27. GEOCHEMICAL, MINERALOGICAL, AND PALEONTOLOGICAL STUDIES

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CONTENTS

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TABLES

SPECIFIC FEATURES OF MINERALOGY

(A. P. Lisitzin)

Introduction

On the basis of the mineralogy of the coarse fraction of recent sediment samples by Soviet expeditions Petelin (1965) has proposed a series of mineralogical provinces. According to this system Sites 44 to 46 belong to the central mineralogical province, and Sites 47 to 60 to the western part of the andesite zone. Small sub-provinces differing in their mineralogical associations are distinguished within these two larger provinces.

Minerals of the andesite provinces range from 1500 to 2700 kilometers out into the ocean. The complex and multiform association of minerals is composed of clastic-continental minerals (quartz, orthoclase, some plagioclase, garnet, ilmenite, epidote, etc.), as well as pyroclastic and volcanoclastic minerals (these are derivatives of andesite lava, such as, colorless and brown volcanic glass, plagioclase, orthorhombic and monoclinic pyroxene, hornblende, magnetite, etc.). A few islands in the northwestern Pacific also supply disintegration products of tholeitic basalt, olivine basalt, and picrite basalt (MacDonald, 1949).

Thus, it can be seen that the association of minerals in the andesite zone is characterized by its great complexity and variety. The peculiar feature of this zone is the abundance of pyroclastic minerals in association with typically continental minerals.

Further out into the ocean from the andesite zone the mineral associations rapidly change. Continental minerals disappear from the association with the result that pyroclastic minerals become predominant. In the pelagic part of the andesite zone the volcanogenic minerals predominate. Volcanogenic minerals are also predominant over large parts of the central province, and eolian material (particularly quartz) predominate in its arid portions. Besides, the mineral complex of the central portion of the province is characterized by a wide distribution of authigenic (diagenetic) minerals, such as, phillipsite, celestobarite, barite, ferrous and manganese hydroxide and palagonite.

Organogenic minerals include calcareous foraminiferal tests and remains of coccolithophoridae, opal radiolarian and diatom shells, teeth and bones of fishes (collophane).

Local sub-provinces are clearly distinguished in the vicinity of islands in the central Pacific. The sub-province of the Hawaiian Islands is especially pronounced and can be traced to a distance of 1000 kilometers off shore.

In a number of cases organogenic minerals suppress completely clastic minerals, and in order to study the clastic part such fractions were often treated with 5 per cent hydrochloric acid.

The change of a mineralogical suite with depth in the holes can serve as an evidence of changing conditions of sedimentation. Of especially great interest is the distribution of quartz with depth in the holes, which is an indicator of tradewind currents in the northern Pacific, volcanic glass which is indicative of volcanic activity, and authigenic minerals which reflect the conditions of sedimentation

Results

Tables 1 to 4 (at end of this chapter) list the occurrence of light and heavy minerals in the following size ranges, respectively: >0.1, 0.1 to 0.01, 0.1 to 0.05, and 0.05 to 0.01 millimeters.

Sites 44 to 46

Heavy minerals in recent sediments from the area of these sites include abundant ore minerals (5 to 20 per cent) and monoclinic pyroxene (1 to 10 per cent); the light minerals include phillipsite (20 to 40 per cent), small amounts of quartz (less than 1 per cent), plagioclase (less than 10 per cent) and colorless volcanic glass (1 to 10 per cent)

The mineral complex of the sandy-aleuritic fraction (see grain size section in this chapter) of Site 44 (Horizon Ridge) is characterized by a high content of carbonate (calcite) remains of foraminifera and coccolithophoridae. After the fractions were treated with hydrochloric acid, only a small number of grains of the heavy fraction remained unchanged. Many samples lack heavy mineral grains altogether. The minerals of the heavy fraction included here are orthorhombic and monoclinic pyroxene, epidote, and separate garnet grains. Quartz content after the dissolution of carbonates ranges from less than 1 per cent to 55 per cent (44.0-2-CC). Quartz is usually associated with orthoclase which indicates an eolian supply for these minerals. Plagioclase (n=1.540-1.565) is also abundant, but volcanic glass is found in quantities of less than 5 per cent.

In Hole 44-3-CC large sand and gravel fraction was found. It consists mainly of chert fragments (30 to 100 per cent), and numerous diamond grains. Diamonds usually form concentrations in the finer fractions. For example, the 0.5 to 1.0-millimeter fraction had a trace, 0.5 to 0.25-millimeter fraction contained 0.28 per cent, and 0.1 to 0.25-millimeter fraction had 2.44 per cent. These diamonds are undoubtedly derived from the destruction of the diamond bit when drilling chert. The same evidence is given by a rather high content of the alloy which is used for fixing diamonds in the bit face, which under the microscope looks like bronze or native copper.

The fine sandy fraction contains appreciable amounts of pyroxene and epidote as typical clastic minerals. The composition of the sandy-aleuritic fractions from Hole 44-4-CC is also similar. The mineral complex in Hole 44 therefore did not undergo essential changes from the Cenomanian to the Recent—testimony to the stability of trade winds and currents determining the supply of minerals to this part of the ocean.

The preliminary data from Sites 45 and 46 (abyssal floor) show a typically very low content of minerals of the heavy fraction, however, the analysis showed predominance of pyroxene and, in some layers, of amphibole. The light fraction contains quartz, plagioclase (up to 12 per cent) and green-brown glass (1.564 to 1.570).

Thus, this group of sites is characterized by a small content of colorless volcanic glass from the Eocene to Recent, by a high content of quartz and a relatively low content of pyroxene. Abyssal red clay is characterized by the abundance of phillipsite.

Mineralogy of Sediments from the Shatsky Rise Area (Sites 47 to 50)

Despite the fact that the sites of this area are close to each other, a certain difference in mineralogical composition separates Sites 47 and 48 from Sites 49 and 50. The first two sites located on the upper part of the rise (depth 2619 to 2689 meters) are characterized by a sharp predominance of carbonate (calcite) material and by a low content of the heavy fraction. Among a small number of heavy mineral grains, orthorhombic and monoclinic pyroxene predominate, amphibole, ore minerals and garnet are found in small amounts. The predominant minerals of the light fraction are volcanic glass of varying composition, phillipsite (20 to 50 per cent), teeth and bones of fishes (15 to 30 per cent), quartz (1 to 15 per cent); all the determinations were made for the material after digestion in hydrochloric acid. As a whole, the cores characterized by the predominance of the acid variety of volcanic glass (R.I. = 1.505 to 1.510), and some interlayers contain small amounts of brown glass with a refraction index of 1.522 to 1.531. Plagioclase is found in small amounts, its refraction index being 1.56 to 1.58.

Site 47 is characterized by a high content of glass with a refraction index of 1.525 to 1.528 in the upper cores.

The sandy fraction has been studied from Hole 47.2-4-CC. It is composed mainly of the remains of carbonate and siliceous organisms, with a few grains of diamond, limonite, and rust (from drill pipe). A similar composition of this fraction was found at Hole 48.2-2-1, 145-150 centimeters.

The cores from Sites 49 and 50 were taken from 4282 to 4487 meters depths, that is, in the vicinity of the critical depth for calcium carbonate ($CaCO_3$). Therefore, the mineral complex of the sandy-aleuritic fractions in them is much richer.

The complex of heavy minerals is characterized here by a high content of monoclinic and orthorhombic pyroxene (40 to 50 per cent together), the content of monoclinic pyroxene being twice that of orthorhombic pyroxene.

The amount of pyroxene exceeds greatly that of amphibole (their content is usually below 10 per cent). Appreciable vertical changes of the content of ore minerals are observed (from 8 to 20 per cent).

Among the minerals of the light fraction, colorless volcanic glass (R.I. = 1.504 to 1.513) predominates, having in some interlayers the admixtures of brown (R.I. = 1.540) and green (R.I. = 1.555) glass. The glass content ranges from a maximum in the Pleistocene to a minimum in the Tithonian. Most of the plagioclase is characterized by a refractive index of 1.555 to 1.564, and a small number of grains have a higher index 1.570 to 1.573. The quartz content is much lower than in Sites 44 and 45, rarely exceeding 1 per cent. Phillipsite (to 22 per cent) is common together with the teeth and bones of fishes. The content of phillipsite and of teeth and bones of fishes is particularly high in Tithonian sediments.

The sand and gravel fraction in Hole 49.1-1-5, 60 centimeters, contains rock fragments, appreciable amounts of zeolite, and many iron-manganese micronodules. The Lower Cretaceous-Tithonian sediments from Site 50 are characterized by a high content of chert fragments, siliceous and carbonate organisms as well as limonite and rust particles. Pyroxene, hornblende, barite, mica and glauconite are found as separate grains.

Mineralogy of the Abyssal Floor East of Japan (Sites 51, 52)

Both these sites are in very deep water (5744 to 5980 meters) and penetrated abyssal red clay. The sites are characterized by a high content of pyroclastic material. The most ancient sediments obtained from the sites are Cretaceous. The period of sedimentation covered by these cores is characterized by an increase of volcanic activity from the Mesozoic era to a maximum activity, as far as can be judged from these and other sites described earlier, in late Tertiary time. Evidence of this is given, in particular, by the content of colorless acid volcanic glass; its concentration in the Tertiary sediments from Site 51 is as high as 66 per cent, and in the Mesozoic sediments it is often less than 1 per cent. It is very interesting to note that the refractive index of glass at these sites has remained constant during the last 70 million years. On the one hand, this indicates the constant character of volcanic activity in the feeding province, and on the other hand, it shows good preservation of acid glass in sediments (no hydration is observed in diagenetic transformations).

Among minerals of the heavy fraction in Sites 51 and 52, as also for the other sites discussed above, pyroxene usually predominates (to 70 per cent) with monoclinic pyroxene twice as abundant as orthopyroxene. Abundant ore minerals and sometimes hornblende are contained in several interlayers.

The quartz content of the light fraction is not large—less than 1 per cent; in addition to volcanic glass, with a refractive index of about 1.505 to 1.510, there are many bones and teeth of fishes (to 51 per cent) and plagioclase. The refractive index of plagioclase ranges from 1.550 to 1.570; it comprises 30 to 34 per cent of the light fraction in the upper layers; a downward decrease accords with the decrease in the amount of acid glass, suggesting that the plagioclase is of volcanic origin. In Hole 52.0-10-CC the refractive index of the glass sharply increases to 1.550-1.560.

The coarse sand and gravel fractions from these sites have been found to contain mainly rock fragments, small amounts of mica, pyroxene, garnet, glauconite, iron manganese nodules and rust.

Mineralogy of the Cores from the Philippine Sea and the Western Slope of the Mariana Trench (Sites 53, 54, 60)

The cores in this area ranged down to Lower Miocene and Oligocene age. Volcanogenic minerals are distributed here most widely. The character of glass changes sharply as compared to the earlier sites. In the Philippine Sea, light green acid glass with a refractive index higher than 1.510 (with maxima to 1.555) predominates over colorless glass. Colorless acid volcanic glass with a refractive index of 1.504 to 1.510 predominates in the upper horizons at Site 53. The island of Guam is probably one of the sources of the colorless and light green glass (refractive index 1.510 to 1.520). Site 60 in the vicinity of this island penetrated Recent to Lower Miocene sediments. Light green glass with a refractive index of 1.510 to 1.520, and of 1.525 to 1.530 in the lowermost layers predominates among the glass in this hole. Among plagioclase (10 to 20 per cent of the light fraction), grains with a refractive index of 1.561 to 1.570 and particularly from 1.561 to 1.567 are predominant.

The mineral suite in the heavy fraction at these sites is typical for the western part of the andesite zone. Monoclinic and orthorhombic pyroxene is predominant here, and, unlike the earlier sites, in approximately equal amounts; the ratio 2:1 of monoclinic to orthorhombic pyroxene common throughout the andesite zone is found here only in the lower layers. Epidote, garnet and amphibole have been found in small amounts.

The content of quartz is very small, usually less than 1 per cent. The sand-gravel fractions of these cores are characterized by the predominance of rock fragments, appreciable amounts of pyroxene, hornblende, epidote, garnet and volcanic glass. The content of ore minerals—ilmenite and magnetite—is very small.

Mineralogy of the Caroline Ridge Sediments (Sites 55-59)

Three of the five sites drilled here were in shallower water, and the cores mainly comprised foraminiferal-nannoplankton ooze chalk (Sites 55, 56 and 57). Site 58 located close to the critical depth for dissolution of calcite contains diatom-nannoplankton ooze. The other site (59) drilled in 5554 meters of water comprised diatom ooze and zeolitic clay.

The analyses show that the group of sites of the Caroline Ridge has its own mineral suite which is characterized by a sharp predominance of monoclinic pyroxene over orthorhombic pyroxene and amphibole in the heavy fraction. In places, orthorhombic pyroxene is absent altogether. High concentrations of ore minerals with admixtures of epidote and garnet are typical of these cores.

The distinguishing feature of the light fraction is a sharp change in the composition of the volcanic glass. Brown olive glass with a high refractive index (1.594 to 1.600) is predominant in all the cores studied. Colorless and pale green volcanic glass with a low refraction index is encountered rarely. Only Core 2 of Site 59 has glass with a predominant refractive index of 1.510 to 1.520. The light fraction contains many ash particles; the plagioclase content ranges up to 10 per cent, with a refractive index in the range 1.564 to 1.570.

Ash interlayers consisting entirely of pyroclastic material (mainly glass) are sometimes encountered. In some cases the interlayers are correlated by tephrochronological methods. In particular, samples from Hole 58.2-1-5 and Hole 57.1-3-1 are probably of the same age because olive-green glass with a refractive index of 1.520 to 1.600 and plagioclase of similar composition are noticeably predominant in them. Dating of Hole 57.1-3-1 by microfauna has shown it to be Upper Oligocene.

Conclusions

The preliminary mineralogical study of the cores shows that the sandy-aleuritic fractions vary in their mineralogical composition. Groups of drilling sites can be combined into provinces and subprovinces based on their common mineralogical composition. The observed changes of mineralogical composition in time are especially sharp when interlayers of volcanogenic material are encountered. Many sites (particularly those in the northern portion of the ship's track) are characterized, on the contrary, by uniform mineralogical composition over long periods of time, at least 70 to 100 million years. Minerals may be used as indicators of the stability of the trade-wind and current system in this part of the ocean, and of the stability of the composition of volcanogenic material. The change of the composition of volcanogenic material in the western part of the andesite zone recorded in the lower layers of Tertiary time and Mesozoic period indicates, apparently, large-scale changes in the history of volcanic activity of Japan and the adjacent island arcs.

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METHODS USED IN MINERALOGICAL ANALYSIS

(A. P. Lisitzin)

The mineralogical analysis was made by using optical and X-ray diffraction methods. The optical methods were applied to the studies of mineral fractions coarser than 0.1 millimeter (fine and medium sand according to the scale accepted in the USSR), 0.1 to 0.05 millimeter (course aleurite[2]). These fractions were obtained by a grain-size analysis of wet sediment. A number of investigations have shown previously that it is these two fractions which contain the most representative set of minerals. The results are given in Tables 1 and 3 at the end of this chapter.

The sand fraction (0.25 to 0.1 millimeters) was subjected to magnetic and then electromagnetic separation yielding three electromagnetic fractions. The separation of heavy minerals was achieved by using a liquid of 2.90 specific weight. The examination of minerals was made under a binocular microscope by the universally accepted methods (Chueva, 1950; Lozhkin, 1962). To study the insoluble remains in carbonate sediments, calcium carbonate was removed with the aid of a 5 per cent solution of hydrochloric acid.

The mineralogical analysis of the fraction from 0.1 to 0.05 millimeter was also made using gravity separation in liquid with 2.90 specific weight. Counts were made usually for 400 to 600 grains of both light and heavy fractions. Particularly great attention was paid to a division of volcanogenic minerals (volcanic glass, plagioclase, pyroxene), as well as, authigenic (diagenetic) minerals (phillipsite, iron-manganese minerals, celestobarite, barite). Quantitative determinations were also made on the products of glass devitrification (palagonite and palagonitized glass). Great attention was paid to the suite of terrigenous minerals (quartz, garnet, orthoclase, etc.).

In the mineralogical studies of the residues of carbonate sediments after acid treatment, it was found that the nondurable minerals, such as phillipsite and apatite, survive. In many cases the heavy mineral content in carbonate sediments amounts to only a few grains (as in Site 44) and for some samples it is absent altogether.

Most analytical determinations have been made at the Institute of Oceanology, the USSR Academy of Sciences, by engineers (Mrs. Kazakova and A. N. Rudakova) with control determinations carried out by the author. Data are presented in Tables 1 to 4.

A partial mineralogical immersion analysis of the fraction from 0.05 to 0.01 millimeter, which includes large quantities of volcanogenic material of a long-range dispersal and the bulk of the eolian material from tropospheric and stratospheric fallout was also made and the results given in Table 4.

The mineralogic study of carbonate minerals and quartz was conducted by the X-ray methods for sediment as a whole and for its major fractions (Table 5). A description of methods used follows in the next section.

The pelitic fraction (0.01 to 0.001 millimeter was studied mineralogically to determine the clay mineralogy (Table 6). Methods used are described elsewhere in this chapter.

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METHODS USED IN THE QUANTITATIVE X-RAY DETERMINATION OF QUARTZ AND CARBONATE MINERALS

(V. V. Serova)

Quantitative mineral determinations were made with a diffractometer using the internal standard method.

All the samples were ground by hand to a fine powder ($< 1\mu$). Then each sample was mixed with the internal standard to obtain a homogenous mixture. The homogenization of the mixture was achieved by grinding the mixed powder with alcohol (0.15 gram of the sample plus 1 cubic-centimeter of alcohol). Good reproducibility was attained when settling the sample on glass

[2] Aleurite - silt and coarse clay fraction (see Figure 4).

(peak heights varied by only 2 to 3 millimeters and less). A precise change of the homogenous mixture (0.05 grams) as water suspensate was placed on an 18 by 18 millimeter cover glass, thereby covering the glass with a sediment layer of equal thickness.

A URS-501M diffractometer with Geiger counter was used. Optimum conditions were found when the reflection is rather intensive at the minimum content of minerals (< 2 per cent) and does not go off scale at the maximum content (about 100 per cent). This could be achieved by the selection of different slits between the X-ray tube and the meter and operation procedure. The slits from the tube were 1, 0.5, and 0.005 millimeters. Use was made of CuK α-radiation with the nickel-filter. The Geiger counter used was of the MSTR-Y type, and every sixty-fourth impulse was fixed by an electronic counter. Time constant was four, voltage on the tube 25 kilowatts, strength of the current 10 milliamperes, scanning rate 1°/min, and the chart speed 6 mm/min.

Chemically pure calcium fluoride was used as an internal standard. This substance was selected for a standard since it gives an intense reflection at 3.15 Å (in the same region as quartz and carbonates) and does not undergo any changes in the air. Calcium fluoride was added to each sample in amounts of 20 per cent of the sample weight.

The calibration curves were constructed from the known mixtures of pure minerals (quartz, calcite, aragonite and dolomite). The latter were used as a matrix. The mixtures contained from 2 to 20 per cent of each mineral.

The analysis of the samples was made in the middle of every week. The calibration curves were constructed on the basis of three repeated analyses of each sample. Each sample under study was analyzed three times. Calcite determinations were based on the 3.03 Å peak, dolomite determinations on the 2.88 Å peak, aragonite determinations on the 3.40 Å peak, and quartz determinations on the 4.26 Å and 3.33 Å peaks. These were compared with the 3.15 Å peak of calcium fluoride.

The sensitivity of the carbonate determination with the diffractometric method is 1 per cent for calcite, 1.5 to 2 per cent for dolomite and aragonite, and 1 per cent for quartz.

The average quadratic error of the determination is 2 to 3 per cent.

The results are given in Table 5 at the end of this chapter.

SPECIFIC FEATURES OF GEOCHEMISTRY

(A. P. Lisitzin)

Introduction

A variety of geochemical methods were used to determine the chemical composition of a large number of sediment samples.

The spectrochemical and flame-photometric varieties of the complete silicate analysis were widely used in these studies. These methods make possible the determination of the 10 sediment-forming elements (SiO_2, TiO_2, Al_2O_3, Fe_2O_3, MgO, CaO, Na_2O, K_2O, H_2O) in bottom sediments and rock (Table 7). The content of the main biogenous components of the bottom sediment amorphous silica (Table 8), carbon dioxide, calcium carbonate and organic carbon (Table 9) and phosphorus (Table 10) has been determined by the classical methods of chemistry.

The content of terrigenous and volcanogenic material is established both from the indirect determination of the contribution of clastic material by the difference 100% - ($CaCO_3$ + $SiO_{2\,amorph}$ + C_{org}) and from the direct determination of a complete silicate analysis, as well as from the determination of the content of the element-indicators of clastic material (Al_2O_3, TiO_2, Fn, Cr, Fe, V, Th). Since the percentage of these elements greatly depends on the presence of more widely distributed elements and compounds, the analysis of the ratio of hydrolyzate elements in rocks and sediment is of importance (SiO_2/Al_2O_3;$Al_2O_3/TiO_2/$Fn;TiO_2/Cr – see Table 7).

Numerous trace elements (Mo, Pb, Cu, Fn, Co, Ni, V, Cr, Zr, Cd, Sr, Na, K, Li, Rb, Cs) can be used, for the most part, as geochemical indicators of the conditions of sedimentation.

The geochemical interpretation of the sediment cores was based on the chemical, spectrochemical, atomic absorption, flame-photometric and neutron activation methods, in conjunction with the X-ray diffraction method for the quantitative determination of quartz and carbonate minerals, and the microscopic study of sediment (smear slides, immersion slides, heavy concentrates). The combination of these analytical methods enable genetic interpretation to be made of the most widely distributed and important elements of marine sediments.

For instance, the total amount of silicic acid in a sample can be determined with the aid of the complete silicate analysis (the spectral method); this is the sum of amorphous silica (determined chemically by the X-ray and infra-red method with the control under a microscope), quartz silica (determined by the X-ray method), and silica as silicate and silica in volcanic glass (determined spectrally).

$$SiO_{2\,total} = SiO_{2\,amorph} + SiO_2 + SiO_{2\,silicate}$$

The total amount of calcium is the sum of its portion associated with carbonates (determined chemically) and the portion associated with silicate material (determined spectrally).

$$Ca_{total} = Ca_{CaU_3} + Ca_{silicate}$$

A similar method was used for elucidating the genesis of magnesium. The total amount of magnesium in the sediment (determined in the complete silicate analysis) comprises both the portion associated with carbonates (determined chemically in a hydrocloric acid extraction) and that with the silicates.

$$Mg_{total} = Mg_{CaMg(CO_3)_2} + Mg_{silicate}$$

So far, the following elements have been determined for the Leg 6 samples: $SiO_{2\,amorph}$, (Table 8) $CaCO_3$ and C_{org}, (Table 9), Fe_2O_3, TiO_2, MnO (Table 12), CaO, MgO (Table 13), P_2O_5 (Table 10) have been determined by the wet chemical methods; and, SiO_2, Al_2O_3, Fe_2O_3, MgO, CaO, MnO, TiO_2 (Table 7), as well as Mn, Ti, Cr, V, Ni, Co, Zr, Pb, Mo, Ca (Table 11) have been determined spectro-chemically. The content of Na, K, Li, Rb, Cs (Table 14) has been determined by the flame-photometric methods, and Zn, Cd, Sr, Cu, Ni (Table 15) have been analyzed with the aid of atomic absorption in the arc and flame. The content of Mn^{56}, Sc^{46}, W^{187}, Fe^{59}, Ca^{48}, Sc, C_2, Sb, Cu and others has been determined by the neutron activation methods (Table 16).

A review of all the data pertinent to the methods used, their accuracy, sensitivity and the reproducibility of determinations follow in this chapter. A comparison of the analyses results obtained by wet chemistry and spectro-chemistry for some elements is given in Figure 6 at the end of this chapter.

A comparison of the tables shows that the analyses for most of the methods important elements (iron, manganese, titanium, calcium and nickle) were made twice by two different methods thereby minimizing the analytical errors. All the determinations were compared to the G-1 standard and others of the American Bureau of Standards and to a red clay standard presented by Oiva Joensuu (Institute of Marine Science, University of Miami, Florida).

The data given in this report should be considered as preliminary; it requries further checking, statistical, and graphical processing. However, the obtained results even in their present form can be used for a preliminary geochemical interpretation. The objectives of the geochemical studies are best served if the chemical determinations are used in comparison with the data yielded by the X-ray and optical mineralogical studies, the microscopic analysis of organic remains, and the study of the content of separate elements in mineral grains or monomineral fractions. In this way, the geochemical history of separate elements from the deep-sea sediment cores can be traced with assurance.

Complete Silicate Analysis

Sedimentary rocks and their disintegration products contain mostly the ten oxides listed here: SiO_2, Al_2O_3, FeO, Fe_2O_3, TiO_2, MgO, CaO, Na_2O, and K_2O, and H_2O. In addition, BaO, DrO, MnO, FnO, Li_2O, CO_2 and Cl are present in small amounts. The content of water is usually less than 2 to 3 per cent, that is why it can be disregarded for general determinations; chlorine (Cl) and sulfate (SO_3) are usually contained in negligible amounts (less than 1 per cent). They increase in importance only in evaporites. The percentage of different oxides in rocks and sediments can be used as a basis for computations by the method of Niggly, Zavaritsky *et al.*

According to the method of Zavaritsky, the mathematical concept of the chemical composition of rock is given by the ratio between the following seven elements determined by this analyses: Si:Al:Fe:Mg:Ca:Na:K. In this ratio, manganese which is usually present in small amounts, is combined with iron and titanium, conventionally, with silicon. The relations between cations of different elements are used to determine the relationship of femic and salic components of rocks, to elucidate the excess or deficiency of silicic acid and to find out "symptomatic" minerals, the peculiarities of feldspar, aluminosilicate, etc.

Unlike the interpretation of chemical analyses of magmatic rocks, the analysis of sedimentary rocks requires the clastic and biogenous parts of the sediment to be separated. As seen below, a considerable part, and sometimes the basic part, of calcium, magnesium and silicon in sedimentary rocks is usually associated with the biogenous process and may result in a confused interpretation. Because of this some additional analyses for the content of biogenous components in sediments have been made. They are excluded from the interpretation of the chemical composition of the initial rocks, and, conversely, can be taken into consideration when the sediment is regarded as an association of chemical elements.

Volcanic glass representing noncrystallized magmatic melt is of great importance in the composition of the sediment cores. The composition of volcanic glass and its physical properties change depending on the acidity of the melt. The typical chemical analysis of the recent sediment from the Pacific (Tables 17 A-D: abyssal red clay, radiolarian, diatom and foraminiferal oozes, respectively), sedimentary rocks and basalts (Table 18) are given; and, data on the chemical composition of the cores appears in Tables 7 to 16.

Geochemistry of Biogenous Material from the Cores

The most important biogenous components of bottom sediments and sedimentary rocks include siliceous and carbonate material, organic carbon, part of phosphorus, iron, manganese and some other elements which are essential either in the life cycle of organisms for the construction of their soft parts, or in the construction of their tests. Siliceous and carbonate remains are of paramount importance. According to the classification accepted in the USSR, biogenous sediments are those with more than 50 per cent biogenous remains, this includes siliceous and carbonate material and organic carbon. According to the classification of Olausson (1960), the lower limit for biogenous ooze is 30 per cent.

The content of biogenous material can be determined by different methods. Amorphous silica is determined by chemical methods; in a number of cases these methods are controlled by the X-ray analyses and infrared spectroscopy. A wide application of the chemical methods for the quantitative determinations of opal in bottom sediments together with the microscopic and electron microscopic analyses of the samples makes possible the determination of both the genesis of siliceous material and its amount.

Carbonates were determined by several methods. First of all, the quantity of carbon dioxide was determined, as well as the Ca:Mg ratio in hydrochloric acid extractions. These determinations together with a quantitative estimate of the content of carbonate minerals inferred from the X-ray analysis of sediment and with the microscopic study of the samples allow one to determine the genesis and to quantitatively evaluate the contribution of different organisms to the formation of the carbonate part of the sediment. Along with the quantitative determinations of calcium and magnesium, the ratio between them as well as the Ca:Sr ratio is very important. The obtained results are presented in Tables 13 and 14.

The content of calcium carbonate in the sediment cores ranges in a very wide limit from less than 0.1 per cent to maximum values of 97 to 97.65 per cent (for carbon dioxide). According to the X-ray determinations, in a number of cases carbonate minerals compose practically 100 per cent of the sample.

As far as mineralogy is concerned, calcite is sharply dominant among the carbonates in all sediments and comprises more than 20 per cent of all the carbonates. The quantitative determinations of aragonite, high magnesium calcite, and dolomite have shown that aragonite is the more widely distributed of these minerals. At some sites (47, 50) its content is as high as 3 to 4 per cent of sediment, however, in such cases it is still far less important than calcite.

Dolomite is usually formed in thick sequences of carbonate sediment as a result of diagenesis or metasomatism. There is evidence of the formation of primary dolomite in carbonate sediments only a few thousand years of age. Therefore, it is quite natural to expect dolomite in the deep-sea drilling cores whose age is many tens of millions of years. On earlier cruises in the Atlantic Ocean concentrations of dolomite were found in sediments above the basalt. A thorough analysis of all the samples of Leg 6 has shown, however, that dolomite is either absent, or is found as separate grains, such as in trace amounts. This is confirmed by the chemical data on the content of magnesium in hydrochloric acid extractions from carbonate sediments. Typical dolomite [$CaMg(CO_3)_2$] contains 30.4 per cent calcium oxide and 21.8 per cent magnesium. The weight ratio $CaO:MgO = 1.39$. As a rule, magnesium-oxide content in the cores of Leg 6 ranges from a trace to 1 per cent, but one core from Site 53 gave 2.63 per cent, and from Site 60 another sample gave 1 to 2 per cent.

All this shows that calcite predominates among carbonates in the cores of Leg 6. It is responsible for the composition of the tests of foraminifera and coccolithophoridae which are the major organisms forming carbonate sediments. No geochemical indicators have so far been able to determine the contribution of each group of organisms to sedimentation. This can, however, be easily deduced from a microscopic study of the sediment. The microscopic study of the cores shows that radiolarians are of the greatest importance among siliceous organisms. Radiolarians are often found in microsections of chert. They were also encountered in considerable amounts in sediments from Sites 46 and 58.

Diatoms, particularly the equatorial diatom *Ethmodiscus rex*, is of significance in the formation of some sediment horizons at Sites 50, 51, 58 and 59.

The chemical analysis in Table 8 shows that the content of amorphous silica in the core from Site 46 is 20.64 per cent, in separate layers from Site 52.0, up to 20.5 or 21.12 per cent, and from Site 59.2, up to 11.26 per cent. An examination of siliceous remains under the microscope indicates a higher content of organic opal. This can be attributed to the fact that skeletons of radiolarians and diatoms have delicate perforated walls and the real silica contribution by weight to sediments is far less than it seems. In carbonate sediments amorphous silica is usually absent or is encountered in quantities of 1 to 2 per cent. The same values have been obtained for zeolitic red clay. Interlayers enriched in volcanic glass do not reveal, as a rule, a rise in the content of authigenic opal; in other words, the glass proves to be rather stable to the natron leaching. In particular, this is clearly demonstrated by Site 60 where in places 50 to 100 per cent of the sediment is composed of volcanic glass and ash, but the amorphous silica only ranges from 1 to 2 per cent and is due to the presence of scattered radiolarians.

Typical siliceous sediments containing more than 50 per cent amorphous silica have not been discovered by drilling on Leg 6. It should be noted that some samples of diatom oozes from Antarctica contain up to 72 per cent amorphous silica. In the equatorial Pacific the amorphous silica content of the surface sediments is usually 10 to 30 per cent, rarely 30 to 50 per cent and more than 50 per cent only in radiolarian oozes and 40 to 60 per cent for *Ethmodiscus* diatom oozes (Lisitzin, 1966).

Organic carbon (C_{org}) is one of the most reliable indicators of organic matter. The study of organic carbon in the surface layer of the bottom sediment of the Pacific (Bogdanov, Lisitzin, Romankevich–in press) shows that organic carbon concentrations in the pelagic sediments determined by the Knopp-Frezenius method of wet combustion are less than 0.25 per cent. The analyses of organic-carbon distribution in the cores show that it is in the range from less than 0.05 per cent to the maximum values of 0.35 per cent recorded in the sediments from Horizon Ridge (Site 44). Most organic carbon concentrations are less than 0.25 per cent, that is, they are in the same range as those in the surface layer of the pelagic sediments. No regular decrease of organic-carbon content of the cores with age has been found in sediments up to 100 million years old. This is evidently related to the fact that the most stable part of organic carbon is preserved in the deep-sea sediments, there being no essential decay of this organic matter with considerable periods of time. This fact is also confirmed by the observations of the oxidation-reduction potential (Eh) of sediments as well as by the absence of a reduced zone in them. This is one of the fundamental differences of oceanic sediments from those of peripheral parts of the oceans and seas where a complex diagenetic reconstruction of sediment, the migration of numerous elements, and the formation of typical authigenic minerals proceed under the action of organic matter decay.

Phosphorus is also associated, to a great extent, with biogenous sedimentation. Part of it is related to the fragments of rocks and ash particles (basic rocks are especially enriched in phosphorus), separate minerals (particularly apatite) and adsorption on the surface of clay particles. In the pelagic sediments, the geochemistry of phosphorus is much dependent on the concentrations of teeth and bones of fishes which are a ubiquitous component of abyssal red clay. The phosphate matter of bones and teeth is called collophane. Phosphorus is a good indicator for the quantitative estimate of the content of teeth and bones in the cores. The phosphorus content (in terms of P_2O_5) ranges from 0.02 or 0.03 per cent to maximum values of 1.05 and even 1.69 per cent in the lower layers of Hole 59.2. A great amount of bones and teeth of fishes has been found here in Eocene and Paleocene zeolitic red clay and radiolarian ooze. High concentrations of P_2O_5 have been found also in some horizons at Sites 51 and 52, however, they do not exceed 0.40 to 0.55 per cent here. Sediments of Site 51 are deposited in deep water below the critical depth of carbonate accumulation (5980 meters), they are zeolitic clay and radiolarian ooze with an appreciable amount of teeth and bones. Similar sediments have been obtained from the cores of Site 52 (5744 meters depth). No regular decrease in the phosphorus content from Recent to Upper Cretaceous has been found. This can evidently be related to a high stability of fish remains in pelagic sediments.

Geochemistry of Clastic Material from the Cores

Clastic and clay material form a considerable, and often basic part of many cores. Most clay minerals in recent sediments can be classified as terrigenous minerals (Rateev, Gorbunova, Lisitzin, Nosov, 1969). The laws governing the distribution of these minerals correspond to the laws of the distribution of other fine elastic minerals. Some of the clay minerals in the cores, such as montmorillonite, can undoubtedly be related to a volcanic origin. Thus, at the present time it is often very difficult to distinguish terrigenous fine dispersed minerals from volcanogenic; similar problems are encountered in coarse sediment fractions. Old volcanogenic strata are of great importance in the erosion of a water discharge area and islands in the western peripheral region of the Pacific. At the same time, the supply of undoubtedly pyroclastic material to sediments can often be noted. A thorough mineralogical and X-ray study of the cores often makes it possible to determine the genesis of clastic material, that is, to separate volcanogenic from terrigenous material. In many cases this study becomes easier due to the use of the indicator-elements of clastic material.

According to Goldschmidt's ideas, based on the ion potential (the ratio of ion charges Z to their radia z), all elements can be divided into three groups by their properties: cations, hydrolytic elements, and elements of the dissolved anion complex. The ion potential for the most widely distributed elements of hydrolysis is in the range 3.0 to 9.5. These are amphoteric elements forming acid and basic oxides, their ions are associated with water ions, that is, they are hydrolyzed. The elements of hydrolysis do not usually migrate in the process of diagenetic transformations of sediment. Among them there are sediment-forming elements contained in appreciable amounts (Al, Ti, Fe''') and peculiar accessory elements (Zr, Ga, Th, Ta, Nb, Hf, Cr, V, Mo).

Many elements at one valence behave as hydrolyzates and at another valence, as cations (iron, manganese, etc.). Therefore, proceeding from their relation to the reliable hydrolyzates which are used as evidence-elements (Al, Ti, Zr, Th), the clastic part of iron and manganese and other elements can be determined.

Since the content of hydrolyzates greatly depends on their dilution with biogenous material, in particular with calcium carbonate and amorphous silica, it is more convenient to use their ratios rather than percentage. Silica-aluminum and aluminum-titanium modules(SiO_2/Al_2O_3 and Al_2O_3/TiO_2) and other ratios are widely used in geochemistry. The ratio SiO_2/Al_2O_3 allows one to judge the genesis of the leucocratic part of clastic material, whereas the ratios Fe_2O_3/TiO_2; TiO_2/Th; TiO_2/Zr; TiO_2/Cr; TiO_2/Ca and others, of the melanocratic part.

The change of the silica-aluminum ratio in space and time is very interesting. The major carriers of aluminum in bottom sediments are mica, orthoclase and clay minerals. Abyssal red clay has a ratio ranging from 2.4 to 3.3, more often 3.2 to 3.3, radiolarian ooze from the southwestern North Pacific has a ratio of 2.5; foraminiferal ooze of the Pacific, 2.7 to 3.5; tholeiitic basalt of the Pacific, 3.1, with the average 3.0 for the world ocean and 3.1 for basalt from Site 57.

When determining the silica-aluminum ratio it should be kept in mind that part of the silica may be associated not with the clastic and clay material of sediments, but with their biogenous component (radiolarian skeletons, diatom frustules and sponge spicules). This correction may be significant and, therefore, should be taken into consideration; another correction may be introduced for free quartz. In this case, the silica-aluminum ratio will be determined chiefly by the relationship of these sediment-forming elements in aluminum silicates and in volcanic glass.

A detailed study of this relationship in comparison with the data on the mineralogical composition (the X-ray and immersion methods) makes possible a correlation by clastic material and the establishment of horizons different in the composition and genesis of the clastic part of their sediment. The analysis of these relationships in depths of the cores, such as, in time, enables one to judge the changes in the supplying provinces of the past and the peculiarities of ancient volcanic activity.

Quartz determined both by chemical methods and by X-ray and optical analyses of sediments is an important indicator of terrigenous material. Quartz is seldom encountered in the mineral complexes of islands and volcanic arcs fringing the Pacific Ocean or in pyroclastic material. The bulk of this mineral is of continental origin. The supply of large amounts of quartz to the sediments of the arid zones of the Atlantic and Pacific Oceans in the eolian way was established long ago.

The study of soils of the Hawaiian Islands has shown that quartz contained in these soils is contributed together with products of tropospheric transport from North America (Rex, 1969). Quartz in the sediments of this part of the ocean is of a similar genesis, as well as quartz from the radioactive fallout in Japan (Miyake *et al.,* 1956).

The quantitative determination of quartz in sediments without their division into fractions was made by the X-ray diffraction method for all the samples of Leg 6 analyzed. Parallel quartz content determinations were made by chemical methods. As the studies of eolian quartz have shown, the major part of the latter forms a fraction 2 to 10 microns, that is, beyond convenient optical resolution. Part of the quartz, however, forms a coarse-aleuritic fraction (0.1 to 0.05 millimeter) where it can be determined by the immersion method. The quartz content of cores from the Horizon Ridge was very small because of its dilution with carbonate material. In sediments from Site 45, quartz makes up 5 per cent of the sediment, whereas, from Site 46 it makes up 20 per cent—the twofold variations of its content in time being observed there. Carbonate sediments from Site 47 contain much quartz (to 11 per cent) in the upper layers; down the sediment core the content of quartz drops to less than 1 per cent, yet some interlayers are rich in this mineral.

The rise in the content of quartz in the cores from the western part of the ocean (Sites 49, 50, 51, 52) seems quite natural. Most cores were taken from depths exceeding the critical depth for calcite dissolution. The proximity to Asia is determined here by a high (as much as 20 to 25 per cent) content of quartz in the cores. The cores obtained in the Philippine Sea, Mariana Trench (Sites 53, 54, 60) and from the Caroline Ridge (Sites 55 through 59) usually contain less than 1 per cent quartz and only in some cases as much as 10 per cent. Low quartz concentrations in this area can be attributed to both the peculiarities of the supplying province and the location of all these sites in the equatorial humid zone where no tropospheric transport of quartz is recorded.

The analysis of the distribution of quartz in time makes possible the preliminary conclusion that the system of trade winds in the northern arid zone of the Pacific during the last 70 or 100 million years was very stable.

There were periods when the eolian transport was more or less intense, and these periods were apparently associated with changes of humidity in the supplying provinces of the North America and Asia.

Geochemistry of Trace Elements

The geochemical history of trace elements in the deep-sea drilling cores as well as in bottom sediments is extremely complicated. Part of them is related to clastic material (especially to titanium, chromium, zirconiun and vanadium), other trace elements undoubtedly take part in a biogenous cycle (iron, manganese, zinc and molybdenum).

Among rare alkaline metals, lithium is bound together with clay minerals filling their crystalline lattice. Rubidium and cesium are also related to fine-dispersed minerals but they are adsorbed mainly on their surface. The highest concentrations of natrium (Na) are recorded in sediments rich in minerals of the feldspar group. For the same reason, the greatest amount of natrium is found usually not in the fine-dispersed but in sandy-aleuritic fractions of sediment. Part of natrium is adsorbed on the surface of fine particles. The highest concentrations of lithium in the lattice of clay minerals were recorded for montmorillonite and kaolinite, minerals which are widely distributed in the cores of Leg 6. The bulk of potassium, rubidium and cesium are associated with hydromica.

During diagenesis the mineral carriers of the alkaline elements are redistributed with the supply of part of the elements to interstitial waters. The preliminary analysis of the cores shows that such changes are not usually essential. The geochemical history of iron, manganese, partially molybdenum, zinc and some other elements is no less complicated. Part of them is bound with the lattice of minerals, that is, with clastic and clay material of sediments, another part is associated with a biogenous cycle, in particular with the formation of iron-organic and other organic compounds, finally, their adsorption on the surface of clay particles is very significant. Many elements migrate in sediments during diagenesis with the resulting formation of authigenic minerals. The formation of phillipsite, iron-manganese grains and nodules, and locally of celestobarite is of particular importance. These new minerals were seen in cores from Sites 45, 46, 47, 48, 49, 50, 52, 53, 55, 58 and 59. All this shows that the correct judgment of the geochemistry of most elements requires a thorough study of their chemical forms and an analysis of the minerals.

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METHODS USED IN GEOCHEMICAL DETERMINATIONS

(A. P. Lisitzin)

Chemical determinations were made by the same methods as those widely accepted in the USSR for the analysis of marine sediments and sedimentary rocks (Strakhov, 1957).

Calcium carbonate and organic carbon determinations were made by the wet combustion method using a Knopp-Frezenius device. Simultaneously with these determinations, calcium oxide and magnesium-oxide content was controlled spectrochemically and in hydrochloric extraction. This enables one to determine calcium forms in sedimentary rock existing as carbonates and silicates.

Amorphous silica (opal) was determined twice by a chemical method in 5 per cent sodium-carbonate extraction above a boiling water bath. In addition total silica was determined spectrochemically, and quartz silica by the X-ray method in the same samples. Thus, the quantitative evaluation of the major silica varieties in sediment: quartz, silicate, opal (amorphous) became possible. Along with the chemical determinations, amorphous silica was determined by the X-ray method (Goldberg, 1958; Calvert, 1966) and microscopically in smear slides (estimation of organic opal remains). A comparison of the methods was given earlier (Lisitzin, 1966). Comparative determinations with the aid of infrared spectroscopy have commenced.

Ferrum was determined calorimetrically with sulphasalicylic acid in ammonical solution, and at high iron content the gravimetric method was used. At the same time, in all the samples ferrum was determined spectrochemically, and to some samples the neutron-activation method of analysis was applied.

Manganese was determined calorimetrically after the sample was decomposed into HF + H_2SO_4 and then melted together with potassium pyrosulphate. When the manganese content was high the gravimetric method was used. At the same time, in all the samples manganese was determined spectrochemically, and in some samples, also by the neutron-activation method.

Titanium was determined calorimetrically with hydrogen peroxide, as well as spectrochemically.

Phosphorus was also determined calorimetrically as a phosphorusmolybdenum-vanadium complex.

The samples were analyzed in the Analytical Laboratory of the Institute of Oceanology, USSR Academy of Sciences, directed by O. I. Felenskaya. The analyses were made by M. I. Gochvat, A. G. Samosudova, N. K. Voshesenskoja, M. B. Cheremchanzeva and E. M. Mochalova.

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SPECTRAL METHOD FOR DETERMINATION OF OXIDES

(I. B. Zverinskaya)

This method is used to determine concentrations of the following major oxides: silica, aluminum, calcium, manganese, magnesium, titanium, and iron.

Preparation of Samples for Analysis

Fifty milligrams of a ground sample are mixed with buffer in the ratio 1:20. The sample then is reground and thoroughly mixed by hand with buffer and with alcohol in a jasper mortar for 30 minutes.

The composition of the buffer solution is as follows: coal powder, strontium carbonate and cupric oxide in the ratio 39:19:1.5. Previous checking of spectral purity of all the components of the buffer solution is required.

Spectral Analysis

Spectral analysis is carried out with the aid of a diffraction spectrograph DFS-8 with a three-lense system of lighting the slit through a three-stepped reducer. The DFS-8 spectrograph has a flat diffraction grating 600 hatch/mm. The operating range of the instrument is 2000 to 10,000 Å, and linear dispersion, 6 Å/mm. The slit width of the spectrograph is 0.027. The spectrum of each sample is photographed three times (at random) onto a spectrographic plate of Type II, with sensitivity of 15 units ASA. Spectra of standards are photographed onto each of the plates.

Rocks with a known content of rock-forming oxides (a reliable chemical analysis) are used as standards. An alternating-current arc from the DG-2 generator is used for the excitation of the spectrum.

The upper electrodes are cone-shaped. The sample prepared for the analysis is tightly packed into the electrode crater. The arc is switched on by bringing the electrodes together at a weak current, then separating them to 4 millimeters and increasing the strength of the current 17 amperes. The analytical intervening space of 4 millimeters is kept constant during combustion. The latter proceeds until the sample is completely burned (one minute).

Photometering

The obtained spectra are photometered with the aid of the MF-2 microphotometer used for measuring the densities of darkened spectrograms. The ranges of densities of darkening are from 0 to 2. Magnification of the instrument is 30 ×, and sensitivity of the photocell is no less than 30 milliamps/lumen.

Analytical lines and comparison lines are given below:

1. Si 2435 Å-Cu 2441 Å	4. Mn 2801 Å-Cu 3010 Å
Si 2587 Å-Cu 3010 Å	5. Mg 2775 Å-Cu 3010 Å
2. Al 2652 Å-Cu 3010 Å	6. Fe 3024 Å-Cu 3010 Å
3. Ca 3006 Å-Si 2531 Å	7. Ti 2556 Å-Cu 3010 Å

Silicon-dioxide and magnesium-oxide concentrations are determined from two pairs of analytical lines.

Determination of Concentrations

Average differences of the darkening of analytical lines are calculated from three parallel spectra. Then diagrams are constructed with the following coordinates: difference of darkening (ΔS), and concentration logarithms (lg C). The diagram is used to find a logarithmic value of the concentration of the corresponding oxide after which the concentration is calculated in percentage.

Estimate of Accuracy and Reproducibility of the Method, Limits of the Concentration to be Determined

The results of analyses of G-1 standard:

Oxides	Number of Determinations	Concentration (%)	Known Concentration (Fleischer, 1963) (%)	Deviation (%)
SiO_2	7	73.41	72.610	1.10
Al_2O_3	7	15.00	14.040	6.80
CaO	Not determined		1.390	
MgO	Not determined		0.041	
MnO	Not determined		0.030	
ΣFe_2O_3	7	1.97	1.960	0.51
TiO_2	7			

The results of the analysis of red clay standard:

Oxides	Number of Determinations	Concentration (%)	Known Concentration (Jensun, personal communication) (%)	Deviation (%)
SiO_2	5	50.24	48.75	2.57
Al_2O_3	5	17.18	17.90	4.03
CaO	5	2.34	2.06	13.60
MgO	5	3.58	3.22	11.20
MnO	Not determined		0.58	–
ΣFe_2O_3	5	7.40	–	–
TiO_2	5	0.76	0.83	8.50

The estimate of reproducibility was made from the results of the analysis of Sample 6-45.1-1-5, 60 cm:

Oxides	Concentration (%)	Coefficient of Deviation	Limits of the Concentrations to be Determined (%)
SiO_2	47.38	6.60	4.600 – 95.50
Al_2O_3	16.03	6.06	0.700 – 45.00
CaO	3.42	10.10	0.880 – 60.00
MgO	3.35	7.60	0.660 – 24.50
MnO	Not determined		0.030 – 0.21
TiO_2	0.72	12.60	0.150 – 2.25
ΣFe_2O_3	6.10	6.50	1.900 – 10.00

Reference

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DETERMINATION OF CHROMIUM, NICKEL, COBALT, LEAD, MANGANESE, TITANIUM, ZIRCONIUM, COPPER AND MOLYBDENUM BY THE SPECTRAL ANALYSIS METHOD

(V. Lukashin)

Preparation of the Samples

The sample is thoroughly ground in a mortar to 200-mesh after which it is mixed with a buffer in the ratio 1:2.5. The buffer consists of spectrally pure calcium carbonate and coal powder in the proportions 1:1.5.

Standards

Synthetic standards are used for the analysis. The percentage base components of the standards are as follows: silica - 50; calcium carbonate - 30; alumina - 8; total iron - 5; sodium chloride - 4; potassium chloride - 2; and magnesium oxide - 1. There are seven standards with the percentage concentrations of chromium, cobalt, nickel, lead, vanadium, and molybdenum from 0.05 to 0.0005, zirconium from 0.024 to 0.00024, copper from 0.1 to 0.0001, manganese from 5 to 0.15, and titanium from 3 to 0.03. Before combustion the standards are also mixed with a buffer.

Electrodes

Electrodes of the spectrally pure coal are used for combustion. The depth of the electrode's crater is 4 millimeters, and height, 4 millimeters. There is a channel under the crater. The upper electrode is of the same form, yet it has no crater. Thirty milligrams of the sample prepared for the analysis are placed into the electrode's crater.

Excitation

An alternating-current is produced by an arc generator DG-2 which serves as the excitation source. The strength of the current is 17 amperes and the time of the combustion of the sample is 3.5 minutes.

Recording

The DFS-8 spectrograph of 6 Å/mm average dispersion with the diffraction grating of 600 hatch/mm is used for the analysis. A three-sense lighting system is placed in front of the spectrograph slit. The slit of the intermediate lense is 3.2 millimeters. The spectrograph is 26μ wide. Spectra are recorded onto spectral photographic plates of Type II with sensitivity equal to 15 units according to ASA.

Developing

The plates are developed in metal hydroquinone developer at 20°C for 3 minutes.

Photometering

Photometering is made with the aid of the MF-2 microphotometer. The ranges of measuring darkening densities are 0 to 2. The sensitivity of the photocell is no less than 350 milliamps/lumen.

The analytical lines are as follows:

Cr - 3014.9Å	Cu - 3274.0Å
Ni - 3050.8Å	Zr - 3273.05Å
V - 3102.3Å	Pb - 2833.1Å
Mo - 3194.0Å	Mn - 2534.1Å; 3070.3Å
Co - 3453.5Å	Ti - 2841.9Å; 2956.1Å

The background in the vicinity of each line serves as an internal standard. The method of "three standards" is used for the determination of concentrations.

Calibration Diagrams

Calibration diagrams are constructed for each element, and for each photographic plate with the coordinates Δs-lg C.

Accuracy

The accuracy of the analysis is 0.005 per cent for cobalt, nickel, vanadium, molybdenum, lead and zirconium; 0.001 per cent for chromium and copper; 0.05 per cent for manganese; and 0.03 per cent for titanium.

X-RAY DIFFRACTION METHOD FOR THE STUDY OF CLAY MINERALS

(Z. N. Gorbunova)

Clay minerals were studied with the <0.001-millimeter fraction obtained from the grain-size analysis of the samples made with sodium tripoliphosphate additions. The <0.001-millimeter fraction was washed twice with distilled water in a centrifuge to separate it from dissolved salts. If the samples contained carbonates, the latter were dissolved with 1N hydrochloric acid and then washed out.

Amorphous iron was removed using the method of Mehra and Jackson (1960), since it creates a strong background on diffractograms and makes the identification of minerals difficult. After such treatment, the fractions were saturated with magnesium cations for which purpose the fractions were placed in a 1N magnesium chloride solution for one day, after which the salt excess was washed out with distilled water in a centrifuge. The fractions were settled on 18 by 18 millimeter glass and then analyzed with the aid of a diffractometer. Each sample was analyzed three times; first, when it was saturated with magnesium cations, second, when it was saturated with glycerine, and third, when it was heated for an hour to 550°C.

In addition, an analysis was made on the part of the samples saturated with a lithium cation, heated to 300°C and saturated with glycerine, according to the method of Green-Kelly (1953). This enables montmorillonite proper to be distinguished from other minerals of this group.

In addition to this, another part of the samples was treated with 1N potassium hydroxide and saturated with glycerine to determine the genesis of montmorillonite by Weaver's (1958) method. A number of samples which were supposed to contain palygorskite were heated to 340°C during an hour after which a displacement of the reflection was observed in the vicinity of 10 Å, as recommended in the paper by Heller (1960).

X-Ray Performance of the Instrument

The <0.001 millimeter fractions were analyzed with the aid of a diffractometer Dron-1 supplied with a scintillation counter on a copper-radiation anode having a nickel filter. The operating conditions of the diffractometer were as follows: voltage on the tube – 38 kilovolts; strength of the current – 19 milliampere, slits before the sample – 1 millimeter; slits after the sample – 0.5 millimeter; window – 10 volts; initial threshold – 10; and, terminal threshold – 99. The time constant is 40; the range of impulses per second varied depending on the intensity of reflection (200 to 2000). Scanning speed was 1° per minute, chart speed 10 millimeters per minute. At such operating speed the 3.54/3.57 peaks were resolved clearly enough.

The samples saturated with magnesium and glycerine were analyzed in the range from 2 to 3320, and those heated and saturated with lithium and potassium in the range from 2 to 1320.

Identification of Minerals

The following minerals have been identified in the samples analyzed: montmorillonite group (smectite), illite, chlorite, kaolinite groups, sometimes probably palygorskite and serpentine. In addition, mixed-layered formations have also been found. The above-mentioned groups of minerals have been identified proceeding from the universally accepted methods (Brown, 1961). The results are given in Table 6 at the end of this chapter.

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METHODS FOR THE DETERMINATION OF ZINC

(V. V. Gordeev and Yu. N. Khodkevich)

Zinc was determined by the atomic absorption methods in solution with the aid of a two-beam one-channel device with a quartz monochromator (SFDA type). An electrodeless high-frequency lamp whose light is generated with a high-frequency 45-mHz generator served as a translucent source. A cooled slit burner, acetylene as combustible gas, and air as oxidizer were used. A galvanometer graduated in optical density units was used as a recording device. The preparation of the samples was made in the same manner as that of alkaline elements; usually the same samples were used.

Standards with zinc concentrations of 0.1 γ/ml; 0.5, 1; 2; 3 and 4 were prepared from synthetic standards on a carbonate basis – calcium carbonate ($CaCO_3$) - 70 per cent, magnesium carbonate ($MgCO_3$) - 12 per cent, silica (SiO_2) - 15 per cent, iron (Fe_2O_3) - 1 per cent, alumina (Al_2O_3) - 2 per cent – by their acidic decomposition similar to the decomposition of the samples.

Samples with zinc concentrations higher than 4 γ/ml were diluted with distilled water.

Sensitivity of the technique is 0.05 γ/ml for 1 per cent absorbance. Variation coefficient is 5 per cent. The analysis of the international standard of G-1 gives a zinc concentration of 40 ppm (average from the results of many authors is 45 ppm; See Fleischer, 1963).

Results are given in Table 15.

Reference

Fleischer, W., 1963. Summary of new data on rock samples G-1 and W-1. *Geochim. Cosmochim. Acta.* **29**, 12.

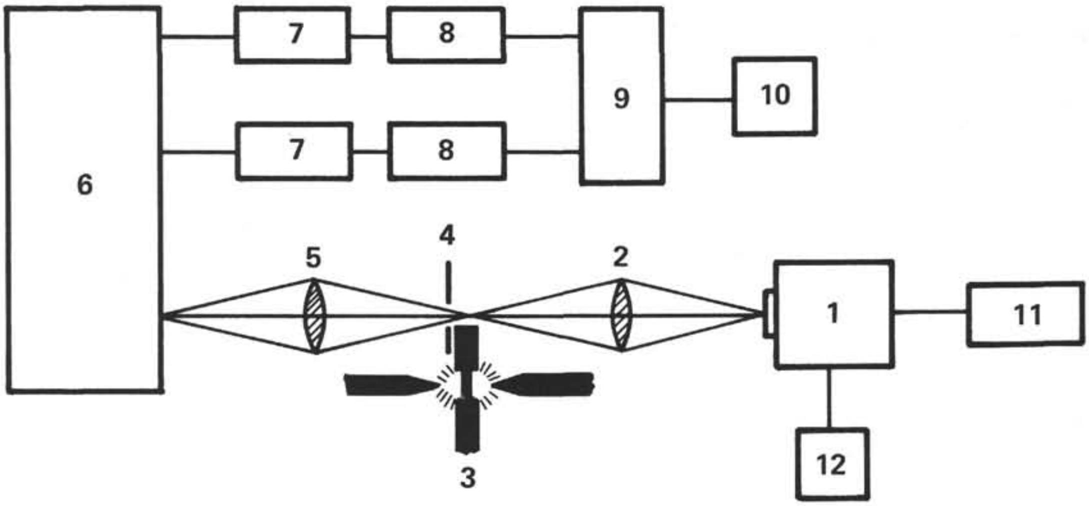

Figure 1. *Schematic of the atomic absorption system with arc.*

METHODS FOR DETERMINATION OF COPPER AND NICKEL

(V. V. Gordeev and V. N. Zhurenko)

Copper and nickel were determined by the atomic absorption technique in solutions with the aid of the Japanese Janagimoto spectrophotometer, model AA-1E, assembled as the American atomic absorption spectrophotometer manufactured by "Jurrel Ash" Company. The instrument is based on a single-beam circuit with a three-way passage of the beam through flame. The monochromator has a diffraction grid hollow-cathode lamp. An air/acetylene flame was used. The signal is recorded with a tenfold scale expansion recorder.

Standards and samples were prepared in the same manner as those for the zinc analysis. Copper and nickel concentrations of the standards were 0.1; 0.5; 1; 2; 2 and 4 γ/ml. If necessary, the samples were diluted with distilled water. Sensitivity of the technique applied was 0.05 γ/ml for copper and 0.1 γ/ml for nickel at 1 per cent absorption. Variation coefficient is 8 per cent for copper and 9 per cent for nickel.

The analysis of the international standard of G-1 has given 74 ppm copper (Fleischer recommends 13 ppm) and less than 10 ppm nickel (1 to 2 ppm, according to Fleischer).

METHODS FOR DETERMINATION OF CADMIUM, COPPER, NICKEL AND ZINC BY ATOMIC ABSORPTION

(V. V. Gordeev, A. M. Pchelintsev and Yu. I. Belyaev)

The identification of cadmium was made by the atomic absorption method with impulsive fractional atomization of the solid samples.

The block diagram of the device is shown in Figure 1. The radiation of the high-frequency cadmium-lamp (1) on having been modulated electrically with the aid of an acoustic generator (410 c/s frequency) passes through the vapor of the arc impulsive atomizer (3) and is focused by lenses (2 and 5) onto the entrance slit of a polychromator (6) – (filter quartz polychromator of a vacuum quantometer), the outlet slits of which separate the resonance (2288 Å) and nonresonance (2265 Å) lines of cadmium. Signals from two photomultipliers (7) after cathode followers (8) arrive at the entrance of a logarithmic amplifier (9) and the logarithmic difference between the intensities of the resonance and nonresonance lines is passed to the exit of the recording potentiometer (10).

Cadmium vapor obtained with the impulsive fractional evaporation of the sample from the electrode (3) heated by a direct current arc absorbs radiation with wave length Cd-2288 Å, whereas radiation with wavelength Cd-2265 Å is not absorbed. Therefore, signals are proportional to optical density on the exit of the logarithmic amplifier.

The calibration of the unit was made using synthetic standards prepared on the basis of graphite powder from graphite electrodes and was checked using the international standards G-1 (cadmium content 6.10^{-6} per cent). Figure 2 shows a graduated diagram (D = f (c)) for identifications which indicates a point corresponding to the international standard and G-1. A powdered sample weighing 10 grams was placed in a graphite electrode shaped as a wine glass and tightly pressed, evaporation being produced by a 10-amphere direct current arc.

Sensitivity of a method with respect to thirty-six criteria is 1.10^{-6} per cent, and coefficient of variation

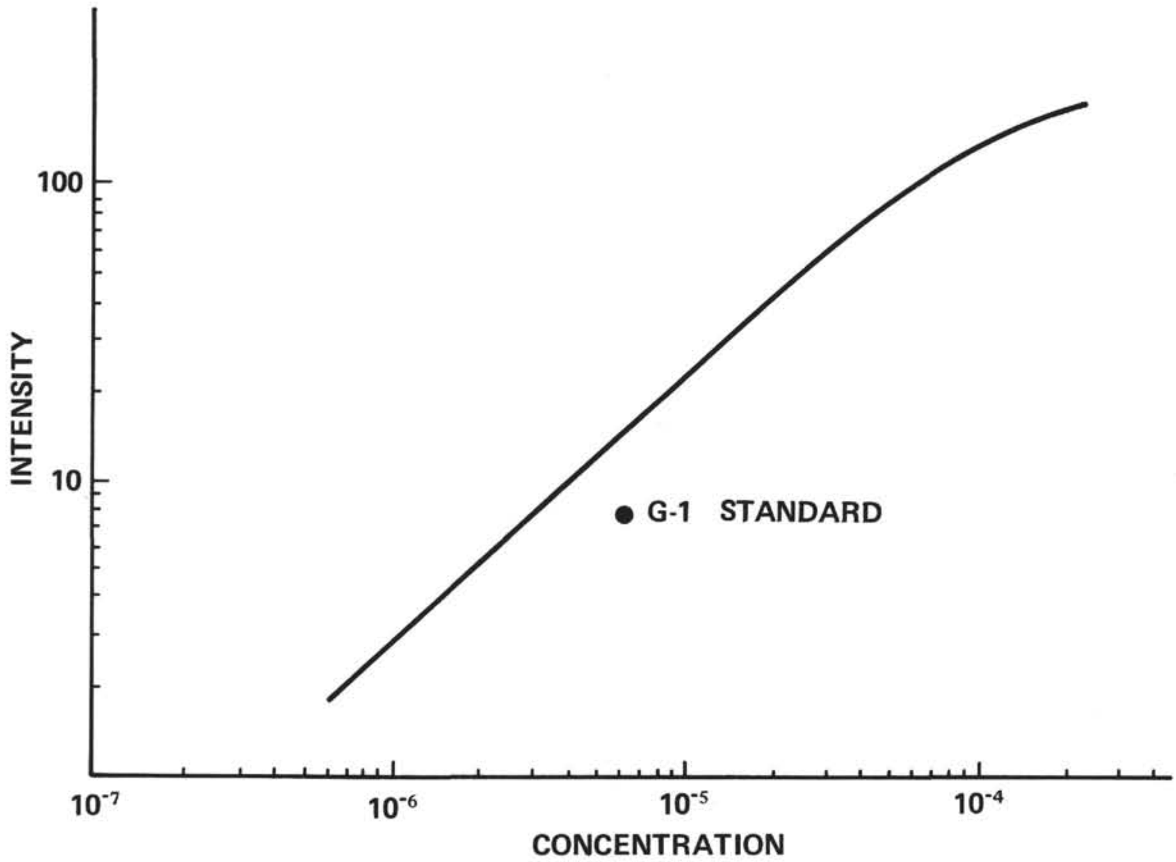

Figure 2. *Calibration graph for Cadmium.*

is ~ 30 per cent. Confidential range for concentrations from 10^{-6} to 10^{-5} with a confidential level of 0.95 is $1.5 \cdot 10^{-6}$ per cent. This level is $1.2 \cdot 10^{-5}$ for concentrations from 10^{-5} to 10^{-6}

GAMMA RAY SPECTROMETRY

(N. I. Popov)

Introduction

The reliability of identifications of volcanic ash interlayers from the total gamma activity of the sediment core depends on the contribution of other gamma radiation sources, except for K^{40}, to this activity. This contribution for sedimentary rocks is 50 per cent. As in oceanic sediments, the composition of the recorded gamma radiation in ash beds is little known.

Only a few measurements of this type are known, and all of them are for comparatively young formations (not older than 500,000 years), since they were made during attempts to date marine sediments by the nonsupported decay products of uranium. No data have been published so far on the content of gamma radiating radionucleides belonging to the titanium and uranium families in marine sediments of greater age.

When determining natural gamma activity of the samples aboard the ship, their total activity is determined without analyzing their energy spectrum. A detailed study of the energy spectrum is possible only in a shore laboratory.

Methods

A verification was made of the spectral composition of gamma radiation in those samples which possessed a high gamma activity as measured on the cores aboard the *Challenger*. The work was carried out with the aid of a gamma spectrometer consisting of a sensor (scintillation crystal NaJ (J1), 80 × 80 mm) with lead protection and a 100-channel analyzer of impulses.

Taking into account a considerable "potassium" background of the used crystal itself, due to which the spectrum region lower than approximately 1.2 Mev proved to be an occupied band of the Compton radiation of gamma-ray quanta of K^{40}, the measurements were made in the energy region from 1.2 to 2.8 Mev. A satisfactory resolution was observed here of photopeaks of K^{40} (1.46 Mev) and decay products of U^{238}: RaC (Bi^{214}) with energies 1.76 and 2.20 Mev, and Th^{232}: Te^{208} with energy 2.62 Mev. The calibration of the instrument was made according to the marine sediment standard containing additional admixtures of uranium and thorium together with their decay products.

Samples for measurements represented wet natural sediment packed up into polyethylene cylinders. The weight of the standard ranged from 35 to 40 grams. Due to a relatively low rate of counting, particularly in the rigid spectrum region, each measurement lasted from 24 to 72 hours.

Results

A list of the samples studied is as follows:

1. 45.1-1-1, 70	5. 51.1-1-4, 30	9. 53.1-3-2, 40
2. 47.0-1-4, 95	6. 52.0-1-2, 30	10. 54.0-7-2, 80
3. 47.2-2-1, 47	7. 52.0-8-3, 40	11. 54.0-1-2, 30
4. 49.1-1-5, 60	8. 53.0-0-2, CC	12. 55.0-13-3, 40

Gamma spectra of each sample (the background of the instrument excluded) are presented graphically in Figure 3. The obtained spectra clearly show that in all the samples studied, gamma radiation of K^{40} predominates in the total gamma activity of oceanic sediments of any age. In only one sample (47.2-2-47, 52), in addition to photopeak of K^{40}, did the peak of the relevant decay product of uranium, Bi^{214} (1.76 MeV), became apparent. However, its contribution to the total gamma activity does not exceed, evidently, 3 per cent of the contribution of K^{40}.

The data cited make possible a conclusion that the appreciable growth of the total gamma activity observed at some levels of the sediment column in the ocean is a unique evidence of the growth of K^{40} concentration at these levels.

DETERMINATION OF FLUORINE

(O. V. Shishkina)

Introduction

Studies of the fluorine concentration in deep sea sediments have indicated an average content of 0.054 per cent, with a range of 0.031 to 0.071 per cent. The fluorine concentrations the authors have obtained for different types of marine sediments are similar to those of Shepherd (1940) and particularly to the data of Koritnig (1951), but differ from the data of Seraphim (1951) in both their lower average values and less scatter.

A comparison of fluorine concentrations in deep sea sediments with their content of organic carbon, carbonates, phosphorus, and pelitic fraction shows no relationship between these values (Shishkina, 1966).

In the marginal parts of the ocean, on the contrary, high fluorine concentrations have been found to be confined to the sediments rich in phosphorus and organic matter.

In Shishkina (1966), the fluorine content of sediments is computed to a depth of 7 meters below the ocean floor. No variation in fluorine content with depth is observed.

This contribution contains the results of the fluorine analysis of sediment cores from Holes 51.1 and 55.0 in the Pacific Ocean.

Methods

The procedure for fluorine determinations comprises three operations: mud decomposition by fusion, fluorine distillation, and its determination proper. From 0.5 to 1 gram of fluorine are fused with six times the amount of potassium-sodium carbonate. Fluorine is distilled off in the form of fluorsilicic acid with vapour at 130 to 140°C. In the distillate collected, fluorine is determined with an arsenazo-aluminum complex (Kuteinikov, Brodskaya, Lanskay, 1962). The optical density (measured with the aid of a light filter) has a maximum at 580 millimicrons. A detailed description of the method was given earlier (Shishkina, Pavlava, Eykova, 1967).

Results

Fluorine content of the sediment cores was determined as deep as 130 meters from the sea floor. The obtained data are presented in Table 19, where fluorine content is given as an average of two-three parallel determinations differing by no more than ±0.002 per cent.

Samples from Hole 51.1 are oxidized, practically carbonate-free muds with a low content of organic matter (Table 9). In four samples from Hole 51.1 the fluorine content was somewhat higher than its average concentration (0.054 per cent) and shows an increase with depth. The fluorine content in the sediment at the maximum depth (126.8 meters) of this site was 0.16 per cent, that is, approximately three times as great as its average. Samples from Hole 55.0 are chalk oozes with a low content of organic matter (Table 9), phosphorus (Table 10) and silicic acid (Table 8). In four samples from this hole down to 60 meters depth, the fluorine content ranged from 0.030 to 0.074 per cent, that is, within the same limits as those established earlier for the upper layers of Quaternary marine sediments (down to 7 meters). From 60 meters to 130 meters depth the fluorine concentration in these carbonate sediments was only 0.020 per cent and remained at this low level. Thus, in this case no increase of fluorine concentration (as reported by Carpenter, 1969) was observed in carbonate sediments with more than 90 per cent calcium (Table 9); on the contrary, the fluorine content was extremely low.

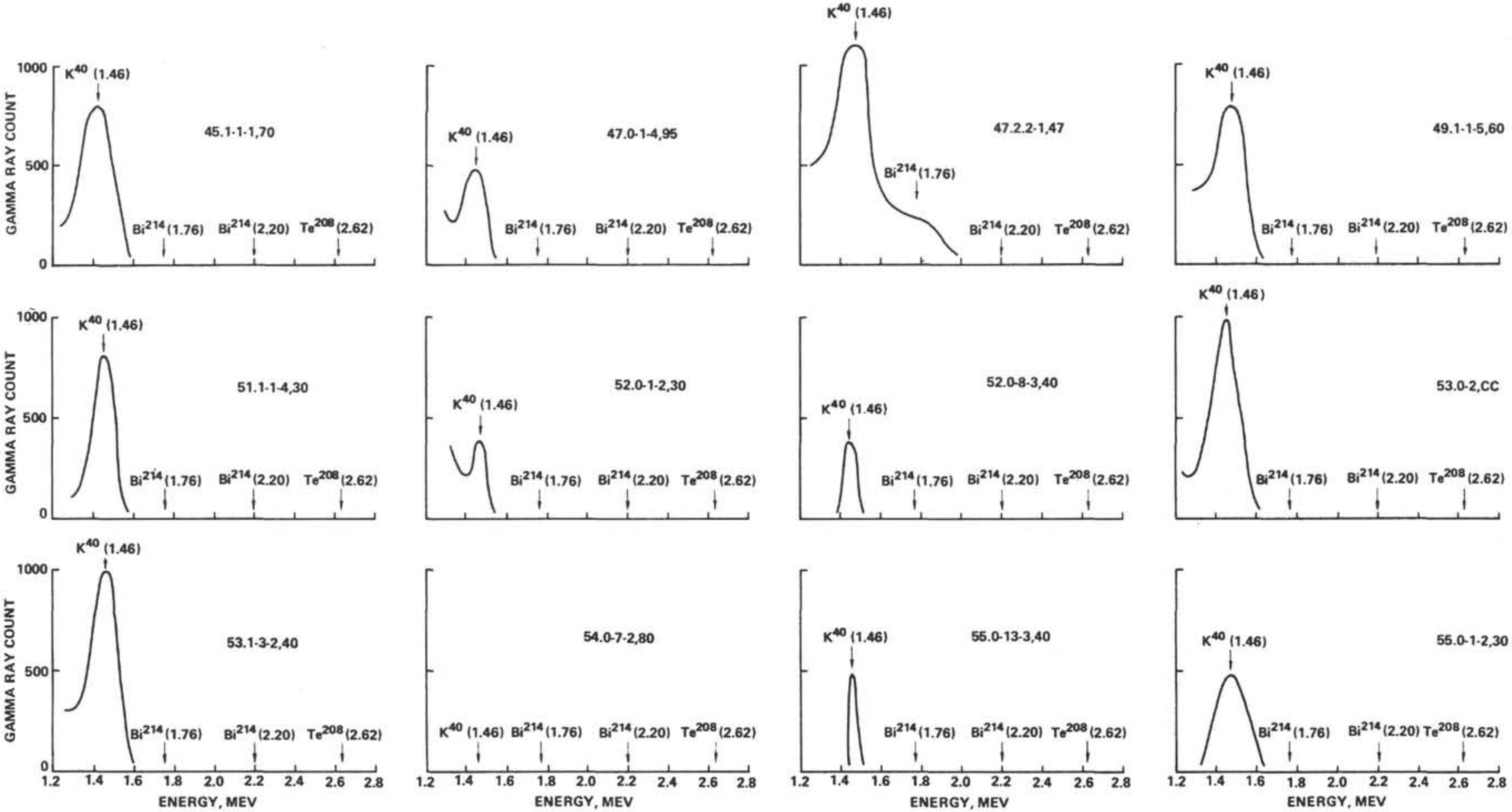

Figure 3. *Gamma ray spectra of Leg 6 samples.*

As a whole, all separate data obtained so far indicate that the fluorine concentrations in sediments at depths of 100 to 130 meters below the sea floor do not differ greatly from the average content in the upper layers of Quaternary sediments. However, the fluorine concentration in the deep layers of siliceous sediments (Hole 51.1) is several times higher than its concentrations in carbonate sediments (Hole 55.0).

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DETERMINATION OF ALKALINE ELEMENTS BY FLAME PHOTOMETRY

(N. M. Morozov)

Methods

Decomposition and Dilution of the Samples

A sample weighing 0.5 to 1 gram was placed in a glass beaker to which 3 milliliters of hydrochloric acid (1:1) were added; the sample had previously been wetted with distilled water (~ 1 milliliter). After mixing the solution and adding to it 3 milliliters more of hydrochloric acid (1:1), the sample was left to stand overnight.

On the following day, another 3 milliliters of acid (HCl - 1:1) were added to the solution, and after evolution of carbon dioxide ceased the undecomposed residue was filtered off. The filters were first dried in porcelain crucibles in a closed electric oven (until they became black) and then burnt in muffle ovens at t ≈ 500°C. After cooling, the residue was placed in platinum bowls, wetted with water (2 to 3 milliliters), covered with 10 to 15 milliliters of hydrogen fluoride (concentrated) and 0.4 to 0.5 milliliter of $HClO_4$ (70 per cent) and heated on a sand bath at 200 to 250°C to wet salts. This procedure was repeated. For a more complete removal of fluorine, 15 milliliters of distilled water and from 0.4 to 0.5 milliliter of $HClO_4$ were added to the samples after which they were steamed dry. This was repeated three times. Filtrates (obtained after the samples were treated with hydrochloric acid) were added to the dry residue of the samples, the mixtures were boiled for about 5 minutes after which, together with the undecomposed residue, they were placed into beakers and kept there for a night.

On the following day, the samples were filtered. If the sample was carbonate-free, 5 milliliters of buffer solution of lantharum (10,000 γ/ml) were added to the filtrate to eliminate the depressing effect of aluminum in strontium determinations; the solution in a measuring flask was made up to 100 milliliters.

For sodium and potassium determinations, an aliquot part of 1 milliliter volume was taken from the solution and diluted by 100-fold (in case of carbonate-free samples) and by 50-fold (in case of carbonate samples).

One milliliter of buffer solution potassium (50,000 γ/ml) was added to the remaining part of the sample (99 milliliters); this solution was used for the flame-spectrophotometric determination of lithium, rubidium, cesium, and the atomic absorption analysis for magnesium, strontium, zinc, nickel and copper.

Photometering Technique

Alkaline elements were determined with the aid of a two-channel flame-spectrophotometric device with the application of a turbulent oxy-hydrogen flame (Figure 1).

Sodium and potassium were determined by a method of comparison with the calibration diagrams after photometering the solutions of samples and standards. The standard solutions were prepared by a subsequent dilution with a distillate of the solution containing 10 γ/ml of potassium prepared, in its turn, from sodium and potassium head-solutions (1000 γ/ml).

A series of the standard solutions contained the following concentrations of sodium and potassium: 0.1, 0.5, 1.0, 2.5 and 5.0 γ/ml. In the case of carbonate samples, in addition to sodium and potassium, a series of the standards contained a constant amount of calcium (15 γ/ml).

Lithium, rubidium and cesium were determined also to be the method of comparison with the calibration diagrams. The standard solutions were prepared by diluting the solution which contained 2.5 γ/ml of lithium, 5 γ/ml of rubidium and 1 γ/ml of cesium, and was prepared from the standard head-solutions of these elements (1000 γ/ml). A working series of the standards contained the following concentrations of the elements and buffer to be determined:

Solution No.	Li	Rb	Cs	Na	K	HCl (conc.)
1	2.5	5.00	1.00	-	-	-
2	1.250	2.50	0.50	1000	1000	6.25
3	0.500	1.00	0.20	1000	1000	6.25
4	0.250	0.50	0.10	1000	1000	6.25
5	0.125	0.25	0.05	1000	1000	6.25
6	0.050	0.10	0.02	1000	1000	6.25

Estimate of Sensitivity, Reproducibility and Error of the Analysis

The photometering of the samples was made in the range of the concentrations corresponding to the linear sections of the calibration diagrams or the scale limits of the instruments. These concentration ranges are taken to be values of the minimum and maximum sensitivity and are as follows:

Na and K	0.05 - 3.0 γ/ml
Rb	0.05 - 1.6
Li	0.01 - 0.8
Cs	0.50 - 1.3

The reproducibility of the method is illustrated below. The results of a complete analysis (including decomposition) of ten parallel determinations of one carbonate sample (55.0-13-3, 40 cm) and one red clay sample (49.1-1-5, 60 cm) are as follows:

Element	Carbonate Sediment		Red Clay	
	Average of 10 determinations (%)	Vc %	Average of 10 determinations (%)	Vc %
Na	0.28	±14	0.55	± 4.2
K	0.08	±36	1.32	±11.0
Li	0.24×10^{-3}	±21	6.0×10^{-3}	± 5.7
Rb	Trace	-	9.2×10^{-3}	±11.5
Cs	No	-	Trace	-

The results of four determinations of alkaline elements in a standard sample of red clay are as follows:

Element	Average of 4 determinations (%)	Concentration according to the sample's passport[a] (%)	Deviation of the average from the value in the passport
Na	1.42	1.52	- 6.5
K	2.41	2.91	- 17.0
Li	1.5×10^{-3}	6.6×10^{-3}	+14.0
Rb	17.1×10^{-3}	16.0×10^{-3}	+ 7.0
Cs	0.9×10^{-3}	—	—

[a]Red clay sample was presented by Dr. Oliva Joensuu, Institute of Marine Science, University of Miami.

GRAIN SIZE ANALYSIS OF BOTTOM SEDIMENT

(A. P. Lisitzin)

Several hundred sediment samples were subjected to grain-size analysis by a method of combined continuous analysis widely accepted in the USSR. This method was developed at the Institute of Oceanography, the U.S.S.R. Academy of Sciences (Petelin, 1968), and at the present time it is the principle method of grain-size analysis used in that country. Only samples containing their original moisture are used for the analysis. The method involved the use of a dispergator, size control of the fractions under a microscope, and the division of fine fractions by a prepared analysis.

The analysis distinguishes fractions according to a metric scale. The relationship between this Russian classification and that of Wentworth and the Phi scale is shown in Figure 4.

The relationship between the major sediment-forming components (calcium carbonate, amorphous silica, iron, manganese and organic carbon) and their origins predetermine the material-genetic parts of the classification (Bezzukov and Lisitzin, 1960).

A wet sediment sample weighing ten to twenty grams was used in the analysis. Of this sample, two grams were taken for moisture determination. The sample is treated with a peptizer, 40 milliliters of 0.2 N solution of $Na_5P_3O_6$ for carbonate-free and 50 milliliters for carbonate rich sediments. The suspensate is thoroughly mixed and passed through two sieves which collect the sand and coarse aleurite fractions, respectively.

The suspensate is washed with a weak jet of deionized water over a large glass cylinder. After washing thoroughly, water is added, a total of three liters to that already in the cylinder, and then left over night for temperature equalization. Next, 30 milliliter samples are withdrawn by pipette to determine the content of fractions of 0.01 to 0.005 millimeters, 0.005 to 0.001 millimeters and finer than 0.001 millimeters. Suspensates are placed into weighed sample boxes and dried in ovens. The sample bottles are reweighed to determine the weight of each fraction. Along with the fractions, 30 milliliters of deionized water is also taken as a control sample.

The suspensate that remained in the glass cylinder is separated from the pelitic fraction by washing, the sizes of particles being controlled under a microscope. Pelitic fractions (finer than 0.01 millimeter and finer than 0.001 milliliter) are collected in separate jars and settled in a centrifuge, the $Na_5P_3O_6$ having been washed out with distilled water.

If the sediment contains appreciable amounts of sand and coarser material the initial weight of the sample is 100 to 150 grams and more. After the fraction finer than 0.05 millimeter is washed out the material is dried and split with the aid of sieves. When estimating the results of the analysis, a correction for salt content of the interstitial water is introduced taking into consideration the moisture determinations. The analysis yields percentage (weight) of the following sediment fractions: $>$ 0.25 millimeter (which may be further subdivided); 0.25 to 0.1 millimeter; 0.1 to 0.05 millimeter; 0.05 to 0.01 millimeter; 0.01 to 0.005 millimeter; 0.005 to 0.001 millimeter; $<$ 0.001 millimeter. The results obtained were used to construct cumulative curves (Figures 5 to 10) with a logarithmic abscissa and an arithmetic ordinate from which median diameter (Md) and sorting coefficient (So) have been determined using Trask's system. Some other mathematical parameters can be determined as well. The same cumulative curves can be used to convert from the decimal fraction system to the geometrical fractions or to the logarithmic Phi-system. The author has suggested a method of conversion to any scale and nomenclature based on the cumulative curve (Lisitzin, 1956).

The grain-size analyses have been made by Z. I. Vinenskaya, A. E. Rubtsova and L. I. Strelanova, of the Institute of Oceanology, the USSR Academy of Sciences.

The fractions obtained by the analyses were then used for mineralogical studies by optical methods (fractions coarser than 0.1 millimeter and from 0.1 to 0.05 millimeter) and X-ray methods (fractions finer than 0.01 millimeter and finer than 0.001 millimeter) and for the infrared and differential thermal analysis. Also, many fractions were analyzed to determine the content of some elements by spectrochemical methods, atomic absorption and neutron-activation.

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INFRARED SPECTROSCOPY

(I. I. Plyusnina)

Methods

Absorption bands in the 1250 to 1100, 830 to 750 and 530 to 460 centimeter^{-1} ranges are typical of silica (SiO_2) modifications. In addition, each crystalline form of silica has its own specific bands. For γ – quartz these are 1167, 784, 695 and 526 centimeter^{-1} (especially two latter frequencies); whereas for γ –

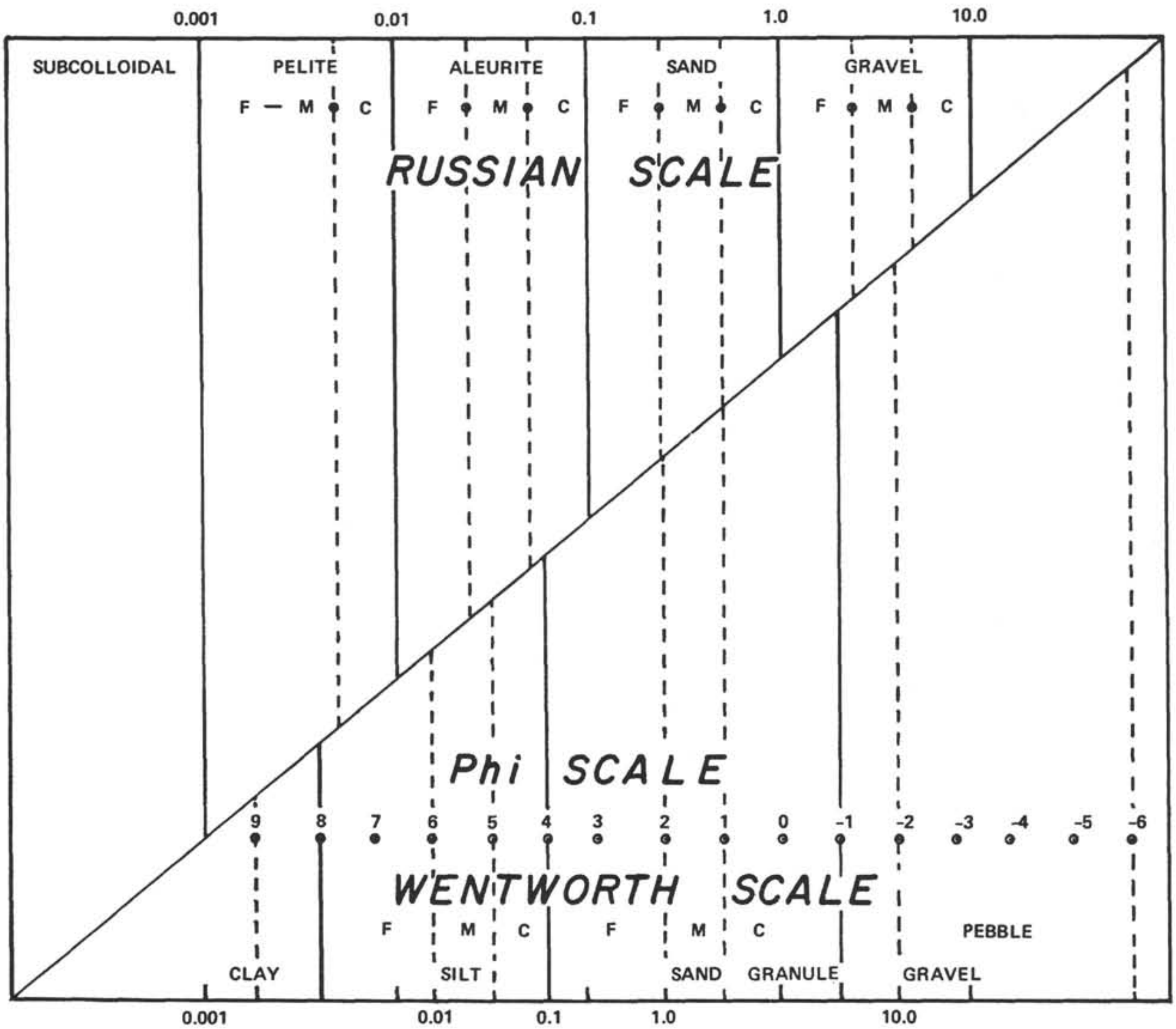

Figure 4. *Grain size classification of sediments.*

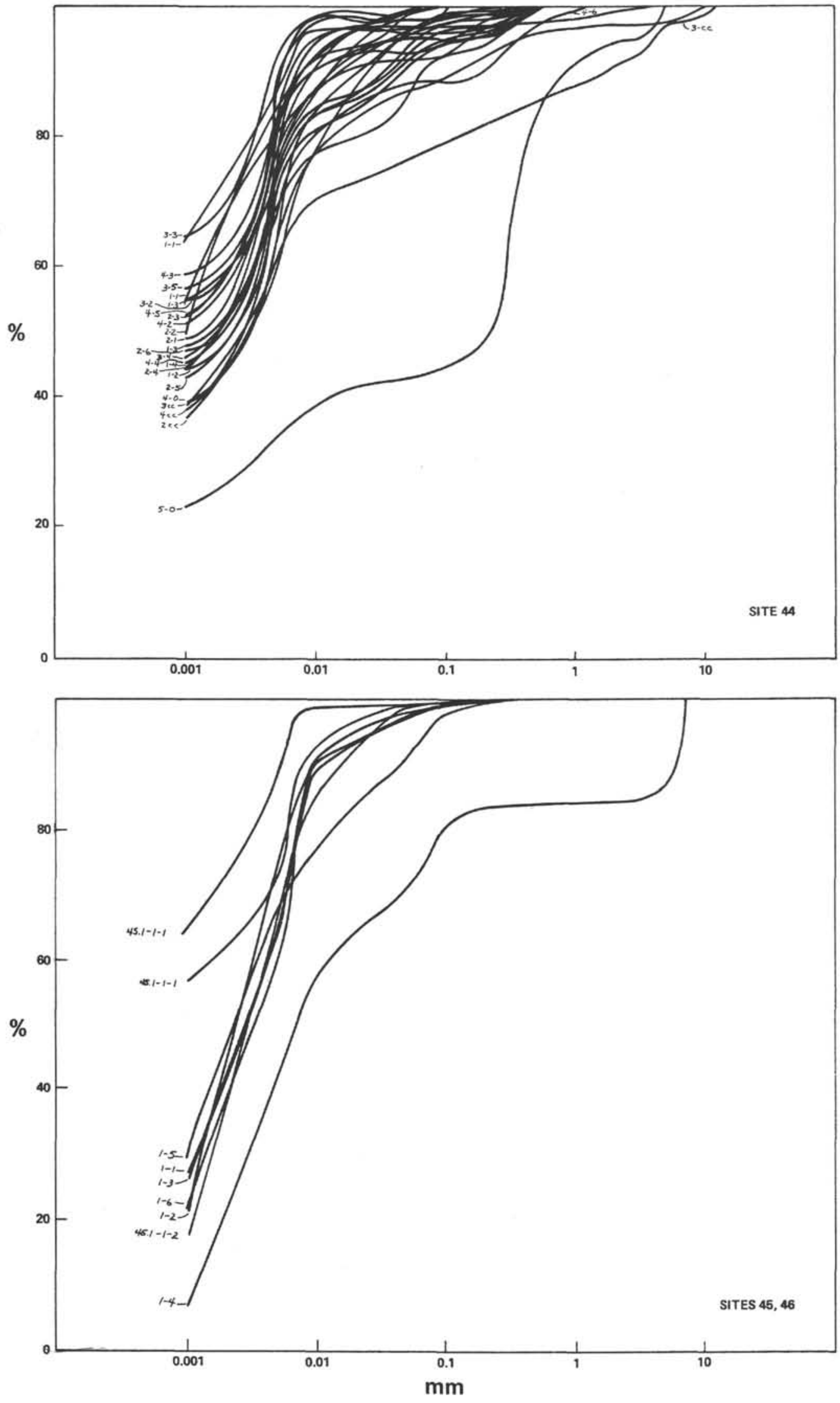

Figure 5. *Cumulative curves for samples from Sites 44, 45 and 46.*

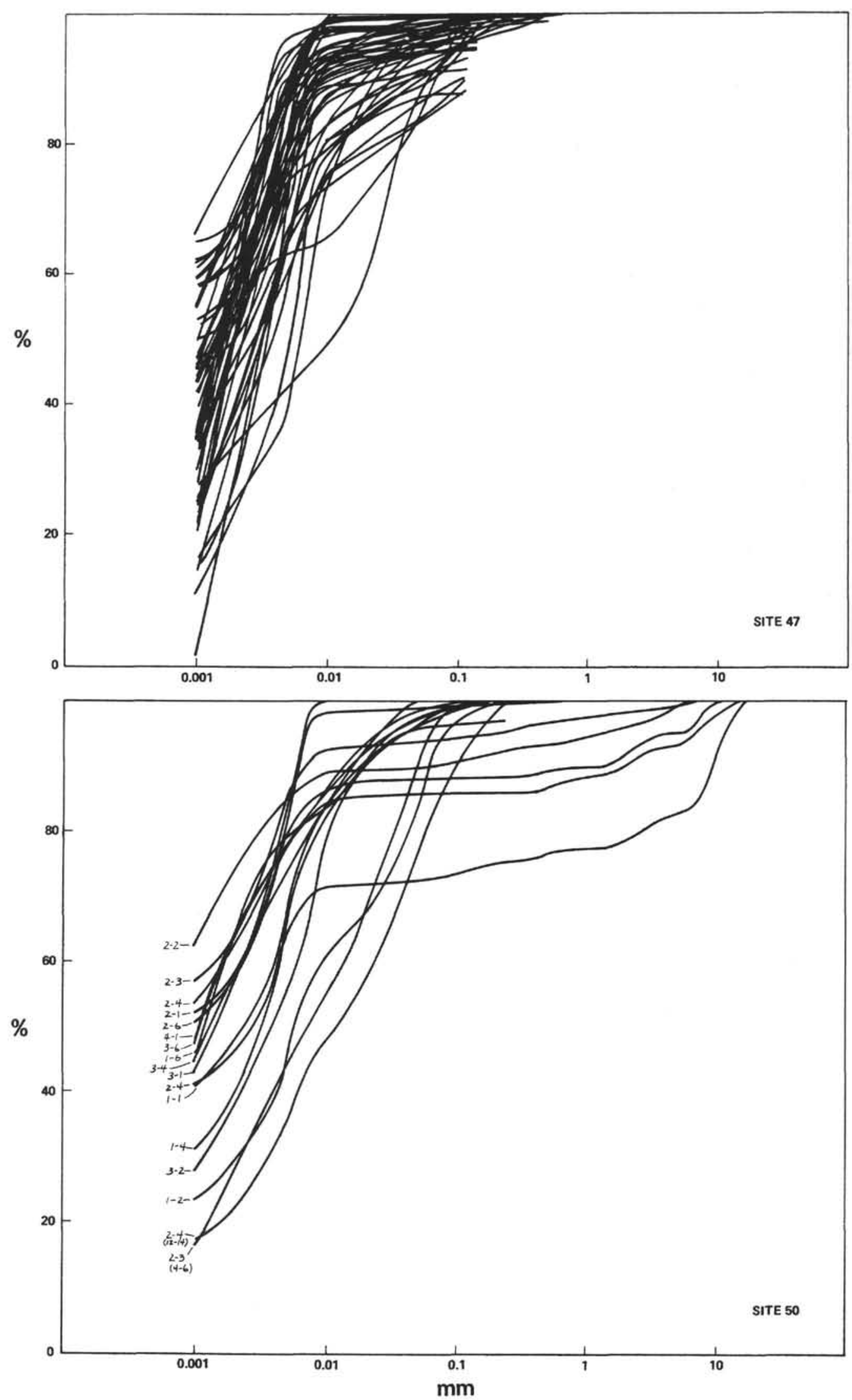

Figure 6. *Cumulative curves for samples from Sites 47 and 50.*

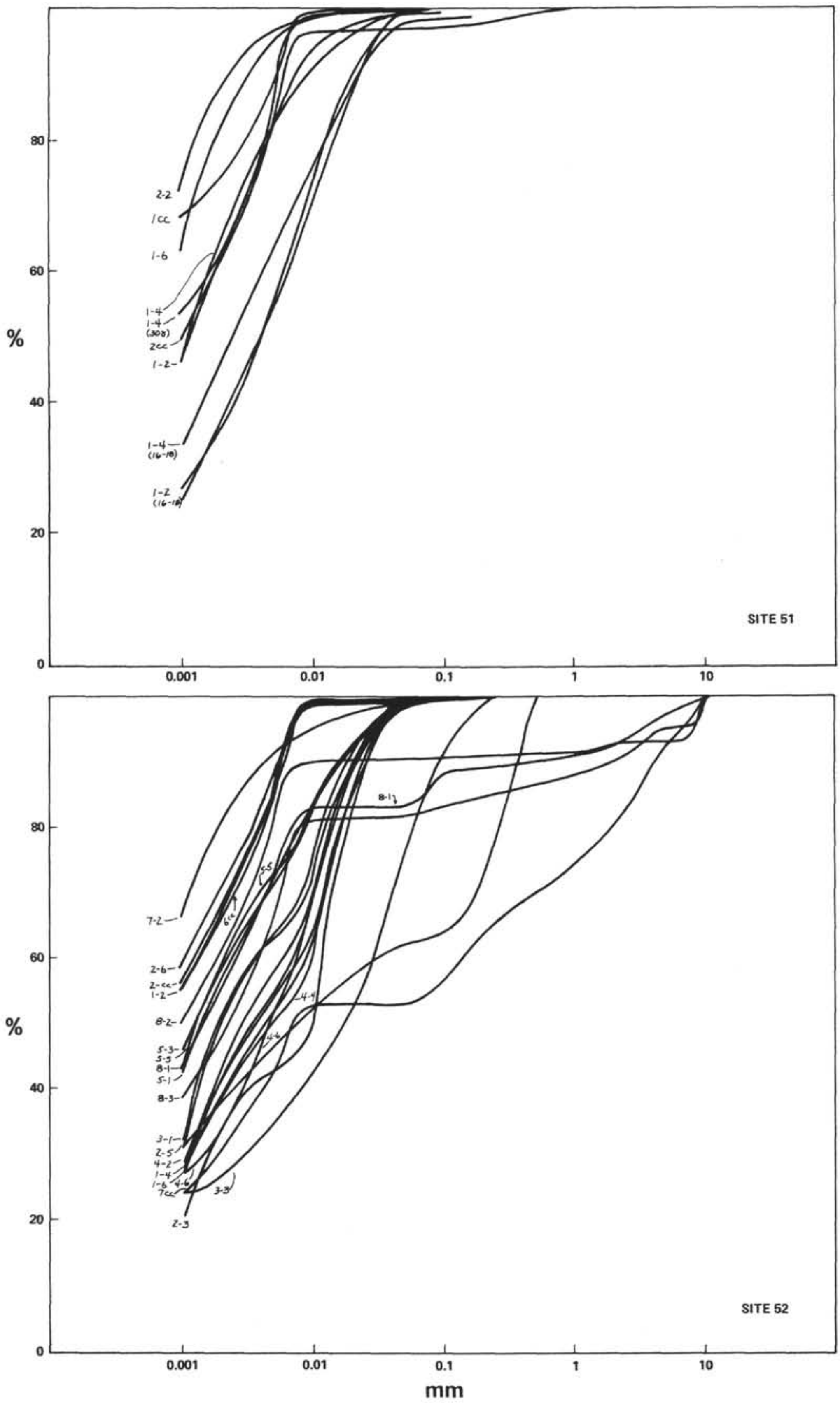

Figure 7. *Cumulative curves for samples from Sites 51 and 52.*

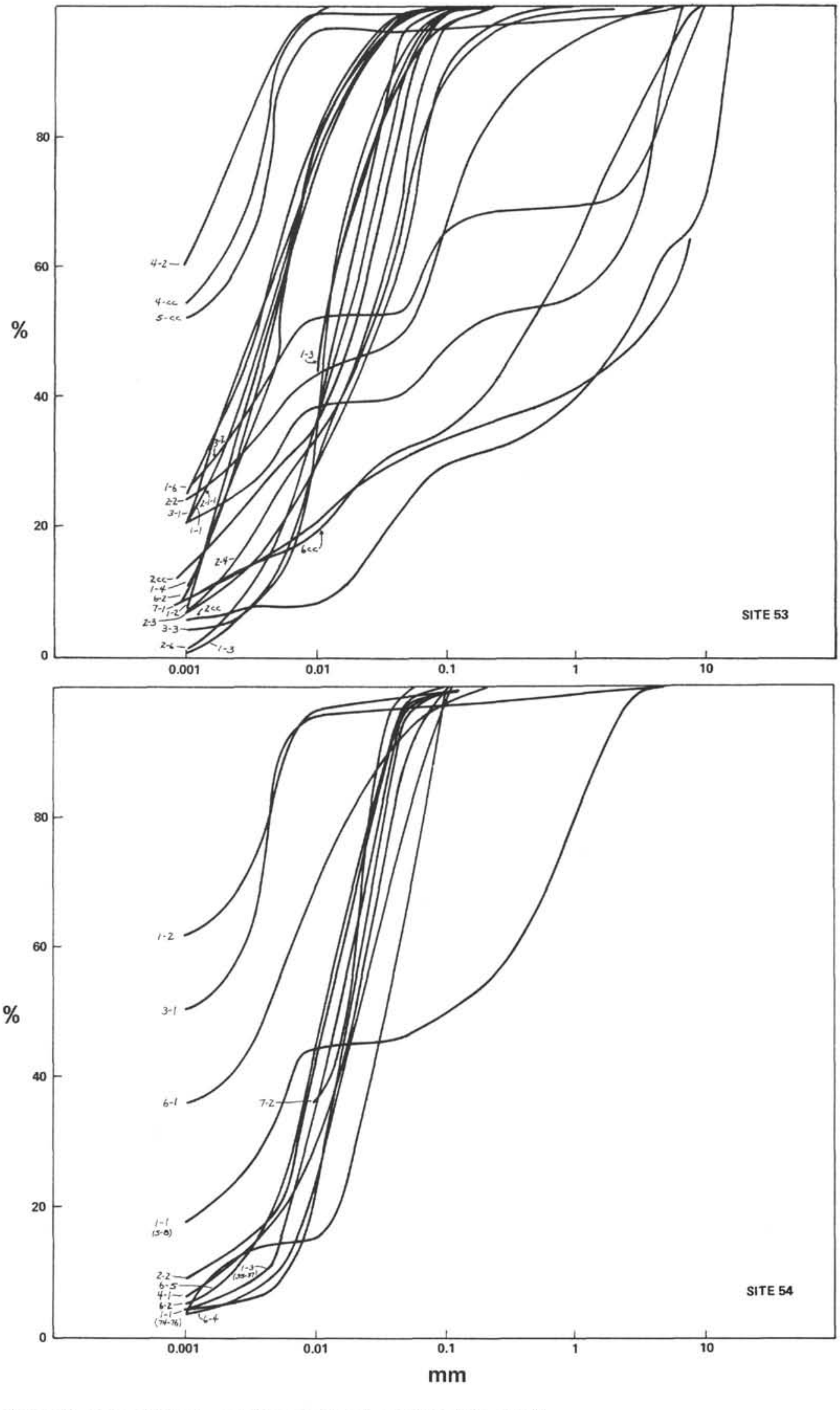

Figure 8. *Cumulative curves for samples from Sites 53 and 54.*

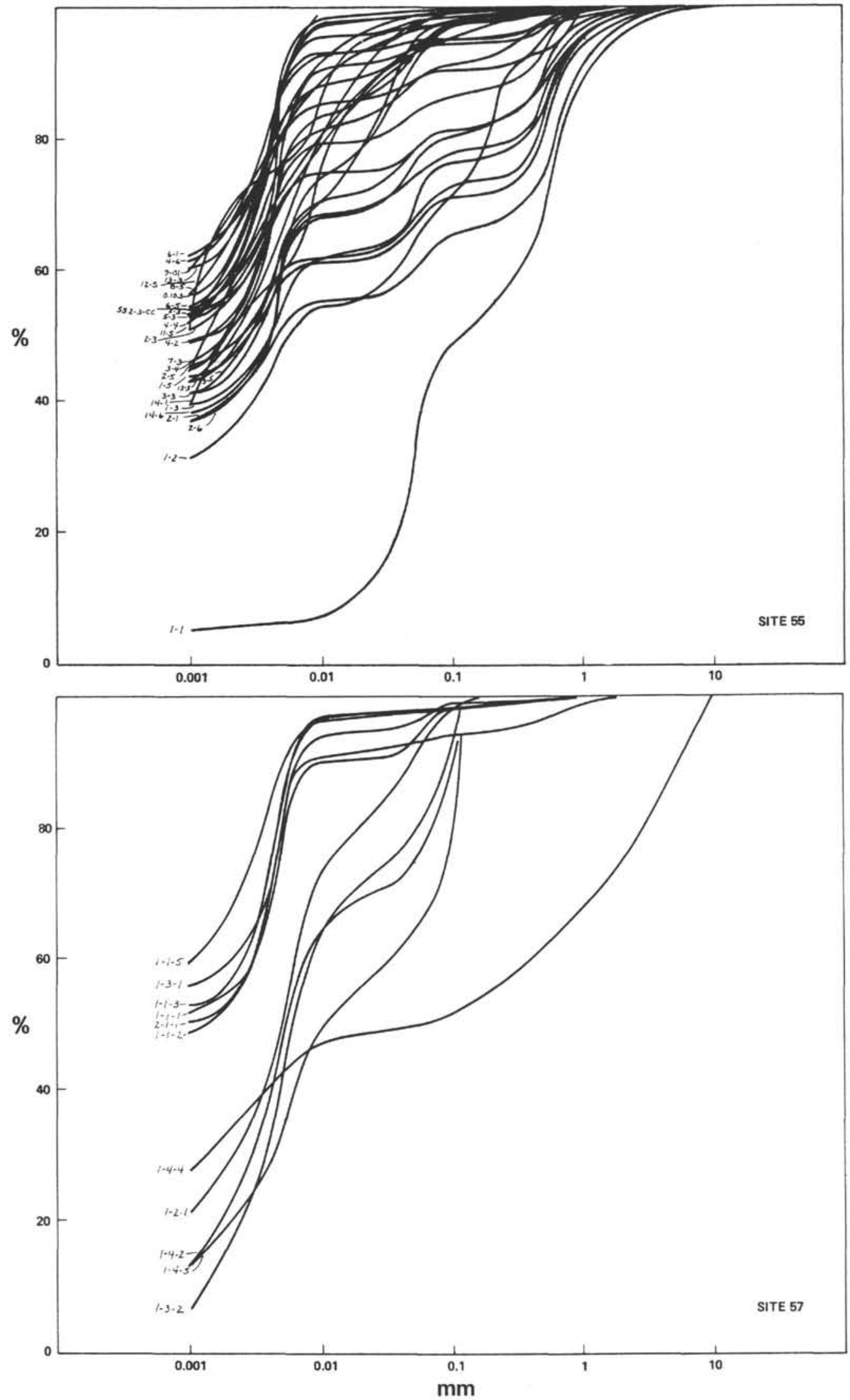

Figure 9. *Cumulative curves for samples from Sites 55 and 57.*

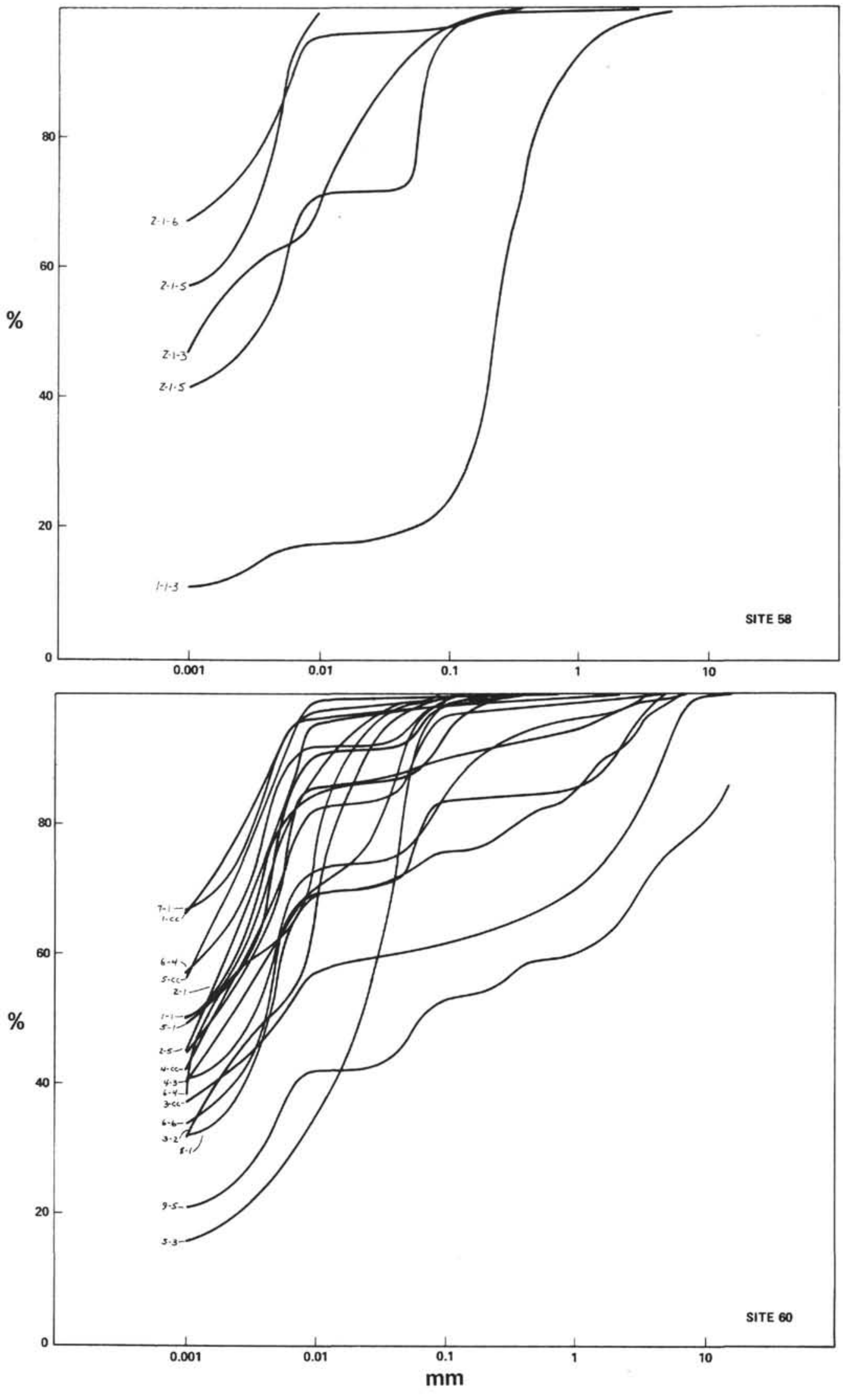

Figure 10. *Cumulative curves for samples from Sites 58 and 60.*

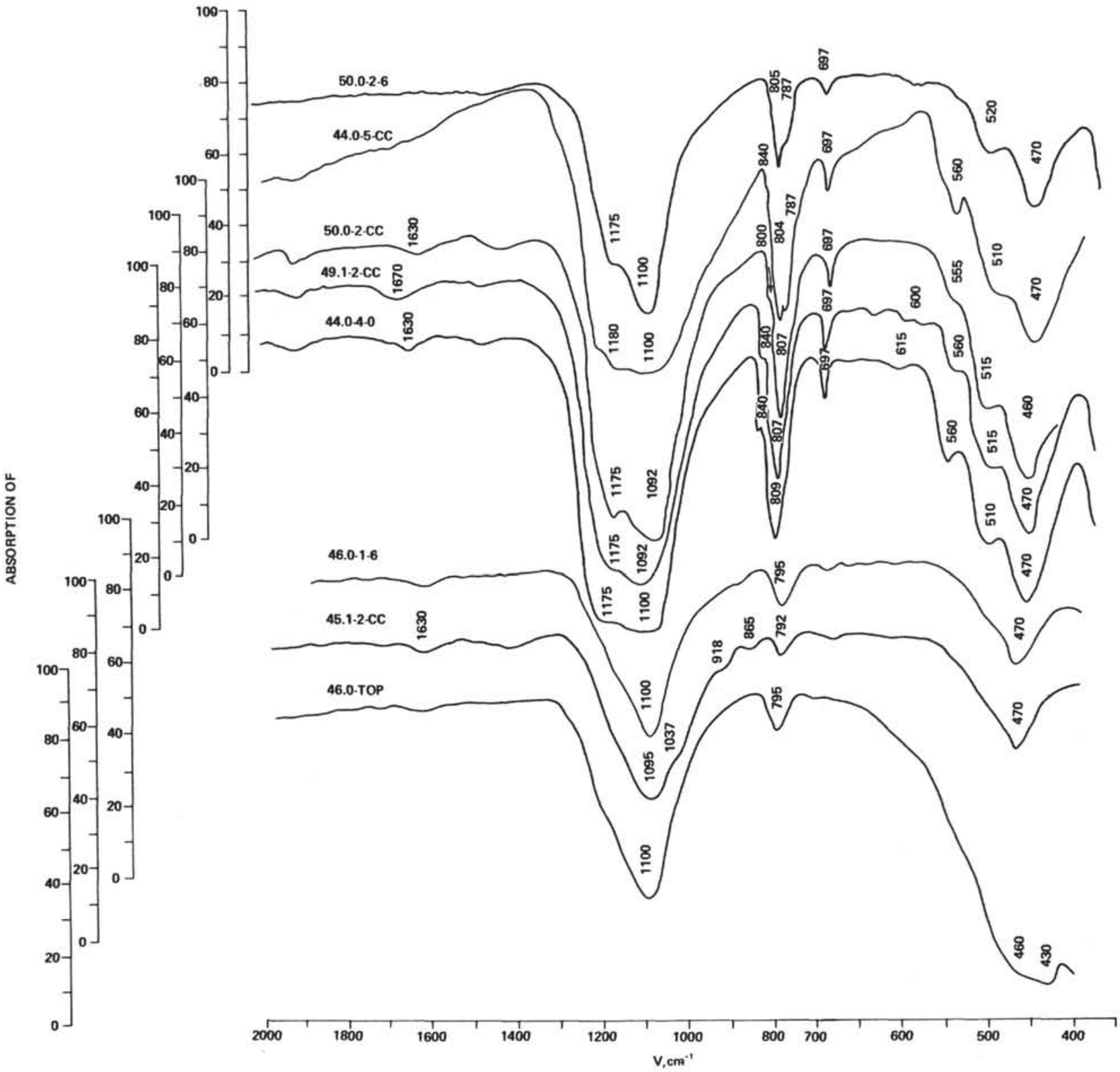

Figure 11. *Infra-red spectra results on Leg 6 samples.*

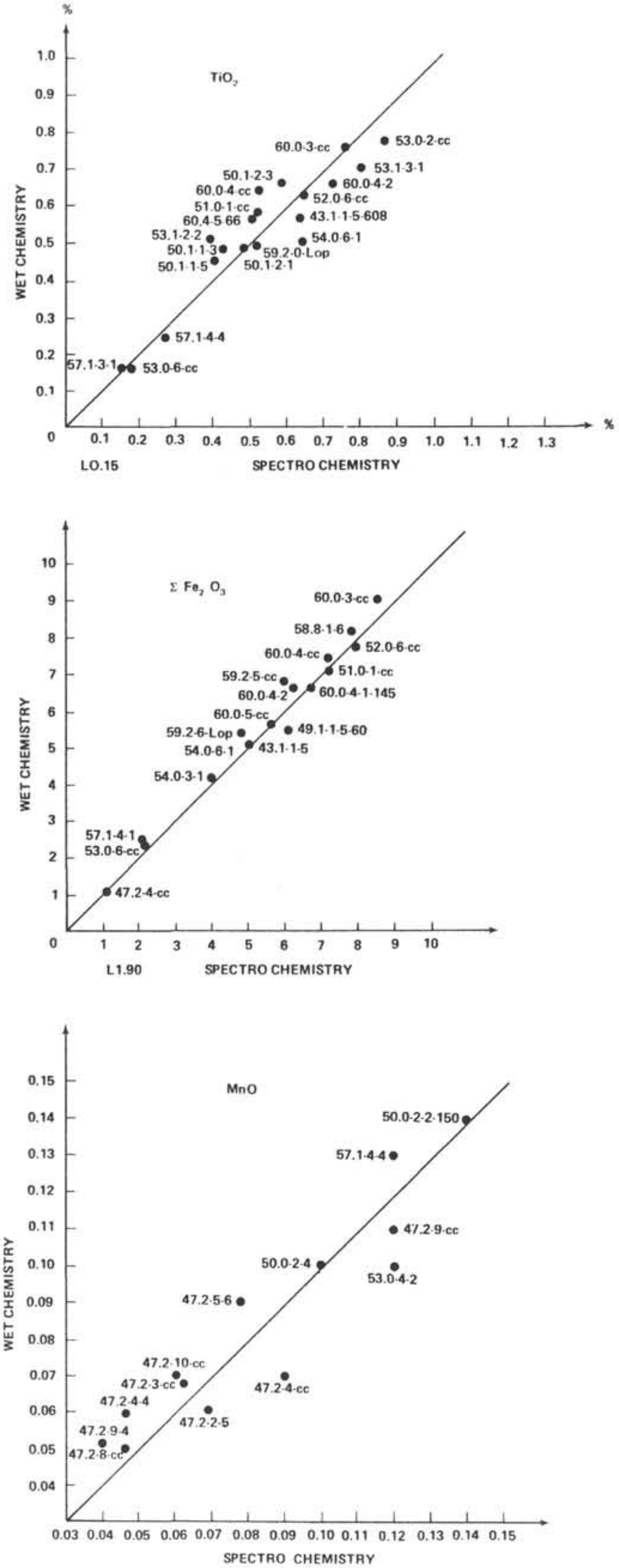

Figure 12. *Comparison of analyses for TiO_2, Fe_2O_3 and MnO using wet chemistry and spectrochemistry.*

tridymite, 568 centimeter^{-1}. Quartz glass in the region of 1250 to 1100 centimeter^{-1} and 830 to 750 centimeter^{-1}, as compared to the corresponding bands of crystalline silica has wider and less intensive absorption bands whose position in the spectrum in most cases coincides almost exactly with the position of similar bands of γ – quartz.

Absorption bands of the 1100 centimeter^{-1} region are considered as valent and those of the 460 to 530 centimeter^{-1} region as deformation variations of SiO_4–tetrahedra. Bands in the 830 to 750 centimeter^{-1} region correspond to V_5 SiOSi variations (which consist of one or two components formed from the splitting of a fully symmetrical fluctuation of an SiO_4–tetrahedron). The splitting of the fluctuation and removal of the degeneration is related to a lowering of the SiO_4–tetrahedron symmetry when bands of SiO_4–tetrahedrons are formed in the framework silicates, which are SiO_2 modifications.

The infrared absorption spectra were recorded in the 2000 to 4000 centimeter^{-1} with the UR-10 infrared spectrophotometer. Fine dispersed powder films on the KBr basis were prepared by the sedimentation method and used as samples. The thickness of the films expressed arbitrarily in mg/cm^2 was 0.2 to 0.3.

Results

The obtained spectra (Figure 11) can be divided into several groups:

(1) Samples 50.0-2-6; 44.0-5-CC–The spectra of these samples are very close to the γ–quartz spectrum (especially of Sample 50.0-2-6); bands 1167, 1095, 804, 785, 695, 523 and 465 centimeter^{-1}, all being the bands of γ–quartz, are detectable. Water is absent almost completely.

Sample 44.0-5-CC has an γ–quartz spectrum, except for bands 560 centimeter^{-1} and 625 centimeter^{-1} (weak). Such a spectrum is typical of the cryptocrystalline varieties of silica (for instance, chalcedony). An additional band (560 centimeter^{-1}) can be attributed either to γ–tridymite admixture, that is, the tridymite type parts of the structure, or to a peculiar deformation of SiO_4–tetrahedrons typical of cryptocrystalline varieties of silica. Water is present in the sample in small amounts (to 0.5 of a molecule per each formal unit of silica). Unlike quartz studied previously in different deposits, the analyzed sample has a weakly intensive peak of 840 centimeters^{-1}.

(2) A group of the samples: 49.1-2-CC, 50.0-2-CC, 44.0-4-0 have spectra similar to that of γ–quartz (bands 1175, 1092, 697, 515, 460 centimeter^{-1} are detectable) but differing from γ–quartz in:

(a) new bands of 620 and 560 centimeter^{-1} which, as was already stated, are probably related to crystobalite and "tridymite components";

(b) the average (in relation to the first group of the samples) number of water molecules;

(c) The presence of band 808 centimeter^{-1} with an additional peak–"shoulder" of 837 centimeters^{-1} in the 804 to 785 centimeter^{-1} region instead of γ–quartz duplicate; the latter variation is the main one not recorded earlier for the natural samples. Such changes are related, most probably, to a noticeable deformation of relations between Si-O-Si and SiO_4–tetrahedrons in the crystalline structure of the latter group of the samples.

(3) A number of the samples 45.1-11-CC, 46.0-top, 46.0-1-6, by the type of their spectrum (the presence of bands 1100, 795 and 470 centimeter^{-1}), can be regarded as a considerably "amorphisized" variety of silica. The bands are diffusive and not clearly cut, therefore, relics of γ–quartz are evidently present; in Sample 45.1-11-CC, admixture bands are found.

DETERMINATION OF DIATOMS ON SAMPLES FROM LEG 6

(A. P. Jouse, O. G. Kozlova and V. V. Mukhina)

Methods

Dry sediment is boiled for 15 to 20 minutes in sodium tripolyphosphate ($Na_5P_3O_{10}$) and hydrogen peroxide (H_2O_2 – 33 per cent) to disperse the sediment and remove organic admixtures. After boiling, the sediment is washed in distilled water to remove sodium tripolyphosphate. Thus, treated sediment is used to prepare consistent microscope slides by placing the sediment in 1.68. The slides are examined under a biological microscope with X 90 immersion objective.

Results

Hole	Core	Section	Interval (cm)	Determinations	Age
48.1	1	4	17-19	No diatoms were found.	
49.0	1	1	11-13	Among the diatoms there are: *Thalassionema nitzschieides* Grun, *Ethmodiscus rex* Hendey, *Coscinodiscus nodulifer* A. S., *Planktoniella sol* Schutt., *Nitzschia marina* Grun.	Pleistocene
49.0	1	4	6-8	No diatoms were found.	
49.0	1	5	70-72	Single spores (moss?)	
49.0	2	1	70-71	Mostly coccoliths.	
49.1	1	1	77-79	No diatoms were found. One valve of Gladius (?) was found.	Cretaceous
49.1	1	2	124-126	One valve of *Stephanopyxis* sp. was found.	
49.1	1	5	38-40	No diatoms were found. Mostly coccoliths.	
49.1	2	2	145-150	Mostly coccoliths.	
50.1	1	1	62-64	*Nitzschia praemarina* Jouse, *Thalassionema nitzschioides* Grun, *Th. nitzschioides v. parva* Heiden, *Th. nitzschioides v. obtusa, Thalassiosira pestriepii* Pr.-Lavr., *Nitzschia marina* Grun., *Th. pesrupii v. plana* Jouse, *Coscinodiscus crenulatus* Grun., *Hemidiscus cuneiformis v. ventricosa* Hust.	
50.1	1	2	15-17	*Coscinodiscus nodulifer* A. S., *C. crenulatus* Grun., *Nitzschia marina* Grun., *Thalassionema nitzschioides v. plana* Jouse, *Thalassionema nitzschioides* Grun., *Th. nit. v. parva.* A wide tropical complex of diatoms.	Early and Middle Pleistocene
50.1	1	3	7-9	A wide tropical complex of diatoms. The most typical species of the complex are: *Nitzschia marina* Grun., *Coscinodiscus crenulatus* Grun., *Ethmodiscus rex* Hendey, *Coscinodiscus africanus* Janisch, *C. nodulifer* A. S., *Hemidiscus cuneiformus* Wall., *Planktoniella sol* Schutt, *Thalassiosira lineata* Jouse, *Thalassionema nitzschioides* Grun., *Pseudoeunotia doliolus* Grun.	Late Pleistocene
50.1	1	4	17-19	*Thalassionema nitzschioides v. parva* Heiden, *Th. nit. v. obtusa, Thalassiosira pestrupii v. plana* Jouse, *Coscinodiscus lineatus* Ehr., *C. wailesii* Grun et Ougst., *Actinocyclus ehrenbergii* Ralfs.	Early Pleistocene
50.1	1	5	15-17	The composition of diatoms and their age are the same as in Sample 50.1-1-2, 15-17 centimeters.	
50.1	1	6	16-18	The composition and age of diatoms are the same as in Sample 50.1-1-1, 62 to 64 centimeters.	
50.1	2	1	130-132	No diatoms were found; single radiolarian shells were found.	
50.1	2	3	4-6	No diatoms were found.	
50.1	2	3	35-37	Single fragments of diatoms cannot be determined.	
50.1	2	4	12-14	No diatoms were found; single sponge spicules were found.	
50.1	2	5	8-10	The same as above.	

Hole	Core	Section	Interval (cm)	Determinations	Age
50.1	3	3	15-17	No diatoms were found. Single spores of moss were found. Single Radiolaria poorly preserved.	
50.1	3	5	28-30	No diatoms were found.	
50.1	3	2	76-78	No diatoms were found.	
51.1	1	1	15-17	Wide tropical species are peculiar for the diatom complex: *Thalassiosira oestrupii v. plana* Jouse, *Nitzschia praemarina* (Jouse), *N. marina f. minor*, *N. pliocene* Brun., *Hemidiscus cuneiformis f. ventricosa* Hust., *Thalassionema nitzschiodes v. parva* Heiden.	Late Pliocene
51.1	1	2	16-18	The number of diatoms and silicoflagellates is less than in sample 51.1-1-1, 15-17 centimeters. The composition of diatoms and their age are the same.	
51.1	1	3	30-32	The diatom complex includes: *Nitzschia praemarina* (Jouse), *Thalassiosira oestrupii v. plana* Jouse, *Denticula kamchatica* Zabelina.	Late Pliocene
51.1	1	5	16-18	The diatom complex includes: *Thalassiosira oestrupii v. plana* Jouse, *Nitzschia pliocena* Brun., *N. praemarina* (Jouse), *N. marina f. minor*, *Thalassionema nitzschioides v. parva* Heiden, *Denticula kamchatica* Zabelina.	Late Pliocene
51.1	2	2	8-10	No diatoms were found.	
59.2	2	2	145	No diatoms were found. Mostly radiolarians.	
59.2	2	4	4-6	Diatoms are poorly preserved, mostly fragments of *Hemialus* sp., *Asteromphalus* sp., *Coscinodiscus* sp.	Miocene (?)
59.2	2	6	16-18	No diatoms were found. Mostly radiolarians.	
59.2	6	6	0-5	No diatoms were found. Fragments of Tertiary radiolarians.	
58.2	1	4	31-33	The diatom complex includes single fragments of *Coscinodiscus paleaceus* Rattr., *Hemiaulus* sp., *Cestodiscus* sp.	Miocene (?)

TABLE 1
Mineralogical Analysis of Fraction Greater Than 0.1 mm

Grain Size (mm)	Rock Debris	Volc. Glass Colorless	Volc. Glass Brown & Black	Org. Remains	Carbonate	Chert	Chalcedony	Mins. of Lt. Frac.	Rust	Magnetite	Limonite	Ilmenite	Bronze	Pyrite	Copper	Fe-Mn Nodules	Garnet Grossular	Pyroxene	Amphibole	Epidote	Mica	Diamond	Indet. Mins.
Hole 44.0-3-CC																							
0.25-0.1	0.72	–	–	36.39	–	35.20	–	–	–	–	–	–	15.00	–	8.80	–	–	0.65	–	0.80	–	2.44	–
0.5-0.25	0.46	–	–	33.30	–	34.63	–	–	–	–	–	–	25.24	–	5.39	–	–	–	–	–	–	0.98	–
1-0.5	–	–	–	12.91	–	48.79	–	–	–	–	–	–	29.90	–	8.40	–	–	–	–	–	–	–	–
2-1	15.00	–	–	–	–	70.00	–	–	–	–	–	–	14.00	–	1.00	–	–	–	–	–	–	–	–
3-2	15.00	–	–	–	–	70.00	–	–	–	–	–	–	12.00	–	3.0	–	–	–	–	–	–	–	–
5-3	20.00	–	–	–	–	75.00	–	–	–	–	–	–	5.00	–	–	–	–	–	–	–	–	–	–
7-5	–	–	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
10-7	–	–	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
>10	–	–	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 44.0-4-CC																							
0.25-0.1	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.5-0.25	–	–	–	95.67	–	4.00	–	–	–	–	–	–	0.33	–	–	–	–	–	–	–	–	–	–
1-0.5	–	–	–	85.10	–	12.30	–	–	–	–	–	–	2.60	–	–	–	–	–	–	–	–	–	–
Hole 47.2-8-CC																							
0.25-0.1	–	–	–	90.70	–	–	–	–	9.30	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.5-0.25	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1-0.5	–	–	–	4.70	–	2.40	–	–	92.90	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 48.2-2-1, 145 cm																							
0.25-0.1	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.5-0.25	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1-0.5	1.23	–	–	96.30	–	2.47	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 49.1-1-5, 60 cm																							
0.25-0.1	18.33	–	–	1.33	–	0.66	2.00	2.33	–	–	–	–	–	75.35	–	–	–	–	–	–	–	–	–

TABLE 1 – *Continued*

Grain Size (mm)	Rock Debris	Volc. Glass: Colorless	Volc. Glass: Brown & Black	Org. Remains	Carbonate	Chert	Chalcedony	Mins. of Lt. Frac.	Rust	Magnetite	Limonite	Ilmenite	Bronze	Pyrite	Copper	Fe-Mn Nodules	Garnet Grossular	Pyroxene	Amphibole	Epidote	Mica	Diamond	Indet. Mins.
Hole 49.1-1-5, 60 cm (Continued)																							
0.5-0.25	48.62	–	1.39	4.16	–	–	–	4.16	–	–	–	–	–	41.67	–	–	–	–	–	–	–	–	–
Hole 50.0-2-1, Top 145																							
0.25-0.1	35.66	–	–	35.00	–	28.82	0.17	–	–	–	–	–	–	0.35	–	–	–	–	–	–	–	–	–
0.5-0.25	28.96	–	–	10.74	–	49.24	–	–	9.52	0.20	–	–	0.19	0.55	–	–	–	–	–	–	–	0.40	0.20
1-0.5	40.80	–	–	1.10	–	56.42	–	–	–	–	–	–	0.29	1.39	–	–	–	–	–	–	–	–	–
2-1	23.89	–	–	–	3.43	60.96	–	–	7.53	–	–	–	–	4.11	–	–	–	–	–	0.08	–	–	–
3-2	9.37	–	–	–	–	68.75	–	–	21.88	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	50.00	–	–	–	–	50.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
10-7	–	–	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 50.0-2-2, 150 cm																							
0.25-0.1	6.87	–	–	18.12	–	74.48	0.41	–	–	–	–	–	–	0.12	–	–	–	–	–	–	–	–	–
0.5-0.25	12.85	–	–	1.95	–	84.72	0.48	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1-0.5	27.69	–	–	–	–	62.91	–	–	4.22	–	–	–	–	4.69	–	–	–	–	–	0.49	–	–	–
2-1	19.23	–	–	–	–	73.07	–	–	7.70	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	30.77	–	–	–	–	69.23	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	50.00	–	–	–	–	50.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 50.0-2-4, 150 cm																							
0.25-0.1	7.48	–	–	17.78	–	74.73	–	–	–	–	–	–	–	0.01	–	–	–	–	–	–	–	–	–
0.5-0.25	19.45	–	–	3.94	–	72.51	–	–	–	–	–	–	–	3.77	–	–	–	–	–	–	–	0.13	0.20
1-0.5	7.00	–	–	–	–	92.67	–	–	–	–	–	–	–	–	–	–	–	–	–	0.33	–	–	–
2-1	12.20	–	–	–	–	87.80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	20.00	–	–	–	–	80.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	–	–	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7-5	25.00	–	–	–	–	75.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

TABLE 1 – *Continued*

Grain Size (mm)	Rock Debris	Volc. Glass Colorless	Volc. Glass Brown & Black	Org. Remains	Carbonate	Chert	Chalcedony	Mins. of Lt. Frac.	Rust	Magnetite	Limonite	Ilmenite	Bronze	Pyrite	Copper	Fe-Mn Nodules	Garnet Grossular	Pyroxene	Amphibole	Epidote	Mica	Diamond	Indet. Mins.
Hole 50.0-2-4, 150 cm (Continued)																							
10-7	–	–	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
>10	–	–	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 50.0-2-6, 150 cm																							
0.25-0.1	52.42	–	–	8.75	–	30.32	0.11	–	3.13	–	–	–	4.02	1.15	–	–	–	–	–	–	–	–	0.10
0.5-0.25	33.27	–	–	2.80	–	54.37	0.31	–	–	–	–	–	3.28	5.57	–	0.10	–	–	–	0.10	–	–	0.20
1-0.5	28.91	–	–	0.60	–	62.06	–	–	5.26	–	–	–	–	2.29	–	–	–	–	–	0.88	–	–	–
2-1	15.24	–	–	–	–	81.44	–	–	0.95	–	–	–	–	1.90	–	–	–	–	–	0.77	–	–	–
3-2	4.35	–	–	–	–	84.78	–	–	4.34	–	–	–	–	6.53	–	–	–	–	–	–	–	–	–
5-3	20.00	–	–	–	–	80.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7-5	33.33	–	–	–	–	66.67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
>10	–	–	–	–	–	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 52.0-8-4, 145 cm																							
0.25-0.1	95.67	0.33	–	3.33	–	–	–	–	–	–	–	–	–	0.67	–	–	–	–	–	–	–	–	–
0.5-0.25	96.34	1.33	–	–	–	0.67	–	–	–	–	–	–	–	1.66	–	–	–	–	–	–	–	–	–
1-0.5	96.00	–	–	–	–	2.00	–	–	1.00	–	–	–	–	1.00	–	–	–	–	–	–	–	–	–
2-1	97.56	–	–	–	–	2.44	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	93.94	–	–	–	–	6.06	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7-5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
10-7	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 52.0-8-5, 145 cm																							
0.25-0.1	97.34	–	–	1.66	–	0.33	0.34	–	–	–	–	–	–	0.33	–	–	–	–	–	–	–	–	–
0.5-0.25	97.68	–	–	–	–	6.66	–	–	–	–	–	–	–	0.66	–	–	–	–	–	–	–	–	–

TABLE 1 – *Continued*

Grain Size (mm)	Rock Debris	Volc. Glass Colorless	Volc. Glass Brown & Black	Org. Remains	Carbonate	Chert	Chalcedony	Mins. of Lt. Frac	Rust	Magnetite	Limonite	Ilmenite	Bronze	Pyrite	Copper	Fe-Mn Nodules	Garnet Grossular	Pyroxene	Amphibole	Epidote	Mica	Diamond	Indet. Mins.
Hole 52.0-8-5, 145 cm (Continued)																							
1-0.5	98.34	–	–	–	–	1.66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-1	99.00	–	–	–	–	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	96.00	–	–	–	–	4.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	95.24	–	–	–	–	4.76	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7-5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 53.0-2-CC																							
0.25-0.1	98.67	0.33	0.33	0.67	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.5-0.25	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1-0.5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-1	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7-5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
10-7	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
>10	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 53.0-7-1, 150 cm																							
0.25-0.1	99.23	0.04	–	–	0.40	–	0.33	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.5-0.25	98.66	0.14	–	–	1.20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1-0.5	89.68	–	–	0.16	10.00	–	0.16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-1	95.17	–	–	2.23	2.60	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	90.48	–	–	4.76	4.76	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7-5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
10-7	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
>10	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

TABLE 1 – *Continued*

Grain Size (mm)	Rock Debris	Volc. Glass: Colorless	Volc. Glass: Brown & Black	Org. Remains	Carbonate	Chert	Chalcedony	Mins. of Lt. Frac	Rust	Magnetite	Limonite	Ilmenite	Bronze	Pyrite	Copper	Fe-Mn Nodules	Garnet Grossular	Pyroxene	Amphibole	Epidote	Mica	Diamond	Indet. Mins.
Hole 53.1-2-2, 145 cm																							
0.25-0.1	23.00	44.32	16.10	0.08	0.17	–	–	15.73	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.5-0.25	2.77	86.20	2.84	–	–	–	–	8.19	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1-0.5	3.33	94.67	0.66	–	–	–	–	0.67	–	–	–	–	–	–	–	–	–	0.67	–	–	–	–	–
2-1	4.00	93.00	1.00	–	–	–	–	0.67	–	–	–	–	–	–	–	0.66	–	0.67	–	–	–	–	–
3-2	25.00	66.66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.34	–	–	–	–	–
5-3	40.00	40.00	–	–	–	–	–	–	–	–	–	–	–	–	–	20.00	–	–	–	–	–	–	–
Hole 53.1-2-3, 16 cm																							
0.25-0.1	13.90	55.76	25.36	–	–	–	2.30	–	–	–	0.85	–	–	–	0.01		0.11	–	–	–	–	–	–
0.5-0.25	4.88	92.04	3.08	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 54.0-1-1																							
0.25-0.1	33.00	19.00	16.28	1.03	–	–	–	27.20	0.03	2.03	–	0.01	–	–	–	–	–	1.42	–	–	–	–	–
0.5-0.25	40.32	19.09	15.70	0.62	–	–	–	20.06	0.08	0.12	–	–	–	–	–	–	–	3.98	0.01	0.01	0.01	–	–
1-0.5	46.53	18.91	11.73	0.28	–	–	–	22.43	0.03	–	–	–	–	–	–	–	–	0.11	–	–	–	–	–
2-1	69.00	21.66	8.34	0.34	–	–	–	0.66	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 54.0-6-2, 16 cm																							
0.25-0.1	0.74	95.73	3.53	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 54.0-6-4, 16 cm																							
0.25-0.1	11.08	81.18	4.00	–	–	–	3.41	–	–	–	–	–	–	–	–	0.33	–	–	–	–	–	–	–
Hole 57.1-4-4, 145 cm																							
0.25-0.1	3.30	–	88.00	8.70	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

TABLE 1 – *Continued*

Grain Size (mm)	Rock Debris	Volc. Glass: Colorless	Volc. Glass: Brown & Black	Org. Remains	Carbonate	Chert	Chalcedony	Mins. of Lt. Frac	Rust	Magnetite	Limonite	Ilmenite	Bronze	Pyrite	Copper	Fe-Mn Nodules	Garnet Grossular	Pyroxene	Amphibole	Epidote	Mica	Diamond	Indet. Mins.
Hole 57.1-4-4, 145 cm (Continued)																							
0.5-0.25	85.70	9.00		5.30	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1-0.5	99.30	0.70		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-1	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7-5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
10-7	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 58.1-1-3, 145 cm.																							
0.25-0.1	12.87	–	0.60	78.08	8.12	–	–	–	–	–	–	–	–	–	–	0.11	–	0.22	–	–	–	–	–
0.5-0.25	15.26	0.01	0.53	76.89	7.13	–	–	–	–	–	–	–	–	–	–	0.05	–	0.13	–	–	–	–	–
1-0.5	25.89	0.08	0.88	62.93	9.80	0.08	0.30	–	–	–	–	–	–	0.04	–	–	–	–	–	–	–	–	–
2-1	86.33	0.68	–	10.66	–	2.33	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	75.00	–	–	12.50	–	12.50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 60.0-2-1, 87 cm																							
0.25-0.1	0.62	58.31	0.35	–	–	–	30.31	–	–	2.20	–	–	–	–	0.01	8.18	0.02	–	–	–	–	–	–
0.5-0.25	1.49	85.86	0.33	1.34	–	–	10.82	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 60.0-3-CC																							
0.25-0.1	88.44	0.64	2.58	0.64	–	–	–	4.83	0.03	1.00	–	0.02	–	–	–	–	–	1.76	0.04	0.02	–	–	–
0.5-0.25	99.00	0.33	0.33	–	–	–	–	0.34	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1-0.5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-1	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7-5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

TABLE 1 – *Continued*

Grain Size (mm)	Rock Debris	Volc. Glass		Org. Remains	Carbonate	Chert	Chalcedony	Mins. of Lt. Frac.	Rust	Magnetite	Limonite	Ilmenite	Bronze	Pyrite	Copper	Fe-Mn Nodules	Garnet Grossular	Pyroxene	Amphibole	Epidote	Mica	Diamond	Indet. Mins.
		Colorless	Brown & Black																				
Hole 60.0-3-CC (Continued)																							
10-7	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
>10	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 60.0-4-CC																							
0.25-0.1	84.66	11.00	4.34	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.5-0.25	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1-0.5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-1	99.35	–	–	0.65	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 60.0-4-1, 145 cm																							
0.25-0.1	94.66	0.66	2.00	–	–	–	–	2.68	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.5-0.25	98.33	0.33	1.00	–	–	–	–	0.34	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1-0.5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-1	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7-5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 60.0-8-1, 145 cm																							
0.25-0.1	71.32	0.24	11.42	1.28	–	–	15.74	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
0.5-0.25	94.58	–	1.08	0.09	–	–	4.25	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1-0.5	99.00	–	–	–	–	–	1.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-1	99.67	–	–	–	–	–	0.33	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

TABLE 1 – *Continued*

Grain Size (mm)	Rock Debris	Volc. Glass		Org. Remains	Carbonate	Chert	Chalcedony	Mins. of Lt. Frac	Rust	Magnetite	Limonite	Ilmenite	Bronze	Pyrite	Copper	Fe-Mn Nodules	Garnet Grossular	Pyroxene	Amphibole	Epidote	Mica	Diamond	Indet. Mins.
		Colorless	Brown & Black																				
Hole 60.0-8-1, 145 cm (Continued)																							
5-3	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7-5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hole 60.0-9-5, 16 cm																							
0.25-0.1	60.80	2.09	6.15	0.23	–	–	20.02	–	0.30	1.26	–	–	–	–	0.06	9.09	–	–	–	–	–	–	–
0.5-0.25	73.66	10.13	10.66	0.17	–	–	5.37	–	–	–	–	–	–	–	–	0.01	–	–	–	–	–	–	–
1-0.5	97.67	1.00	1.34	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-1	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
3-2	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
5-3	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
7-5	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
10-7	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
>10	100.00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

[a]Negligible traces of manganese, garnet (almondine), olivine, staurolite, barite and indeterminable ore minerals were found in some of these samples.

TABLE 2A
Mineralogical Analysis of Heavy Fraction in Size Range 0.1 – 0.01 mm

Sample Designation[a]	Bk Magnetic Debris Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite - Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction	Others[b]
44.0-1-1, 145 after acid	55																														55	
44.0-1-2, 145 after acid	44																														44	
44.0-1-3, 50 after acid											1									1												
44.0-2-CC after acid	29	2	4						2	5	2			1	2		5		1		1					1	1			1	57	
44.0-2-1, 145																																
44.0-2-2, 145 after acid (5%)																																
44.0-2-3, 145																																
44.0-2-4, 145	15													1																	16	
44.0-2-5 after acid																																
44.0-2-6, 145	15																														15	
44.0-3-CC after acid (5%)					3				5		1				1												10 1				446	427[A]
44.0-3-2, 145 after acid																																
44.0-3-3, 145	6																														6	
44.0-3-4, 145 after acid																																
44.0-3-5, 145 after acid (5%)	9				88																						18 3				113	2[A]

TABLE 2A – *Continued*

Sample Designation[a]	Bk Magnetic Debris Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite - Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction	Others[b]
44.0-4-0, Top after acid	120																														120	
44.0-4-CC after acid (5%)	37									1	1				1 3				 1							1	26 14			2	210	
44.0-4-2, 145																																
44.0-4-3, 145 after acid																																
44.0-4-4, 145																																
44.0-4-5, 145																																
44.0-4-6, 145 after acid	95																														95	
44.0-5-0, 145 after acid (10%)	356		1		6	69				1				1	2					1											437	1[K]
44.1-1	124													2	16		1														143	
44.1-3, All	30		1																							5					38	
44.1-3, 145 after acid (5%)	10																1						2								13	
44.1-4, 145 after acid (10%)															1		2															
45.1-1, 7			5					3			2				1															1	14	3[R]
47.0-1-4, 90 after acid (5%)			1 1					2			1			1 2	3 3				 1	 1			1							 1		
47.1-1-1, Top	201						1	24		3				13	13		2												12		296	
47.1-1-1, 145 after acid	171						1							2	3		1			1											179	

TABLE 2A – *Continued*

Sample Designation[a]	Bk Magnetic Debris Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite - Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction	Others[b]
47.2-1-2, 23	77							30		2	9			30	71													38			257	
47.2-3-CC after acid (5%)	12	1							2		2			2	3				1	1							6 1			1	534	
47.2-4-CC	19	2			2		11	1		1				3	2												3				44	
47.2-8-6-CC	167				1			21		3	2						1										2		2		199	
47.2-9-CC	261							21	1						1				1			1			1						287	
47.2-9-CC																																
47.2-9-1, 150 after acid (5%)																																495[A]
47.2-9-4, 0																																
47.2-9-5, 150 after acid (5%)																																
47.2-9-6, 0 after acid	25					37																			9						71	
47.2-10-CC	68						2	14							1		3										1				82	
47.2-10, Top after acid (10%)	150	6			40																				11 5						211	
47.2-11-CC	50														4				1								3				56	
47.2-11-3, 145		1		1		9																			4						15	
47.2-11-4, 145 after acid																																
47.2-11-6, 145 after acid																																
47.2-12-CC	261									1				1	1		1								1		2			1	268	1[A]

TABLE 2A – *Continued*

Sample Designation[a]	Bk Magnetic Debris Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite - Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction	Others[b]
47.2-12-1, 145 after acid (5%)																											1 2					
47.2-13-CC after acid (10%)	11														1												2				12	
47.2-13-5																																
47.2-14-CC after acid	103							2																							105	
47.2-14-1, 145 after acid (5%)																									1							
48.2-1-CC after acid	42							3					1	1					1												48	
48.2-1-1, 28 after acid (5%)														2	3										2						7	
48.2-2-CC	12														1																13	
48.2-2-1, 145 after acid																																
49.0-1-1, 11			11					14			3			20	40		1					1									138	41[R] 1[P]
49.0-1-2, 16			55	3	124			42			6	1		51	194					1		2	1			1					481	
49.0-1-4, 6	114										19			55	137													86			411	
49.0-1-5, 70	22		20					14						2	2																60	
49.0-2-1, 70 after acid				83				1						2	2												1				89	
49.1-1-1, 77	50			3				37	48		8			42	209		1	1								1					400	
49.1-1-2, 124		1	13	22				10			3			4	9					2						2					66	
49.1-1-4, 17																																
49.1-1-5, 38	50																1									3					54	
49.1-1-5, 60																																

TABLE 2A – *Continued*

Sample Designation[a]	Bk Magnetic Debris Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite - Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction	Others[b]
50.0-1-2, 135	109							151			1			2	4		1								3	20					298	
50.0-2-2, 150 after acid	88			11				108						1	7		1								1	14					231	
50.0-2-3, 150	9			11	2		5								1										2	26					56	
50.0-2-4, 150	15		3	7	38			3																	2	10					78	
50.0-2-6, 150	20																														20	
50.1-1-1, 62			17					7			4	1		43	102			1		1			2								250	73R
50.1-1-2, 15			33					4		1	29	1		45	56			1		2		6	3								252	71R
50.1-1-4, 17			38					7			24	2		41	86		2	1		3		1	2	2							294	81R
50.1-1-6, 16			62	34	15			25			28	3	1	23	55			1		1			2					103			353	
50.1-2-3, 4			20		46			26			2			38	97		1		1	1								125			367	
50.1-2-4, 12			32		36			28			54			22	84		1	1				1				1		62			322	
50.1-2-4, 50	9								3		1				6		1														20	
50.1-3-1, 145																																
50.1-3-1, 11															4															1		
50.1-3-2, 76	13										1			1	2													5			22	
50.1-3-4, 16			3					5			2			9	58		3		1	1											91	11R
50.1-3-6, 16			20					40			4		1	2	7		2			1		1	2	1		2					87	4R
51.0-1-CC	200	1	4	2											4										1					1	213	
51.0-2-CC	500	2												1	2	1			1												507	
51.1-1-2, 16			39	3				16			7			42	116								1					39			263	
51.1-1-4, 30	10		42		2									26	41		2	1		1								48		15	187	
51.1-1-6, 16			54	2	12			30			40			35	79			1		2								30			385	

TABLE 2A – *Continued*

Sample Designation[a]	Bk Magnetic Debris Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite - Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction	Others[b]
52.0-1-2, 30	14		65						14	1	1			82	171								1					5			356	
52.0-1-4, 8			66	3				25			8			31	125		3			3			1					22			287	
52.0-1-6, 9			92		32			27			1			43	187		3						3								388	
52.0-2-CC	4		10					2	4		1			5	9				1												35	
52.0-1-3, 7			45		30			37			4			19	142		3											42			322	
52.0-2-6, 145	5		8						2		7			3	25		2		1	1											53	
52.0-3-1, 16			132	7	25			47			3	2		16	93		3						2								330	
52.0-3-3, 16			103		44			71			2		3	13	146		3						2			10					397	
52.0-4-4, 6			99	1	30			89			4	1	3	2	17		10														256	
52.0-4-6, 18			121	2	47			69			5			2	3		42		2				1								294	
52.0-5-1, 127			98	3	50			81			4			2	11		27						2								279	
52.0-5-5, 18			84		11			55			2			3	1		25						2								183	
52.0-6-CC	4		12												5										1						22	
52.0-7-CC	250				3										1				1			1									255	
52.0-7-2, 37			4	28	2			2							1				1	1											39	
52.0-8-1, 145	31									2				1	2	1	1													1	39	
52.0-8-2, 145	131								6		5			7	8	1	4				1		1		1						165	
52.0-8-3, 40	25										2																				27	
52.0-8-5, 145	92										1			1			1														95	
52.0-8-5, 145			128		12			44			1			2																	187	
52.0-9-CC	66							5		1				1	1						1										77	
52.0-10-CC	19							6						1	6													39			71	
53.0-1-3, 17			62		9			12						60	159		2						6			1					311	

TABLE 2A – *Continued*

Sample Designation[a]	Bk Magnetic Debris Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite - Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction	Others[b]
53.0-2-CC after acid	76		156						7	1				9	16		1									2	1		19		228	
53.0-4-2		92						26	64		3		1	90	190		1	1													468	
53.0-6-CC after acid			170					5																						7	180	
53.1-2-2, 145	58							16	34		12	1		95	145		4	2					2								369	
53.1-3-1, 150	118							10	49	4	3			70	133	2	2														391	
53.1-3-2, 40	23							20	50		1			43	132		1														270	
53.2-4-CC																																
53.2-5-CC																																
54.0-1-1, 5			60					6		2	1			74	148		3	1					1	1				32			335	
54.0-1-2, 7																																
54.0-3-1, 140			36					10			50			41	83		1	2					1		1	1		17			243	
54.0-6-1, 145																																
55.0-3-4, 145 after acid	6																														6	
55.0-9, Top after acid (5%)	16										1				1																18	
55.0-13-3, 40 after acid																																
55.2-2-3, CC																																
55.2-3, Top																																
57.1-3-1, 17	250	20												2	43		1					1			1	1	2				321	
57.1-4-4, 145 after acid (5%)	1		1												7																20	

TABLE 2A – *Continued*

Sample Designation[a]	Bk Magnetic Debris Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite - Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction	Others[b]
58.2-1-5, 0	47								92		1				259		1													2	402	
58.2-1-6, 95		32						6	27						12				2				23								81	2A
59.1-3-CC																			1													
59.2-1-CC	75													5	34																114	
59.2-2-CC	42							108			1			5	14		2					1			1						174	
59.2-6, Top BII																																
60.0-1-CC	80										1			12	15		1														109	
60.0-2-CC	68							6	8	4	4	2		119	131		1						1	1							345	
60.0-3-CC	196							5	9		4			42	68		1											48	21		394	
60.0-4-CC	92							12		1	1			33	63		2							1				55	41		301	
60.0-4-CC		4	146		5			9		2	1			38	49		1		1				1					18			274	
60.0-4-2, 145																			1													
60.0-5-CC after acid		1	38					9		1	1			16	31		1		1	1			2					36		1	138	1A
60.0-7-1, 81.5			6																												6	

[a]Data on samples which were treated with HCl follows such samples and is indicated by "after acid."

[b]Other minerals: A = Alloy; K = Kyanite; L = Limonite; M = Muscovite; O = Opal debris; R = Rock debris; P = Palagonite; V = Volcanic glass basic

TABLE 2B
Mineralogical Analysis of Light Fraction in Size Range 0.1 – 0.01 mm

Sample Designation[a]	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-mn Debris	Clay Min. Aggregates	Zeolite	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.510-1.520	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay-Palagonite Grains	Total Grains in Light Fraction	Others[b]
44.0-1-1, 145	1									264					3														268	
after acid																														
44.0-1-2, 145										231					3														234	
after acid																	7												7	
44.0-1-3, 50				1						327					2					1									331	
after acid (5%)	19		2	4								5	2	1						3		1			1				48	8R
44.0-2-CC	54	2	18			1				293					15					1						1			392	4M
after acid (5%)	180	4	106	1		1	1						2	2						3						22			326	
44.0-2-1, 145	1	1								425					78					1									506	
40.2-2, 145	2			2						320					20					2									346	
after acid (5%)	7	1	3	2																8			1						27	3R
44.0-2-3, 145	1		1							387					24		2				2								417	
44.0-2-4, 145										251					11							1							263	
44.0-2-5 after acid										246					14														260	
44.0-2-6, 145										252					32							1							285	
44.0-3-CC	1	1								273		156			3					1									437	1M
after acid (5%)	2											228	48	3						2						4			292	1M
44.0-3-2, 145	2		1	1						337		2			9		1			1									354	
after acid (5%)	10	1	2	2								45								4			1						67	2O
44.0-3-3, 145	2									250				1	19						1								273	
44.0-3-4, 145	1		1	1						322		2			25	1				1									354	
after acid (10%)	5			3								15				4				6		1							41	5R
44.0-3-5, 145	1								4	102		110	115		6		1			1						12			359	5O
after acid (5%)	2		1									100	99							2						12			227	8O
44.0-4-0, Top										275					5					1			1						285	
after acid (10%)	12	1		2							3	191								10		1	2						226	1R
44.0-4-CC	1		1							361		4			7	2										4			382	
after acid (5%)	24	1	10								1	150	60	1		18						1			2	10			299	1M

TABLE 2B – *Continued*

Sample Designation[a]	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-mn Debris	Clay Min. Aggregates	Zeolite	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.510-1.520	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay-Palagonite Grains	Total Grains in Light Fraction	Others[b]
44.0-4-2, 145										379					4														383	
44.0-4-3, 145										333					2														335	
44.0-4-4, 145										346					3														349	
44.0-4-5, 145	3					1				252					45					1									302	
44.0-4-6, 145	1			1						288		2			5	6							1						304	
after acid (5%)	14		3	2								7	5			32		1		1									68	2R
44.0-5-0, 145										325		16			2	1													348	2R
after acid (10%)	5			1								283				3				2									299	2R
44.1-1	2	1		7				1		13	1	4			69	11	147	1			7	5			10				282	
44.1-3, All										328					3														331	
44.1-3, 145										388		2			2							1							393	
after acid (5%)	19	2	8	3							1	34		3			1	1		2					4	4			86	3R
44.1-4, 145										388					5					1									339	
after acid (10%)	9	4	7	4							1	1		2				1		3					3	4			48	6R
45.1-1, 7	2		2	27					1	1		1		3	5	2	104			26		1	12		3				234	1M
47.0-1-4, 90				2					2	273	6				2					69		1	1						369	4R
after acid (5%)	1		1	8							6	1		2			2			244		4	1		1				311	1M
47.1-1-1, Top				13						157	1				4		3		7	12			2		1				201	
47.1-1-1, 145 after acid	1			1						243					3			2	1	8						1			261	
47.2-1-2, 23				2	23						14			1			3		50		252	3	3						350	
47.2-3-CC	1			3			1			288	7	2			3					16		1	1						333	1M
after acid (5%)	7		2	19							4	4						1		188		3	3						334	101R
47:2-4-CC	1			1						264	2				5					3			1						278	
47.2-8-6-CC	20	4	5								2	65						8	7	16		4	4		4				134	
47.2-9-CC	1							1		187	2				78		3	5											275	

TABLE 2B – *Continued*

Sample Designation[a]	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-mn Debris	Clay Min. Aggregates	Zeolite	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.510-1.520	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay-Palagonite Grains	Total Grains in Light Fraction	Others[b]
47.2-9-CC				3				2		3		66			27			45		3		1	1			13			171	
47.2-9-1, 150				1						360			1		18					5									385	
after acid (5%)	2		1	1									15			1				17		2	1						44	4R
47.2-9-4, 0	3	1								348					77		2				1								432	
47.2-9-5, 150										332			10		33					2									377	
after acid (5%)	1			1									60							2					3				70	3R
47.2-9-6, 0 after acid	1			1						524					100			25			1	3				2			657	
47.2-10-CC			1							304					18														323	
47.2-10	1									351		3			3														358	
after acid (10%)	14	2	2	6		1					1	49		4			1	5		13		1	2		3				119	2P
47.2-11-CC	4	3	3	1						306	1	19			16			1								2			364	2M 2R
47.2-11-3, 145										321		1			1														323	
47.2-11-4, 145 after acid			1							265					4	1	1	1		1									274	
47.2-11-6, 145 after acid					1					295		7			6	3	9				7	1		5	3				337	
47.2-12-CC	3	3	3	1						222		98			23		1	1		1			1						362	1M 1R
47.2-12-1, 145	3			1						252		113			16	1				4			1						435	1O 1P
after acid (5%)	10		1	3								197		1		3				12			5						241	2O 2P
47.2-13-CC	1			1						352	1	2			2			1											360	
after acid (10%)	25	2	7	2							3	138						1		2									188	4O 2R
47.2-13-5	11	8	13	4		1		2			2	111		6	11	4				2			1		2	3			181	

TABLE 2B – *Continued*

Sample Designation[a]	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-mn Debris	Clay Min. Aggregates	Zeolite	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.510-1.520	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay-Palagonite Grains	Total Grains in Light Fraction	Others[b]
47.2-14-CC after acid			1							254					1														256	
47.2-14-1, 145										309		2			3					4									319	1^R
after acid (5%)	1										1	18								40			2		1				72	1^O 1^P 6^R
48.2-1-CC after acid	1		1	1				1		236	1				4			4		2			1						252	
48.2-1-1, 28	2			2					48	263	4				5		4	2			26	1	1		2				368	8^R
after acid (5%)	1			4			1				2	1					10	24			31	1	3		5				179	36^R
48.2-2-CC	1									293				1															295	
48.2-2-1, 145 after acid	1									388		3		2															294	
49.0-1-1, 11	1		3	23						1	1	3		2	29	20	63	36		182		9	3						387	17^R
49.0-1-2, 16			6		17										3				30	244		1		1					302	
49.0-1-4, 6	4	2	39	2							3				3				96	226		2	4						381	
49.0-1-5, 70		1		3	37										63	80	102	12		72		1				11			382	
49.0-2-1, 70 after acid								64		94				24	4	3	7	2		11									209	
49.1-1-1, 77	1		1	1	30					1				3		9			60	229		2			1				338	
49.1-1-2, 124		1			2							1			98	15	3	210		5		2			1				338	
49.1-1-4, 17														2	218	19	21	74											334	
49.1-1-5, 38										29				159	28	47	7	11		19									300	
49.1-1-5, 60	1	2	5	8					1	7		3		14	57	43	36	104			3		1		2				294	7^R
50.0-2-1, 145				1				3	1			148	6	64	6	11		1					1		4	10			256	
50.0-2-2, 150	1		1					2		124		130		41	7	7		4											312	
after acid				2			1					161		62		3	8	10	1	2		1	1		4				256	
50.0-2-3, 150			1									147		98		9	10	1			1				1	2			270	

TABLE 2B – *Continued*

Sample Designation[a]	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-mn Debris	Clay Min. Aggregates	Zeolite	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.510-1.520	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay-Palagonite Grains	Total Grains in Light Fraction	Others[b]
50.0-2-4, 150	1								35	13		217		110	9	4		2							1	2			394	
50.0-2-6, 150				1					54	6		193		108	8	6		1			1				3				389	8^{R}
50.1-1-1, 62				6							125	1		1	2	1	4	3		95		2	2							1^{P} 49^{R}
50.1-1-2, 15	1		3	5							31			1			2	1		236			2							17^{R}
50.1-1-4, 17	2		1	11						21	29				4	6	15	1		146		2	1							1^{P} 66^{R}
50.1-1-6, 16	2	1	1		19						1			2		8			83	164	10	4							296	1^{V}
50.1-2-3, 4	2		3		35						2				1				123	208		2							376	
50.1-2-4, 12	1		4		54					1	4				3	10			86	188		1			1				356	3^{V}
50.1-2-4, 50	1		2	6					2	1		1		3	201	3	78				6	2	6		5				332	15^{R}
50.1-3-1, 145	4	1	4	53		1				1	2			12	18	56	118	1		20		1	1		1	3			313	1^{P} 15^{R}
50.1-3-1, 145	5	3	9	39						1	3	6	27	61	9	45	32	2		19		2	3		1	5			305	28^{R}
50.1-3-2, 76	3		3	7	27					1	5				29	27	62		30	85		1	1						281	
50.1-3-4, 16	1		2	21								1		7	11	29	116	7		56		7	3						280	17^{R}
50.1-3-6, 16	3	1	5	20		1						1		9	27	20	133	138		6		1	1			9			383	1^{P} 7^{R}
51.0-1-CC		1	2	4		1	1		2	5	2			7	233	21	33	4			31	3	5		4				372	13^{R}
51.0-2-CC	1		7	10					1	1	5	61		50	96	21	14	1			1				22	25			298	
51.1-1-2, 16	1		3		69							2			4	5		7	113	37		13			1				255	
51.1-1-4, 30	2		1	62						1				4	3		4				36	2	12		3				306	175^{R}
51.1-1-6, 16		1	1		27						2			1		2	2	2	36		198	27							299	
52.0-1-2, 30	9	1	5	50			2		1	9				23	2		13	1			12				9				267	89^{R}
52.0-1-4, 8	1	5	1		37											17			47	147		3							270	12^{L}
52.0-1-6, 9	1	4	5		96											23		1	73	79		2			2				286	
52.0-2-CC	2		5	165						1		2		6			5				4				2	3			280	84^{R}

TABLE 2B – *Continued*

Sample Designation[a]	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-mn Debris	Clay Min. Aggregates	Zeolite	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.510-1.520	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay-Palagonite Grains	Total Grains in Light Fraction	Others[b]
52.0-2-3, 7	1	1	1		174						1				1		16		56	49		1							301	
52.0-2-6, 145	5	1	6	96		1	1		1	1	1	2		8	2	3	93					1	1		3	15			279	37^{R}
52.0-3-1, 16	2	1	6		155						5	2			2	11		1	30	17		2			1	8			258	15^{L}
52.0-3-3, 16		3	2		110						2					2		1	60		26	14		1	2	33			256	
52.0-4-4, 6	2	6	5		91									1	1	32	56	1	5		1					55			256	
52.0-4-6, 18	4	5	3		115										2	35	61			5						46			287	1^{M} 1^{V} 4^{L}
52.0-5-1, 127	1	1	5		63					2		9			2	78	75	4			1								244	
52.0-5-5, 18	3	9	4		38					1			3		2	71	53			3				1		65			254	1^{M}
52.0-6-CC	3		2	12								3	13	1	5	2	67			4			3		1				121	5^{R}
52.0-7-CC	2			1			1						120	245	2	1		1			1	1							376	
52.0-7-2, 37	1	1	1											7	202	19	19	5							3	3			269	
52.0-8-1, 145	1	1	1	7						2				336	33	3		2			2	3	1		1				394	1^{R}
52.0-8-2, 145													198	73	60	6	66												403	
52.0-8-3, 40	1	1											176	46	35	1	10			1			1		1				273	
52.0-8-5, 145	1							1					219	33	5	2	9				2								272	
52.0-8-5, 145					1								247			2	46												296	
52.0-9-CC		2											118	34	182	8	8	1							1				354	
52.0-10-CC	3			3		1							48	26	32	14	11		38		11	8	4		1				200	
53.0-1-3, 17					31								3						64	178		15		7					298	
53.0-2-CC	1	1		13		1				2	2						288			33			10						375	24^{R}
after acid	10		5	51							1	1			3	3	23			56		9	43						329	2^{P} 120^{R}
53.0-4-2					19		1						24	2	14		180	1	31		2	3	5						282	
53.0-6-CC	1		3	1						10		1								3			1						343	1^{M}
after acid	2		80	4										2				4		4		1	3		1	99			251	47^{R}

TABLE 2B – *Continued*

Sample Designation[a]	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-mn Debris	Clay Min. Aggregates	Zeolite	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.510-1.520	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay-Palagonite Grains	Total Grains in Light Fraction	Others[b]
53.1-2-2, 145	1				24					4									83		77	13	13		2				217	
53.1-3-1	1	1	1	30							1						3		215		33	11	22						318	
53.1-3-2, 40	1		1		15														168		11	26	4		1				227	
53.2-4-CC	4	2	2	31						3	2	2		3	24	14		22			3	3		5	26	55			246	1M 44R
53.2-5-CC	2		1		18					5	43		95	42	69	36		27			1		2		36	23			400	
54.0-1-1, 5			2	25						1	3						21				116	26	8		1				312	107R
54.0-1-2, 7				12						2	4							2	69		171	31	15						306	
54.0-3-1, 140	1	2		27						1	5	1		2	3			2			164	2	2		4				285	1M 68R
54.0-6-1, 145	1		2	5						1	3										263	9	15		2	1			324	22R
55.0-3-4, 145	1									336	1				4		2	1			1								346	
after acid		1			2			2			75	35					9				2	1	1			10			138	
55.0-9, Top	1	1	246							99	111				2		2				30								492	
after acid (5%)	1	1	2								99					2	11	3	15		77	1	3						215	
55.0-13-3, 40					1					243	14						6		12		27	3							306	
after acid					22						49	24		15					105		71	7	21			3			317	
55.2-2-3, CC	1		1	48		1				5		3		7	12	14		32			2	1	2		68	41			306	68R
55.2-3, Top			1		4						18				3	5	99	1			2		1			25	115	55	329	
57.1-3-1, 17			1	9						145	1			1	1						2	1		83					318	74R
57.1-4-4, 145				1					194	158	9													50					429	1P 16R
after acid (5%)			1	3							4						6			2		1		142					242	1P 82R
58.2-1-5, 0					28				1		2	3							98		1			166	9				308	
58.2-1-6, 95	1		11	7					4	6	4	6		1	2			2			5	147		8	2	2			270	61R
59.1-3-CC	1		2	17						2	1	2		6	4	9		36			3			32	65	50			268	37R
59.2-1-CC	1	2									134				2	2	25		18		42		1		11				238	

TABLE 2B – *Continued*

Sample Designation[a]	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlrotie Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-mn Debris	Clay Min. Aggregates	Zeolite	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.510-1.520	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay-Palagonite Grains	Total Grains in Light Fraction	Others[b]
59.2-2-CC	1				2						252				2	4	26				7		1						294	
59.2-6, Top					1					29	3				25	7		248			9			19	6	13			360	
60.0-1-CC	1			22							4							1	17		31	4	1		107				188	
60.0-2-CC				35						1	3								70		118	21	7		2	4			261	
60.0-3-CC	1			17						14	2								189		30	16	11		2				282	
60.0-4-CC		1		24						4									131		99	9	17		2				287	
60.0-4-CC				15																	241	47	14		1				403	84R
60.0-4-2, 145				10								2					31	1			233	24	9		1				366	54R
60.0-5-CC			1	7						2	1				1		90				144	1	9		1				299	40R
after acid			1	18						1	1						7	1			116	19	25		2				341	50R
60.0-7-1, 81.5	2	1			13					10	3				1		99		51		142								331	8V

[a]Data on samples which were treated with HCl follows such samples and is indicated by "after acid."

[b]Other minerals: A = Alloy; K = Kyanite; L = Limonite; M = Muscovite; O = Opal debris; R = Rock debris; P = Palagonite; V = Volcanic glass basic

TABLE 3A
Mineralogical Analysis of Heavy Fraction in Size Range 0.1 – 0.05 mm

Sample Designation	Bk Magnetic Debris, Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk ore minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction
45.0-1-4, 145			227	–			–	47		–	1	–		–	2		–	1	–	–			–			1		–	–		279
45.1-1-1, 7			98	–			–	16		–	–	–		–	–		–	–	–	–			–			–		126	–		114
45.1-1-2	81		4	–	–				–	–	–	–	–	1	0	–	2	–	–	–	–	–	–		–		–			–	94
46.0-1-1, 145	347		3	7				34			1		1	9							1									1	412
46.0-1-2, 145			51	–			–	3		–	–	–		–	1		–	–	–	–			–		–	–		–			55
46.0-1-3, 145	40	2	3	7	–			–			–		–	2	–		–			–	–		–		–	–	–			1	55
46.0-1-5, 145	652	–	–	–	2			–			–		–	3	1		–			–	–		–		–	–	–			–	87
46.0-1-6			88	16			1	19		–	–	–		–	1		–	–	–	–			–		–	–		–			125
47.0-1-4, 90	–	–	23	–	–	–	–	9	–	–	1	–	–	20	16	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	87
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–
47.2-1-2, 181	–	–	5	–	–	–	27	–	2	–	1	–	–	2	17	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	54
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	84	–	–	–
47.2-1-3, 90	–	–	12	–	–	–	5	3	4	–	–	–	–	2	6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	32
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	17	–	–	–
47.2-2-2, 8	–	–	14	–	–	–	–	16	2	–	–	–	–	13	21	–	–	–	–	–	–	–	–	–	–	–	–	14	–	–	74
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	66	–	–	–
47.2-2-4, 7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	–	–	–
47.2-2-6, 6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	–	–	–
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	41	–	–	–
47.2-2-2, 47	6	–	27	–	1	–	–	–	2	–	1	–	–	?	51	–	1	–	–	–	–	–	–	–	1	–	1	–	–	–	116
47.2-3-3, 6	–	–	9	–	–	–	–	2	–	–	–	–	–	3	7	–	1	–	–	–	–	–	–	–	–	–	–	17	–	–	34
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16	–	–	–
47.2-4-1, 16	–	–	19	–	–	–	–	5	–	–	1	–	–	17	28	–	1	–	–	–	–	–	–	–	–	–	–	161	–	–	181
after HCl	–	–	10.4	–	–	–	–	2.8	–	–	0.6	–	–	9.3	15.3	–	0.6	–	–	–	–	–	–	–	–	–	–	241.0	–	–	–
47.2-4-3, 16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12	–	–	–
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	158	–	–	–
47.2-4-5, 16.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-5-1, 17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-5-3, 6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

TABLE 3A – *Continued*

Sample Designation	Bk Magnetic Debris, Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction
47.2-5-5, 6	–	–	–	3	–	–	–	7	–	–	–	–	–	5	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-6-2, 6	169	–	8	4	–	–	–	26	–	–	7	–	–	11	8	–	1	–	–	1	–	–	1	–	1	1	–	–	–	–	238
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-7-1, 17	–	–	11	4	–	–	–	?	–	–	2	–	–	34	4	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	621
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-7-3, 13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-7-5, 27.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
47.2-8-1, 27	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-8-3, 18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–
47.2-8-5, 17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-9-1, 16	–	–	70	–	–	–	–	45	–	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	117
47.2-9-3, 17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-10-2, 17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-10-4, 17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-10-6, 16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-11-2, 145	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–
47.2-12-2, 17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-12-4, 145	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–
47.2-13-2, 145	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-13-6, 145	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-14-3, 145	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
47.2-14-4, 145	–	–	7	–	–	–	1	7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15
after HCl	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
50.1-4-1, 75 cm	32	1	41						–	1	12	–	–	3	4		1	–	–	2	–		–		–	1				–	138
51.0-1-2	8		12	25	–				3	1	9	–	–	4	11	–	3	–	–	2	1	–	1		–		–			–	79
51.0-1-4, 6			–	–			–	–		–	–	–		–	–		–	–	–	–			–			–		136	–		–
51.0-1-6, 16			4	2			–	27		–	2	–		–	3		–	–	–	–			–		–	–		7			38
51.1-1-4	9	–	89	–					–	–	11	–	6	40	98		3	–	2	2	1		–		–	–				–	316
51.1-2-2	90	–	15	–					–	–	4	–	–	1	8		–	–	–	2	–		–		–	–				–	119

TABLE 3A – *Continued*

Sample Designation	Bk Magnetic Debris, Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction
52.0-1-2	27	–	27	–					–	–	2	–	–	14	30		–	–	–	–	–		–		–	–				–	105
52.0-2-5	47	–	76	–					13	1	5	–	1	28	160		6	2	–	–	1		2		–	–				1	379
52.0-3-5	12	–	66	–					31	–	2	–	–	–	103		2	–	–	–	–		1		–	–				–	217
52.0-4-2	26		35	11	1				16	–	12	–	1	2	5	–	16	–	–	–	–	–	1		–		–			–	146
52.0-5-2	68	–	64	–					36	3	2	–	3	–	4		16	2	1	1	–		3		–	–				1	202
52.0-5-3	22		46	7	6				28	–	2	–	1	1	9	–	13	3	2	–	–	–	3		–		–			–	142
52.0-8-2	22	–	9	57					–	–	–	–	1	–	1		–	–		–	–		–		–	1				–	419
52.0-8-4	260		1	–	–				–	–	–	–	–	–	3	–	–	–	–	–	–	–	–		–		–			–	204
52.0-8-6	28	2	–	103					–	–	–	–	–	–	2		–	–		–	–		–		–	–				–	332
53.0-0-2	–	–	–	–	–			–			–		–	–	–		–			1	–				–	–	–			–	–
53.0-1-1	18	–	69	–					90	–	3	1	1	48	193		2	1		–	–		3		1	1				–	426
53.0-7-1	3		13	–	–				42	–	4	–	–	1	12	–	–	1		3	1	–	1		–					5	86
53.1-1-1	4		9	–	–				–	–		–	–	3	12	–	1	–	–	–	–	–	1		1		–			1	39
53.1-1-2	6		16	3	–				–	–	2	–	–	4	39	–	2	–	–	–	–	–	–		–		–			–	74
53.1-1-4, 11			138				–	12		1	2	–		7	174		2	–	–	1			1		17	–		51			355
53.1-1-6, 28			–	–			–	–		–	–	–		–	–		–	–	2				–		–	–		42			–
53.1-2-4	4		32	–	–				–	–	6	2	1	52	167	–	2	–	–	–	–	–	1		–		–			–	416
53.1-2-3, 16			122	–			–	22		–	22	–		20	38		4	1	–	–			3		49	–		96			411
53.1-2-6	14		55	–	–				78	–	13	–	3	72	194	–	2	–	1		1	–	1		–		–			–	434
53.1-3-3, 23			55	–			–	24		–	–	1		62	125		1	–	–	2			–		124	–		142			394
53.1-3-5	4		45	–	–				–	–	2	–	–	19	177	–	2	–	–	–	–	–	1		–		–			–	464
53.2-1-1	5		3	–	–				–	–	1	–	–	4	23	–	–	–	–	1	–	–	–		–		–			1	119
53.2-1-3, 23			97	–			–	12		–	–	–	97		127		3	–	–	–			–		64	–		161			400
53.2-1-5, 7			111	–			–	27		–	3	–		65	154		1	–	–	–			1		57	–		195			419
53.0-6-2, 66			161	–			–	119		1	–	–		2	1		–	–	1	–			–			–		225	–		294
54.0-1-1	9		7	–	–				–	–	1	–	–	–	7	–	–	–	1	–	–		–		–					1	24
54.0-1-3, 35				–			–	4		–	–	–		2	2		1	–	–	–			–			–		41			
54.0-2-2	–		20	2	–				–	–	2	–	–	16	124	–	2	–	–	–	–	–	–		–		–		–	1	382
54.0-4-1	3		39	–	–				–	–	2	–	–	45	110	–	2	–	–	–	–	–	–		–		–			–	256
54.0-7-2	3		6	63	–				–	–	–	–	1	15	39	–	1	–	–	–	–	–	–		–		–			–	256
54.0-6-2, 16	–		20	–			–	5		–	1	–		35	162		3	–	–	–			1			–		28	11		238
54.0-6-4, 16			63	–			–	10	–	–	9	–		45	210		2	–	–	–			1			–		106			446
54.0-6-5, 17			5	–			–	2	–	–	–	–		4	10		–		–	–			–			–		15			36

TABLE 3A – *Continued*

Sample Designation	Bk Magnetic Debris, Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction
55.0-1-2			–	–			–	–	–	–	–	–		–	–		–	–	–	–			–			–		–			–
55.0-2-5, 7			7				–	–	–	–	–			2	7		–		–							–		36			17
55.0-2-6	–	–	–	–	–			–			–		–	–	–		–			–	–		–		–	–	–			–	–
55.0-4-2, 145			–				–	–	–	–	–			–	–		–		–							–		25			–
55.0-8-1	–	–	–	–	–			–			–		–	–	–		–			–	–		–		–	–	–			–	–
55.0-8-5, 18			7				–		2	–	–			1	2		1		–							–		30			19
55.0-10-3	–	–	–	–	–			–			–		–	–	–		–			–	–		–		–	–	–			–	–
55.0-11-1, 46			6				–	5	–	–	1			2	3		–		–							–		107			62
55.0-11-5	–	–	–	–	–			–			–		–	–	–		–			–	–		–		–	–	–			–	–
55.0-12-2	–	–	–	–	–			–		–	–		–	–	–		–			–	–		–		–	–	–			–	–
55.0-12-5, 7			45				–	–	–	–	–			3	13		–		–							–		376			267
55.0-13-3, 7			1				–	12	–	–	–			–	13		–		–							–		125			98
55.0-14-1	–	–	5	1	–			12			2		–	90	2		–			–	–		–		–	–	–			–	343
55.0-14-3, 145			15				–	11	–	1	2			–	4		–		–							–		172			162
55.0-14-6	–	–	3	–	–			6			1			5	–		–			–	–		–		–	–	–			–	
56.2-1-2	7	–	4							2	2	–	–	1	90		2	–	–	–	1		1		–					–	473
56.2-1-4	–		–	–	–				–	–	1	–	–	2	5	–	–	–	–	–	–	–	–		–		–			2	9
56.2-2-2, 90		–	80	–	–		13	18	–	–	–	–		–	–	–	–	–	–	1		–	–		–			–	–		112
56.2-2-6, 16			–	–			–	–	–	–	–	–		–	–		–	–	–	–			–			–		–			–
56.2-3-2, 7		–	37	–	–		–	4	–	5	13	–		3	44	2	9	–	–	3		2	3		–			277	–		402
56.2-3-2, 145		–	–	–	–		–	–	–	–	–	–		–	–	–	–	–	–	–		–	–		–			–	–		–
56.2-4-2, 10			19				–				1	–		–	1		–	–	–	–			–			–		–			22
56.2-4-5, 13		–	12	–	–		–	6	6	13	17	–		2	13	1	4	–	–	–		–	3		–			–	–		77
56.2-6-4	7		17	–	–				2	3	3	–	1	1	39	1	2	1	–	1	–	1	1		2		–			–	353
56.2-6-6, 16		–	7	–	–		–	–	–	9	25	–		6	11	1	7	–	–	5		–	–		–			214	–		285
56.2-7-2, 43		–	31	–	–		–	38	7	2	4	–		2	6	–	1	–	–	1		1	2		–			349	–		444
56.2-7-4, 39		–	102	–	–		–	24	–	1	11	7		2	147	16	10	–	–	–		–	–		–			90	–		410
56.2-8-2, 7			49	–			–	31	–	4	3	–		2	37		2	–	–	–			1			–		161			290
56.2-9-6, 8		–	32	–	–		–	7	–	–	2	–		5	39	5	2	–	–	1		3	–		–			150	–		246
56.2-10-4	3	–	10							–	1	–	1	1	48		1	–	1	1	–		1		–					–	393
56.2-5-4	–	–	–							–	–	–	–	–	–		–	–	–	–	–		–		–					–	
57.1-1-2, 0		–	41	–	–		–	18	–	–	3	–		2	143	–	2	–	–	–		–	–		–			236	–		445

TABLE 3A – *Continued*

Sample Designation	Bk Magnetic Debris, Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains For Heavy Fraction
57.1-1-3	1	1	1							1	2	–	–	–	12		1	–	–	–	–		–		–					–	336
57.1-1-5, 7		–	–	–	–		–	–	–	–	–	–		–	–	–	–	–	–	–		–	–		–			–	–		–
57.1-1-8, 7			–	–			–	–	–	–	–	–	–		–		–	–	–	–			–			–		–			–
57.1-2-1, 44			46	–			–	12	–	–	–	–	2		15		1	–	–	–			–			–		278			354
57.1-3-2, 108			27	–			–	9	6	1	1	–	2		15		2	–	–	–			–			–		347			380
57.2-1-1	–		–	–	–	–			–	–	–	–	–	–	–	–	–	–	–	–	–		–				–			–	–
58. -1-3, 145		–	6	–	1		–	7	15	–	3	–		–	93	–	1	148	–	–		–	–		–			–	–		274
58.2-1-3, 16		–	24	–	–		–	13	–	1	3	–		2	30	1	2	–	–	1		–	2		–			281	–		360
58.2-1-5	–	–	–							–	1	1	–	2	16		–	–	–	–	–		–		1					–	129
59.1-3-2, 11		–	66	–	–		–	113	9	–	4	–		29	9.9	–	2	2	–	–		–	1		–			58	–		383
59.1-3-5, 146		–	–	–	–		–	–	–	–	–	–		–	–	–	–	–	–	–		–	–		–			–	–		–
59.2-1-2, 4		1	41	–	–		–	58	118	–	2	–		10	115	–	4	–	–	–		1	–		1			115	–		466
59.2-2-3	5	–	2							–	1	–	–	2	49		–	–	–	–	–		1		–					–	319
59.2-2-5, 35		–	9	–	–		–	6	6	–	1	–		–	5	–	–	–	–	–		–	–		–			–	–		27
59.2-3-2	11	–	25							–	1	–	–	5	134		–	–	1	1	–		1		–					–	250
60.0-1-1, 7		–	48		–		–	14	17	–	15	–		32	274	–	3	1	1	–		–	–		–			42	–		405
60.0-2-1	2	–	121						6	–	2	–	–	104	116		–	–	1	–	–		2		–					–	357
60.0-3-2, 8		–	19		–		–	10	5.0	1	3	–		32	47	–	–	–	–	1		–	–		–			86	2		121
60.0-5-1, 51		–	6		–		–	–	–	–	8	–		4	5	–	–	–	–	–		–	–		–			210	–		30
60.0-5-3, 40		–	31		–		–	42	–	–	2	–		13	81	–	4	1	2	–		–	1		–			244	51		417
60.0-6-2	2	–	2							–	1	–	–	16	37		2	–	–	–	–		1							1	98
60.0-6-4, 25		–	–		–		–	–	–	–	–	–		–	–	–	–	–	–	–		–	–		–			131	–		–
60.0-6-6	5	–	20							1	2	–	1	55	244		6	1	2	–	1		1		–					–	414
60.0-8-1	2	–	13							1	1	–	–	19	196		–	1	–	–	–		1		–					–	291
60.0-8-3, 145		–	65		–		–	3	–	–	5	–		37	242	–	4	1	–	–		–	3		–			205	–		454
60.0-9-5	3		130	–	–				–	–	6	–	2	73	205	1	–	–	1	–	–	–	2		–		–			–	435
60.03-CC			–				–	–		–	–			–	–		–		–							–		243			–

TABLE 3B
Mineralogical Analysis of Light Fraction in Size Range 0.1-0.05 mm

Sample Designation	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite - Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-Mn Debris	Clay Mineral Aggregates	Zeolites	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.520-1.540	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay - Palagonite Grains	Total Grains in Light Fraction		Other[a]	
45.0-1-4, 145	1	–	–		–	–		1		–	–	57	39	119	6	–	11	–			–	–	–	–	–	–	–	–		234		
45.1-1-1, 7	2	4	–		11	–		1		4	1	–	–	–	52	2	32	–			8	–	1	11	–	4	–	–		261	2^{O}	
45.1-1-2	4	1	4	18	18	–	–	7	–	–	–	–	–	–	19	39		2			2	–				–	19		–	142	9^{V} 17^{P}	1^{P}
46.0-1-1, 145	1		1	1	1			1		119	270	8	17								1									423	7^{R}	$2+2^{V}$
46.0-1-2, 145	2	2	–	–	2	–				–	2	21	43	148	24	0.8	9	1		–	3	1	3	–	–	–	–				2^{O}	
46.0-1-3, 145	–	–	1	2	2	–	–	–	–	–	–		79	239	20	–	22	1		–	1		–	–		1	–		3	313	$–^{M}$ 2^{R} 1^{P}	$1+2^{V}$ $–^{O}$
46.0-1-5, 145	–	–	–	2	2	–			9	200	61	–	–	–	2	–		1		–	78		–	–		–	–		8	365	4^{R}	
46.0-1-6	–	–	–		–	–		–		–	2	91	43	90	10	6	24	–			–	–	–	–	–	2	–	–		269	1^{O}	
47.0-1-4, 90	–	–	–	2	2	–	–	–	9	200	61	–	–	–	2	–	–	1		–	78	–	–	–	–	–	–	–	8	365		$17+4^{R}$
after HCl	–	–	2	9	9	–	–	–	–	–	62	–	–	–	–	–	–	–		–	234	–	5	–	–	–	–	–	8	407	5^{V} 1^{P}	30^{R}
47.2-1-2, 181	–	–	–	–	1	–	–	–	–	267	3	–	–	–	4	–	11	–		–	3	1	–	–	–	–	–	–	–	292		
after HCl	–	–	–	–	29	–	–	–	–	?	13	–	–	–	–	–	48	3		–	51	31	–	1	–	–	1	–	–	270		
47.2-1-3, 90	–	–	–	–	3	–	–	–	–	247	1	–	–	–	2	–	–	–		–	3	–	–	–	–	–	–	–	–	256		
after HCl	–	1	–	–	10	–	–	–	–	5	19	–	–	–	–	–	78	6		–	86	5	–	6	–	–	–	–	–	233		
47.2-2-2, 8	–	–	–	–	2	–	–	–	–	233	10	–	–	–	6	–	10	–		–	16	–	–	–	–	–	–	–	–	283		
after HCl	1	–	–	–	19	–	–	–	–	–	28	–	–	–	–	–	–	–		–	167	3	–	–	–	–	–	–	–	284		
47.2-2-4, 7	1	–	–	–	–	–	–	–	–	186	6	–	–	–	3	–	–	–		–	36	–	–	–	–	–	–	–	–	233		
after HCl	1	–	–	–	2	–	–	–	–	3	27	–	–	–	–	–	7	–		–	190	–	–	2	–	–	–	–	–	242		
47.2-2-6, 6	–	–	–	–	–	–	–	–	–	277	4	–	–	–	4	–	–	–		–	30	–	–	2	–	–	–	–	–	324		
after HCl	2	1	–	–	1	–	–	–	–	51	9	–	–	–	–	–	–	1		–	154	2	–	2	–	–	–	–	–	264		
47.2-2-2, 47	10	–	9	?	?	–	1	22	–	1	2	8		2	–	–	–	3		–	173	7	–	–	–	–	6	–	10	398	4^{V} 5^{P}	$10+14^{R}$ 3^{K}
47.2-3-3, 6	–	–	–	–	1	–	–	–	–	234	14	–	–	–	2	–	–	–		–	36	–	–	–	–	–	–	–	–	242		
after HCl	–	–	–	–	6	–	–	–	–	–	10	–	–	–	–	–	6	–		–	191	1	–	1	–	–	–	–	–	231		
47.2-4-1, 16	–	–	–	–	5	–	–	–	–	236	1	–	–	–	5	–	–	–		–	7	–	–	7	–	–	312	–	–	–		
after HCl	1	–	–	–	16	–	–	–	–	5	1	–	–	–	–	–	6	–		–	25	10	–	31	–	–	275	–	–	–		
47.2-4-3, 16	1	1	–	–	4	–	–	–	–	243	–	–	–	–	9	–	–	–		–	4	–	–	1	–	1	276	–	–	–		
after HCl	–	1	1	–	36	–	–	–	–	9	–	–	–	–	1	–	3	–		–	–	78	–	8	–	–	295	–	–	–		
47.2-4-5, 16.5	1	–	–	2	2	–	–	–	–	408	11	–	–	–	7	–	–	–		–	16	–	1	–	–	–	-	–	4	457	1^{V}	6^{R}
after HCl	1	–	2	9	9	–	–	–	–	–	12	–	–	–	–	–	–	1		–	242	–	9	–	–	–	–	–	10	316	3^{V} 1^{P}	26^{R}

TABLE 3B – *Continued*

Sample Designation	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite - Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-Mn Debris	Clay Mineral Aggregates	Zeolites	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.520-1.540	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay - Palagonite Grains	Total Grains in Light Fraction	Other[a]		
47.2-5-1, 17	1	–	1	2	2	–	–	–	–	239	6	–	–	–	1	–	–	–		–	116	–	–	–	–	–	–	–	1	315	2^{V}	6^{R}
after HCl	2	–	1	14	14	–	–	1	–	–	7	1	–	–	–	1	–	–		–	263	–	7	–	–	–	–	–	2	385	$?^{V}$	74^{R}
47.2-5-3, 6	–	–	–	5	5	–	–	–	2	287	8	–	–	–	5	–	–	1		–	58	–	1	–	–	–	–	–	–	428	4^{V}	17^{R}
after HCl	1	–	2	11	11	–	–	–	–	–	5	–	–	–	–	–	–	1		–	335	–	7	–	–	–	–	–	–	443	4^{V}	77^{R}
47.2-5-5, 6	–	–	–	1	1	–	–	–	–	280	16	–	–	–	3	–	–	–		–	103	–	2	–	–	–	–	–	–	408	4^{R}	
after HCl	1	–	1	5	5	–	–	–	–	–	6	1	–	–	–	–	–	–		–	414	–	4	–	–	–	–	–	3	?	1^{V}	15^{R}
47.2-6-2, 6	–	–	5	8	8	–	–	–	2	282	2	–	–	–	7	–	–	–		–	222	–	2	–	–	–	–	–	–	538	5^{V}	3^{R}
after HCl	–	–	6	8	8	–	–	–	–	–	2	–	–	–	–	–	–	–		–	362	–	5	–	–	–	–	–	–	400	5^{V}	12^{R}
47.2-7-1, 17	–	–	–	7	7	–	–	–	–	313	5	–	–	–	13	4	–	1		–	41	–	–	–	–	–	3	–	–	439	2^{V} 1^{P}	611^{R}
after HCl	2	–	8	48	48	–	–	–	–	–	4	4	–	–	–	3	–	6		–	104	–	1	–	–	–	–	–	7	459	270^{R}	2^{P}
47.2-7-3, 13	–	–	–	1	1	–	–	–	–	393	–	1	–	–	118	–	–	–		–	8	–	–	–	–	–	–	–	–	523	2^{R}	
47.2-7-5, 27.5	5	–	1	4	4	–	–	–	–	220	1	1	–	–	133	–	–	–		–	11	–	–	–	–	–	–	–	–	398	1^{V}	20^{R}
47.2-8-1, 27	1	–	1	–	–	–	–	–	–	409	–	–	–	–	39	–	–	3		–	3	–	–	–	–	–	–	–	1	?	1^{V}	2^{R}
47.2-8-3, 18	–	–	–	–	–	–	–	–	–	288	–	–	–	–	24	–	–	–		–	3	–	–	–	–	–	–	–	–	317		
47.2-8-5, 17	1	–	–	–	–	–	–	–	–	318	–	–	–	–	126	–	–	–		–	2	–	–	–	–	–	2	–	–	449		
47.2-9-1, 16	–	–	–	–	–	–	–	–	–	324	–	–	–	–	14	–	–	–		–	1	–	–	–	–	–	–	–	–	339		
47.2-9-3, 17	1	–	–	–	–	–	–	–	–	212	–	–	–	–	46	–	–	1		–	2	–	–	–	–	–	5	–	–	267		
47.2-10-2, 17	–	–	–	–	–	–	–	–	–	249	–	–	–	–	44	–	–	–		–	3	–	–	–	–	–	3	–	–	299		
47.2-10-4, 17	2	1	–	–	–	–	–	–	–	267	–	–	–	–	65	–	–	–		–	?	–	–	–	–	–	3	–	–	339		
47.2-10-6, 16	2	1	–	–	2	–	–	–	–	247	–	1	–	–	18	1	–	–		–	2	–	–	–	–	–	3	–	–	277		
47.2-11-2, 145	–	–	–	–	–	–	–	1	–	300	–	–	–	–	–	–	–	–		–	–	–	–	–	–	–	–	–	–	301		
after HCl	3	–	–	–	–	–	–	99	–	–	1	26	–	–	–	23	–	3		–	51	–	–	–	–	–	–	–	25	243	2^{V}	5^{R}
47.2-12-2, 17	–	–	–	–	–	–	–	–	–	256	–	112	–	–	8	–	–	–		–	7	–	–	–	–	–	–	–	–	353	2^{R}	7^{O}
after HCl	–	–	–	1	1	–	–	1	–	–	–	267	–	–	–	1	–	–		–	79	–	–	–	–	–	4	–	–	369	1^{V} 11^{O}	4^{R}
47.2-12-4, 145	1	–	–	–	–	–	–	–	–	265	–	4	–	–	21	2	–	–		–	4	–	–	–	–	–	–	–	–	300		
47.2-13-2, 145	2	–	1	–	–	–	–	–	–	344	–	10	–	–	12	1	–	–		–	1	–	–	–	–	–	–	–	–	371		
47.2-13-6, 145	1	–	–	–	–	–	–	–	–	283	–	22	–	–	12	–	–	–		–	–	–	–	–	–	–	–	–	–	318		
after HCl	–	–	–	–	1	–	–	–	–	28	–	215	–	–	–	–	–	1		–	4	–	–	–	–	1	6	–	–	256		
47.2-14-3, 145	17	5	8	–	3	–	–	–	–	8	4	?	4	–	–	–	4	–		–	14	–	3	?	–	–	6	27	–	?		
47.2-14-4, 145	–	–	–	–	–	–	–	–	–	278	–	–	–	–	4	2	–	–		–	2	–	–	–	–	–	286	–	–	–		
after HCl	–	–	–	–	–	–	–	–	–	18	–	–	–	–	–	4	–	–		–	1	–	–	–	–	–	–	–	–	–		

TABLE 3B – *Continued*

Sample Designation	Quartz	Feldspar n <1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite - Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-Mn Debris	Clay Mineral Aggregates	Zeolites	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.520-1.540	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay - Palagonite Grains	Total Grains in Light Fraction		Other^{a}	
50.1-4-1, 75	2	–	4	5						–	–	–	2	1	19	21		153			1		–			–	–		95	314	1^{V} 2^{P}	3^{R}
51.0-1-2	4	–	6	23	23	–	–	–	2	–	3	9	1	2	11	28		3			135	18				–	4		113	459	19^{V} 2^{P}	84^{R}
51.0-1-4, 6	10	1	2		12	–		–		1	1	–	–	–	20	–	6	–			28	–	1	–	–	–	–	–		235		
51.0-1-6, 16	2	1	–		–	–		–		1	4	–	–	–	279	4	7	–			2	–	1	–	–	–	–	–		308		
51.1-1-4	1	–	21	37	37					–	–	2	2	–	1	–		1			33		–			–	–		2	313	1^{M} 2^{P}	8^{R} 63^{K}
51.1-2-2	–	–	1	3	3					–	–	1	1	6	291	2		2			13		3			1	–		4	242	1^{V}	2^{P}
52.0-1-2	–	–	4	8	8					–	1	1	–	–	1	1		–			19		2			–	–		7	352	1^{A}	17^{R}
52.0-2-5	11	1	7	112	112					–	2	–	–	2	1	7		3			103		2			–	40		5	396	134^{R}	2^{P}
52.0-3-5	–	6	8	180	180					–	1	–	1	1	–	–		4			2		–			1	27		3	293	65^{R}	2^{P}
52.0-4-2	2	2	16	138	138	–	–	–	–	–	2	4	–	–	–	53		13			6	1				1	139		3	480	72^{R}	2^{P}
52.0-5-2	–	–	34	81	81					–	–	1	1	1	1	42	8				4		1				112		10	336	36^{R}	1^{P}
52.0-5-3	2	–	41	110	110	–	–	–	–	–	2	1	–	–	5	50		9			2	–				1	36			332	3^{V} 1^{P}	24^{R}
52.0-8-2	–		1	2	2					–	–	1	184	103	340	2		1			1		–			–	–		1	406	1^{V}	1^{P}
52.0-8-4	–	–	41	110	110	–		–	–	–	–	36	–	32	3	3		–			1	1				–	–		6	425		
52.0-8-6	–	–	–	1	1					–	–	–	186	54	226	2		2			1		–			4	2		3	326	2^{R}	
53.0-0-2	10	3	2	15	15	–	1	-	1	3	–	–	–	–	–	–		–		132	9		2	–		–	2		–	204	11^{V}	11^{R}
53.0-1-1	–	–	4	13	13				–	–	1		4	2	–	–		1			46		48			–	6		–	484	97^{V} 1^{P}	201^{R}
53.0-7-1	–	–	35	90	90	–	–	–	–	–	–	–	–	–	3	–		1			2	–				–	8		–	336	1^{V} 2^{P}	193^{R}
53.1-1-1	9	–	6	138	138	–	–			–	–	5	–	3	1	–		2			2	–				–	43		12	264	3^{V} 3^{P}	40^{R}
53.1-1-2	1	–	?	82	82	–	–	–	–	–	1	44	26	66	5	2		1			2	1				–	30		–	287	14^{R}	1^{P}
53.1-1-4, 11	6	–	4		151	–		3		–	–	11	–	–	1	–	–	–		–	–	–	–	–	–	–	55	–		282		
53.1-1-6, 28	1	–	1		112	–		–		–	3	–	–	2	10	12	99	2			1	–	1	6	–	–	3	–		297		
53.1-2-4	2	–	?	67	67	–	–	–	–	–	–	–	–	1		1		–			35	15				–	–		–	548	18^{V} 3^{P}	502^{R}
53.1-2-3, 16	–	1	–		38	–		–		–	1	1	–	–	–	–	6	–			141	–	12	5	–	2	12	–		315		
53.1-2-6	–	–	?	42	42	–	–	–	–	–	2	1	–		1	–		–			48	31				–	–		–	454	88^{V} 1^{P}	230^{R}

TABLE 3B – *Continued*

Sample Designation	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite - Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-Mn Debris	Clay Mineral Aggregates	Zeolites	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.520-1.540	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay - Palagonite Grains	Total Grains in Light Fraction	Other[a]		
53.1-3-3, 23	3	–	–		40	–		–		–	1	1	–	1	–	–	–	–			–	31	16	58	–	–	1	–		294		
53.1-3-5	–	–	–	51	51	–	–	–	–	–	–	–	–	–	1	–		1			43	12				–	–		–	403	100^{V} 2^{P}	370^{R}
53.2-1-1	2	–	?	140	140	–	–	–	–	–	–	–	–	–	2	–		1			8	3				–	19		–		23^{V} 1^{P}	32^{R}
53.2-1-3, 23	1	1	1		64	–		–		–	–	–	–	–	–	–	–	–			–	15	4	7	–	–	–	–		254		
53.2-1-5, 7	–	–	1		49	–		–		–	–	–	–	–	–	–		–			–	56	6	19	–	–	14	–		340		
53.0-6-2, 66	3	50	–		–	–		–		1	1	–	–	–	2	–	–	–			–	17	1	1	–	–	41	–		343		
54.0-1-1	–	–	?	16	16	–	–	–	–	–	2	–	–	–	1	–		–			229	47	47			–	2		–	399	18^{V}	32^{R}
54.0-1-3, 35	1	–	–		8	–		–		–	3	1	–	–	–	–	2	–			–	247	24	10	–	–	–	–		337		
54.0-2-2	1	–	?	77	77	–	–	–	–	1	–	–	1	–	1	–		–			44	2				–	3		–	416	534^{R}	3^{P}
54.0-4-1	–	–	–	5	5	–	–	–	–	–	3	–	–	–	–	–		–			418	11				–	–		–	454	61^{R}	2^{P}
54.0-7-2	1	–	?	39	39	–	–	–	–	–	3	–	–	–	3	21					124	29				1	–		–	369	13^{V} 2^{P}	267^{R}
54.0-6-2, 16	–	1	–		4	–		–		–	–	–	–	–	–	–	–	–		–	233	1	9	–	–	–	–	–		216		
54.0-6-4, 16	1	–	–		32	–		1		–	1	1	–	–	–	–	–	–		94	–	137	12	4	–	2	–		–	285		
54.0-6-5, 17	–	–	–		19	–		–		–	1	–	–	–	–	–	–	–		71	–	184	9	7	–	1	–		–	292		
55.0-1-2	11	1	3		7	–		–		12	46	4	–	–	8	–	33	–		83	41	–	3	5	–	2	–		–	259		
55.0-2-5, 7	1	–	–		4			–		236	2				8	–	–	–			–	44		3	–	–	–			333		
55.0-2-6	1	–	2	4	4	–	–	–	–	321	3	1	–	2	2	–		–		–	46		5	–		–	–		–	404	5^{V} 1^{P}	10^{R}
55.0-4-2, 145	2	–	–		12			3		192	–				18		–	1			–	53		5	–	1	–			314		
55.0-8-1	2	–	2	18	18	1	–	2	–	99	152	–	–	2	2	3		–		–	30		6	–		–	–			383	6^{V} 2^{P}	62^{R}
55.0-8-5, 18	–	5	1		3			–		2	178				–	11	7	–			72	5		3	–	2	–			314		
55.0-10-3	1	–	–	2	2	–	–	–	–	–	305	–	–	–	–	–	3	–		–	12		–	–		–	–		4	418	4^{V} 1^{P}	11^{R}
55.0-11-1, 46	1	–	1		5			–		–	193				–			–			–	24		6	–	–	–			297		
55.0-11-5	1	–	–	1	1	–	–	–	–	–	341	–	–	–	–	3		–		–	5		2	–		–	–		1	407	3^{R}	
55.0-12-1	3	1	4	15	15	–	–	–	–	1	31	–	–	1	–	–		1		–	63		5	1		–	–		–	331	22^{V} 1^{P}	182^{R}
55.0-12-5, 7	–	1	–		84			3		–	43				–	–	3	–				13		16	–	8	7			348		
55.0-13-3, 7	1	–	–		16			–		2	127				–	4	7	–			–	19		2	–	5	–			236		
55.0-14-1	1	3	–	3	3	–	–	8	–	2	27	1	–	–	–	2		–		–	168		6	1		–	–		–	289	9^{V} 8^{P}	269^{R}

TABLE 3B – *Continued*

Sample Designation	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite - Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-Mn Debris	Clay Mineral Aggregates	Zeolites	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.520-1.540	Volcanic Glass 1.520-1.540	Volcanic glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay - Palagonite Grains	Total Grains in Light Fraction		Other[a]	
55.0-14-3, 145	–	2	–		4			–		–	30				–	1	–	–			–	144		5	–	2	–			231		
55.0-14-6	1	–	1	2	2	–	–	16	–	4	108	–	–	–	–	–		–		–	233		7	1		–	–		–	413	1^{M} 181^{R}	8^{V} 5^{P}
56.2-1-2	2	–	3	18	18	–	–			1	8	1		1	–	–		2				2		–		4	5		–	424	326^{V} 1^{P}	200^{R}
56.2-1-4	6	1	?			1	–	–	–	1	9	–	22	–	–	2		3			1	–				–	–		5	294	162^{V} 1^{O}	50^{R}
56.2-2-2, 90	21	5	2		3	–		–		–	181	–		–	–	1	–	–		10	10	–		–	16	–			2	251		
56.2-2-6, 16	11	3	1		4	–		–		1	126	–	–	–	–	–	10	–		23	4	–	–	14	–	–	–		–	197		
56.2-3-2, 7	3	39	–	12	–	–		–		2	28	1		–	–	–	–	–		182		50		2	–	–	–		–	319		
56.2-3-2, 145	12	2	1	14	1	–		1.3		35	229	–		–	–	–	–	–		3		–		–	–	–	–		–	316		
56.2-4-2, 10	7	1	–		1	–		–		8	145	–	–	–	–	1	3	–		21	10	–	1	6	–	2	–		–	206		
56.2-4-5, 13	10	2	2		15	–		5		2	182	–		–	–	–	7	–		50	–	30		3	–	–	–		–	308		
56.2-6-4	3	1	?	19	19		–	–	–	1	88	–	–	–	1	2		1			83	4				–	–		16	353	5^{V} 4^{P}	396^{R}
56.2-6-6, 16	2	1	5		18	1		–		–	3	–		–	–	–	–	–		253	–	5		–	8	–	–		–	296		
56.2-7-2, 43	4	2	–		1	–		–		5	31	–		–	–	–	–	–		52	–	204		2	–	–	–		–	301		
56.2-7-4, 39	6	21	9		21	–		1		4	75	–		–	1	–	–	–		95	–	42		2	–	–	–		3	280		
56.2-8-2, 7	2	3	1		3	1		–		–	62	–	–	–	1	–	–	–		142	–	63	2	11	–	–	–		–	291		
56.2-9-6, 8	–	2	2		19	–		–		–	23	–		–	–	–	–	–		176	–	32		3	–	–	–		14	271		
56.2-10-4	3	1	3	10	10	–	1			1	50	–	1	1	1	1		–			93		–			4	–		9	342	16^{V} 4^{P}	462^{R}
56.2-5-4	6	–	5	11	11	–	–			–	218	3	1	–	–	–		–			19		1			7	–		3	322	4^{V}	49^{R}
57.1-1-2, 0	1	1	–		20	–		–		–	84	–		–	–	–	–	–		78	–	19		–	77	–	–		–	281		
57.1-1-3	–	–	1	12	12	–	–			1	44	–	2	1	–	–		2			12		1			14	–		–	340		
57.1-1-5, 7	7	6	2		7	–		–		–	75	–		–	–	–	20	1		57	–	17		–	21	1	–		–	214		
57.1-1-8, 7	4	3	1		4	–		–		35	53	–	–	–	–	2	–	–		103	–	17	–	–	82	–	–		–	338		
57.1-2-1, 44	1	1	–		16	–		–		–	13	2	–	–	–	–	–	–		87	–	7	3	–	191	–	–		–	321		
57.1-3-2, 108	–	1	–		9	–		–		–	7	2	–	–	–	–	–	–		75	–	1	2	–	135	1	–		–	233		
57.2-1-1	11	2	?	5	5	–	–		1	3	164	3	–	–	4	–		–			57	5				–	–		13	236		
58.1-3, 145	1	3	–		24	–		–		–	17	1		–	–	–	–	21		85	–	12		–	38	34	–		–	236		
58.2-1-3, 16	–	7	3		7	–		–		55	50	–		–	3	–	22	2		69	–	52		–	15	36	10		–	331		
58.2-1-5	1	1	14	9	9	–	–			1	71	–	1	–	–	–		–			20		2			8	22		–	301	13^{V} 2^{P}	244^{R}

TABLE 3B – *Continued*

Sample Designation	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite - Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-Mn Debris	Clay Mineral Aggregates	Zeolites	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.520-1.540	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay - Palagonite Grains	Total Grains in Light Fraction		Other[a]	
59.1-3-2, 11	–	–	–		2	–		–		–	7	–		–	2	2	65	57		–	–	3		–	1	25	38		–	272		
59.1-3-5, 146	2	3	4		9	–		–		5	2	–		–	5	4	22	13		–	–	13		–	2	60	25		–	169		
59.2-1-2, 4	1	2	1		6	–		6		2	61	–		–	4	5	–	–		47	60	4		1	–	17	8		121	346		
59.2-2-3	1	–	3	14	14	–	–			1	59	–	4	1	2	2		2			79		–			9	–		143	422	4^{V} 8^{P}	379^{R}
59.2-2-5, 35	–	1	–		6	–		–		3	3	–		–	1	–	–	–		112	133	7		–	12	5	–		–	283		
59.2-3-2	1	–	8	84	84	–	–			1	8	24	–	–	13	14		22			4		–			10	–		106	392	11^{V} 6^{P}	151^{R}
60.0-1-1, 7	1	1	–		34	–		–		13	7	–		3	–	–	10	5			–	12	1	–	–	134	–		–	263		
60.0-2-1	–	–	–	164	164	–	1			4	2	–	–	–	–	–		4			83		11			18	–		2	335	21^{V}	68^{R}
60.0-3-2, 8	2	3	2		74	–		–		7	4	–		4	–	–	–	1			–	27	10	35	–	4	–		–	259		
60.0-5-1, 51	–	–	–		20	–		5		15	3	1		–	–	–	–	–			–	28	4	2	–	2	–		–	290		
60.0-5-3, 40	1	–	1		29	–		–		2	1	–		–	–	–	–	–			195	–	6	25	–	–	–		–	315		
60.0-6-2	1	1	4	20	20	1	–				40	–	–	6	5	4		1			84		1			12	–		107	368	2^{V} 4^{P}	111^{R}
60.0-6-4, 25	–	–	1		42	–		–		2	3	–		–	–	–	–	–			124	–	2	–	31	2	–		–	338		
60.0-6-6	–	–	2	34	34	–	–			2	1	–	–	–	–	–		–			232		1			2	–		–	517	78^{V} 1^{P}	234^{R}
60.0-8-1	1	–	2	44	44	–	–			1	1	121	–	–	–	–		17			2		2			1	–		2	339	131^{V} 2^{P}	74^{R} 1^{O}
60.0-8-3, 145	–	1	–		36	–		–		–	3	–		141	–	–	–	8			–	64	15	–	13	1	–		–	393		
60.0-9-5	–	–	?	164	164	–	–		–	1	1	–	51	–	1	–		3			21	2				–	–		9	348	5^{V}	87^{R}
60.03-CC	4	–	2		4			–		9	–					–	–	–			3	–		6	–	–	–			271		

[a]Other minerals: A = Alloy; K = Kyanite; L = Limonite; M = Muscovite; O = Opal debris; R = Rock debris; P = Palagonite; V = Volcanic glass basic

TABLE 4A
Mineralogical Analysis of Heavy Fraction in Size Range 0.05 – 0.01 mm

Sample Designation	Bk Magnetic Debris, Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains in Light Fraction
51.0-1-2, 8			192		–		–	138	7	1	6	–	2	10	12		12	1	–	–		3	2			–		19			387
51.0-1-4		2	340	25			–	88	–	2	2	–	–	4	8	1	10	1		2	1	6	2		–	–				7	498
51.0-1-6, 16			235	–	10		–	21	14	–	1	–	–	32	200		6	–	1	–		1	2			–		10			513
53.0-0-2		–	199	–			25	9	–	–	2	–	–	6	27	–	9	1		–	2		–		1	6				2	291
53.0-6-2, 66			383	–	–		–	47	11	–	2	–	–	–	11		2	–	–	–		–	1			–		144			457
53.0-7-1, 150			103	–	–		–	388	22	2	1	–	–	3	28		2	–	–	–		1	1			–		–			551
53.1-1-1, 7			252	–	–		–	62	25	–	3	–	1	18	109		4	–	–	–		–	2			–		53			476
53.1-1-2 .		–	200	–			–	15	–	1	1	–	–	8	21	–	2	1		–	–	–	1		–	1				1	301
53.1-1-4		–	311	–			–	14	–	–	1	–	–	3	45	1	4	–		1	–	–	1		–	–				–	330
53.1-1-6		–	421	–			–	34	–	1	6	1	–	9	91	–	2	1		–	–	–	3		–	–				1	570
53.1-2-3		–	130	–			–	16	–	–	18	2	1	50	181	–	4	2		–	–	–	4		–	–				–	430
53.1-2-4		–	126	–			–	7	–	–	8	2	–	40	190	1	3	–		–	–	–	2		–	–				–	347
53.1-2-6		–	165	–			–	37	–	–	4	1	2	38	185	–	3	–		–	–	–	1		–	1				–	449
53.1-3-3		–	153	–			–	7	–	–	7	–	–	45	200	1	2	3		–	–	–	2		–	–				–	427
53.1-3-5, 23			202	–	5	–	–	24		1	–	–	–	44	175		3	–	–	–		1	2			–		151			457
53.2-1-1, 21			184	–	101	–	–	63		–	2	–	–	19	170		5	1	–	1		1	4			–		42			551
53.2-1-3, 22			152	–	27	–	–	29		1	1	1	–	42	177		3	–	1	–		1	1			–		188			436
53.2-1-5, 7			223	–	20	–	–	82		1	4	–	–	29	192		4	–	1	–		1	1			–		156			558
53.1-1-4		–	311	–			–	14	–	–	1	–	–	3	45	1	4	–		1	–	–	1		–	–				–	330
54.0-1-1, 74	–	–	275	–	–	–	–	11	–	1	1	–	–	54	139	1	7	–	–	–	1	–	3	–	–	–	–	–	–	–	540
54.0-1-3, 35	–	–	105	–	–	–	–	21	–	–	2	–	–	17	35	–	4	–	–	–	–	2	–	–	–	–	–	92	–	–	199
54.0-2-2, 23	–	–	208	–	–	–	–	11	–	–	1	–	–	17	?	–	4	–	–	–	1	–	2	–	–	–	–		–	–	?
54.0-4-1, 108	–	–	309	–	6	–	1	33	–	–	1	–	–	24	64	–	11	–	2	–	–	–	7	–	–	–	–	38	–	–	458
54.0-6-2, 16	–	–	256	–	–	–	–	25	–	–	2	–	–	47	238	–	8	–	–	–	–	1	14	–	–	–	–	34	–	–	591
54.0-6-4, 16	–	–	142	–	–	–	–	11	–	1	1	–	1	47	?	–	3	–	–	–	–	–	2	–	–	–	–	–	–	–	380
54.0-6-5, 17	–	–	172	–	–	–	–	15	–	1	1	–	–	39	123	2	9	–	–	1	–	–	–	–	–	1	–	–	–	–	378
54.0-7-2, 34	–	–	181	–	14	–	–	89	–	–	1	–	–	12	–	–	1	–	–	–	–	–	1	–	25	–	–	37	–	–	324
55.0-3-3, 14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–	–	–	–	–	–	–	–	–	–	–	44	–	–	–
55.0-3-5, 15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	11	–	–	–
55.0-4-4, 145	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
55.0-4-6, 145	–	–	60	–	–	–	–	108	–	–	–	–	–	–	2	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
55.0-5-3, 1	–	–	7	–	–	–	–	–	–	–	–	–	–	–	14	–	–	–	–	–	–	–	–	–	–	–	–	26	–	–	–

TABLE 4A – *Continued*

Sample Designation	Bk Magnetic Debris, Grains, Plates (Rust?)	Bk Magnetic Spherules	Bk Ore Minerals	Manganese	Gray Spherules	Rust	Pyrite - Marcasite	Fe-Oxide	Indet. Grains	Garnet	Hornblende	Hornblende (Basaltic)	Actinolite Tremolite	Pyroxene - Orthorhombic	Pyroxene - Monoclinic	Aegirine	Epidote	Olivine	Chlorite	Biotite	Titanite (Sphene)	Zircon	Apatite	Rutile	Corundum	Celesto - Barite	Diamond	Volcanic Ash	Volcanic Glass - Acid	Carbonate	Total Grains for Heavy Fraction
55.0-6-1, 7	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	42	–	–	–
55.0-6-5, 16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–	–	–	–	–	–	29	–	–	–
55.0-7-3, 18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	78	–	–	–
57.1-2-1, 44	–	–	67	–	–	–	2	8	–	–	1	–	–	13	43	–	–	–	–	–	–	–	2	–	–	1	–	36	–	–	556
57.1-3-2, 109	–	–	45	–	–	–	–	31	–	–	–	–	1	7	57	–	1	1	–	–	–	–	3	–	–	–	–	–	–	–	336
after HCl	–	–	45	–	–	–	–	31	–	–	–	–	1	7	57	–	1	1	–	–	–	–	3	–	–	–	–	–	–	–	336
57.1-4-2, 20	–	–	28	–	–	–	–	6	–	–	1	–	–	4	35	–	2	–	–	–	–	–	–	–	–	–	–	166	–	–	522
57.1-4-5, 145	–	–	3	–	–	–	–	–	–	–	–	–	–	1	25	–	–	1	–	–	–	–	48	–	–	–	–	–	–	–	479
after HCl	–	–	3	–	–	–	–	–	–	–	–	–	–	1	25	–	–	1	–	–	–	–	48	–	–	–	–	–	–	–	479

TABLE 4B
Mineralogical Analysis of Light Fraction in Size Range 0.05 – 0.01 mm

Sample Designation	Quartz	Feldspar $n < 1.54$	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite - Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-Mn Debris
51.0-1-2, 8	13	1	1		7			1		–	6				28	
51.0-1-4	43	3	2	9	9			–	–	1	1	–	12	–	37	30
51.0-1-6, 16	2	11	–		2			2		–	3				313	
53.0-0-2	6	–	3	20	20			–	–	–	2	–	–	1	1	–
53.0-6-2, 66	10	213	2		2			3		106	–				–	
53.0-7-1, 150	1	7	8		160			–		–	–				3	
53.1-1-1, 7	16	–	2		211			2		–	3				11	
53.1-1-2	19	5	11	148	148			–	–	1	1	2	–	–	12	–
53.1-1-4	13	2	13	181	181			–	–	1	–	–	–	6	21	–
53.1-1-6	8	–	25	209	209			–	–	–	–	–	–	3	2	–
53.1-2-3	2	–	4	46	46			–	–	–	1	–	–	1	–	–
53.1-2-4	2	–	5	34	34			–	–	–	3	–	–	1	1	–
53.1-2-6	3	–	4	28	28			–	–	–	3	–	–	–	–	–
53.1-3-3	1	–	2	34	34			–	–	1	1	–	–	1	1	–
53.1-3-5, 23	1	1	–		29			–		–	2				–	
53.2-1-1, 21	7	4	–		301			–		–	–				7	
53.2-1-3, 22	–	–	–		49			–		–	4				–	
53.2-1-5, 7	3	2	–		52			–		–	12				–	
54.0-1-1, 74	1	–	3	33	33	–	–	–	–	–	3	–	–	3	–	–
54.0-1-3, 35	7	–	–	–	20	–	–	–	–	–	3	–	–	–	–	–
54.0-2-2, 23	–	–	2	20	20	–	–	–	–	–	3	–	–	–	1	–
54.0-4-1, 108	–	–	21	–	–	–	–	2	–	–	5	–	–	–	–	–
54.0-6-2, 16	?	–	–	–	31	–	–	–	–	–	–	–	–	–	–	–
54.0-6-4, 16	–	–	4	47	47	–	–	–	–	–	2	–	–	–	3	–

Sample Designation	Clay Mineral Aggregates	Zeolites	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.520-1.540	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay - Palagonite Grains	Total Grains in Light Fraction		Other[a]	
51.0-1-2, 8	275	37			93	–		2		1	32			516		
51.0-1-4		3			65		–			–	13		28	233	4^{V} 13^{R}	1^{P}
51.0-1-6, 16	33	43			4	–		–		5	57			494		
53.0-0-2		1			250		3			–	111		–	421	3^{V} 26^{R}	1^{P}
53.0-6-2, 66	74	–			14	–		–		–	–			568		
53.0-7-1, 150	9	–			–	–		–		–	223			411		
53.1-1-1, 7	75	–			2	–		2		–	22			399		
53.1-1-2		1			4		–			–	46		1	272	2^{V} 15^{R}	1^{P}
53.1-1-4		1			5		–			–			8	253	6^{V} 13^{R}	1^{P}
53.1-1-6		1			2		–			–	–		82	369	2^{V} 34^{R}	1^{P}
53.1-2-3		1			81		17			–	4		–	326	25^{V} 163^{R}	2^{P}
53.1-2-4		1			123		16			–	4		–	368	27^{V} 168^{R}	1^{P}
53.1-2-6		1			70		92			–	–		7	377	69^{V} 185^{R}	1^{P}
53.1-3-3		–			120		9			–	100		–	301	30^{V} 32^{R}	1^{P}
53.1-3-5, 23	–	–			–		137	25		–	–			346		
53.2-1-1, 21	77	–			5		2	2		1	–			448		
53.2-1-3, 22	23	–			–		39	23		1	–			327		
53.2-1-5, 7	14	–			–		233	17		2	–			491		
54.0-1-1, 74	–	1	–	–	155	–	26	–	–	–	59	–	–	454	19^{V} 23^{R}	1^{P}
54.0-1-3, 35	–	–	–	–	–	238	9	2	–	–	–	–	–	371	20^{V} 15^{R}	1^{P}
54.0-2-2, 23	–	1	–	–	253	–	8	–	–	–	1	–	–	275		
54.0-4-1, 108	–	–	–	–	–	262	13	3	–	2	3	–	–	349		
54.0-6-2, 16	–	–	–	–	–	405	8	7	–	–	–	–	–	486		
54.0-6-4, 16	–	1	–	–	134	–	18	–	–	–	?	–	–	275	8^{V}	1^{P}

TABLE 4B – *Continued*

Sample Designation	Quartz	Feldspar n < 1.54	Feldspar - Acid	Feldspar - Medium	Feldspar - Basic	Microcline	Glauconite	Chlorite - Debris	Carbonate Debris	Biogenic Carbonate	Biogenic Siliceous Debris	Chalcedonic Debris	Rock Debris With Chalcedony	Biogenic Chalcedonic Debris	Fish Bones and Teeth	Fe-Mn Debris	Clay Mineral Aggregates	Zeolites	Volcanic Ash	Volcanic Glass Acid 1.505-1.510	Volcanic Glass 1.520-1.540	Volcanic Glass 1.520-1.540	Volcanic Glass 1.555-1.570	Volcanic Glass 1.594-1.600	Palagonite	Indet. Grains	Chert Debris	Clay - Palagonite Grains	Total Grains for Heavy Fraction		Other[a]	
54.0-6-5, 17	–	–	–	17	17	–	–	–	–	–	2	–	–	–	–	–	–	1	–	–	246	–	11	–	–	–	66	–	–	361	17^{V}	1^{P}
54.0-7-2, 34	10	–	–	–	10	–	–	–	–	–	9	–	–	–	–	–	–	–	–	–	–	275	5	6	–	1	1	–	–	354		
55.0-3-3, 14	–	–	–	–	15	–	–	–	–	7	15	–	–	–	–	–	–	–	–	–	–	18	5	1	–	–	4	–	–	124		
55.0-3-5, 15	4	2	1	1	6	–	–	–	–	257	12	–	–	–	–	–	13	–	–	–	–	15	–	1	–	1	348	–	–	7		
55.0-4-4, 145	8	4	2	12	38	–	–	–	–	28	23	–	–	–	–	–	–	–	–	–	–	18	–	–	–	2	190	–	–	20		
55.0-4-6, 145	13	1	5	–	5	–	–	11	–	5	26	–	–	–	–	–	–	–	–	–	–	10	–	–	–	5	278	–	–	26		
55.0-5-3, 1	11	3	2	–	48	–	–	51	–	4	25	–	–	–	–	–	14	–	–	–	–	3	–	–	–	28	290	–	–	22		
55.0-6-1, 7	5	–	1	–	11	–	–	8	–	6	137	–	–	–	1	–	18	–	–	–	–	11	–	–	–	15	267	–	–	12		
55.0-6-5, 16	1	1	1	–	6	–	–	7	–	–	177	–	–	–	–	–	27	–	–	–	–	11	–	1	–	1	284	–	–	–		
55.0-7-3, 18	8	2	–	–	9	–	–	3	–	–	116	–	–	–	–	–	20	–	–	–	–	12	–	2	–	3	253	–	–	–		
57.1-2-1, 44	–	–	–	–	4	–	–	–	–	–	138	–	–	–	–	–	5	–	–	–	–	5	–	187	–	–	–	–	–	375		
57.1-3-2, 109	–	–	–	3	3	–	–	1	?	32	15	–	–	1	1	–	–	1	–	–	6	–	2	–	–	2	–	–	9	289		
after HCl	–	?	–	3	3	–	–	–	–	–	11	–	–	–	–	–	–	1	–	–	5	–	2	–	–	9	42	–	–	221		
57.1-4-2, 20	1	–	–	–	10	–	–	–	–	–	41	–	–	–	–	–	20	–	–	–	–	22	–	169	–	–	–	–	–	430		
57.1-4-5, 145	–	–	–	–	–	–	–	–	–	–	40	–	–	–	5	–	–	–	–	–	15	–	–	–	–	5	–	–	7	317		1^{P}
after HCl	–	–	1	4	4	–	–	–	–	–	3	–	–	2	–	–	–	–	–	–	11	–	11	–	–	8	–	–	–	322		1^{P}

TABLE 5
Quartz and Carbonate Minerals as Determined by X-ray Analysis

Sample No.	Fraction (mm)	Quartz %	Calcite %	Aragonite %	Feldspar	Cristobalite
45.1-1-1, 7	0.05-0.01	3.0	-	-	+	-
45.1-1-2, 100	0.05-0.01	1.0	-	-	+	-
46.0-1-1, 145	0.05-0.01	45.0	-	-	+	-
46.0-1-2, 145	0.05-0.01	50.0	-	-	+	-
46.0-1-3, 145	0.05-0.01	30.0	-	-	+	-
46.0-1-4, 145	0.05-0.01	75.0(?)	-	-	+	-
46.0-1-5, 145	0.05-0.01	50.0	-	-	+	-
47.0-1-1, 17	0.05-0.01	30.0	22.0	-	+	-
47.2-1-2, 23	0.05-0.01	27.0	30.0	-	+	-
47.2-1-2, 181	0.05-0.01	30.0	60.0	-	+	-
47.2-1-3, 90	0.05-0.01	25.0	70.0	-	+	-
47.2-2-2, 8	0.05-0.01	22.0	70.0	-	+	-
47.2-2-6, 6	0.05-0.01	10.0	85.0	-	+	-
47.2-3-3, 6	0.05-0.01	72.0	52.0	-	+	-
47.2-4-1, 16	0.05-0.01	8.0	90.0	<1.0	-	-
47.2-4-3, 16	0.05-0.01	5.0	94.0	-	-	-
47.2-4-5, 16.5	0.05-0.01	10.0	62.0	-	+	-
47.2-5-1, 17	0.05-0.01	7.0	65.0	-	+	-
47.2-5-3, 6	0.05-0.01	18.0	80.0	-	+	-
47.2-5-5, 6	0.05-0.01	10.0	78.0	-	+	-
47.2-7-1, 17	0.05-0.01	20.0	75.0	-	+	-
47.2-7-3, 13	0.05-0.01	-	100.0	-	-	-
47.2-7-5, 27.5	0.05-0.01	-	100.0	-	-	-
47.2-8-1, 27	0.05-0.01	-	100.0	-	-	-
47.2-8-3, 18	0.05-0.01	-	100.0	-	-	-
47.2-8-5, 17	0.05-0.01	-	100.0	-	-	-
47.2-9-1, 16	0.05-0.01	-	100.0	-	-	-
47.2-9-3, 17	0.05-0.01	-	100.0	-	-	-
47.2-10-2, 17	0.05-0.01	2.0	97.0	1.0	-	-
47.2-10-6, 16	0.05-0.01	-	100.0	-	-	-
47.2-11-2, 145	0.05-0.01	-	100.0	-	-	-
47.2-12-2, 17	0.05-0.01	3.0	97.0	-	-	-
47.2-12-4, 145	0.05-0.01	1.0	85.0	-	-	-
47.2-13-2, 145	0.05-0.01	2.0	97.0	-	-	-
47.2-14-4, 145	0.05-0.01	-	100.0	-	-	-
47.2-14-6, 145	0.05-0.01	-	100.0	-	-	-
48.2-1-2, 33	0.05-0.01	7.0	92.0	-	-	-
48.2-1-4, 16	0.05-0.01	8.0	60.0	-	-	-
48.2-1-6, 11	0.05-0.01	1.0	98.0	-	-	-

TABLE 5 – *Continued*

Sample No.	Fraction (mm)	Quartz %	Calcite %	Aragonite %	Feldspar	Cristobalite
48.2-2-5, 16	0.05-0.01	-	100.0	-	-	-
48.2-3-1, 117	0.05-0.01	-	100.0	-	-	-
48.2-3-3, 17	0.05-0.01	-	100.0	-	-	-
48.2-3-5, 16	0.05-0.01	-	100.0	-	-	-
49.0-1-1, 11	0.05-0.01	19.0	-	-	+	-
49.0-1-2, 16	0.05-0.01	16.0	5.0	-	+	-
49.0-1-4, 6	0.05-0.01	20.0	-	-	+	-
49.0-1-5, 70	0.05-0.01	22.0	-	-	+	-
49.0-2-1, 70	0.05-0.01	20.0	32.0	-	+	-
49.1-1-1, 77	0.05-0.01	15.0	1.0	-	+	-
49.1-1-4, 17	0.05-0.01	7.0	<1.0	-	+	-
49.1-2-2, 145	0.05-0.01	45.0	37.0	-	+	-
50.1-1-4, 17	0.05-0.01	27.0	8.0	-	+	-
50.1-2-3, 4	0.05-0.01	15.0	-	-	+	-
50.1-3-2, 73	0.05-0.01	27.0	-	-	+	-
45.1-1-1, 7	<0.01	12.0	<1.0	-	+	-
45.1-1-2, 100	<0.01	5.0	-	-	+	-
46.0-1-2, 145	<0.01	25.0	-	-	+	-
46.0-1-5, 145	<0.01	27.0	2.0	-	+	-
46.0-1-6, 145	<0.01	37.0	-	-	+	-
50.0-4-1, 75	<0.01	22.0	-	-	+	-
50.1-3-4, 16	<0.01	28.0	-	-	+	-
51.0-1-2, 8	<0.01	25.0	2.0	-	+	-
51.0-1-4, 6	<0.01	35.0	<1.0	-	+	-
51.0-1-6, 17	<0.01	20.0	-	-	+	-
51.1-1-2, 16	<0.01	22.0	-	-	+	-
51.1-1-4, 16	<0.01	20.0	-	-	+	-
51.1-1-6, 16	<0.01	20.0	trace	-	-	-
51.1-2-2, 8	<0.01	25.0	-	-	+	-
52.0-1-4, 8	<0.01	37.0	-	-	+	-
52.0-2-3, 9	<0.01	20.0	-	-	+	-
52.0-3-3, 16	<0.01	20.0	-	-	+	-
52.0-4-2, 7	<0.01	17.0	-	-	+	-
52.0-5-2, 17	<0.01	18.0	<1.0	-	-	-
52.0-8-4, 145	<0.01	30.0	-	-	+	+
52.0-8-5, 145	<0.01	30.0	-	-	+	-
52.0-8-6, 145	<0.01	32.0	1.0	-	+	-
53.0-1-3, 17	<0.01	5.0	-	-	+	-
53.1-1-4, 17	<0.01	12.0	1.0	-	+	-

TABLE 5 – *Continued*

Sample No.	Fraction (mm)	Quartz %	Calcite %	Aragonite %	Feldspar	Cristobalite
53.1-2-4, 10	<0.01	3.0	1.0	-	+	-
53.1-3-5, 23	<0.01	2.0	1.0	-	+	-
54.0-1-1, 74	<0.01	2.0	-	-	+	-
54.0-1-3, 35	<0.01	1.0	-	-	+	-
54.0-6-2, 16	<0.01	1.0	-	-	-	-
54.0-6-5, 17	<0.01	1.0	-	-	-	-
57.1-2-1, 44	<0.01	-	62.0	-	-	-
57.1-3-2, 109	<0.01	-	98.0	-	-	-
57.1-4-2, 20	<0.01	-	100.0	-	-	-
57.1-4-5, 145	<0.01	<1.0	52.0	-	-	-
44.0-2-6, 145	0.001	-	100.0	-	-	-
45.1-1-2, 100	0.001	2.0	-	-	+	-
46.0-1-2, 145	0.001	13.0	-	-	+	-
46.0-1-3, 145	0.001	18.0	-	-	+	-
46.0-1-4, 145	0.001	12.0	-	-	+	-
46.0-1-6, 145	0.001	25.0	-	-	+	-
47.0-1-1, 17	0.001	18.0	72.0	-	+	-
47.0-1-4, 90	0.001	10.0	-	-	+	-
47.0-1-6, 14	0.001	-	100.0	-	-	-
47.1-1-2, 16	0.001	-	100.0	-	-	-
47.2-1-2, 23	0.001	3.0	95.0	-	-	-
47.2-1-3, 90	0.001	2.0	97.0	-	-	-
47.2-2-6, 6	0.001	2.0	97.0	-	-	-
47.2-2-6, 7	0.001	7.0	90.0	-	-	-
47.2-3-CC	0.001	1.0	98.0	-	-	-
47.2-4-3, 16	0.001	-	100.0	-	-	-
47.2-4-5, 16.5	0.001	1.0	97.0	-	-	-
47.2-5-1, 17	0.001	1.0	96.0	-	-	-
47.2-5-3, 6	0.001	1.0	98.0	-	-	-
47.2-5-5, 6	0.001	1.0	98.0	-	-	-
47.2-6-2, 6	0.001	1.0	97.0	-	-	-
47.2-7-1, 17	0.001	2.0	97.0	-	-	-
47.2-7-3, 13	0.001	2.0	65.0	-	-	-
47.2-7-5, 27.5	0.001	3.0	60.0	-	-	-
47.2-8-1, 27	<0.001	-	100.0	-	-	-
47.2-8-3, 18	<0.001	-	98.0	-	-	-
47.2-8-5, 17	<0.001	<1.0	98.0	<1.0	-	-
47.2-9-1, 16	<0.001	-	100.0	-	-	-
47.2-9-3, 17	<0.001	-	98.0	-	-	-

TABLE 5 – *Continued*

Sample No.	Fraction (mm)	Quartz %	Calcite %	Aragonite %	Feldspar	Cristobalite
47.2-10, top	< 0.001	-	100.0	-	-	-
47.2-10-2, 17	< 0.001	-	98.0	-	-	-
47.2-10-4, 17	< 0.001	-	100.0	-	-	-
47.2-10-6, 16	< 0.001	-	100.0	-	-	-
47.2-11-2, 145	< 0.001	-	100.0	-	-	-
47.2-12-4, 145	< 0.001	-	100.0	-	-	-
47.2-13-6, 145	< 0.001	-	100.0	-	-	-
47.2-14-3, 145	< 0.001	-	98.0	-	-	-
47.2-14-4, 145	< 0.001	-	98.0	-	-	-
47.2-14-6, 145	< 0.001	-	100.0	-	-	-
48.2-1-2, 33	< 0.001	-	98.0	-	-	-
48.2-1-4, 16	< 0.001	-	98.0	-	-	-
48.2-1-6, 11	< 0.001	-	98.0	-	-	-
48.2-2-3, 145	< 0.001	-	100.0	-	-	-
48.2-2-5, 16	< 0.001	-	100.0	-	-	-
48.2-3-1, 117	< 0.001	-	100.0	-	-	-
48.2-3-3, 17	< 0.001	-	100.0	-	-	-
48.2-3-5, 16	< 0.001	-	98.0	-	-	-
49.0-1-1, 11	< 0.001	10.0	1.0	-	+	-
49.0-1-2, 16	< 0.001	15.0	<1.0	-	+	-
49.0-1-2, 124	< 0.001	15.0	<1.0	-	+	-
49.0-1-4, 6	< 0.001	10.0	-	-	+	-
49.0-1-5, 70	< 0.001	18.0	-	-	+	-
49.0-2-1, 70	< 0.001	-	98.0	-	-	-
49.1-1-1, 77	< 0.001	7.0	<1.0	-	-	-
49.1-1-2, 124	< 0.001	15.0	1.0	-	-	-
49.1-1-5, 38	< 0.001	<1.0	98.0	-	-	-
50.1-1-2, 15	< 0.001	10.0	-	-	+	-
50.1-1-4, 17	< 0.001	21.0	-	-	+	-
50.1-1-6, 16	< 0.001	22.0	-	-	+	-
50.1-4-1, 75	< 0.001	10.0	-	-	+	-
51.0-1-2, 8	< 0.001	13.0	-	-	+	-
51.0-1-6, 16	< 0.001	8.0	-	-	+	-
51.1-1-4, 16	< 0.001	<1.0	-	-	+	-
51.1-1-6, 16	< 0.001	22.0	-	-	+	-
51.1-2-2, 8	< 0.001	18.0	-	-	+	-
52.0-1-2, 8	< 0.001	18.0	-	-	+	-
52.0-1-4, 8	< 0.001	13.0	-	-	+	-
52.0-1-6, 9	< 0.001	15.0	1.0	-	+	-

TABLE 5 – *Continued*

Sample No.	Fraction (mm)	Quartz %	Calcite %	Aragonite %	Feldspar	Cristobalite
52.0-2-3, 7	<0.001	13.0	1.0	-	+	-
52.0-2-5, 18	<0.001	12.0	-	-	+	-
52.0-3-1, 16	<0.001	15.0	-	-	+	-
52.0-3-3, 16	<0.001	3.0	-	-	+	-
52.0-3-5, 7	<0.001	20.0	1.0	-	+	-
52.0-4-2, 7	<0.001	10.0	-	-	+	-
52.0-4-4, 6	<0.001	7.0	-	-	+	-
52.0-4-6, 18	<0.001	18.0	<1.0	-	+	-
52.0-5-1, 127	<0.001	20.0	<1.0	-	+	-
52.0-5-2, 17	<0.001	25.0	<1.0	-	+	-
52.0-5-3, 18	<0.001	20.0	-	-	+	-
52.0-5-5, 18	<0.001	20.0	-	-	+	-
52.0-7-2, 37	<0.001	30.0	1.0	-	+	-
52.0-8-2, 145	<0.001	20.0	-	-	+	-
52.0-8-5, 145	<0.001	20.0	12.0	-	+	+
52.0-8-6, 145	<0.001	30.0	-	-	+	-
53.0-1-1, 10	<0.001	<1.0	-	-	+	-
53.0-2-CC	<0.001	<1.0	-	-	-	-
53.0-6-2, 66	<0.001	<1.0	6.0	-	-	-
53.0-7-1, 150	<0.001	1.0	-	-	+	-
53.1-1-2, 70	<0.001	6.0	-	-	+	-
53.1-1-6, 28	<0.001	6.0	-	<1.0	+	-
53.1-2-4, 10	<0.001	3.0	<1.0	-	+	-
53.1-2-6, 7	<0.001	2.0	-	-	+	-
53.1-3-2, 40	<0.001	1.0	-	-	+	-
53.1-3-5, 22	<0.001	-	<1.0	-	-	-
53.2-1-1, 21	<0.001	5.0	-	-	+	-
53.2-1-3, 22	<0.001	<1.0	-	-	+	-
53.2-1-5, 7	<0.001	1.0	-	-	+	-
53.2-5-CC	<0.001	12.0	<1.0	-	+	-
54.0-1-3, 35	<0.001	<1.0	<1.0	-	-	-
54.0-2-2, 23	<0.001	1.0	<1.0	-	-	-
54.0-4-1, 108	<0.001	1.0	-	-	-	-
54.0-6-2, 16	<0.001	<1.0	-	-	-	-
54.0-6-4, 16	<0.001	1.0	<1.0	-	-	-
55.0-2-5, 7	<0.001	-	100.0	-	-	-
55.0-4-6, 145	<0.001	-	100.0	-	-	-
55.0-6-5, 16	<0.001	1.0	98.0	-	-	-
55.0-7-3, 18	<0.001	-	100.0	-	-	-

TABLE 5 – *Continued*

Sample No.	Fraction (mm)	Quartz %	Calcite %	Aragonite %	Feldspar	Cristobalite
56.2-8-2, 17	<0.001	-	100.0	-	-	-
57.1-1-2, 0	<0.001	-	100.0	-	-	-
57.1-4-5, 145	<0.001	32.0	-	-	+	-
57.1-2-1, 44	<0.001	1.0	96.0	-	-	-
60.0-4-CC	<0.001	-	5.0	-	-	-

TABLE 6
X-Ray Analysis of Clay Minerals in Fraction < 0.001mm

Sample No.	Major Minerals						Minor Minerals (10%)						Removal of KCO_3	Abundance Amorphous Material
	Illite		Chlorite		Montmorillonite		Illite	Kaolinite	Chlorite	Montmor-illonite	Mixed Layer	Paly-gorskite		
	4 X area (cm^2)	%	2 X area (cm^2)	%	1 X area (cm^2)	%								
45.1-1-1, 7	406	24	140	8	1120	68	–	–	–	–	+	–	+	+
45.1-1-2, 100	–	–	–	–	–	100	+	–	+	–	–	–	+	+
47.0-1-4, 90	356	69	150	31	–	–	–	+	–	–	+	+	+	+
47.2-1-2, 23	462	81	110	13	–	–	–	–	–	–	+	+	–	+
47.2-1-3, 90	276	72	105	28	–	–	–	+	–	–	+	+	+	+
47.2-9-6, 0	392	34	–	–	770	66	–	–	+	–	+	+	–	+
47.2-11-4, 145	312	32	40	48	–	–	–	–	–	–	+	+	–	+
49.0-1-1, 11	570	74	185	26	–	–	–	–	–	–	–	+	–	+
49.0-1-2, 46	780	74	270	26	–	–	–	–	–	–	–	–	+	+
49.0-1-4, 6	240	61	154	32	–	–	–	–	–	+	–	+	+	+
49.0-1-5, 70	840	59	240	17	340	24	–	–	–	–	–	+	+	+
49.1-1-1, 77	476	80	120	20	–	–	–	–	–	–	–	–	+	+
49.1-1-2, 124	420	37	120	10	600	53	–	–	–	–	–	–	+	+
49.1-1-4, 17	–	–	–	–	–	100	+	–	+	–	–	+	+	+
50.0-2-1, 145	294	59	–	–	200	41	–	–	–	–	+	+	–	+
50.0-2-2, 150	132	50	–	–	130	50	–	–	+	–	+	+	–	+
50.0-2-3, 150	280	31	–	–	620	69	–	–	+	–	+	+	–	+
50.0-2-4, 150	200	31	–	–	540	69	–	–	+	–	+	+	–	+
50.0-2-6, 150	200	40	–	–	300	60	–	–	+	–	+	+	–	+
50.1-3-4, 16	220	65	120	35	–	–	–	–	–	+	–	+	+	+
50.1-3-6, 16	1040	61	203	12	441	27	–	+	–	–	–	+	+	+
50.1-4-1, 75	354	50	70	10	280	40	–	+	–	–	+	+	+	+
51.0-1-6, 16	207	36	72	12	300	52	–	+	–	–	+	+	+	+

TABLE 6 – *Continued*

Sample No.	Major Minerals						Minor Minerals (10%)						Removal of KCO_3	Abundance Amorphous Material
	Illite		Chlorite		Montmorillonite		Illite	Kaolinite	Chlorite	Montmor-illonite	Mixed Layer	Paly-gorskite		
	4 × area (cm^2)	%	2 × area (cm^2)	%	1 × area (cm^2)	%								
52.0-1-4, 8	320	39	120	13	450	48	–	+	–	–	–	–	+	+
52.0-1-6, 9	–	–	–	–	–	100	+	+	+	–	–	±	+	–
52.0-2-3, 7	–	–	–	–	–	100	+	+	+	–	–	–	+	–
52.0-2-5, 18	–	–	–	–	–	100	+	+	+	–	–	–	+	–
52.0-3-1, 16	–	–	–	–	–	100	+	–	+	–	–	–	+	–
52.0-3-3, 16	–	–	–	–	–	100	+	–	–	–	–	–	+	–
52.0-3-5, 7	–	–	–	–	–	100	+	+	+	–	–	–	+	–
52.0-4-2, 7	–	–	–	–	–	100	+	+	+	–	–	–	+	–
52.0-4-4, 6	–	–	–	–	–	100	+	+	+	–	–	–	+	–
52.0-4-6, 18	660	27	228	9	1560	64	–	+	–	–	–	–	+	–
52.0-5-1, 127	916	30	90	12	420	58	–	+	–	–	–	–	+	–
52.0-5-2, 17	420	40	126	10	410	50	–	+	–	–	–	–	+	–
55.0-1-2,	180	72	70	28	–	–	–	+	–	–	+	–	–	+
58.2-1-3	–	–	–	–	–	100	–	–	–	–	–	–	–	++
58.2-1-5	–	–	–	–	–	100	–	–	+	–	–	–	–	++
60.0-1-1	–	–	–	–		100	–	–	–	–	–	–	+	+
60.0-2-1	–	–	225	39	348	61	–	–	–	–	+	–	+	+
60.0-3-2	–	–	180	27	480	73	–	+	–	–	–	–	+	+
60.0-5-1	–	–	–	–	–	100	+	–	+	–	–	–	+	+
60.0-5-3	–	–	–	–	–	100	–	–	+	–	–	–	–	+
60.0-6-2	–	–	60	37	100	63	–	–	–	–	–	–	+	+
60.0-6-4	–	–	–	–	–	100	–	–	+	–	–	–	+	+
60.0-6-6	–	–	–	–	–	100	–	–	+	–	–	–	+	+
60.0-7-1	–	–	–	–	–	100	–	–	+	–	–	–	+	+
60.0-8-1	–	–	–	–	–	100	–	–	+	–	–	–	+	+
60.0-8-3	–	–	–	–	–	100	–	–	+	–	–	–	+	+

TABLE 7
Results of Partial Silicate Analysis

Sample Designation	SiO_2 (%)	SiO_2/Al_2O_3	Al_2O_3 (%)	Al_2O_3/TiO_2	CaO (%)	MgO (%)	CaO/MgO	MnO (%)	TiO_2 (%)	Fe_2O_3/TiO_2	Fe_2O_3 (%)
44.0-1-3, 145	< 4.60		< 0.70		50.70	<0.66		<0.030	<0.15		< 1.90
44.0-1-1, 145	< 4.60		< 0.70		56.20	<0.66		<0.030	<0.15		< 1.90
44.0-1-2, 145	< 4.60		< 0.70		56.80	<0.66		<0.030	<0.15		< 1.90
44.0-1-3, 145	< 4.60		< 0.70		48.40	<0.66		<0.030	<0.15		< 1.90
44.0-1-3, All slops	< 4.60		< 0.70		51.90	<0.66		<0.030	<0.15		< 1.90
44.0-1-4, 145	< 4.60		< 0.70		50.70	<0.66		<0.030	<0.15		< 1.90
44.0-2-CC	< 4.60		< 0.70		38.90	<0.66		<0.030	<0.15		< 1.90
44.0-2-1, 145	< 4.60		< 0.70		47.80	<0.66		<0.030	<0.15		< 1.90
44.0-2-2, 145	< 4.60		< 0.70		46.30	<0.66		0.030	<0.15		< 1.90
44.0-2-3, 145	< 4.60		< 0.70		50.20	<0.66		<0.030	<0.15		< 1.90
44.0-2-4, 145	< 4.60		< 0.70		47.30	<0.66		<0.030	<0.15		< 1.90
44.0-2-5, 145	< 4.60		< 0.70		46.30	<0.66		<0.030	<0.15		< 1.90
44.0-2-6, 145	< 4.60		< 0.70		47.90	<0.66		<0.030	<0.15		< 1.90
44.0-3-CC	12.70		< 0.70		43.60	<0.66		0.090	<0.15		< 0.190
44.0-3-2, 145	< 4.60		< 0.70		48.40	<0.66		0.031	<0.15		< 1.90
44.0-3-3, 145	< 4.60		< 0.70		51.80	<0.66		0.031	<0.15		< 1.90
44.0-3-4, 145	< 4.60		< 0.70		48.40	<0.66		0.037	<0.15		< 1.90
44.0-3-5, 145	10.20		< 0.70		45.20	<0.66		0.040	<0.15		< 1.90
44.0-4-0, Top	>93.50		2.82		0.88	<0.66		<0.030	<0.15		< 1.90
44.0-4-2, 145	< 4.60		< 0.70		51.90	<0.66		0.038	<0.15		< 1.90
44.0-4-3, 145	< 4.60		< 0.70		56.20	<0.66		0.035	<0.15		< 1.90
44.0-4-4, 145	< 4.60		< 0.70		55.00	<0.66		0.033	<0.15		< 1.90
44.0-4-5, 145	< 4.60		< 0.70		47.30	<0.66		0.049	<0.15		< 1.90
44.0-4-6, 145	< 4.60		< 0.70		59.60	<0.66		0.044	<0.15		< 1.90
44.0-4-CC	< 4.60		< 0.70		58.90	<0.66		0.038	<0.15		< 1.90
44.0-5-0, Total	11.20		< 0.70		50.70	<0.66		0.040	<0.15		3.59
44.1-1-CC	38.80	3.13	12.40	12.16	3.80	5.69	0.67	>0.210	1.02	8.33	8.50
45.1-1-1, 7	42.60	3.16	13.50	10.47	2.82	2.95	0.96	>0.210	1.29	7.16	9.23
45.1-1-1, 70	48.40	3.81	12.70	7.05	1.78	1.20	1.48	>0.210	1.80	5.83	10.50
45.1-1-1, 145	38.80	3.23	12.00	5.7	3.27	3.20	1.02	>0.210	2.10		>10.00
45.1-1-2, 100	41.70	3.02	13.80	7.93	2.75	3.47	0.79	>0.210	1.74		>10.00
45.1-1-2, 124	44.60	3.81	11.70		6.31	3.77	1.67	0.210	>2.25		>10.00
45.1-1-3, 23	43.60	3.73	11.70		5.90	5.25	1.12	0.150	>2.25		>10.00
45.1-1-4, 22	40.80	4.08	10.00		6.92	5.25	1.32	0.170	>2.25		>10.00
45.1-1-4, 136	34.30	3.69	9.30	4.45	14.80	5.25	2.82	0.140	2.09	4.41	9.20
45.1-1-5, 4	42.20	2.37	17.80	8.9	11.00	6.60	1.67	>0.210	2.00	5.00	10.00
45.1-3-CC	70.80	14.45	4.90	14.	0.91	1.51	0.60	0.210	0.35	6.34	2.22
45.1-3-CC	91.00	12.18	4.47	17.19	< 0.88	1.10		0.120	0.26	8.23	2.14
45.1-3-CC	72.50	29.47	2.46		6.03	0.72	8.38	<0.030	<0.15		< 1.90
46.0-	91.20		< 0.70		< 0.88	<0.66		<0.030	<0.15		< 1.90
46.0-1-6	79.40	33.79	2.35		< 0.88	<0.66		<0.030	<0.15		< 1.90
46.0-1-6	89.10		< 0.70		< 0.88	<0.66		<0.030	<0.15		< 1.90
46.0-1-1, 145	50.70	3.43	14.80		2.10	3.98	0.60	>0.210	0.62	23.87	6.46
46.0-1-2, 145	49.60	3.35	14.80		< 0.88	3.35		>0.210	0.77	19.22	6.84
46.0-1-3, 145	45.70	3.69	12.40		0.88	3.63	0.24	>0.210	0.65	19.80	5.43
46.0-1-4, 145	43.60	3.55	12.30		4.63	2.92	1.59	>0.210	0.76	16.18	6.61

TABLE 7 – *Continued*

Sample Designation	SiO_2 (%)	SiO_2/Al_2O_3	Al_2O_3 (%)	Al_2O_3/TiO_2	CaO (%)	MgO (%)	CaO/MgO	MnO (%)	TiO_2 (%)	Fe_2O_3/TiO_2	Fe_2O_3 (%)
46.0-1-5, 145	54.30	6.02	9.02		< 0.88	2.57		>0.210	0.60	15.30	5.19
46.0-1-6, 145	47.30	3.97	11.90	22.88	1.62	3.17	0.50	>0.210	0.52	11.35	5.90
46.1-2-CC	66.10	14.79	4.47	12.08	4.47	1.30	3.28	0.240	0.37	6.00	2.22
47.0-1-1, 17	21.40	3.47	6.16	16.65	32.30	1.05	30.76	0.040	0.37	7.43	2.75
47.0-1-2, 5	25.70	3.62	7.09	3.55	24.80	1.82	13.63	0.060	2.00	1.84	3.68
47.0-1-2, 16	19.00	2.44	7.78	21.60	25.20	1.93	13.06	0.047	0.36	7.22	2.80
47.0-1-3, 16	19.00		7.78		25.20	1.93		0.047	0.36		2.60
47.0-1-4, 90	20.90	3.63	5.76	16.94	31.60	0.93	33.98	0.035	0.34	7.74	2.63
47.0-1-4, 95	23.20	3.51	6.61	28.76	32.30	1.45	22.28	0.040	0.23	8.48	1.95
47.0-1-5, 3.5	11.60	3.02	3.84	1.84	29.50	1.10	26.81	0.046	2.09	0.90	< 1.90
47.0-1-6, 14	12.30	3.47	3.54	14.75	45.70	<0.66		0.042	0.24	8.13	1.95
47.1-1, Top	< 7.60		< 0.70		51.90	<0.66		0.080	<0.15		< 1.90
47.1-1-, 145	< 7.60		< 0.70		35.50	0.08		<0.660	<0.15		< 1.90
47.1-1-2, 16	< 4.60		< 0.70		44.60	<0.66		0.058	<0.15		< 1.90
47.1-3-1, 17	< 4.60		< 7.00		44.70	0.89		0.090	0.15		< 1.90
47.2-1-2, 23	14.80	3.47	4.26	14.69	39.80	0.66		0.051	0.29	7.90	2.29
47.2-1-2, 181	12.20	2.74	4.26	1.35	43.10	1.11	38.83	0.050	0.33	0.69	2.29
47.2-1-3, 11	13.50	1.76	7.68	27.43	33.90	0.94	36.06	0.058	0.28	7.82	2.19
47.2-1-3, 90	8.51	2.34	3.63	16.50	45.20	<0.66		0.047	0.23		< 1.90
47.2-1-4, 7	10.00	3.72	2.69		46.80	0.85	55.06	0.049	<0.15		< 1.90
47.2-2-2, 8	12.60	3.20	3.94	15.76	42.60	0.90	47.33	0.043	0.25	8.36	2.09
47.2-2-2, 47	16.60	4.46	3.72	12.00	42.20	1.51	27.95	0.056	0.31	7.23	2.24?
47.2-2-3, 7	< 4.60		0.98		52.60	0.60	87.67	0.100	<0.15		< 1.90
47.2-2-4, 7	10.00	4.46	2.24	9.74	38.40	<0.66		0.038	0.23		< 1.90
47.2-2-5, 5	< 4.60		0.83		47.80	0.66	72.42	0.069	<0.15		< 1.90
47.2-2-6, 6	4.57	3.81	1.20		46.20	<0.66		0.076	<1.90		< 0.15
47.2-3-2, 6.5	7.15	4.02	1.78		35.90	0.87	41.26	0.036	<0.15		1.90
47.2-3-3, 6	5.25	4.02	0.70		50.00	<0.66		0.035	<0.15		< 1.90
47.2-3-4, 16	< 4.60		< 0.70		40.40	0.63	64.12	0.090	<0.15		< 1.90
47.2-3-CC	< 4.60		< 0.70		50.50	<0.66		0.062	<0.15		< 1.90
47.2-4-CC	< 4.60		< 0.70		41.70	0.89		0.091	<0.07		< 1.90
47.2-4-1, 16	< 4.60		< 0.70		49.00	<0.66		0.061	<0.15		< 1.90
47.2-4-2, 17	< 4.60		< 0.70		51.40	<0.66		0.061	<0.15		< 1.90
47.2-4-3, 16	< 4.60		< 0.70		47.30	<0.66		0.078	<0.15		< 1.90
47.2-4-4, 16.5	< 4.60		< 0.70		37.20	0.57	65.26	0.046	<0.15		< 1.90
47.2-4-5, 16.5	< 4.60		< 0.70		53.60	<0.66		0.055	<0.15		< 1.90
47.2-4-6, 17	< 4.60		< 0.70		50.60	<0.66		0.097	<0.15		< 1.90
47.2-5-1, 17	< 4.60		< 0.70		50.00	<0.66		0.076	<0.15		< 1.90
47.2-5-2, 6	< 4.60		< 0.70		49.50	<0.66		0.082	<0.15		< 1.90
47.2-5-3, 6	< 4.60		< 0.70		48.40	<0.66		0.074	<0.15		< 1.90
47.2-5-4, 6	< 4.60		1.00		38.90	0.60	64.83	0.068	<0.15		< 1.90
47.2-5-5, 6	< 4.60		< 0.70		43.20	<0.66		0.071	<0.15		< 1.90
47.2-5-6, 6.5	< 4.60		< 0.70		41.60	0.56	74.29	0.078	<0.15		< 1.90
47.2-6-2, 6	< 4.60		< 0.70		51.30	<0.66		0.091	<0.15		< 1.90
47.2-6-3, 17	< 4.60		< 0.70		49.50	<0.66		0.090	<0.15		< 1.90
47.2-7-1, 17	< 4.60		< 0.70		49.00	<0.66		0.148	<0.15		< 1.90
47.2-7-2, 17	< 4.60		< 0.70		45.20	<0.66		0.054	<0.15		< 1.90
47.2-7-3, 13	< 4.60		< 0.70		52.50	<0.66		0.085	<0.15		< 1.90

TABLE 7 – *Continued*

Sample Designation	SiO_2 (%)	SiO_2/Al_2O_3	Al_2O_3 (%)	Al_2O_3/TiO_2	CaO (%)	MgO (%)	CaO/MgO	MnO (%)	TiO_2 (%)	Fe_2O_3/TiO_2	Fe_2O_3 (%)
47.2-7-4, 17	< 4.60		< 0.70		55.00	<0.66		0.057	<0.15		< 1.90
47.2-7-5, 27.5	< 4.60		< 0.70		58.80	<0.66		0.042	0.15		< 1.90
47.2-7-6, 126	< 4.60		< 0.70		49.00	<0.66		0.066	<0.15		< 1.90
47.2-8-1, 27	< 4.60		< 0.70		56.20	<0.66		0.037	<0.15		< 1.90
47.2-8-2, 17	< 8.60		< 0.70		48.40	<0.66		0.047	<0.15		< 1.90
47.2-8-3, 18	< 4.60		< 0.70		56.20	<0.66		0.037	<0.15		< 1.90
47.1-8-4, 17	< 4.60		< 0.70		46.30	<0.66		0.032	<0.15		< 1.90
47.2-8-5, 17	< 4.60		< 0.70		47.80	<0.66		<0.030	<0.15		< 1.90
47.2-8-6, 16	< 4.60		< 0.70		52.50	<0.66		0.029	<0.15		< 1.90
47.2-8-6-CC	< 4.60		< 0.70		59.00	<0.66	0.10	0.046	<0.15		< 1.90
47.2-9-1, 16	< 4.60		< 0.70		55.60	<0.66		0.036	<0.15		< 1.90
47.2-9-1, 150	< 4.60		< 0.70		45.60	<0.66		0.070	<0.15		< 1.90
47.2-9-2, 17	< 4.60		< 0.70		47.30	<0.66		0.050	<0.15		< 1.90
47.2-9-3, 17	< 4.60		< 0.70		56.20	<0.66		0.056	<0.15		< 1.90
47.2-9-4, 0	< 4.60		< 0.70		43.60	<0.66		0.040	<0.15		< 1.90
47.2-9-5, 17	< 4.60		< 0.70		>60.00	<0.66		0.047	<0.15		< 1.90
47.2-9-5, 150	< 4.60		< 0.70		42.60	<0.66		0.050	<0.15		< 1.90
47.2-9-6, 0	< 4.60		< 0.70		50.20	<0.66		0.051	<0.15		< 1.90
47.2-9-CC	< 4.60		< 0.70		40.80	<0.66		0.120	<0.15		< 1.90
47.2-10-1, 17	< 4.60		< 0.70		49.00	<0.66		0.032	<0.15		< 1.90
47.2-10-2, 17	< 4.60		< 0.70		49.00	<0.66		0.030	<0.15		< 1.90
47.2-10-3, 18	< 4.60		< 0.70		50.20	<0.66		0.036	<0.15		< 1.90
47.2-10-4, 17	< 4.60		< 0.70		55.60	<0.66		0.100	<0.15		< 1.90
47.2-10-5, 17	< 4.60		< 0.70		>60.00	<0.66		0.100	<0.15		< 1.90
47.2-10-6, 16	< 4.60		< 0.70		52.50	<0.66		0.045	<0.15		< 1.90
47.2-10-CC	< 4.60		< 0.70		37.10	<0.66		0.060	<0.15		< 1.90
47.2-10, Top	< 4.60		< 0.70		51.30	<0.66		0.004	<0.15		< 1.90
47.2-11-1, 145	< 4.60		< 0.70		46.80	<0.66		0.023	<0.15		< 1.90
47.2-11-2, 145	< 4.60		< 0.70		57.60	<0.66		<0.030	<0.15		< 1.90
47.2-11-3, 145	< 4.60		< 0.70		50.00	<0.66		<0.030	<0.15		< 1.90
47.2-11-4, 145	< 4.60		< 0.70		47.30	<0.66		<0.030	<0.15		< 1.90
47.2-11-5, 145	< 4.60		< 0.70		57.60	<0.66		0.028	<0.15		< 1.90
47.2-11-6, 145	< 4.60		< 0.70		38.00	<0.66		<0.030	<0.15		< 1.90
47.2-11-CC	< 4.60		< 0.70		57.60	<0.66		<0.030	<0.15		< 1.90
47.2-12-1, 145	< 4.60		< 0.70		53.70	<0.66		<0.030	<0.15		< 1.90
47.2-12-2, 17	< 4.60		< 0.70		<51.30	<0.66		<0.030	<0.15		< 1.90
47.2-12-3, 145	< 4.60		< 0.70		46.90	<0.66		<0.030	<0.15		< 1.90
47.2-12-4, 145	< 4.60		< 0.70		59.00	<0.66		<0.030	<0.15		< 1.90
47.2-12-CC	< 4.60		< 0.70		56.30	<0.66		<0.030	<0.15		< 1.90
47.2-13-1, 145	< 4.60		< 0.70		57.60	<0.66		<0.030	<0.15		< 1.90
47.2-13-2, 145	< 4.60		< 0.70		52.50	<0.66		<0.030	<0.15		< 1.90
47.2-13-3, 16	< 4.60		< 0.70		45.20	<0.66		<0.030	<0.15		< 1.90
47.2-13-4, 145	< 4.60		< 0.70		57.60	<0.66		0.027	<0.15		< 1.90
47.2-13-5, 145	< 4.60		< 0.70		49.60	<0.66		<0.030	<0.15		< 1.90
47.2-13-6, 145	< 4.60		< 0.70		54.30	<0.66		<0.030	<0.15		< 1.90
47.2-13-CC	< 4.60		< 0.70		46.80	<0.66		<0.040	<0.15		< 1.90
47.2-14-1, 145	< 4.60		< 0.70		55.00	<0.66		<0.039	<0.15		< 1.90
47.2-14-2, 145	< 4.60		< 0.70		49.00	<0.66		<0.030	<0.15		< 1.90
47.2-14-3, 145	< 4.60		< 0.70		52.50	<0.66		<0.030	<0.15		< 1.90

TABLE 7 – *Continued*

Sample Designation	SiO_2 (%)	SiO_2/ Al_2O_3	Al_2O_3 (%)	Al_2O_3/ TiO_2	CaO (%)	MgO (%)	CaO/MgO	MnO (%)	TiO_2 (%)	Fe_2O_3/ TiO_2	Fe_2O_3 (%)
47.2-14-4, 145	< 4.60		< 0.70		>60.00	<0.66		<0.030	<0.15		< 1.90
47.2-14-5, 145	< 4.60		< 0.70		50.60	<0.66		<0.030	<0.15		< 1.90
47.2-14-6, 145	< 4.60		< 0.70		57.60	<0.66		<0.030	<0.15		< 1.90
47.2-14-CC	< 4.60		< 0.70		56.30	<0.66		<0.030	<0.15		< 1.90
48.1-1-1, 26	10.10	0.78	3.23	19.00	50.50	0.98	51.53	0.170	0.17	10.47	1.78
48.2-1-CC	< 4.60		< 0.70		55.00	<0.66		0.035	<0.15		< 1.90
48.2-1-1, 28	< 4.60		< 0.70		45.60	<0.66		0.090	<0.15		< 1.90
48.2-1-2, 33	< 4.60		< 0.70		49.50	<0.66		0.076	<0.15		< 1.90
48.2-1-3, 16	< 4.60		< 0.70		42.60	0.65	65.54	0.076	<0.15		< 1.90
48.2-1-4, 16	< 4.60		< 0.70		44.70	<0.66		0.058	<0.15		< 1.90
48.2-1-5, 14.5	< 4.60		< 0.70		45.20	<0.60	75.33	0.083	<0.15		< 1.90
48.2-1-6, 11	< 4.60		< 0.70		53.60	<0.66		<0.030	<0.15		< 1.90
48.2-2-1, 145	< 4.60		< 0.70		44.20	<0.66		<0.030	<0.15		< 1.90
48.2-2-2, 17	< 4.60		< 0.70		>60.00	<0.66		<0.030	<0.15		< 1.90
48.2-2-3, 145	< 4.60		< 0.70		57.60	<0.66		<0.030	<0.15		< 1.90
48.2-2-4, 18	< 4.60		< 0.70		57.60	<0.66		<0.030	<0.15		< 1.90
48.2-2-5, 16	< 4.60		< 0.70		55.00	<0.66		<0.030	<0.15		< 1.90
48.2-2-6, 16	< 4.60		< 0.70		>60.00	<0.66		<0.030	<0.15		< 1.90
48.2-2-CC	< 4.60		< 0.70		57.60	<0.66		<0.030	<0.15		< 1.90
48.2-3-1, 117	< 4.60		< 0.70		51.30	<0.66		<0.030	<0.15		< 1.90
48.2-3-2, 18	< 4.60		< 0.70		34.70	<0.66		<0.030	<0.15		< 1.90
48.2-3-3, 17	< 4.60		< 0.70		47.80	<0.66		<0.030	<0.15		< 1.90
48.2-3-4, 17	< 4.60		< 0.70		>60.00	<0.66		<0.030	<0.15		< 1.90
48.2-3-5, 16	< 4.60		< 0.70		56.20	<0.66		<0.030	<0.15		< 1.90
49.0-1-1, 11-13	42.30		13.95		2.79	3.09		>0.210	0.59		5.75
49.0-1-1, 76	29.50	3.31	8.90	19.78	21.40	2.16	9.91	0.050	0.45	8.84	3.98
49.0-1-2, 16-18	48.50		12.89		6.24	2.29		>0.210	0.38		4.26
49.0-1-3, 16	52.50	3.32	15.80	24.31	1.97	3.80	0.52	>0.210	0.65	8.95	5.82
49.0-1-4, 6-8	49.50		13.95		2.02	3.20		>0.210	0.57		6.16
49.0-1-5, 7	55.60	3.35	16.60	25.94	1.95	3.39	0.58	>0.210	0.64	9.17	5.87
49.0-1-5, 70-72	46.30		13.80		1.57	3.20		>0.210	0.72		6.10
49.0-1-5, 130	83.20	50.12	1.66		< 0.88	<0.66		<0.030	<0.15		< 1.90
49.0-1-6, 7	52.50	3.28	16.00	19.51	2.14	3.35	0.64	>0.210	0.82	7.44	6.10
49.0-2-1, 70-71	< 4.60		< 0.70		38.20	<0.66		<0.030	<0.15		< 1.90
49.1-1-1, 77-79	46.80		14.62		7.50	3.06		>0.210	0.54		4.67
49.1-1-2, 16	45.70	3.31	13.80	20.91	1.95	3.17	0.62	>0.210	0.66	8.42	5.56
49.1-1-2, 124-126	41.70		12.60		5.36	2.24		>0.210	0.40		4.77
49.1-1-3, 22	44.20	3.51	12.60	19.09	6.92	2.54	2.54	>0.210	0.66	8.73	5.76
49.1-1-4, 17-19	44.10		13.80		9.45	3.80		>0.210	0.89		6.76
49.1-1-4, 117	16.60	0.54	30.50	145.24	31.60	1.59	19.87	>0.210	0.21	12.10	2.54
49.1-1-5, 38-40	< 4.60		< 0.70		>60.00	<0.66		0.040	<0.15		< 1.90
49.1-1-5, 60	13.60	2.85	15.30	21.55	3.99	3.46	1.15	>0.210	0.71	8.51	6.04
49.1-2-CC	77.60	34.64	2.24		< 0.88	<0.66		<0.030	<0.15		< 1.90
49.1-2-1, 145	< 4.60		< 0.70		48.00	<0.66		0.180	<0.15		< 1.90
49.1-2-2, 145-150	< 4.60		< 0.70		69.50	<0.66		0.033	<0.15		< 1.80
49.1-2-3, 145	< 4.60		< 0.70		41.30	0.92		0.032	0.21		1.97
50.0-2-CC	93.40	35.50	2.63		< 0.88	<0.66		<0.030	<0.15		< 1.90
50.0-2-1, 145	9.33		< 0.07		45.20	0.60	75.33	0.120	<0.15		< 1.90

TABLE 7 – *Continued*

Sample Designation	SiO_2 (%)	SiO_2/Al_2O_3	Al_2O_3 (%)	Al_2O_3/TiO_2	CaO (%)	MgO (%)	CaO/MgO	MnO (%)	TiO_2 (%)	Fe_2O_3/TiO_2	Fe_2O_3 (%)
50.0-2-2, 150	9.55		0.70		37.20	0.14		<0.660	<0.15		< 1.90
50.0-2-3, 150	54.30	2.89	18.80	23.80	5.68	2.57	2.28	>0.210	0.79	10.29	8.12
50.0-2-4, 150	23.20		< 0.70		41.70	<0.66		0.150	<0.15		< 1.90
50.0-2-6, 150	45.40		< 0.70		26.90	<0.14		<0.660	<0.15		< 1.90
50.1-1-1, 62-64	51.30		13.95		7.59	2.69		>0.210	0.54		5.75
50.1-1-2, 15-17	57.50		15.50		1.80	2.39		>0.210	0.60		5.96
50.1-1-3,7	46.80	4.84	9.66	23.00	13.50	2.40	5.63	0.270	0.42	10.62	4.46
50.1-1-4, 17-19	49.50		14.45		10.80	3.02		0.195	0.65		5.62
50.1-1-5, 15	36.30	3.85	9.44	23.60	18.20	2.32	7.84	0.190	0.40	9.95	3.98
50.1-1-6, 16	42.60	3.09	13.80	21.23	9.10	1.86	4.89	>0.210	0.65	8.08	5.25
50.1-2-1, 130	40.30	3.91	10.30	21.46	12.30	2.57	4.79	0.270	0.48	9.21	4.42
50.1-2-3, 4-6	56.30		16.00		2.16	3.09		>0.210	0.71		7.00
50.1-2-3, 35	58.80	3.84	15.30	30.60	2.40	3.24	0.74	>0.210	0.50	11.06	5.53
50.1-2-4, 12-14	51.30		15.66		1.35	3.54		>0.210	0.56		6.84
50.1-2-4, 50	47.90	3.17	15.10	20.41	1.41	3.47	0.41	>0.210	0.74	8.93	6.61
50.1-2-5, 8	58.20	3.68	15.80	21.94	1.20	3.63	0.33	>0.210	0.72	8.88	6.39
50.1-3-1, 145	44.10	2.26	19.50	24.68	1.15	3.39	0.34	>0.210	0.79	8.96	6.92
50.1-3-3, 15	53.00	3.63	14.60	25.17	1.20	3.09	0.39	>0.210	0.58	9.14	5.30
50.1-3-4, 16	49.50		15.10		1.32	3.63		>0.210	0.73		5.55
50.1-3-5, 28	47.30	3.19	14.80	20.29	1.64	3.24	0.51	>0.210	0.73	8.55	6.24
50.1-3-6, 16	48.40		15.30		1.48	3.72		>0.210	0.53		5.37
50.1-4-1,75	50.00		16.20		2.19	3.17		>0.210	0.74		3.89
51.0-1-CC	51.30	3.02	17.00	33.33	1.10	3.72	0.30	>0.210	0.51	13.90	7.09
51.0-1-1, 11	49.00	3.06	16.00	21.05	1.86	2.95	0.63	>0.210	0.76	10.21	7.76
51.0-1-2, 8-10	52.40	17.00	17.00		1.10	3.35		>0.210	0.72		7.40
51.0-1-3, 6	51.30	3.02	17.00	27.42	1.12	3.13	0.36	>0.210	0.62	10.06	6.27
51.0-1-4, 6-8	50.70		19.00		1.29	3.42		>0.210	0.62		7.58
51.0-1-5, 15	45.60	3.02	15.10	21.88	1.76	2.62	0.69	>0.210	0.69	10.28	7.09
51.0-1-6, 16-18	48.40		17.20		1.55	3.23		>0.210	0.84		7.67
51.0-2-CC	46.70	2.94	15.90	20.13	1.23	3.47	0.35	>0.210	0.79	10.04	7.93
51.1-1-1, 15	40.70	3.45	11.80	15.13	1.48	2.66	0.56	>0.210	0.78	8.90	7.00
51.1-1-1, 145	61.00	3.63	16.80	32.94	1.48	3.31	0.48	>0.210	0.51	9.32	4.78
51.1-1-2, 16	56.30		15.10		2.48	3.05		0.150	0.60		5.76
51.1-1-3, 30	65.30	4.27	15.30	27.32	2.04	2.79	0.73	0.180	0.56	10.75	6.02
51.1-1-4, 16	57.50		15.80		1.40	3.31		>0.210	0.68		5.63
51.1-1-4, 30	53.60	3.12	17.20	28.69	1.41	3.02	0.49	0.190	0.60	10.28	6.17
51.1-1-5, 16	59.60	3.90	15.30	31.88	2.40	1.97	1.22	0.110	0.48	9.88	4.74
51.1-1-6, 16	58.20		15.50		1.12	3.24		0.210	0.56		5.37
51.1-2-1, 127	42.60	3.09	13.80	19.40	1.45	2.75	0.53	>0.210	0.81	8.54	6.92
51.1-2-2, 8	50.00		17.00		1.10	3.17		>0.210	0.82		6.17
52.0-1-1, 27	51.30	3.31	15.50	22.80	1.82	3.39	0.54	>0.210	0.68	9.41	6.60
52.0-1-2, 8	57.50		16.20		1.74	3.20		>0.210	0.66		5.89
52.0-1-2, 30	50.60	3.26	15.50	24.60	1.51	3.35	0.45	>0.210	0.63	10.34	6.53
52.0-1-3, 8	55.60	3.81	14.60	26.55	2.22	3.02	0.74	>0.210	0.55	10.00	5.55
52.0-1-4, 8	55.00		15.80		1.41	3.43		>0.210	0.78		6.31
52.0-1-5, 10	43.70	3.01	14.50	18.13	2.13	3.31	0.65	>0.210	0.80	8.65	6.92
52.0-1-6, 9	49.50		1.62		1.40	3.59		>0.210	0.74		6.40
52.0-2-CC	49.50	24.90	19.90	26.18	1.62	3.27	0.50	>0.210	0.76	10.22	7.77

TABLE 7 – *Continued*

Sample Designation	SiO_2 (%)	SiO_2/Al_2O_3	Al_2O_3 (%)	Al_2O_3/TiO_2	CaO (%)	Mgo (%)	CaO/MgO	MnO (%)	TiO_2 (%)	Fe_2O_3/TiO_2	Fe_2O_3 (%)
52.0-2-2, 7	57.60	3.79	15.20	27.14	2.14	3.13	0.68	>0.210	0.56	10.64	5.96
52.0-2-3, 7	56.30		17.00		1.70	3.79		>0.210	1.02		7.67
52.0-2-4, 8	46.70	3.22	14.50	22.31	2.51	3.35	0.75	>0.210	0.65	10.89	7.09
52.0-2-5, 18	49.00		16.20		1.70	3.55		>0.210	0.79		6.31
52.0-2-6, 145	51.80	2.43	19.00	25.00	1.45	3.47	0.42	>0.210	0.76	9.53	7.24
52.0-3-1, 16	56.30		19.10		1.41	4.13		>0.210	0.85		7.25
52.0-3-2, 19	45.60	3.21	14.20	20.88	2.09	3.02	0.69	>0.210	0.68	9.29	6.32
52.0-3-3, 16	56.30		15.90		1.00	4.67		>0.210	0.55		5.37
52.0-3-4, 16	56.30	3.06	18.40	36.08	1.35	4.13	0.33	>0.210	0.51	11.50	5.88
52.0-3-5, 7	51.30		16.60		1.62	3.55		>0.210	0.80		6.60
52.0-3-6,6	53.60	2.82	19.00	25.00	1.88	3.84	0.49	>0.210	0.76	8.40	6.61
52.0-4-2, 7	56.30		18.60		1.48	4.26		>0.210	0.76		7.07
52.0-4-3, 5	55.00	3.59	15.30	30.60	2.29	3.20	0.72	>0.210	0.50	11.50	5.75
52.0-4-4, 6	51.30		16.40		1.82	4.17		>0.210	0.62		6.17
52.0-4-5, 6	53.20	3.28	16.20	23.48	1.48	3.67	0.40	0.157	0.69	12.06	8.32
52.0-4-6, 18	52.40		16.60		1.78	3.80		>0.210	0.54		6.13
52.0-4-6, 128	53.80		17.00		1.40	3.84		>0.210	0.76		8.40
52.0-5-1, 127	47.80		18.60		1.12	3.63		>0.210	0.82		6.76
52.0-5-2, 10	52.50	3.32	15.80	35.11	2.48	3.47	0.71	>0.210	0.45	14.67	6.60
52.0-5-2, 17	50.60		17.60		1.32	3.55		>0.210	1.00		7.67
52.0-5-3, 15	49.00	2.63	18.60	22.41	1.86	3.55	0.52	0.210	0.83	10.02	8.32
52.0-5-3, 18	51.30		17.80		1.51	3.89		>0.210	0.70		6.76
52.0-5-4, 18	41.70	2.51	16.60	20.00	1.52	3.72	0.41	>0.210	0.83	9.57	7.94
52.0-5-5, 18	46.70		17.80		1.12	3.63		>0.210	0.93		7.25
52.0-6-CC	51.90	2.92	17.80	28.25	1.02	3.63	0.28	>0.210	0.63	12.62	7.95
52.0-6-1, 24	55.60	2.85	19.50	22.41	1.35	3.55	0.42	>0.210	0.87	9.11	7.93
52.0-7-2, 37-39	45.70		16.00		2.16	2.95		>0.210	0.48		6.52
52.0-7-CC	79.40	35.13	2.26		1.26	1.00	1.26	>0.210	<0.15		<1.90
52.0-8-1, 145	63.00	6.53	9.65	30.16	2.14	2.92	0.73	>0.210	0.32	12.75	4.08
52.0-8-2, 145-150	54.30		10.12		3.22	2.75		>0.210	0.52		5.19
52.0-8-3, 21	53.70	5.26	10.20	21.25	2.57	2.82	0.31	>0.210	0.48	10.46	5.02
52.0-8-3, 40	67.60	9.14	7.40	29.60	1.58	2.40	0.13	>0.210	0.25	13.56	3.39
52.0-8-5, 145-150	65.10		5.70		1.27	1.70		>0.210	0.32		3.55
52.0-8-6, 145	44.60	3.16	14.10	21.69	3.31	3.47	0.95	>0.210	0.65	8.85	5.70
52.0-9-CC	53.10	3.28	16.20	32.40	1.82	3.20	0.57	>0.210	0.50	11.36	5.68
52.0-10-CC	45.70	2.69	17.00	31.48	1.86	3.55	0.52	>0.210	0.54	12.22	6.60
53.0-1-1, 10-12	51.30		13.80		5.50	3.98		0.158	0.74		8.23
53.0-1-2, 144	52.50	4.04	13.00	22.03	4.46	2.46	1.81	0.130	0.59	10.08	5.95
53.0-1-3, 17-19	55.00		13.95		4.37	2.48		0.128	0.49		6.16
53.0-2-CC	50.60		13.80		4.85	3.88		0.170	0.87		8.70
53.0-2-CC	63.10		13.80		4.46	3.35		0.143	0.49		5.19
53.0-3-1, 17	46.80	33.91	1.38	1.92	4.16	0.14	0.98	4.260	0.72	10.31	7.42
53.0-4-2, 0	51.30	4.89	10.50		1.50	4.78	0.31	0.120	0.61		9.00
53.0-6-2, 65	5.90	2.95	2.00		45.60	1.12	40.71	>0.210	<0.15		2.34
53.0-6-2, 66-67	38.90		<0.70		46.70	1.20		0.176	<0.15		2.63
53.0-6-CC	15.30	5.43	2.82	16.59	35.10	4.46	7.87	0.210	0.17	12.29	2.09
53.0-7-1, 150	38.40		15.12		18.00	3.94		0.100	0.94		2.48
53.0-8-CC	51.30	3.09	16.60	150.91	5.00	6.68	0.75	0.070	0.11	82.73	9.10

TABLE 7 – *Continued*

Sample Designation	SiO_2 (%)	SiO_2/Al_2O_3	Al_2O_3 (%)	Al_2O_3/TiO_2	CaO (%)	MgO (%)	CaO/MgO	MnO (%)	TiO_2 (%)	Fe_2O_3/SiO_2	Fe_2O_3 (%)
53.1-1-1, 7-9	44.30		14.30		3.85	3.02		>0.210	0.90		>10.00
53.1-1-2, 7	42.60	2.51	17.00	19.54	2.70	3.24	0.83	>0.210	0.87		>10.00
53.1-1-2, 70-72	39.50		13.80		3.67	2.98		>0.210	0.91		>10.00
53.1-1-3, 18	43.60	2.99	14.60	16.40	3.90	2.95	1.32	>0.210	0.89	6.18	5.50
53.1-1-4, 17-19	41.20		13.65		4.84	2.69		>0.210	0.92		>10.00
53.1-1-5, 18	44.60	2.88	15.50	24.22	3.55	3.02	1.18	>0.210	0.64	13.91	8.90
53.1-1-6, 28-30	46.80		15.15		2.57	3.23		>0.210	0.89		>10.00
53.1-2-1, 145	57.50	3.30	17.40	31.07	5.26	2.12	2.48	0.230	0.56	10.89	6.10
53.1-2-2, 145	54.40	3.51	15.50	39.74	6.30	2.19	2.88	0.210	0.39	12.17	5.02
53.1-2-3, 16-18	61.00		14.62		5.50	2.09		>0.210	0.52		5.62
53.1-2-3, 90	50.20	3.98	12.60	16.15	5.76	2.60	2.22	0.200	0.78	9.62	7.50
53.1-2-4, 10-12	50.70		15.15		6.46	2.66		>0.210	0.72		7.24
53.1-2-5, 7	55.60	3.52	15.80	17.36	6.03	2.40	2.51	>0.210	0.91		>10.00
53.1-2-6, 7-9	44.90		14.48		5.37	2.57		0.186	0.76		7.07
53.1-3-1, 150	47.90	2.81	17.00	21.25	8.22	3.20	2.56	>0.210	0.80	12.50	10.00
53.1-3-2, 16	43.60	3.49	12.50	14.04	5.90	2.42	2.44	>0.210	0.89	6.63	5.90
53.1-3-2, 40	53.00	2.95	18.00	27.69	5.50	2.95	1.86	>0.210	0.65	12.49	8.12
53.1-3-3, 23-25	50.00		12.60		7.76	2.43		0.166	0.63		7.50
53.1-3-4, 26	56.30	3.73	15.10	16.24	6.39	2.82	2.27	0.170	0.93	10.39	9.66
53.1-3-5, 23-25	48.40		12.45		8.32	2.82		0.182	0.88		8.14
53.2-1-1, 21-22	45.70		15.32		3.43	3.72		>0.210	0.94		>10.00
53.2-1-2, 16	49.00	3.71	13.20	19.70	7.78	2.14	3.64	>0.210	0.67	14.25	9.55
53.2-1-3, 22-24	45.70		14.80		9.45	2.95		>0.210	0.85		9.10
53.2-1-4, 7	42.70	3.09	13.80	17.04	8.91	2.45	3.64	0.186	0.81	11.23	9.10
53.2-1-5, 7-9	53.20		15.00		8.33	2.37		>0.210	0.73		8.11
53.2-1-6, 7	50.20		17.40		6.17	2.26		0.250	0.69		7.86
53.2-4-4, CC	50.00		12.89		3.71	1.52		>0.210	7.16		>10.00
53.2-5-5, CC	57.50		11.32		2.16	4.07		>0.210	1.00		7.00
54.0-1-1, 5	9.10		< 0.70		41.20	<0.66		0.130	<0.15		< 1.90
54.0-1-1, 74-76	55.00		14.95		6.46	2.11		0.151	0.52		6.60
54.01-2, 7	53.80	3.96	13.60	28.86	7.95	2.46	3.23	0.162	0.35	16.42	5.75
54.0-1-2, 20	53.00	3.84	13.80	21.56	7.50	2.69	2.79	0.180	0.64	9.97	6.38
54.0-1-2, 20	47.80	4.02	11.90	19.83	56.30	2.26	24.91	0.170	0.60	9.60	5.76
54.0-1-3, 35-37	61.00		14.62		7.25	2.88		0.148	0.55		6.85
54.0-2-1, 17	55.60	4.03	13.80	26.54	7.10	1.82	3.90	0.150	0.52	10.81	5.62
54.0-2-2, 23-25	59.50		12.30		10.20	2.51		0.141	0.46		6.24
54.0-2-4, 16	49.00	3.89	12.60	24.23	8.92	1.74	5.13	0.133	0.52	10.58	5.50
54.0-3-1, 140	48.40	3.67	13.20	24.44	11.40	1.45	7.86	0.140	0.54	7.37	3.98
54.0-4-1, 108-110	52.40		11.88		8.20	1.00		0.130	0.50		4.73
54.0-4-2, 14	55.60	4.41	12.62	27.39	9.76	1.55	6.30	0.170	0.46	10.65	4.90
54.0-6-1, 145	51.20	3.56	14.40	22.86	4.95	1.26	3.93	0.150	0.63	7.78	4.90
54.0-6-2, 16-18	52.40		13.50		4.85	1.33		0.133	0.55		5.50
54.0-6-3, 23	49.00	4.30	11.40	25.33	10.00	1.95	5.13	0.13	0.45	11.27	5.07
54.0-6-1, 16-18	62.40		15.12		5.50	2.75		0.151	0.46		5.88
54.0-6-4, 78	52.50	4.57	11.50	24.47	8.72	1.70	5.13	0.132	0.47	10.69	5.00
54.0-6-5, 17-19	50.70		12.60		5.95	7.86		0.138	0.47		5.24
54.0-7-2, 34-36	58.80		13.18		7.37	1.51		0.210	0.51		5.62
54.0-7-1, 138	55.60	9.31	12.90	26.88	5.25	1.70	3.09	>0.210	0.48	9.10	4.37

TABLE 7 – *Continued*

Sample Designation	SiO_2 (%)	SiO_2/Al_2O_3	Al_2O_3 (%)	Al_2O_3/TiO_2	CaO (%)	MgO (%)	CaO/MgO	MnO (%)	TiO_2 (%)	Fe_2O_3/TiO_2	Fe_2O_3 (%)
54.0-7-3, 16	56.20	4.68	12.00	21.82	3.98	1.20	3.32	0.190	0.55	9.55	5.25
54.0-9-1	18.60	2.37	7.83	16.70	30.90	3.55	8.70	0.102	0.47	10.09	4.74
55.0-1-1, 7-9	< 4.60		< 0.70		56.20	<0.66		0.063	<0.15		< 1.80
55.0-1-2, 7	< 4.60		< 0.70		43.70	<0.66		0.107	<0.15		< 1.90
55.0-1-2, 30	< 4.60		< 0.70		44.60	<0.66		0.110	<0.15		< 1.90
55.0-1-3, 7-9	< 4.60		< 0.70		49.00	<0.66		0.098	<0.15		< 1.90
55.0-1-4, 7	< 4.60		< 0.70		46.80	<0.66		0.091	<0.15		< 1.90
55.0-1-5, 7-9	< 4.60		< 0.70		50.70	<0.66		0.055	<0.15		< 1.90
55.0-1-6, 7	< 4.60		< 0.70		49.00	<0.66		0.065	<0.15		< 1.90
55.0-2-1, 7-9	< 4.60		< 0.70		45.80	<0.66		0.072	<0.15		< 1.90
55.0-2-2, 7	< 4.60		< 0.70		46.80	<0.66		<0.030	<0.15		< 1.90
55.0-2-4, 15	< 4.60		< 0.70		50.00	<0.66		0.035	<0.15		< 1.90
55.0-2-5, 7-9	< 4.60		< 0.70		52.40	<0.66		0.032	<0.15		< 1.90
55.0-2-5, 70	< 4.60		< 0.70		46.80	<0.66		<0.030	<0.15		< 1.90
55.0-2-6, 32-37	< 4.60		< 0.70		45.80	<0.66		<0.030	<0.15		< 1.90
55.0-3-1, 16	< 4.60		< 0.70		46.80	<0.66		<0.030	<0.15		< 1.90
55.0-3-3, 14-16	< 4.60		< 0.70		47.90	<0.66		0.030	<0.15		< 1.90
55.0-3-4, 145	< 4.60		< 0.70		54.40	<0.66		<0.030	<0.15		< 1.90
55.0-3-5, 15-17	< 4.60		< 0.70		44.60	<0.66		<0.030	<0.15		< 1.90
55.0-4-1, 13	< 4.60		< 0.70		46.80	<0.66		<0.030	<0.15		< 1.90
55.0-4-2, 145-150	< 4.60		< 0.70		47.90	<0.66		<0.030	<0.15		< 1.90
55.0-4-3, 7	< 4.60		< 0.70		50.00	<0.66		<0.030	<0.15		< 1.90
55.0-4-4, 145-150	< 4.60		< 0.70		56.20	<0.66		<0.030	<0.15		< 1.90
55.0-4-5, 7	< 4.60		< 0.70		40.70	<0.66		<0.030	<0.15		< 1.90
55.0-4-6, 145-150	< 4.60		< 0.70		53.10	<0.66		<0.030	<0.15		< 1.90
55.0-5-1, 7	< 4.60		< 0.70		47.80	<0.66		<0.030	<0.15		< 1.90
55.0-5-3, 10	< 4.60		< 0.70		53.70	<0.66		<0.030	<0.15		< 1.90
55.0-5-5, 7	< 4.60		< 0.70		51.30	<0.66		<0.030	<0.15		< 1.90
55.0-6-1, 7-9	< 4.60		< 0.70		52.40	0.82		0.053	<0.15		< 1.90
55.0-6-3, 17	< 4.60		< 0.70		45.70	<0.66		0.031	<0.15		< 1.90
55.0-6-5, 16-18	< 4.60		< 0.70		56.20	0.76		0.017	<0.15		< 1.90
55.0-7-1, 14	< 4.60		< 0.70		45.70	<0.66		<0.030	<0.15		< 1.90
55.0-7-3, 18-20	< 4.60		< 0.70		52.40	0.68		0.040	<0.15		< 1.90
55.0-7-5, 19	< 4.60		< 0.70		50.00	<0.66		<0.030	<0.15		< 1.90
55.0-8-3, 16	< 4.60		< 0.70		36.30	<0.66		<0.030	<0.15		< 1.90
55.0-8-5, 18-20	< 4.60		< 0.70		52.40	0.68		<0.036	<0.15		< 1.90
55.0-9	< 4.60		< 0.70		49.00	<0.66		0.038	<0.15		< 1.90
55.0-10-2, 10	9.11		< 0.70		44.20	<0.66		0.049	<0.15		< 1.90
55.0-10-3, 37-39	< 4.60		< 0.70		52.10	0.74		0.050	<0.15		< 1.90
55.0-10-5, 16	< 4.60		< 0.70		45.70	<0.66		<0.031	<0.15		< 1.90
55.0-11-1, 46-48	< 4.60		< 0.70		52.40	0.80		0.039	<0.15		< 1.90
55.0-11-3, 17	< 4.60		< 0.70		33.90	<0.66		0.038	<0.15		< 1.90
55.0-11-5, 7-9	< 4.60		< 0.70		46.70	0.70		0.034	<0.15		< 1.90
55.0-12-1, 13	< 4.60		< 0.70		50.00	<0.66		0.056	<0.15		< 1.90
55.0-12-3, 8	< 4.60		< 0.70		45.70	<0.66		0.072	<0.15		< 1.90
55.0-13-1, 7	< 4.60		< 0.70		47.80	<0.66		0.072	<0.15		< 1.90
55.0-13-3, 40	< 4.60		< 0.70		44.70	<0.66		<0.030	<0.15		< 1.90
55.0-13-5, 7	< 4.60		< 0.70		45.70	<0.66		<0.030	<0.15		< 1.90

TABLE 7 – *Continued*

Sample Designation	SiO_2 (%)	SiO_2/Al_2O_3	Al_2O_3 (%)	Al_2O_3/TiO_2	CaO (%)	MgO (%)	CaO/MgO	MnO (%)	TiO_2 (%)	Fe_2O_3/TiO_2	Fe_2O_3 (%)
55.0-14-2, 145	< 4.60		< 0.70		50.00	<0.66		0.062	<0.15		< 1.90
55.0-14-4, 145	< 4.60		< 0.70		36.80	<0.66		<0.030	<0.15		< 1.90
55.0-14-6, 145	< 4.60		< 0.70		47.80	<0.66		<0.030	<0.15		< 1.90
56.2-3-CC	16.70		13.95		1.13	5.00		>0.210	1.48		>10.00
56.2-3, Top of Core	53.60		11.49		3.58	4.90		>0.210	1.82		>10.00
56.2-1-2, 11-13	13.50		1.09		40.70	2.95		0.051	0.37		2.54
56.2-1-1, 23-29	< 4.60		< 0.70		51.80	<0.66		<0.030	<0.15		< 1.90
56.2-1-6, 7	< 4.60		< 0.70		51.40	<0.66		<0.030	<0.15		< 1.90
56.2-2-4, 36	< 4.60		< 0.70		49.00	<0.66		<0.030	<0.15		< 1.90
56.2-2-6, 16-18	< 4.60		< 0.70		47.30	<0.66		<0.030	<0.15		< 1.90
56.2-2-9, Top 90	< 4.60		< 0.70		53.60	<0.66		<0.030	<0.15		< 1.90
56.2-3-2, 145	< 4.60		< 0.70		45.60	<0.66		<0.030	<0.15		< 1.90
56.2-4-2, 10-11	< 4.60		< 0.70		42.60	<0.66		<0.030	<0.15		< 1.90
56.2-4-4, 14	< 4.60		< 0.70		44.60	<0.66		<0.030	<0.15		< 1.90
56.2-4-5, 13-15	< 4.60		< 0.70		49.00	<0.66		<0.030	<0.15		< 1.90
56.2-5-2, 13	< 4.60		< 0.70		52.50	<0.66		<0.030	<0.15		< 1.90
56.2-5-4, 21-23	< 4.60		< 0.70		>60.00	<0.66		<0.030	<0.15		< 1.90
56.2-5-6, 7	< 4.60		< 0.70		46.30	<0.66		0.071	<0.15		< 1.90
56.2-6-2, 7	< 4.60		< 0.70		44.60	<0.66		<0.030	<0.15		< 1.90
56.2-6-4, 7-9	< 4.60		< 0.70		25.40	<0.66		0.030	<0.15		< 1.90
56.2-6-6, 16-18	< 4.60		< 0.70		51.30	<0.66		0.031	<0.15		< 1.90
56.2-7-2, 43-45	< 4.60		< 0.70		49.50	<0.66		0.035	<0.15		< 1.90
56.2-7-4, 39-41	< 4.60		< 0.70		55.00	<0.66		<0.030	<0.15		< 1.90
56.2-7-6, 7	< 4.60		< 0.70		40.00	<0.66		<0.030	<0.15		< 1.90
56.2-8-2, 7-9	< 4.60		< 0.70		55.00	<0.66		<0.030	<0.15		< 1.90
56.2-8-4, 7	< 4.60		< 0.70		47.30	<0.66		0.068	<0.15		< 1.90
56.2-9-2, 7-9	< 4.60		< 0.70		47.80	<0.66		0.041	0.20		< 1.90
56.2-9-4, 19	< 4.60		< 0.70		49.00	<0.66		0.076	0.33		< 1.90
56.2-9-6, 8-10	< 4.60		< 0.70		>60.00	0.71		0.057	0.29		< 1.90
56.2-10-2, 10	< 4.60		< 0.70		46.80	<0.66		0.034	0.27		< 1.90
56.2-10-4, 19-21	< 5.62		< 0.70		44.60	0.79		0.052	0.35		< 1.90
56.2-10-6, 13	16.80	5.83	2.88	7.38	39.80	1.48	26.89	0.068	0.39	8.10	3.16
57.0 Basalt	49.60		15.70		10.90	5.69		0.180	2.63		12.50
57.0-1-1, Top 5	12.60		< 0.70		39.80	1.68		0.049	0.32		2.09
57.1-1-2, 0-4	< 4.60		< 0.70		>60.00	0.68		0.069	<0.15		< 1.90
57.1-1-2, 13	< 4.60		< 0.70		51.40	<0.66		<0.030	<0.15		< 1.90
57.1-1-3, 7-9	< 4.60		< 0.70		>60.00	<0.66		<0.030	<0.15		< 1.90
57.1-1-4, 7	< 4.60		< 0.70		46.80	<0.66		<0.030	<0.15		< 1.90
57.1-1-5, 7-9	< 4.60		< 0.70		>60.00	<0.66		<0.030	<0.15		< 1.90
57.1-1-6, 11	< 4.60		< 0.70		51.40	<0.66		<0.030	<0.15		< 1.90
57.1-2-1, 44-46	11.50		< 0.70		46.70	1.23		0.058	0.36		1.93
57.1-3-1, 22	< 4.60		< 0.70		47.80	2.69	69.28	0.085	0.23	7.39	< 1.90
57.1-3-2, 109-110	11.75		2.00		47.40	1.52		0.080	0.51		2.34
57.1-4-1, 86	12.30	10.79	1.14	2.78	34.00	2.46	13.82	0.095	0.41	8.07	3.31
57.1-4-2, 20-22	6.31		< 0.70		44.60	1.41		0.073	0.31		2.29
57.1-4-3, 14	6.62		< 0.70		45.60	0.85	53.65	0.120	0.29	7.03	2.04
57.1-4-4, 145	6.76		0.70		51.30	1.86	27.58	0.130	0.27	7.48	2.02
57.1-4-5, 145	25.70		4.27		36.30	4.26		0.071	0.88		6.80

TABLE 7 – *Continued*

Sample Designation	SiO_2 (%)	SiO_2/Al_2O_3	Al_2O_3 (%)	Al_2O_3/TiO_2	CaO (%)	MgO (%)	CaO/MgO	MnO (%)	TiO_2 (%)	Fe_2O_3/TiO_2	Fe_2O_3 (%)
57.2-1-1, 22-24	< 4.60		< 0.70		>60.00	<0.66		0.030	<0.15		< 1.90
58.1-1-1, 139	22.70	4.69	4.84	13.83	33.50	2.04	16.42	<0.030	0.35	9.89	3.46
58.1-1-2, 91	< 4.60		< 0.70		42.60	0.75	5.68	0.140	<0.15		< 1.90
58.1-1-3, 145-150	< 4.60		< 0.70		>60.00	3.20		<0.030	<0.15		< 1.90
58.2-1-2, 16	14.20	5.53	2.57	4.21	38.00	1.51	25.17	0.130	0.61	5.12	3.16
58.2-1-4, 31	28.80	4.26	6.76	6.76	25.70	3.32	7.74	0.100	1.00	6.10	6.10
58.2-1-5, 0	44.20		16.00		1.29	4.73		0.140	1.66		>10.00
58.2-1-5, 1	45.70	4.27	10.70	6.29	12.00	6.92	1.73	0.150	1.70		<10.00
58.2-1-5, 26-28	22.90		3.89		38.90	1.62		0.229	0.46		2.95
58.2-1-6, 95	50.60	3.97	12.75	9.81	6.10	2.40	2.54	0.180	1.66		10.00
58.2-1-8, 16-18	< 4.60		< 0.70		>60.00	<0.66		0.098	<0.15		< 1.90
58.9-1-5, 0-3	50.00		13.50		13.50	5.57		0.132	1.84		>10.00
59.1-3-CC	46.80	2.93	16.00	10.32	1.78	3.63	0.49	>0.210	1.55	6.58	10.20
59.1-3-1, 130	44.30	2.95	15.00	12.50	2.57	3.98	0.65	>0.210	1.20	7.08	8.50
59.1-3-3, 7	42.60	2.34	18.20	12.64	1.82	3.43	0.53	>0.210	1.44		10.00
59.1-3-3, 146-148	66.90		5.25		0.88	1.60		0.036	0.36		2.72
59.1-3-2, 11-13	49.50		15.30		2.95	3.68		>0.210	1.12		8.32
59.2-1-1, 47	45.70	3.91	11.70	5.63	3.93	5.38	0.73	>0.210	2.08		10.00
59.2-1-2, 4-6	45.70		10.70		4.07	4.57		>0.210	>2.25		>10.00
59.2-1-3, 4	47.80	4.27	11.20	6.02	5.50	5.00	1.10	>0.210	1.86	4.89	9.10
59.2-1-CC	49.50	4.42	11.20	5.33	3.51	3.98	0.88	>0.210	2.10	4.34	9.12
59.2-2-2, 145	49.50	4.95	10.00	5.75	4.27	5.75	0.74	>0.210	1.74	4.78	8.31
59.2-2-3, 7-9	43.60		10.48		5.76	4.17		>0.210	>2.25		>10.00
59.2-2-4, 4	46.70	5.07	9.22	3.84	4.57	4.36	1.05	>0.210	2.40	3.54	8.50
59.2-2-5, 35-37	46.30		10.00		3.89	3.80		>0.210	>2.25		>10.00
59.2-2-6, 16	49.50	6.11	8.10	4.35	4.36	4.90	0.85	>0.210	1.86	4.27	7.95
59.2-2-CC	50.60	4.96	10.20	63.75	4.48	5.00	0.90	>0.210	0.16	58.38	9.34
59.2-3, Top	50.00	4.07	12.30	5.62	3.51	4.26	0.82	>0.210	2.19		5.30
59.2-3-1, 145	40.40	4.34	9.30	5.05	5.01	3.23	1.55	>0.210	1.84	5.31	9.77
59.2-3-2, 145-150	44.30		12.30		4.68	3.98		>0.210	>2.25		>10.00
59.2-3-CC	50.00	3.62	13.80	10.22	2.98	4.13	0.72	>0.210	1.35	2.24	9.77
59.2-4-1, 66	42.60	3.20	13.30	7.73	4.62	4.32	1.07	>0.210	1.72	5.06	8.71
59.2-4-CC	45.70	2.86	16.00	8.42	3.85	3.85	1.00	>0.210	1.90		>10.50
59.2-5-1, 89	46.30	4.79	9.66	20.13	4.07	3.24	1.26	>0.210	0.48	9.31	4.47
59.2-5-CC	51.90	5.37	9.67	7.67	1.87	3.80	0.49	>0.210	1.26	4.73	5.96
59.2-6, Top	52.50	3.80	13.80	28.37	2.45	3.39	0.72	0.210	0.49	9.78	4.79
59.2-6, Top	42.60	3.77	11.30	9.58	9.34	4.95	1.89	0.140	1.18	8.29	9.78
59.2-6, Top	38.04	4.68	8.12	16.57	3.02	3.71	0.81	>0.210	0.49	7.41	3.63
59.2, 6	46.80		8.92		1.88	3.51		>0.210	0.71		>10.00
59.2-6-2, 0	42.20	4.67	9.04	6.55	5.07	3.63	1.40	>0.210	1.38	5.62	7.76
60.0-1-1, 7-9	30.20		8.92		22.62	2.66		0.059	0.46		5.62
60.0-1-2, 9	14.80	2.82	5.24	16.90	42.20	1.27	33.23	0.110	0.31	9.74	3.02
60.0-1-3, 10	17.00	3.24	5.24	18.07	36.70	0.83	44.22	0.130	0.29	9.28	2.69
60.0-1-CC	38.00	4.27	8.90	19.35	17.40	3.16	5.50	0.068	0.46	11.41	5.25
60.0-2-1, 87-89	28.50		8.82		26.15	1.50		0.133	0.35		3.24
60.0-2-2, 12	38.90	3.89	10.00	23.81	21.60	2.09	10.33	0.100	0.42	10.88	4.57
60.0-2-CC	48.90	3.76	13.00	20.63	7.59	1.74	4.36	0.150	0.63	8.73	5.50
60.0-3-1, 117	53.70	4.40	12.20	35.88	4.57	1.15	3.97	0.130	0.34	9.41	3.20

TABLE 7 – *Continued*

Sample Designation	SiO_2 (%)	SiO_2 / Al_2O_3	Al_2O_3 (%)	Al_2O_3/ TiO_2	CaO (%)	MgO (%)	CaO/MgO	MnO (%)	TiO_2 (%)	Fe_2O_3/ TiO_2	Fe_2O_3 (%)
60.0-3-2, 8-16	47.80		12.60		6.93	3.05		0.170	0.91		8.62
60.0-3-CC	49.00	3.71	13.20	17.60	6.82	3.72	1.83	0.150	0.75	11.33	8.50
60.0-4-CC	57.10	3.81	15.00	28.85	6.38	2.57	2.48	0.200	0.52	13.63	7.09
60.0-4-1, 145	49.60	4.13	12.00	20.69	8.62	2.40	3.59	0.160	0.58	11.52	6.68
60.0-4-1, 145	52.50	3.55	14.80	28.46	10.50	1.78	5.90	0.170	0.52	11.60	6.03
60.0-4-2, 145	49.50	3.67	13.50	18.75	4.22	2.21	1.91	0.180	0.72	8.56	6.16
60.0-5-1, 51-53	51.80		10.70		5.00	0.93		0.106	0.33		3.02
60.0-5-2, 26	57.70	5.43	9.34	23.35	6.54	0.65	10.06	0.090	0.40	8.38	3.35
60.0-5-3, 40-42	51.20		11.50		5.24	1.23		0.116	0.48		4.07
60.0-5-CC	60.30	4.45	13.55	23.77	5.05	1.80	2.81	0.210	0.57	9.86	5.62
60.0-6-1, 86	51.30	3.98	12.90	19.85	9.11	2.48	3.67	0.190	0.65	12.51	8.13
60.0-6-2, 16-18	51.80		13.18		9.43	2.45		0.188	0.81		8.43
60.0-6-3, 14	4.31	3.06	14.10	16.59	11.70	1.80	6.50	0.170	0.85	9.02	7.67
60.0-6-4, 25-27	50.60		14.10		9.78	2.57		0.138	0.65		7.95
60.0-6-5, 37	53.70	4.33	12.40	22.96	5.44	1.05	5.18	0.140	0.54	8.09	4.37
60.0-6-6, 26	55.00		12.89		9.12	1.72		0.138	0.65		6.38
60.0-6-7, 40	63.10	4.89	12.90	26.88	5.36	1.27	4.22	0.160	0.48	8.69	4.77
60.0-7-1, 81	60.30		11.10		5.68	1.25		0.132	0.54		5.25
60.0-7-2, 7	52.50	4.41	11.90	24.28	5.62	0.80	6.99	0.200	0.49	8.61	4.22
60.0-8-1, 145	50.60		12.75		6.03	2.45		0.168	0.89		7.95
60.0-8-2, 72	49.00	3.80	12.90	17.92	5.82	2.82	2.06	$>$0.210	0.72	9.50	6.34
60.0-8-3, 145	53.70		12.16		5.55	2.34		0.166	0.69		6.04
60.0-9-2, 145	49.60	3.52	21.04	21.04	5.25	2.11	2.49	0.190	0.67	9.64	6.46
60.0-9-5, 16-18	51.80		13.32		7.33	2.51		0.143	0.76		7.00

TABLE 8
Results of Determination of Amorphous Silica

Sample Designation	SiO_2 (%)	Sample Designation	SiO_2 (%)	Sample Designation	SiO_2 (%)
44.0-1-1, 145	0.05	47.1-1-1, 145	0.46	47.2-13-4, 145	0.21
44.0-1-2, 145	0.00	47.2-1-3, 11	1.48	47.2-13-4, 145	0.17
44.0-1-3, 145	0.05	47.2-1-4, 7	1.37	47.2-13-5, 145	0.18
44.0-1-3	0.33	47.2-2-2, 47	1.72	47.2-14-CC	Tr.
44.0-1-3, Mixed	0.00	47.2-2-3, 7	1.12	47.2-14-1, 145	0.00
44.0-1-4, 145	0.09	47.2-2-5, 5	1.52	47.2-14-2, 145	0
44.0-2-CC	Tr.	47.2-3-CC	0.86	47.2-14-3, 145	Tr.
44.0-2-1, 145	0.07	47.2-3-2, 6.5	1.10	47.2-14-5, 145	Tr.
44.0-2-2, 145	0.10	47.2-3-4, 16	1.38	48.1-1-1, 26	1.14
44.0-2-3, 145	0.04	47.2-4-CC	0.91	48.2-1-CC	0.12
44.0-2-4, 145	0.05	47.2-4-2, 17	0.82	48.2-1-1, 28	0.64
44.0-2-5, 145	0.12	47.2-4-4, 16.5	0.94	48.2-1-3, 16	0.73
44.0-2-6, 145	0.00	47.2-4-6, 17	0.84	48.2-1-5, 14.5	0.83
44.0-3-CC	2.42	47.2-5-2, 6	0.74	48.2-2-CC	0.07
44.0-3-2, 145	0.00	47.2-5-4, 6	1.22	48.2-2-1, 145	0.06
44.0-3-3, 145	0.00	47.2-5-6, 6.5	0.75	48.2-2-2, 17	0.08
44.0-3-4, 145	0.00	47.2-6-3, 17	0.54	48.2-2-4, 18	0.06
44.0-3-5, 145	3.53	47.2-7-2, 17	0.14	48.2-2-6, 16	Tr
44.0-3-5, 145	3.56	47.2-7-4, 17	0.16	48.2-3-2 28	1.71
44.0-4-CC	0.05	47.2-7-6, 126	0.22	48.2-3-4, 17	2.11
44.0-4-0, Top	0.00	47.2-8-2, 17	0.04	49.0-1-1, 76	1.16
44.0-4-2, 145	Tr.	47.2-8-4, 17	0.15	49.0-1-6, 7	3.33
44.0-4-3, 145	0.00	47.2-8-6-CC	0.15	49.1-1-2, 16	1.15
44.0-4-4, 145	0.00	47.2-8-6, 16	0.00	49.1-1-3, 22	1.27
44.0-5-0,	1.35	47.2-9-CC	0.36	49.1-1-4, 117	1.10
44.0-4-5, 145	0.00	47.2-9-1, 150	0.18	49.1-1-5, 60	2.52
44.0-4-6, 145	0.00	47.2-9-2, 17	0.21	49.1-1-5, 60	0.21
44.1-1-CC	0.95	47.2-9-4, 0	0.19	49.1-2-1, 145	0.61
45.1-1-1, 70	1.10	47.2-9-5, 17	0.11	49.1-2-3, 145	3.52
45.1-1-1, 7	1.73	47.2-9-5, 150	0.16	50.0-2-CC	0.97
45.1-1-1, 145	1.51	47.2-9-6, 0	0.25	50.0-2-1, 145	0.77
45.1-1-2, 100	2.48	47.2-10-CC	0.23	50.0-2-3, 150	2.09
45.1-1-2, 124	1.27	47.2-10	0.05	50.0-2-4, 150	0.82
45.1-1-3, 23	1.34	47.2-10-1, 17	0.08	50.0-2-6, 150	1.65
45.1-1-4, 22	1.88	47.2-10-3, 18	0.03	50.1-1-3, 7	1.80
45.1-1-4, 136	1.34	47.2-10-5, 17	0.12	50.1-1-3, 7	1.62
45.1-1-5, 4	1.19	47.2-11-CC	0.03	50.1-1-5, 17	2.95
45.1-2-CC	31.10	47.2-11-1, 145	Tr.	50.1-2-1, 130	1.50
45.1-2-CC	27.64	47.2-11-3, 145	0.19	50.1-2-3, 35	1.90
46.0	19.44	47.2-11-4, 145	0.27	50.1-2-5, 8	2.22
46.0-1-2, 145	1.51	47.2-11-5, 145	Tr.	50.1-2-6, 150	1.50
46.0-1-4, 145	2.44	47.2-11-6, 145	0.21	50.1-3-3, 15	1.14
46.0-1-6	31.96	47.2-12-CC	0.05	50.1-3-5, 28	1.36
47.0-1-2, 5	2.67	47.2-12-1, 145	0.16	51.0-1-CC	1.01
47.0-1-3, 16	11.88	47.2-12-3, 145	0.00	51.0-1-1, 11	1.52
47.0-1-4, 95	2.15	47.2-13-CC	Tr.	51.1-1-3, 30	2.82
47.0-1-5, 3.5	1.76	47.2-13-1, 145	0.00	51.1-1-4, 30	4.26
47.1-1,	0.24	47.2-13-3, 16	0.03	51.1-1-5, 16	3.77

TABLE 8 – *Continued*

Sample Designation	SiO_2 (%)	Sample Designation	SiO_2 (%)	Sample Designation	SiO_2 (%)
51.0-1-3, 6	1.35	54.0-2-1, 17	2.37	55.0-13-3, 40	1.43
51.0-1-5, 15	1.38	54.0-2-4, 16	2.89	55.0-13-5, 7	1.13
51.1-1-1, 15	2.55	54.0-3-1, 140	3.24	55.0-14-2, 145	0.65
51.1-1-3, 30	2.82	54.0-4-2, 14	2.90	55.0-14-4, 145	1.10
51.1-1-4, 30	4.26	54.0-6-3-23, 25	2.96	55.0-14-6, 145	1.20
51.1-1-5, 16	3.77	54.0-6-4, 78	3.74	56.2-1-6, 7	1.15
51.1-2-1, 127	1.24	54.0-7-17, 138	3.18	56.2-1-2, 145	0.26
51.1-10-1, 145	1.21	54.0-7-8, 16	2.03	56.2-2-4, 36	0.15
51.0-1-1, 27	1.60	54.0-9-1, Basalt	3.19	56.2-3-2, 145	0.26
52.0-1-3, 8	1.85	55.0-1-2, 7	0.71	56.2-3-6, 145	0.28
52.0-2-CC	1.70	55.0-1-2, 30	0.84	56.2-3-6, 145	0.26
52.0-2-2, 7	2.08	55.0-1-4, 7	0.64	56.2-4-4, 14	0.27
52.0-2-6, 145	1.25	55.0-1-6, 7	0.51	56.2-5-6, 7	0.66
52.0-4-3, 5	2.30	55.0-2-2, 7	0.50	56.2-6-2, 7	0.94
52.0-5-2, 0	2.11	55.0-2-4, 15	0.32	56.2-7-6, 7	1.25
52.0-5-4, 18	1.23	55.0-2-4, 15	0.54	56.2-8-4 7	1.17
52.0-6-CC	1.44	55.0-2-5,70	0.48	56.2-9-4, 19	1.00
52.0-7-CC	0.75	55.0-3-1, 16	0.36	56.2-10-2, 10	0.96
52.0-8-1, 145	21.12	55.0-3-4, 145	0.45	56.2-10-6, 13	1.39
52.0-8-4, 145	9.55	55.0-4-1, 13	0.33	57.1-3-1, 17	1.10
52.0-8-5, 145	14.89	55-0-4-3, 7	0.28	57.1-4-4, 145	1.56
52.0-9-CC	20.54	55.0-4-5, 7	0.19	58.2-1-6, 95	4.06
52.0-10-CC	3.14	55.0-4-1, 7	0.13	59.1-3-CC	1.71
53.0-2-CC	1.38	55.0-5-5, 7	0.36	59.2-3-CC	2.22
53.0-4-2	2.76	55.0-6-3, 17	0.52	59.2-5-CC	11.26
53.0-6-CC	1.18	55.0-7-1, 14	0.60	59.2-6-	3.49
53.0-8-CC	0.72	55-0-7-5, 19	1.03	59.2-6	2.20
53.1-2-2, 145	1.22	55-0-8-3, 16	1.28	60.0-1-CC	1.40
53.1-3-1, 150	2.22	55.0-9	1.06	60.0-3-CC, Top	2.25
53.1-3-2, 40	2.44	55.0-10-2, 10	2.06	60.0-4-CC	1.68
54.0-1-1, 5	2.39	55.0-10-5, 16	3.34	60.0-4-1, 145	1.91
54.0-1-2, 7	0.66	55.0-12-3, 8	2.60	60.0-4-2, 145	2.82
54.0-1-2, 20	2.53	55.0-13-1, 7	2.06	60.0-5-CC	2.77

TABLE 9
Results of Analysis of CO_2 and Organic Carbon

Sample Designation	CO_2 (%)	Org. C (%)	$CaCO_3$ (%)	Sample Designation	CO_2 (%)	Org. C (%)	$CaCO_3$ (%)
44.0-1-1, 145	41.93	0.20	95.35	47.2-2-2, 47	27.64	0.18	62.92
44.0-1-2, 145	42.26	0.16	96.1	47.2-2-3, 7	36.47	0.11	82.93
44.0-1-3, 145	42.38	0.19	96.37	47.2-2-5, 5	36.12	0.15	82.14
44.0-1-3, 50	42.22	0.06	96.01	47.2-2-5, 5	36.04	0.17	81.95
44.0-1-3, total	42.34	0.05	96.28	47.2-3-CC	38.42	0.11	87.37
44.0-1-4, 145	42.20	0.16	95.96	47.2-3-2, 6.5	33.40	0.15	75.95
44.0-2-CC	42.69	0.06	97.08	47.2-3-4, 16	37.10	0.05	84.37
44.0-2-1, 145	41.48	0.27	94.33	47.2-4-2, 17	39.40	0.05	89.6
44.0-2-2, 145	41.71	0.04	94.85	47.2-4-4, 16.5	36.95	0.10	84.02
44.0-2-3, 145	42.00	0.05	92.51	47.2-4-6, 17	38.90	0.04	88.96
44.0-2-4, 145	42.09	0.08	95.71	47.2-4-CC	37.32	0.18	84.87
44.0-2-5, 145	41.53	0.07	94.44	47.2-5-2, 6	40.18	0.05	91.37
44.0-2-6, 145	42.21	0.12	95.99	47.2-5-4, 6	34.85	0.05	79.25
44.0-3-CC	32.78	0.35	74.54	47.2-5-6, 6.5	37.94	0.05	86.28
44.0-3-2, 145	41.28	0.15	93.87	47.2-6-3, 17	37.55	0.05	85.39
44.0-3-3, 145	42.25	0.08	96.08	47.2-7-2, 17	41.88	0.16	95.24
44.0-3-4, 145	41.69	0.14	94.8	47.2-7-4, 17	41.35	0.16	94.03
44.0-3-5, 145	35.71	0.10	81.2	47.2-7-6, 126	41.97	0.14	95.44
44.0-4-CC	41.51	0.12	94.39	47.2-8-0, 17	42.06	0.06	95.64
44.0-4-0, Top	41.54	0.11	94.46	47.2-8-0, 17	42.28	0.05	96.14
44.0-4-2, 145	42.13	0.09	95.8	47.2-8-4, 17	42.36	0.04	96.33
44.0-4-3, 145	42.10		95.74	47.2-8-6-CC	42.31	0.11	96.21
44.0-4-4, 145	41.93	0.12	95.35	47.2-8-6, 16	42.50	0.05	96.65
44.0-4-5, 145	42.04	0.05	95.6	47.2-9-CC	39.73	0.16	90.35
44.0-4-6, 145	41.61	0.19	94.62	47.2-9-1, 150	42.00	0.08	95.51
44.0-5-0,	36.38	0.22	82.73	47.2-9-2, 17	42.08	0.03	95.69
45.1	0.04	0.03	0.09	47.2-9-4, 0-5	41.76	0.11	94.96
	0.07	0.03	0.16	47.2-9-5, 17	41.91	0.04	95.30
45.1-1-2, 124	0.12	0.23	0.27	47.2-9-5, 150	41.04	0.17	93.32
45.1-1-3, 23	0.12	0.04	0.27	47.2-9-6, 0-5	41.16	0.09	93.6
45.1-1-4, 22	0.16	0.04	0.36	47.2-10-CC	41.37	0.09	94.08
45.1-1-4, 136	13.51	0.14	30.79	47.2-10, Top	41.94	0.09	95.37
45.1-1-5, 4	4.66	0.08	10.6	47.2-10-1, 17	42.94	0.17	97.65
46.0	0.16	NIL	0.36	47.2-10-3, 18	42.21	0.09	95.99
46.0-1-2, 145	0.16	0.07	0.36	47.2-10-5, 17	41.35	0.03	94.03
46.0-1-4, 145	0.21	0.05	0.48	47.2-11-CC	42.42	0.03	96.46
46.0-1-6, 145	0.15	0.03	0.34	47.2-11-1, 145	41.89	0.10	95.26
47.0-1-4, 25	24.70	0.24	56.17	47.2-11-3, 145	41.80	0.14	95.05
47.0-1-2, 5	22.22	0.16	50.52	47.2-11-4, 145	42.52	0.03	96.69
47.0-1-3, 16		0.40	53.95	47.2-11-5, 145	42.49	0.11	96.69
47.0-1-5, 3.5		0.16	74.14	47.2-11-6, 145	42.58	0.07	96.83
47.1-1, Top	40.70	0.10	92.55	47.2-12-CC	42.48	0.08	96.6
47.1-1-1, 145	37.33	0.14	84.89	47.2-12-1, 145-150	42.26	0.08	96.1
47.2-1-3, 11	30.92	0.12	70.31	47.2-12-3, 145	42.63	0.05	96.94
47.2-1-4, 7	32.84	0.12	74.68	47.2-13-CC	42.87	0.05	97.49

TABLE 9 – *Continued*

Sample Designation	CO_2 (%)	Org. C (%)	$CaCO_3$ (%)	Sample Designation	CO_2 (%)	Org. C (%)	$CaCO_3$ (%)
47.2-13-1, 145		0.03	97.4	52.0-1-1, 27		0.10	Nil
47.2-13-3, 16		0.03	96.87	52.0-1-3, 8	0.04	0.03	0.09
47.2-13-4, 145		0.05	95.99	52.0-1-5, 10		0.08	Nil
47.2-13-5, 145	42.70	0.03	97.1	52.0-1-3, 8	0.05	0.03	0.11
47.2-14-CC	42.62	0.07	96.92	52.0-2-4, 8		0.07	0.16
47.2-14-1, 145	42.27	0.08	96.12	52.0-2-6, 145		0.10	0.52
47.2-14-2, 145	42.50	0.04	96.65	52.0-3-2, 19		0.05	0.23
47.2-14-3, 145	42.38	0.10	96.37	51.0-3-4, 16		0.08	0.07
47.2-14-5, 145	42.59	0.05	96.85	52.0-3-6, 6		0.08	0.23
48.0-2-6, 16		0.40	96.47	52.0-4-3, 5	0.05	0.04	0.11
48.0-3-2, 28	0.0	0.07	96.34	52.0-4-5, 6		0.21	0.23
48.1-1-1, 26	33.15	0.03	75.38	52.0-4-6, 128		0.12	0.11
48.2-1-CC	40.58	0.15	92.28	52.0-5-2, 17	0.05	0.02	0.11
48.2-1-1, 28	28.20	0.12	86.87	52.0-5-3, 15		0.05	0.30
48.2-1-3, 16	36.17	0.05	82.25	52.0-5-4, 18	0.05	0.02	0.11
48.2-1-5, 14.5	37.41	0.06	85.07	52.0-6-1, 24		0.34	0.23
48.2-2-CC	42.50	0.11	96.65	52.0-6-CC	0.11	0.05	0.25
48.2-2-1, 145	42.23	0.06	96.03	52.0-7-CC	0.05	0.05	0.11
48.2-2-2, 17	42.60	0.05	96.87	52.0-8-1, 145		0.05	0.36
48.2-2-4, 18	42.85	0.05	97.44	52.0-8-2, 145		0.11	0.39
48.2-3-4, 17	42.42	0.05	96.46	52.0-8-3, 21		0.10	0.57
49.0-1-1, 76	17.90	0.04	40.70	52.0-8-4, 145		0.07	0.16
49.1-1-4, 117	25.90	0.05	58.44	52.0-8-5, 145	0.14	Nil	0.32
49.1-1-5, 60	3.40	0.09	7.73	53.0-1-2, 144		0.05	1.36
49.1-2-1, 145	39.72	0.09	90.32	53.0-2-CC		0.02	2.27
49.1-2-3, 145	35.60	0.09	80.95	53.0-3-1, 17		0.05	0.27
50.0-1-3, 340	40.84	0.11	92.87	53.0-4-2	0.07	0.09	0.16
50.0-2-1, 145	34.71	0.08	78.93	53.0-6-2, 65		0.05	82.14
50.0-2-2, 150	34.21	0.16	77.79	53.0-6-CC	28.42	0.28	64.62
50.0-2-3, 150	0.62	0.03	1.41	53.0-8-CC	1.13	0.04	2.57
50.0-2-4. 150	28.93	0.04	65.79	53.1-1-3, 18		0.10	0.64
50.0-2-6, 150	22.40	0.05	50.94	53.1-1-2, 7		0.11	0.91
50.0-2-CC		0.09	Nil	53.1-1-5, 18		0.09	0.08
50.1-1-3, 7	40.13	0.05	23.04	53.1-2-1, 145		0.08	2.16
50.1-1-5, 17	15.45	0.09	35.13	53.1-2-2, 145	0.96	0.05	2.16
50.1-2-1, 130	9.39	0.04	21.35	53.1-2-3, 90		0.03	Nil
50.1-2-5, 8	0.04	0.02	0.09	53.1-2-5, 7		0.05	0.23
50.1-3-1, 145	0.12	0.04	0.27	53.1-3-1, 150	0.46	0.08	1.05
50.1-3-5, 28		0.05	Nil	53.1-3-2, 40	0.17	0.03	0.39
51.0-1-3, 6	0.02	0.02	0.05	53.1-3-4, 26		0.18	Nil
51.0-1-5, 15		0.11	0.23	53.2-1-2, 16		0.04	7.00
51.0-10-1, 175		0.17	1.81	53.2-1-6, 7		0.02	0.61
51.1-1-3, 30		0.14		53.2-1-4, 7		0.06	1.52
51.1-1-5, 16	0.04	0.09	0.09	54.0-1-1, 5	34.90	0.08	79.36
51.1-2-1, 127		0.06	0.11	54.0-1-2, 7		0.02	6.41

TABLE 9 – *Continued*

Sample Designation	CO_2 (%)	Org. C (%)	$CaCO_3$ (%)	Sample Designation	CO_2 (%)	Org. C (%)	$CaCO_3$ (%)
54.0-1-2, 20		Nil	5.93	56.2-1-2, 145		0.09	95.68
54.0-2-1, 17		Nil	4.11	56.2-2-4, 36		0.14	95.09
54.0-2-4, 16		0.03	8.66	56.2-3-2, 145		0.07	96.02
54.0-3-1, 140	5.06	0.10	11.51	56.2-3-6, 145		0.06	94.16
54.0-4-2, 14		0.05	11.30	56.2-4-4, 14		0.17	93.18
54.0-6-1, 145	0.60	0.04	1.36	56.2-5-2, 13		0.08	91.93
54.0-6-3, 23		0.08	10.30	56.2-5-6, 7		0.10	92.56
54.0-6-4, 78		0.06	8.25	56.2-6-2, 7		0.07	90.56
54.0-7-1, 138		0.05	2.41	56.2-7-6, 7		0.05	93.13
54.0-7-3, 16		Nil	1.84	56.2-8-4, 7		0.03	92.79
55.0-1-2, 73		0.22	87.74	56.2-9-4, 19		0.03	87.10
55.0-1-2, 30	38.53	0.25	87.62	56.2-10-1, 10		0.04	85.74
55.0-1-4, 7		0.16	88.81	57.1-1-1, 10			93.04
55.0-1-6, 7		0.12	87.90	57.1-1-2, 13		0.03	95.57
55.0-2-2, 7		0.24	91.70	57.1-1-4, 7		0.13	93.29
55.0-2-4, 15		0.22	91.81	57.1-1-6, 11		0.06	93.01
55.0-2-5, 70		0.10	93.20	57.1-3-1, 17	37.01	0.12	84.16
55.0-3-1, 16		0.12	92.68	57.1-3-4, 22		0.03	85.17
55.0-3-4, 145		0.06	94.63	57.1-4-1, 26		0.05	68.68
55.0-4-1, 13		0.06	94.47	57.1-43, 14		0.03	78.76
55.0-4-3, 7		0.05	95.00	57.1-4-4, 145	33.51	0.15	76.20
55.0-4-5, 7		0.10	94.02	58.1-1-1, 139		0.17	48.83
55.0-5-7-1, 7		0.07	93.40	58.1-1-2, 91		0.17	90.97
55.0-5-5, 7		0.05	93.04	58.2-1-2, 16		0.08	64.16
55.0-6-3, 17		0.05	92.02	58.2-1-4, 31		0.07	36.23
55.0-7-1, 14		0.06	90.97	59.1-3-CC	0.05	0.16	0.11
55.0-7-5, 19		0.07	91.38	59.2-3CC	0.05	0.05	0.11
55.0-8-3, 16		0.05	91.79	59.2-5-CC	0.20	0.05	0.45
55.0-9, Top	38.30	0.14	87.05	59.2-6, Top	0.20	0.10	0.45
55.0-10-2, 10		0.06	87.05	60.0-1-CC	13.88	0.15	31.56
55.0-10-2, 10		0.06	79.82	60.0-3-CC	2.94	0.10	6.69
55.0-10-5, 16		0.03	85.42	60.0-4-CC	1.12	0.05	2.55
55.0-14-2, 145		0.05	93.50	60.0-4-1, 145	3.38	Nil	7.69
55.0-14-4, 145		0.05	93.54	60.0-4-1, 145	3.41	Nil	7.75
55.0-14-6, 145		0.11	93.95	60.0-4-2, 145	0.90	0.03	2.05
56.2-1-6, 7		0.07	96.07	60.0-5-CC	2.00	0.04	4.55

TABLE 10
Results of Determination of Phosphorous

Sample Designation	P_2O_5 %	Sample Designation	P_2O_5 %
44.0-1, CC	0.39	47.2-13-CC	0.02
44.0-1-1, 145	0.07	47.2-13-5, 145	0.06
44.0-1-2, 145	0.07	47.2-14-CC	0.02
44.0-1-3, 145	0.08	47.2-14-1, 145	0.06
44.0-2-CC	0.10	47.2-14-3, 145	0.03
44.0-2-5, 145	0.06	48.2-1-1, 28	0.07
44.0-2-6, 145	0.07	48.2-2-CC	0.02
44.0-3-CC	0.08	48.2-2-1, 145	0.08
44.0-3-CC	0.08	48.2-11-CC	0.08
44.0-3-2, 145	0.09	49.1-1-5, 60	0.17
44.0-3-3, 145	0.08	50.0-2-1, 145	0.14
44.0-3-4, 145	0.10	50.0-2-2, 150	0.15
44.0-3-5, 145	0.08	50.0-2-3, 150	0.16
44.0-4-CC	0.20	50.0-2-4, 150	0.13
44.0-4-0, Top	0.07	50.0-2-6, 150	0.11
44.0-4-2, 145	0.08	51.0-1-CC	0.55
44.0-4-3, 145	0.08	52.0-2-CC	0.36
44.0-4-4, 145	0.11	52.0-6-CC	0.40
44.0-4-4, 145	0.09	52.0-9-CC	1.27
44.0-4-5, 145	0.11	52.0-10-CC	0.57
44.0-4-6, 145	0.09	53.0-2-CC	0.17
44.0-5-	0.12	53.0-4-2	0.10
47.0-1-4, 95	0.15	53.0-6-CC	0.07
47.1-1, Top	0.18	54.0-1-1, 5	0.16
47.2-3-CC	0.04	53.1-2-2, 145	0.12
47.2-4-1-CC	0.09	54.0-1-2, 20	0.17
47.2-8-6-CC	0.14	54.0-3-1, 140	0.13
47.2-9-CC	0.46	54.0-6-1, 145	0.14
47.2-9-1, 150	0.17	55.0-3-4, 145	0.09
47.2-9-4, 0	0.10	55.0-9, Top	0.08
47.2-9-5, 150	0.13	55.0-13-3, 40	0.04
47.2-9-6, 0	0.19	57.1-4, 145	0.08
47.2-10-CC	0.24	59.2-5-CC	1.05
47.2-10, Top	0.14	59.2-6, Top	1.69
47.2-11-CC	0.06	60.0-3-CC	0.21
47.2-11-3, 145	0.13	60.0-4-CC	0.22
47.2-11-4, 145	0.07	60.0-4-1, 145	0.16
47.2-11-6, 145	0.05	60.0-4-2, 145	0.22
47.2-12-CC	0.03	60.0-5-CC	0.17
47.2-12-1, 145	0.03		

TABLE 11
Spectrochemical Analysis of Trace Elements

Sample Designation	Mn	Ti	Cr	V	Ni	Co	Zr	Cu	Pb	Mo
6-44.0-1-1, 145	<500	<300	<10	<5	<5	<5	5.2	21	20	<5
6-44.0-1-2, 145	320	<300	<10	<5	<5	<5	<2	10	17	<5
6-44.0-1-3, 50	310	<300	<10	<5	<5	<5	3.6	420	<5	<5
6-44.0-1-3, 145	<300	<300	<10	<5	<5	<5	3.6	20	16	<5
6-44.0-1-3, mixed	360	<300	<10	<5	<5	<5	<2	20	10	<5
6-44.0-1-4, 145	360	<300	<10	<5	<5	<5	3.6	19	26	<5
6-44.0-1, CC	24,000	7,000	290	150	530	175	190	<500	27	76
6-44.0-2-1, 145	430	<300	<10	<5	<5	<5	5.6	15	<5	<5
6-44.0-2-2, 145	350	<300	<10	<5	<5	<5	<2	10	<5	<5
6-44.0-2-3, 145	300	<300	<10	<5	<5	<5	2.4	17	<5	<5
6-44.0-2-4, 145	1,350	330	<10	7	13	–	6.6	84	10	<5
6-44.0-2-5, 145	530	<300	<10	<5	7	–	5	12	11.5	<5
6-44.0-2-6, 145	470	<300	<10	<5	<5	–	4.6	17.5	17	<5
6-44.0-2, CC	530	<100	<10	<5	<5	<5	2	10	6	<5
6-44.0-3-2, 145	820	<300	<10	<5	12	–	4	16.5	13	<5
6-44.0-3-3, 145	380	<300	<10	<5	11	–	4.6	<10	<5	<5
6-44.0-3-4, 145	520	<300	<10	<5	12	–	4	39	<5	<5
6-44.0-3-5, 145	820	<300	<10	<5	11	–	5.8	500	<5	<5
6-44.0-3, CC	890	<300	<10	<5	11	<5	–	–	20	<5
6-44.0-4, top	660	<300	<10	<5	16	–	<2	13.5	<5	18
6-44.0-4-0, top	<500	<300	<10	<5	<5	<5	7	–	<5	<5
6-44.0-4-2, 145	660	<300	<10	<5	14	–	4.6	145	<5	10
6-44.0-4-3, 145	820	<300	<10	<5	13	–	4.3	<10	<5	<5
6-44.0-4-4, 145	880	<300	<10	<5	16	–	3.5	<10	14	<5
6-44.0-4-5, 145	550	<300	<10	<5	11	5	<2	20	6	<5
6-44.0-4-6, 145	720	<300	<10	<5	10	<5	2.4	18	<5	<5
6-44.0-4, CC	<510	<100	<10	<5	10	<5	3.2	<10	<5	<5
6-44.0-5, top	750	<300	15	<5	10	<5	<2	<500	54	66
6-45.1-1-1, 7	9,000	10,000	64	140	390	230	420	210	6?	62
6-45.1-1-1, 70	20,000	8,000	113	160	600	195	150	190	98	26
6-45.1-1-1, 145	8,000	12,600	115	260	460	180	330	190	7	80
6-45.1-1-2, 100	10,000	13,000	118	290	550	200	390	280	35	88
6-45.1-1-2, 124	2,400	15,500	460	220	300	66	145	160	<5	<5
6-45.1-1-3, 23	1,500	18,500	440	220	310	62	170	110	<5	<5
6-45.1-1-4, 22	2,400	15,000	490	220	300	64	135	152	<5	?
6-45.1-1-4, 136	1,950	8,900	270	108	370	41	89	105	<5	<5
6-45.1-1-5, 4	3,000	12,000	490	180	530	66	105	124	<5	<5
6-45.1-1, CC	7,000	2,100	14	40	200	30	90	210	<5	5
6-45.1-3, CC	<500	700	12	14.5	20	<5	22	–	6	<5

TABLE 11 – *Continued*

Sample Designation	Mn	Ti	Cr	V	Ni	Co	Zr	Cu	Pb	Mo
6-45.1-3, CC	1,180	1,220	14	25	41	9	50	–	8	<25
6-46.0	<500	860	<10	22	8	<5	26	117	<5	<5
6-46.0-1-1, 145	7,500	3,800	77	110	200	89	260	220	32	50
6-46.0-1-2, 145	8,600	4,400	77	200	240	89	390	310	72	36
6-46.0-1-3, 145	7,500	3,300	66	90	165	76	165	240	60	25
6-46.0-1-4, 145	23,000	3,400	50	105	290	110	210	280	100	50
6-46.0-1-5, 145	3,700	2,600	38	60	110	48	80	240	55	25
6-46.0-1-6	<500	690	<10	9.5	7	<5	24	130	<5	<5
6-46.0-1-6	300	1,470	14	29	21	<5	40	170	6	<5
6-46.0-1-6, 145	6,100	6,700	58	180	195	105	280	120	15	58
6-46.1-2, CC	5,700	2,200	16	39	250	26	110	280	23	5
6-47.0-1-1, 17	<500	3,400	32	68	42	12	105	–	<10	<5
6-47.0-1-2, 5	1,300	3,500	30	165	38	15.5	310	80	20	<5
6-47.0-1-3, 16	660	2,050	20	94	46	12	105	–	16	<5
6-47.0-1-4, 90	<500	2,600	32	62	33	11	50	–	210	<5
6-47.0-1-5, 3.5	560	1,130	12	33	10	<5	48	–	14	<5
6-47.0-1-6, 14	2,500	1,530	15	34	18	8	31	–	<10	<5
6-47.1-1-1, 145	880	490	<10	15	18.5	10	16.5	<10	18.5	<10
6-47.1-1-2, 16	850	<300	<10	5	7	<5	<5	–	<10	<5
6-47.2-1-2, 23	<500	1,920	18	47	21	6	28	–	<10	<5
6-47.2-1-3, 11	1,540	1,820	19.5	32	23	10	57	31	14	<5
6-47.2-1-3, 90	<500	1,440	<10	45	15	<10	32	<10	<10	<10
6-47.2-1-4, 7	780	1,500	<10	36	18	5.7	35	23	10	<5
6-47.2-2-2, 47	830	1,700	27	57	33	9.4	72	43	24	<5
6-47.2-2-3, 7	1.400	630	<10	13	6	<5	18	15	<5	<5
6-47.2-2-4, 7	–	<500	1,500	10	32	14	<5	32	<10	<5
6-47.2-2-6, 6	–	<500	680	10	1.7	14	<5	14	<10	<5
6-47.2-3-2, 65	700	1,650	12.5	52	40	17	34	30	6	<5
6-47.2-3-3, 6	<500	800	10	15	14	<5	25	–	<10	<5
6-47.2-3-4, 16	890	1,200	<10	37	5	<5	19.5	<10	<5	<5
6-47.2-3, CC	<500	420	<10	14.5	8	5	13	<10	<5	<5
6-47.2-4-1, 16	550	430	<10	8	5	<5	8	–	<10	<5
6-47.2-4-2, 17	1,150	340	<10	15.5	7	<5	9.0	36	<5	<5
6-47.2-4-3, 16	<500	370	<10	10	7	<5	7	–	<10	<5
6-47.2-4-4, 16	830	1,150	<10	37	8	<5	19.5	<10	<5	<5
6-47.2-4-5, 16	350	510	<10	12	11	<5	13	–	<10	<5
6-47.2-4-6, 17	1,350	560	<10	17	6	<5	14.7	<10	<5	<5
6-47.2-4, CC	800	700	<10	15	11	<5	12.5	41	26	<5
6-47.2-5-1, 17	520	460	<10	12	11	50	11	–	<10	<5
6-47.2-5-2, 6	1,250	590	<10	14	7	7	9.6	34	15	<5

TABLE 11 – *Continued*

Sample Designation	Mn	Ti	Cr	V	Ni	Co	Zr	Cu	Pb	Mo
6-47.2-5-3, 6	640	480	<10	10	11	<5	12	–	<10	<5
6-47.2-5-4, 6	1,350	1,400	<10	42	19.5	17.5	<10	21	<5	<5
6-47.2-5-5, 6	820	580	<10	13	7	<5	20	–	<10	<5
6-47.2-5-6, 65	1,400	580	<10	9	12.5	4.5	9	18	12	<5
6-47.2-6-2, 6	1,480	870	<10	16	14	<5	24	–	<10	<5
6-47.2-6-3, 17	1,950	760	<10	20	17.5	9	14.7	48	7	<5
6-47.2-7-1, 17	1,330	880	<10	17	39	21	17	–	<10	<5
6-47.2-7-2, 17	1,020	<300	<10	<5	<5	<5	<5	100?	<5	<5
6-47.2-7-3, 13	720	<300	<10	<5	<5	<5	<5	–	<10	<5
6-47.2-7-4, 17	1,350	<300	<10	8	<5	<5	6	70	<5	<5
6-47.2-7-5, 27	900	<300	<10	6	<5	<5	<5	–	<10	<5
6-47.2-7-6, 126	850	<300	<10	<5	<5	<5	<5	<10	<5	<5
6-47.2-8-1, 27	<500	<300	<10	6	<5	<5	<5	–	<10	<5
6-47.2-8-2, 17	550	<300	<10	<5	<5	<5	<5	11.5	<5	<5
6-47.2-8-3, 18	<500	<300	<10	<5	<5	<5	<5	–	<10	<5
6-47.2-8-5, 17	<500	<300	<10	<10	<10	<10	<5	10	<10	<10
6-47.2-8-5, 5	1,100	1,100	<10	22	9	<5	13.5	33	6	<5
6-47.2-8-6, 16	810	<300	<10	<5	<5	7.4	<5	13.5	<5	<5
6-47.2-8-6, CC	540	<300	<10	5	0	<5	5.8	<10	18	32
6-47.2-9-1, 16	<500	<300	<10	<10	<10	<10	<5	<10	<10	<10
6-47.2-9-1, 150	670	<300	<10	<5	<5	<5	<2	47	<5	<5
6-47.2-9-2, 17	760	<300	<10	5	9	8.6	5	<10	<5	<5
6-47.2-9-3, 17	<500	<300	<10	5	7	5	<5	–	<10	<5
6-47.2-9-4, 0	640	150	<10	6	5	<5	3	17.5	7	<5
6-47.2-9-5, 17	1,230	<300	<10	7	10	6.8	16	27	<5	<5
6-47.2-9-5, 150	1,050	<300	<10	<5	<5	<5	<2	35	<5	<5
6-47.2-9-6, 0	700	760	<10	14	15	–	23	500	13	<5
6-47.2-9, CC	1,200	310	<10	7.6	12	7	7.2	19	6	<5
6-47.2-10, top	<500	<300	<10	<5	<5	<5	<2	20	<5	<5
6-47.2-10-1, 17	<500	<300	<10	<5	<5	<5	<5	<10	<5	<5
6-47.2-10-2, 17	<500	<300	<10	<10	<10	<10	<5	10	<10	<10
6-47.2-10-3, 18	740	<300	40	<5	<5	<5	<5	16	<5	<5
6-47.2-10-4, 17	<500	<300	<10	<10	20	<10	11	<10	<10	<10
6-47.2-10-5, 17	3,300	<300	<10	7	15	13	16	23	<5	<5
6-47.2-10-6, 16	<500	<300	<10	<10	<10	<10	<5	<10	<10	<10
6-47.2-10, CC	650	170	<10	6	<5	<5	2	<10	5	<5
6-47.2-11-1, 145	500	<300	<10	<5	<5	<5	<5	18.5	<5	<5
6-47.2-11-2, 145	<500	<300	<10	<5	5	<5	<5	–	<10	<5
6-47.2-11-3, 145	<500	<300	<10	<5	<5	<5	<2	24	<5	<5
6-47.2-11-4, 145	400	<300	<10	<5	<5	<5	7	15	<5	<5

TABLE 11 – *Continued*

Sample Designation	Mn	Ti	Cr	V	Ni	Co	Zr	Cu	Pb	Mo
6-47.2-11-5, 145	650	<300	<10	<5	<5	<5	<5	<10	<5	<5
6-47.2-11-6, 145	390	<300	<10	<5	<5	<5	7.2	76	5.5	<5
6-47.2-11, CC	<500	<100	<10	<5	<5	<5	2.5	10	5	<5
6-47.2-12-1, 145	<300	<300	<10	<5	<5	<5	5.2	17	<5	<5
6-47.2-12-2, 17	<500	<300	<10	<5	<5	<5	<5	–	<10	<5
6-47.2-12-3, 145	<500	<300	<10	<5	<5	<5	<5	19.5	<5	<5
6-47.2-12-4, 145	<500	<300	<10	<10	<10	<10	<5	<10	<10	<10
6-47.2-12, CC	<500	<100	<10	<5	<5	<5	3.7	28	<5	<5
6-47.2-13-1, 145	<500	<300	<10	<5	<5	<5	<5	17	<5	<5
6-47.2-13-2, 145	<500	<300	<10	<5	<5	<5	<5	–	<10	<5
6-47.2-13-3, 16	430	<300	<10	<5	<5	<5	<5	13.5	<5	<5
6-47.2-13-4, 145	720	<300	<10	<5	<5	<5	<5	46	<5	<5
6-47.2-13-5, 145	<500	<300	<10	<5	<5	<5	<2	<10	<5	<5
6-47.2-13-6, 145	<500	<300	<10	<5	<5	<5	<5	–	<10	<5
6-47.2-13, CC	<500	<300	<10	<5	<5	<5	<2	<10	6	<5
6-47.2-14-1, 145	<500	<300	<10	<5	<5	<5	<5	<10	<5	<5
6-47.2-14-2, 145	<500	<300	<10	<5	<5	<5	<5	12	<5	<5
6-47.2-14-3, 145	<500	<300	<10	<5	<5	<5	<2	10	<5	<5
6-47.2-14-4, 145	<500	<300	<10	<5	<5	<5	<5	–	<10	<5
6-47.2-14-5, 145	<500	<300	<10	<5	<5	<5	<5	18.5	<5	<5
6-47.2-14-6, 140	<500	<300	<10	<5	<5	<5	<5	–	<10	<5
6-47.2-14, CC	<500	<100	<10	<5	<5	<5	5.2	27	6.5	<5
6-48.1-1-1, 26	3,800	1,250	19.5	27	54	30	62	85	12	<5
6-48.2-1-1, 28	920	660	<10	14	6	<5	12	13	6	<5
6-48.2-1-2, 33	<500	500	<10	11	18	10	13	–	<10	<5
6-48.2-1-3, 16	700	430	<10	13.3	19	8	24	–	11	<5
6-48.2-1-4, 16	590	480	<10	9	9	<5	11	–	<10	<5
6-48.2-1-5, 14.5	1,270	460	<10	13.3	17	8	12.5	–	11	<5
6-48.2-1-6, 11	<500	<300	<10	<5	<5	<5	<5	–	<10	<5
6-48.2-1, CC	470	320	<10	<5	76	<5	9	21	5.5	<5
6-48.2-2-1, 145	<500	<300	<10	<5	<5	<5	<2	100	<5	<5
6-48.2-2-2, 17	<500	<300	<10	<5	<5	<5	<3	–	<5	<5
6-48.2-2-3, 145	<500	300	<10	<5	<5	<5	<5	–	<10	<5
6-48.2-2-4, 18	<500	<300	<10	<5	<5	<5	8	–	<5	<5
6-48.2-2-5, 16	<500	300	<10	<5	<5	<5	<5	–	<10	<5
6-48.2-2-6, 16	<500	<300	<10	<5	<5	<5	<5	–	<5	<5
6-48.2-2, CC	<500	<100	<10	<5	<5	<5	<3	<10	5	<5
6-48.2-3-1, 117	<500	<300	<10	<5	<5	<5	<5	–	<10	<5
6-48.2-3-2, 28	<500	<300	<10	<5	<5	<5	<5	–	<5	<5
6-48.2-3-3, 17	<500	<300	<10	<5	<5	<5	<5	–	<10	<5

TABLE 11 – *Continued*

Sample Designation	Mn	Ti	Cr	V	Ni	Co	Zr	Cu	Pb	Mo
6-48-2-3-4, 17	<500	<300	<10	<5	<5	<5	<3	–	<5	<5
6-48-2-3-5, 16	<500	<300	<10	<5	<5	<5	<5	–	<10	<5
6-49.0-1-1, 11	>4,000	3,600	64	96	245	110	105	–	–	15.5
6-49.0-1-1, 76	4,900	2,600	47	81	81	22	96	–	–	6
6-49.0-1-2, 16	<500	2,900	58	60	70	40	78	–	48	<10
6-49.0-1-3, 16	10,800	4,600	64	150	340	113	270	–	22	7
6-49.0-1-4, 6	3,800	3,300	84	88	14.5	54	100	–	–	<10
6-49.0-1-5, 7	19,000	3,750	56	136	340	133	270	–	110	26
6-49.0-1-5, 70	8,000	2,000	44	66	195	70	92	–	40	20
6-49.0-1-5, 130	<500	<300	<10	<5	5	<5	9	23	48	<5
6-49.0-1-6, 7	26,000	4,100	54	125	460	230	220	–	88	28
6-49.0-2-1, 70	<500	310	<10	<10	<10	<10	<5	–	<10	<10
6-49.1-1-1, 77	5,400	1,950	31	54	96	39	77	–	41	<10
6-49.1-1-2, 16	16,000	5,000	68	163	380	164	330	–	76	39
6-49.1-1-2, 124	25,000	3,200	34	85	640	105	200	–	83	53
6-49.1-1-3, 22	23,000	3,850	50	105	>500	164	180	–	68	65
6-49.1-1-4, 17	12,500	3,400	34	78	430	80	160	–	56	44
6-49.1-1-4, 117	5,900	1,750	16.5	46	158	35	54	–	14	10
6-49.1-1-5, 38	520	300	<10	<10	<10	<10	7	–	<10	<10
6-49.1-1-5, 60	1,600	3,800	14	88	7	14	54	63	24	8.2
6-49.1-1-5, 60	16,000	4,000	56	120	560	150	225	11.5	98	41
6-49.1-2-1, 145	1,470	300	<10	13.3	<5	<5	6	–	<5	<5
6-49.1-2-2, 145	500	420	<10	12	<10	<10	6	–	<10	<10
6-49.1-2-3, 145	500	700	14	32	8.5	<5	24	–	26	<5
6-49.1-2, CC	<500	<300	<10	<5	<5	<5	8	–	<5	<5
6-50.0-2-1, 145	2,200	520	10	19	16	18	9.5	210	15	19
6-50.0-2-2, 150	770	390	18	21	14	28	6	270	12	<5
6-50.0-2-3, 150	2,100	2,100	<10	76	5	7.6	48	135	6	<5
6-50.0-2-4, 150	1,450	670	<10	23	16	34	14	200	5	<5
6-50.0-2-6, 150	1,000	310	<10	25	12	13	13	74	14	<5
6-50.0-2, CC	<500	<300	<10	<5	<5	<5	<5	–	<5	<5
6-50.1-1-1, 62	4,800	3,300	60	105	98	31	145	–	50	<10
6-50.1-1-2, 15	3,000	2,600	37	78	70	37	105	–	54	<10
6-50.1-1-3, 7	3,900	3,400	42	112	81	32	146	–	28	<5
6-50.1-1-4, 17	2,700	2,700	63	76	70	35	77	–	45	<10
6-50.1-1-5, 15	1,800	3,170	56	100	75	22	118	–	18	<5
6-50.1-1-6, 16	<500	3,700	50	110?	81	27	430	–	25	<5
6-50.1-2-1, 130	3,850	2,900	39	81	85	23	121	–	34	8
6-50.1-2-3, 4	5,600	2,500	40	74	105	43	100	–	58	<10
6-50.1-2-3, 35	3,300	3,300	45	82	105	28	116	–	41?	<5

TABLE 11 – *Continued*

Sample Designation	Mn	Ti	Cr	V	Ni	Co	Zr	Cu	Pb	Mo
6-50.1-2-4, 12	8,600	3,400	60	100	300	71	160	–	76	12
6-50.1-2-4, 50	8,300	4,800	70	105	440	86	190	330	77	32
6-50.1-2-5, 8	6,900	4,800	55	140	240	69	198	–	32	31
6-50.1-3-1, 145	7,400	2,500	43	113	180	77	190	7,500	57	16
6-50.1-3-2, 76	8,000	3,700	56	105	195	59	120	370	28	32
6-50.1-3-3, 15	9,000	3,700	53	110	260	67	146	–	71	30
6-50.1-3-4, 16	9,000	3,100	62	80	200	96	295	–	31	19
6-50.1-3-5, 28	12,800	3,700	50	137	330	188	200	–	88	24
6-50.1-3-6, 16	9,700	3,300	43	86	270	109	310	–	65	18
6-50.1-4-1, 75	14,000	2,900	46	84	400	127	310	–	64	17
6-51.0-1-1, 11	11,100	3,670	44	96	135	84	90	380	58	31
6-51.0-1-2, 8	<23,000	3,800	46	120	170	124	162	>500	23	30
6-51.0-1-3, 6	16,000	4,300	55	128	270	157	185	–	67	33
6-51.0-1-4, 6	15,000	3,000	46	120	185	113	155	>500	56	32
6-51.0-1-5, 15	20,500	4,050	40	110	400	360	118	840	90	43
6-51.0-1-6, 16	>23,000	3,800	<10	123	610	>500	290	>500	80	81
6-51.0-1, CC	20,000	3,800	58	120	>500	190	180	420	150	50
6-51.0-2, CC	5,200	3,700	48	86	200	76	170	79	21	45
6-51.1-1-1, 15	11,500	3,800	57	131	84	37	160	–	35	<5
6-51.1-1-2, 16	1,100	2,400	37	72	50	14	130	–	?	<5
6-51.1-1-3, 30	1,600	3,500	54	128	80	29	110	–	27	<5
6-51.1-1-4, 16	8,600	2,700	62	107	107	46	180	–	48	<5
6-51.1-1-4, 30	1,700	5,100	54	195	77	28	240	120	40	<5
6-51.1-1-5, 16	1,320	2,900	38	56	43	21	91	–	41	<5
6-51.1-1-6, 16	1,050	2,700	50	78	60	20	340	–	33	<5
6-51.1-2-1, 127	18,700	3,950	37	100	330	250	120	750	140	42
6-51.1-2-2, 8	16,800	3,100	50	80	370	125	215	–	90	26
6-51.1-1-1, 145	17,500	3,750	40	98	340	172	96	630	260	42
6-52.0-1-1, 27	6,400	2,850	54	115	88	32	130	–	49	5
6-52.0-1-2, 30	4,600	6,200	45	115	57	28	155	165	63	13.5
6-52.0-1-2, 8	3,650	3,000	40	86	58	22	225	–	175	<5
6-52.0-1-2, 30	4,300	4,500	53	145	76	31	195	92	43	13
6-52.0-1-3, 8	5,200	4,300	54	120	80	33	160	–	39	6
6-52.0-1-4, 8	4,400	3,300	55	104	77	32	280	–	25	14
6-52.0-1-5, 10	5,800	4,450	60	140	122	92	130	430	28	15
6-52.0-1-6, 9	3,500	3,500	60	110	75	35	225	–	28	5
6-52.0-2-2, 7	5,800	3,700	58	118	82	45	130	–	41	<5
6-52.0-2-3, 7	3,000	4,000	62	128	71	30	195	–	26	<5
6-52.0-2-4, 8	4,700	4,800	30	144	90	32	105	240	28	<10

TABLE 11 – *Continued*

Sample Designation	Mn	Ti	Cr	V	Ni	Co	Zr	Cu	Pb	Mo
6-52.0-2-5, 18	3,400	3,400	46	86	62	38	260	–	23	<5
6-52.0-2-6, 145	6,800	3,400	50	128	80	52	158	–	43	<5
6-52.0-2-6, 145	4,200	5,300	38	180	58	32	450	115	6	<5
6-52.0-2, CC	4,900	4,300	35	140	79	53	210	215	73	<5
6-52.0-3-1, 16	4,600	2,900	37	96	62	38	180	–	28	<5
6-52.0-3-2, 19	7,200	3,670	40	100	70	62	86	320	10	<10
6-52.0-3-3, 16	1,850	2,700	23	54	66	13	190	–	25	<5
6-52.0-3-4, 16	4,900	2,500	32	88	70	18.7	200	–	26	<5
6-52.0-3-5, 7	2,500	3,500	31	104	42	30	205	–	28	<5
6-52.0-3-6, 6	3,100	3,800	37	100	76	31	210	–	28	<5
6-52.0-4-2, 7	3,700	3,500	27	98	50	34	215	–	35	<5
6-52.0-4-3, 5	3,900	4,100	34	145	62	51	175	–	31	<5
6-52.0-4-4, 6	3,500	3,200	25	80	46	29	190	–	28	<5
6-52.0-4-5, 6	1,370	3,900	46	148	60	11	168	–	39	<5
6-52.0-4-6, 18	4,550	3,300	24	95	48	30	185	–	33	<5
6-52.0-4-6, 128	1,500	2,850	29	104	54	6	145	–	31	<5
6-52.0-5-1, 127	9,000	4,650	52	120	125	80	310	–	98	20
6-52.0-5-2, 10	6,300	4,000	36	149	90	53	142	–	36	8
6-52.0-5-2, 17	4,000	3,300	70	98	47	50	69	–	–	<10
6-52.0-5-3, 15	8,200	3,000	40	108	106	64	132	–	31	18
6-52.0-5-3, 18	4,000	2,900	88	85	58	57	62	–	–	10.5
6-52.0-5-4, 18	11,500	3,900	40	152	160	107	204	–	43	43
6-52.0-5-5, 18	4,000	3,400	110	85	78	80	78	–	–	15.5
6-52.0-6-1, 24	9,800	3,900	40	108	150	100	118	600	50	31
6-52.0-6, CC	5,600	4,500	43	190	270	145	270	>500	100	40
6-52.0-7-2, 37	74,000	3,100	105	96	280	115	92	–	–	30
6-52.0-7, CC	2,600	1,150	<10	25	62	16	52	120	5	12
6-52.0-8-1, 145	12,600	2,500	34	80	370	81	142	–	52	27
6-52.0-8-1, 145	9,600	2,300	20	61	310	66	130	250	56	28
6-52.0-8-2, 145	>4,000	2,500	120	70	210	80	90	–	–	13.5
6-52.0-8-2, 145	20,000	2,900	23	110	560	120	170	540	30	37
6-52.0-8-3, 21	12,000	2,900	25	66	290	86	96	800	10	24
6-52.0-8-3, 40	9,200	2,400	20	74	340	70	155	230	24	35
6-52.0-8-4, 145	8,400	1,650	17	43	177	49	70	–	27	20
6-52.0-8-5, 145	8,800	1,700	13	73	300	52	105	860	16	15.5
6-52.0-8-5, 145	4,300	1,400	110	40	118	52	54	–	–	<10
6-52.0-8-6, 145	11,000	2,900	37	106	400	117	155	–	49	24
6-52.0-9, CC	9,800	2,300	29	78	150	61	120	330	37	14.5
6-52.0-10, CC	18,000	4,300	60	150	480	140	210	290	29	43
6-53-0-1-1, 10	1,300	3,200	<40	125	10.5	20	51	–	–	<10

TABLE 11 – *Continued*

Sample Designation	Mn	Ti	Cr	V	Ni	Co	Zr	Cu	Pb	Mo
6-53-0-1-3, 17	1,200	2,400	<40	63	<10	12	51	–	–	<10
6-53.0-2, CC	1,550	2,600	<10	58	<10	15	74	64	19	<10
6-53.0-2, CC	2,000	4,250	<10	168	15	27	61	128	11	<10
6-53.0-2, CC	1,500	6,500	<10	280	12	26	100	100	10	11
6-53.0-3-1, 17	1,180	3,700	<10	147	15	20	55	96	6.6	<10
6-53.0-4-2	1,450	>6,000	<10	145	38	18	66	>1,000	<5	<5
6-53.0-6-2, 65	1,190	510	11	12	38	<10	9	15.5	<10	<5
6-53.0-6, CC	6,400	1,250	<10	<5	560	32	32	100	6.6	<5
6-53.0-6-2, 66	1,800	700	<10	14	38	<10	9	22	<10	<10
6-53.0-7-1, 150	1,350	6,300	145	250	180	35	70	58	11	<10
6-53.0-8, CC	1,000	5,100	20	230	170	49	72	210	34	<5
6-53.1-1-2, 7	12,000	4,950	30	173	96	54	105	700	68	20
6-53.1-1-3, 18	8,000	4,250	38	147	76	40	86	630	58	12
6-53.1-1-5, 18	8,000	3,600	28	130	76	40	65	360	23	11
6-53.1-2-1, 145	6,400	3,700	<10	130	9	17	60	500	12	<10
6-53.1-2-2, 145	2,400	2,200	<10	100	7	17	110	150	23	<5
6-53.1-2-3, 16	>23,000	3,500	<10	140	35	25	107	96	<10	27
6-53.1-2-3, 90	5,400	5,000	<10	180	12.5	21	73	560	12	<10
6-53.1-2-5, 7	3,500	3,750	<10	172	23	29	53	170	19	<10
6-53.1-3-1, 150	22,000	76,000	32	320	44	35	100	450	12	18
6-53.1-3-2, 16	17,000	4,150	<10	186	27	31	68	560	13	26
6-53.1-3-2, 40	12,000	5,400	76	200	31	26	91	310	20	11
6-53.1-3-4, 26	4,200	4,100	<10	210	8	24	56	370	12	<10
6-53.2-1-2, 16	2,500	8,200	<10	127	220	28	70	255	<10	<5
6-53.2-1-4, 7	5,900	5,200	<10	350	23	34	84	740	8	<10
6-53.2-1-6, 7	5,800	4,400	<10	220	23	30	86	740	26	<10
6-53.2-2, CC	1,600	8,400	260	93	135	26	130	76	5	<5
6-53.2-4, CC	3,400	6,400	115	100	110	38	100	250	12	<10
6-53.2-5, CC	3,700	5,700	56	62	163	39	130	270	28	<10
6-54.0-1-1, 5	660	410	<10	17	12	9.4	8	45	<5	<5
6-54.0-1-1, 74	1,900	3,300	<10	82	<10	18	66	65	12	<10
6-54.0-1-2, 7	3,400	3,800	<10	130	7	12	86	125	8.6	<10
6-54.0-1-2, 20	2,100	4,500	<10	140	8	18	77	85	14	9.6
6-54.0-1-2, 20	1,850	2,800	<10	80	34	16	64	90	11	<10
6-54.0-1-3, 35	1,400	3,800	<10	66	<10	16	68	56	11	<10
6-54.0-2-1, 17	1,530	2,700	<10	90	<5	<10	80	300	<10	<5
6-54.0-2-2, 23	1,800	2,500	<10	82	17	19	75	240	<10	<10
6-54.0-2-4, 16	1,460	2,520	<10	80	5	11	86	92	<10	<5
6-54.0-3-1, 140	1,300	1,700	<10	40	5	<5	100	84	<5	<5

TABLE 11 – *Continued*

Sample Designation	Mn	Ti	Cr	V	Ni	Co	Zr	Cu	Pb	Mo
6-54.0-4-1, 108	1750	2,800	<10	53	14	9	81	52	19	<10
6-54.0-4-2, 14	2,300	2,900	<10	58	11	16	86	39	11	<10
6-54.0-6-1, 145	1,150	2,100	<10	42	1.5	7.6	115	62	5	<5
6-54.0-6-2, 16	1,800	2,700	<10	50	<10	14	100	50	<10	<10
6-54.0-6-3, 23	3,200	3,000	<10	73	8	11	92	125	12	<10
6-54.0-6-4, 16	1,600	3,300	<10	72	18	15	87	52	<10	<10
6-54.0-6-4, 78	1,300	2,170	<10	43	<5	<10	78	27	<10	<5
6-54.0-6-5, 17	1,650	3,000	<10	58	12	12	93	33	<10	<10
6-54.0-7-1, 138	4,600	3,500	<10	100	13	20	140	152	6	13
6-54.0-7-2, 34	2,500	2,800	<10	42	35	11	96	27	38	<10
6-54.0-7-3, 16	2,700	3,400	<10	46	<5	<10	13	52	<10	<5
6-54.0-9-1	450	2,300	45	78	125	20	40	25	<10	<5
6-55.0-1-2, 7	660	240	<10	6	7	<10	<5	14	<10	<5
6-55.0-1-2, 30	870	280	<10	13	<5	<5	5.4	18.5	5	<5
6-55.0-1-4, 7	860	350	<10	11	16	<10	7	37	<10	<5
6-55.0-1-6, 7	460	420	<10	11	16	<10	12	20	<10	<5
6-55.0-2-2, 7	<500	<300	<10	6	11	<10	<5	17.5	<10	<5
6-55.0-2-4, 15	<500	240	<10	6	8	<10	<5	<10	<10	<5
6-55.0-2-5, 70	<500	<300	<10	6	5	<10	<5	10	<10	<5
6-55.0-3-1, 16	<500	<300	<10	6	<5	<10	<5	19	<10	<5
6-55.0-3-4, 145	<500	<300	<10	5	5	<10	<5	10	<10	<5
6-55.0-3-4, 145	430	340	<10	5	6	<5	5.2	23	<5	<5
6-55.0-4-1, 13	<500	<300	<10	<5	5	<10	<5	16.5	<10	<5
6-55.0-4-3, 7	<500	<300	<10	5	<5	<10	<5	<10	<10	<5
6-55.0-4-5, 7	<500	<300	<10	<5	<5	<5	<5	<10	<5	<10
6-55.0-5-1, 7	<500	310	<10	<10	<10	40	<5	8	<10	<10
6-55.0-5-5, 7	<500	420	<10	<10	<10	<10	<5	24	16	<10
6-55.0-6-3, 17	680	520	<10	7	9	<5	7	19	<5	<10
6-55.0-7-1, 14	<500	700	11	10	11	<10	9	27	<10	<10
6-55.0-7-5, 19	<500	480	12	10	<10	<10	<5	23	<10	<10
6-55.0-8-3, 16	<500	390	<10	<5	<5	<5	<5	16.5	<5	<10
6-55.0-9, Top	460	760	<10	11	8	<5	28	20	5	<5
6-55.0-10-2, 10	<500	660	18	11	10	<10	9	<10	<10	<10
6-55.0-10-5, 16	<500	730	14	10	<10	<10	12	19.5	<10	<10
6-55.0-11-3, 17	<500	270	<10	<5	<5	<5	<5	14.5	<5	<10
6-55.0-12-1, 13	700	750	<10	9	9	<5	5	39	<5	<10
6-55.0-12-3, 8	<500	310	<10	<10	<10	<10	<5	22	<10	<10
6-55.0-13-1, 7	<500	450	<10	<10	<10	<10	52	<10	<10	<10
6-55.0-13-3, 40	340	3,900	<10	6	<5	<5	4.2	18	<5	<5
6-55.0-13-5, 7	<500	<300	<10	<10	<10	<10	<5	11	<10	<10

TABLE 11 – *Continued*

Sample Designation	Mn	Ti	Cr	V	Ni	Co	Zr	Cu	Pb	Mo
6-55.0-14-2, 145	<500	<300	<10	<10	<10	<10	<5	22	<10	<10
6-55.0-14-5, 145	<500	270	<10	<5	<5	<5	6	37	<5	<10
6-55.0-14-6, 145	<500	310	<10	<10	<10	<10	<5	18.5	<10	<10
6-56.2-1-2, 145	<500	<300	<10	<5	<5	<5	<5	44	<5	<10
6-56.2-1-6, 7	<500	<300	<10	<10	<10	<10	<5	65	<10	<10
6-56.2-2-4, 36	<500	<300	<10	<5	<5	<5	<5	10	<5	<10
6-56.2-3-2, 145	<500	<300	<10	<5	<5	<5	<5	26	<5	<10
6-56.2-3-6, 145	<500	380	<10	<5	<5	<5	<5	52	<5	<10
6-56.2-4-4, 14	<500	330	<10	<5	8	<5	<5	16.5	<5	<10
6-56.2-5-2, 13	<500	550	<10	<5	8	<5	<5	19	<5	<10
6-56.2-5-6, 7	<500	430	<10	<10	<10	<10	<5	10	<10	<10
6-56-2-6-2, 7	<500	1,110	<10	9	6.5	<5	7	32	<5	<10
6-56.2-7-6, 7	<500	510	<10	<5	<5	<5	<5	25	<5	<10
6-56.2-8-4, 7	<500	660	<10	<10	<10	<10	6	9	<10	<10
6-56.2-9-4, 19	480	2,800	<10	15	<10	<10	37	10	<10	<10
6-56.2-10-2, 10	<500	750	<10	<10	<10	<10	36	12.5	<10	<10
6-56.2-10-6, 13	500	3,700	<10	54	<10	<10	155	<10	<10	<10
6-57.1-1-1	<500	<300	<10	<10	<10	<10	<5	<10	<10	<10
6-57.1-1-2, 13	<500	<300	<10	<10	<10	<10	<5	11	<10	<10
6-57.1-1-4, 7	<500	<300	<10	<10	<10	<10	<5	9	<10	<10
6-57.1-1-6, 11	<500	<300	<10	<10	<10	<10	<5	23	<10	<10
6-57.1-3-1, 22	520	1,360	10	27	11	<10	13	18	<10	<10
6-57.1-3-1, 17	1,200	1,050	<10	26	9	<5	16	94	16	<5
6-57.1-4-1, 86	720	2,250	23	76	19	10	15	31	<5	<10
6-57.1-4-3, 14	800	1,770	10	40	13	<10	14	36	<10	<10
6-57.1-4-4, 145	2,800	2,000	17.5	53	12	7.8	24	>500	6	<5
6-58.1-1-1, 139	2,800	3,700	27	89	68	38	64	130	23	<10
6-58.1-1-2, 91	1,140	630	14	12	18	<10	14	27	<10	<10
6-58.1-2-5, 1	1,340	10,500	450	270	188	43	77	120	<10	13
6-58.2-1-2, 16	<500	5,300	27	76	40	20	70	82	<10	<10
6-58.2-1-4, 31	<500	8,100	120	100	125	33	64	120	<10	<10
6-58.2-1-5, 0	2,000	11,500	600	450	220	53	190	145	<5	<5
6-58.2-1-6, 95	1,300	3,800	16	32	13	6	380	50	7	<5
6-59.1-3-1, 130	8,000	7,700	74	165	165	79	170	260	39	<10
6-59.1-3-3, 7	6,800	6,200	39	120	135	63	110	200	28	27
6-59.1-3, CC	8,500	6,400	60	155	195	68	220	400	59	17.5
6-59.2-1-1, 47	2,000	10,800	135	150	125	35	106	138	<10	<10
6-59.2-1-3, 4	2,200	9,700	83	145	90	41	146	190	<10	<10
6-59.2-1, CC	3,500	12,500	200	160	138	35	300	200	5	<5
6-59.2-2-2, 145	1,250	6,600	120	95	80	28	67	172	<10	<10

TABLE 11 – *Continued*

Sample Designation	Mn	Ti	Cr	V	Ni	Co	Zr	Cu	Pb	Mo
6-59.2-2-4, 4	1,730	9,500	138	137	135	39	106	200	25	<10
6-59.2-2-6, 16	1,200	5,800	117	117	112	30	110	120	<10	<10
6-59.2-3, Top	2,100	7,100	100	98	58	24	100	170	13	<5
6-59.2-3-1, 145	2,300	9,000	125	145	100	39	115	180	25	<10
6-59.2-3, CC	2,600	11,500	130	160	240	48	134	230	14	9
6-59.2-4-1, 66	2,200	5,900	105	105	92	34	73	120	<10	<10
6-59.2-4, CC	3,400	12,000	185	170	240	54	140	200	25	9
6-59.2-5-1, 89	4,900	2,650	25	62	195	53	60	250	35	<10
6-59.2-5, CC	6,900	8,600	58	93	390	55	190	200	29	13
6-59.2-6, Top?	1,430	6,000	185	108	69	29	78	–	<5	<5
6-59.2-6, Top	23,000	5,400	50	100	380	87	190	>500	48	15
6-59.2-6, Top	4,600	3,100	16	77	199	62	73	165	40	<10
6-59.2-6, Top	6,200	2,700	15	54	250	58	140	160	61	13
6-59.2-6-2, 0	4,350	5,200	52	105	123	38	110	114	33	<10
6-60.0-1-2, 7	<500	1,550	20	92	25	<10	28	16	<10	<10
6-60.0-1-3, 10	<500	1,230	<10	50	18	<10	25	10	<10	<10
6-60.0-1, CC	340	3,300	98	90	60	17	53	74	<5	<5
6-60.0-2-2, 12	<500	2,300	<10	105	11	<10	38	37	<10	<10
6-60.0-3-1, 117	<500	1,480	<10	54	<10	<10	54	70	<10	<10
6-60.0-3, CC	2,900	4,900	<10	200	14	24	58	>500	32	14
6-60.0-4-1	500	2,160	<10	96	<10	<10	47	34	<10	<10
6-60.0-4-1, 145	1,650	3,300	63?	125	10	15	81	160	30	7
6-60.0-4-2, 145	1,800	4,200	<10	83	<5	11	84	74	14	<5
6-60.0-4, CC	1,500	3,500	<10	80	6	9	115	92	25	<5
6-60.0-5-2, 26	<500	1,270	<10	30	<10	<10	58	16.5	<10	<10
6-60.0-5, CC	1,650	3,900	<10	61	6	11	84	56	10	<5
6-60.0-6-1, 86	<500	2,500	<10	112	<10	11	35	34	23	<10
6-60.0-6-3, 14	510	3,350	<10	120	<10	13	47	37	<10	<10
6-60.0-6-5, 37	<500	2,300	<10	68	<10	<10	65	52	<10	<10
6-60.0-6-7, 90	<500	2,200	<10	34	<10	<10	72	28	<10	<10
6-60.0-7-2, 7	530	2,000	<10	23	<10	10	78	16	<10	<10
6-60.0-8-2, 72	660	3,500	<10	133	<10	11	60	33	<10	<10
6-60.0-9-2, 145	660	4,200	<10	148	11	12	60	37	<10	<10

TABLE 12
Results of the Analysis of Fe_2O_3, TiO_2, and MnO (%)

Sample Designation	Fe_2O_3	TiO_2	MnO	Sample Designation	Fe_2O_3	TiO_2	MnO
44.0-1-1, 145	0.26		0.02	47.2-2-3, 7	1.12	Tr.	0.06
44.0-1-2, 145	0.26		0.02	47.2-2-5, 5	1.28	Tr.	0.06
44.0-1-3, 145	0.22		0.02	47.2-3-CC	0.96	0.06	0.06
44.0-1-3, Mixed	0.19		0.02	47.2-3-2, 6.5	1.79	Tr.	0.05
44.0-1-3, 145	0.19		0.02	47.2-3-4, 16	1.28	Tr.	0.07
44.0-1-4, 145	0.38		0.02	47.2-4-CC	1.02		0.07
44.0-2-CC	0.25	0.00	0.03	47.2-4-2, 17	0.70	Tr.	0.07
44.0-2-1, 145	0.45		0.02	47.2-4-4, 16.5	1.28	Tr.	0.06
44.0-2-2, 145	0.19		0.02	47.2-4-6, 17	0.80	0.08	0.09
44.0-2-3, 145	0.32		0.02	47.2-5-2, 6	0.83	Tr.	0.08
44.0-2-4, 145	0.26		0.03	47.2-5-4, 6	1.75	0.13	0.10
44.0-2-5, 145	0.26		0.02	47.2-5-6, 6.5	1.15	0.08	0.09
44.0-2-6, 145	0.26		0.02	47.2-6-3, 17	0.96	0.10	0.10
44.0-3-CC	0.77	0.00	0.09	47.2-7-2, 17	0.32	Tr.	0.06
44.0-3-CC	0.76	0.00	0.10	47.2-7-4, 17	0.38	Tr.	0.06
44.0-3-2, 145	0.26		0.03	47.2-7-6, 126	0.45	Tr.	0.06
44.0-3-3, 145	0.26		0.03	47.2-8-1, 150	0.31	0.00	0.05
44.0-3-4, 145	0.26		0.03	47.2-8-2, 17	0.32		0.05
44.0-3-5, 145	0.26		0.03	47.2-8-4, 17	0.39	Tr.	0.03
44.0-4-CC	0.25	0.00	0.03	47.2-8-6-CC	0.70	0.00	0.05
44.0-4-0, Top	0.60		0.03	47.2-8-6, 16	0.29	Tr.	0.03
44.0-4-0, Top	0.66		0.04	47.2-9-CC	0.77	0.00	0.11
44.0-4-2, 145	0.45		0.03	47.2-9-2, 17	0.38		0.05
44.0-4-3, 145	0.26		0.02	47.2-9-4, 0	0.26	0.0	0.05
44.0-4-4, 145	0.19		0.03	47.2-9-5, 17	0.38	Tr.	0.05
44.0-4-5, 145	0.32		0.05	47.2-9-5, 150	0.32		0.04
44.0-4-6, 145	0.26		0.03	47.2-9-6, 0	0.32	0.00	0.06
44.0-5-0,	4.12		0.09	47.2-10, Top	0.22	0.00	0.04
45.1-1-2, 100	11.55	1.57	1.31	47.2-10-CC	0.57	0.00	0.07
45.1-1-2, 124	12.44	2.36	0.18	47.2-10-1, 17	0.32		0.03
45.1-1-3, 23	12.19	2.32	0.15	47.2-10-3, 18	0.26		0.03
45.1-1-4, 22	12.57	2.29	0.16	47.2-10-5, 17	0.57	Tr.	0.11
45.1-1-4, 136	7.85	1.41	0.12	47.2-11-CC	0.31	0.00	0.02
45.1-1-5, 4	10.65	2.00	0.22	47.2-11, 145	1.27	0.06	0.10
45.1-2-CC	3.25	0.38	0.45	47.2-11-1, 145	0.26		0.02
45.1-2-CC, Total	3.13	0.34	0.31	47.2-11-3, 145	0.31	0.00	0.03
46.0	1.34	Tr.	0.02	47.2-11-4, 145	0.26	0.00	0.03
46.0-1-2, 145	7.50	0.77	0.62	47.2-11-5, 145	0.26		0.03
46.0-1-6,	1.08	0.13	Tr.	47.2-11-6, 145	0.32	0.00	0.02
46.0-1-5, 145	5.68	0.48	0.31	47.2-12-CC	0.22	0.00	0.02
47.0-1-2, 5	3.99	0.34	0.03	47.2-12-1, 145	0.26		0.02
47.0-1-4, 95	2.55	0.27	0.05	47.2-12-3, 145	0.26		0.02
47.1, Top	0.96	0.00	0.09	47.2-13-CC	0.31	0.00	0.02
47.2-1-3, 11	2.23	0.21	0.06	47.2-13-1, 145	0.26		0.02
47.2-1-4, 7	2.04	0.16	0.05	47.2-13-3, 16	0.26		0.02
47.2-2-1, 145	0.22	0.00	0.02	47.2-13-4, 145	0.26	Tr.	0.03

TABLE 12 – *Continued*

Sample Designation	Fe_2O_3	TiO_2	MnO	Sample Designation	Fe_2O_3	TiO_2	MnO
47.2-13-5, 145	0.32	0.00	0.03	51.1-1-1, 15	6.54	0.59	1.01
47.2-14-CC	0.25	0.00	0.02	52.0-6-CC	7.72	0.64	1.12
47.2-14-1, 145	0.26	0.00	0.02	52.0-7-CC	1.91	0.11	0.37
47.2-14-2, 145	0.26		Tr.	53.0-2-CC	8.48	0.76	0.14
47.2-14-3, 145	0.26	0.00	0.02	53.0-4-2	10.21	0.61	0.10
47.2-14-5, 145	0.26		0.02	53.0-6-CC	2.42	0.16	0.48
48.1-1, 28	0.80	Tr.	0.07	53.0-8-CC	8.49	1.16	0.07
48.1-1-1, 26	1.85	0.16	0.15	53.1-2-2, 145	6.19	0.50	0.18
48.2-1-CC	0.31	0.00	0.03	53.1-3-1, 150	9.57	0.70	1.62
48.2-1-3, 16	1.08	0.06	0.07	54.0-1-1, 5	1.47	Tr.	0.11
48.2-1-5, 14.5	0.99	0.06	0.07	54.0-3-1, 140	4.15	0.45	0.14
48.2-2-CC	0.25	0.00	0.01	54.0-6-1, 145	5.10	0.48	0.14
48.2-2-4, 18	0.26		0.02	54.0-12, 20	6.70	0.53	0.13
48.2-3-4, 17	0.26	Tr.	0.02	55.0-1-2, 30	0.89	0.00	0.10
49.0-1-1, 76	4.47	0.42	0.20	55.0-3-4, 145	0.45	Tr.	0.02
49.0-1-6, 7	7.18	0.66	1.15	55.0-9, Top	0.89	Tr.	0.03
49.1-1-5, 60	5.49	0.56	0.14	55.0-13-3, 40	0.45	0.00	0.03
49.1-2-1, 145	1.12		0.16	57.1-3-1, 148	1.60	0.16	0.10
50.0-2-1, 145	1.72	Tr.	0.11	57.1-4-4, 145	2.49	0.24	0.12
50.0-2-2, 150	1.60	0.08	0.14	58.2-1-6, 95	8.04	0.99	0.15
50.0-2-3, 150	7.50	0.59	0.23	59.2-3-CC	10.85	1.57	0.35
50.0-2-4, 150	1.02	Tr.	0.10	59.2-5-CC	6.83	1.00	0.43
50.0-2-6, 150	1.44	Tr.	0.13	59.2-6, Top	5.30	0.51	0.83
50.1-1-3, 7	5.23	0.48	0.31	60.0-3-CC	9.00	0.75	0.15
50.1-1-5, 17	4.72	0.45	0.16	60.0-4-CC	7.46	0.64	0.16
50.1-2-1, 130	6.38	0.48	0.37	60.0-4-CC	7.43	0.64	0.17
50.1-2-3, 35	6.48	0.56	0.45	60.0-4-1, 145	6.54	0.51	0.18
50.1-3-3, 15	6.76	0.66	0.87	60.0-4-2, 145	6.57	0.64	0.15
51.0-1-CC	7.15	0.58	1.70	60.0-5-CC	5.61	0.50	0.20

TABLE 13
Results of Analysis of Calcium Oxide and Magnesium Oxide

Sample Designation	CaO (%)	MgO (%)	CaO/MgO	Sample Designation	CaO (%)	MgO (%)	CaO/MgO
44.0-0-3, 50	54.88	0.08	686.00	47.2-5-4, 6	45.76	0.19	240.84
44.0-1-1, 145	54.96	NIL		47.2-5-6, 6.5	48.64	0.12	405.33
44.0-1-2, 145	55.12	NIL		47.2-6-3, 17	49.40	0.16	308.75
44.0-1-3, 145	54.80	0.10	548.00	47.2-7-2, 17	55.04	0.13	423.38
44.0-1-3, Mixed	54.72	NIL		47.2-7-4, 17	53.92	0.13	414.77
44.0-1-4, 145	54.64	0.10	546.40	47.2-7-6, 126	53.88	0.14	384.86
44.0-2-CC	55.28	0.06	921.33	47.2-8-2, 17	54.88	0.25	219.52
44.0-2-1, 145	55.28	NIL		47.2-8-4, 17	55.20	0.24	230.00
44.0-2-2, 145	54.44	NIL		47.2-8-6, 16	54.56	0.07	779.43
44.0-2-3, 145	54.96	0.10	549.60	47.2-8-6	54.36	0.10	543.60
44.0-2-4, 145	55.00	0.07	785.71	47.2-9-CC	52.20	0.10	522.00
44.0-2-5, 145	54.88	NIL		47.2-9-1	54.44	NIL	
44.0-2-6, 145	54.88	NIL		47.2-9-2, 17	55.28	0.10	552.80
44.0-3-CC	43.12	NIL		47.2-9-4, 0	54.68	NIL	
44.0-3-2, 145	55.16	NIL		47.2-9-5, 17	54.36	0.16	339.75
44.0-3-3, 145	55.40	NIL		47.2-9-5, 150	53.80	NIL	
44.0-3-4, 145	55.20	NIL		47.2-9-6, 0	53.88	NIL	
44.0-3-5, 145	47.68	NIL		47.2-10, Top	54.88	NIL	
44.0-4-0, Top	54.88	0.09	609.78	47.2-10-CC	53.72	0.12	447.67
44.0-4-CC	54.36	0.12	453.00	47.2-10-1, 17	54.68	0.16	341.75
44.0-4-CC	54.32	0.14	388.00	47.2-10-3, 18	54.24	0.12	452.00
44.0-4-2, 145	55.00	NIL		47.2-10-5, 17	54.04	0.13	415.69
44.0-4-3, 145	55.08	NIL		47.2-11-CC	54.96	0.06	916.00
44.0-4-4, 145	54.60	NIL		47.2-11-1, 145	54.64	0.25	218.56
44.0-4-5, 145	55.28	0.09	614.22	47.2-11-3, 145	54.20	0.10	542.00
44.0-4-6, 145	54.24	NIL		47.2-11-4, 145	54.80	0.06	913.33
44.0-5-0	46.56	0.09	517.33	47.2-11-5, 145	55.68	0.16	348.00
45.1-1-3, 23	0.64	2.63	0.24	47.2-11-6, 145	55.20	0.06	920.00
45.1-1-4, 22	0.60	2.66	0.23	47.2-12-CC	55.20	0.07	788.57
45.1-1-5, 4	6.06	3.06	1.98	47.2-12-1, 145	54.56	0.16	341.00
47.0-1-5, 3.5	40.48	0.98		47.2-12-3, 145	55.20	0.12	460.00
47.1, Top	52.76	0.09	586.22	47.2-13-CC	55.56	0.08	694.50
47.1-1-1, 145	48.24	0.20	241.20	47.2-13-CC	55.60	0.07	794.29
47.2-1-3, 11	40.40	0.16	252.50	47.2-13-1, 145	54.44	0.16	340.25
47.2-1-4, 7	41.96	0.30	139.87	47.2-13-3, 16	54.72	0.19	288.00
47.2-2-3	47.76	0.43	111.07	47.2-13-4, 145	54.44	0.16	340.25
47.2-2-5, 5	47.68	0.17	280.47	47.2-13-5, 145	54.92	0.09	610.22
47.2-3-2, 6.5	43.48	0.43	88.73	47.2-14-CC	55.20	0.13	424.62
47.2-3-4, 16	48.24	0.31	155.61	47.2-14-1, 145	55.12	NIL	
47.2-4-CC	48.60	0.19	255.79	47.2-14-2, 145	54.44	0.17	320.24
47.2-4-2, 17	52.08	0.06	868.00	47.2-14-3, 145	55.08	0.07	786.86
47.2-4-4, 76.5	48.00	0.23	208.70	47.2-14-5, 145	55.08	0.13	423.69
47.2-4-6, 17	51.24	NIL		48.2-1-CC	53.20	0.13	409.23
47.2-5-2, 6	51.04	0.07	729.14	48.2-1-5, 14.5	47.88	0.22	217.64

TABLE 13 – *Continued*

Sample Designation	CaO (%)	MgO (%)	CaO/MgO	Sample Designation	CaO (%)	MgO (%)	CaO/MgO
48.2-2-CC	55.48	0.12	452.33	55.0-13-5, 7	53.76	NIL	
48.2-2-1, 145	54.56	0.12	454.67	57.1-1-1, 10	52.16	0.27	
48.2-2-4, 18	54.48	0.14	389.14	57.1-1-2, 13	53.76	NIL	
48.2-2-6, 16	54.72	0.24		57.1-1-4, 7	52.72	0.25	
48.2-3-2, 28	54.48	NIL		57.1-1-6, 11	53.52	0.82	
49.1-1-5, 60	4.59	0.26	17.65	57.1-3-1, 17	48.56	0.30	161.87
50.0-2-1, 145	44.96	0.28	160.57	57.1-3-4, 22	48.08	0.78	
50.0-2-2, 150	44.32	0.19	233.26	57.1-41, 86	40.32	1.55	
50.0-2-3, 150	1.96	0.51	3.84	57.1-4-3, 14	45.12	0.83	
50.0-2-4, 150	34.32	1.65	20.80	57.1-4-4, 145	44.40	0.79	562.03
50.0-2-6, 150	28.80	0.13	221.54	58.1-1-2, 91	53.28	1.13	
52.0-1-5, 10	1.08	2.38		58.2-1-2, 16	36.32	1.29	
52.0-2-6, 145	0.64	2.54		58.2-1-4, 31	20.84	2.77	
52.0-3-2, 19	0.64	2.03		58.2-1-5, 0	7.06	3.80	
52.0-7-CC	0.54	0.27	2.00	58.2-1-5, 1	6.40	4.06	
53.0-1-2, 144	1.96	1.54		59.2-1-3, 4	0.72	2.09	
53.0-2-CC	2.76	1.59		59.2-2-2, 145	0.88	2.38	
53.0-3-1, 17	2.28	1.94		59.2-4-1, 66	1.44	NIL	
53.0-6-2, 65	45.68	1.01		59.2-5-1, 89	3.16	2.19	
53.0-6-CC	36.64	2.64	13.88	59.2-6-Top	2.68	2.86	
53.1-2-1, 145	2.64	0.70		60.0-1-2, 7	36.00	1.01	
53.1-2-2, 145	2.48			60.0-1-3, 10	34.80	0.25	
53.1-2-5, 7	1.84	0.93		60.0-1-CC	18.88	1.72	10.98
53.1-3-1, 150	1.96	0.67	2.93	60.0-2-2, 12	15.52	1.43	
53.1-3-2, 16	1.88	1.38		60.0-3-1, 117	1.74	0.71	
53.1-3-4, 26	1.24	0.90		60.0-3-CC	4.82	1.00	4.82
53.2-1-4, 7	3.16	0.77		60.0-4-1, 145	6.28	1.10	
53.2-1-6, 7	2.18	0.88		60.0-4-CC	2.28		
54.0-1-1, 5	44.80	0.20	224.00	60.0-4-2, 145	2.18	0.32	6.81
54.0-3-1, 140	7.48	0.32	23.38	60.0-5-2, 26	3.50	0.46	
54.0-6-1, 145	1.48	0.18	8.22	60.0-5-CC	3.46	0.34	
55.0-3-4, 145	54.20	0.23	235.65	60.0-6-1, 86	4.12	1.35	
55.0-4-5, 7	53.68	0.36		60.0-6-3, 14	6.28	0.84	
55.0-9, Top	49.28	0.26	189.54	60.0-6-5, 37	2.32	0.35	
55.0-11-3, 17	51.92	0.27		60.0-6-7, 40	2.16	0.58	
55.0-12-3, 8	48.90	0.54		60.0-7-2, 7	3.24	0.33	
55.0-13-1, 7	51.20	0.27		60.0-8-2, 72-73	2.34	1.30	
55.0-13-3, 40	52.96	0.14	378.29	60.0-9-2, 45	2.12	1.22	

TABLE 14
Alkaline Elements as Determined by Flame Photometry

Sample Designation	Na%	K%	Li n.10^{-3}%	Rb n.10^{-3}%	Cs-HO n.10^{-3}%
44.0-1-2, 145	0.340	0.7000			
44.0-1-1, 145	0.650	0.0100			
44.0-1-3, 50	0.250	0.0500		0.00050	
44.0-1-3, 145	0.250	0.0600			
44.0-1-3, Mixed	0.350	0.1100			
44.0-1-4, 145	0.330	0.1500			
44.0-2-CC	0.200			0.00080	
44.0-2-1, 145	0.200	$<$0.0500			
44.0-2-3, 145	0.320	$<$0.0500			
44.0-2-4, 145	0.380	$<$0.0500			
44.0-2-5, 145	0.350	0.5000	0.00010	$<$0.00025?	
44.0-2-6, 145	0.370	0.0500	0.00010	0.00070	
44.0-3-2, 145	0.300	0.1900		$<$0.00025?	
44.0-3-3, 145	0.300	0.1000			
44.0-3-4, 145	0.270	0.0500			
44.0-3-5, 145	0.270	0.2000			
44.0-4-0, Top	$<$0.050	0.7500	0.00025	0.00300	
49.0-4-2, 145	0.250	0.2000			
44.0-4-3, 145	0.300	$<$0.0500			
44.0-4-4, 145	0.350	0.1100			
44.0-4-5, 145	0.370	0.0500			
44.0-4-6, 145	0.300	0.1500			
44-0-4-CC	0.120	0.6200		$<$0.00050	
44.0-5-0, Total	0.310	0.1000			
44.1-1-CC	1.500	0.9100	0.00500	0.00500	
45.1-1-1, 7	2.500	1.4000	0.00490	0.00960	0.00050
45.1-1-1, 70	1.820	0.9000	0.00500	0.00400	
45.1-1-1, 145	1.600	1.2500	0.00430	0.00590	
45.1-1-2, 100	1.810	1.1500	0.00480	0.00760	
45.1-1-2, 124	1.500	0.7000	0.00330	0.00330	
45.1-1-3, 23	1.500	0.9500	0.00340	0.00450	
45.1-1-4, 22	1.200	0.8000	0.00290	0.00370	
45.1-1-4, 136	0.950	0.4800	0.00320	0.00190	
45.1-3-CC	0.050	0.2000	0.00300	0.00470	
45.1-1-5, 4	0.930	0.5000	0.00290	0.00210	
46.0-1-6	0.140	0.3400	0.00200	0.00360	
46.0-1-1, 145	1.800	1.1500	0.00530	0.01520	0.00130
46.0-1-2, 145	1.210	1.3500	0.00590	0.01550	0.00120
46.0-1-3, 145	1.920	1.1100	0.00450	0.00900	
46.0-1-4, 145	1.530	1.2100	0.00500	0.01500	0.00100
46.0-1-5, 145	1.000	1.1000	0.00240	0.01180	0.00080
46.0-1-6, 145	1.980	1.2500	0.00500	0.01180	0.00110
46.1-2-CC	1.290	2.1400	0.00200	0.00360	
47.0-1-1, 17	0.760	0.4900			
47.0-1-2, 5	0.600	0.3700	0.00230	0.00640	0.00050
47.0-1-3, 16	0.570	0.4000	0.00200	0.00760	$<$0.00050
47.0-1-4, 90	0.660	0.1900			
47.0-1-4, 95	1.500	1.1300	0.00160	0.00440	
47.0-1-5, 3.5	0.370	0.2000	0.00300	0.00410	

TABLE 14 – *Continued*

Sample Designation	Na%	K%	Li n.10^{-3}%	Rb n.10^{-3}%	Cs-HO n.10^{-3}%
47.0-1-6, 14	0.530	0.2200			
47.1-1, Top of Section 1	0.370	0.2300	<0.00050	0.00140	
47.1-1-1, 145	0.500	0.1000	0.00050	0.00220	
47.1-1-2, 16	0.2900	0.0600	0.00050		
47.2-1-2, 23	0.7900	0.4500			
47.2-1-2, 181	0.8000	0.3600			
47.2-1-3, 11	0.5000	0.2700	0.00125	0.00470	
47.2-1-3, 90	0.5000	0.3300			
47.2-1-4, 7	0.5000	0.2500	0.00110	0.00720	
47.2-2-2 8	0.6000	0.3000			
47.2-2-2, 47	1.3500	0.9400	0.00130	0.00330	
47.2-2-3, 7	0.4700	0.2100	0.00070	0.00400	
47.2-2-4, 7	0.7000	0.2690			
47.2-2-5, 5	0.4700	0.1900	0.00065	0.00320	
47.2-2-6, 6	0.5000	0.1200			
47.2-3-2, 6.5	0.5000	0.2500	0.00160	0.00700	
47.2-3-3, 6	0.7000	0.3000			
47.2-3-4, 16	0.4000	0.1200	0.00500	0.00170	
47.2-3-CC	0.8500	0.3300	0.00040	<0.00050	
47.2-4-CC	1.7000	0.2400	0.00050	0.00100	
47.2-4-1, 16	0.6500	0.3200			
47.2-4-2, 17	0.4000	0.1000	0.00025	0.00220	
47.2-4-3, 16	0.3000	0.0700	<0.00050		
47.2-4-4, 16.5	0.4000	0.1700	0.00080	0.00250	
47.2-4-5, 16.5	0.3300	0.1300	0.00050		
47.2-4-6, 17	0.3300	0.2500	0.00026	0.00240	
47.2-5-1, 17	0.3800	0.0900	<0.00050		
47.2-5-2, 6	0.4000	<0.0500	0.00050		
47.2-5-3, 6	0.3000	0.1200	0.00010	0.00050	
47.2-5-4, 6	0.4000	0.1000	0.00060	0.00100	
47.2-5-5, 6	0.4900	0.1400			
47.2-5-6, 6.5	0.4000	0.1700	0.00070	0.00200	
47.2-6-2, 6	0.6000	0.1900			
47.2-6-3, 17	0.4000		0.00065	0.00200	
47.2-7-1, 17	0.5000	0.3600			
47.2-7-2, 17	0.2000	0.0500		<0.00050	
47.2-7-3, 13	0.3500	0.1600		0.00083	
47.2-7-4, 17	0.2500	<0.1000		0.00070	
47.2-7-5, 27.5	0.2700	0.1000		0.00180	
47.2-7-6, 126	0.3000	0.0700		0.00500	
47.2-8-1, 27	0.2300	<0.0500			
47.2-8-2, 17	0.2000	<0.0500			
47.2-8-3, 18	0.2100	<0.0500			
47.2-8-4, 17	0.2500	0.0600	<0.00050		
47.2-8-5, 17	0.2200	0.0500			
47.2-8-6, 16	0.2200	0.0600		<0.0005	
47.2-8-6-CC	0.4500	0.0750			
47.2-9-1, 16	0.2300	<0.0500			
47.2-9-2, 17	0.2200	0.0500		<0.0005	

TABLE 14 – *Continued*

Sample Designation	Na%	K%	Li n.10^{-3}%	Rb n.10^{-3}%	Cs-HO n.10^{-3}%
47.2-9-3, 17	0.280	0.0900		0.00180	
47.2-9-4, 0	0.200	0.1000		0.00070	
47.2-9-5, 17	0.210	0.0700			
47.2-9-5, 150	0.200	3.8000		0.00080	
47.2-9-6, 0	0.250	0.3000		0.00050	
47.2-9-CC	0.200	0.1000	0.00010	0.00090	
47.2-10-1, 17	0.220	0.0500			
47.2-10-2, 17	0.250	<0.0900		0.00083	
47.2-10-3, 18	0.250	0.0500			
47.2-10-4, 17	0.270	0.0900		<0.00050	
47.2-10-5, 17	0.300	0.0500	0.00250	0.00060	
47.2-10-6, 16	0.290	<0.0500			
47.2-10-CC	0.200	<0.1000		0.00060	
47.2-10-Top	0.220	<0.1000		0.00050	
47.2-11-1, 145	0.340	0.0500			
47.2-11-2, 145	0.320	<0.0500			
47.2-11-3, 145	0.260	<0.1000		<0.00050	
47.2-11-4, 145	0.100	<0.1000		0.00060	
47.2-11-5, 145	0.270	0.2000			
47.2-11-6, 145	0.100	<0.1000		0.00070	
47.2-11-CC	0.380	0.1300		0.00050	
47.2-12-1, 145	0.580	2.3700		<0.00050	
47.2-12-2, 17	0.210	0.1100		0.00075	
47.2-12-4, 145	0.280	<0.0500			
47.2-12-CC	0.600	0.2000		<0.00050	
47.2-13-1, 145	0.470	0.1600		0.00050	
47.2-13-2, 145	0.260	0.0300			
47.2-13-3, 16	0.250	<0.0500			
47.2-13-4, 145	0.250	0.1000	<0.0005		
47.2-13-5, 145	0.250	<0.1000		<0.00040	
47.2-13-6, 145	0.230	<0.0500			
47.2-13-CC	0.550	0.1300			
47.2-14-1, 145	0.300	<0.1000		0.00050	
47.2-14-2, 145	0.220	<0.0500		<0.00050	
47.2-14-3, 145	0.300	<0.1000			
47.2-14-4, 145	0.240	<0.0500			
47.2-14-5, 145	0.270	0.0500		<0.00050	
47.2-14-6, 145	0.240	0.0900		0.00180	
47.2-14-CC	0.550	0.4500		<0.00050	
48.1-1-1.26	0.450	0.2700	0.00080	0.00400	
48.2-1-CC	1.020	0.1300	0.00030	0.00050	
48.2-1-1, 28	0.400	<0.1000	0.00050	0.00016	
48.2-1-2, 33	0.550	0.0900			
48.2-1-3, 16	0.500	0.2500	0.00075	0.00250	
48.2-1-4, 16	0.600	0.1900			
48.2-1-5, 14.5	0.510	0.1700	0.00090	0.00250	
48.2-1-6, 11	0.270	0.0200			
48.2-2-1, 145	0.300	<0.1000		0.00140	
48.2-2-2, 17	0.250	0.1000			

TABLE 14 – *Continued*

Sample Designation	Na%	K%	Li n.10^{-3}%	Rb n.10^{-3}%	Cs-HO n.10^{-3}%
48.2-2-3, 145	0.270	0.0200			
48.2-2-4, 18	0.300	<0.0500			
48.2-2-5, 16	0.280	0.0300			
48.2-2-6, 16	0.400	0.3000		<0.00050	
48.2-2-CC	0.540	0.0075		0.00030	
48.2-3-1, 117	0.290	0.0200			
48.2-3-2, 28	0.250	<0.0500			
48.2-3-3, 17	0.230	0.0300			
48.2-3-4, 17	0.260	0.0700			
48.2-3-5, 16	0.250	0.0200			
49.0-1-1, 76	0.770	0.5700	0.00320	0.01720	0.00140
49.0-1-3, 16	1.600	1.2000	0.00670	0.02200	0.00220
49.0-1-5, 7	1.000	0.8300	0.00600	0.02100	0.00200
49.0-1-5, 130	<0.050	0.0500	0.00070	0.00350	
49.0-1-6, 7	1.700	0.8200	0.00700	0.01830	0.00190
49.1-1-2, 16	1.200	0.2700	0.00700	0.01100	0.00180
49.1-1-3, 22	1.100	1.2500	<0.00400	0.01300	0.00110
49.1-1-4, 117	0.470	0.3700	0.00260	0.00550	<0.00050
49.1-1-5, 60	1.500	0.9600	0.00080	0.00280	
49.1-2-CC	<0.050	0.1000	0.00110	0.00390	
49.1-2-1, 145	0.300	0.1600	<0.00050	0.00130	
49.1-2-3, 145	0.370	0.2200	0.00090	0.00370	
50.0-2-CC	<0.050	<0.0500	0.00080	0.00310	
50.0-2-1, 145	0.420	0.1500	0.00110	0.00100	
50.0-2-2, 150	0.430	0.1700	0.00060	0.00350	
50.2-3, 150	1.650	0.9600	0.00120	0.00280	
50.0-2-4, 150	0.850	<0.1000	0.00080	0.00220	
50.0-2-6, 150	0.340	0.1700	0.00060	0.00300	
50.1-1-3, 7	0.870	0.9200	0.00390	0.01550	0.00170
50.1-1-5, 15	0.720	0.5700	0.00320	0.00900	0.00090
50.1-2-1, 130	0.850	0.5700	0.00420	0.01120	0.00050
50.1-2-3, 35	1.440	1.0300	0.00500	0.01300	0.00120
50.1-2-4, 50	2.340	1.1900	0.01090	0.01390	0.00053
50.1-2-5, 8	1.270	1.0200	0.00750	0.01580	0.00050
50.1-3-3, 15	1.100	0.9000	0.00560	0.01450	0.00130
50.1-3-5, 28	0.970	1.2500	0.00700	0.01730	0.00130
51.0-1-1, 11	1.300	1.0500	0.00700	0.01750	0.00150
51.0-1-3, 6	1.400	0.3000	0.00570	0.01430	0.00160
51.0-1-5, 15	0.800	1.2000	0.00700	0.01270	0.00100
51.0-2-CC	3.860	1.4000	0.00460	0.01210	0.00080
51.1-1, 145	0.750	1.2500	0.00530	0.01080	0.00080
51.1-1-1, 15	1.250	1.1700	0.00610	0.01000	
51.1-1-3, 30	0.920	0.9200	0.00520	0.00710	0.00050
51.1-1-4, 30	2.720	1.7200	5.05000	12.10000	0.00010
51.1-1-5, 16	0.910	0.9700	0.00400	0.01030	0.00100
51.1-2-1, 127	0.810	1.1700	0.00600	0.01100	0.00100
52.0-1-1, 27	1.110	1.0200	0.00550	0.01470	0.00110
52.0-1-3, 8	0.950	0.9700	0.00600	0.01430	0.00125
52.0-1-5, 10	1.000	0.7200	0.00530	0.00690	<0.00050

TABLE 14 – *Continued*

Sample Designation	Na%	K%	Li n.10^{-3}%	Rb n.10^{-3}%	Cs-HO n.10^{-3}%
52.0-2-CC	1.620	1.2400	0.00520	0.00100	
52.0-2-2, 7	1.020	1.0200	0.00560	0.01620	0.00230
52.0-2-4, 8	1.350	1.3500	0.00480	0.00690	0.00050
52.0-3-2, 19	1.000	0.8700	0.00620	0.01000	0.00070
52.0-3-4, 16	1.000	0.7500	0.00950	0.00600	<0.00050
52.0-3-6, 6	0.600	0.6500	0.00650	0.00360	
52.0-4-3, 5	1.080	0.8000	0.00650	0.01480	0.00130
52.0-4-5, 6	1.200	0.9000	0.00550	0.01040	0.00070
52.0-4-6, 128	0.920	0.7000	0.00580	0.01150	0.00100
52.0-5-2, 14	1.470	0.6500	0.00580	0.01200	0.00180
52.0-5-3, 15	1.400	0.7800	0.00640	0.00840	0.00070
52.0-5-4, 18	1.100	0.9200	0.00560	0.00670	0.00050
52.0-6-CC	1.000	1.2500	0.00490	0.00360	
52.0-6-1, 24	1.100	1.0000	0.00670	0.01210	0.00080
52.0-7-CC	0.500	1.3300	0.00100	0.00200	
52.0-8-1, 145	0.920	0.7200	0.00420	0.00900	0.00100
52.0-8-2, 145	1.300	0.9000	0.00320	0.00950	0.00050
52.0-8-3, 21	1.400	0.9000	0.00430	0.01090	0.00070
52.0-8-3, 40	1.000	0.8100	0.00250	0.00680	0.00050
52.0-8-4, 145	0.750	0.5200	0.00260	0.00980	0.00100
52.0-8-5, 145	0.960	0.7100	0.00230	0.00660	0.00050
52.0-8-6, 145	1.200	1.0000	0.00380	0.01050	0.00090
52.0-10-CC	1.000	1.5100	0.00580	0.01700	0.00140
53.0-1-2, 144	1.150	0.8500	0.00230	0.00360	
53.0-2-CC	1.050	0.5000	0.00300	0.00230	
53.0-3-1, 17	0.900	0.3100	0.00260	0.00200	
53.0-4-2, 0	1.130	1.5500	0.00340	0.00460	
53.0-6-2, 65	0.150	0.3700	<0.00050	0.00080	
53.0-6-CC	0.500	0.7300	0.00160	0.00075	
53.1-1-2, 7	1.400	0.7200	0.00540	0.00590	
53.1-1-3, 18	1.250	0.6500	0.00480	0.00690	0.00050
53.1-1-5, 18	1.200	0.2500	0.00230	0.00200	
53.1-2-1, 145	1.350	0.7200	0.00110	0.00570	
53.1-2-2, 145	1.100	2.6000	0.00080	0.00360	
53.1-2-3, 90	1.120	0.6500	0.00130	0.00400	
53.1-2-5, 7	1.400	0.7200	0.00150	0.00450	
53.1-3-1, 150	1.300	0.6500	0.00200	0.00190	
53.1-3-2, 16	1.100	0.5500	0.00130	0.00340	
53.1-3-4, 26	1.120	0.6500	0.00120	0.00370	
53.2-1-2, 16	1.100	0.5200	0.00175	0.00280	
53.2-1-4, 7	0.800	0.5000	0.00120	0.00170	
53.2-1-6, 7	1.100	0.6000	0.00130	0.00340	
53.2-4-CC	1.040	0.4600	0.00010	0.00020	
53.2-5-CC	1.140	0.8500	0.00090	0.00100	
54.0-1-1, 5	0.300	0.1800	0.00070	0.00230	
54.0-1-2, 7	1.150	0.7200	0.00180	0.00390	
54.0-1-2, 20	1.050	0.6500	0.00180	0.00440	
54.0-2-1, 17	0.970	0.4200	0.00110	0.00230	
54.0-2-4, 16	0.850	0.5000	0.00110	0.00370	<0.00050

TABLE 14 – *Continued*

Sample Designation	Na%	K%	Li n.10^{-3}%	Rb n.10^{-3}%	Cs-HO n.10^{-3}%
54.0-4-2, 14	1.100	0.6100	0.00150	0.00300	
54.0-6-3, 23	1.090	0.6200	0.00170	0.00260	
54.0-6-4, 78	1.000	0.5500	0.00240	0.00300	0.00050
54.0-7-1, 138	1.100	0.6800	0.00120	0.00270	
54.0-7-3, 16	1.100	0.6700	0.00120	0.00280	<0.00050
54.0-9-1	0.350	0.1000	0.00100	0.00050	
55.0-1-2, 7	0.700	<0.1000	0.00025	0.00080	
55.0-1-4, 7	0.400	>2.0000	0.00060	0.00060	
55.0-1-6, 7	0.380	0.0500	0.00050	0.00090	
55.0-2-1, 7	0.032	0.0030			
55.0-2-2, 7	0.340	0.1100	<0.00050	<0.00050	
55.0-2-3, 16	0.037	0.0080			
55.0-2-3-CC	1.540	0.7200	0.00050	0.00040	
55.0-2-4, 15	0.340	0.0600	<0.00050		
55.0-2-5, 70	0.420	0.2200	<0.00050	0.00050	
55.0-3-1, 16	0.350	0.2000	<0.00050	<0.00050	
55.0-3-3, 14	0.036	0.0060			
55.0-3-4, 145	0.570	0.0750		0.00040	
55.0-3-5, 15	0.027	0.0050			
55.0-4-1, 13	0.290	0.0700	<0.00050		
55.0-4-2, 145	0.026	<0.0040			
55.0-4-3, 7	0.320	0.2700	<0.00050		
55.0-4-4, 145	0.002				
55.0-4-5, 7	0.270	<0.0500		<0.00025	
55.0-4-6, 145	0.020	0.0030			
55.0-5-1, 7	0.500	0.2700	<0.00050		
55.0-5-5, 7	0.320	0.1900	<0.00050	<0.00050	
55.0-6-3, 17	0.500	0.6700	0.00050	0.00050	
55.0-6-5, 16	0.025	0.0040			
55.0-7-1, 14	0.540	0.6100	<0.00050		
55.0-7-3, 18	0.038	0.0090			
55.0-7-5, 19	0.320	0.0500	<0.00050		
55.0-8-3, 16	0.500	0.7000	0.00025	<0.00050	
55.0-8-5, 18	0.032	0.0070			
55.0-9	0.600	0.1500	0.00025	0.00040	
55.0-10-2, 10	0.370	0.0500	0.00050	0.00040	
55.0-10-5, 16	0.440	0.2700	<0.00050	<0.00050	
55.0-11-3, 17	0.400	<0.0500	0.00050	0.00080	
55.0-11-5, 7	0.082	0.0150			
55.0-12-1, 13	0.320	0.0500	<0.00025		
55.0-12-2, 13	0.024	0.0055			
55.0-12-3, 8	0.270	0.0500	<0.00050		
55.0-13-1, 7	0.290	0.1700	<0.00050	0.00050	
55.0-13-3, 7	0.023	0.0050			
55.0-13-3, 40	0.870	0.1700	0.00025		
55.0-13-5, 7	0.270	0.1500	<0.00050	0.00050	
55.0-14-1, 145	0.018	0.0023			
55.0-14-2, 145	0.260	0.1200	<0.00050	0.00150	
55.0-14-3, 145	0.019	0.0030			

TABLE 14 – *Continued*

Sample Designation	Na%	K%	Li n.10^{-3}%	Rb n.10^{-3}%	Cs-HO n.10^{-3}%
55.0-14-3, 145	0.019	0.0030			
55.0-14-4, 145	0.270	<0.0500	<0.00025		
55.0-14-6, 145	0.270	0.0900	<0.00500	<0.00050	
56.2-1-2, 145	0.200	<0.0500			
56.2-1-6, 7	0.220	0.0700			
56.2-2-4, 36	0.400	0.4700			
56.2-3-2, 145	0.290	<0.0500			
56.2-3-6, 145	0.270	0.0500	<0.00025		
56.2-4-4, 14	0.290	<0.0500	<0.00025		
56.2-5-2, 13	0.270	<0.0500	0.00030	<0.00025	
56.2-5-6, 7	0.350	0.1900	<0.00050		
56.2-6-2, 7	0.250	<0.0500	0.00030	<0.00025	
56.2-7-6, 7	0.200	<0.0500	<0.00025		
56.2-8-4, 7	0.290	0.0500	<0.00050		
56.2-10-2, 10	0.450	0.1400	<0.00050	1.10000	
56.2-10-6, 13	0.650	0.5000	0.00150	0.00250	
57.0-1-1, 5	0.550	0.1900			
57.0	0.003?	0.0040?			
57.1-1-1, 10	0.450	0.1200	<0.00050	<0.00050	
57.1-1-2, 13	1.200	0.9000	<0.00050		
57.1-1-4, 7	0.310	0.1000	<0.00050		
57.1-1-6, 11	0.360		<0.00050	<0.00050	
57.1-3-1, 22	0.600	<0.1000	0.00030	0.00080	
57.1-4-1, 86	0.450	0.0500	0.00100		0.00080
57.1-4-3, 14	0.370	0.0800	0.00060	0.00060	
57.1-4-4, 145	1.100	0.3700	0.00073	0.00070	
58.1-1-1, 139	0.520	<0.0500	<0.00050	0.00060	
58.1-1-2, 91	0.370	0.2500	<0.00050	1.10000	
58.2-1-2, 16	0.630	0.2000	0.00175	0.00190	
58.2-1-4, 31	1.100	0.2500	0.00340	0.00180	
58.2-1-5, 1	0.800	0.1700	0.00330	0.00110	
59.1-3-1, 130	1.350	0.6200	0.00630	0.00950	0.00100
59.1-3-CC	1.820	1.2500	0.00240	0.00880	0.00025
59.2-1-1, 47	1.750	0.5700	0.00480	0.00200	
59.2-1-3, 4	1.520	0.4200	0.00500	0.00190	
59.2-2-2, 145	1.500	0.4000	0.00470	0.00330	
59.2-2-4, 4	1.800	0.4500	0.00500	0.00250	
59.2-2-6, 16	>2.000	0.5000	0.00430	0.00250	
59.2-2-CC	1.910	0.5000	0.00400	0.00160	
59.2-3, Top of core	1.020	0.5100	0.00500	0.00280	
59.2-3-1, 145	1.420	0.5700	0.00610	0.00350	
59.2-3-CC	2.850	3.2600	0.00520	0.00360	
59.2-4-1, 66	1.600	0.7000	0.00450	0.00270	<0.00050
59.2-4-CC	3.710	1.9900	0.00390	0.00240	
59.2-5-CC	1.800	1.2000	0.00490	0.00450	
59.2-6 Top of core	0.700	0.4300	0.00400	0.00130	
59.2-6-2, 0	1.900	0.5000	0.00600	0.00350	<0.00050
60.0-1-2, 9	0.470	0.2000	0.00125		
60.0-1-3, 10	0.570	0.3100	0.00125	<0.00050	

TABLE 14 – *Continued*

Sample Designation	Na%	K%	Li $n.10^{-3}\%$	Rb $n.10^{-3}\%$	Cs-HO $n.10^{-3}\%$
60.0-2-2, 12	0.950	0.5500	0.00210	0.00340	
60.0-3-1, 117	0.800	0.5200	0.00090	0.00400	0.00050
60.0-3-CC	1.800	1.2500	0.00170	0.00170	
60.0-4-CC	1.210	0.8000	0.00130	0.00360	
60.0-4-1, 145	2.560	1.8500	0.00120	0.00250	
60.0-4-2, 145	1.570	1.1100	0.00100	0.00480	
60.0-5-2, 26	1.100	0.7200	0.00125	0.00370	
60.0-5-CC	1.390	0.7500	0.00180	0.00360	
60.0-6-1, 86	1.220	0.4000	0.00240	0.00450	$<$0.00050
60.0-6-3, 14	0.970	0.4200	0.00200	0.00360	
60.0-6-5, 37	1.350	0.5500	0.00125	0.00260	
60.0-6-7, 40	1.070	0.6000	0.00110	0.00380	0.00050
60.0-7-2, 7	1.050	0.5000	0.00080	0.00430	
60.0-8-1, 145	1.010	0.5900			
60.0-8-2, 72	0.900	0.4700	0.00240	0.00250	0.00050
60.0-9-2, 145	0.750	0.4000	0.00200	0.00270	$<$0.00050
60.0-9-5, 16	1.040	0.3800			

TABLE 15
Determination of Zn, Cu, Ni, Cd, Sr by Atomic Absorption

Sample Designation	Zn	Cu	Ni	Cd	Sr	Sample Designation	Zn	Cu	Ni	Cd	Sr
44.0-1-1, 145	430			0.085		46.0-1-1, 145	840			0.044	
44.0-1-1, 145	675			0.150		46.0-1-2, 145	365	188	153		20
44.0-1-3, 50	43			0.059	1850	46.0-1-3, 145	440	180	135		45
44.0-1-3, 145	550			0.230		46.0-1-4, 145	645	257	230		<10
44.0-1-3, mixed	400			0.370		46.0-1-5, 145	382	138	97	0.011	
44.0-1-4, 145	965			0.190		46.0-1-6, 145	1030	195	142		35
44.0-2-CC	80			0.400	2950	46.1-2-CC	160	165		0.030	
44.0-2-1, 145	30			0.100	1850	47.0-1-1, 17	55			0.055	1000
44.0-2-2, 145				0.160		47.0-1-2, 5				0.034	
44.0-2-3, 145	28			0.120		47.0-1-3, 16	60			0.080	
44.0-2-4, 145	30			0.115	2250	47.0-1-4, 90	55			0.068	1200
44.0-2-5, 145	30			0.050		47.0-1-4, 95	50	83		0.115	1600
44.0-2-6, 145	700			0.290		47.0-1-5, 3.5	37			0.056	2300
44.0-3-CC	5840	8800		0.540		47.0-1-6, 14	38			0.058	1200
44.0-3-2, 145	40			0.092		47.1-1, Top of Section 1	365			0.150	
44.0-3-3, 145	60			0.047							
44.0-3-4, 145	37			0.110		47.1-1-1, 145	1350				
44.0-3-5, 145	465			0.020		47.1-1-2, 16	195			0.100	
44.0-4-0, Top	90			0.010		47.1-3-1, 17	405			0.084	
44.0-4-2, 145	102			0.016		47.2-1-2, 23	42			0.076	1050
44.0-4-3, 145	37			0.021		47.2-1-2, 181	79			0.055	1250
44.0-4-4, 145	34			0.027		47.2-1-3, 11	65			0.120	2100
44.0-4-5, 145	39			0.084		47.2-1-3, 90	41			0.060	1350
44.0-4-6, 145	110			0.110		47.2-1-4, 7	88			0.033	2200
44.0-4-CC	238	15		0.095	2000	47.2-2-2, 8	155			0.046	900
44.0-5-0, Total	2000			0.240		47.2-2-2, 47	73	37	50	0.052	1400
44.1-1-CC	206	224		<0.010	20	47.2-2-3, 7	60			0.020	2650
45.1-1-1, 7	325			0.012	50	47.2-2-4, 7	42			0.045	1200
45.1-1-1, 70	160	290		<0.010	<20	47.2-2-5, 5	50			0.088	2750
45.1-1-1, 145	400			0.011	35	47.2-2-6, 6	32			0.070	1450
45.1-1-2, 100	480			<0.010	50	47.2-3-2, 6.5	60			0.180	2200
45.1-1-2, 124	172			0.012	70	47.2-3-3, 6	45			0.068	2200
45.1-1-3, 23	154			0.010	175	47.2-3-4, 16	35			0.041	2750
45.1-1-4, 22	220			0.010	80	47.2-3-CC	167	28		0.026	3100
45.1-1-4, 136	107			0.140	170	47.2-4-CC	378	30		0.145	2900
45.1-2-CC	130	180	208	0.050	70	47.2-4-1, 16	28			0.085	2150
45.1-3-CC	330			0.077	40	47.2-4-2, 17	32			0.135	2800
45.1-3-CC				0.075		47.2-4-3, 16	17			0.060	3400
45.1-1-5, 4	103			0.300		47.2-4-4, 16.5	37			0.020	2600
46.0-	40	12		<0.070	70	47.2-4-5, 16.5	22			0.080	3200
46.0-1-6	120	38	27	0.021	40	47.2-4-6, 17	45			0.080	2700
46.0-1-6	40	28	<10	<0.010	<20	47.2-5-1, 17	17			0.021	3200

TABLE 15 – *Continued*

Sample Designation	Zn	Cu	Ni	Cd	Sr	Sample Designation	Zn	Cu	Ni	Cd	Sr
47.2-5-2, 6	30			0.087		47.2-12-3, 145				0.080	
47.2-5-3, 6	50			0.160	2050	47.2-12-4, 145	187			0.145	1900
47.2-5-4, 6	37			0.060	2700	47.2-12-CC	91	12		0.070	1900
47.2-5-5, 6	26			0.050	1950	47.2-13-1, 145	18			0.080	2150
47.2-5-6, 6.5	35			0.025	2900	47.2-13-2, 145	21			0.060	1920
47.2-6-2, 6	290			0.170	1450	47.2-13-3, 16	30			0.055	1700
47.2-6-3, 17	37			0.070	2600	47.2-13-4, 145	28			0.048	2200
47.2-7-1, 17	42					47.2-13-5, 145	107			0.030	2300
47.2-7-2, 17	25			0.100	1150	47.2-13-6, 145	68			0.080	1970
47.2-7-3, 13	26			0.160	830	47.2-13-CC	44	12			1850
47.2-7-4, 17	37			0.070	800	47.2-14-1, 145	40			0.050	2250
47.2-7-5, 27.5	20			0.220	660	47.2-14-2, 145	15			0.110	1650
47.2-7-6, 126	43			0.230	900	47.2-14-3, 145				0.016	
47.2-8-1, 27	19			0.140		47.2-14-4, 145	16			0.058	1800
47.2-8-2, 17	20			0.150	850	47.2-14-5, 145	35			0.100	1800
47.2-8-3, 18	20			0.250	1300	47.2-14-6, 145	200			0.120	1300
47.2-8-4, 17	25			0.260	1800	47.2-14-CC	90	14		0.035	2000
47.2-8-5, 17	28			0.140	2150	48.1-1-1, 26	35			0.160	2450
47.2-8-6, 16	30			0.130	2300	48.2-1-CC	350	16			2100
47.2-8-6-CC	2000	23		0.330	1950	48.2-1-1, 28	172			0.053	3400
47.2-9-1, 16	130			0.130	2420	48.2-1-2, 33	32			0.030	1450
47.2-9-1, 150				0.098	2800	48.2-1-3, 16	30			0.037	3350
47.2-9-2, 17	25			0.190	2200	48.2-1-4, 16	52			0.030	1650
47.2-9-3, 17	23			0.085	1550	48.2-1-5, 14.5	287			0.054	3300
47.2-9-4, 0	34			0.065	2850	48.2-1-6, 11	44			0.050	1920
47.2-9-5, 17	11			0.100	2800	48.2-2-1, 145	130			0.075	2150
47.2-9-5, 150	30			0.200	2850	48.2-2-2, 17	367			0.200	2500
47.2-9-6, 0	37			0.043		48.2-2-3, 145	32			0.070	1800
47.2-9-CC	630			0.170	2500	48.2-2-4, 18	12			0.065	2100
47.2-10-1, 17	25			0.230	1300	48.2-2-5, 16	23			0.120	1720
47.2-10-2, 17	23			0.120	1500	48.2-2-6, 16	20			0.080	2350
47.2-10-3, 18	25			0.150	1250	48.2-2-CC	81	11		0.100	2050
47.2-10-4, 17	28			0.054	1400	48.2-3-1, 117	280			0.150	1650
47.2-10-5, 17	37			0.105	1550	48.2-3-2, 28	57			0.070	2300
47.2-10-6, 16	22			0.185	1460	48.2-3-3, 17	106			0.094	1880
47.2-10-CC	88			0.250	1650	48.2-3-4, 17	43			0.060	2500
47.2-10, Top	160			0.110	1300	48.2-3-5, 16	38			0.180	2300
47.2-11-1, 145	25			0.180	1400	49.0-1-1, 11				0.140	
47.2-11-2, 145	25			0.140	1650	49.0-1-1, 76	112			0.085	650
47.2-11-3, 145	30			0.120		49.0-1-2, 16				0.034	
47.2-11-4, 145	22			0.090	1500	49.0-1-3, 16	170			0.013	35
47.2-11-5, 145	18			0.070	1350	49.0-1-4, 6				0.026	
47.2-11-6, 145	50			0.085	1750	49.0-1-5, 7	143			$<$0.010	45
47.2-11-CC	208	15		0.074	1400	49.0-1-5, 130				$<$0.010	
47.2-12-1, 145	470			0.195	1850	49.0-1-6, 7	165			0.037	35
47.2-12-2, 17	18			0.050	1850	49.0-2-1, 70				0.100	

TABLE 15 – *Continued*

Sample Designation	Zn	Cu	Ni	Cd	Sr
49.1-1-1, 77				0.010	
49.1-1-2, 16	144			0.019	40
49.1-1-2, 124				0.050	
49.1-1-3, 22	198			0.049	
49.1-1-4, 117	84			0.130	350
49.1-1-5, 38				0.028	
49.1-1-5,	280	44		0.038	120
49.1-2-CC	30			0.010	35
49.1-2-1, 145	94			0.060	1120
49.1-2-2, 145				0.043	
49.1-2-3, 145	1050				1360
50.0-2-1, 145	1600			0.105	650
50.0-2-2, 150	1650			0.160	950
50.0-2-3, 150	365	165		0.060	120
50.0-2-4, 150	188			0.050	800
50.0-2-6, 150	685			0.071	400
50.1-1-1, 62				0.036	
50.1-1-2, 15				< 0.010	
50.1-1-3, 7	100			0.030	250
50.1-1-4, 17				0.021	
50.1-1-5, 15	90			0.045	650
50.1-1-6, 16				0.076	
50.1-2-1, 130	75			0.029	200
50.1-2-3, 4				0.045	
50.1-2-3, 35	156			0.031	
50.1-2-4, 12				0.053	
50.1-2-4, 5	250	246		0.048	< 20
50.1-2-5, 8	155			0.011	300
50.1-3-1, 145	206	210	220	0.112	< 20
50.1-3-3, 15	165			0.023	55
50.1-3-4, 16				0.072	
50.1-3-5, 28	143			0.043	35
51.0-1-CC				0.280	
51.0-1-1, 11	310			0.140	< 10
51.0-1-3, 6	225			0.080	< 10
51.0-1-4, 6	204			0.310	
51.0-1-5, 15	204			0.014	
51.0-1-6, 16				0.040	
51.0-2-CC	2600	168	245	0.480	< 20
51.1-1-145	320			< 0.01	
51.1-1-1, 15	115			0.020	20
51.1-1-2, 16				< 0.010	
51.1-1-3, 30	108			0.015	35
51.1-1-4, 16				0.040	
51.1-1-4, 30	240	80	85	0.026	< 20
51.1-1-5, 16	82			0.020	25

Sample Designation	Zn	Cu	Ni	Cd	Sr
51.1-1-6, 16				0.012	
51.1-2-1, 127	167				
51.1-2-2, 8				0.042	
52.0-1-1, 27	92			0.025	25
52.0-1-2, 8				0.270	
52.0-1-2, 30	330	130		0.054	90
52.0-1-3, 8	127			0.068	10
52.0-1-4, 8	20			0.054	
52.0-1-5, 10	107			0.012	75
52.0-1-6, 9				0.018	
52.0-2-CC	330	165	80	< 0.010	50
52.0-2-2, 7	98			< 0.010	40
52.0-2-3, 7				0.028	
52.0-2-4, 8	190			0.012	60
52.0-2-5, 18				0.011	
52.0-2-6, 145	440	136	80	0.051	80
52.0-3-1, 16				0.010	
52.0-3-2, 19	113			0.013	15
52.0-3-3, 16				0.010	
52.0-3-4, 16	182			0.010	15
52.0-3-5, 7				< 0.010	
52.0-3-6, 6	100			< 0.010	35
52.0-4-2, 7				< 0.010	
52.0-4-3, 5	103			0.016	650
52.0-4-5, 6	107			< 0.010	55
52.0-4-6, 128	134			< 0.010	
52.0-5-2, 14	150			< 0.010	30
52.0-5-3, 15	294			< 0.010	300
52.0-5-3, 18	294				
52.0-5-4, 18	142			< 0.010	30
52.0-5-5, 18				0.018	
52.0-6-CC	177	310		0.040	45
52.0-6-1, 24	150				
52.0-7-CC	120	66	57	< 0.010	60
52.0-7-2, 37				0.025	
52.0-8-1, 145	160	220	205	0.024	65
52.0-8-2, 145	213	200		0.028	35
52.0-8-3, 21	140			0.010	55
52.0-8-3, 40	213	200	220	0.045	
52.0-8-4, 145	117			0.010	40
52.0-8-5, 145	254	328		< 0.010	55
52.0-8-6, 145	186			0.022	
52.0-9-CC	148	170	340	0.026	70
52.0-9-CC	148	170		0.026	
52.0-10-CC	605	204		0.060	15
53.0-1-1, 10				0.050	
53.0-1-2, 144	86			0.012	60
53.0-1-3, 17				0.011	
53.0-2-CC				0.120	

TABLE 15 – *Continued*

Sample Designation	Zn	Cu	Ni	Cd	Sr
53.0-2-CC	370			0.043	
53.0-3-1, 12	92			<0.010	65
53.0-4-2, 0	200	38	40	<0.010	
53.0-6-2, 65	23			0.350	25
53.0-6-2, 66				0.260	
53.0-6-CC	152	116		0.160	15
53.0-7-1, 150				0.120	
53.0-8-CC	60		140	<0.010	
53.1-1-2, 7	130			<0.010	50
53.1-1-3, 2	220	162	40	0.020	
53.1-1-3, 18	115			0.014	
53.1-1-4, 17				0.010	
53.1-1-5, 18	88			0.010	150
53.1-2-1, 145	730			0.085	100
53.1-2-2, 145	300			0.031	80
53.1-2-3, 16				0.018	
53.1-2-3, 90	86			<0.010	148
53.1-2-4, 10				0.026	
53.1-2-5, 7	125			<0.010	100
53.1-2-6, 7				0.030	
53.1-3-1, 150	200	163	42	0.018	95
53.1-3-2, 16	182			<0.010	90
53.1-3-2, 40	220	162	40	0.020	130
53.1-3-3, 23.5				0.017	
53.1-3-4, 26	90			<0.010	
53.1-3-5, 23				0.014	
53.2-1-1, 21				0.011	
53.2-1-2, 16	90			0.010	100
53.2-1-3, 22				<0.010	
53.2-1-4, 7	90				30
53.2-1-5, 7				0.010	
53.2-1-6, 7	97			0.012	100
53.2-4-CC	92			0.011	185
53.2-5-CC	156			0.023	130
54.0-1-1, 5	124			0.050	800
54.0-1-1, 74				<0.010	
54.0-1-2, 7	278			<0.010	180
54.0-1-2, 20	100			0.012	140
54.0-1-3, 35				<0.010	
54.0-2-1, 17	75				
54.0-2-2, 23				0.017	
54.0-2-4, 16	72			0.011	
54.0-3-1, 140	148	40		0.038	350
54.0-4-1, 108				0.012	
54.0-4-2, 14	148			0.026	20
54.0-6-1, 145	108	42		0.028	140
54.0-6-2, 16				0.010	
54.0-6-3, 23	65			0.020	150
54.0-6-4, 16				0.018	
54.0-6-4, 78	77			0.014	
54.0-6-5, 17				0.018	
54.0-7-1, 138	280			0.050	1050
54.0-7-2, 34				0.015	
54.0-7-3, 16	98			0.200	65
54.0-9-1	40			0.400	200
55.0-1-2, 7	52			0.140	1200
55.0-1-2, 30	150			0.089	2850
55.0-1-3, 7				0.160	
55.0-1-4, 7	28			0.120	1850
55.0-1-5, 7				0.150	
55.0-1-6, 7	23			0.270	2600
55.0-2-1, 7	19			0.076	1250
55.0-2-2, 7	18			0.170	2850
55.0-2-3, 16	500			0.037	200
55.0-2-3-CC	400			0.018	55
55.0-2-4, 15	12			0.140	3100
55.0-2-5, 7				0.120	
55.0-2-5, 70	15			0.130	3200
55.0-2-6, 32				0.065	
55.0-3-Top of core				0.052	
55.0-3-1, 16	20			0.010	3250
55.0-3-3, 14	18			0.070	900
55.0-3-4, 145	16	16		0.095	2800
55.0-3-5, 15	18			0.072	2000
55.0-4-1, 13	14			0.080	2300
55.0-4-2, 145	24			0.037	2000
55.0-4-3, 7	15			0.066	2250
55.0-4-4, 145	29			0.032	70
55.0-4-5, 7	25			0.023	2150
55.0-4-6, 145				0.031	
55.0-5-1, 7	14			0.043	2650
55.0-5-3, 8				0.028	
55.0-5-5, 7	15			0.044	2750
55.0-6-1, 7				0.033	
55.0-6-3, 17				0.070	
55.0-6-5, 16	24			0.010	1550
55.0-7-1, 14	18			0.070	2000
55.0-7-3, 18	14			0.017	1400
55.0-7-5, 19	15			0.014	2200
55.0-8-1, 15				0.038	
55.0-8-3, 16	18			0.076	2150
55.0-8-5, 18	30				6600
55.0-9	84	28		0.084	
55.0-10-2, 10	15			0.074	1950
55.0-11-5, 16	19			0.080	3400
55.0-11-3, 17	30			0.038	2500
55.0-11-5, 7	20			0.010	1550
55.0-12-1, 13	18			0.060	2000
55.0-12-2, 13	25			0.052	1100
55.0-12-3, 8	12			0.090	2650
55.0-12-5, 7	52			0.026	5600

TABLE 15 – *Continued*

Sample Designation	Zn	Cu	Ni	Cd	Sr	Sample Designation	Zn	Cu	Ni	Cd	Sr
55.0-13-1, 7	18			0.050	3000	58.2-1-5, 0				0.020	
55.0-13-3, 4	61				1150	58.2-1-5, 1	115			0.011	100
55.0-13-3, 7	61			0.010	1150	58.2-1-8, 16				0.090	
55.0-13-3, 40	25	23		0.022	2700	59.1-3-CC	350	295	180	0.018	
55.0-13-5, 7	10			0.060	3200	59.1-3-1, 130	172			0.010	40
55.0-14-1, 145	10			0.040	2100	59.1-3-3, 7				<0.010	
55.0-14-2, 145	15			0.052	3100	59.2-1-1, 47	180	116		<0.010	
55.0-14-3, 145	10			0.053	700	59.2-1-3, 4	160			<0.010	
55.0-14-4, 145	25			0.011		59.2-1-CC	120	32		0.150	1860
55.0-14-6, 145	22			0.140	3150	59.2-2-2, 145	237			0.010	
56.2-1-2, 145	168			0.017	2900	59.2-2-4, 4	242			<0.010	75
56.2-1-4, 23				0.019		59.2-2-6, 16	160			< .010	80
56.2-1-6, 7	18			0.028	2750	59.2-2-CC	372	140	140	0.020	40
56.2-2-4, 36	25			0.075	2100	59.2-3, Top of core	970	142	88	140	100
56.2-3-2, 145	128			0.140	2350	59.2-3-1, 145	890			0.042	55
56.2-3-6, 145	27			0.048	2300	59.2-3-2, 145	100	110	31	0.012	
56.2-4-2, 10				0.044		59.2-3-CC	510	200		<0.010	<20
56.2-4-4, 14	35			0.025	1700	59.2-4-1, 66	143			<0.010	55
56.2-5-2, 13	25			0.036	2000	59.2-4-CC	220	195		<0.010	60
56.2-5-6, 7	15			0.035	2200	59.2-5-1, 89				0.012	
56.2-6-2, 7	20			0.065	2450	59.2-5-CC	330	254			80
56.2-6-4, 7				0.015		59.2-6, Top of core	232			<0.012	
56.2-6-6, 16				0.014		59.2-6				<0.010	
56.2-7-2, 43				0.014		59.2-6-2, 0	360			0.010	65
56.2-7-4, 39				0.062		60.0-1-1, 7				0.048	
56.2-7-6, 7	23			0.080	2700	60.0-1-2, 9	25			0.014	1650
56.2-8-2, 7				0.014		60.0-1-3, 10	30			0.015	1650
56.2-8-4, 7	20			0.033	2500	60.0-1-CC	180	85	60		40
56.2-9-4, 19	25			0.028	2700	60.0-2-2, 12	65			0.090	350
56.2-10-2, 10	177			0.060	2250	60.0-3-1, 117	68			0.023	85
56.2-10-6, 13	60			0.028		60.0-3-2, 8				0.013	
57.0-1-1, 5	207			0.035	1200	60.0-3-CC	760	130			1200
57.1-1-1, 10	12			0.024	2750	60.0-4-CC	400	72		0.054	85
57.1-1-2, 0				0.096		60.0-4-1, 145	320	92		0.056	150
57.1-1-2, 13				0.035	2550	60.0-4-2, 145	200	60			60
57.1-1-4, 7	12			0.048	2700	60.0-5-2, 26	72			0.013	150
57.1-1-5, 7				0.034		60.0-5-CC	440	38			130
57.1-1-6, 11	17			0.029	2800	60.0-6-1, 86	1730			0.170	100
57.1-2-1, 44				0.010		60.0-6-2, 16				0.050	
57.1-3-1, 22	148			0.020	3520	60.0-6-3, 14	96			<0.010	150
57.1-3-2, 109				0.028		60.0-6-4, 25				0.020	
57.1-4-1, 86	47			0.015	3250	60.0-6-5, 37	64			0.015	
57.1-4-2, 20				0.014		60.0-6-6, 26.5				0.026	
57.1-4-3, 14	20			0.021	2500	60.0-6-7, 40	112			0.033	65
57.1-4-4, 145		61				60.0-7-1, 81.5				0.033	
57.1-4-5, 145				0.047		60.0-7-2, 7	84			0.018	
58.1-1-1, 139	28			0.027	2650	60.0-8-1, 145	95			0.016	25
58.1-1-2, 91	14					60.0-8-2, 72	142			0.014	65
58.2-1-2, 16	40			0.034	2200	60.0-9-2, 145	103			0.019	55
58.2-1-4, 31	68			0.017	650	60.0-9-5, 16	95			0.027	100

TABLE 16
Neutron Activation Analysis of Cherts

Sample No.	Radioisotope			
	Mn^{56}	Sc^{46}	W^{187}	Fe^{59}
44.0-3-CC	$(1.9 \pm 0.2) \times 10^{-2}$	$(7.7 \pm 0.8) \times 10^{-5}$	$(4.7 \pm 0.5) \times 10^{-2}$	$(4.7 \pm 0.5) \times 10^{-2}$
44.0-3-CC	$(1.1 \pm 0.1) \times 10^{-2}$	$(7.5 \pm 0.7) \times 10^{-5}$	$(5.4 \pm 0.7) \times 10^{-2}$	$(5.4 \pm 0.5) \times 10^{-1}$
46.0-1-6	$(1.1 \pm 0.1) \times 10^{-2}$	$(4.2 \pm 0.4) \times 10^{-4}$	$(1.5 \pm 0.2) \times 10^{-2}$	$(5.2 \pm 0.5) \times 10^{-1}$
46.0-1-6	$(5.3 \pm 0.5) \times 10^{-3}$	$(1.6 \pm 0.2) \times 10^{-4}$	$(1.1 \pm 0.1) \times 10^{-1}$	$(2.4 \pm 0.2) \times 10^{-1}$
46.0-1-6	$(1.1 \pm 0.1) \times 10^{-1}$	$(1.3 \pm 0.1) \times 10^{-3}$	$(3.5 \pm 0.4) \times 10^{-1}$	4.3 ± 0.4
47.2-12-2	$(4.5 \pm 0.4) \times 10^{-3}$	$(1.5 \pm 0.1) \times 10^{-4}$	$(7.0 \pm 0.7) \times 10^{-2}$	$(1.7 \pm 0.2) \times 10^{-1}$
49.1-2-CC	$(6.4 \pm 0.2) \times 10^{-4}$	$(1.7 \pm 0.2) \times 10^{-4}$	$(3.6 \pm 0.4) \times 10^{-2}$	$(2.4 \pm 0.3) \times 10^{-1}$
50.0-2-CC	$(2.0 \pm 0.6) \times 10^{-3}$	$(2.0 \pm 0.2) \times 10^{-4}$	$(8.4 \pm 0.8) \times 10^{-3}$	$(2.0 \pm 0.2) \times 10^{-1}$
50.0-2-CC	$(6.2 \pm 0.6) \times 10^{-2}$	$(6.1 \pm 0.6) \times 10^{-4}$	–	2.4 ± 0.2
50.0-2-CC	$(1.9 \pm 0.2) \times 10^{-2}$	$(1.7 \pm 0.2) \times 10^{-4}$	$(8.8 \pm 0.8) \times 10^{-2}$	$(4.4 \pm 0.5) \times 10^{-1}$
50.0-2-CC	$(2.3 \pm 0.2) \times 10^{-3}$	$(2.3 \pm 0.2) \times 10^{-4}$	$(9.8 \pm 0.9) \times 10^{-2}$	$(6.0 \pm 0.6) \times 10^{-1}$
59.2-6	$(1.4 \pm 0.1) \times 10^{-1}$	$(1.4 \pm 0.1) \times 10^{-3}$	–	2.3 ± 0.2
59.2-6, TOP	$(4.5 \pm 0.4) \times 10^{-2}$	$(6.2 \pm 0.6) \times 10^{-4}$	–	2.6 ± 0.3
59.2-6, TOP	$(7.9 \pm 0.8) \times 10^{-2}$	$(3.1 \pm 0.3) \times 10^{-3}$	$(3.9 \pm 0.4) \times 10^{-1}$	10.1 ± 1.0

TABLE 17
Chemical Analyses of Recent Sediments

TABLE 17A–Abyssal Red Clay

Element	1	2	3	4	5	Description
SiO_2	54.48	54.28	55.16	50.77	52.45	1. Average 51 samples red clays Pacific, Atlantic and Indian oceans (Clarke, Steiger)
TiO_2	0.98	–	0.56	–	0.84	
Al_2O_3	15.94	16.41	16.79	20.75	16.05	2. Average data of Challenger Expedition
Fe_2O_3	8.66	13.58	5.65	10.54	8.26	3. Average data of Meteor Expedition
FeO	0.84	1.26	1.38	–	–	4. Average 6 samples red clay S-W part of North Pacific Ocean (Ishibashi, Huroda)
MnO	1.21	1.62	4.13	2.01	1.12	
MgO	3.31	1.76	2.76	3.08	3.35	5. Average 16 samples S-W part of North Pacific Ocean (Hamoguchi)
CaO	1.96	0.74	0.27	1.72	2.44	
Na_2O	2.05	1.37	2.41	1.39	4.98	
K_2O	2.85	1.61	1.09	2.78	2.57	
H_2O	7.04	7.02	9.08	9.75	7.34	
P_2O_5	0.30	0.35	0.32	0.28	0.34	

TABLE 17B–Radiolarian Ooze

Element	Composition (%)	Description
SiO_2	56.86	From southwest part of North Pacific (mijoni, 1966)
Al_2O_3	22.28	
Fe_2O_3	7.50	
CaO	1.85	
MgO	3.34	
Na_2O	1.08	
K_2O	0.39	

TABLE 17C–Diatom Ooze

Compound	Composition (%)	Description
SiO_2	69.72	Murray and Renard
Al_2O_3	0.55	
Fe_2O_3	0.39	
$CaCO_3$	19.29	
$CaSO_4$	0.29	
$Ca_3P_2O_8$	0.41	
$MgCO_3$	1.13	
Insoluble Residue	4.47	
Loss on ignition	5.30	

TABLE 17 – *Continued*

TABLE 17D–Globigerina Ooze (non-carbonate part) and Red Clay

Compound	Sample No.[a] 1602	1562	1572	Average Composition of Red Clay
SiO_2	56.76	55.84	51.10	56.70
TiO_2	0.65	1.49	1.41	0.91
Al_2O_3	15.52	17.89	18.73	17.35
Fe_2O_3	9.03	11.18	11.11	8.93
MnO	0.59	1.42	1.18	1.21
MgO	4.53	1.38	5.64	3.62
CaO	4.76	1.20	1.69	2.64
Na_2O	7.50	4.62	4.63	5.38
K_2O	2.13	4.22	3.33	2.78
P_2O_5	0.54	0.75	1.18	0.48
Total $CaCO_3$ + $MgCO_3$	56.59	68.75	80.23	

[a]Hamoguchi's sample numbers

TABLE 18
Chemical Composition of Basalts and Volcanic Ash from Leg 6

	Leg 6 Samples				Tholeitic Basalts (Engel, Engel, 1968)			
	Site 57 Oligocene Diabasic Basalt	Site 53 Oligocene-Miocene Basalt	Site 54	45.1-3-CC Lithified Ash	Atlantic Ocean	Pacific Ocean	Indian Ocean	Average
SiO_2	49.60	51.30	18.600	91.00	49.80	50.25	50.29	50.11
TiO_2	2.63	0.11	0.470	0.26	1.33	1.56	1.21	1.37
Al_2O_3	15.70	16.60	7.850	4.47	16.87	16.09	17.16	16.71
F_2O					7.28	7.20	6.51	7.00
Fe_2O_3	12.50	9.10	4.740	2.14	2.07	2.72	2.26	2.35
MnO	0.18	0.07	0.102	0.12	0.16	0.19	0.16	0.17
MgO	5.69	6.68	3.550	1.10	8.01	7.02	7.75	7.59
CaO	10.90	5.00	30.900	<0.88	11.38	11.81	11.55	11.58
Na_2O	–	–	–	–	2.78	2.81	2.83	2.81
KaO	–	–	–	–	0.18	0.20	0.19	0.19
P_2O_5	–	–	–	–	0.14	0.15	0.09	0.13

TABLE 19
Results of the Analysis of Fluorine

Hole	Core	Section	Sampled at	Fluorine% (dry material)
51.1	1	3	30-32	0.101
51.1	1	5	16-18	0.080
51.1	2	1	127-129	0.122
51.1	2	2	145	0.160
55.0	1	2	7-9	0.074
55.0	3	4	145-150	0.050
55.0	6	3	17-19	0.030
55.0	7	5	19-21	0.045
55.0	11	3	17-19	0.025
55.0	13	1	7-9	0.020
55.0	14	4	145-150	0.025
55.0	14	6	145-150	0.020

Analysis made by V.S. Bykova