87	54		-25
Cu	71	197	122	51	32		-74
Ni	42	71	54	56	35		-35
Cr	53	45	50	112	69	52	4
V	66	112	85	153	95		12
Ba	319	1913	963	664	410		-57
Sc	7.2	13.8	9.9	16	10	8	-24
La	17	36	24	39	24		-2
Ce	31	93	56	82	51		-10
Nd	13	31	20	33	20		-1
Sm	2.8	7.0	4.5	5.72	3.54		-22
Eu	.59	1.44	.94	1.12	.69		-26
Ib	.41	.91	.61	.79	.49		-21
YD	1.5	2.9	2.1	2.86	1.77		-14
Lu	.24	.46	.33	.44	.27		-17
Cs	3.3	4.3	3.7	15.3	9.5	7.1	90
Hf	2.7	3.8	3.1	5.1	3.2	2.4	-25
Ta*	.41	.74	.67				
w•	2.3	4.0	3.5				
Co*	9	27	21	23.5	14.5		-30
As	4.3	8.0	5.8				
Sb	.9	.7	.9	12/2022	2021	2.2	
In	5.8	8.9	7.0	14.9	9.2	6.9	-2
U	1.8	.9	1.5	3.2	2.0		31

\* Samples powdered in WC excluded from estimate for these elements.

PAAS from Taylor and McLennan (1985), renormalized to 100%.

exhibits complex behavior in the marine environment, Ba contents may be enormously high (10,000 ppm levels) in siliceous oozes. A rough association exists between Ba and radiolarian abundances in Site 765 sediments (Figs. 3B and 3C). This association may result from barite nucleation on decaying siliceous skeletons in the water column (Bishop, 1988). Predominance of siliceous organisms is a characteristic of regions of high productivity maintained by active upwelling, such as in equatorial regions. Thus, Ba has been used as a paleoproductivity indicator, as well as an equatorial reference frame for charting plate motions (Schmitz, 1987).

3. REEs. The REEs typically display post-Archean shale patterns and are quantitatively diluted by cc and silica. REEs may become enriched, however, by phosphate or Fe-Mn oxide phases. Positive Ce anomalies are characteristic of sediments rich in Fe-Mn oxides, while negative Ce anomalies are characteristic of sediments rich in biogenic cc or phosphate. A few arc volcanics possess negative Ce anomalies (Heming and Rankin, 1979), which might have been inherited from REE-rich phosphates.

4. High field-strength elements (HFSE; Nb, Ta, Hf, Zr). These elements, like the alkalis, are completely coupled to the detrital component, although they may become enriched in turbidite sands from heavy mineral concentrations. The high concentrations of HFSE in sediments and the notoriously low concentrations in arc volcanics provide convincing evidence against *bulk* assimilation of sediment in subduction zones. The transfer of material from the

subducting slab to the asthenosphere beneath arcs must be one selective to certain elements (Morris and Hart, 1983).

5. Parent/daughter ratios. Although carbonate dilution has had a dramatic effect on concentrations of elements, the ratios of several elements remain relatively constant throughout Site 765 sediments, especially in the Cenozoic sequence. Indeed, we took advantage of the constant and upper crustal ratios for several elements to refine our estimate of the bulk composition of Site 765 sediments. For example, the Sm/Nd ratio is remarkably constant in Site 765 sediments, even though Sm concentrations may vary by a factor of 20 because of cc dilution. Important radioactive parent/daughter ratios, however, will vary significantly with carbonate content. The most obvious is Rb/Sr, which decreases significantly in carbonate-rich lithologies as a result of both dilution of Rb and incorporation of Sr in marine carbonates. The U/Th ratio will vary in an inverse way, because Th is quantitatively diluted, while U is somewhat taken up in carbonates (Ben Othman et al., 1989). Thus, first-order variations in these important parent-daughter ratios may also be controlled by carbonate content.

## SEDIMENT SUBDUCTION ALONG THE SUNDA TRENCH

Although not the specific aim of this study, these data for Site 765 sediments have obvious applications to sediment recycling at the Sunda Arc. Geophysical observations along the Sunda Trench are ambiguous regarding structural evidence for sediment subduction. A large gradient in sediment thickness occurs along the Sunda Trench (Fig. 17). In the northwest, south of Sumatra, there may be as much as 5 km of sediment, much of which is being accreted in the forearc (Moore et al., 1980). Farther east, south of Java, only a thin veneer of sediment approaches the trench: as little as 200 m in places (Moore et al., 1980). Available seismic data, however, show little resolvable structure within the Java Trench slope and thus leave open the question of sediment accretion (Curray et al., 1977).

The isotope <sup>10</sup>Be was measured in samples from 10 volcanoes on Java and on Bali, and abundances were indistinguishable from lavas in other tectonic settings (Tera et al., 1986). A lack of <sup>10</sup>Be enrichment in Indonesian volcanics does not prove that sediments were not subducted beneath Java. Because <sup>10</sup>Be has such a short half-life (about 1.5 m.y.), it is present only in Neogene sediments, and the absence of <sup>10</sup>Be in Java volcanics might simply mean that Neogene sediments were not subducted and erupted within 10 m.y. (the time over which <sup>10</sup>Be decays). It is entirely possible that older sediments are being subducted. Whitford and Jezek (1982) suggested that sediments were incorporated in the source of Java magmas, based on the radiogenic Pb isotopic compositions and steep <sup>207</sup>Pb/<sup>204</sup>Pb vs. <sup>206</sup>Pb/<sup>204</sup>Pb trend defined by Java volcanics. These data have long served as one of the classic examples for sediment incorporation, even though no sediment data were available at the time Whitford and Jezek (1982) formed their model. However, new Pb isotopic data for piston core samples of sediments outboard of Java overlap with the volcanics (Ben Othman et al., 1989) and provide new support for the original interpretation. Thus, the most compelling argument for subduction comes from Pb isotopic data.

Some data exist with which to extrapolate the lithologic and geochemical stratigraphies developed at Site 765 regionally along the Sunda Arc. Several holes that penetrated basement were drilled during DSDP Legs 22 and 27, and although recovery was poor (often less than 20%), data from these holes do provide a means of estimating the lithologic sections around the Sunda Trench (see Fig. 17). These holes include two around the Australian margin (Sites 261 and 260), two farther west in the Wharton Basin (Sites 212 and 213), and one just south of the Sunda Trench (Site 211). From descriptions in the Initial Reports volumes of these cruises, it appears that calcareous turbidites from the Australian margin extend as far north as Site 261 and as far west as Site 212 in the Wharton Basin. Site 213 contains little carbonate, but has accumulated siliceous oozes since the Miocene. An extensive section of Site 211 is composed of clastic turbidites of the Nicobar Fan.

A small amount of geochemical data has been published for sediments from Sites 261 and 260 (largely major elements; Cook, 1974), Sites 211 through 213 (transition metals; Pimm, 1974), and for a few piston cores outboard of the Sunda Trench (trace elements and isotopes; Ben Othman et al., 1989; see Fig. 17). Because no shared set of elements exists, one finds it difficult to draw many regional conclusions. Future research will include isotopic



Figure 17. Location map of other DSDP and ODP holes (closed circles) throughout the region outboard of the Sunda Trench. Water depth in meters. Open circles are piston cores V34-47, V34-45, V28-341, and V28-343 from Ben Othman et al. (1989) that are discussed in the text (other piston cores from Ben Othman et al., 1989, are on the north side of the Sunda Trench and are not discussed here).

analyses of Site 765 sediments, as well as analyses of major and trace elements in the piston core samples for which Ben Othman et al. (1989) analyzed isotopes. These data will allow for more confident extrapolation of information along the entire Sunda Arc. However, the following preliminary observations can be made. Sites 260 and 261 along the Australian margin are similar to Site 765 in that the Cretaceous section is dominated by clays, the Cenozoic section contains calcareous turbidites, and the detrital end-member, at least based on the  $K_2O/TiO_2$  ratios (Fig. 18), appears similar to PAAS. Although one would wish to analyze more clay samples for more elements, calculating the bulk composition of these two sites may be as simple as estimating the cc and Al contents, as we demonstrated for Site 765 sediments.

MnO-rich clays may be more common from the Wharton Basin sites than from those sites nearer the Australian margin (Fig. 19).



Figure 18. K<sub>2</sub>O vs. TiO<sub>2</sub> for sediments around the Argo Abyssal Plain. Data for DSDP Sites 260 and 261 from Cook (1974).



Figure 19. FeO\* vs. MnO for sediments from DSDP Sites 212 and 213 in or near the Wharton Basin and Site 765. Data for Sites 212 and 213 from Pimm (1974).

Although no higher in concentration than the most manganiferous sediments from Site 765, almost all of the samples analyzed from Sites 212 and 213 are rich in MnO, perhaps reflecting a greater hydrogenous/detrital fraction in the clays. This interpretation is consistent with these sections being farther from the Australian continent and their detrital sources. The isotopic compositions of the piston core samples near the Australian margin are distinctive of old cratonic material (i.e., high <sup>207</sup>Pb/<sup>204</sup>Pb, low <sup>143</sup>Nd/<sup>144</sup>Nd), while those west of the Wharton Basin are distinctly less enriched (Fig. 20), perhaps reflecting influx of younger material from the Nicobar Fan. The Wharton Basin sample has higher Lu contents than any sample from Site 765, while other piston core samples as far west as the Ninetyeast Ridge and as far east as the Banda Islands overlap completely with Site 765 sediments (Fig. 21).

Existing data are patchy, but suggest it may be possible to extrapolate at least certain aspects of Site 765 sediments across the entire basin from the Banda Islands to Ninetyeast Ridge. Australian continental detritus is most likely an important component of sediments at least out into the Wharton Basin. Key analyses of other important components, such as Mn-rich clays of the Wharton Basin, clastic material fed from the Nicobar Fan, and ash from the active arc, coupled with careful consideration of the lithologic characteristics of the DSDP holes (e.g., carbonate vs. clay fractions), might yield good first-order estimates of elemental fluxes into the Sunda Trench.

### CONCLUSIONS

1. The dominant signal in the geochemical variability of Site 765 sediments is dilution of a detrital component by biogenic calcium carbonate and silica. This dilution leads to enormous variations in the concentrations of most elements. Dilution from carbonate or silica may be a long-lived feature of the sedimentary column, even if subducted to great depths because of the relatively high temperatures required for decarbonation reactions (Gill, 1981; Abbott and Lyle, 1984).



Figure 20. Pb and Nd isotopic compositions for surface samples outboard of the Sunda Trench (from Ben Othman et al., 1989).



Figure 21. Sm and Lu concentrations for Site 765 sediments and the four piston core samples shown in Figure 20 from the Banda region (BAN), Argo Abyssal Plain (AAP), Ninetyeast Ridge (90E), and Wharton Basin (WB).

2. Significant differences occur between Cenozoic and Cretaceous clays, involving increases in Fe, Ti, Mn, Ba, REEs, changes in REE patterns, and development of positive Ce anomalies down the section. These variations may result from increases in hydrogenous, hydrothermal, phosphate, and/or volcanic phases during the Cretaceous. Although important for identifying changes in the provenance, sediment supply, or rate with time, these phases led to small deviations from the average composition of the hole, which is dominated by dilution of an average shale composition.

3. The K<sub>2</sub>O and Al<sub>2</sub>O<sub>3</sub> downhole logs correspond well with "ground truth" chemical analyses. The bulk composition of the hole can be calculated by using the visual core descriptions to weight the individual analyses over appropriate intervals. This composition, however, agrees remarkably well (to 30% for most elements) with an estimate based simply on average Australian shales and the average cc and Al<sub>2</sub>O<sub>3</sub> contents of the hole. This result suggests that estimating other sections dominated by carbonate and continental detritus may require minimal analytical effort. Ideally, only core descriptions and logging data should provide estimates of cc and Al contents that are accurate enough to characterize a site.

4. Although Site 765 is an important reference section for sedimentary columns along the Sunda Arc, our results are more general. Site 765 sediments are well described by dilution of average shale by biogenic phases, and because average shale compositions are remarkably similar around the world, results from Site 765 are general, not restricted to provenances or processes about the Indonesian region. Site 765 should thus serve as a useful reference for calculating other continental margin sections approaching trenches around the world (e.g., the Antilles, Americas, Mediterranean). A recent study by Hay et al. (1988) about global distribution of sediments on the ocean floor estimated that roughly 40% of ocean sediments is calcium carbonate and roughly 45% is terrigenous detrital material. Therefore, Site 765 sediments, dominated by cc and terrigenous detritus, is representative of a large part of the global marine sedimentary reservoir.

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