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Arsenic mobilization in response to the draining and filling of the reservoir at Milltown, Montana

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ARSENIC MOBILIZATION IN RESPONSE
TO THE DRAINING AND FILLING
OF THE RESERVOIR AT MILLTOWN, MONTANA

By

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Arsenic Mobilization in Response to the Draining and Filling of the Reservoir at Milltown, Montana (140 pp.)

Director: Johnnie N. Moore

Arsenic released from sediments filling the reservoir at Milltown, Montana has migrated off-site and contaminated the adjacent Milltown aquifer. Arsenic mobilization is associated with migration of diagenetic environments within the sediments caused by dam operations which drain and fill the reservoir, forcing the water table in the sediments to fluctuate. Arsenic concentrations in ground water are controlled by historical concentrations in sediments, diagenetic reactions, and advection.

Ground water samples were collected from six piezometer nests in the sediments as the reservoir was drained and refilled. Samples were analyzed for arsenic, calcium, iron, magnesium, manganese, bicarbonate, and sulfate. Changes in arsenic concentrations corresponded to changes in diagenetic environments observed in the uppermost, dewatered sediments. Ground water geochemistry is best explained by the following model: Draining the reservoir lowered the water table in the sediments, allowing oxidation of previously reduced sediments. Arsenic released by oxidation of sulfide minerals and/or organic matter coprecipitated with iron and manganese oxyhydroxides. When the reservoir was refilled, the water table rose and a reducing environment was re-established within these sediments. Iron and manganese oxyhydroxides were reduced, liberating coprecipitated arsenic. The persistence of high iron and arsenite concentrations in anoxic zones despite evidence of diagenetic sulfide formation indicates that sulfide is limiting in this system. Ground water flowing through the reduced sediments becomes contaminated with arsenic (mainly as arsenite). This system is complicated by sediment heterogeneity and continuous solute transport by ground water flow.

Hydraulic conductivities of the fine-grained reservoir sediments are considerably lower than those reported for the adjacent Milltown aquifer. Coarser sediments underlying the contaminated reservoir sediments appear hydrologically continuous with both the Milltown reservoir and coarse-grained strata of the Milltown aquifer. This coarse-grained layer acts as a "drain", inducing the strong vertical gradients observed in the fine-grained sediments, and transporting arsenic leached from the fine-grained sediments towards the Milltown aquifer to the northeast.

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ACKNOWLEDGEMENTS

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INTRODUCTION

Arsenic mobilization in contaminated sediments is often correlated with changing redox environments. Diagenetic models for arsenic mobilization have been described for deep-marine (Edenborn et al, 1986) and lacustrine or reservoir environments (Farmer & Lovell, 1986; Aggett and O'Brien, 1985). This study examines arsenic mobilization in a fresh-water reservoir where the water table and redox boundary regularly fluctuate within the contaminated reservoir sediments.

Milltown Dam, constructed in 1907, impounds the Clark Fork River immediately below its confluence with the Blackfoot River at Milltown, Montana (Figures 1 & 2). Sediments filling Milltown Reservoir are enriched in arsenic and metals (including cadmium, copper, manganese, lead, and zinc), which have migrated off-site and contaminated the adjacent sand-and-gravel Milltown aquifer (Woessner et al, 1984). Arsenic concentrations in ground water within the sediments range from <0.03 to 10 mg/L.

The Clark Fork is a coarse-grained, high-gradient river whose tributaries (Warm Springs and Silver Bow Creeks) drain the Butte mining district, an area which includes the Anaconda smelter (Anaconda, MT) and the Berkeley Pit (Butte, MT). After the dam was constructed, Milltown Reservoir became the first point where the Clark Fork was impounded downstream from Anaconda and Butte until the 1950s, when sediment traps were constructed approximately 190 km upstream at Warm Springs, MT.

In the Milltown area, the Clark Fork's floodplain overlies relatively impermeable Precambrian Belt metasediments (Woessner et al, 1984). Well

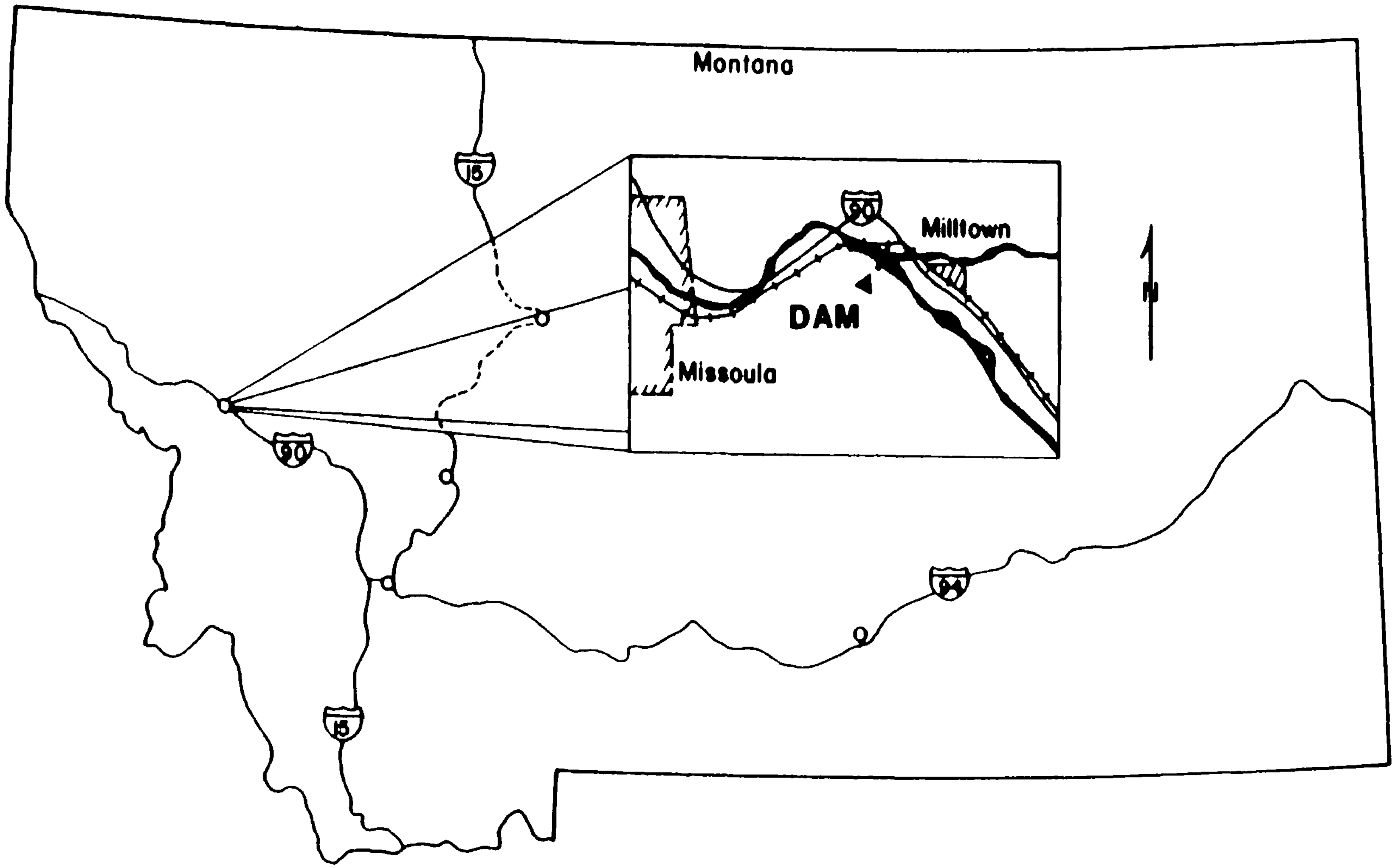


Figure 1: Location Map

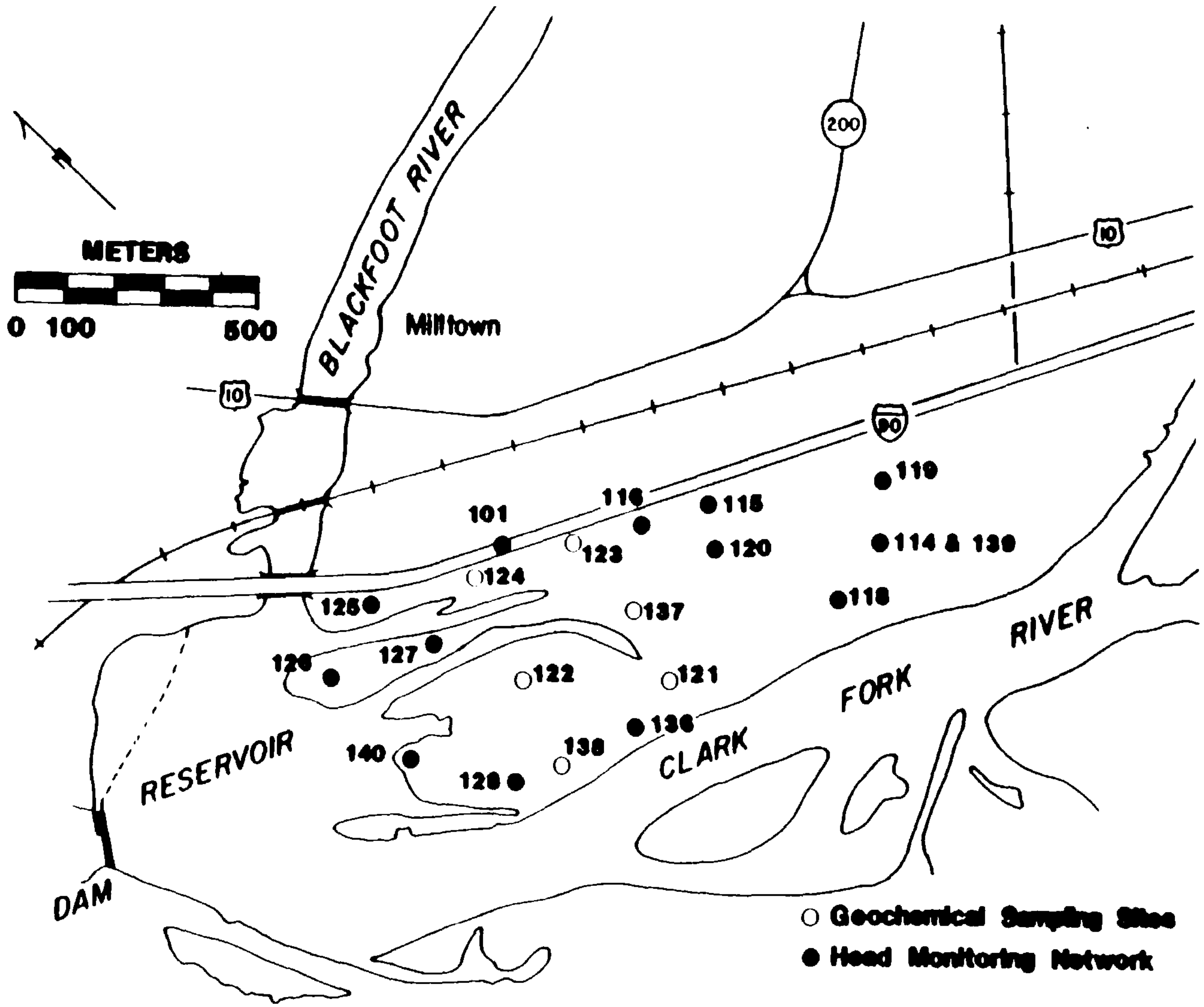


Figure 2: Location of Project Sampling Sites

logs indicate that prior to dam construction this floodplain was largely composed of sands and gravels (Woessner et al, 1984). Fine-grained sediments have since filled the reservoir to capacity. Cores of these fine-grained sediments have extremely complex, centimeter-scale lithologies (Appendix 3; Moore et al, 1988; Rosasco and Catts, 1985; Woessner et al, 1984). Sediment compositions range from clays and organic-rich muds to well-sorted coarse sands and sands with gravel. Typically, units cannot be correlated within the reservoir area. Rosasco and Catts (1985) indicate that the finer-grained reservoir sediments reach a maximum thickness of 7.6 meters, and that the contact between these and the underlying original, coarser floodplain sediments varies from sharp to gradational.

In the winter of 1986, runoff from an early thaw severely damaged the dam. Repairs performed that spring and summer required lowering the reservoir stage approximately 2.5 meters. Stage was held stable at this lower level through March 1987, allowing the uppermost strata of reservoir sediments to dewater. When the reservoir was refilled at the end of March 1987, these sediments were resaturated.

The shallow ground water chemistry and hydrogeology of the fine-grained reservoir sediments were studied from August, 1986 through August, 1987 to determine how the water table and redox boundary within the sediments responded to changes in reservoir stage, and to examine the response of arsenic to changing diagenetic environments. The draining and resaturation of the reservoir sediments would presumably allow progressive transitions from initially anoxic environments through oxic to anoxic within at least some strata. Monthly samples from nested piezometers recorded changes in ground water chemistry over time and across the redox boundary. This allowed separation of the effects of diagenesis and advective transport from depositional variations in arsenic concentrations, permitting analysis of how the migration of redox environments affected arsenic solubility and mobilization despite the stratigraphic complexities of this system.

METHODS

Six geochemical sampling sites were established within the reservoir sediments, with thirteen additional sites providing an extensive head-measurement network (Figure 2; Appendix 2). At each geochemical sampling site a nest of at least four piezometers with adjacent screen intervals provided coverage from 1 to 5 meters below ground surface (Figure 3).

Piezometers were constructed of 5 cm PVC pipe casings fitted with 0.8 meter long, 0.25 mm slot screens, and were developed by alternately using a surge-block and pumping. Hydraulic conductivities of the reservoir sediments were determined using the Bouwer & Rice (1976) method to analyze the results of slug removal tests performed at sites 123 and 124 (Appendix 2). Vertical hydraulic gradients were calculated for all installations with two or more piezometers (Appendix 2). Horizontal hydraulic gradients were calculated from flow system models (Figures 4A, 4B, 5A, & 5B).

Ground water samples (Appendix 1) and head measurements (Appendix 2) were collected at four-week intervals from August 1986 through August

SCHEMATIC DIAGRAM OF GEOCHEMICAL SAMPLING SITE 124

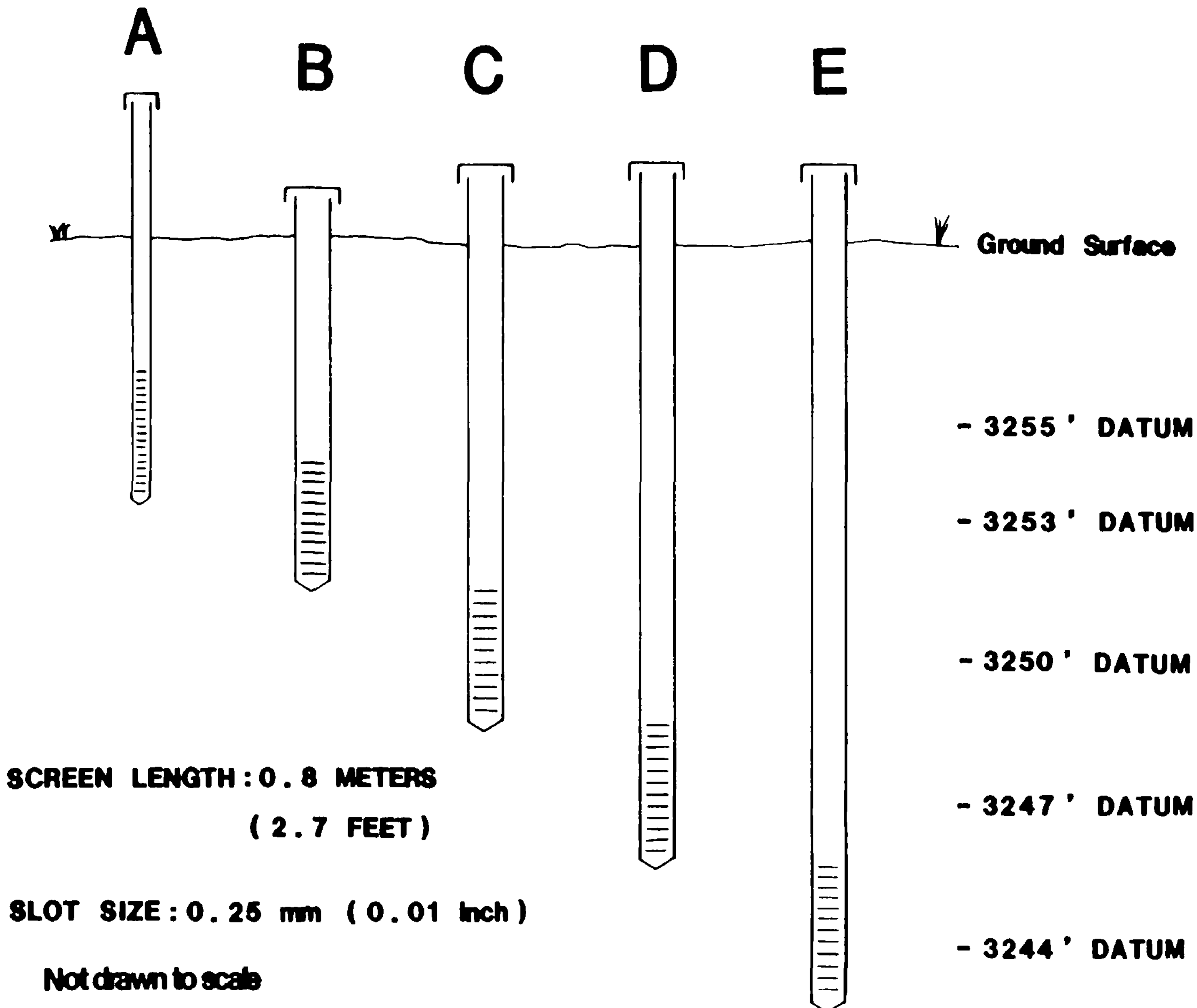


Figure 3

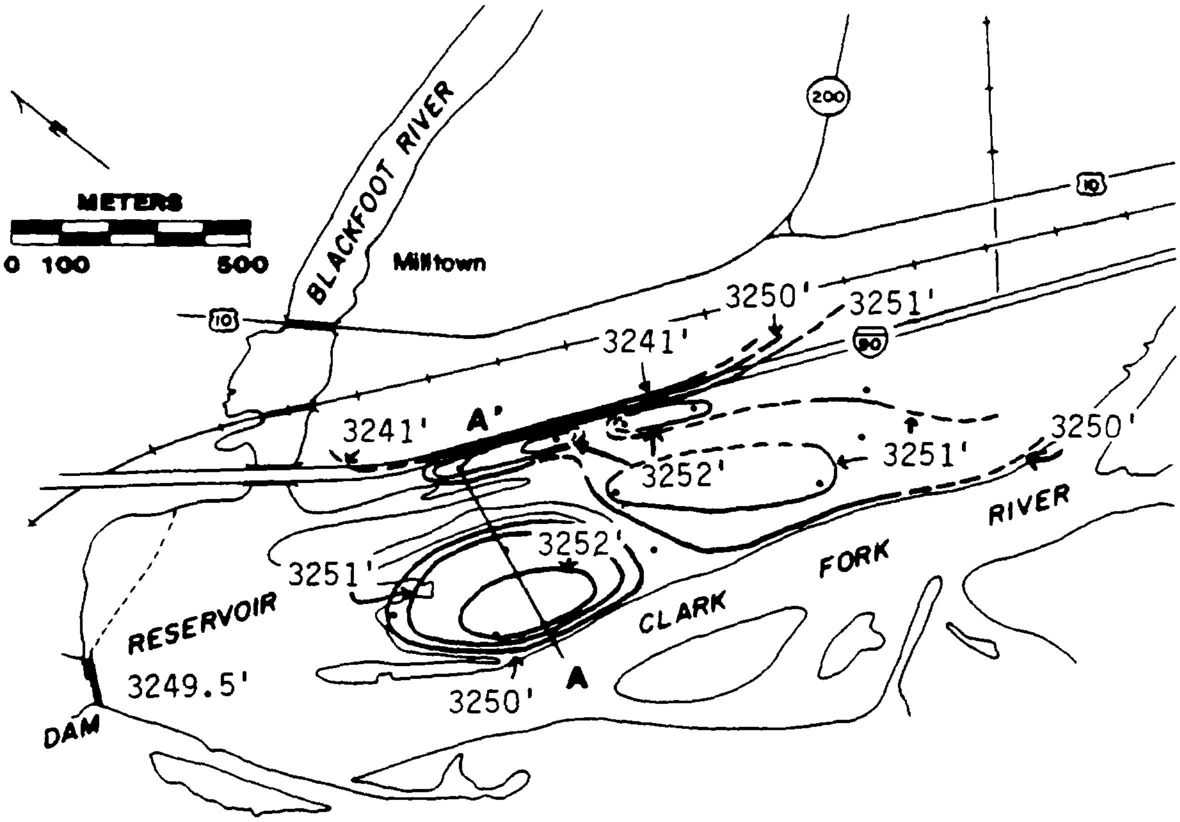


Figure 4A: Water table configuration as of 9/16/86

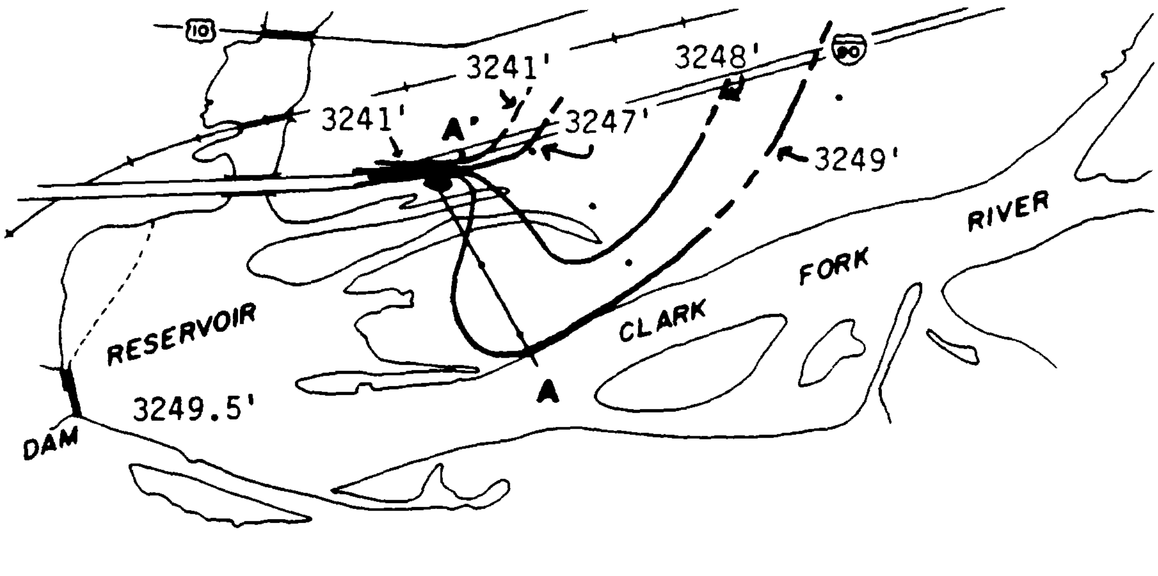


Figure 4B: Potentiometric surface at 3244' as of 9/16/86

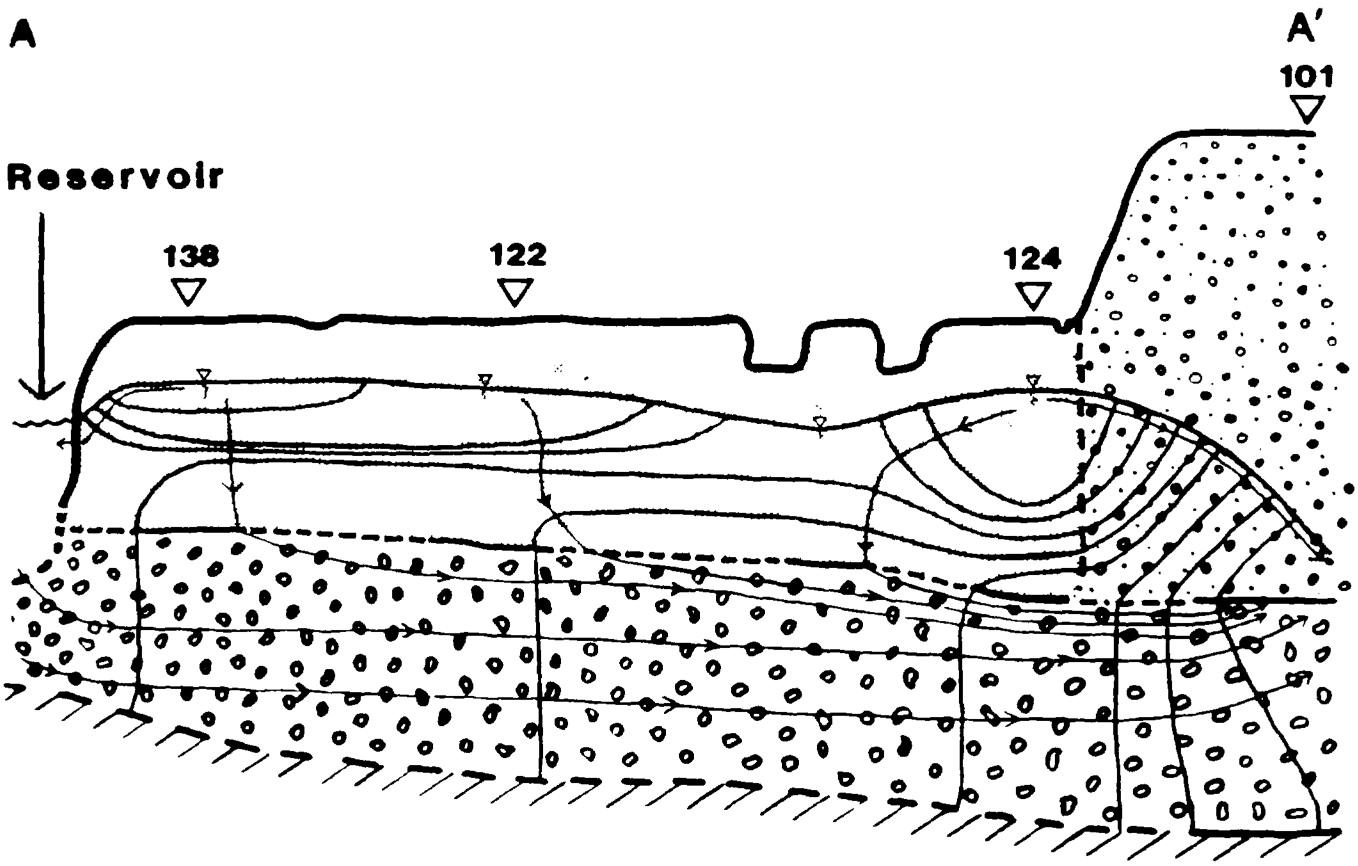
· **Control point**

— **Equipotential line (dashed where inferred)**

A - A' Cross-section (Figure 4C)

Figure 4

Schematic cross-section showing ground water flow as of 9/16/86 (Reservoir is draining)



Fine-grained reservoir sediments

Interlayered silt, sand, gravel

Coarse-grained sand and gravel

Low-conductivity Belt metasediments

Contacts dashed where inferred

Equipotential line

Flow line

Water table

Not drawn to scale

Figure 4C

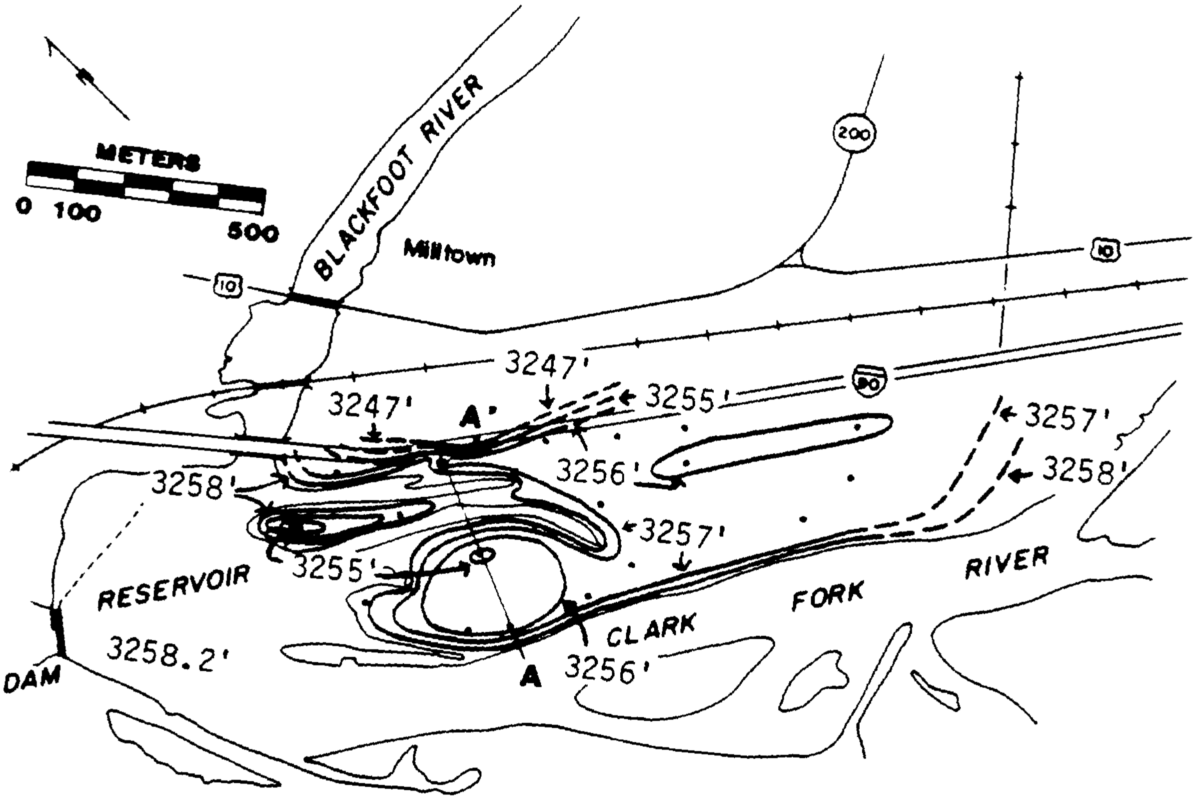


Figure 5A: Water table configuration as of 8/11/87

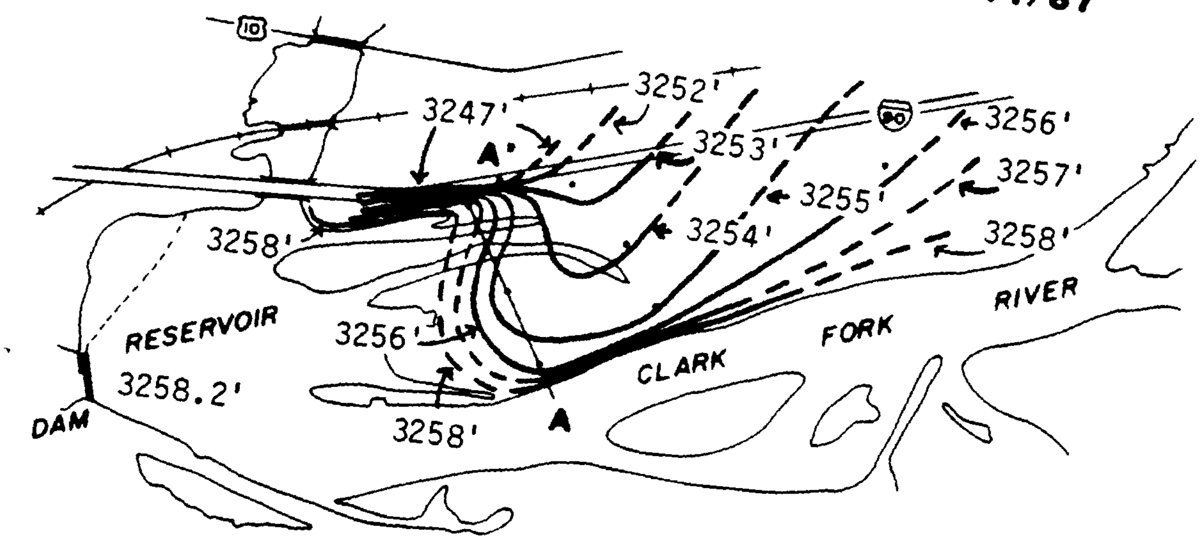


Figure 5B: Potentiometric surface at 3244' as of 8/11/87

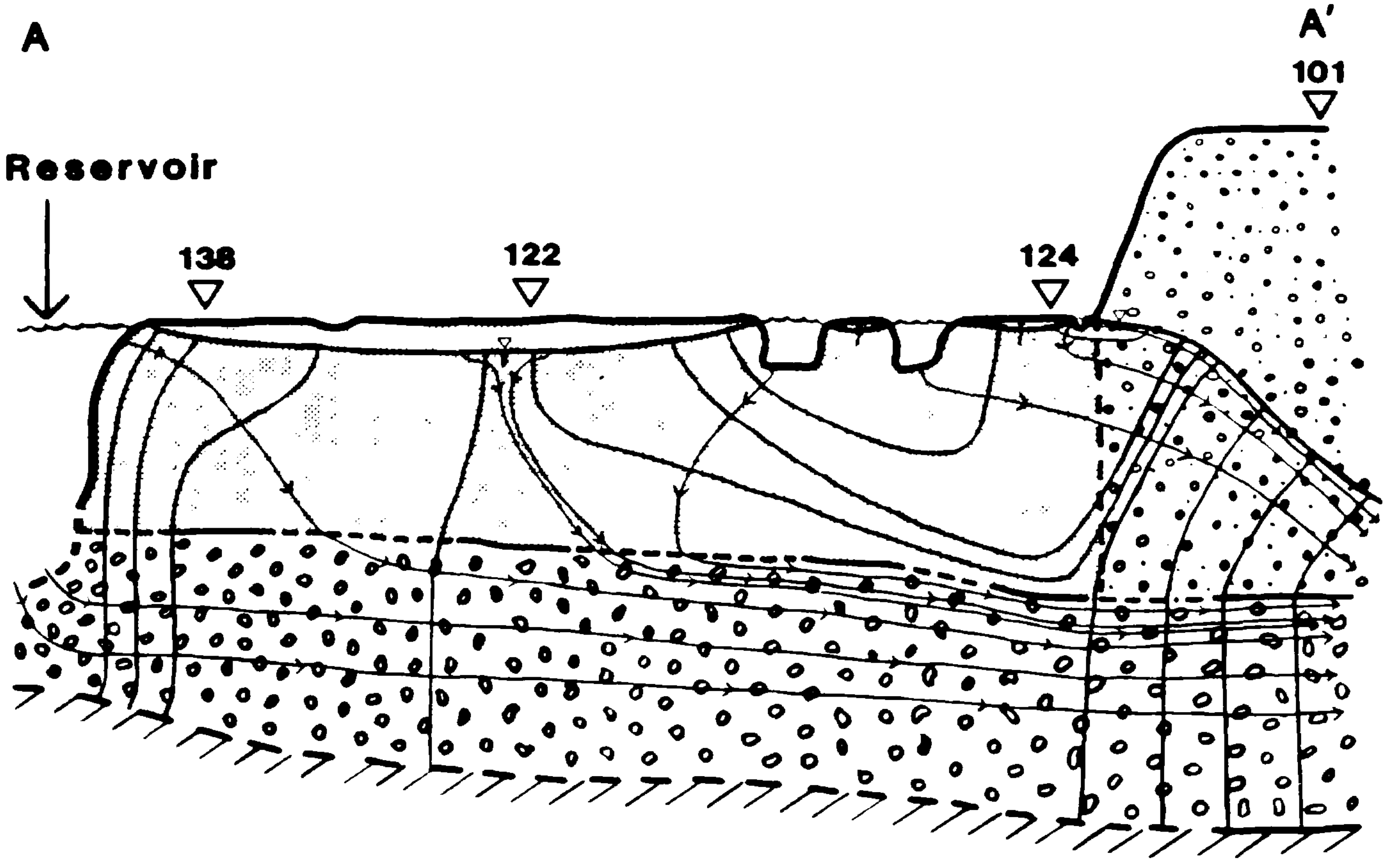
· Control point

— Equipotential line (dashed where inferred)

A - A' Cross-section (Figure 5C)

Figure 5

Schematic cross-section showing ground water flow as of 8/11/87 (Reservoir is filled)



Fine-grained reservoir sediments

Interlayered silt, sand, gravel

Coarse-grained sand and gravel

Low-conductivity Belt metasediments

Contacts dashed where inferred

Equipotential line

Flow line

Water table

Not drawn to scale

Figure 5C

1987. This schedule was disrupted by freezing weather in December, and the March-April sampling interval was shortened to three weeks. A minimum of three piezometers were sampled at each site per sampling period. These included the uppermost piezometer containing adequate volume, plus the lowermost and an intermediate piezometer. As of March 1988, all piezometers containing adequate volume were sampled. The Clark Fork River branch of the reservoir was sampled from April through August, 1987. One to two days prior to collecting ground water samples, heads were measured at all accessible piezometers and geochemical sampling piezometers were purged.

Separate ground water samples were collected and analyzed for major elements and bicarbonate (Appendix 1). Beginning in January 1987, samples were also collected and analyzed for sulfate. All samples except bicarbonate were filtered to 0.45um. The major-elements sample, which was also used for arsenic and iron species analysis, was preserved by acidification to pH 2 with concentrated reagent-grade HCl.

Arsenate (As(V)) and arsenite (As(III)) were separated by ion-exchange (Ficklin, 1983) within eight hours of sample collection. Ferrous iron was determined using bipyridine complexation (Brown _et al_, 1974). Total alkalinity (reported as mg/L bicarbonate) was determined by a Gran plot of acidimetric titration (Stumm & Morgan, 1981). Ferrous iron and alkalinity samples were analyzed within sixteen hours of collection.

Sulfate concentrations were determined with a Dionex 2000i Ion Chromatograph. Samples were refrigerated until analysis, and analyzed within six days of collection.

A Jarrell-Ash Atom Comp Series 800 Inductively Coupled Argon Plasma Emission Spectrometer (ICAPES) was used to analyze major-element samples for arsenic, calcium, iron, magnesium and manganese concentrations, and for analysis of arsenic species separates. USGS water standards T91, T95 and T97, and NBS water standard 1643A were analyzed for quality assurance. Results were generally within one standard deviation of certified concentrations (Appendix 1).

All previous ground water studies at this site have used English measurement units. In order to remain consistent with these earlier studies, head and elevation data are presented in English units, while SI units have been used for all other measurements.

RESULTS AND DISCUSSION

Analysis of sediment cores and the stratigraphic framework of the fine-grained Milltown Reservoir sediments indicates that deposits with relatively high hydraulic conductivities (e.g. point bars or channel sands) are abruptly truncated by and interlayered with deposits having lower conductivities (Appendix 3). While the vertical ordering of these deposits is irregular, higher-conductivity units may be laterally extensive and provide preferred avenues for ground water flow. Logs from borings and wells penetrating the reservoir sediments also define an underlying continuous layer of coarser-grained sediments at the same elevation as coarse-grained units of the adjacent Milltown aquifer (Appendix 3). Hydraulic conductivities for the reservoir sediments

(Table 1) are considerably lower than the 8.84×10^3 to 1.83×10^6 cm/day range reported for the Milltown aquifer (Woessner et al, 1984).

Stage fluctuations caused by dam operations and lithologic complexities of the sediments combine to create a complex hydrogeologic system. The surface of the sediment pile is cut by several large abandoned channels which dissect the uppermost strata into separate unconfined aquifers as the reservoir drains (Figures 4A & 4C). When the reservoir fills these channels become constant head sources, allowing the sediments to quickly flood (Figures 5A & 5C).

However, at the 3244-foot datum the shape of the potentiometric surface remained relatively stable regardless of reservoir stage or water table configuration (Figures 4B, 4C, 5B & 5C). At this depth, there was a continuous horizontal hydraulic gradient towards the Milltown aquifer to the north and east.

Horizontal hydraulic gradients (Table 1, Figures 4 & 5) indicate that the water table constantly slopes steeply down from Sites 123 and 124 towards Site 101. At all other sites vertical hydraulic gradients were typically one to three orders of magnitude greater than the horizontal (Table 1, Appendix 2). This pattern persisted regardless of reservoir stage, although vertical hydraulic gradients decreased after the reservoir had been impounded at full stage for five months.

The steeply sloping water table between Sites 123 and 124 and Site 101 straddles the proposed boundary between pre-reservoir Clark Fork River floodplain and reservoir sediments (Woessner et al, 1984). The rapid head loss across this boundary supports Woessners' interpretation that reservoir sediments, with relatively low hydraulic conductivities, are juxtaposed against the Milltown aquifer in this area. The strong vertical hydraulic gradients within the reservoir sediments also indicate that there is a sharp contrast in hydraulic conductivities between reservoir and pre-reservoir sediments. These vertical hydraulic gradients may be generated by the underlying coarser-grained sediments acting as a "drain", which primarily transmits ground water from the reservoir to the Milltown aquifer underneath the fine-grained sediments (Figures 4C & 5C). Ground water draining through the contaminated fine-grained sediments would augment this flow.

General trends in ground water geochemistry observed at all sites are typified at Site 138 (Figure 6, Appendix 1). With increasing depth below the water table, arsenic, iron and bicarbonate concentrations increased, sulfate concentrations decreased, and manganese concentrations decreased towards a relatively constant value. Ground water pH rarely varied outside a range of 6.3 to 6.9. Ground water chemistries at all depths remained relatively constant until March 1987. Refilling of the reservoir began approximately two days before collection of the March samples. March ground water samples revealed the start of radical chemical changes which were particularly evident in samples from water-table piezometers: although pHs remained constant, sulfate, calcium, magnesium, manganese, iron and arsenic concentrations rapidly increased while bicarbonate concentrations decreased.

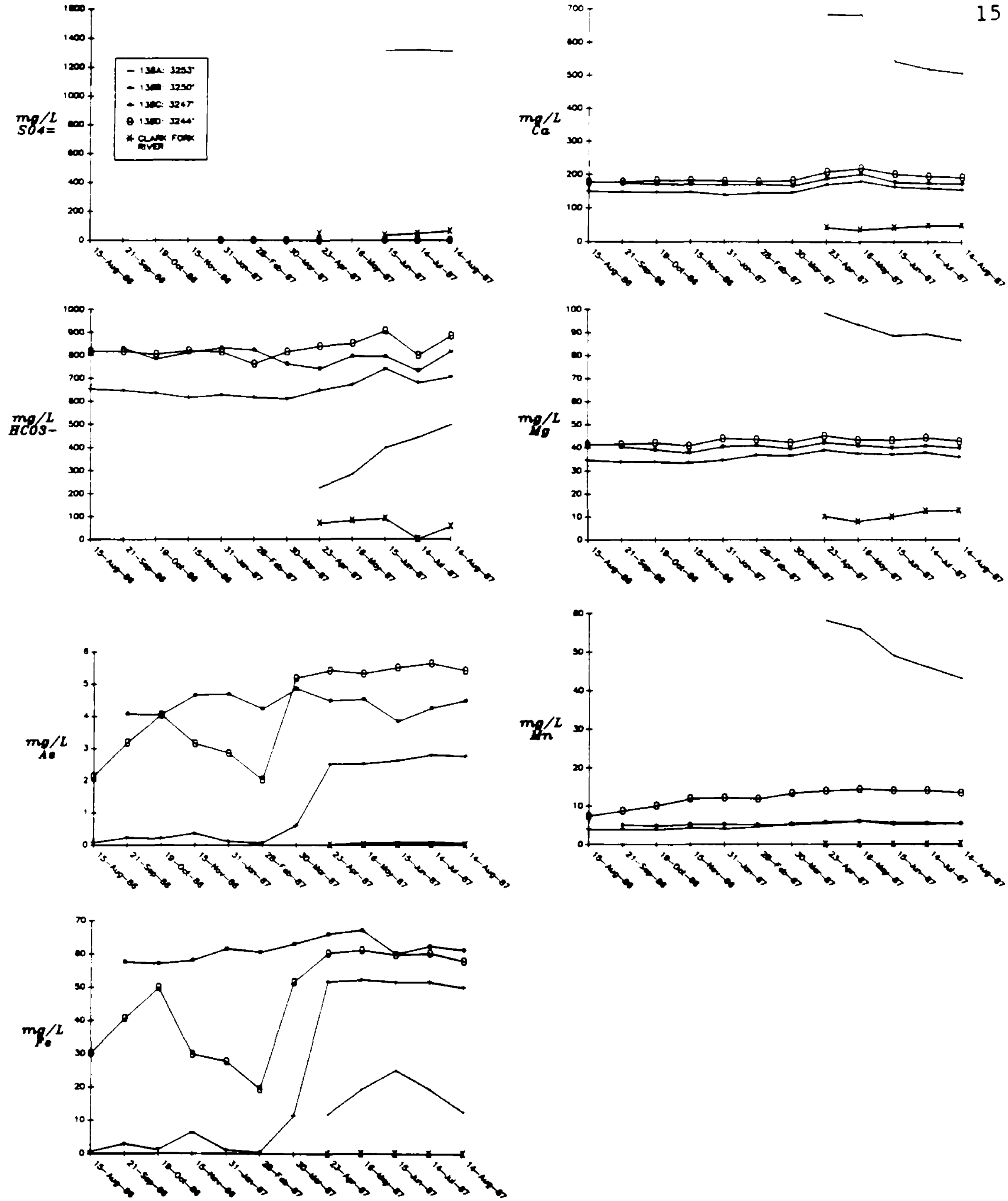


Figure 6: Ground water chemistry - Site 138

Typically, elevated concentrations of calcium, magnesium, manganese and sulfate immediately began to decline, while bicarbonate steadily increased. Calcium, magnesium and manganese were strongly correlated with sulfate at all sites, especially in shallow-datum piezometers (Figure 7).

Arsenic and iron concentrations in water-table piezometers began decreasing approximately two months after the reservoir had been refilled. Arsenic and iron concentrations consistently increased with depth, but temporal trends in deeper piezometers were inconsistent among sampling sites. In all piezometers, changes in arsenic and iron concentrations were similar but not systematic (Table 2). Arsenic was not detected unless sulfate concentrations were low (less than 2 mmoles/liter), and high concentrations of arsenic only occurred when sulfate concentrations were undetectable (Figure 7).

In deep piezometers (sampling the 3244-foot datum), the dominant arsenic species was usually As(III). Shortly after the reservoir was refilled, deep piezometers at several sites showed temporary increases in As(V):As(III) ratios (Table 3). When analyzed, Fe(II) concentrations invariably equalled or exceeded total iron concentrations.

Steady-state diagenetic models describing marine (Edenborn et al, 1986; Froelich et al, 1979) and fresh-water lacustrine environments (Farmer and Lovell, 1986; Aggett and O'Brien, 1985; Berner, 1980) can be applied to arsenic mobilization within the contaminated Milltown Reservoir sediments. As these models address idealized systems with no lateral variations in sediment properties, diagenetic reactions

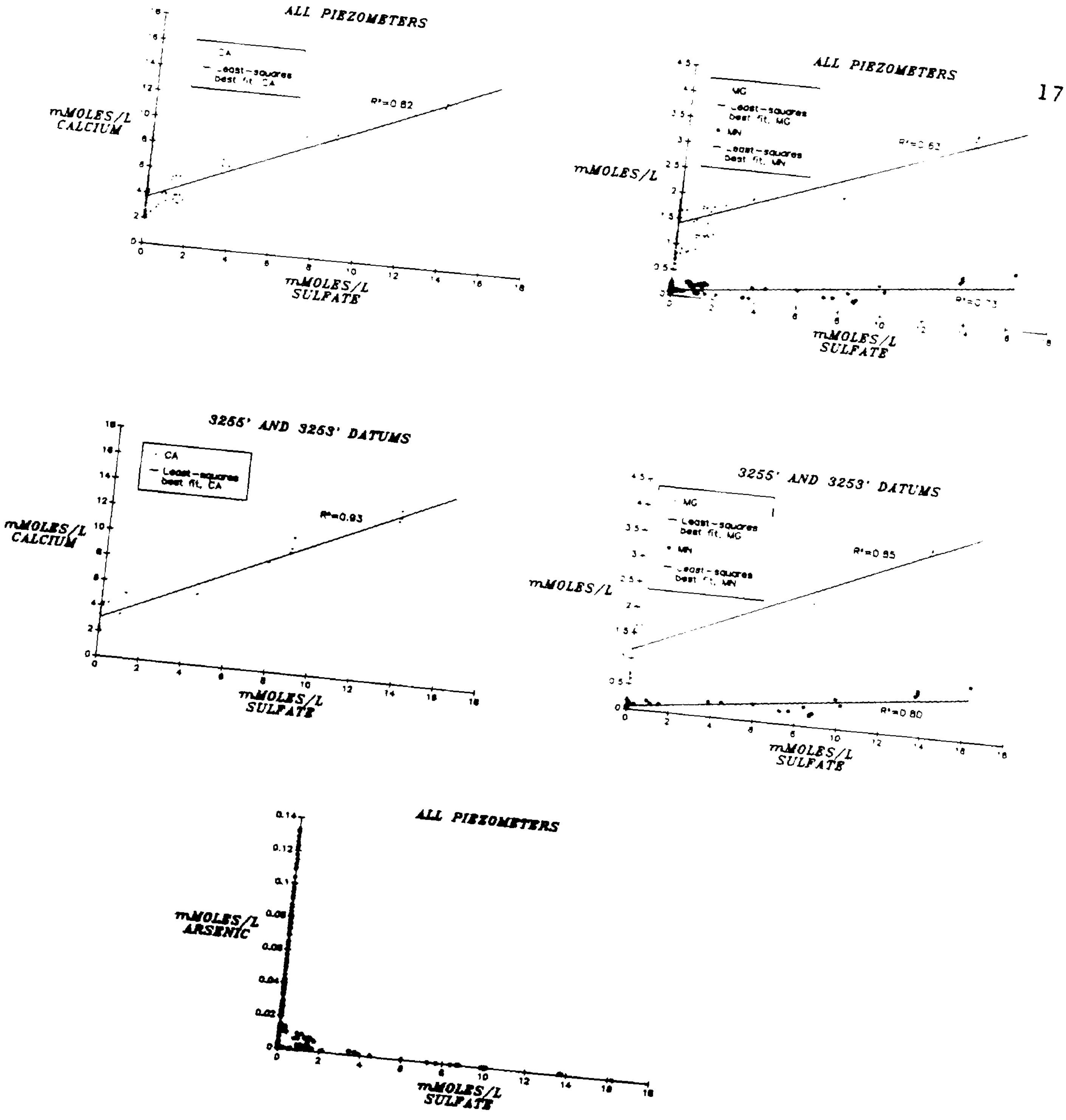


Figure 7: Correlations of major cations with sulfate

progress uniformly with depth throughout the study areas. These models also assume no advective flow except the upward expulsion of porewater as sediment porosity decreases (Berner, 1980). Therefore, the main chemical transport mechanism is diffusion, not advection, and thermodynamic equilibrium can be assumed.

These assumptions are not valid for the Milltown reservoir system, where sediment composition varies radically in every dimension over distances of even a few centimeters. Strong vertical gradients observed throughout the sampling period indicate that advective ground water flow continuously transported components from the oxic (water table) environment downward into the anoxic environment. In such a complex, dynamic system it is likely that thermodynamic equilibrium is rarely achieved.

Despite these complications, clear diagenetic trends are observed at the Milltown site. These changes are best explained using an equilibrium model where porewater chemistry is controlled by diagenetic reactions, although the uniform expression of these trends throughout the reservoir area is often interrupted.

When reduced sediments are drained and allowed to oxidize, reactions controlling arsenic stability which would ordinarily be depth-successive become time-successive. The following reactions are expected:

1) Oxidation of mineral phases which are stable under reducing conditions, such as:

Sulfides: $FeS_2(s) + 7/2\ O_2 + H_2O \rightarrow Fe^{2+} + 2\ SO_4^{2-} + 2H^+$

(Stumm and Morgan, 1981).

2) Aerobic oxidation of organic material:

$(CH_2O)_{106}(NH_3)_{16}(H_3PO_4) + 138\ O_2 + 122\ CaCO_3 \rightarrow$

$228\ HCO_3^- + 16\ NO_3^- + 122Ca^{2+} + 16\ H_2O + H_3PO_4$

(Froelich _et al_, 1979).

Ions bound by organic matter will be liberated as the organic matter is oxidized. Production of carbon dioxide may also yield dissolution of carbonate minerals (shown above as calcite).

3) Oxidation and precipitation of reduced iron or manganese as oxides and/or hydroxides, with co-precipitation of arsenate (Peterson and Carpenter, 1986).

When this oxidized zone is resubmerged, the diagenetic environment evolves from oxic through anoxic-sulfidic to anoxic-methanic, again with normally spatial transitions being observed temporally.

Froelich _et al_ (1979) have described this series of reactions as:

1) MnO_2 reduction:

$(CH_2O)_{106}(NH_3)_{16}(H_3PO_4) + 236\ MnO_2 + 366\ Ca^{2+} + 260\ HCO_3^- \rightarrow$

$366\ CaCO_3 + 236\ Mn^{2+} + 8\ N_2 + H_3PO_4 + 260\ H_2O$

2) Nitrate reduction:

$$(CH_2O)_{106}(NH_3)_{16}(H_3PO_4) + 94.4\ NO_3^- + 11.6\ CaCO_3 \dashrightarrow$$

$$55.2\ N_2 + 117.6\ HCO_3 + 11.6\ Ca^{2+} + H_3PO_4 + 71.2\ H_2O$$

3) Fe(III) reduction:

$$(CH_2O)_{106}(NH_3)_{16}(H_3PO_4) + 424\ FeOOH + 758\ Ca^{2+} + 652\ HCO_3^- \dashrightarrow$$

$$758\ CaCO_3 + 16\ NH_4^+ + H_3PO_4 + 424\ Fe^{2+} + 636\ H_2O$$

4) Sulfate reduction:

$$(CH_2O)_{106}(NH_3)_{16}(H_3PO_4) + 53\ SO_4^{2-} \dashrightarrow$$

$$106\ CO_2 + 16\ NH_3 + 53\ S^{2-} + H_3PO_4 + 106\ H_2O$$

5) Methane production:

$$(CH_2O)_{106}(NH_3)_{16}(H_3PO_4) \dashrightarrow 53\ CO_2 + 53\ CH_4 + 16\ NH_3 + H_3PO_4$$

The reactions above are listed in order of decreasing oxidant strength, and thus generally reflect order of occurrence. With the exception of MnO_2 reduction, all of these reactions have been demonstrated to be microbially mediated (Hanselmann, 1986).

In oxidizing environments, arsenic typically occurs as As(V) (arsenic acid or arsenate), while As(III) (arsenite) is typical of reducing environments (Cherry et al, 1979). Peterson and Carpenter (1983) suggest that arsenate-arsenite conversion is intermediate between the MnO_2-Mn(II) and ferric-ferrous reactions in marine environments.

Application of these general diagenetic reactions to the draining and resaturation of the Milltown Reservoir sediments explains arsenic mobilization in this system (Figures 8A, 8B, & 8C). As the water table dropped below the screens of the shallowest piezometers (3255- and 3253-foot datums) in November of 1986, an oxidizing front descended upon previously reduced sediments. Primary and/or diagenetic sulfides oxidized, releasing sulfate plus associated metals to porewater (Figure 8B). Moore et al (1988), have shown that arsenic and iron are associated with sulfides in this system. Aerobic oxidation of organic matter would have liberated ions associated with the organic matter and caused carbonate dissolution, yielding increased concentrations of calcium, magnesium and manganese. The inverse relationship between calcium and bicarbonate concentrations, coupled with relatively constant pHs (Appendix 1) indicate that this system is buffered by carbonate-system reactions which prevent acidification.

In oxidizing environments, Ca(II), Mg(II) and Mn(II) form stable complexes with sulfate (Hem, 1963; Stumm and Morgan, 1981), which may explain the strong correlations of these cations with sulfate (Figure 7). Sulfate minerals may have precipitated as the capillary fringe retreated.

Mn(II) can be removed from solution by microbial oxidation to MnO_2 (Nealson, 1983). Moore et al (1988), found that in both reducing and oxidizing environments manganese typically occurred in the "reducible" fraction, which includes oxyhydroxides. However, the high concentrations

Figure 8A:

STATIC CONDITIONS:
HIGH WATER TABLE, RESERVOIR IS FILLED

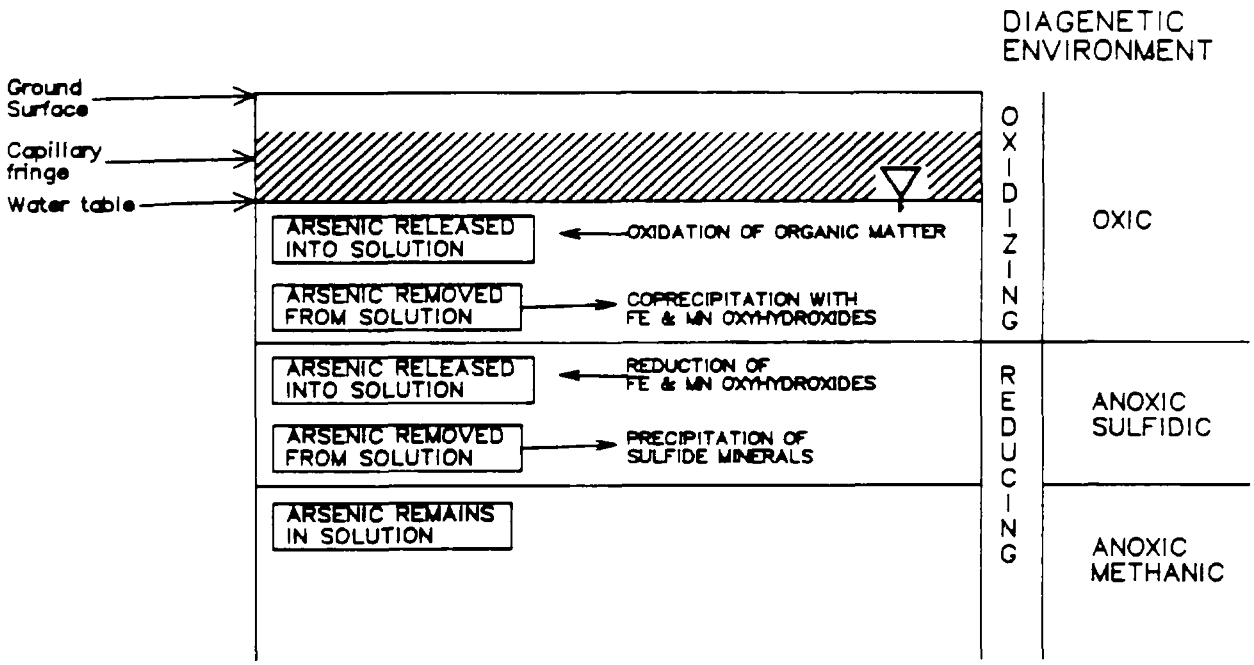


Figure 8B:

WATER TABLE FALLS AS RESERVOIR IS DRAINED

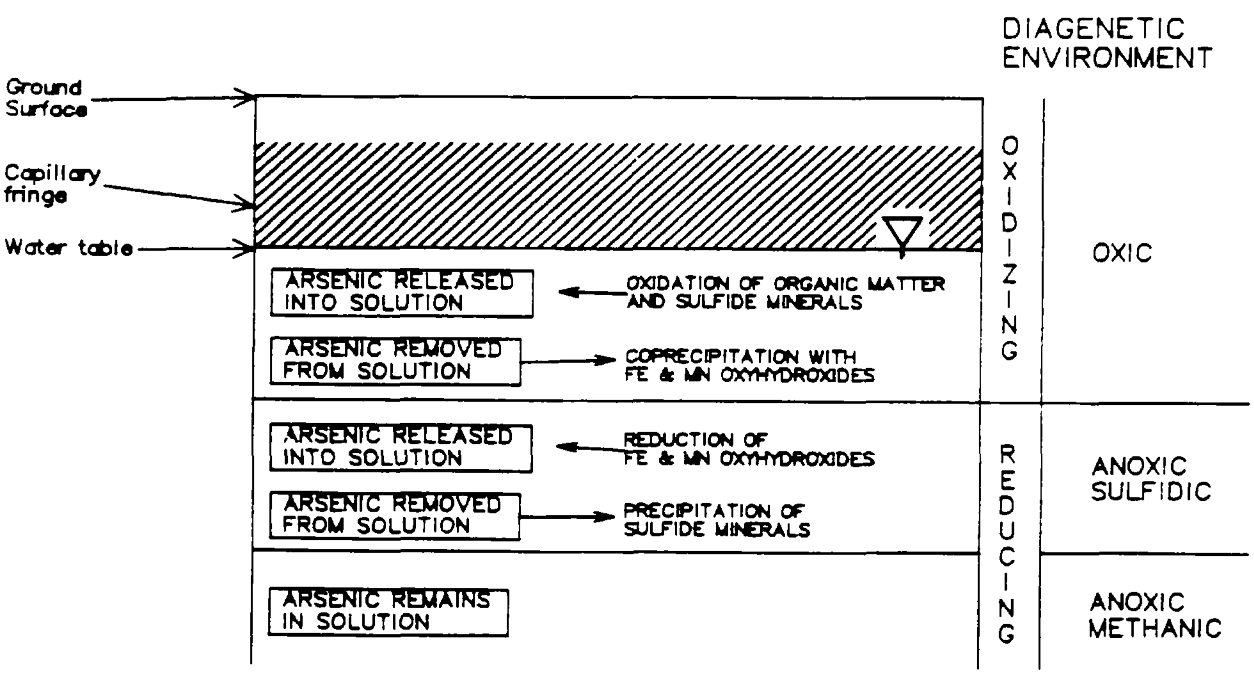
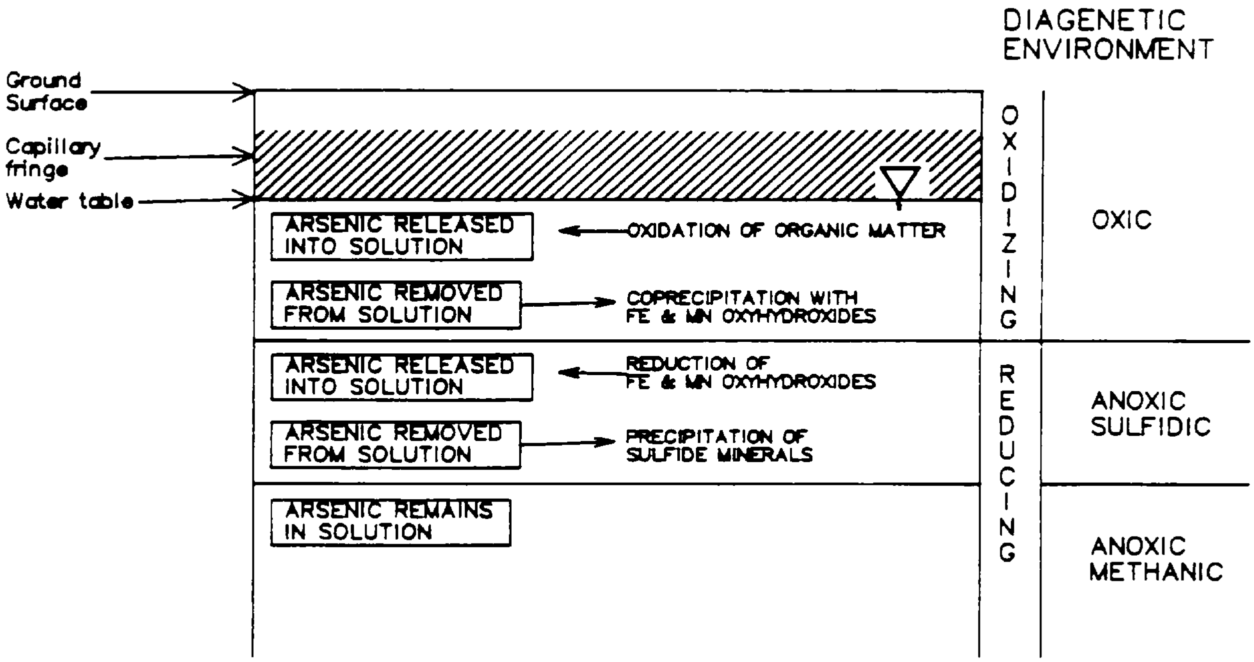


Figure 8C:

WATER TABLE RISES AS RESERVOIR IS REFILLED



of Mn(II) observed in piezometers sampling the oxic environment indicate that this process did not control Mn(II) concentrations.

Fe(II) released into solution by sulfide oxidation or caught by the advancing oxidation front would have swiftly reprecipitated as iron oxyhydroxide (Berner, 1971).

Arsenic released by oxidation of sulfide minerals and/or organic matter may have re-adsorbed onto organic matter (Andrae and Froelich, 1984; Peterson and Carpenter, 1983), or been adsorbed by and/or coprecipitated with iron and/or manganese oxyhydroxides (Figure 8B) (Moore et al, 1988; Brannon and Patrick, 1987; Peterson and Carpenter, 1986; Aggett and O'Brien, 1985; Takamatsu et al, 1985; Huang et al, 1982; Pierce and Moore, 1982; Matthess, 1981; Oscarson et al, 1981; Ferguson and Gavis, 1972). Moore et al (1988) found that while arsenic occurred in organic and sulfide phases, it was most strongly associated with the "reducible" (oxyhydroxide) fractions in the oxidized zone of these sediments. Coprecipitation of arsenic with iron and/or manganese oxyhydroxides would explain the extremely low concentrations of both iron and arsenic in water-table piezometers, and the irregular correlation of arsenic with iron (Table 3). The efficiency of these processes were demonstrated by the low concentrations of iron and arsenic in piezometers sampling the oxic environment (Figure 6, Appendix 1).

When the reservoir was refilled in March, the sediments were resaturated and the water table stabilized above the screens of the shallow-datum piezometers. Reservoir water conducted into the sediments by advective flow had constituent concentrations much lower those observed in shallow-datum ground water samples (Figure 6, Appendix 1). The low bicarbonate and high calcium, magnesium, manganese and sulfate concentrations in shallow-datum piezometers immediately upon resaturation record the previous aerobic oxidation of these sediments.

As the diagenetic environment transformed from oxic to anoxic, manganese and iron oxyhydroxides would have become unstable (Froelich et al, 1979) and, upon reduction, released manganese, iron, and any coprecipitated arsenic into solution (Figure 8C).

After initial increases following the refilling of the reservoir, sulfate concentrations decreased both temporally and with depth, indicating that sulfate was being reduced to sulfide. Despite the instability of iron and manganese oxyhydroxides in the anoxic sulfidic zone, where their reduction would release Fe(II) and Mn(II) into solution, iron and manganese concentrations decreased concurrently with sulfate. Iron concentrations continuously increased with depth, while manganese stabilized at the lower concentrations (Figure 6, Appendix 1).

These trends probably reflect precipitation of Fe(II) as monosulfide minerals and possibly iron-arsenic sulfides while sulfide was available, which supports the hypothesis that diagenetic sulfides form in the Milltown sediments (Moore et al, 1988). The increase of iron concentrations with depth suggests that sulfide concentrations were insufficient to precipitate the available iron. As rhodochrosite is the most probable stable manganese mineral in reducing environments unless sulfide concentrations are exceptionally high (Berner, 1981), Mn(II) concentrations are probably controlled by rhodochrosite precipitation (Froelich et al, 1979). However, Moore et al (1988) found neither manganese sulfides nor carbonates in the Milltown sediments.

In reducing environments, As(III) can be precipitated as either a mixed iron-arsenic sulfide or arsenous sulfide (Moore et al, 1988; Aggett and O'Brien, 1985), or be immobilized by adsorption onto charged surfaces such as residual iron and/or manganese oxyhydroxides (Takamatsu et al, 1985; Huang et al, 1982). After available sulfide is consumed and charged surfaces are saturated, As(III) will remain in solution and be transported off-site (Figure 8C).

Unlike sulfate, arsenic concentrations typically remained constant or increased over time and with depth in all piezometers throughout the sampling period (Figure 6, Appendix 1). The inverse relationship between arsenic and sulfate concentrations (Figure 7), the low As(V):As(III) ratios in deep piezometers (Table 3), and persistent high arsenic concentrations at depth suggest that sulfide concentrations were insufficient to precipitate all of the available arsenite as sulfide minerals. Ficklin (personal communication) has proposed that sulfate (and therefore sulfide) is limited in this system, which allows arsenite to escape off-site and contaminate the Milltown aquifer. The data collected for this study strongly support this hypothesis.

The diagenetic model proposed above is regularly modified by local stratigraphy and advective flow. Complications in spatial and temporal diagenetic trends result from historical variations in original sediment composition and local hydrologic anisotropies and heterogeneities.

Depositional variations in metals concentrations occur throughout the reservoir area (Woessner _et al_, 1984). Therefore, the chemical trends observed at Site 138 were not always systematically developed at other sites.

The interrelationships between sediment composition, anisotropic advective flow and diagenetic environment are demonstrated at Site 124. After the reservoir was refilled, piezometers 124A and 124B (sampling the 3255- and 3253-foot datums respectively) showed trends in calcium, magnesium, manganese, iron, arsenic and bicarbonate concentrations which were similar to those observed at Site 138 (Figure 9). However, sulfate never reached detectable levels in 124B, despite high (>50 mg/L) sulfate concentrations in surrounding piezometers (124A and 124C). Sulfate concentrations at this site were unusually high in deep piezometers (124C, 124D and 124E), where they increased erratically over time. Unlike all other sites, iron and bicarbonate concentrations decreased with depth, and high arsenic concentrations were consistently restricted to specific datums (3253- and 3244-feet, sampled by 124B and 124E respectively).

Slug tests demonstrated that the hydraulic conductivities of strata sampled by piezometers 124B and 124E are considerably lower than those sampled by 124C and 124D (Table 1). Ground water velocities at the site were calculated for the dates when gradients into 124B and 124E are at their greatest (Table 4). These indicate that, at their greatest, discharges per unit cross-sectional area through the strata sampled by 124B or 124E were extremely low, especially in comparison to surrounding

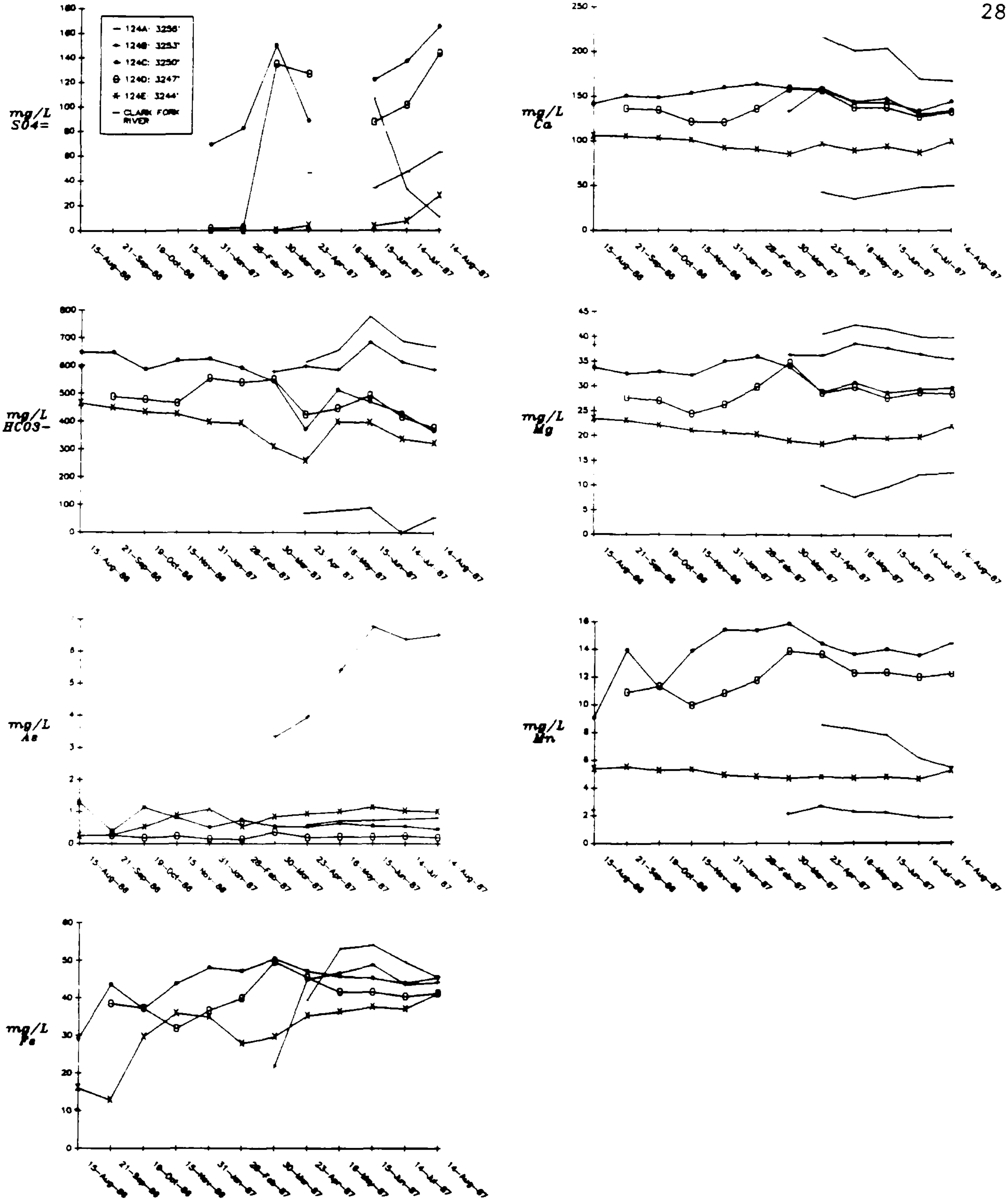


Figure 9: Ground water chemistry — Site 124

strata (Table 4). These low flow rates allowed the ground water in the lower-conductivity strata sampled by 124B or 124E to remain strongly reduced (as indicated by low sulfate concentrations) even while less reducing conditions prevailed in surrounding strata. Unlike higher-conductivity strata, reduction reactions in 124B and 124E could keep pace with incoming reactants. Low ground water velocities also precluded the rapid advective leaching of these strata. Therefore, high arsenic concentrations in samples from 124B and 124E reflect high depositional arsenic concentrations which have been mobilized by locally strongly reduced diagenetic environments, but have not yet been leached.

The stratum sampled by 124B remained strongly reduced even after the water table fell beneath its screen. It is likely this stratum has such low hydraulic conductivity that it persisted as a tension-saturated zone perched above the water table, with oxygenation dependent upon diffusion.

The influence of advective flow in this system is also demonstrated by the elevated As(V):As(III) ratios at depth immediately after the reservoir was refilled (Table 3). These ratios indicate that while As(V) was normally reduced to As(III) before reaching the deepest piezometers, the increased gradients resulting from the rapid rise in reservoir stage drove As(V) deeper into the system. As gradients decreased and the system re-equilibrated with the redox boundary further above the deep piezometers, the As(V):As(III) ratios returned to previous levels.

This model implies continuous transport of arsenic off-site, with arsenic being leached from sediments which are alternately oxidized and reduced as the water table fluctuates. If true, arsenic concentrations in at least some parts of the reservoir sediments (especially surficial sediments intercepted by the redox boundary) must be decreasing. Arsenic concentrations in shallow-datum piezometers (3255′ and 3253′) throughout the study area were invariably low (Appendix 1, Table B; Woessner et al, 1984). Moore et al (1988) found that arsenic concentrations in the top 0.5 meters of sediment were relatively low (less than 150 ug/g). Cores from the study area analyzed by Woessner et al (1984, Cores #2-5) showed the same general trends. While this could reflect historical decreases of arsenic concentrations in sediments deposited by the Clark Fork River, it may also indicate leaching of these surficial sediments.

CONCLUSIONS

Arsenic occurring in the Milltown Reservoir sediments can be immobilized by coprecipitation with iron and manganese oxyhydroxides in oxidizing environments, or precipitation as sulfide minerals in reducing environments. Reservoir stage fluctuations, which force concomitant migration of the water table and redox boundary, destabilize minerals which had been in equilibrium and mobilize arsenic (Figures 8A, 8B, & 8C). Lowering the water table causes oxidation of previously reduced sediments. Oxidation of sulfide minerals and/or organic matter releases arsenic, which coprecipitates with iron and manganese oxyhydroxides. Raising the water table causes reduction of previously oxidized sediments. Reduction of iron and manganese oxyhydroxides liberates coprecipitated arsenic. Arsenic released to ground water in anoxic environments typically remains in solution, reflecting limited sulfide concentrations in this system. Absolute arsenic concentrations in ground water depend on depositional concentrations in sediments, which are modified by local diagenetic environments and advective flow.

Coarser sediments underlying the fine-grained reservoir sediments act as a "drain", conducting ground water from the reservoir to the Milltown aquifer. Vertical gradients induced within the upper 0-5m of reservoir sediments direct ground water downward to the underlying "drain", which intercepts the arsenic-contaminated ground water and transports it to the Milltown aquifer.

TABLE 1. Gradients and average hydraulic conductivities of sediments at geochemical sampling sites.

IN THE VICINITY OF SITE #	HORIZONTAL HYDRAULIC GRADIENTS (WATER TABLE) (9/16/86)	HORIZONTAL HYDRAULIC GRADIENTS (WATER TABLE) (8/11/87)
101	0.072	0.062
122	-0.005	0.016
123	-0.671	-0.061
138	-0.015	0.013

AT SITE #	VERTICAL HYDRAULIC GRADIENTS (9/16/86)	VERTICAL HYDRAULIC GRADIENTS (8/11/87)
101	0.070	-0.137
121	-0.237	-0.133
122	-0.457	-0.079
123	-0.851	-0.411
124	-0.027	-0.000
137	-0.715	-0.283
138	-0.460	-0.044

PIEZOMETER	AVERAGE HYDRAULIC CONDUCTIVITY (cm/day)
123D	9
123E	111
123F	269
124B	10
124C	245
124D	524
124E	10

TABLE 2. Correlation coefficients (R^2) for arsenic with iron.

	DATUM					
SITE	3255′	3253′	3250′	3247′	3244′	ALL
ALL	N/A	0.39	0.48	0.47	0.25	0.15
121	N/A	0.61	0.19	0.58	0.57	0.59
122	N/A	0.26	0.01	0.01	0.05	0.38
123	N/A	N/A	0.11	N/A	0.46	0.10
124	0.28	0.78	0.72	0.21	0.86	0.02
137	N/A	0.08	0.70	0.98	0.28	0.64
138	N/A	0.25	0.99	0.20	0.93	0.85

The correlation coefficient for the 3255′ datum at Site 123 has not been included because arsenic concentrations in 123C were consistently below detection limits.

TABLE 3. Ratios of AS(V):AS(III) at the 3244′ datum for selected dates:

SITE	10/86	1/87	4/87	7/87
122A	0.16	0.11	0.14	0.08
123D	0.33	0.05	0.81	0.15
124E	0.30	0.05	1.40	0.11
137D	0.10	0.03	0.24	0.03
138D	0.10	0.08	0.08	0.06

Table 4: Calculated ground water velocities and discharges per unit volume for sampling periods which yield maximum gradients through 124B and 124E:

CALCULATED BETWEEN PIEZOMETERS	SAMPLING DATE	VERTICAL HYDRAULIC GRADIENT	ESTIMATED EFFECTIVE POROSITY	VELOCITY (CM/DAY)	DISCHARGE PER UNIT VOLUME (CM^3/DAY)
124A-->124B	7/30/86	-0.261	20%	13.0	2.6
124C-->124E	3/26/87	-0.069	20%	3.4	0.7

CALCULATED BETWEEN PIEZOMETERS	SAMPLING DATE	HORIZONTAL HYDRAULIC GRADIENT	ESTIMATED EFFECTIVE POROSITY	VELOCITY (CM/DAY)	DISCHARGE PER UNIT VOLUME (CM^3/DAY)
124B-->101B	9/16/86	-0.072	20%	3.6	0.7
124E-->101B	9/16/86	-0.072	20%	3.6	0.7
124C-->101B	9/16/86	-0.072	35%	50.4	17.6
124D-->101B	9/16/86	-0.072	35%	107.8	37.7

The following formulas were used:

$$Q = -K\ A\ (dh/dl)$$

$$v = Q\ /\ (A\ n) = (-K\ /\ n) * (dh/dl)$$

where:
Q = Discharge
K = hydraulic conductivity (see Table 1)
A = cross-sectional area
(dh/dl) = hydraulic gradient
v = seepage velocity
n = effective porosity

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APPENDIX # 1

This appendix contains all water chemistry data for this study. All concentrations are reported as mg/L.

List of Contents:

Abbreviations used:

STD. DEV. = standard deviation
BDL = Below detection limit
LOD = Limit of detection (3 * STD. DEV. of reagent blank concentration)
uc = uncertified
na = not analyzed
n = the number of analyses recorded above the limit of detection
% RECD. = percent received
#2 = designates the replicate analysis of a given sample
NR = Not received
F = Field. Designates pH values taken in the field, using a Beckman pH meter.
L = Lab. Designates pH values taken from bicarbonate samples in the lab, using an Orion or a Beckman Zeromatic SS-3 pH meter.

DESCRIPTION OF GROUND WATER SAMPLE COLLECTION PROCEDURES:

Purging procedure:

Piezometers were purged by removing at least one casing-volume of ground water with a Black & Decker "Jackrabbit" peristaltic pump. In all piezometers except 124C and 124D, purging one casing volume completely emptied the casing. Piezometers which were pumped dry required one to two days to completely recharge.

Sample collection procedure:

Groundwater samples were collected using a Black & Decker "Jackrabbit" peristaltic pump, within two days of purging.

The ground water sampling procedure began with pumping and discarding a minimum volume of 300 ml. A 1-liter Nalgene collection beaker was then rinsed with 50 ml of sample three times. A 60 ml Beckton-Dickson syringe and the acid-washed Nalgene sample containers were then rinsed three times with sample or filtrate.

Unfiltered bicarbonate samples were pumped directly into rinsed sample containers.

Filtered samples for major elements and sulfate were collected from water in the beaker. The 60 ml syringe with attached Millipore Swinnex-25 filter holders was used to transfer samples from the beaker to labeled containers. The first few milliliters passing through each 0.45um filter were discarded. The 125 ml major-elements sample, which was also used for arsenic and iron species analysis, was preserved with 1.0 ml concentrated reagent-grade HCl per 100 ml sample volume. After collecting samples from a given piezometer, the syringe and beaker were rinsed three times with distilled, deionized water. 750 ml of distilled, deionized water were then pumped through the Jackrabbit pump. The beaker was rinsed again. The outside of the pump tubing was wiped with a clean towel, then rinsed with distilled, deionized water. The Clark Fork branch of the Milltown Reservoir was sampled approximately two feet offshore of Site 138 using the above procedures. After finishing sample collection for the day, a blank of distilled, deionized water was collected using the same procedures and reagents.

Note that because of limited transmissivities, purging emptied almost all of the piezometers. Therefore, ground water flowing back into the piezometers from anoxic diagenetic zones may have become at least partially aerated. In-line sample collection was not possible given available sampling equipment and limited casing volumes. Pumping ground water into the collection beaker (as described above) necessarily aerated the samples. Any oxidation would swiftly precipitate iron oxyhydroxides, which would coprecipitate other ions (including arsenic). Orange precipitates were often observed on filters. Therefore, metal concentrations must be viewed as minimum values, particularly for samples with high iron concentrations.

TABLE A: This table contains quality control data for ICAPES, ion chromatograph, Gran titration, and ferrous iron analyses. Analyses of USGS and NBS standards, results of replicate analyses, and Limits of Detection are included. Standards have been corrected for SRM density. Standards T97 and T97+As were analyzed with the ICAPES spectrum shifter disengaged.

The "+As" designation for USGS standards indicates that the standard was spiked in the lab with arsenic standard to a concentration of approximately 0.5 or 1.0 mg/L.

For ICAPES analyses:

The 11/86 limits of detection were used for analyses of sample collection dates 8/86, 9/86, 10/86 and 11/86. The 10/87 limits of detection were used for analyses of sample collection dates 12/86, 1/87, 2/87, 3/87, 4/87, 5/87, 6/87 and 7/87. The 11/87 limits of detection were used for analyses of sample collection date 8/87. The 4/88 limits of detection were used for all arsenic speciation analyses.

For iron speciation: A 30 mg/L standard was prepared in the lab. The standard, and a blank of distilled, deionized water spiked with the same concentrations of reagents as the samples, were analyzed after every third sample. If any instrument drift was observed, affected samples were rerun. Samples whose concentrations were greater than 35 mg/L were diluted to yield concentrations less than 30 mg/L.

Quality Control and Limits of Detection- ICAPES

		AL	AS	CA	CD	CU	FE
NBS values:		AL	AS	CA	CD	CU	FE
NBS1643a	MEAN	na	0.077	27	0.010	0.018	0.089
	STD.DEV.		0.007	uc	0.001	0.002	0.004
Results:							
NBS1643a	MEAN	0.12	0.07	26.980	0.0098	0.0221	0.085
	STD.DEV.	0.01	0.01	0.905	0.0007	0.0016	0.003
	n=11	n=11	n=11	n=11	n=11	n=11	n=11
	%RECD.		92.92		96.18	120.82	94.77
USGS values:		AL	AS	CA	CD	CU	FE
T91	MEAN	0.383	0.0008	na	0.0350	0.940	0.298
	STD.DEV.	0.075	0.0006		0.0037	0.043	0.031
Results:							
T91	MEAN	0.39	BDL	26.810	0.0347	0.9490	0.407
	STD.DEV.	0.02		0.539	0.0014	0.0426	0.080
	n=8	n=8	n=0	n=8	n=8	n=8	n=8
	%RECD.	101.26			99.25	100.96	136.46
T91+As	MEAN	0.41	0.50	26.950	0.0336	0.9913	0.428
(spiked to	STD.DEV.	0.01	0.02	0.565	0.0042	0.0390	0.074
± 0.5 ppm)	n=12	n=12	n=12	n=12	n=12	n=12	n=12
	%RECD.	105.89	99.49		96.03	105.45	143.75
USGS values:		AL	AS	CA	CD	CU	FE
T95	MEAN	0.055	0.00096	72.4	0.00045	0.0109	0.0110
	STD.DEV.	0.031	0.00055	4.5	0.00026	0.0043	0.0068
Results:							
T95	MEAN	0.06	BDL	70.458	BDL	0.0069	0.031
	STD.DEV.	0.02		3.174		0.0010	0.030
	n=13	n=12	n=0	n=13	n=0	n=11	n=7
	%RECD.	103.33		97.32		63.22	285.78
T95+As	MEAN	0.05		69.523	0.0063	0.0075	0.019
(overall)	STD.DEV.	0.01		2.606	0.0000	0.0016	0.017
	n=13	n=12		n=13	n=2	n=13	n=9
	%RECD.	86.23		96.03	1400.00	69.21	169.42
T95+As	MEAN	0.03	0.51	72.390	BDL	0.0051	0.043
(spiked to	STD.DEV.	0.00	0.00	0.375		0.0004	0.002
± 0.5 ppm)	n=3	n=2	n=3	n=3	n=0	n=3	n=3
	%RECD.	62.84	102.18	99.99		46.40	390.08
T95+As	MEAN	0.05	0.95	68.663	0.0063	0.0083	0.007
(spiked to	STD.DEV.	0.01	0.02	2.362	0.0000	0.0010	0.001
± 1.0 ppm)	n=10	n=10	n=10	n=10	n=2	n=10	n=6
	%RECD.	90.91	95.20	94.84	1400.00	76.06	59.09
USGS values:		AL	AS	CA	CD	CU	FE
T97	MEAN	0.126	0.0113	54.0	0.0163	0.0168	0.100
	STD.DEV.	0.042	0.0015	2.1	0.0023	0.0025	0.009
Results:							
T97	MEAN	0.15	BDL	55.211	0.0168	0.0098	0.110
	STD.DEV.	0.02		1.087	0.0008	0.0009	0.004
	n=9	n=9	n=0	n=9	n=9	n=9	n=9
	%RECD.	119.05		102.24	103.20	58.07	110.11
T97+As	MEAN	0.16	0.55	55.333	0.0260	0.0113	0.336
(spiked to	STD.DEV.	0.01	0.01	0.926	0.0011	0.0011	0.007
± 0.5 ppm)	n=12	n=12	n=12	n=12	n=12	n=12	n=12
	%RECD.	124.34	109.00	102.47	159.66	67.11	336.25
Limits of detection	DATE	AL	AS	CA	CD	CU	FE
LOD	11/86	0.03	0.03	0.004	0.0021	0.0027	0.008
LOD	10/87	0.02	0.03	0.004	0.0039	0.0021	0.006
LOD	11/87	0.01	0.02	0.006	0.0017	0.0015	0.003
LOD	4/88	0.02	0.03	0.004	0.0020	0.0020	0.004

		K	MG	MN	NA	NI	PB
NBS values:		K	MG	MN	NA	NI	PB
NBS1643a	MEAN	2	8	0.032	9	0.056	0.027
	STD.DEV.	uc	uc	0.002	uc	0.003	0.001
Results:							
NBS1643a	MEAN	0.7	7.552	0.0314	8.8	0.0513	0.019
	STD.DEV.	0.3	0.095	0.0007	0.4	0.0032	0.004
	n=11	n=6	n=11	n=11	n=11	n=11	n=7
	%RECD.			99.45		91.71	69.71
USGS values:		K	MG	MN	NA	NI	PB
T91	MEAN	na	na	2.360	na	0.0200	0.0170
	STD.DEV.			0.084		0.0072	0.0077
Results:							
T91	MEAN	2.2	10.515	2.3872	6.0	0.0221	0.034
	STD.DEV.	0.9	0.230	0.0504	0.3	0.0029	0.000
	n=8	n=8	n=8	n=8	n=8	n=8	n=2
	%RECD.			101.15		110.28	198.83
T91+As	MEAN	2.0	10.656	2.4267	6.0	0.0217	BDL
(spiked to	STD.DEV.	0.6	0.151	0.0257	0.1	0.0036	
± 0.5 ppm)	n=12	n=10	n=12	n=12	n=12	n=12	n=0
	%RECD.			102.83		108.44	
USGS values:		K	MG	MN	NA	NI	PB
T95	MEAN	4.7	32.8	0.0040	190	0.0088	0.0039
	STD.DEV.	0.7	1.6	0.0028	7	0.0069	0.0026
Results:							
T95	MEAN	3.6	31.480	0.0021	187.2	0.008	BDL
	STD.DEV.	0.7	1.710	0.0011	7.6		
	n=13	n=12	n=13	n=7	n=13	n=1	n=0
	%RECD.	76.04	95.98	52.50	98.53	93.75	
T95+As	MEAN	3.3	31.656	0.0015	187.9	0.0062	BDL
(overall)	STD.DEV.	0.7	0.424	0.0005	7.1		
	n=13	n=12	n=13	n=6	n=13	n=1	n=0
	%RECD.	71.16	96.51	37.50	98.90	70.45	
T95+As	MEAN	2.0	32.162	0.0021	191.1	BDL	BDL
(spiked to	STD.DEV.	0.0	0.603		3.8		
± 0.5 ppm)	n=3	n=2	n=3	n=1	n=3	n=0	n=0
	%RECD.	41.85	98.05	52.50	100.56		
T95+As	MEAN	3.6	31.504	0.0014	187.0	0.0062	BDL
(spiked to	STD.DEV.	0.4	0.159	0.0005	7.6		
± 1.0 ppm)	n=10	n=10	n=10	n=5	n=10	n=1	n=0
	%RECD.	77.02	96.05	34.50	98.39	70.45	
USGS values:		K	MG	MN	NA	NI	PB
T97	MEAN	3.6	18.9	0.0305	59.0	0.0152	0.0015
	STD.DEV.	0.3	1.0	0.0032	3.1	0.0058	0.0037
Results:							
T97	MEAN	3.2	18.729	0.0302	58.9	0.0115	BDL
	STD.DEV.	0.5	0.136	0.0007	0.9	0.0026	
	n=9	n=9	n=9	n=9	n=9	n=9	n=0
	%RECD.	89.51	99.09	99.09	99.85	75.95	
T97+As	MEAN	5.1	18.659	0.0308	58.4	0.0121	0.027
(spiked to	STD.DEV.	0.6	0.124	0.0006	1.2	0.0029	0.005
± 0.5 ppm)	n=12	n=12	n=12	n=12	n=12	n=12	n=2
	%RECD.	141.44	98.72	101.04	98.97	79.44	1800.0

Limits of detection	DATE	K	MG	MN	NA	NI	PB
LOD	11/86	1.2	0.013	0.0018	1.19	0.0071	0.031
LOD	10/87	0.7	0.012	0.0017	0.04	0.0105	0.035
LOD	11/87	0.3	0.011	0.0002	0.02	0.0059	0.011
LOD	4/88	0.8	0.009	0.0010	0.20	0.0070	0.020

Quality Control and Limits of Detection- ICAPES

NBS values:		SB	P	SI	TI	ZN
NBS1643a	MEAN	na	na	na	na	0.069
	STD.DEV.					0.004
Results:						
NBS1643a	MEAN	0.031	BDL	BDL	0.0074	0.0625
	STD.DEV.	0.001			0.0005	0.001
	n=11	n=3	n=0	n=0	n=11	n=11
	%RECD.					90.41
USGS values:		SB	P	SI	TI	ZN
T91	MEAN	2	na	na	na	5.600
	STD.DEV.	na				0.250
Results:						
T91	MEAN	0.035	BDL	6.665	BDL	5.6665
	STD.DEV.	0.004		0.881		0.2247
	n=8	n=3	n=0	n=8	n=0	n=8
	%RECD.	1.75				101.19
T91+As (spiked to ± 0.5 ppm)	MEAN	0.035	0.115	6.724	BDL	5.8965
	STD.DEV.	0.004		0.833		0.0676
	n=12	n=6	n=1	n=12	n=0	n=12
	%RECD.	1.76				105.29
USGS values:		SB	P	SI	TI	ZN
T95	MEAN	uc	na	3.9	na	0.0176
	STD.DEV.			0.1		0.0044
Results:						
T95	MEAN	0.070	1.032	3.617	BDL	0.0153
	STD.DEV.	0.028	0.089	0.560		0.0109
	n=13	n=12	n=13	n=13	n=0	n=13
	%RECD.			92.75		86.81
T95+As (overall)	MEAN	0.069	1.035	3.483	BDL	0.0145
	STD.DEV.	0.012	0.033	0.359		0.0021
	n=13	n=13	n=13	n=13	n=0	n=13
	%RECD.			89.31		82.54
T95+As (spiked to ± 0.5 ppm)	MEAN	0.055	1.027	2.863	BDL	0.0118
	STD.DEV.	0.011	0.029	0.017		0.0008
	n=3	n=3	n=3	n=3	n=0	n=3
	%RECD.			73.41		67.32
T95+As (spiked to ± 1.0 ppm)	MEAN	0.073	1.037	3.669	BDL	0.0153
	STD.DEV.	0.010	0.034	0.132		0.0017
	n=10	n=10	n=10	n=10	n=0	n=10
	%RECD.			94.07		87.10
USGS values:		SB	P	SI	TI	ZN
T97	MEAN	0.0157	na	3.3	na	0.153
	STD.DEV.	0.0113		0.2		0.010
Results:						
T97	MEAN	0.093	0.473	3.474	BDL	0.1575
	STD.DEV.	0.013	0.025	0.035		0.0031
	n=9	n=9	n=9	n=9	n=0	n=9
	%RECD.	590.23		105.26		102.94
T97+As (spiked to ± 0.5 ppm)	MEAN	0.099	0.486	3.491	BDL	0.1597
	STD.DEV.	0.011	0.034	0.029		0.0030
	n=12	n=12	n=12	n=12	n=0	n=12
	%RECD.	629.51		105.78		104.40

Limits of detection	DATE	SB	P	SI	TI	ZN
LOD	11/86	0.029	0.088	0.021	0.0017	0.0015
LOD	10/87	0.056	0.142	0.022	0.0015	0.0021
LOD	11/87	0.026	0.095	0.014	0.0009	0.0017
LOD	4/88	0.030	0.090	0.020	0.0020	0.0020

SAMPLE	AL	AS	CA	CD	CU	FE	K	MG
2121f	BDL	0.14	126.777	BDL	0.0266	22.143	3.1	28.184
2121f #2	0.05	0.16	131.589	BDL	0.0036	22.393	5.0	26.628
2124b	0.03	1.23	140.978	BDL	0.0355	10.258	6.9	38.266
2124b #2	0.05	1.28	151.592	BDL	0.0054	10.652	8.5	36.643
1123f	BDL	1.73	170.384	BDL	0.0508	69.759	4.0	41.367
1123f #2	0.06	1.81	184.094	BDL	0.0063	71.021	5.9	39.327
3122d	0.04	0.06	209.972	BDL	0.0224	3.461	5.4	38.715
3122d #2	0.05	0.07	222.997	BDL	0.0107	4.005	6.6	37.162
3121e	0.03	0.13	125.469	BDL	0.0085	25.013	4.0	27.949
3121e #2	0.04	0.16	136.500	BDL	0.0093	27.019	5.2	26.486
5123a	0.03	8.49	169.393	BDL	0.0224	23.265	BDL	37.005
5123a #2	BDL	8.69	183.706	BDL	0.0055	24.383	BDL	34.152
5121f	0.03	0.28	133.484	BDL	0.0087	27.663	BDL	27.809
5121f #2	BDL	0.30	144.610	BDL	0.0093	29.339	BDL	25.754
4123f	0.07	1.88	171.792	BDL	0.0259	64.137	3.5	40.238
4123f #2	0.05	1.95	188.713	BDL	0.0126	67.784	3.4	35.895
9121a	0.05	0.31	127.613	BDL	0.0065	29.999	BDL	29.184
9121a #2	0.03	0.32	126.627	BDL	0.0052	30.756	1.8	29.219
6123e	0.10	1.71	174.919	BDL	0.0088	70.372	5.3	41.651
6123e #2	0.08	1.74	171.816	BDL	BDL	69.323	7.4	41.965
7123e	0.07	2.05	170.550	BDL	BDL	71.099	5.7	41.334
7123e #2	0.07	2.03	170.921	BDL	BDL	70.679	5.6	41.532
7137b	0.04	0.21	127.903	BDL	0.0041	10.380	7.3	29.162
7137b #2	0.03	0.19	129.607	BDL	BDL	10.083	6.8	30.030
8121f	0.05	0.16	125.636	BDL	0.0120	20.236	2.1	27.626
8121f #2	BDL	0.17	122.564	BDL	BDL	20.062	2.5	28.129
8138b	0.04	0.06	145.228	BDL	0.0144	0.287	5.5	36.753
8138b #2	0.05	0.06	144.744	BDL	0.0113	0.230	6.6	36.990
9124b	0.04	3.33	133.444	BDL	0.0078	21.637	4.6	36.473
9124b #2	0.04	3.21	137.631	BDL	0.0094	21.347	4.6	38.251
11138a	0.05	0.05	BDL	BDL	BDL	19.333	6.4	93.036
11138a #2	BDL	0.07	BDL	BDL	BDL	19.604	5.3	93.461
7122a5	BDL	0.73	0.540	0.0099	0.0021	0.528	BDL	0.089
7122a5 #2	BDL	0.69	0.528	0.0089	BDL	0.502	BDL	0.068
10123d5	BDL	3.69	0.095	0.0543	BDL	0.362	BDL	BDL
10123d5 #2	BDL	3.53	0.091	0.0578	BDL	0.351	BDL	BDL
10124e2	BDL	0.57	42.956	0.0060	BDL	16.938	BDL	9.278
10124e2 #2	BDL	0.57	44.913	0.0062	BDL	17.346	BDL	9.277
10138d2	0.03	4.54	90.821	0.0764	BDL	27.332	2.1	20.363
10138d2 #2	0.05	4.65	93.004	0.0784	BDL	27.597	2.5	20.277
13122a1	0.02	0.79	107.690	0.0079	BDL	35.352	BDL	24.391
13122a1 #2	0.03	0.79	108.384	0.0084	BDL	35.337	BDL	24.307
13123d4	BDL	0.15	0.212	BDL	BDL	0.465	BDL	BDL
13123d4 #2	BDL	0.13	0.223	BDL	BDL	0.480	BDL	0.013
13137d5	BDL	0.18	0.266	BDL	BDL	0.325	BDL	BDL
13137d5 #2	BDL	0.20	0.275	BDL	BDL	0.329	BDL	BDL
b02011	BDL	0.40	0.092	BDL	BDL	0.005	BDL	BDL
b02011 #2	BDL	0.39	0.096	BDL	BDL	0.005	BDL	BDL
b04223	BDL	0.14	BDL	BDL	BDL	0.011	BDL	BDL
b04223 #2	BDL	0.14	BDL	BDL	BDL	0.008	BDL	BDL

GRAN TITRATION REPLICATES:

SAMPLE	ANALYSIS NUMBER #1	#2	% ERROR
2122A	817	845	3.4
2121D	326	317	2.8
7124C	625	608	2.7
10137A	376	355	5.6
11122A	822	816	0.7
11124A	658	700	6.4
12137B	552	544	0.4
13121E	452	474	4.9
14121B	271	256	5.5
14124D	379	333	12.1
	MEAN ERROR (%)		4.5
	STD. DEV. OF ERROR (%) (n = 10)		3.2

Replicate analyses: ICAPES, Gran Titration and Ion Chromatograph.

SAMPLE	MN	NA	NI	PB	SB	P	SI	TI	ZN
2121f	9.7280	12.4	BDL	BDL	0.072	0.963	25.458	BDL	0.0939
2121f #2	9.9125	11.6	BDL	BDL	0.056	0.944	18.106	BDL	0.0937
2124b	2.3978	9.1	0.0083	BDL	0.081	BDL	21.676	BDL	0.1810
2124b #2	2.5060	8.7	BDL	BDL	0.100	BDL	15.860	BDL	0.1876
1123f	3.5306	10.8	BDL	BDL	0.076	0.530	26.727	BDL	0.3371
1123f #2	3.6785	10.9	0.0115	BDL	0.087	0.457	19.803	BDL	0.3476
3122d	4.2480	16.1	BDL	BDL	0.095	BDL	21.908	BDL	0.1554
3122d #2	4.5529	15.8	BDL	BDL	0.087	BDL	15.536	BDL	0.1623
3121e	4.2570	11.9	BDL	BDL	0.047	1.828	26.960	BDL	0.0266
3121e #2	4.6164	11.0	BDL	BDL	0.076	1.972	19.310	BDL	0.0271
5123a	3.6739	13.5	BDL	BDL	0.086	0.252	13.333	BDL	0.2891
5123a #2	3.8618	12.9	BDL	BDL	0.075	0.303	12.984	BDL	0.2920
5121f	9.9870	12.0	BDL	BDL	0.047	1.642	18.031	BDL	0.0200
5121f #2	10.5866	11.4	BDL	BDL	0.040	1.614	17.746	BDL	0.0182
4123f	3.6586	11.1	BDL	BDL	0.096	0.237	19.544	BDL	0.3344
4123f #2	3.8615	10.2	0.0082	BDL	0.086	0.182	19.247	BDL	0.3348
9121a	8.3370	12.3	BDL	BDL	0.064	1.952	24.829	BDL	0.0100
9121a #2	8.3833	12.2	BDL	BDL	0.061	2.082	25.238	BDL	0.0116
6123e	3.5309	11.2	0.0134	BDL	0.100	0.609	26.322	BDL	0.3131
6123e #2	3.4674	11.1	0.0114	BDL	0.086	0.654	27.051	BDL	0.3125
7123e	3.4204	11.0	BDL	BDL	0.078	0.294	25.590	BDL	0.3723
7123e #2	3.4033	11.1	0.0081	BDL	0.079	0.290	26.416	BDL	0.3705
7137b	3.0022	9.8	0.0072	BDL	0.054	0.155	21.720	BDL	0.1030
7137b #2	2.9997	10.3	BDL	BDL	0.050	0.191	22.714	BDL	0.1045
8121f	9.0294	12.0	BDL	BDL	0.047	0.456	25.014	BDL	BDL
8121f #2	8.8615	12.4	BDL	BDL	0.048	0.473	25.773	BDL	BDL
8138b	4.6087	14.8	BDL	BDL	0.080	BDL	19.542	BDL	0.1555
8138b #2	4.6043	14.8	0.0081	BDL	0.066	BDL	19.938	BDL	0.1598
9124b	2.1064	8.8	BDL	BDL	0.079	0.122	18.185	BDL	0.4550
9124b #2	2.1198	9.4	0.0095	BDL	0.058	0.170	19.868	BDL	0.4555
11138a	BDL	13.8	BDL	0.048	0.253	0.211	25.596	BDL	0.0096
11138a #2	BDL	13.8	BDL	0.037	0.249	BDL	25.938	BDL	0.0088
7122a5	0.0147	BDL	BDL	BDL	BDL	1.951	BDL	BDL	0.0217
7122a5 #2	0.0139	BDL	BDL	BDL	BDL	1.880	BDL	BDL	BDL
10123d5	BDL	BDL	BDL	BDL	BDL	0.282	BDL	BDL	0.0025
10123d5 #2	BDL	BDL	BDL	BDL	BDL	0.246	BDL	BDL	BDL
10124e2	2.2698	3.7	BDL	BDL	0.055	BDL	20.045	BDL	BDL
10124e2 #2	2.3279	3.6	BDL	BDL	0.058	BDL	20.187	BDL	BDL
10138d2	6.3446	8.5	BDL	BDL	0.121	BDL	21.767	BDL	0.0268
10138d2 #2	6.4149	8.3	0.0079	BDL	0.113	BDL	21.871	BDL	0.0274
13122a1	3.2975	10.8	0.0120	BDL	0.151	BDL	1.785	BDL	0.0672
13122a1 #2	3.2999	10.8	0.0125	BDL	0.138	BDL	1.775	BDL	0.0653
13123d4	0.0031	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13123d4 #2	0.0038	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
13137d5	0.0072	BDL	BDL	BDL	BDL	0.365	BDL	BDL	BDL
13137d5 #2	0.0072	BDL	BDL	BDL	BDL	0.333	BDL	BDL	BDL
b02011	0.0014	1.7	BDL	BDL	BDL	BDL	BDL	BDL	BDL
b02011 #2	0.0010	1.8	BDL	BDL	BDL	BDL	BDL	BDL	BDL
b04223	BDL	BDL	0.0007	BDL	BDL	BDL	BDL	BDL	BDL
b04223 #2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Replicate analyses: ICAPES, Gran titration and Ion Chromatograph.

ION CHROMATOGRAPH REPLICATES:
ANIONS #3 is the standard used for calibrating the ion chromatograph, and was prepared to the following concentrations:

F-	Cl-	NO2-	NO3-	HPO4=	SO4=
10.0	15.0	15.0	15.0	25.0	25.0

DATE	SAMPLE/STANDARD	F-	Cl-	NO2-	NO3-	HPO4=	SO4=
2/6/87	ANIONS #3	10.1	15.2	15.2	15.2	25.3	25.4
2/6/87	ANIONS #3	9.9	15.0	14.8	14.9	24.6	24.5
2/6/87	ANIONS #3	10.0	15.0	15.3	15.1	25.4	25.4
3/3/87	ANIONS #3	10.0	15.1	15.3	15.1	25.5	25.3
3/3/87	ANIONS #3	10.3	15.5	15.6	15.5	25.9	25.7
3/3/87	ANIONS #3	9.5	14.1	13.8	15.0	25.1	25.2
4/2/87	ANIONS #3	10.4	15.5	15.3	15.1	26.2	26.6
4/2/87	ANIONS #3	9.4	14.1	14.2	14.1	24.2	23.7
4/2/87	ANIONS #3	10.7	16.0	16.1	16.1	27.7	26.9
4/2/87	ANIONS #3	9.8	14.7	15.0	14.9	24.9	24.9
4/2/87	ANIONS #3	NR	14.9	14.8	14.8	25.2	24.5
5/3/87	ANIONS #3	9.2	13.9	13.9	14.1	23.5	23.1
5/3/87	ANIONS #3	10.5	15.8	15.1	15.6	26.4	26.7
5/3/87	ANIONS #3	9.1	13.2	14.6	14.5	24.9	24.2
5/3/87	ANIONS #3	9.2	13.7	14.1	14.2	24.2	23.6
5/3/87	ANIONS #3	NR	14.5	16.0	15.9	26.3	26.2
6/17/87	ANIONS #3	11.3	14.6	13.9	15.6	25.3	26.0
6/17/87	ANIONS #3	11.7	15.1	14.5	16.0	27.3	26.6
6/17/87	ANIONS #3	11.1	16.8	16.8	16.6	29.7	27.9
6/19/87	ANIONS #3	9.7	14.7	14.7	14.6	26.4	24.6
6/19/87	ANIONS #3	10.0	15.0	15.1	14.9	26.2	25.0
6/19/87	ANIONS #3	8.6	13.0	13.4	13.0	22.6	21.6
6/19/87	ANIONS #3	10.7	16.1	16.1	16.0	26.4	26.8
6/19/87	ANIONS #3	9.8	14.8	14.8	14.8	24.6	24.6
7/17/87	ANIONS #3	9.2	16.4	16.0	13.2	23.3	26.8
7/17/87	ANIONS #3	10.2	15.5	15.7	15.4	25.5	26.1
7/17/87	ANIONS #3	10.0	15.1	15.1	15.0	24.9	25.7
7/17/87	ANIONS #3	10.5	15.8	15.9	15.8	28.3	25.6
7/17/87	ANIONS #3	10.7	16.1	16.1	16.1	27.0	26.6
7/17/87	ANIONS #3	9.6	14.1	14.3	17.7	27.0	24.8
8/22/87	ANIONS #3	10.2	15.6	15.2	15.4	25.1	25.6
8/22/87	ANIONS #3	10.1	15.2	15.0	15.1	26.2	24.9
8/22/87	ANIONS #3	9.9	15.0	14.9	15.0	25.1	24.9
	MEAN	10.1	15.0	15.0	15.2	25.6	25.3
	STANDARD DEVIATION	2.5	0.8	0.8	0.9	1.4	1.3
	% RECEIVED (n = 33)	100.5	100.0	100.3	101.0	102.6	101.3

2/6/87	Blank	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
3/3/87	Blank	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
4/2/87	Blank	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
5/3/87	Blank	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
6/17/87	Blank	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
6/19/87	Blank	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
7/17/87	Blank	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
8/22/87	Blank	<0.2	0.1	<0.2	<0.2	<0.2	<0.2
5/3/87	10121D #1	0.6	1.7	<0.2	<0.2	<0.2	6.0
5/3/87	10121D #2	<0.2	1.8	<0.2	<0.2	<0.2	5.6
6/19/87	12137B #1	0.7	2.4	<0.2	<0.2	<0.2	0.9
6/19/87	12137B #2	0.6	2.2	<0.2	<0.2	<0.2	0.5

TABLE B: This table contains results of all chemical analyses of water samples collected during this study. The analyses of samples from the Clark Fork branch of the Milltown Reservoir, and arsenic and iron speciation results are tabulated separately.

Two to five days were needed to collect samples from all piezometers. The central date of each sampling run is considered the "sampling date", regardless of the exact date upon which an individual piezometer was sampled.

Milltown Reservoir Site 121, Water Chemistry Data

DATE	WELL	HEAD	pH	AL	AS	CA	CD
09-Aug-86	121d	3251.27	6.9F	0.04	0.09	80.028	BDL
09-Aug-86	121e	3248.92	6.6F	0.04	0.11	123.588	BDL
09-Aug-86	121f	3248.52	6.4F	BDL	0.15	125.189	BDL
15-Aug-86	121d	3250.91	6.0F	BDL	0.05	85.805	BDL
15-Aug-86	121e	3248.57	6.0F	BDL	0.09	121.853	BDL
15-Aug-86	121f	3248.12	5.9F	BDL	0.14	126.451	BDL
21-Sep-86	121e	3248.27	6.8L	0.03	0.12	125.356	BDL
21-Sep-86	121a	3248.18	6.7L	BDL	0.36	131.158	BDL
21-Sep-86	121f	3248.29	7.1L	BDL	0.20	133.254	BDL
19-Oct-86	121e	3248.02	6.7F	0.04	0.12	121.408	BDL
19-Oct-86	121a	3247.91	6.4F	0.08	0.37	133.709	BDL
19-Oct-86	121f	3248.08	6.7F	0.05	0.24	134.906	BDL
15-Nov-86	121e	3249.55	6.9F	BDL	0.12	122.099	BDL
15-Nov-86	121a	3249.69	6.7F	BDL	0.44	132.500	BDL
15-Nov-86	121f	3246.33	6.3F	BDL	0.28	133.398	BDL
31-Jan-87	121e	3249.73	6.7F	0.06	0.18	123.354	BDL
31-Jan-87	121a	3249.73	6.5F	0.05	0.28	126.654	BDL
31-Jan-87	121f	3249.67	6.6F	0.03	0.22	125.454	BDL
28-Feb-87	121e	3247.47	6.4L	0.05	0.13	126.847	BDL
28-Feb-87	121a	3247.50	6.6L	0.05	0.28	128.957	BDL
28-Feb-87	121f	3248.18	6.5L	0.05	0.16	125.636	BDL
30-Mar-87	121e	3247.37	6.7L	0.04	0.19	124.700	BDL
30-Mar-87	121a	3247.37	6.5L	0.05	0.31	127.613	BDL
30-Mar-87	121f	3247.40	6.8L	0.03	0.20	124.910	BDL
23-Apr-87	121b	3257.38	6.7L	0.04	BDL	78.330	BDL
23-Apr-87	121d	3254.50	6.7L	0.05	0.07	99.918	BDL
23-Apr-87	121e	3255.30	6.8L	0.04	0.14	119.417	BDL
23-Apr-87	121f	3255.27	6.7L	0.04	0.20	118.815	BDL
16-May-87	121b	3258.21	6.6L	0.03	BDL	87.308	BDL
16-May-87	121d	3257.71	6.7L	0.03	0.05	113.177	BDL
16-May-87	121e	3256.61	6.7L	0.03	0.12	125.776	BDL
16-May-87	121f	3256.55	6.7L	0.03	0.19	119.974	BDL
15-Jun-87	121b	3258.30	6.8L	0.02	0.03	85.488	BDL
15-Jun-87	121d	3257.85	6.8L	0.03	0.03	114.938	BDL
15-Jun-87	121e	3257.54	6.8L	0.03	0.13	113.738	BDL
15-Jun-87	121f	3256.55	6.8L	0.02	0.19	103.938	BDL
14-Jul-87	121b	3257.23	6.5L	0.03	0.04	89.607	BDL
14-Jul-87	121d	3256.78	6.6L	0.04	0.04	121.046	BDL
14-Jul-87	121e	3255.49	6.6L	0.04	0.14	115.545	BDL
14-Jul-87	121f	3255.49	6.6L	0.04	0.20	103.044	BDL
14-Aug-87	121b	3256.13	6.6L	0.02	0.02	95.661	BDL
14-Aug-87	121d	3255.85	6.4L	0.03	0.06	121.150	BDL
14-Aug-87	121e	3254.95	6.4L	0.02	0.16	119.349	BDL
14-Aug-87	121f	3254.95	6.3L	0.01	0.20	105.048	BDL

Milltown Reservoir Site 121, Water Chemistry Data

DATE	WELL	CU	FE	K	MG	MN	NA	NI
09-Aug-86	121d	0.0175	1.206	4.7	14.386	4.2035	7.5	BDL
09-Aug-86	121e	0.0144	21.603	5.6	27.307	4.1655	11.3	BDL
09-Aug-86	121f	0.0196	20.224	4.0	27.776	9.4305	12.3	BDL
15-Aug-86	121d	0.0149	BDL	4.6	15.123	4.0035	7.5	BDL
15-Aug-86	121e	0.0051	22.036	5.4	27.114	4.1625	11.3	BDL
15-Aug-86	121f	0.0048	22.114	4.2	28.164	9.7095	12.2	BDL
21-Sep-86	121e	0.0104	25.008	5.0	27.947	4.2520	11.9	BDL
21-Sep-86	121a	0.0069	29.109	4.3	28.938	8.2810	12.2	BDL
21-Sep-86	121f	0.0100	24.986	3.1	29.187	9.8670	12.7	BDL
19-Oct-86	121e	0.0153	26.011	4.5	27.014	4.1871	11.1	BDL
19-Oct-86	121a	0.0069	30.761	5.7	29.732	8.6432	12.4	BDL
19-Oct-86	121f	0.0183	28.000	3.7	29.566	10.2830	12.7	BDL
15-Nov-86	121e	0.0089	26.248	BDL	26.091	4.1816	10.8	BDL
15-Nov-86	121a	0.0041	31.040	BDL	28.010	8.3656	11.8	BDL
15-Nov-86	121f	0.0089	27.646	BDL	27.792	9.9846	12.0	BDL
31-Jan-87	121e	BDL	28.281	6.5	28.600	4.9503	11.5	BDL
31-Jan-87	121a	BDL	30.921	4.5	29.249	8.7613	12.3	BDL
31-Jan-87	121f	BDL	26.491	4.9	28.651	9.3304	12.3	BDL
28-Feb-87	121e	0.0102	23.725	1.5	28.488	4.9497	11.5	BDL
28-Feb-87	121a	0.0056	28.165	1.9	28.760	8.4630	12.2	BDL
28-Feb-87	121f	0.0120	20.236	2.1	27.626	9.0294	12.0	BDL
30-Mar-87	121e	0.0073	26.201	BDL	28.409	4.8370	11.5	BDL
30-Mar-87	121a	0.0065	29.999	BDL	29.184	8.3370	12.3	BDL
30-Mar-87	121f	0.0086	21.908	BDL	28.023	9.0960	12.1	BDL
23-Apr-87	121b	0.0062	4.297	3.1	14.767	8.3040	7.3	BDL
23-Apr-87	121d	0.0106	12.145	4.2	17.379	4.4050	7.0	BDL
23-Apr-87	121e	BDL	28.044	5.5	27.191	4.3459	10.4	BDL
23-Apr-87	121f	BDL	27.713	5.2	26.403	8.7848	11.0	BDL
16-May-87	121b	BDL	9.900	3.2	16.204	9.3876	7.3	BDL
16-May-87	121d	0.0028	12.842	4.1	19.064	5.1045	6.9	BDL
16-May-87	121e	BDL	28.371	5.2	27.884	4.4444	9.8	BDL
16-May-87	121f	BDL	27.471	5.1	25.984	8.7173	10.6	BDL
15-Jun-87	121b	0.0022	11.181	3.6	16.790	9.2595	8.8	BDL
15-Jun-87	121d	BDL	11.941	5.0	20.703	5.3794	8.4	BDL
15-Jun-87	121e	BDL	27.201	5.7	26.966	4.0443	11.1	BDL
15-Jun-87	121f	BDL	24.961	4.9	24.090	7.8622	11.2	BDL
14-Jul-87	121b	0.0028	12.704	4.1	17.210	9.5195	8.9	BDL
14-Jul-87	121d	BDL	12.004	5.0	21.362	5.6665	8.7	BDL
14-Jul-87	121e	BDL	27.154	5.4	26.983	4.2304	11.3	BDL
14-Jul-87	121f	BDL	24.714	4.9	23.285	7.7704	11.1	BDL
14-Aug-87	121b	BDL	9.825	3.8	17.241	9.7033	8.3	BDL
14-Aug-87	121d	BDL	15.194	4.6	19.790	5.3102	7.6	BDL
14-Aug-87	121e	BDL	27.373	5.0	25.840	4.1531	10.0	BDL
14-Aug-87	121f	BDL	24.363	4.3	22.139	7.6861	9.9	BDL

Milltown Reservoir Site 121, Water Chemistry Data

DATE	WELL	PB	SB	P	SI	TI	ZN	HCO3	SO4
09-Aug-86	121d	BDL	0.034	BDL	21.517	BDL	0.1855	NA	NA
09-Aug-86	121e	BDL	0.057	1.021	25.556	BDL	0.0454	NA	NA
09-Aug-86	121f	BDL	0.037	0.390	25.289	BDL	0.1176	NA	NA
15-Aug-86	121d	BDL	0.049	BDL	21.793	BDL	0.2742	330	NA
15-Aug-86	121e	BDL	0.064	1.041	25.921	BDL	BDL	530	NA
15-Aug-86	121f	BDL	0.073	0.968	25.398	BDL	BDL	550	NA
21-Sep-86	121e	BDL	0.059	1.805	26.960	BDL	0.0213	550	NA
21-Sep-86	121a	BDL	0.056	1.469	25.922	BDL	0.0288	620	NA
21-Sep-86	121f	BDL	0.066	0.984	26.517	BDL	0.0079	610	NA
19-Oct-86	121e	BDL	0.048	2.030	18.766	BDL	0.0211	540	NA
19-Oct-86	121a	BDL	0.049	1.724	18.735	BDL	0.0117	590	NA
19-Oct-86	121f	BDL	0.037	1.493	18.797	BDL	0.0078	590	NA
15-Nov-86	121e	BDL	0.046	2.374	18.639	BDL	0.0235	520	NA
15-Nov-86	121a	BDL	0.061	1.936	17.680	BDL	0.0397	580	NA
15-Nov-86	121f	BDL	0.046	1.620	18.019	BDL	0.0033	580	NA
31-Jan-87	121e	BDL	0.073	2.337	26.176	BDL	0.0016	510	BDL
31-Jan-87	121a	BDL	0.063	2.286	25.735	BDL	BDL	570	BDL
31-Jan-87	121f	BDL	0.053	1.478	25.747	BDL	BDL	530	BDL
28-Feb-87	121e	BDL	0.054	1.094	25.439	BDL	0.0150	510	BDL
28-Feb-87	121a	BDL	0.063	1.269	24.663	BDL	0.0183	540	BDL
28-Feb-87	121f	BDL	0.047	0.456	25.014	BDL	BDL	520	BDL
30-Mar-87	121e	BDL	0.047	1.964	24.654	BDL	0.0043	500	BDL
30-Mar-87	121a	BDL	0.064	1.952	24.829	BDL	0.0100	510	BDL
30-Mar-87	121f	BDL	0.053	0.763	24.699	BDL	BDL	500	BDL
23-Apr-87	121b	BDL	BDL	BDL	21.657	BDL	0.1303	200	7
23-Apr-87	121d	BDL	BDL	0.364	23.188	BDL	0.1500	330	6
23-Apr-87	121e	BDL	0.062	2.294	24.369	BDL	0.0036	500	BDL
23-Apr-87	121f	BDL	0.063	1.904	24.270	BDL	BDL	480	BDL
16-May-87	121b	BDL	BDL	0.189	22.936	BDL	0.0529	230	NA
16-May-87	121d	BDL	0.069	0.345	23.595	BDL	0.0993	280	NA
16-May-87	121e	BDL	0.070	2.335	24.055	BDL	BDL	510	NA
16-May-87	121f	BDL	0.062	2.112	24.164	BDL	BDL	430	NA
15-Jun-87	121b	BDL	BDL	0.155	23.221	BDL	0.0436	370	2
15-Jun-87	121d	BDL	BDL	0.190	23.205	BDL	0.0602	420	49
15-Jun-87	121e	BDL	BDL	2.386	23.478	BDL	BDL	510	BDL
15-Jun-87	121f	BDL	BDL	1.988	23.182	BDL	0.0056	330	BDL
14-Jul-87	121b	BDL	BDL	BDL	24.579	BDL	0.0375	290	1
14-Jul-87	121d	BDL	BDL	0.158	24.263	BDL	0.0440	350	59
14-Jul-87	121e	BDL	0.069	2.432	23.717	BDL	BDL	450	BDL
14-Jul-87	121f	BDL	0.057	2.145	23.561	BDL	BDL	390	BDL
14-Aug-87	121b	BDL	0.046	BDL	24.760	BDL	0.0323	270	1
14-Aug-87	121d	BDL	0.062	0.374	25.299	BDL	0.0363	360	24
14-Aug-87	121e	BDL	0.062	2.246	23.518	BDL	BDL	450	BDL
14-Aug-87	121f	BDL	0.063	1.977	23.307	BDL	BDL	320	BDL

Milltown Reservoir Site 122, Water Chemistry Data

DATE	WELL	HEAD	pH	AL	AS	CA	CD
15-Aug-86	122b	3252.44	6.7F	0.03	BDL	354.511	BDL
15-Aug-86	122d	3252.15	6.6F	0.04	BDL	211.110	BDL
15-Aug-86	122a	3249.15	6.6F	BDL	6.00	183.612	BDL
21-Sep-86	122d	3251.34	6.6L	0.05	0.06	209.904	BDL
21-Sep-86	122e	3249.29	6.9L	BDL	3.55	176.404	BDL
21-Sep-86	122a	3248.46	7.3L	BDL	6.20	182.504	BDL
19-Oct-86	122d	3250.99	6.8F	BDL	0.10	211.322	BDL
19-Oct-86	122e	3246.02	7.1F	BDL	3.92	176.322	BDL
19-Oct-86	122a	3245.15	7.0F	BDL	6.00	183.723	BDL
15-Nov-86	122d	3250.23	6.9F	BDL	0.43	200.096	BDL
15-Nov-86	122e	3248.93	7.2F	BDL	4.43	172.896	BDL
15-Nov-86	122a	3245.40	7.0F	BDL	6.93	181.697	BDL
31-Jan-87	122d	3251.68	6.8L	0.07	0.12	216.757	BDL
31-Jan-87	122e	3250.28	6.7L	0.05	2.85	173.580	BDL
31-Jan-87	122a	3249.46	6.7L	0.06	6.90	177.335	BDL
28-Feb-87	122d	3251.07	6.9L	0.08	0.15	215.225	BDL
28-Feb-87	122e	3248.79	6.7L	0.10	2.62	178.627	BDL
28-Feb-87	122a	3247.98	6.7L	0.11	6.22	181.622	BDL
30-Mar-87	122d	3251.94	6.7F	0.05	0.08	236.088	BDL
30-Mar-87	122e	3249.13	6.9F	0.05	3.04	174.186	BDL
30-Mar-87	122a	3247.67	6.4F	0.04	7.27	174.191	BDL
23-Apr-87	122b	3257.39	6.9L	0.05	BDL	376.324	BDL
23-Apr-87	122d	3257.11	6.8L	0.05	0.08	257.119	BDL
23-Apr-87	122e	3255.69	6.7L	0.05	2.47	174.414	BDL
23-Apr-87	122a	3254.66	6.5L	0.02	6.07	179.928	BDL
16-May-87	122b	3258.11	6.7L	0.03	BDL	428.568	BDL
16-May-87	122d	3257.94	6.6L	0.07	0.13	262.647	BDL
16-May-87	122e	3257.08	6.6L	0.02	2.58	177.732	BDL
16-May-87	122a	3256.32	6.5L	BDL	5.83	190.573	BDL
15-Jun-87	122b	3258.24	6.7L	BDL	0.03	424.555	BDL
15-Jun-87	122d	3257.94	6.8L	0.03	0.15	281.953	BDL
15-Jun-87	122e	3257.06	6.6L	0.02	2.89	185.852	BDL
15-Jun-87	122a	3256.33	6.5L	BDL	5.95	184.757	BDL
14-Jul-87	122b	3255.83	6.5L	0.07	0.03	378.740	BDL
14-Jul-87	122d	3256.04	6.5L	0.06	0.14	262.240	BDL
14-Jul-87	122e	3255.34	6.4L	0.05	2.48	168.440	BDL
14-Jul-87	122a	3254.80	6.5L	0.04	5.64	174.640	BDL
14-Aug-87	122b	3254.98	6.5L	0.05	0.03	391.427	BDL
14-Aug-87	122d	3254.92	6.5L	0.04	0.17	261.726	BDL
14-Aug-87	122e	3254.60	6.5L	0.03	2.82	173.926	BDL
14-Aug-87	122a	3254.39	6.4L	0.04	5.85	180.028	BDL

DATE	WELL	CU	FE	K	MG	MN	NA	NI
15-Aug-86	122b	0.0063	10.090	5.5	67.267	13.5784	18.1	BDL
15-Aug-86	122d	0.0210	2.467	5.8	39.635	5.0597	16.6	BDL
15-Aug-86	122a	0.0177	58.170	5.7	44.200	5.6672	17.4	0.0104
21-Sep-86	122d	0.0131	3.465	6.5	38.712	4.2450	16.2	BDL
21-Sep-86	122e	0.0173	48.252	6.0	38.893	3.4280	16.7	BDL
21-Sep-86	122a	0.0111	56.932	5.7	42.511	5.5140	16.7	0.0113
19-Oct-86	122d	0.0120	7.378	5.3	40.541	4.4451	16.9	BDL
19-Oct-86	122e	0.0107	49.037	2.1	38.051	3.2400	16.8	BDL
19-Oct-86	122a	0.0074	54.058	4.4	42.572	5.4083	17.3	0.0106
15-Nov-86	122d	0.0069	22.262	BDL	37.033	4.7694	15.3	0.0073
15-Nov-86	122e	0.0100	51.132	BDL	35.494	3.2313	15.6	0.0115
15-Nov-86	122a	0.0092	56.574	BDL	40.092	5.5556	16.3	0.0151
31-Jan-87	122d	BDL	24.719	8.2	42.242	4.4469	15.8	BDL
31-Jan-87	122e	BDL	46.144	6.3	41.657	3.7136	15.9	0.0098
31-Jan-87	122a	BDL	58.814	7.8	42.736	5.5302	16.7	0.0136
28-Feb-87	122d	0.0068	17.953	5.2	42.816	4.4404	16.7	BDL
28-Feb-87	122e	0.0080	47.873	5.4	43.175	3.7825	16.8	BDL
28-Feb-87	122a	0.0143	55.653	5.2	43.797	5.5603	17.7	0.0162
30-Mar-87	122d	0.0056	46.906	1.8	42.943	4.4139	16.3	BDL
30-Mar-87	122e	0.0062	52.626	3.5	41.533	3.8431	15.9	BDL
30-Mar-87	122a	BDL	58.336	2.7	41.263	5.5176	16.6	0.0123
23-Apr-87	122b	0.0148	24.907	8.8	69.757	13.3868	15.5	BDL
23-Apr-87	122d	BDL	54.744	8.6	44.184	4.5097	14.5	BDL
23-Apr-87	122e	BDL	49.712	7.5	41.945	3.6418	15.5	BDL
23-Apr-87	122a	BDL	58.709	8.6	43.201	5.4829	16.3	0.0132
16-May-87	122b	BDL	43.649	8.5	77.458	14.7632	15.2	BDL
16-May-87	122d	BDL	58.556	8.2	48.641	4.7029	16.6	BDL
16-May-87	122e	BDL	51.958	8.3	42.501	3.7238	16.6	BDL
16-May-87	122a	BDL	60.451	8.4	44.273	5.6402	16.1	0.0136
15-Jun-87	122b	BDL	46.206	8.6	78.539	14.0487	16.8	BDL
15-Jun-87	122d	BDL	60.185	8.1	48.548	4.9176	15.1	BDL
15-Jun-87	122e	BDL	55.274	7.3	41.826	3.8325	14.5	0.0114
15-Jun-87	122a	BDL	60.317	7.9	43.301	5.5047	16.6	0.0145
14-Jul-87	122b	BDL	41.703	10.0	75.898	12.3241	18.4	BDL
14-Jul-87	122d	BDL	56.543	9.2	49.289	4.6511	17.6	BDL
14-Jul-87	122e	BDL	46.773	8.5	41.559	3.5351	16.7	BDL
14-Jul-87	122a	BDL	59.434	8.2	43.727	5.3481	17.9	0.0155
14-Aug-87	122b	BDL	29.269	9.6	72.637	11.9731	17.1	BDL
14-Aug-87	122d	BDL	53.618	9.0	48.168	4.7081	17.2	0.0073
14-Aug-87	122e	BDL	51.368	8.5	41.579	3.5901	16.4	0.0080
14-Aug-87	122a	BDL	59.449	8.2	42.456	5.3722	16.7	0.0135

DATE	WELL	PB	SB	P	SI	TI	ZN	HCO3	SO4
15-Aug-86	122b	BDL	0.138	BDL	21.201	BDL	BDL	700	NA
15-Aug-86	122d	BDL	0.081	BDL	21.328	BDL	BDL	760	NA
15-Aug-86	122a	BDL	0.089	1.456	26.213	BDL	0.1645	850	NA
21-Sep-86	122d	BDL	0.107	BDL	21.871	BDL	0.1455	770	NA
21-Sep-86	122e	BDL	0.107	0.657	26.051	BDL	0.3197	820	NA
21-Sep-86	122a	BDL	0.119	1.619	26.411	BDL	0.2967	830	NA
19-Oct-86	122d	BDL	0.059	0.112	23.303	BDL	0.1269	760	NA
19-Oct-86	122e	BDL	0.051	0.732	26.030	BDL	0.3276	820	NA
19-Oct-86	122a	BDL	0.069	1.368	27.116	BDL	0.2865	810	NA
15-Nov-86	122d	BDL	0.071	0.111	16.078	BDL	0.1844	710	NA
15-Nov-86	122e	BDL	0.065	1.036	17.498	BDL	0.3408	790	NA
15-Nov-86	122a	BDL	0.085	1.907	18.639	BDL	0.3316	860	NA
31-Jan-87	122d	BDL	0.088	BDL	21.229	BDL	0.1101	690	125
31-Jan-87	122e	BDL	0.076	0.631	25.225	BDL	0.6434	810	BDL
31-Jan-87	122a	BDL	0.088	2.130	25.704	BDL	0.3743	890	BDL
28-Feb-87	122d	BDL	0.084	BDL	20.899	BDL	0.1199	710	109
28-Feb-87	122e	BDL	0.085	0.799	25.522	BDL	0.7439	800	BDL
28-Feb-87	122a	BDL	0.102	1.641	25.976	BDL	0.3805	860	BDL
30-Mar-87	122d	BDL	0.083	0.637	20.428	BDL	0.0298	820	159
30-Mar-87	122e	BDL	0.085	1.605	23.680	BDL	0.7913	800	BDL
30-Mar-87	122a	BDL	0.099	1.849	24.616	BDL	0.3346	820	BDL
23-Apr-87	122b	BDL	0.158	BDL	20.494	BDL	0.1432	580	698
23-Apr-87	122d	BDL	0.103	0.753	20.711	BDL	0.0435	810	208
23-Apr-87	122e	BDL	0.101	0.793	24.290	BDL	0.7208	760	BDL
23-Apr-87	122a	BDL	0.095	1.569	24.816	BDL	0.3523	770	BDL
16-May-87	122b	BDL	0.182	0.537	23.199	BDL	0.0308	620	NA
16-May-87	122d	BDL	0.123	0.854	21.778	BDL	0.0300	730	NA
16-May-87	122e	BDL	0.110	1.153	23.476	BDL	0.7185	770	NA
16-May-87	122a	BDL	0.110	1.672	25.314	BDL	0.3659	820	NA
15-Jun-87	122b	BDL	0.163	0.579	23.653	BDL	0.0211	640	845
15-Jun-87	122d	BDL	0.118	0.857	21.962	BDL	0.0282	780	333
15-Jun-87	122e	BDL	0.109	1.581	23.901	BDL	0.7826	820	BDL
15-Jun-87	122a	BDL	0.100	1.651	24.104	BDL	0.3462	860	BDL
14-Jul-87	122b	BDL	0.167	0.398	23.438	BDL	0.0213	560	833
14-Jul-87	122d	BDL	0.116	0.746	22.398	BDL	0.0283	660	360
14-Jul-87	122e	BDL	0.097	0.600	23.339	BDL	0.5820	760	BDL
14-Jul-87	122a	BDL	0.107	1.856	23.807	BDL	0.3375	810	BDL
14-Aug-87	122b	0.025	0.180	0.146	23.306	BDL	0.0223	600	838
14-Aug-87	122d	0.013	0.096	0.512	22.708	BDL	0.0248	740	329
14-Aug-87	122e	0.013	0.082	1.146	23.769	BDL	0.6177	770	BDL
14-Aug-87	122a	0.013	0.117	1.892	23.575	BDL	0.3493	890	BDL

DATE	WELL	HEAD	pH	AL	AS	CA	CD
09-Aug-86	123e	3253.37	6.4F	BDL	1.43	164.100	BDL
09-Aug-86	123f	3253.35	6.3F	BDL	1.73	170.099	BDL
09-Aug-86	123d	3247.93	6.3F	0.03	4.67	160.090	BDL
15-Aug-86	123e	3252.16	6.1F	BDL	0.71	168.647	BDL
15-Aug-86	123f	3250.13	6.2F	BDL	1.50	169.848	BDL
15-Aug-86	123d	3247.54	6.5F	BDL	5.79	163.849	BDL
21-Sep-86	123e	3252.61	6.8L	0.04	1.51	172.751	BDL
21-Sep-86	123f	3252.52	6.9L	BDL	1.71	174.151	BDL
21-Sep-86	123d	3247.11	7.2L	BDL	5.47	163.653	BDL
19-Oct-86	123e	3252.27	6.5F	0.09	1.28	173.410	BDL
19-Oct-86	123f	3252.19	6.6F	0.07	1.88	171.608	BDL
19-Oct-86	123d	3246.82	6.6F	0.05	7.49	166.305	BDL
15-Nov-86	123e	3252.08	6.3F	BDL	1.61	170.107	BDL
15-Nov-86	123f	3252.02	6.3F	BDL	1.93	170.106	BDL
15-Nov-86	123a	3247.22	6.1F	BDL	8.49	169.309	BDL
15-Nov-86	123d	3246.79	6.6F	BDL	5.97	160.708	BDL
15-Dec-86	123e	3252.38	6.6L	0.10	1.71	174.919	BDL
15-Dec-86	123f	3252.35	7.0L	0.10	1.68	175.517	BDL
15-Dec-86	123a	3247.02	6.6L	0.07	9.05	168.522	BDL
31-Jan-87	123e	3252.20	6.5F	0.07	2.05	170.550	BDL
31-Jan-87	123f	3252.16	6.6F	0.07	2.41	170.648	BDL
31-Jan-87	123a	3247.42	6.4L	0.06	9.12	164.354	BDL
31-Jan-87	123d	3247.49	6.8L	0.05	4.03	151.554	BDL
28-Feb-87	123e	3251.92	6.5L	0.12	1.44	169.672	BDL
28-Feb-87	123f	3251.90	6.5L	0.13	1.42	170.665	BDL
28-Feb-87	123a	3246.02	6.7L	0.06	8.13	169.326	BDL
28-Feb-87	123d	3246.55	6.6L	0.06	4.82	162.316	BDL
30-Mar-87	123e	3252.41	6.5F	0.07	1.75	169.889	BDL
30-Mar-87	123f	3252.36	6.5F	0.07	1.90	166.094	BDL
30-Mar-87	123a	3245.79	6.9L	BDL	8.78	161.496	BDL
30-Mar-87	123d	3246.07	6.4F	BDL	3.68	159.393	BDL
23-Apr-87	123c	3257.85	6.3L	0.06	BDL	342.217	0.0135
23-Apr-87	123b	3257.09	6.7L	0.04	3.14	169.010	BDL
23-Apr-87	123e	3257.62	6.8L	BDL	1.63	159.812	BDL
23-Apr-87	123f	3253.96	6.8L	BDL	1.93	154.509	BDL
23-Apr-87	123a	3252.56	6.8L	0.05	9.37	165.514	BDL
23-Apr-87	123d	3252.58	6.8L	0.04	7.46	164.805	BDL
16-May-87	123c	3258.48	6.6L	0.06	BDL	288.849	0.0079
16-May-87	123b	3257.95	6.7L	0.04	3.11	169.653	BDL
16-May-87	123e	3258.46	6.7L	0.03	1.68	168.242	BDL
16-May-87	123f	3258.44	6.8L	0.03	1.99	164.038	BDL
16-May-87	123a	3254.52	6.4L	0.04	9.25	166.256	BDL
16-May-87	123d	3254.63	6.8L	0.04	7.97	165.846	BDL
15-Jun-87	123c	3258.69	6.5L	0.08	BDL	330.931	0.0070
15-Jun-87	123b	3258.17	6.7L	0.03	3.13	161.433	BDL
15-Jun-87	123e	3256.56	6.7L	0.02	1.90	163.626	BDL
15-Jun-87	123f	3258.53	6.7L	0.02	2.17	156.223	BDL
15-Jun-87	123a	3254.50	6.8L	0.02	9.80	157.538	BDL
15-Jun-87	123d	3254.64	6.8L	0.04	8.56	160.028	BDL

Milltown Reservoir Site 123, Water Chemistry Data

DATE	WELL	HEAD	pH	AL	AS	CA	CD
14-Jul-87	123c	3257.33	6.5L	0.07	BDL	335.541	0.0051
14-Jul-87	123b	3257.01	6.6L	0.04	2.95	163.942	BDL
14-Jul-87	123e	3257.64	6.7L	0.04	1.69	160.451	BDL
14-Jul-87	123f	3257.52	6.8L	0.05	2.13	157.551	BDL
14-Jul-87	123a	3252.64	6.6L	0.04	9.59	158.943	BDL
14-Jul-87	123d	3253.03	6.7L	0.04	8.36	152.752	BDL
14-Aug-87	123c	3256.48	6.1L	0.01	BDL	360.344	0.0056
14-Aug-87	123b	3256.53	6.3L	0.01	3.54	169.845	BDL
14-Aug-87	123e	3256.89	6.2L	0.03	1.56	177.242	BDL
14-Aug-87	123f	3256.86	6.3L	0.02	1.84	176.141	BDL
14-Aug-87	123a	3252.12	6.3L	0.02	9.92	163.447	BDL
14-Aug-87	123d	3252.29	6.3L	0.03	9.22	171.243	BDL

DATE	WELL	CU	FE	K	MG	MN	NA	NI
09-Aug-86	123e	0.0198	63.645	6.8	39.150	3.4563	10.4	BDL
09-Aug-86	123f	0.0401	69.734	5.4	41.363	3.5091	10.8	BDL
09-Aug-86	123d	0.0277	25.365	7.4	39.596	3.0545	14.0	BDL
15-Aug-86	123e	BDL	52.931	6.5	39.793	3.5395	10.8	BDL
15-Aug-86	123f	0.0090	62.132	6.5	40.890	3.4255	11.0	BDL
15-Aug-86	123d	0.0206	31.533	6.2	41.135	3.0675	14.3	0.0074
21-Sep-86	123e	0.0030	64.243	6.0	40.106	3.3440	11.1	BDL
21-Sep-86	123f	0.0116	68.472	4.9	40.805	3.5230	11.1	0.0077
21-Sep-86	123d	0.0176	30.785	4.4	41.847	2.5590	14.6	0.0093
19-Oct-86	123e	BDL	64.366	6.1	40.418	3.4779	12.0	BDL
19-Oct-86	123f	0.0130	64.126	4.8	40.228	3.6519	11.1	BDL
19-Oct-86	123d	0.0252	39.879	4.2	42.158	2.7230	14.7	BDL
15-Nov-86	123e	0.0287	62.864	BDL	38.431	3.3875	10.6	BDL
15-Nov-86	123f	0.0305	63.192	BDL	38.752	3.6034	10.9	BDL
15-Nov-86	123a	0.0197	23.247	BDL	36.990	3.6696	13.5	BDL
15-Nov-86	123d	0.0323	26.075	BDL	39.450	3.0545	13.8	0.0079
15-Dec-86	123e	0.0088	70.372	5.3	41.651	3.5309	11.2	0.0134
15-Dec-86	123f	0.0099	69.970	5.5	42.261	3.7648	11.2	0.0150
15-Dec-86	123a	0.0107	26.854	7.3	39.061	3.6651	14.2	0.0131
31-Jan-87	123e	BDL	71.099	5.7	41.334	3.4204	11.0	BDL
31-Jan-87	123f	BDL	73.797	5.4	41.874	3.6883	11.2	BDL
31-Jan-87	123a	BDL	24.751	6.7	39.162	3.7265	14.2	BDL
31-Jan-87	123d	0.0057	11.531	6.8	41.083	2.6245	14.3	BDL
28-Feb-87	123e	0.0116	64.715	BDL	40.789	3.4338	10.9	BDL
28-Feb-87	123f	0.0056	61.693	4.2	42.089	3.6684	11.1	BDL
28-Feb-87	123a	0.0281	22.856	2.9	39.283	3.7181	14.4	BDL
28-Feb-87	123d	0.0216	20.466	1.9	41.461	3.0288	14.6	BDL
30-Mar-87	123e	0.0167	69.424	BDL	40.424	3.4180	10.6	0.0117
30-Mar-87	123f	0.0151	71.631	2.2	40.545	3.6230	10.5	BDL
30-Mar-87	123a	0.0153	26.249	BDL	38.087	3.5340	13.9	BDL
30-Mar-87	123d	0.0165	17.156	BDL	42.016	2.8970	14.7	0.0074
23-Apr-87	123c	0.0253	2.647	6.5	53.232	14.1164	6.3	0.0180
23-Apr-87	123b	BDL	57.580	7.2	40.117	3.1045	9.7	BDL
23-Apr-87	123e	BDL	67.280	5.9	35.456	3.1262	8.1	0.0127
23-Apr-87	123f	BDL	66.329	5.8	34.525	3.1052	8.0	BDL
23-Apr-87	123a	0.0026	39.402	7.5	37.421	3.2976	11.7	BDL
23-Apr-87	123d	BDL	40.237	7.1	39.124	3.3094	11.9	BDL
16-May-87	123c	0.0106	7.147	6.2	51.822	16.5081	6.8	BDL
16-May-87	123b	BDL	57.222	7.0	42.224	3.1591	10.3	BDL
16-May-87	123e	BDL	71.366	5.9	39.077	3.3092	8.7	BDL
16-May-87	123f	BDL	71.094	5.9	38.265	3.3563	8.8	BDL
16-May-87	123a	BDL	42.033	7.0	39.576	3.3770	12.6	BDL
16-May-87	123d	BDL	42.648	6.8	40.259	3.7362	11.8	BDL
15-Jun-87	123c	0.0088	7.696	9.0	58.100	20.1731	8.7	0.0147
15-Jun-87	123b	BDL	56.168	8.2	41.585	3.0441	11.7	BDL
15-Jun-87	123e	BDL	70.383	7.6	38.509	3.2172	10.2	BDL
15-Jun-87	123f	BDL	69.332	7.1	36.994	3.1903	10.1	BDL
15-Jun-87	123a	BDL	43.151	7.2	39.743	3.2971	13.9	BDL
15-Jun-87	123d	BDL	43.825	8.1	39.445	3.7092	13.6	BDL

DATE	WELL	CU	FE	K	MG	MN	NA	NI
14-Jul-87	123c	0.0097	1.965	8.1	63.329	25.3843	9.6	0.0121
14-Jul-87	123b	0.0027	51.663	7.5	42.327	3.0713	12.0	BDL
14-Jul-87	123e	BDL	69.206	7.2	40.231	3.2067	11.2	BDL
14-Jul-87	123f	BDL	70.435	7.0	39.752	3.2676	11.1	BDL
14-Jul-87	123a	BDL	42.743	7.2	39.206	3.2674	14.0	0.0123
14-Jul-87	123d	BDL	43.936	7.1	40.191	3.5557	14.4	BDL
14-Aug-87	123c	0.0108	1.152	8.0	63.056	31.7268	8.5	0.0108
14-Aug-87	123b	BDL	57.832	6.7	40.887	3.0889	10.9	0.0072
14-Aug-87	123e	BDL	73.420	6.6	39.244	3.3726	9.6	0.0077
14-Aug-87	123f	BDL	75.179	6.4	39.764	3.4765	9.8	0.0106
14-Aug-87	123a	BDL	43.862	6.4	37.948	3.2500	12.8	0.0089
14-Aug-87	123d	BDL	47.860	6.8	40.235	3.6557	12.7	0.0083

Milltown Reservoir Site 123, Water Chemistry Data

DATE	WELL	PB	SB	P	SI	TI	ZN	HCO3	SO4
09-Aug-86	123e	BDL	0.063	0.500	26.213	BDL	0.3506	NA	NA
09-Aug-86	123f	BDL	0.072	0.540	26.673	BDL	0.3109	NA	NA
09-Aug-86	123d	BDL	0.079	BDL	21.451	BDL	0.3657	NA	NA
15-Aug-86	123e	BDL	0.069	0.289	26.123	BDL	0.2043	760	NA
15-Aug-86	123f	BDL	0.080	0.306	26.332	BDL	0.2212	780	NA
15-Aug-86	123d	BDL	0.096	0.120	22.336	BDL	0.3579	710	NA
21-Sep-86	123e	BDL	0.085	0.764	28.154	BDL	0.3026	780	NA
21-Sep-86	123f	BDL	0.076	0.559	27.996	BDL	0.3151	830	NA
21-Sep-86	123d	BDL	0.098	0.166	23.575	BDL	0.3244	730	NA
19-Oct-86	123e	BDL	0.074	0.343	19.983	BDL	0.2930	710	NA
19-Oct-86	123f	BDL	0.088	0.196	19.513	BDL	0.3311	770	NA
19-Oct-86	123d	BDL	0.066	0.308	17.078	BDL	0.3606	690	NA
15-Nov-86	123e	BDL	0.092	0.388	18.667	BDL	0.2749	760	NA
15-Nov-86	123f	BDL	0.098	0.468	18.506	BDL	0.3029	700	NA
15-Nov-86	123a	BDL	0.093	0.311	13.319	BDL	0.2731	700	NA
15-Nov-86	123d	BDL	0.082	0.174	15.658	BDL	0.2998	710	NA
15-Dec-86	123e	BDL	0.100	0.609	26.322	BDL	0.3131	780	NA
15-Dec-86	123f	BDL	0.110	0.482	25.662	BDL	0.3349	720	NA
15-Dec-86	123a	0.053	0.094	0.346	19.631	BDL	0.3217	720	NA
31-Jan-87	123e	BDL	0.078	0.294	25.590	BDL	0.3723	730	BDL
31-Jan-87	123f	BDL	0.062	0.557	26.089	BDL	0.3864	750	BDL
31-Jan-87	123a	BDL	0.057	0.414	19.368	BDL	0.2915	680	BDL
31-Jan-87	123d	BDL	0.081	BDL	21.109	BDL	0.1864	650	BDL
28-Feb-87	123e	BDL	0.063	0.172	23.780	BDL	0.3182	770	BDL
28-Feb-87	123f	BDL	0.084	0.103	24.275	BDL	0.3481	750	BDL
28-Feb-87	123a	BDL	0.070	0.120	19.860	BDL	0.3410	680	BDL
28-Feb-87	123d	BDL	0.092	BDL	21.915	BDL	0.2449	660	BDL
30-Mar-87	123e	BDL	0.060	0.746	24.051	BDL	0.2803	720	BDL
30-Mar-87	123f	BDL	0.097	0.421	22.828	BDL	0.3602	700	BDL
30-Mar-87	123a	BDL	0.052	0.238	18.966	BDL	0.2336	670	BDL
30-Mar-87	123d	BDL	0.049	BDL	21.318	BDL	0.2231	620	BDL
23-Apr-87	123c	BDL	0.138	BDL	16.429	BDL	5.3607	280	739
23-Apr-87	123b	BDL	0.094	0.641	22.586	BDL	0.3433	740	BDL
23-Apr-87	123e	BDL	0.094	1.030	22.765	BDL	0.2789	630	BDL
23-Apr-87	123f	BDL	0.105	0.871	22.664	BDL	0.2966	630	6
23-Apr-87	123a	BDL	0.096	0.915	20.599	BDL	0.2747	710	BDL
23-Apr-87	123d	BDL	0.101	0.403	21.354	BDL	0.2780	720	BDL
16-May-87	123c	BDL	0.133	BDL	17.747	BDL	2.7216	280	NA
16-May-87	123b	BDL	0.113	0.649	23.018	BDL	0.3784	660	NA
16-May-87	123e	BDL	0.095	1.075	23.607	BDL	0.3197	680	NA
16-May-87	123f	BDL	0.102	1.032	23.586	BDL	0.3634	710	NA
16-May-87	123a	BDL	0.101	1.277	20.828	BDL	0.3287	730	NA
16-May-87	123d	BDL	0.096	0.692	21.487	BDL	0.2893	750	NA
15-Jun-87	123c	BDL	0.130	BDL	17.543	BDL	2.6446	310	806
15-Jun-87	123b	BDL	0.088	0.781	22.659	BDL	0.3563	750	BDL
15-Jun-87	123e	BDL	0.091	1.134	23.703	BDL	0.2916	760	BDL
15-Jun-87	123f	BDL	0.082	1.153	23.248	BDL	0.3203	700	4
15-Jun-87	123a	BDL	0.086	1.400	20.705	BDL	0.3007	780	BDL
15-Jun-87	123d	BDL	0.087	0.803	20.938	BDL	0.2723	480	2

DATE	WELL	PB	SB	P	SI	TI	ZN	HCO3	SO4
14-Jul-87	123c	BDL	0.142	BDL	17.223	BDL	2.4913	530	973
14-Jul-87	123b	BDL	0.097	0.447	23.629	BDL	0.3520	670	BDL
14-Jul-87	123e	BDL	0.107	1.118	24.236	BDL	0.2844	740	1
14-Jul-87	123f	BDL	0.083	1.189	23.477	BDL	0.3203	730	BDL
14-Jul-87	123a	BDL	0.094	1.192	20.875	BDL	0.2973	690	BDL
14-Jul-87	123d	BDL	0.092	0.822	20.606	BDL	0.2679	680	1
14-Aug-87	123c	0.016	0.155	BDL	16.043	BDL	2.5007	170	947
14-Aug-87	123b	BDL	0.102	0.689	24.344	BDL	0.3540	690	BDL
14-Aug-87	123e	0.020	0.101	1.166	25.581	BDL	0.3179	730	BDL
14-Aug-87	123f	BDL	0.092	1.202	25.390	BDL	0.3471	710	BDL
14-Aug-87	123a	BDL	0.098	1.200	20.825	BDL	0.2720	720	BDL
14-Aug-87	123d	0.016	0.112	0.832	21.642	BDL	0.3076	690	1

Milltown Reservoir Site 124, Water Chemistry Data

DATE	WELL	HEAD	pH	AL	AS	CA	CD
15-Aug-86	124b	3252.67	6.5F	0.03	1.20	140.509	BDL
15-Aug-86	124c	3252.56	6.5F	BDL	1.31	141.806	BDL
15-Aug-86	124e	3252.41	6.3F	BDL	0.24	105.604	BDL
21-Sep-86	124c	3251.80	6.8L	BDL	0.39	150.804	BDL
21-Sep-86	124d	3251.66	6.6F	BDL	0.25	136.503	BDL
21-Sep-86	124e	3251.72	6.1F	BDL	0.27	105.403	BDL
19-Oct-86	124c	3251.59	6.8F	BDL	1.13	148.722	BDL
19-Oct-86	124d	3251.42	6.5F	BDL	0.18	134.723	BDL
19-Oct-86	124e	3251.42	6.8F	BDL	0.53	102.924	BDL
15-Nov-86	124c	3251.48	6.3F	BDL	0.82	153.904	BDL
15-Nov-86	124d	3251.35	6.1F	BDL	0.24	121.503	BDL
15-Nov-86	124e	3251.33	6.5F	BDL	0.89	101.202	BDL
31-Jan-87	124c	3251.84	6.1F	0.05	0.50	160.246	BDL
31-Jan-87	124d	3251.76	6.6F	0.03	0.15	121.044	BDL
31-Jan-87	124e	3251.73	6.6F	0.04	1.08	92.518	BDL
28-Feb-87	124c	3251.56	6.8L	0.09	0.74	163.829	BDL
28-Feb-87	124d	3251.40	6.7L	0.08	0.13	136.029	BDL
28-Feb-87	124e	3251.36	6.7L	0.05	0.54	90.468	BDL
30-Mar-87	124b	3252.52	6.7L	0.04	3.33	133.444	BDL
30-Mar-87	124c	3252.45	7.1F	0.04	0.53	159.305	BDL
30-Mar-87	124d	3252.19	7.1F	0.05	0.35	158.766	BDL
30-Mar-87	124e	3252.14	7.0F	BDL	0.84	85.377	BDL
23-Apr-87	124a	3257.65	6.7L	0.03	0.58	217.512	BDL
23-Apr-87	124b	3257.63	6.7L	0.03	3.94	159.908	BDL
23-Apr-87	124c	3257.51	6.7L	0.02	0.52	158.703	BDL
23-Apr-87	124d	3257.32	6.9L	BDL	0.19	157.299	BDL
23-Apr-87	124e	3257.26	6.8L	BDL	0.93	97.264	BDL
16-May-87	124a	3258.54	6.6L	0.05	0.72	201.247	BDL
16-May-87	124b	3258.52	6.7L	0.05	5.40	144.247	BDL
16-May-87	124c	3258.42	6.7L	0.03	0.64	143.247	BDL
16-May-87	124d	3258.29	6.8L	0.02	0.22	137.537	BDL
16-May-87	124e	3258.24	6.8L	BDL	1.00	89.084	BDL
15-Jun-87	124a	3258.43	6.8L	0.02	0.73	204.350	BDL
15-Jun-87	124b	3258.42	6.8L	BDL	6.77	148.248	BDL
15-Jun-87	124c	3258.34	6.8L	BDL	0.55	143.546	BDL
15-Jun-87	124d	3258.33	6.8L	BDL	0.21	137.843	BDL
15-Jun-87	124e	3258.30	6.8L	BDL	1.14	93.802	BDL
14-Jul-87	124a	3257.91	6.7L	0.04	0.77	170.250	BDL
14-Jul-87	124b	3257.92	6.8L	0.04	6.37	130.750	BDL
14-Jul-87	124c	3257.86	6.8L	0.04	0.54	134.450	BDL
14-Jul-87	124d	3257.70	6.8L	0.03	0.24	127.649	BDL
14-Jul-87	124e	3257.66	6.7L	0.03	1.02	87.009	BDL
14-Aug-87	124a	3256.98	6.4L	0.04	0.81	167.725	BDL
14-Aug-87	124b	3257.11	6.5L	0.03	6.51	134.624	BDL
14-Aug-87	124c	3257.12	6.5L	0.02	0.45	144.724	BDL
14-Aug-87	124d	3257.04	6.5L	0.01	0.19	133.221	BDL
14-Aug-87	124e	3257.01	6.4L	0.01	1.00	99.829	BDL

DATE	WELL	CU	FE	K	MG	MN	NA	NI
15-Aug-86	124b	0.0164	10.251	7.5	38.223	2.3759	9.1	0.0088
15-Aug-86	124c	BDL	29.060	6.0	33.750	9.0349	10.4	BDL
15-Aug-86	124e	0.0176	16.049	5.3	23.419	5.3727	9.3	0.0087
21-Sep-86	124c	0.0170	43.542	4.5	32.504	13.9180	10.1	BDL
21-Sep-86	124d	BDL	38.472	3.6	27.664	10.8880	8.9	BDL
21-Sep-86	124e	0.0095	12.891	5.7	23.073	5.5120	9.0	BDL
19-Oct-86	124c	0.0140	37.076	2.8	32.970	11.1648	10.3	BDL
19-Oct-86	124d	BDL	37.307	3.0	27.072	11.3149	8.1	BDL
19-Oct-86	124e	0.0047	29.689	6.6	22.104	5.2470	8.6	BDL
15-Nov-86	124c	0.0093	43.771	BDL	32.271	13.8554	9.7	BDL
15-Nov-86	124d	0.0164	31.871	BDL	24.469	9.9524	7.7	BDL
15-Nov-86	124e	0.0201	35.940	BDL	21.127	5.3375	8.1	BDL
31-Jan-87	124c	BDL	48.016	5.2	35.173	15.4052	9.7	BDL
31-Jan-87	124d	BDL	36.635	4.6	26.403	10.8251	8.1	BDL
31-Jan-87	124e	BDL	34.910	6.6	20.791	4.9241	8.1	BDL
28-Feb-87	124c	BDL	47.103	2.7	36.104	15.3367	10.2	BDL
28-Feb-87	124d	0.0037	39.922	2.6	29.923	11.7367	9.5	BDL
28-Feb-87	124e	0.0054	27.852	4.0	20.333	4.7877	8.1	BDL
30-Mar-87	124b	0.0078	21.637	4.6	36.473	2.1064	8.8	BDL
30-Mar-87	124c	BDL	50.408	1.3	33.952	15.8296	9.2	BDL
30-Mar-87	124d	BDL	49.558	1.4	34.861	13.8477	9.5	BDL
30-Mar-87	124e	0.0041	29.579	3.7	19.080	4.6809	7.6	0.0075
23-Apr-87	124a	0.0048	39.341	7.0	40.718	8.5442	6.5	0.0184
23-Apr-87	124b	0.0035	44.889	7.4	36.373	2.6751	6.3	0.0111
23-Apr-87	124c	BDL	47.077	5.0	28.978	14.4059	5.9	BDL
23-Apr-87	124d	BDL	45.415	4.7	28.823	13.6258	5.7	BDL
23-Apr-87	124e	BDL	35.253	5.2	18.438	4.8226	5.6	BDL
16-May-87	124a	BDL	53.146	7.3	42.531	8.1819	8.5	0.0121
16-May-87	124b	BDL	46.675	8.5	38.751	2.2569	9.1	BDL
16-May-87	124c	BDL	45.695	5.5	30.841	13.5979	8.8	BDL
16-May-87	124d	BDL	41.571	6.0	29.982	12.2571	8.7	BDL
16-May-87	124e	BDL	36.370	6.5	19.791	4.6770	7.9	BDL
15-Jun-87	124a	BDL	54.103	6.9	41.704	7.7904	7.8	0.0110
15-Jun-87	124b	BDL	48.832	7.9	37.833	2.1963	8.4	BDL
15-Jun-87	124c	BDL	45.251	4.6	28.851	13.9883	7.5	BDL
15-Jun-87	124d	0.0041	41.519	4.7	27.756	12.3083	7.2	BDL
15-Jun-87	124e	BDL	37.619	5.1	19.543	4.7804	7.0	BDL
14-Jul-87	124a	BDL	49.465	8.1	40.232	6.1585	8.7	BDL
14-Jul-87	124b	BDL	43.544	8.9	36.702	1.8715	9.5	BDL
14-Jul-87	124c	BDL	43.843	5.7	29.592	13.5544	8.9	BDL
14-Jul-87	124d	BDL	40.313	5.3	28.963	11.9843	8.4	BDL
14-Jul-87	124e	BDL	37.062	6.3	19.933	4.6313	7.9	BDL
14-Aug-87	124a	BDL	45.497	8.1	40.000	5.4641	8.2	0.0079
14-Aug-87	124b	BDL	44.137	9.2	35.681	1.8281	9.1	BDL
14-Aug-87	124c	BDL	45.427	5.8	29.892	14.4530	8.4	0.0075
14-Aug-87	124d	BDL	41.245	5.8	28.629	12.2332	8.0	BDL
14-Aug-87	124e	BDL	41.114	6.4	22.175	5.2433	8.1	0.0081

Milltown Reservoir Site 124, Water Chemistry Data

DATE	WELL	PB	SB	P	SI	TI	ZN	HCO3	SO4
15-Aug-86	124b	BDL	0.077	BDL	21.616	BDL	BDL	590	NA
15-Aug-86	124c	BDL	0.068	0.165	22.973	BDL	BDL	650	NA
15-Aug-86	124e	BDL	BDL	BDL	20.772	BDL	0.0437	460	NA
21-Sep-86	124c	BDL	0.090	1.087	26.251	BDL	0.0055	650	NA
21-Sep-86	124d	BDL	0.070	1.452	25.859	BDL	0.0025	490	NA
21-Sep-86	124e	BDL	0.050	0.279	21.386	BDL	0.1087	450	NA
19-Oct-86	124c	BDL	0.044	0.562	25.576	BDL	0.0319	590	NA
19-Oct-86	124d	BDL	0.047	1.402	26.057	BDL	0.0093	480	NA
19-Oct-86	124e	BDL	0.048	0.405	23.520	BDL	0.1363	430	NA
15-Nov-86	124c	BDL	0.063	1.326	18.255	BDL	0.0049	620	NA
15-Nov-86	124d	BDL	0.061	1.074	17.934	BDL	BDL	470	NA
15-Nov-86	124e	BDL	0.062	1.057	16.963	BDL	0.1554	430	NA
31-Jan-87	124c	BDL	0.065	1.406	25.279	BDL	0.0080	630	69
31-Jan-87	124d	BDL	0.043	1.593	25.298	BDL	BDL	560	2
31-Jan-87	124e	BDL	0.037	0.656	23.755	BDL	0.1539	400	BDL
28-Feb-87	124c	BDL	0.072	1.035	24.317	BDL	0.0137	590	83
28-Feb-87	124d	BDL	0.073	1.546	25.109	BDL	0.0017	540	2
28-Feb-87	124e	BDL	0.051	0.105	22.900	BDL	0.1371	390	BDL
30-Mar-87	124b	BDL	0.079	0.122	18.185	BDL	0.4550	580	BDL
30-Mar-87	124c	BDL	0.055	1.696	23.279	BDL	0.0083	540	150
30-Mar-87	124d	BDL	0.089	1.753	23.542	BDL	0.0016	550	135
30-Mar-87	124e	BDL	0.036	0.257	21.575	BDL	0.1380	310	BDL
23-Apr-87	124a	BDL	0.118	0.198	19.602	BDL	2.2854	620	144
23-Apr-87	124b	BDL	0.102	0.404	20.086	BDL	0.4967	600	BDL
23-Apr-87	124c	BDL	0.091	1.364	23.319	BDL	0.0037	370	88
23-Apr-87	124d	BDL	0.080	1.475	23.243	BDL	BDL	430	126
23-Apr-87	124e	BDL	0.075	0.956	21.736	BDL	0.1610	260	4
16-May-87	124a	BDL	0.124	0.811	21.708	BDL	1.6555	660	NA
16-May-87	124b	BDL	0.111	0.538	20.968	BDL	0.5150	590	NA
16-May-87	124c	BDL	0.097	1.432	23.508	BDL	0.0174	510	NA
16-May-87	124d	BDL	0.078	1.490	23.468	BDL	BDL	450	NA
16-May-87	124e	BDL	BDL	1.088	21.647	BDL	0.1616	400	NA
15-Jun-87	124a	BDL	0.123	0.703	22.260	BDL	0.9923	780	106
15-Jun-87	124b	BDL	0.103	0.547	21.269	BDL	0.5224	690	BDL
15-Jun-87	124c	BDL	0.056	1.337	23.688	BDL	0.0133	470	121
15-Jun-87	124d	BDL	0.070	1.566	23.875	BDL	BDL	500	87
15-Jun-87	124e	BDL	BDL	0.924	21.864	BDL	0.1666	400	3
14-Jul-87	124a	BDL	0.093	0.540	22.228	BDL	0.3157	690	33
14-Jul-87	124b	BDL	0.075	0.651	21.008	BDL	0.5163	620	BDL
14-Jul-87	124c	BDL	0.061	1.438	23.139	BDL	0.0210	430	137
14-Jul-87	124d	BDL	0.068	1.457	23.490	BDL	BDL	420	101
14-Jul-87	124e	BDL	BDL	1.263	21.080	BDL	0.1592	340	7
14-Aug-87	124a	BDL	0.110	0.423	22.941	BDL	0.1525	670	11
14-Aug-87	124b	BDL	0.097	0.634	21.453	BDL	0.5220	590	BDL
14-Aug-87	124c	BDL	0.053	1.460	23.654	BDL	0.0085	370	165
14-Aug-87	124d	0.011	0.073	1.520	24.201	BDL	BDL	380	143
14-Aug-87	124e	BDL	0.059	1.105	21.586	BDL	0.1518	320	28

DATE	WELL	HEAD	pH	AL	AS	CA	CD
09-Aug-86	137b	3252.63	6.3F	BDL	0.07	128.199	BDL
09-Aug-86	137c	3250.28	6.8F	BDL	0.42	146.099	0.0036
09-Aug-86	137d	3248.08	6.6F	BDL	5.79	143.498	BDL
15-Aug-86	137a	3253.09	6.4F	BDL	0.07	107.048	BDL
15-Aug-86	137b	3252.61	6.8F	BDL	0.05	128.449	BDL
15-Aug-86	137d	3247.68	6.8F	BDL	5.60	144.849	BDL
21-Sep-86	137b	3251.93	7.0L	BDL	0.15	126.202	BDL
21-Sep-86	137c	3249.57	7.1L	0.04	0.13	155.901	BDL
21-Sep-86	137d	3247.53	6.7L	BDL	6.84	145.600	BDL
19-Oct-86	137b	3251.38	7.0F	0.05	0.23	131.707	BDL
19-Oct-86	137c	3249.15	7.0F	0.06	0.27	153.505	BDL
19-Oct-86	137d	3247.23	6.8F	0.06	7.20	148.504	BDL
15-Nov-86	137b	3250.64	6.7F	BDL	0.42	131.996	BDL
15-Nov-86	137c	3249.19	6.3F	BDL	1.30	152.696	BDL
15-Nov-86	137d	3245.34	6.0F	BDL	8.13	147.996	BDL
15-Dec-86	137b	3252.26	NA	0.07	2.74	178.415	BDL
15-Dec-86	137d	3248.44	6.7L	0.08	7.02	147.212	BDL
31-Jan-87	137b	3251.58	6.7L	0.04	0.21	127.903	BDL
31-Jan-87	137c	3249.78	6.8L	0.05	2.87	147.025	BDL
31-Jan-87	137d	3249.06	6.6L	0.04	7.75	144.945	BDL
28-Feb-87	137b	3250.68	7.3L	0.05	0.10	120.158	BDL
28-Feb-87	137c	3248.39	7.0L	0.06	2.69	145.729	BDL
28-Feb-87	137d	3247.47	6.8L	0.10	6.78	144.844	BDL
30-Mar-87	137b	3251.59	6.3F	BDL	0.39	126.269	BDL
30-Mar-87	137c	3248.41	7.0L	BDL	1.00	144.244	BDL
30-Mar-87	137d	3246.68	6.6F	BDL	8.19	143.120	BDL
23-Apr-87	137a	3257.44	6.8L	0.04	BDL	137.406	0.0040
23-Apr-87	137b	3256.88	6.9L	0.02	0.74	132.204	BDL
23-Apr-87	137c	3256.08	6.8L	0.03	3.85	150.501	BDL
23-Apr-87	137d	3254.35	6.7L	0.02	6.90	153.399	BDL
16-May-87	137a	3257.77	6.7L	0.03	0.03	177.066	BDL
16-May-87	137b	3258.01	6.8L	0.02	0.83	135.965	BDL
16-May-87	137c	3257.02	6.7L	0.03	4.59	160.463	BDL
16-May-87	137d	3255.85	6.7L	0.02	6.88	157.661	BDL
15-Jun-87	137a	3258.63	6.7L	0.02	0.04	219.420	BDL
15-Jun-87	137b	3257.99	6.8L	0.02	0.88	127.620	BDL
15-Jun-87	137c	3256.90	6.8L	0.03	5.42	152.520	BDL
15-Jun-87	137d	3255.85	6.7L	0.02	7.06	148.920	BDL
14-Jul-87	137a	3257.56	6.4L	0.05	0.08	195.340	BDL
14-Jul-87	137b	3257.16	6.5L	0.04	0.95	119.340	BDL
14-Jul-87	137c	3255.66	6.3L	0.04	5.12	151.727	BDL
14-Jul-87	137d	3254.58	6.3L	0.03	7.12	146.324	BDL
14-Aug-87	137a	3256.51	6.2L	0.02	0.06	221.039	BDL
14-Aug-87	137b	3256.27	6.2L	0.03	1.04	134.838	BDL
14-Aug-87	137c	3254.95	6.3L	0.02	5.71	162.837	BDL
14-Aug-87	137d	3253.91	6.2L	0.02	7.44	159.536	BDL

DATE	WELL	CU	FE	K	MG	MN	NA	NI
09-Aug-86	137b	0.0738	0.414	7.0	28.258	3.8486	10.0	BDL
09-Aug-86	137c	0.2297	0.135	7.8	32.135	4.4029	12.1	BDL
09-Aug-86	137d	0.0846	35.821	8.0	36.451	5.2394	13.2	BDL
15-Aug-86	137a	0.0108	0.208	6.1	19.787	3.6735	8.6	BDL
15-Aug-86	137b	0.0040	2.375	6.6	27.595	3.7995	10.0	BDL
15-Aug-86	137d	0.0341	34.343	7.4	36.162	5.3025	13.2	BDL
21-Sep-86	137b	0.0098	9.280	5.4	26.782	3.2110	9.9	BDL
21-Sep-86	137c	0.0225	0.041	5.9	36.551	2.6330	13.1	BDL
21-Sep-86	137d	0.0113	39.041	4.7	36.740	5.3730	13.3	0.0107
19-Oct-86	137b	0.0136	10.725	6.1	28.338	3.1649	10.3	BDL
19-Oct-86	137c	0.0219	0.439	8.5	36.418	2.2178	13.3	BDL
19-Oct-86	137d	0.0112	39.744	6.5	37.508	5.5808	13.4	0.0127
15-Nov-86	137b	0.0106	18.053	BDL	27.125	3.1201	9.7	BDL
15-Nov-86	137c	0.0161	7.718	BDL	34.216	2.5539	12.7	BDL
15-Nov-86	137d	0.0136	44.703	BDL	34.776	5.6458	12.7	0.0130
15-Dec-86	137b	0.0148	45.868	4.8	41.781	3.7536	16.6	BDL
15-Dec-86	137d	0.0205	40.186	7.7	37.561	5.7164	13.9	0.0112
31-Jan-87	137b	0.0041	10.380	7.3	29.162	3.0022	9.8	0.0072
31-Jan-87	137c	0.0085	20.345	6.6	36.398	2.4929	12.7	0.0105
31-Jan-87	137d	BDL	44.200	6.2	37.864	5.8223	13.3	0.0085
28-Feb-87	137b	0.0171	3.837	3.2	27.550	2.6181	9.9	BDL
28-Feb-87	137c	0.0201	15.846	4.4	35.959	2.3466	13.2	BDL
28-Feb-87	137d	0.0179	37.677	5.5	37.922	5.6474	13.9	0.0075
30-Mar-87	137b	0.0122	20.563	3.2	28.420	3.1362	9.7	BDL
30-Mar-87	137c	0.0306	4.423	1.5	35.375	2.1063	12.7	BDL
30-Mar-87	137d	0.0176	44.996	1.9	36.870	5.7734	13.1	BDL
23-Apr-87	137a	0.0237	5.375	4.0	22.245	10.8662	6.8	BDL
23-Apr-87	137b	BDL	34.306	6.1	27.284	3.1811	8.3	BDL
23-Apr-87	137c	0.0032	36.785	7.2	33.073	2.9781	10.4	BDL
23-Apr-87	137d	BDL	50.133	7.8	35.663	6.0551	11.2	0.0140
16-May-87	137a	0.0057	18.268	4.4	28.795	14.3133	7.9	BDL
16-May-87	137b	BDL	36.447	5.7	28.843	3.1793	8.4	BDL
16-May-87	137c	BDL	43.616	6.4	36.120	3.0154	9.7	BDL
16-May-87	137d	BDL	50.305	6.4	37.698	6.1214	10.1	0.0115
15-Jun-87	137a	0.0030	28.810	5.4	37.538	17.9534	10.6	BDL
15-Jun-87	137b	BDL	34.730	6.6	28.028	3.0364	9.6	BDL
15-Jun-87	137c	BDL	44.771	7.6	36.388	2.9304	12.5	BDL
15-Jun-87	137d	BDL	50.051	8.0	37.368	5.9745	13.0	0.0125
14-Jul-87	137a	BDL	26.163	5.5	35.850	15.8641	11.0	BDL
14-Jul-87	137b	BDL	34.313	7.0	27.790	2.8971	10.3	BDL
14-Jul-87	137c	BDL	44.706	7.9	36.670	2.6228	13.1	BDL
14-Jul-87	137d	BDL	49.845	7.7	37.757	5.8237	13.6	0.0130
14-Aug-87	137a	BDL	22.478	5.5	34.773	16.4364	9.7	BDL
14-Aug-87	137b	BDL	36.448	6.5	27.502	3.0794	9.1	BDL
14-Aug-87	137c	BDL	46.307	7.5	36.841	2.8383	12.5	0.0074
14-Aug-87	137d	BDL	51.756	7.6	38.070	6.1432	12.7	0.0125

DATE	WELL	PB	SB	P	SI	TI	ZN	HCO3	SO4
09-Aug-86	137b	BDL	0.074	BDL	20.924	BDL	0.2908	NA	NA
09-Aug-86	137c	BDL	0.064	BDL	18.573	BDL	1.4648	NA	NA
09-Aug-86	137d	BDL	0.084	0.182	25.494	BDL	0.7423	NA	NA
15-Aug-86	137a	BDL	0.052	BDL	20.731	BDL	0.0293	370	NA
15-Aug-86	137b	BDL	0.041	BDL	21.810	BDL	0.2025	540	NA
15-Aug-86	137d	BDL	0.082	0.120	25.839	BDL	0.7637	670	NA
21-Sep-86	137b	BDL	0.061	0.178	23.904	BDL	0.1179	510	NA
21-Sep-86	137c	BDL	0.062	0.129	21.121	BDL	0.1684	660	NA
21-Sep-86	137d	BDL	0.070	1.425	24.849	BDL	0.4552	730	NA
19-Oct-86	137b	BDL	0.067	BDL	17.044	BDL	0.0966	510	NA
19-Oct-86	137c	BDL	0.059	BDL	15.294	BDL	0.0848	660	NA
19-Oct-86	137d	BDL	0.079	1.175	18.424	BDL	0.4015	710	NA
15-Nov-86	137b	BDL	0.038	BDL	17.017	BDL	0.0963	530	NA
15-Nov-86	137c	BDL	0.055	BDL	15.247	BDL	0.1741	650	NA
15-Nov-86	137d	BDL	0.067	2.116	18.016	BDL	0.6135	680	NA
15-Dec-86	137b	BDL	0.083	0.572	25.253	BDL	0.6242	NA	NA
15-Dec-86	137d	BDL	0.096	0.849	26.114	BDL	0.7675	690	NA
31-Jan-87	137b	BDL	0.054	0.155	21.720	BDL	0.1030	560	BDL
31-Jan-87	137c	BDL	0.074	0.407	21.565	BDL	0.2042	690	BDL
31-Jan-87	137d	BDL	0.082	1.258	26.502	BDL	0.8532	720	BDL
28-Feb-87	137b	BDL	0.057	BDL	18.820	BDL	0.0847	470	BDL
28-Feb-87	137c	BDL	0.069	0.284	20.707	BDL	0.2225	640	BDL
28-Feb-87	137d	BDL	0.071	0.445	24.950	BDL	0.6405	610	BDL
30-Mar-87	137b	BDL	0.062	0.120	20.771	BDL	0.1009	480	BDL
30-Mar-87	137c	BDL	0.075	BDL	18.555	BDL	0.0959	600	BDL
30-Mar-87	137d	BDL	0.083	1.299	23.769	BDL	0.6478	640	BDL
23-Apr-87	137a	BDL	0.061	BDL	20.203	BDL	0.9065	380	88
23-Apr-87	137b	BDL	0.089	0.635	21.591	BDL	0.1076	470	BDL
23-Apr-87	137c	BDL	0.101	0.764	21.210	BDL	0.4167	620	BDL
23-Apr-87	137d	BDL	0.095	1.902	24.949	BDL	1.2164	710	BDL
16-May-87	137a	BDL	0.080	BDL	22.806	BDL	0.4494	320	NA
16-May-87	137b	BDL	0.077	0.936	22.844	BDL	0.0977	590	NA
16-May-87	137c	BDL	0.108	1.006	22.212	BDL	0.4099	650	NA
16-May-87	137d	BDL	0.093	1.869	25.030	BDL	1.1229	690	NA
15-Jun-87	137a	BDL	0.085	BDL	23.054	BDL	0.2814	220	576
15-Jun-87	137b	BDL	0.076	0.973	22.364	BDL	0.1031	550	1
15-Jun-87	137c	BDL	0.085	1.301	21.385	BDL	0.4207	540	BDL
15-Jun-87	137d	BDL	0.090	2.078	24.065	BDL	1.1014	740	BDL
14-Jul-87	137a	BDL	0.056	BDL	23.649	BDL	0.2088	260	370
14-Jul-87	137b	BDL	BDL	0.931	22.709	BDL	0.0829	450	BDL
14-Jul-87	137c	BDL	0.089	0.979	22.370	BDL	0.2826	560	BDL
14-Jul-87	137d	BDL	0.089	2.176	24.526	BDL	0.9832	630	BDL
14-Aug-87	137a	0.014	0.092	BDL	25.058	BDL	0.1322	260	430
14-Aug-87	137b	BDL	0.077	1.120	24.417	BDL	0.0894	440	BDL
14-Aug-87	137c	BDL	0.095	1.160	22.576	BDL	0.3394	680	BDL
14-Aug-87	137d	0.015	0.102	2.057	25.015	BDL	1.0822	660	BDL

Milltown Site 138, Water Chemistry Data

DATE	WELL	HEAD	pH	AL	AS	CA	CD
15-Aug-86	138a	3252.96	6.4F	0.05	0.20	161.202	BDL
15-Aug-86	138b	3252.16	6.8F	BDL	0.07	149.199	BDL
15-Aug-86	138d	3248.44	6.8F	BDL	2.14	177.097	BDL
21-Sep-86	138b	3251.64	7.0L	0.04	0.23	147.451	BDL
21-Sep-86	138c	3248.55	6.8L	BDL	4.08	175.351	BDL
21-Sep-86	138d	3248.60	6.9L	BDL	3.19	177.851	BDL
19-Oct-86	138b	3251.35	6.6F	BDL	0.20	147.025	BDL
19-Oct-86	138c	3248.22	6.3F	BDL	4.05	171.126	BDL
19-Oct-86	138d	3248.03	6.3F	BDL	4.05	182.227	BDL
15-Nov-86	138b	3250.48	6.4F	0.34	0.37	147.201	BDL
15-Nov-86	138c	3249.47	6.0F	BDL	4.66	170.100	BDL
15-Nov-86	138d	3248.61	6.4F	BDL	3.15	181.799	BDL
31-Jan-87	138b	3251.22	7.3L	0.06	0.11	138.544	BDL
31-Jan-87	138c	3249.92	6.7L	0.07	4.69	169.343	BDL
31-Jan-87	138d	3249.46	6.6L	0.06	2.85	180.341	BDL
28-Feb-87	138b	3250.32	7.8L	0.04	0.06	145.228	BDL
28-Feb-87	138c	3247.91	6.7L	0.11	4.23	171.328	BDL
28-Feb-87	138d	3247.55	6.8L	0.06	2.03	179.942	BDL
30-Mar-87	138b	3250.24	6.9L	0.04	0.60	146.788	BDL
30-Mar-87	138c	3247.73	6.8F	0.04	4.85	167.091	BDL
30-Mar-87	138d	3247.61	6.9F	0.03	5.18	182.962	BDL
23-Apr-87	138a	3257.70	6.6L	0.05	BDL	682.270	BDL
23-Apr-87	138b	3257.09	6.7L	0.09	2.50	170.912	BDL
23-Apr-87	138c	3255.94	6.6L	0.12	4.47	189.312	BDL
23-Apr-87	138d	3255.68	6.7L	0.10	5.41	208.812	BDL
16-May-87	138a	3258.53	6.7L	0.05	0.05	680.340	BDL
16-May-87	138b	3257.90	6.7L	0.07	2.52	180.344	BDL
16-May-87	138c	3257.10	6.8L	0.05	4.52	202.237	BDL
16-May-87	138d	3256.94	6.8L	0.04	5.31	219.029	BDL
15-Jun-87	138a	3258.39	6.7L	BDL	0.07	540.500	BDL
15-Jun-87	138b	3258.02	6.7L	0.02	2.62	163.340	BDL
15-Jun-87	138c	3257.06	6.7L	0.02	3.83	177.740	BDL
15-Jun-87	138d	3257.05	6.7L	BDL	5.50	201.439	BDL
14-Jul-87	138a	3256.64	6.5L	0.07	0.08	519.600	BDL
14-Jul-87	138b	3256.35	6.4L	0.04	2.79	160.219	BDL
14-Jul-87	138c	3255.88	6.4L	0.05	4.25	174.916	BDL
14-Jul-87	138d	3255.84	6.4L	0.04	5.63	196.013	BDL
14-Aug-87	138a	3255.84	6.7L	0.02	0.04	508.010	BDL
14-Aug-87	138b	3255.80	6.6L	0.04	2.75	156.615	BDL
14-Aug-87	138c	3255.37	6.6L	0.04	4.48	174.413	BDL
14-Aug-87	138d	3255.35	6.5L	0.03	5.41	193.611	BDL

DATE	WELL	CU	FE	K	MG	MN	NA	NI
15-Aug-86	138a	0.0141	2.582	3.4	31.988	6.0096	12.8	BDL
15-Aug-86	138b	0.0093	0.566	5.4	34.517	3.9444	14.3	BDL
15-Aug-86	138d	0.0530	30.146	6.8	41.297	7.4062	17.1	0.0074
21-Sep-86	138b	0.0090	2.955	6.1	33.794	3.9200	14.1	BDL
21-Sep-86	138c	0.0103	57.621	6.3	40.263	5.0810	17.0	BDL
21-Sep-86	138d	0.0205	40.650	5.2	41.382	8.7260	17.0	BDL
19-Oct-86	138b	0.0097	1.107	5.9	33.856	3.8672	14.2	0.0084
19-Oct-86	138c	0.0089	57.091	6.2	39.088	4.8684	16.4	0.0088
19-Oct-86	138d	0.0092	49.953	5.0	42.070	10.0455	17.4	0.0091
15-Nov-86	138b	0.2323	6.510	BDL	33.285	4.3305	13.8	BDL
15-Nov-86	138c	0.0136	58.080	BDL	37.653	5.1626	16.9	BDL
15-Nov-86	138d	0.0136	29.810	BDL	40.662	11.8556	17.0	BDL
31-Jan-87	138b	0.0059	0.997	7.2	34.454	4.0271	13.5	BDL
31-Jan-87	138c	0.0034	61.500	8.3	40.364	5.2260	16.3	0.0088
31-Jan-87	138d	0.0088	27.660	9.4	43.914	12.1258	17.7	0.0085
28-Feb-87	138b	0.0144	0.287	5.5	36.753	4.6087	14.8	BDL
28-Feb-87	138c	0.0074	60.461	5.2	40.862	5.0977	17.0	0.0130
28-Feb-87	138d	BDL	19.301	6.4	43.526	11.8460	18.3	0.0081
30-Mar-87	138b	0.0085	11.310	4.0	36.439	5.3990	14.1	BDL
30-Mar-87	138c	BDL	63.052	3.2	39.434	5.0957	16.2	0.0112
30-Mar-87	138d	0.0056	51.572	2.7	42.123	13.3104	17.5	0.0117
23-Apr-87	138a	BDL	11.772	6.7	98.086	58.1560	17.6	BDL
23-Apr-87	138b	BDL	51.592	8.7	38.926	5.8287	13.5	BDL
23-Apr-87	138c	BDL	65.892	9.7	42.156	5.6297	15.2	0.0157
23-Apr-87	138d	BDL	60.162	10.2	45.147	13.9657	16.5	0.0154
16-May-87	138a	BDL	19.333	6.4	93.036	55.8660	13.8	BDL
16-May-87	138b	BDL	52.221	7.6	37.297	6.0840	10.3	BDL
16-May-87	138c	BDL	67.059	7.7	40.788	5.9837	11.8	0.0144
16-May-87	138d	BDL	61.057	8.0	43.249	14.3625	12.6	0.0137
15-Jun-87	138a	BDL	25.029	6.3	88.141	48.9384	17.6	BDL
15-Jun-87	138b	BDL	51.419	7.3	36.760	5.5814	13.0	BDL
15-Jun-87	138c	BDL	59.919	7.9	39.668	5.1735	14.1	0.0114
15-Jun-87	138d	BDL	59.629	8.2	42.996	13.9585	15.8	0.0112
14-Jul-87	138a	BDL	19.404	7.0	88.823	46.0136	19.4	BDL
14-Jul-87	138b	BDL	51.463	8.3	37.600	5.5786	14.9	BDL
14-Jul-87	138c	BDL	62.281	8.8	40.656	5.2785	16.5	0.0125
14-Jul-87	138d	BDL	60.070	9.1	44.053	13.9735	18.0	BDL
14-Aug-87	138a	BDL	12.494	7.2	86.151	43.0935	17.6	0.0059
14-Aug-87	138b	BDL	49.753	7.8	35.727	5.4296	13.2	0.0078
14-Aug-87	138c	BDL	61.022	7.8	39.603	5.3658	15.1	0.0072
14-Aug-87	138d	BDL	57.681	8.4	42.599	13.3940	15.9	0.0091

DATE	WELL	PB	SB	P	SI	TI	ZN	HCO3	SO4
15-Aug-86	138a	BDL	0.067	BDL	20.342	BDL	BDL	670	NA
15-Aug-86	138b	BDL	0.074	BDL	20.461	BDL	BDL	650	NA
15-Aug-86	138d	BDL	0.073	BDL	21.720	BDL	0.5724	820	NA
21-Sep-86	138b	BDL	0.063	BDL	22.128	BDL	0.1516	650	NA
21-Sep-86	138c	BDL	0.090	0.987	25.640	BDL	0.3374	830	NA
21-Sep-86	138d	BDL	0.088	0.166	22.911	BDL	0.4218	820	NA
19-Oct-86	138b	BDL	0.047	0.095	22.543	BDL	0.1002	630	NA
19-Oct-86	138c	0.033	0.058	1.486	25.076	BDL	0.3400	780	NA
19-Oct-86	138d	BDL	0.056	0.563	24.189	BDL	0.3011	800	NA
15-Nov-86	138b	0.051	0.079	0.190	16.383	0.0100	0.2516	620	NA
15-Nov-86	138c	BDL	0.082	1.658	17.172	BDL	0.3449	810	NA
15-Nov-86	138d	0.040	0.106	0.241	16.161	BDL	0.2615	820	NA
31-Jan-87	138b	BDL	0.085	0.189	19.313	BDL	0.0835	630	BDL
31-Jan-87	138c	BDL	0.069	1.922	24.555	BDL	0.3641	830	BDL
31-Jan-87	138d	BDL	0.079	0.133	23.416	BDL	0.2412	810	BDL
28-Feb-87	138b	BDL	0.080	BDL	19.542	BDL	0.1555	620	NA
28-Feb-87	138c	BDL	0.110	1.832	24.263	BDL	0.4098	820	BDL
28-Feb-87	138d	BDL	0.081	BDL	22.341	BDL	0.1996	760	BDL
30-Mar-87	138b	BDL	0.084	0.147	19.419	BDL	0.1431	610	BDL
30-Mar-87	138c	BDL	0.079	2.074	22.556	BDL	0.3805	760	BDL
30-Mar-87	138d	BDL	0.092	0.665	22.608	BDL	0.2791	810	BDL
23-Apr-87	138a	0.046	0.226	BDL	22.891	BDL	0.0575	220	1560
23-Apr-87	138b	BDL	0.097	0.923	24.831	BDL	0.2830	650	1
23-Apr-87	138c	BDL	0.093	1.765	25.501	BDL	0.4094	740	BDL
23-Apr-87	138d	0.037	0.109	1.384	25.921	BDL	0.3287	840	BDL
16-May-87	138a	0.048	0.253	0.211	25.596	BDL	0.0096	280	NA
16-May-87	138b	BDL	0.108	1.103	24.244	BDL	0.3342	670	NA
16-May-87	138c	BDL	0.130	1.686	24.583	BDL	0.4372	790	NA
16-May-87	138d	BDL	0.127	1.519	24.821	BDL	0.3758	850	NA
15-Jun-87	138a	BDL	0.200	1.336	27.094	BDL	BDL	400	1319
15-Jun-87	138b	BDL	0.091	0.923	23.083	BDL	0.2600	740	1
15-Jun-87	138c	BDL	0.104	1.535	22.883	BDL	0.4246	790	1
15-Jun-87	138d	BDL	0.102	1.903	22.962	BDL	0.3371	900	1
14-Jul-87	138a	BDL	0.190	1.424	28.623	BDL	0.0024	440	1321
14-Jul-87	138b	BDL	0.086	0.875	24.489	BDL	0.2504	680	1
14-Jul-87	138c	BDL	0.109	1.843	23.815	BDL	0.3994	730	BDL
14-Jul-87	138d	BDL	0.100	2.217	23.771	BDL	0.3415	800	BDL
14-Aug-87	138a	0.041	0.213	0.844	26.381	BDL	BDL	500	1311
14-Aug-87	138b	0.013	0.084	0.722	23.326	BDL	0.2268	700	BDL
14-Aug-87	138c	BDL	0.102	1.696	22.911	BDL	0.3708	810	BDL
14-Aug-87	138d	0.013	0.100	1.632	22.636	BDL	0.3188	880	BDL

Water chemistry data for the Clark Fork River branch of the Milltown Reservoir.
Samples were collected near Site 138.

DATE	pH	AL	AS	CA	CD	CU
23-Apr-87	8.1L	0.06	BDL	42.842	BDL	0.0025
16-May-87	8.0L	0.04	BDL	35.132	BDL	0.0020
15-Jun-87	8.4L	0.05	BDL	41.978	BDL	0.0032
14-Jul-87	7.5L	0.03	BDL	48.370	BDL	BDL
14-Aug-87	7.7L	0.03	BDL	50.219	BDL	0.0016

DATE	FE	K	MG	MN	NA	NI	PB
23-Apr-87	0.012	2.8	10.076	0.0167	7.3	BDL	BDL
16-May-87	0.013	1.8	7.712	0.0205	4.0	BDL	BDL
15-Jun-87	BDL	2.1	9.715	0.0281	7.0	BDL	BDL
14-Jul-87	0.019	2.6	12.309	0.0496	10.3	BDL	BDL
14-Aug-87	0.006	2.6	12.655	0.0341	9.2	BDL	BDL

DATE	SB	P	SI	TI	ZN	HCO3	SO4
23-Apr-87	BDL	0.015	7.589	BDL	BDL	70	46
16-May-87	BDL	0.016	6.823	BDL	BDL	80	NA
15-Jun-87	BDL	BDL	7.325	BDL	BDL	90	34
14-Jul-87	BDL	0.043	8.186	BDL	0.0061	0	47
14-Aug-87	0.039	BDL	7.299	BDL	0.0043	55	63

Arsenic speciation results:

Arsenic speciation separates for selected wells (the 3244' datum) and sampling dates were analyzed using the ICAPES.
All concentrations are expressed as mg/L. As(III) and As(V) are reported as percentages of recovered arsenic.
All samples have been corrected for a column blank concentration which was determined by averaging the concentrations of field blanks run through the columns, as shown below.
Arsenite was recovered in separates #1 and #2. Arsenate was recovered in separates #3 through #7.

SITE #122, WELL A	10/86	1/87	4/87	7/87
Initial As concentration	6.00	6.90	6.07	5.64
Total As recovered	6.72	7.09	6.48	6.43
Percent As recovered	112.0	102.8	106.8	114.0
Percent As(III)	86.0	89.7	88.0	92.7
Percent As(V)	14.0	10.3	12.0	7.3
SITE #123, WELL D				
Initial As concentration	7.49	4.03	7.46	8.36
Total As recovered	8.20	3.98	8.08	8.86
Percent As recovered	109.5	98.8	108.3	106.0
Percent As(III)	75.4	95.5	55.2	87.0
Percent As(V)	24.6	4.5	44.8	13.0
SITE #124, WELL E				
Initial As concentration	0.53	1.08	0.93	1.02
Total As recovered	0.79	1.00	1.01	1.12
Percent As recovered	149.1	92.6	100.0	100.0
Percent As(III)	77.2	95.0	41.6	90.2
Percent As(V)	22.8	5.0	58.4	9.8
SITE #137, WELL D				
Initial As concentration	7.20	7.75	6.90	7.12
Total As recovered	7.63	7.48	7.55	7.32
Percent As recovered	106.0	96.5	109.4	102.8
Percent As(III)	90.8	96.7	80.7	97.4
Percent As(V)	9.2	3.3	19.3	2.6
SITE #138, WELL D				
Initial As concentration	4.05	2.85	5.41	5.41
Total As recovered	4.80	2.93	4.93	6.07
Percent As recovered	118.5	102.8	91.1	112.2
Percent As(III)	90.6	92.5	92.3	94.1
Percent As(V)	9.4	7.5	7.7	5.9

Concentration of arsenic in field blank separates #1 through #7:

	SEPARATE #						
DATE	1	2	3	4	5	6	7
10/19/86	0.29	0.19	0.17	0.12			
10/20/86	0.25	0.22	0.16	0.14			
1/31/87	0.18	0.13	0.09	0.08	0.03		
2/01/87	0.40	0.16	0.09	0.08			
4/22/87	0.23	0.16	0.14	0.08	0.11	0.09	0.08
4/23/87	0.19	0.12	0.11	0.12	0.10		
4/25/87	0.10	0.10	0.07	0.09	0.14		
5/15/87	0.16	0.09	0.11	0.10	0.10		
5/16/87	0.14	0.12	0.11	0.09	0.07		
6/14/87	0.31	0.15	0.11	0.10	0.12		
6/16/87	0.15	0.12	0.11	0.12	0.08		
7/12/87	0.26	0.15	0.11	0.09	0.11		
7/16/87	0.27	0.13	0.11	0.12	0.10		
8/13/87	0.23	0.18	0.14	0.13	0.09		
8/15/87	0.34	0.22	0.14	0.13	0.14		
AVERAGE	0.23	0.15	0.12	0.11	0.10	0.09	0.08
STD.DEV.	0.08	0.04	0.03	0.02	0.03		
	(n=15)	(n=15)	(n=15)	(n=15)	(n=12)	(n=1)	(n=1)

Iron speciation results:

SAMPLE DATE	WELL	#	FE2+
09-Aug-86	121	D	2
09-Aug-86	121	E	24
09-Aug-86	121	F	21
09-Aug-86	123	D	23
09-Aug-86	123	E	66
09-Aug-86	123	F	73
09-Aug-86	137	B	<1
09-Aug-86	137	C	<1
09-Aug-86	137	D	35
09-Aug-86	BLANK		<1
15-Aug-86	121	D	<1
15-Aug-86	121	E	21
15-Aug-86	121	F	21
15-Aug-86	122	A	62
15-Aug-86	122	B	9
15-Aug-86	122	D	3
15-Aug-86	124	B	10
15-Aug-86	124	C	29
15-Aug-86	124	E	18
15-Aug-86	137	A	3
15-Aug-86	137	B	<1
15-Aug-86	137	D	35
15-Aug-86	138	A	2
15-Aug-86	138	B	<1
15-Aug-86	138	D	30
15-Aug-86	BLANK		<1
14-Jul-87	121	B	18
14-Jul-87	121	D	17
14-Jul-87	121	E	39
14-Jul-87	121	F	37
14-Jul-87	122	A	59
14-Jul-87	122	B	45
14-Jul-87	122	D	60
14-Jul-87	122	E	48
14-Jul-87	123	A	60
14-Jul-87	123	B	75
14-Jul-87	123	C	3
14-Jul-87	123	D	66
14-Jul-87	123	E	90
14-Jul-87	123	F	90
14-Jul-87	124	A	70
14-Jul-87	124	B	62
14-Jul-87	124	C	64
14-Jul-87	124	D	58
14-Jul-87	124	E	53
14-Jul-87	137	A	27
14-Jul-87	137	B	34
14-Jul-87	137	C	44
14-Jul-87	137	D	50
14-Jul-87	138	A	20
14-Jul-87	138	B	50
14-Jul-87	138	C	60
14-Jul-87	138	D	58
14-Jul-87	CLARK FORK		<1
14-Jul-87	BLANK		<1

SAMPLE DATE	WELL	#	FE2+
14-Aug-87	121	B	10
14-Aug-87	121	D	15
14-Aug-87	121	E	27
14-Aug-87	121	F	23
14-Aug-87	122	A	63
14-Aug-87	122	B	32
14-Aug-87	122	D	57
14-Aug-87	122	E	53
14-Aug-87	123	A	44
14-Aug-87	123	B	57
14-Aug-87	123	C	1
14-Aug-87	123	D	46
14-Aug-87	123	E	58
14-Aug-87	123	F	58
14-Aug-87	124	A	47
14-Aug-87	124	B	46
14-Aug-87	124	C	48
14-Aug-87	124	D	43
14-Aug-87	124	E	42
14-Aug-87	137	A	22
14-Aug-87	137	B	35
14-Aug-87	137	C	45
14-Aug-87	137	D	49
14-Aug-87	138	A	14
14-Aug-87	138	B	50
14-Aug-87	138	C	62
14-Aug-87	138	D	59
14-Aug-87	CLARK FORK		<1
14-Aug-87	BLANK		<1

TABLE C: This table contains results of linear regression calculations of mmoles calcium, magnesium, and manganese with sulfate, and for arsenic with iron.

Correlations of calcium, magnesium, and manganese with sulfate for all piezometers with detectable sulfate:

mmoles Ca vs. mmoles SO4

Regression Output:		
Constant		3.6426
Std Err of Y Est		0.8174
R Squared		0.3516
No. of Observations		165
Degrees of Freedom		163
X Coefficient(s)	0.6712	
Std Err of Coef.	0.0219	

mmoles Mg vs. mmoles SO4

Regression Output:		
Constant		1.3945
Std Err of Y Est		0.3332
R Squared		0.6305
No. of Observations		165
Degrees of Freedom		163
X Coefficient(s)	0.1492	
Std Err of Coef.	0.0089	

mmoles Mn vs. mmoles SO4

Regression Output:		
Constant		0.0944
Std Err of Y Est		0.0770
R Squared		0.7288
No. of Observations		165
Degrees of Freedom		163
X Coefficient(s)	0.0433	
Std Err of Coef.	0.0021	

Correlations of calcium, magnesium, and manganese with sulfate for shallow piezometers (3255' and 3253' datums) with detectable sulfate:

mmoles Ca vs. mmoles SO4

Regression Output:		
Constant		3.0678
Std Err of Y Est		1.0291
R Squared		0.9351
No. of Observations		30
Degrees of Freedom		28
X Coefficient(s)	0.6054	
Std Err of Coef.	0.0301	

mmoles Mg vs. mmoles SO4

Regression Output:		
Constant		1.1464
Std Err of Y Est		0.3976
R Squared		0.8497
No. of Observations		30
Degrees of Freedom		28
X Coefficient(s)	0.1465	
Std Err of Coef.	0.0116	

mmoles Mn vs. mmoles SO4

Regression Output:		
Constant		0.0700
Std Err of Y Est		0.1227
R Squared		0.8035
No. of Observations		30
Degrees of Freedom		28
X Coefficient(s)	0.0384	
Std Err of Coef.	0.0036	

Regression correlations- mmoles As with mmoles Fe

mmoles As vs. mmoles Fe
All groundwater samples:
Regression Output:

Constant	0.0049
Std Err of Y Est	0.0336
R Squared	0.1532
No. of Observations	280
Degrees of Freedom	278
X Coefficient(s) 0.0402	
Std Err of Coef. 0.0057	

mmoles As vs. mmoles Fe
All samples with SO4 > 0
Regression Output:

Constant	-0.0062
Std Err of Y Est	0.0247
R Squared	0.1412
No. of Observations	65
Degrees of Freedom	63
X Coefficient(s) 0.0302	
Std Err of Coef. 0.0094	

mmoles As vs. mmoles Fe
All samples with SO4 > 10
Regression Output:

Constant	-0.0009
Std Err of Y Est	0.0030
R Squared	0.3330
No. of Observations	43
Degrees of Freedom	41
X Coefficient(s) 0.0068	
Std Err of Coef. 0.0015	

mmoles As vs. mmoles Fe
All samples, Site 121
Regression Output:

Constant	-0.0006
Std Err of Y Est	0.0009
R Squared	0.5867
No. of Observations	44
Degrees of Freedom	42
X Coefficient(s) 0.0070	
Std Err of Coef. 0.0009	

mmoles As vs. mmoles Fe
All samples, Site 122
Regression Output:

Constant	-0.0217
Std Err of Y Est	0.0282
R Squared	0.3786
No. of Observations	41
Degrees of Freedom	39
X Coefficient(s) 0.0712	
Std Err of Coef. 0.0146	

mmoles As vs. mmoles Fe
All samples, Site 123
Regression Output:

Constant	0.0816
Std Err of Y Est	0.0410
R Squared	0.0969
No. of Observations	61
Degrees of Freedom	59
X Coefficient(s)-0.0338	
Std Err of Coef. 0.0134	

mmoles As vs. mmoles Fe
All samples, Site 124
Regression Output:

Constant	0.0039
Std Err of Y Est	0.0229
R Squared	0.0180
No. of Observations	47
Degrees of Freedom	45
X Coefficient(s) 0.0176	
Std Err of Coef. 0.0193	

mmoles As vs. mmoles Fe
All samples, Site 137
Regression Output:

Constant	-0.0111
Std Err of Y Est	0.0248
R Squared	0.6412
No. of Observations	46
Degrees of Freedom	44
X Coefficient(s) 0.1048	
Std Err of Coef. 0.0118	

mmoles As vs. mmoles Fe
All samples, Site 138
Regression Output:

Constant	-0.0041
Std Err of Y Est	0.0107
R Squared	0.8475
No. of Observations	41
Degrees of Freedom	39
X Coefficient(s) 0.0589	
Std Err of Coef. 0.0040	

Regression correlations- mmoles As with mmoles Fe

mmoles As vs. mmoles Fe
All samples, 3255' & 3253' datums

Regression Output:	
Constant	-0.0058
Std Err of Y Est	0.0230
R Squared	0.2607
No. of Observations	40
Degrees of Freedom	38
X Coefficient(s) 0.0431	
Std Err of Coef. 0.0118	

mmoles As vs. mmoles Fe
All samples, 3255' datum

Regression Output:	
Constant	-0.0008
Std Err of Y Est	0.0010
R Squared	0.9683
No. of Observations	10
Degrees of Freedom	8
X Coefficient(s) 0.0119	
Std Err of Coef. 0.0008	

mmoles As vs. mmoles Fe
All samples, 3253' datum

Regression Output:	
Constant	-0.0132
Std Err of Y Est	0.0238
R Squared	0.3934
No. of Observations	30
Degrees of Freedom	28
X Coefficient(s) 0.0687	
Std Err of Coef. 0.0161	

mmoles As vs. mmoles Fe
All samples, 3250' datum

Regression Output:	
Constant	-0.0007
Std Err of Y Est	0.0094
R Squared	0.4850
No. of Observations	90
Degrees of Freedom	88
X Coefficient(s) 0.0204	
Std Err of Coef. 0.0022	

mmoles As vs. mmoles Fe
All samples, 3247' datum

Regression Output:	
Constant	-0.0149
Std Err of Y Est	0.0188
R Squared	0.4705
No. of Observations	64
Degrees of Freedom	62
X Coefficient(s) 0.0587	
Std Err of Coef. 0.0079	

mmoles As vs. mmoles Fe
All samples, 3244' datum

Regression Output:	
Constant	0.0036
Std Err of Y Est	0.0372
R Squared	0.2501
No. of Observations	86
Degrees of Freedom	84
X Coefficient(s) 0.0872	
Std Err of Coef. 0.0165	

mmoles As vs. mmoles Fe
Site 121, datum 3253

Regression Output:	
Constant	-0.0003
Std Err of Y Est	0.0002
R Squared	0.6112
No. of Observations	5
Degrees of Freedom	3
X Coefficient(s) 0.0033	
Std Err of Coef. 0.0015	

mmoles As vs. mmoles Fe
Site 121, datum 3250

Regression Output:	
Constant	0.0009
Std Err of Y Est	0.0003
R Squared	0.1888
No. of Observations	7
Degrees of Freedom	5
X Coefficient(s)-0.0011	
Std Err of Coef. 0.0010	

mmoles As vs. mmoles Fe
Site 121, datum 3247

Regression Output:	
Constant	-0.0081
Std Err of Y Est	0.0009
R Squared	0.5831
No. of Observations	19
Degrees of Freedom	17
X Coefficient(s) 0.0221	
Std Err of Coef. 0.0045	

mmoles As vs. mmoles Fe
Site 121, datum 3244

Regression Output:	
Constant	-0.0006
Std Err of Y Est	0.0003
R Squared	0.5749
No. of Observations	13
Degrees of Freedom	11
X Coefficient(s) 0.0074	
Std Err of Coef. 0.0019	

Regression correlations- mmoles As with mmoles Fe

mmoles As vs. mmoles Fe
Site 122, datum 3253

Regression Output:	
Constant	-0.0001
Std Err of Y Est	0.0002
R Squared	0.2559
No. of Observations	6
Degrees of Freedom	4
X Coefficient(s) 0.0004	
Std Err of Coef. 0.0004	

mmoles As vs. mmoles Fe
Site 122, datum 3250

Regression Output:	
Constant	0.0016
Std Err of Y Est	0.0015
R Squared	0.0139
No. of Observations	12
Degrees of Freedom	10
X Coefficient(s) 0.0004	
Std Err of Coef. 0.0011	

mmoles As vs. mmoles Fe
Site 122, datum 3247

Regression Output:	
Constant	0.0282
Std Err of Y Est	0.0090
R Squared	0.0066
No. of Observations	11
Degrees of Freedom	9
X Coefficient(s) 0.0142	
Std Err of Coef. 0.0577	

mmoles As vs. mmoles Fe
Site 122, datum 3244

Regression Output:	
Constant	0.1272
Std Err of Y Est	0.0070
R Squared	0.0459
No. of Observations	12
Degrees of Freedom	10
X Coefficient(s)-0.0423	
Std Err of Coef. 0.0609	

mmoles As vs. mmoles Fe
Site 123, datum 3250

Regression Output:	
Constant	0.0549
Std Err of Y Est	0.0078
R Squared	0.1085
No. of Observations	33
Degrees of Freedom	31
X Coefficient(s)-0.0246	
Std Err of Coef. 0.0126	

mmoles As vs. mmoles Fe
Site 123, datum 3244

Regression Output:	
Constant	0.0455
Std Err of Y Est	0.0199
R Squared	0.4582
No. of Observations	23
Degrees of Freedom	21
X Coefficient(s) 0.0952	
Std Err of Coef. 0.0226	

mmoles As vs. mmoles Fe
Site 124, datum 3255

Regression Output:	
Constant	0.0047
Std Err of Y Est	0.0011
R Squared	0.2816
No. of Observations	5
Degrees of Freedom	3
X Coefficient(s) 0.0057	
Std Err of Coef. 0.0052	

mmoles As vs. mmoles Fe
Site 124, datum 3253

Regression Output:	
Constant	0.0034
Std Err of Y Est	0.0140
R Squared	0.7839
No. of Observations	7
Degrees of Freedom	5
X Coefficient(s) 0.0910	
Std Err of Coef. 0.0214	

mmoles As vs. mmoles Fe
Site 124, datum 3250

Regression Output:	
Constant	0.0338
Std Err of Y Est	0.0021
R Squared	0.7214
No. of Observations	12
Degrees of Freedom	10
X Coefficient(s)-0.0315	
Std Err of Coef. 0.0062	

mmoles As vs. mmoles Fe
Site 124, datum 3247

Regression Output:	
Constant	-0.0003
Std Err of Y Est	0.0007
R Squared	0.2057
No. of Observations	11
Degrees of Freedom	9
X Coefficient(s) 0.0043	
Std Err of Coef. 0.0028	

mmoles As vs. mmoles Fe
Site 124, datum 3244

Regression Output:	
Constant	-0.0034
Std Err of Y Est	0.0016
R Squared	0.8618
No. of Observations	12
Degrees of Freedom	10
X Coefficient(s) 0.0249	
Std Err of Coef. 0.0032	

Regression correlations- mmoles As with mmoles Fe

mmoles As vs. mmoles Fe
Site 137, datum 3253

Regression Output:	
Constant	0.0005
Std Err of Y Est	0.0004
R Squared	0.0769
No. of Observations	6
Degrees of Freedom	4
X Coefficient(s) 0.0005	
Std Err of Coef. 0.0009	

mmoles As vs. mmoles Fe
Site 137, datum 3250

Regression Output:	
Constant	-0.0025
Std Err of Y Est	0.0054
R Squared	0.6980
No. of Observations	14
Degrees of Freedom	12
X Coefficient(s) 0.0286	
Std Err of Coef. 0.0054	

mmoles As vs. mmoles Fe
Site 137, datum 3247

Regression Output:	
Constant	0.0058
Std Err of Y Est	0.0046
R Squared	0.9758
No. of Observations	12
Degrees of Freedom	10
X Coefficient(s) 0.0793	
Std Err of Coef. 0.0040	

mmoles As vs. mmoles Fe
Site 137, datum 3244

Regression Output:	
Constant	0.0564
Std Err of Y Est	0.0087
R Squared	0.2773
No. of Observations	14
Degrees of Freedom	12
X Coefficient(s) 0.0481	
Std Err of Coef. 0.0224	

mmoles As vs. mmoles Fe
Site 138, datum 3253

Regression Output:	
Constant	0.0018
Std Err of Y Est	0.0009
R Squared	0.2506
No. of Observations	6
Degrees of Freedom	4
X Coefficient(s)-0.0032	
Std Err of Coef. 0.0027	

mmoles As vs. mmoles Fe
Site 138, datum 3250

Regression Output:	
Constant	0.0009
Std Err of Y Est	0.0014
R Squared	0.9932
No. of Observations	12
Degrees of Freedom	10
X Coefficient(s) 0.0373	
Std Err of Coef. 0.0010	

mmoles As vs. mmoles Fe
Site 138, datum 3247

Regression Output:	
Constant	0.0227
Std Err of Y Est	0.0039
R Squared	0.1996
No. of Observations	11
Degrees of Freedom	9
X Coefficient(s) 0.0325	
Std Err of Coef. 0.0217	

mmoles As vs. mmoles Fe
Site 138, datum 3244

Regression Output:	
Constant	0.0016
Std Err of Y Est	0.0053
R Squared	0.9265
No. of Observations	12
Degrees of Freedom	10
X Coefficient(s) 0.0659	
Std Err of Coef. 0.0059	

APPENDIX # 2

This appendix contains all hydrogeologic data collected for this study.

List of contents:

TABLE A: This table contains piezometer and lysimeter construction data, and the head measurements taken over the course of this study.

Piezometers installed for this study were constructed of two-inch PVC casings. Geochemical sampling piezometers were fitted with 0.01-inch slot screens that were 3 feet long (of which 2.7 feet was slotted). Piezometers were installed by hand, using a two-inch auger, by drilling an open hole to within six inches of the top of the intended screen interval. The casing was then driven to the intended depth with a post-pounder. Holes were backfilled by tamping with a steel pipe. A six-inch bentonite seal was installed around the top of each casing.

Field readings and heads calculated from those readings are given in feet. All field readings were taken with an electric tape. Measurements were taken to within 0.01 feet, and have been rounded to the nearest 0.1 foot.

Piezometer elevations were determined by a field survey conducted in September, 1986. Sites #116, 119B, and 122A were used as datum reference points, and survey closure error was 0.2 feet. At that time, it became apparent that the elevations of several of the previously-installed shallow piezometers were markedly different from those recorded by earlier surveys (Woessner et al, 1984). This probably reflects frost-heaving. Because of this, the results of the new (9/86) survey were used for all calculations with the exception of elevations for Site 101, which was not resurveyed.

NI = Not yet installed
NS = Not sampled
NA = Not applicable

Well and piezometer installation data

WELL NUMBER	ELEVATION AT TOP OF CASING (FEET)	HEIGHT OF CASING ABOVE GROUND (FEET)	ELEVATION AT TOP OF SCREEN (FEET)	LENGTH OF SCREEN (FEET)
101A	3273.34	0.00	3217.94	5.00
101B	3274.14	0.00	3244.14	5.00
114	3261.24	3.46	3251.70	2.70
115	3260.27	2.98	3250.59	2.70
116	3261.40	2.98	3251.02	2.70
118A	3259.43	1.42	3247.83	1.30
118B	3259.30	1.19	3251.62	1.30
118C	3259.31	1.26	3256.17	1.30
119A	3258.98	2.30	3243.98	1.30
119B	3257.80	1.05	3249.70	1.30
119C	3257.61	0.83	3255.51	1.30
120A	3262.26	3.29	3255.83	2.60
120B	3260.52	1.58	3248.94	0.00
121A	3261.41	2.29	3247.02	1.30
121B	3260.74	1.58	3253.56	1.30
121D	3260.68	1.56	3251.91	2.69
121E	3260.71	1.62	3249.00	2.67
121F	3260.72	1.62	3245.97	2.69
122A	3260.68	2.34	3245.34	1.30
122B	3260.06	1.72	3252.86	1.30
122D	3260.00	1.60	3251.18	2.68
122E	3259.92	1.58	3248.10	2.68
123A	3260.09	0.83	3244.84	1.30
123B	3261.87	2.55	3250.77	1.30
123C	3261.21	1.93	3255.46	1.30
123D	3260.85	1.54	3246.01	2.68
123E	3262.60	3.12	3252.20	2.68
123F	3260.84	1.50	3252.06	2.68
124A	3261.95	3.17	3256.15	2.60
124B	3259.89	1.04	3254.23	2.68
124C	3260.31	1.58	3251.50	2.68
124D	3260.32	1.58	3248.52	2.69
124E	3260.43	1.58	3245.66	2.69
125A	3261.71	2.98	3254.91	2.60
125B	3260.87	2.04	3253.04	4.71
126A	3260.76	2.65	3255.38	2.60
126B	3260.30	2.03	3252.25	4.51
127	3261.14	2.54	3255.54	2.60
128A	3260.33	1.93	3256.33	2.60
128B	3259.87	1.43	3254.75	9.30
136	3261.20	2.04	3254.86	2.60
137A	3260.75	1.58	3254.98	2.69
137B	3261.31	2.13	3252.00	2.70
137C	3262.27	3.08	3248.94	2.69
137D	3261.69	2.56	3245.84	2.70
138A	3260.15	1.58	3254.36	2.69
138B	3261.48	2.96	3251.27	2.67
138C	3260.16	1.58	3248.37	2.70
138D	3262.09	3.51	3245.30	2.69
139	3259.30	1.36	3247.24	0.00
140	3259.94	2.07	3257.04	9.37

Well and piezometer installation data

WELL NUMBER	CASING LENGTH (FEET)	LENGTH TO BOTTOM PERF (FEET)	ELEVATION OF BOTTOM PERF (FEET)	DATUM SAMPLED (FEET)
101A	60.40	60.40	3212.94	
101B	35.00	35.00	3239.14	
114	12.34	12.24	3249.00	
115	12.48	12.38	3247.89	
116	13.18	13.08	3248.32	
118A	13.00	12.90	3246.53	
118B	9.08	8.98	3250.32	
118C	4.54	4.44	3254.87	
119A	16.40	16.30	3242.68	
119B	9.50	9.40	3248.40	
119C	3.50	3.40	3254.21	
120A	9.13	9.03	3253.23	
120B	11.58	11.58	3248.94	
121A	15.79	15.69	3245.72	3247
121B	8.58	8.48	3252.26	3253
121D	11.56	11.46	3249.22	3250
121E	14.48	14.38	3246.33	3247
121F	17.54	17.44	3243.28	3244
122A	16.74	16.64	3244.04	3244
122B	8.60	8.50	3251.56	3253
122D	11.60	11.50	3248.50	3250
122E	14.60	14.50	3245.42	3247
123A	16.65	16.55	3243.54	3244
123B	12.50	12.40	3249.47	3250
123C	7.15	7.05	3254.16	3255
123D	17.62	17.52	3243.33	3244
123E	13.18	13.08	3249.52	3250
123F	11.56	11.46	3249.38	3250
124A	8.50	8.40	3253.55	3255
124B	8.44	8.34	3251.55	3253
124C	11.58	11.49	3248.82	3250
124D	14.58	14.49	3245.83	3247
124E	17.58	17.46	3242.97	3244
125A	9.50	9.40	3252.31	
125B	12.54	12.54	3248.33	
126A	8.08	7.98	3252.78	
126B	12.56	12.56	3247.74	
127	8.30	8.20	3252.94	
128A	6.70	6.60	3253.73	
128B	14.42	14.42	3245.45	
136	9.04	8.94	3252.26	
137A	8.56	8.46	3252.29	3253
137B	12.13	12.01	3249.30	3250
137C	16.13	16.02	3246.25	3247
137D	18.65	18.55	3243.14	3244
138A	8.58	8.48	3251.67	3253
138B	12.99	12.88	3248.60	3250
138C	14.58	14.49	3245.67	3247
138D	19.58	19.48	3242.61	3244
139	12.06	12.06	3247.24	
140	12.27	12.27	3247.67	

LYSIMETER INSTALLATIONS

Six lysimeters were installed at the Milltown Reservoir in September, 1986. One lysimeter was installed at each geochemical study site, at the depth of the June, 1986 water table (approximately four feet below ground level at each site).

Lysimeters were constructed of one-foot lengths of two-inch PVC pipe with a one-bar ceramic cup affixed to one end with silicon cement using standard construction procedures recommended by the manufacturer (Soilmoisture Equipment Corp.) for the Model 1920 pressure-vacuum soil water sampler. The installation procedure was:

An open hole was drilled to the desired depth with a two-inch hand auger. A small amount of 200-mesh silica sand was poured into the bottom of the hole, using a PVC tube to ensure accurate placement. The lysimeter cup was lowered into the hole and seated into this sand. The annulus around the lysimeter was filled with 200-mesh silica sand. A six-foot length of one-half-inch PVC tubing was installed in the boring to support the lysimeter tubing, and as a marker. More sand was added, to approximately six inches above the top of the lysimeter. A six-inch layer of bentonite pellets was placed over the sand, and the remaining borehole was backfilled with cuttings. The intake and discharge tubes were labled above and below ground level.

These lysimeters were not sampled during this study, as the water table quickly fell below their effective range. When the water table rose in the spring of 1987, the lysimeters were almost immediately within the phreatic zone.

SITE #	ELEVATION OF GROUND LEVEL (FEET)	INSTALLATION DEPTH (FEET)	APPROXIMATE ELEVATION OF POROUS CUP (FEET)
121	3259.1	4.0	3255.1
122	3258.4	4.0	3254.4
123	3259.4	4.2	3255.2
124	3258.8	3.8	3255.0
137	3259.2	4.0	3255.2
138	3258.0	3.8	3254.2

Head measurements

WELL NUMBER	FIELD READING 07/30/86	HEAD (FEET) 07/30/86	FIELD READING 08/15/86	HEAD (FEET) 08/15/86	FIELD READING 08/27/86	HEAD (FEET) 08/27/86
101A	29.1	3244.2	30.5	3242.8	31.1	3242.2
101B	32.3	3241.8	33.4	3240.8	33.9	3240.3
114	9.7	3251.5	10.3	3250.9	10.7	3250.6
115	6.6	3253.6	7.0	3253.2	7.3	3253.0
116	7.7	3253.7	8.1	3253.3	8.5	3252.9
118A	9.3	3250.1	10.1	3249.3	10.2	3249.2
118B	7.7	3251.6	DRY	NA	8.3	3251.0
118C	DRY	NA	DRY	NA	DRY	NA
119A	8.3	3250.6	8.9	3250.1	9.0	3250.0
119B	5.6	3252.2	5.9	3251.9	6.2	3251.6
119C	3.4	3254.3	DRY	NA	DRY	NA
120A	8.6	3253.6	DRY	NA	DRY	NA
120B	NI	NA	7.8	3252.7	7.9	3252.6
121A	12.5	3248.9	13.1	3248.3	13.2	3248.2
121B	8.0	3252.7	DRY	NA	DRY	NA
121D	8.9	3251.8	9.8	3250.9	10.2	3250.5
121E	10.2	3250.5	12.1	3248.6	12.5	3248.2
121F	11.8	3249.0	12.6	3248.1	12.5	3248.2
122A	11.2	3249.5	11.5	3249.1	12.1	3248.6
122B	7.2	3252.9	7.6	3252.4	8.0	3252.1
122D	7.4	3252.6	7.9	3252.2	8.2	3251.8
122E	9.3	3250.6	9.9	3250.0	10.5	3249.5
123A	12.1	3248.0	12.7	3247.4	13.1	3247.0
123B	8.6	3253.2	9.3	3252.6	9.6	3252.2
123C	DRY	NA	DRY	NA	DRY	NA
123D	12.5	3248.3	13.3	3247.5	13.7	3247.2
123E	8.7	3253.9	10.4	3252.2	9.7	3252.9
123F	7.1	3253.8	10.7	3250.1	8.0	3252.9
124A	8.3	3253.7	DRY	NA	DRY	NA
124B	6.5	3253.4	7.2	3252.7	7.6	3252.3
124C	7.3	3253.0	7.8	3252.6	8.2	3252.2
124D	7.1	3253.2	7.9	3252.4	8.3	3252.0
124E	7.4	3253.0	8.0	3252.4	8.4	3252.0
125A	DRY	NA	DRY	NA	DRY	NA
125B	NI	NA	8.9	3252.0	DRY	NA
126A	DRY	NA	DRY	NA	DRY	NA
126B	NI	NA	DRY	NA	DRY	NA
127	DRY	NA	DRY	NA	NS	NA
128A	DRY	NA	DRY	NA	DRY	NA
128B	NI	NA	7.1	3252.8	7.3	3252.6
136	7.8	3253.4	8.3	3252.9	8.6	3252.6
137A	7.2	3253.5	7.7	3253.1	8.0	3252.7
137B	8.1	3253.2	8.7	3252.6	9.0	3252.3
137C	12.2	3250.1	12.2	3250.1	12.6	3249.7
137D	13.4	3248.3	14.0	3247.7	14.2	3247.5
138A	6.8	3253.3	7.2	3253.0	7.5	3252.6
138B	8.9	3252.6	9.3	3252.2	9.6	3251.9
138C	10.3	3249.8	11.2	3249.0	11.5	3248.6
138D	13.3	3248.8	13.7	3248.4	14.0	3248.1
139	NI	NA	8.3	3251.0	DRY	NA
140	NI	NA	8.9	3251.0	9.8	3250.2
RESERVOIR:		3251.1		3250.3		3250.0

WELL NUMBER	FIELD READING 09/16/86	HEAD (FEET) 09/16/86	FIELD READING 10/20/86	HEAD (FEET) 10/20/86	FIELD READING 11/14/86	HEAD (FEET) 11/14/86
101A	31.6	3241.8	35.1	3238.3	37.6	3235.8
101B	34.0	3240.1	34.4	3239.8	32.4	3241.7
114	10.6	3250.6	10.8	3250.5	9.8	3251.5
115	7.7	3252.6	7.9	3252.3	8.1	3252.2
116	8.8	3252.6	9.1	3252.3	9.3	3252.1
118A	9.8	3249.7	10.0	3249.4	7.1	3252.3
118B	8.3	3251.0	8.6	3250.7	8.4	3250.9
118C	DRY	NA	DRY	NA	DRY	NA
119A	8.5	3250.5	8.5	3250.5	8.0	3251.0
119B	6.6	3251.2	7.0	3250.9	7.1	3250.8
119C	DRY	NA	DRY	NA	DRY	NA
120A	DRY	NA	DRY	NA	DRY	NA
120B	DRY	NA	DRY	NA	DRY	NA
121A	13.2	3248.2	13.5	3247.9	11.7	3249.7
121B	DRY	NA	DRY	NA	DRY	NA
121D	11.3	3249.4	DRY	NA	11.2	3249.5
121E	12.4	3248.3	12.7	3248.0	11.2	3249.6
121F	12.4	3248.3	12.6	3248.1	14.4	3246.3
122A	12.2	3248.5	15.5	3245.1	15.3	3245.4
122B	8.3	3251.7	DRY	NA	8.4	3251.7
122D	8.7	3251.3	9.0	3251.0	9.8	3250.2
122E	10.6	3249.3	13.9	3246.0	11.0	3248.9
123A	13.2	3246.9	13.6	3246.5	12.9	3247.2
123B	9.9	3252.0	10.2	3251.7	10.4	3251.5
123C	DRY	NA	DRY	NA	DRY	NA
123D	13.7	3247.1	14.0	3246.8	14.1	3246.8
123E	10.0	3252.6	10.3	3252.3	10.5	3252.1
123F	8.3	3252.5	8.7	3252.2	8.8	3252.0
124A	DRY	NA	DRY	NA	DRY	NA
124B	8.0	3251.9	8.2	3251.7	DRY	NA
124C	8.5	3251.8	8.7	3251.6	8.8	3251.5
124D	8.7	3251.7	8.9	3251.4	9.0	3251.4
124E	8.7	3251.7	9.0	3251.4	9.1	3251.3
125A	DRY	NA	DRY	NA	DRY	NA
125B	DRY	NA	DRY	NA	DRY	NA
126A	DRY	NA	DRY	NA	DRY	NA
126B	DRY	NA	DRY	NA	DRY	NA
127	DRY	NA	NS	NA	NS	NA
128A	DRY	NA	DRY	NA	DRY	NA
128B	7.7	3252.2	7.9	3252.0	7.9	3252.0
136	DRY	NA	DRY	NA	DRY	NA
137A	DRY	NA	8.3	3252.4	DRY	NA
137B	9.4	3251.9	9.9	3251.4	10.7	3250.6
137C	12.7	3249.6	13.1	3249.2	13.1	3249.2
137D	14.2	3247.5	14.5	3247.2	16.4	3245.3
138A	7.8	3252.3	8.2	3252.0	DRY	NA
138B	9.8	3251.6	10.1	3251.4	11.0	3250.5
138C	11.6	3248.5	11.9	3248.2	10.7	3249.5
138D	13.5	3248.6	14.1	3248.0	13.5	3248.6
139	8.6	3250.7	DRY	NA	8.3	3251.0
140	9.5	3250.4	9.8	3250.2	DRY	NA
RESERVOIR:		3249.5		3249.6		3249.3

Head measurements

WELL NUMBER	FIELD READING 12/18/86	HEAD (FEET) 12/18/86	FIELD READING 01/30/87	HEAD (FEET) 01/30/87	FIELD READING 02/27/87	HEAD (FEET) 02/27/87
101A	32.2	3241.1	31.6	3241.7	32.2	3241.1
101B	34.5	3239.7	33.1	3241.0	34.9	3239.2
114	9.6	3251.6	9.3	3251.9	11.4	3249.9
115	8.2	3252.0	8.2	3252.1	8.4	3251.9
116	9.3	3252.1	9.2	3252.2	9.6	3251.9
118A	7.7	3251.7	8.0	3251.4	9.9	3249.5
118B	7.7	3251.6	7.4	3251.9	8.6	3250.7
118C	DRY	NA	DRY	NA	DRY	NA
119A	6.6	3252.4	7.0	3252.0	8.7	3250.3
119B	6.5	3251.3	6.1	3251.7	6.4	3251.4
119C	DRY	NA	DRY	NA	3.3	3254.3
120A	DRY	NA	DRY	NA	DRY	NA
120B	DRY	NA	DRY	NA	DRY	NA
121A	12.1	3249.3	11.7	3249.7	13.9	3247.5
121B	DRY	NA	DRY	NA	DRY	NA
121D	11.2	3249.5	10.8	3249.9	10.9	3249.8
121E	11.4	3249.4	11.0	3249.7	13.2	3247.5
121F	11.4	3249.3	11.1	3249.7	12.5	3248.2
122A	11.9	3248.8	11.2	3249.5	12.7	3248.0
122B	7.6	3252.5	7.9	3252.1	DRY	NA
122D	8.0	3252.0	8.3	3251.7	8.9	3251.1
122E	10.1	3249.8	9.6	3250.3	11.1	3248.8
123A	13.1	3247.0	12.7	3247.4	14.1	3246.0
123B	9.8	3252.1	10.2	3251.7	10.6	3251.2
123C	DRY	NA	DRY	NA	DRY	NA
123D	13.8	3247.1	13.4	3247.5	14.3	3246.5
123E	10.2	3252.4	10.4	3252.2	10.7	3251.9
123F	8.5	3252.4	8.7	3252.2	8.9	3251.9
124A	DRY	NA	DRY	NA	DRY	NA
124B	7.6	3252.3	8.0	3251.9	8.2	3251.7
124C	8.3	3252.0	8.5	3251.8	8.8	3251.6
124D	8.5	3251.9	8.6	3251.8	8.9	3251.4
124E	8.6	3251.8	8.7	3251.7	9.1	3251.4
125A	DRY	NA	DRY	NA	DRY	NA
125B	DRY	NA	DRY	NA	DRY	NA
126A	DRY	NA	DRY	NA	DRY	NA
126B	DRY	NA	DRY	NA	DRY	NA
127	NS	NA	NS	NA	NS	NA
128A	DRY	NA	DRY	NA	DRY	NA
128B	6.8	3253.0	7.0	3252.9	7.5	3252.4
136	DRY	NA	DRY	NA	DRY	NA
137A	DRY	NA	DRY	NA	DRY	NA
137B	9.1	3252.3	9.7	3251.6	10.6	3250.7
137C	13.1	3249.2	12.5	3249.8	13.9	3248.4
137D	13.3	3248.4	12.6	3249.1	14.2	3247.5
138A	DRY	NA	DRY	NA	DRY	NA
138B	10.5	3251.0	10.3	3251.2	11.2	3250.3
138C	10.8	3249.4	10.2	3249.9	12.3	3247.9
138D	13.4	3248.7	12.6	3249.5	14.5	3247.6
139	8.0	3251.3	7.2	3252.1	DRY	NA
140	9.0	3250.9	9.2	3250.7	DRY	NA
RESERVOIR:		3249.6		3249.8		3249.7

Head measurements

WELL NUMBER	FIELD READING 03/26/87	HEAD (FEET) 03/26/87	FIELD READING 04/21/87	HEAD (FEET) 04/21/87	FIELD READING 05/14/87	HEAD (FEET) 05/14/87
101A	33.0	3240.4	28.3	3245.0	24.2	3249.1
101B	35.0	3239.2	28.1	3246.0	25.4	3248.7
114	11.6	3249.6	5.7	3255.6	3.7	3257.6
115	8.3	3252.0	5.3	3255.0	2.4	3257.9
116	9.3	3252.1	4.8	3256.6	3.2	3258.3
118A	10.4	3249.0	2.9	3256.6	1.9	3257.5
118B	8.9	3250.4	3.0	3256.3	1.3	3258.0
118C	DRY	NA	2.6	3256.8	0.7	3258.7
119A	9.4	3249.6	2.9	3256.1	1.8	3257.2
119B	6.3	3251.5	4.4	3253.4	2.2	3255.6
119C	3.3	3254.3	DRY	NA	1.5	3256.1
120A	DRY	NA	7.0	3255.3	4.3	3258.0
120B	DRY	NA	7.7	3252.8	5.1	3255.4
121A	14.0	3247.4	6.1	3255.3	4.8	3256.6
121B	DRY	NA	3.4	3257.4	2.5	3258.2
121D	DRY	NA	6.2	3254.5	3.0	3257.7
121E	13.3	3247.4	5.4	3255.3	4.1	3256.6
121F	13.3	3247.4	5.5	3255.3	4.2	3256.5
122A	13.0	3247.7	6.0	3254.7	4.4	3256.3
122B	7.9	3252.2	2.7	3257.4	2.0	3258.1
122D	8.1	3251.9	2.9	3257.1	2.1	3257.9
122E	10.8	3249.1	4.2	3255.7	2.8	3257.1
123A	14.3	3245.8	7.5	3252.6	5.6	3254.5
123B	10.2	3251.7	4.8	3257.1	3.9	3258.0
123C	DRY	NA	3.4	3257.9	2.7	3258.5
123D	14.8	3246.1	8.3	3252.6	6.2	3254.6
123E	10.2	3252.4	5.0	3257.6	4.1	3258.5
123F	8.5	3252.4	6.9	3254.0	2.4	3258.4
124A	DRY	NA	4.3	3257.6	3.4	3258.5
124B	7.4	3252.5	2.3	3257.6	1.4	3258.5
124C	7.9	3252.5	2.8	3257.5	1.9	3258.4
124D	8.1	3252.2	3.0	3257.3	2.0	3258.3
124E	8.3	3252.1	3.2	3257.3	2.2	3258.2
125A	DRY	NA	5.3	3256.4	NS	NA
125B	DRY	NA	8.7	3252.2	NS	NA
126A	DRY	NA	3.1	3257.7	NS	NA
126B	DRY	NA	3.7	3256.7	NS	NA
127	DRY	NA	3.4	3257.7	NS	NA
128A	DRY	NA	2.5	3257.9	NS	NA
128B	6.5	3253.3	2.0	3257.8	NS	NA
136	DRY	NA	3.7	3257.5	2.9	3258.3
137A	DRY	NA	3.3	3257.4	3.0	3257.8
137B	9.7	3251.6	4.4	3256.9	3.3	3258.0
137C	13.9	3248.4	6.2	3256.1	5.3	3257.0
137D	15.0	3246.7	7.3	3254.4	5.8	3255.9
138A	DRY	NA	2.5	3257.7	1.6	3258.5
138B	11.2	3250.2	4.4	3257.1	3.6	3257.9
138C	12.4	3247.7	4.2	3255.9	3.1	3257.1
138D	14.5	3247.6	6.4	3255.7	5.2	3256.9
139	DRY	NA	3.8	3255.5	1.8	3257.5
140	9.2	3250.7	2.1	3257.9	NS	NA
RESERVOIR:		3249.7		3258.9		3259.1

WELL NUMBER	FIELD READING 06/13/87	HEAD (FEET) 06/13/87	FIELD READING 07/11/87	HEAD (FEET) 07/11/87	FIELD READING 08/11/87	HEAD (FEET) 08/11/87
101A	23.7	3249.6	25.8	3247.5	30.2	3243.2
101B	25.5	3248.6	28.6	3245.6	27.4	3246.8
114	3.5	3257.8	4.2	3257.0	4.8	3256.4
115	2.0	3258.3	3.4	3256.9	4.1	3256.1
116	3.0	3258.4	4.0	3257.4	4.7	3256.7
118A	1.8	3257.6	2.3	3257.1	3.0	3256.4
118B	1.0	3258.3	2.1	3257.2	2.4	3256.9
118C	0.8	3258.5	2.0	3257.3	2.6	3256.7
119A	1.8	3257.2	2.4	3256.6	3.1	3255.9
119B	0.8	3257.0	1.8	3256.0	2.5	3255.3
119C	0.4	3257.2	1.6	3256.0	2.4	3255.2
120A	3.9	3258.3	6.3	3256.0	7.1	3255.2
120B	3.7	3256.9	3.6	3256.9	4.1	3256.5
121A	4.9	3256.6	5.9	3255.5	6.5	3255.0
121B	2.4	3258.3	3.5	3257.2	4.6	3256.1
121D	2.8	3257.9	3.9	3256.8	4.8	3255.9
121E	3.2	3257.5	5.2	3255.5	5.8	3255.0
121F	4.2	3256.5	5.2	3255.5	5.8	3255.0
122A	4.4	3256.3	5.9	3254.8	6.3	3254.4
122B	1.8	3258.2	4.2	3255.8	5.1	3255.0
122D	2.1	3257.9	4.0	3256.0	5.1	3254.9
122E	2.9	3257.1	4.6	3255.3	5.3	3254.6
123A	5.6	3254.5	7.5	3252.6	8.0	3252.1
123B	3.7	3258.2	4.9	3257.0	5.3	3256.5
123C	2.5	3258.7	3.9	3257.3	4.7	3256.5
123D	6.2	3254.6	7.8	3253.0	8.6	3252.3
123E	6.0	3256.6	5.0	3257.6	5.7	3256.9
123F	2.3	3258.5	3.3	3257.5	4.0	3256.9
124A	3.5	3258.4	4.0	3257.9	5.0	3257.0
124B	1.5	3258.4	2.0	3257.9	2.8	3257.1
124C	2.0	3258.3	2.5	3257.9	3.2	3257.1
124D	2.0	3258.3	2.6	3257.7	3.3	3257.0
124E	2.1	3258.3	2.8	3257.7	3.4	3257.0
125A	NS	NA	NS	NA	4.8	3256.9
125B	NS	NA	NS	NA	4.3	3256.6
126A	NS	NA	NS	NA	6.0	3254.8
126B	NS	NA	NS	NA	5.8	3254.5
127	NS	NA	3.0	3258.1	3.8	3257.3
128A	NS	NA	2.2	3258.2	4.3	3256.0
128B	NS	NA	1.8	3258.1	3.7	3256.2
136	2.6	3258.6	4.2	3257.0	4.7	3256.5
137A	2.1	3258.6	3.2	3257.6	4.2	3256.5
137B	3.3	3258.0	4.2	3257.2	5.0	3256.3
137C	5.4	3256.9	6.6	3255.7	7.3	3255.0
137D	5.8	3255.9	7.1	3254.6	7.8	3253.9
138A	1.8	3258.4	3.5	3256.6	4.3	3255.8
138B	3.5	3258.0	5.1	3256.4	5.7	3255.8
138C	3.1	3257.1	4.3	3255.9	4.8	3255.4
138D	5.0	3257.1	6.3	3255.8	6.7	3255.4
139	1.5	3257.8	2.3	3257.0	2.7	3256.6
140	NS	NA	NS	NA	2.3	3257.6
RESERVOIR:		3259.0		3258.8		3258.2

TABLE B: This table contains precipitation and reservoir stage data for the time period of this study, transcribed from the records kept by the operators of the Milltown Dam. Dam stage has been corrected to USGS datum using the standard corrections applied by the Montana Power Company, whereby a recorded dam stage of 32.2 feet equals an elevation of 3259.7 feet, which is then corrected to USGS datum by subtracting 1.45 feet (Dr. F. Pickett, personal communication).

MAY/86	PPT (INCHES)	STAGE (FEET)
01-May-86	0.00	3254.5
02-May-86	0.00	3254.5
03-May-86	0.00	3254.6
04-May-86	0.50	3254.5
05-May-86	0.03	3255.0
06-May-86	0.00	3254.8
07-May-86	0.02	3254.3
08-May-86	0.05	3253.2
09-May-86	0.03	3252.2
10-May-86	0.03	3252.1
11-May-86	0.28	3252.2
12-May-86	0.00	3252.0
13-May-86	0.04	3251.9
14-May-86	0.01	3252.0
15-May-86	0.00	3252.0
16-May-86	0.00	3252.0
17-May-86	0.00	3251.7
18-May-86	0.00	3251.6
19-May-86	0.00	3251.7
20-May-86	0.00	3252.3
21-May-86	0.14	3251.7
22-May-86	0.03	3251.8
23-May-86	0.00	3251.7
24-May-86	0.00	3252.1
25-May-86	0.00	3252.1
26-May-86	0.00	3252.0
27-May-86	0.00	3252.7
28-May-86	0.16	3254.5
29-May-86	0.00	3255.2
30-May-86	0.00	3255.7
31-May-86	0.00	3255.6

JUNE/86	PPT (INCHES)	STAGE (FEET)
01-Jun-86	0.00	3255.3
02-Jun-86	0.00	3255.0
03-Jun-86	0.00	3254.5
04-Jun-86	0.11	3254.3
05-Jun-86	0.56	3253.6
06-Jun-86	0.53	3253.7
07-Jun-86	0.02	3253.3
08-Jun-86	0.30	3252.8
09-Jun-86	0.00	3252.7
10-Jun-86	0.00	3252.5
11-Jun-86	0.00	3252.1
12-Jun-86	0.00	3251.7
13-Jun-86	0.00	3252.0
14-Jun-86	0.00	3252.2
15-Jun-86	0.25	3252.0
16-Jun-86	0.00	3251.8
17-Jun-86	0.00	3249.8
18-Jun-86	0.02	3250.3
19-Jun-86	0.00	3249.9
20-Jun-86	0.00	3250.7
21-Jun-86	0.02	3251.3
22-Jun-86	0.00	3251.3
23-Jun-86	0.00	3251.4
24-Jun-86	0.00	3251.3
25-Jun-86	0.00	3251.2
26-Jun-86	0.00	3251.5
27-Jun-86	0.00	3251.6
28-Jun-86	0.00	3251.4
29-Jun-86	1.50	3251.6
30-Jun-86	0.05	3251.6

JULY/86	PPT (INCHES)	STAGE (FEET)
01-Jul-86	0.00	3251.5
02-Jul-86	0.00	3251.3
03-Jul-86	0.02	3251.2
04-Jul-86	0.40	3251.1
05-Jul-86	0.53	3251.5
06-Jul-86	0.00	3251.6
07-Jul-86	0.00	3251.1
08-Jul-86	0.00	3251.5
09-Jul-86	0.00	3251.5
10-Jul-86	0.05	3251.4
11-Jul-86	0.12	3251.2
12-Jul-86	0.00	3251.4
13-Jul-86	0.00	3250.7
14-Jul-86	0.00	3250.7
15-Jul-86	0.00	3251.3
16-Jul-86	0.03	3251.3
17-Jul-86	0.00	3251.5
18-Jul-86	0.00	3251.1
19-Jul-86	0.00	3251.5
20-Jul-86	0.00	3251.3
21-Jul-86	0.00	3251.3
22-Jul-86	0.00	3251.2
23-Jul-86	0.00	3251.5
24-Jul-86	0.00	3251.3
25-Jul-86	0.00	3251.6
26-Jul-86	0.00	3251.7
27-Jul-86	0.00	3251.5
28-Jul-86	0.00	3250.9
29-Jul-86	0.00	3250.6
30-Jul-86	0.00	3251.1
31-Jul-86	0.00	3250.9

AUGUST/86	PPT (INCHES)	STAGE (FEET)
01-Aug-86	0.00	3251.2
02-Aug-86	0.00	3250.9
03-Aug-86	0.00	3251.4
04-Aug-86	0.00	3251.1
05-Aug-86	0.00	3251.1
06-Aug-86	0.00	3250.7
07-Aug-86	0.00	3251.4
08-Aug-86	0.00	3250.3
09-Aug-86	0.00	3249.9
10-Aug-86	0.00	3250.1
11-Aug-86	0.07	3249.7
12-Aug-86	0.27	3250.2
13-Aug-86	0.00	3250.2
14-Aug-86	0.00	3250.2
15-Aug-86	0.00	3250.3
16-Aug-86	0.00	3250.1
17-Aug-86	0.00	3249.9
18-Aug-86	0.00	3250.0
19-Aug-86	0.00	3250.1
20-Aug-86	0.00	3250.0
21-Aug-86	0.03	3250.1
22-Aug-86	0.00	3250.0
23-Aug-86	0.00	3250.1
24-Aug-86	0.00	3249.9
25-Aug-86	0.00	3250.1
26-Aug-86	0.00	3250.1
27-Aug-86	0.00	3250.0
28-Aug-86	0.00	3250.2
29-Aug-86	0.27	3250.0
30-Aug-86	0.00	3250.2
31-Aug-86	0.16	3250.1

SEPT/86	PPT (INCHES)	STAGE (FEET)
01-Sep-86	0.10	3250.2
02-Sep-86	0.80	3249.7
03-Sep-86	0.00	3250.1
04-Sep-86	0.00	3250.1
05-Sep-86	0.00	3249.7
06-Sep-86	0.00	3249.7
07-Sep-86	0.00	3249.7
08-Sep-86	0.13	3249.9
09-Sep-86	0.25	3249.7
10-Sep-86	0.00	3249.8
11-Sep-86	0.00	3249.5
12-Sep-86	0.00	3249.5
13-Sep-86	0.00	3249.7
14-Sep-86	0.00	3249.7
15-Sep-86	0.14	3249.3
16-Sep-86	0.17	3249.5
17-Sep-86	0.00	3250.1
18-Sep-86	0.50	3249.5
19-Sep-86	0.00	3249.5
20-Sep-86	0.00	3249.7
21-Sep-86	0.00	3249.7
22-Sep-86	0.13	3249.7
23-Sep-86	0.00	3250.0
24-Sep-86	0.00	3249.7
25-Sep-86	0.03	3249.7
26-Sep-86	0.02	3249.5
27-Sep-86	0.10	3249.7
28-Sep-86	0.10	3249.7
29-Sep-86	0.00	3249.7
30-Sep-86	0.06	3249.5

OCT/86	PPT (INCHES)	STAGE (FEET)
01-Oct-86	0.17	3249.7
02-Oct-86	0.00	3249.7
03-Oct-86	0.00	3249.4
04-Oct-86	0.00	3249.7
05-Oct-86	0.00	3249.7
06-Oct-86	0.00	3249.2
07-Oct-86	0.00	3249.6
08-Oct-86	0.00	3249.6
09-Oct-86	0.00	3249.5
10-Oct-86	0.27	3249.5
11-Oct-86	0.00	3249.5
12-Oct-86	0.00	3249.6
13-Oct-86	0.00	3249.7
14-Oct-86	0.00	3249.6
15-Oct-86	0.00	3249.7
16-Oct-86	0.00	3249.7
17-Oct-86	0.00	3249.7
18-Oct-86	0.00	3249.7
19-Oct-86	0.00	3249.7
20-Oct-86	0.00	3249.6
21-Oct-86	0.00	3249.7
22-Oct-86	0.00	3249.7
23-Oct-86	0.00	3249.7
24-Oct-86	0.00	3249.5
25-Oct-86	0.00	3249.5
26-Oct-86	0.00	3249.5
27-Oct-86	0.06	3249.5
28-Oct-86	0.01	3249.7
29-Oct-86	0.00	3249.7
30-Oct-86	0.06	3249.7
31-Oct-86	0.00	3249.7

NOV/86	PPT (INCHES)	STAGE (FEET)
01-Nov-86	0.00	3249.7
02-Nov-86	0.00	3249.5
03-Nov-86	0.00	3249.7
04-Nov-86	0.00	3249.7
05-Nov-86	0.06	3249.7
06-Nov-86	0.13	3249.9
07-Nov-86	0.00	3249.7
08-Nov-86	0.13	3249.7
09-Nov-86	0.12	3249.4
10-Nov-86	0.00	3249.7
11-Nov-86	0.19	3249.7
12-Nov-86	0.03	3249.7
13-Nov-86	0.00	3249.9
14-Nov-86	0.19	3249.3
15-Nov-86	0.00	3249.5
16-Nov-86	0.00	3249.1
17-Nov-86	0.09	3249.7
18-Nov-86	0.00	3249.8
19-Nov-86	0.25	3249.7
20-Nov-86	0.00	3249.7
21-Nov-86	0.12	3249.8
22-Nov-86	0.00	3249.7
23-Nov-86	0.00	3249.7
24-Nov-86	0.13	3249.6
25-Nov-86	0.00	3249.6
26-Nov-86	0.01	3249.5
27-Nov-86	0.40	3249.6
28-Nov-86	0.10	3249.5
29-Nov-86	0.00	3249.6
30-Nov-86	0.00	3249.3

DEC/86	PPT (INCHES)	STAGE (FEET)
01-Dec-86	0.00	3249.7
02-Dec-86	0.02	3249.5
03-Dec-86	0.00	3249.7
04-Dec-86	0.00	3249.5
05-Dec-86	0.07	3249.7
06-Dec-86	0.12	3249.7
07-Dec-86	0.13	3249.7
08-Dec-86	0.00	3249.7
09-Dec-86	0.00	3249.5
10-Dec-86	0.00	3250.1
11-Dec-86	0.00	3249.7
12-Dec-86	0.00	3249.9
13-Dec-86	0.00	3249.7
14-Dec-86	0.08	3249.7
15-Dec-86	0.00	3249.7
16-Dec-86	0.00	3249.5
17-Dec-86	0.00	3249.5
18-Dec-86	0.00	3249.6
19-Dec-86	0.00	3249.2
20-Dec-86	0.00	3249.6
21-Dec-86	0.00	3249.7
22-Dec-86	0.00	3249.9
23-Dec-86	0.00	3249.7
24-Dec-86	0.00	3249.7
25-Dec-86	0.00	3249.7
26-Dec-86	0.00	3249.7
27-Dec-86	0.00	3249.7
28-Dec-86	0.00	3249.7
29-Dec-86	0.00	3249.5
30-Dec-86	0.00	3249.7
31-Dec-86	0.00	3249.8

JAN/87	PPT (INCHES)	STAGE (FEET)
01-Jan-87	0.00	3249.9
02-Jan-87	0.00	3249.7
03-Jan-87	0.25	3250.1
04-Jan-87	0.00	3249.7
05-Jan-87	0.00	3249.7
06-Jan-87	0.00	3249.7
07-Jan-87	0.00	3249.7
08-Jan-87	0.00	3249.9
09-Jan-87	0.00	3249.4
10-Jan-87	0.00	3249.7
11-Jan-87	0.00	3249.7
12-Jan-87	0.00	3249.5
13-Jan-87	0.00	3249.7
14-Jan-87	0.03	3250.0
15-Jan-87	0.00	3249.7
16-Jan-87	0.00	3249.5
17-Jan-87	0.00	3249.5
18-Jan-87	0.00	3249.8
19-Jan-87	0.01	3249.2
20-Jan-87	0.00	3249.5
21-Jan-87	0.00	3249.5
22-Jan-87	0.00	3249.6
23-Jan-87	0.00	3249.3
24-Jan-87	0.00	3249.2
25-Jan-87	0.00	3249.7
26-Jan-87	0.11	3249.3
27-Jan-87	0.07	3249.3
28-Jan-87	0.00	3249.4
29-Jan-87	0.00	3249.2
30-Jan-87	0.00	3249.8
31-Jan-87	0.00	3249.4

FEB/87	PPT (INCHES)	STAGE (FEET)
01-Feb-87	0.11	3249.6
02-Feb-87	0.00	3250.0
03-Feb-87	0.10	3249.5
04-Feb-87	0.00	3249.4
05-Feb-87	0.00	3249.5
06-Feb-87	0.00	3249.3
07-Feb-87	0.00	3249.4
08-Feb-87	0.00	3249.5
09-Feb-87	0.00	3249.6
10-Feb-87	0.00	3249.5
11-Feb-87	0.00	3249.8
12-Feb-87	0.00	3249.8
13-Feb-87	0.15	3249.5
14-Feb-87	0.00	3249.8
15-Feb-87	0.00	3249.8
16-Feb-87	0.05	3249.7
17-Feb-87	0.00	3249.7
18-Feb-87	0.00	3249.7
19-Feb-87	0.00	3249.5
20-Feb-87	0.02	3249.5
21-Feb-87	0.00	3249.7
22-Feb-87	0.00	3249.8
23-Feb-87	0.00	3249.5
24-Feb-87	0.00	3249.6
25-Feb-87	0.00	3249.5
26-Feb-87	0.00	3249.9
27-Feb-87	0.00	3249.7
28-Feb-87	0.00	3250.1

MARCH/87	PPT (INCHES)	STAGE (FEET)
01-Mar-87	0.00	3249.7
02-Mar-87	0.03	3249.7
03-Mar-87	0.00	3249.2
04-Mar-87	0.01	3249.4
05-Mar-87	0.00	3249.3
06-Mar-87	0.05	3249.7
07-Mar-87	0.06	3249.5
08-Mar-87	0.00	3249.2
09-Mar-87	0.04	3249.5
10-Mar-87	0.01	3249.2
11-Mar-87	0.00	3249.2
12-Mar-87	0.25	3249.8
13-Mar-87	0.00	3249.0
14-Mar-87	0.00	3249.5
15-Mar-87	0.00	3249.4
16-Mar-87	0.20	3249.6
17-Mar-87	0.55	3249.2
18-Mar-87	0.12	3249.3
19-Mar-87	0.40	3249.4
20-Mar-87	0.18	3249.3
21-Mar-87	0.00	3249.4
22-Mar-87	0.00	3249.5
23-Mar-87	0.00	3249.3
24-Mar-87	0.00	3249.3
25-Mar-87	0.00	3249.3
26-Mar-87	0.02	3249.7
27-Mar-87	0.00	3249.7
28-Mar-87	0.08	3250.8
29-Mar-87	0.00	3251.5
30-Mar-87	0.00	3252.9
31-Mar-87	0.00	3254.2

APRIL/87	PPT (INCHES)	STAGE (FEET)
01-Apr-87	0.00	3254.9
02-Apr-87	0.00	3255.9
03-Apr-87	0.00	3256.6
04-Apr-87	0.00	3258.3
05-Apr-87	0.00	3258.7
06-Apr-87	0.14	3258.5
07-Apr-87	0.00	3258.7
08-Apr-87	0.14	3258.4
09-Apr-87	0.03	3258.7
10-Apr-87	0.00	3258.3
11-Apr-87	0.00	3258.5
12-Apr-87	0.10	3258.5
13-Apr-87	0.12	3258.4
14-Apr-87	0.00	3258.0
15-Apr-87	0.00	3257.7
16-Apr-87	0.00	3258.3
17-Apr-87	0.00	3258.6
18-Apr-87	0.05	3258.9
19-Apr-87	0.00	3259.0
20-Apr-87	0.00	3258.9
21-Apr-87	0.00	3258.9
22-Apr-87	0.00	3258.9
23-Apr-87	0.04	3259.0
24-Apr-87	0.01	3259.1
25-Apr-87	0.00	3259.1
26-Apr-87	0.00	3258.9
27-Apr-87	0.00	3258.7
28-Apr-87	0.00	3258.5
29-Apr-87	0.00	3258.9
30-Apr-87	0.00	3258.9

MAY/87	PPT (INCHES)	STAGE (FEET)
01-May-87	0.15	3258.5
02-May-87	0.09	3258.7
03-May-87	0.00	3258.8
04-May-87	0.00	3259.0
05-May-87	0.00	3259.1
06-May-87	0.00	3259.1
07-May-87	0.00	3259.2
08-May-87	0.00	3259.4
09-May-87	0.00	3259.0
10-May-87	0.00	3258.9
11-May-87	0.00	3258.8
12-May-87	0.05	3259.0
13-May-87	0.09	3259.0
14-May-87	0.00	3259.1
15-May-87	0.00	3259.2
16-May-87	0.44	3259.1
17-May-87	0.00	3259.2
18-May-87	0.00	3259.1
19-May-87	0.00	3259.2
20-May-87	0.00	3259.2
21-May-87	0.03	3259.2
22-May-87	0.00	3259.3
23-May-87	0.00	3259.2
24-May-87	0.00	3259.2
25-May-87	0.45	3259.2
26-May-87	0.00	3259.3
27-May-87	0.03	3259.4
28-May-87	0.15	3259.6
29-May-87	0.00	3259.5
30-May-87	0.00	3259.5
31-May-87	0.46	3259.4

JUNE/87	PPT (INCHES)	STAGE (FEET)
01-Jun-87	0.00	3259.4
02-Jun-87	0.00	3259.3
03-Jun-87	0.00	3259.5
04-Jun-87	0.00	3259.4
05-Jun-87	0.00	3259.4
06-Jun-87	0.00	3259.3
07-Jun-87	0.00	3259.4
08-Jun-87	0.07	3259.3
09-Jun-87	0.15	3259.4
10-Jun-87	0.00	3259.5
11-Jun-87	0.00	3259.4
12-Jun-87	0.00	3259.1
13-Jun-87	0.00	3259.0
14-Jun-87	0.00	3258.7
15-Jun-87	0.00	3258.7
16-Jun-87	0.25	3258.6
17-Jun-87	0.02	3258.7
18-Jun-87	0.24	3258.6
19-Jun-87	0.06	3259.2
20-Jun-87	0.00	3259.3
21-Jun-87	0.18	3259.0
22-Jun-87	0.00	3258.7
23-Jun-87	0.04	3258.6
24-Jun-87	0.00	3258.4
25-Jun-87	0.00	3258.3
26-Jun-87	0.00	3258.4
27-Jun-87	0.00	3258.2
28-Jun-87	0.00	3258.2
29-Jun-87	0.00	3258.3
30-Jun-87	0.00	3258.7

JULY/87	PPT (INCHES)	STAGE (FEET)
01-Jul-87	0.00	3258.6
02-Jul-87	0.00	3258.2
03-Jul-87	0.00	3258.7
04-Jul-87	0.00	3258.7
05-Jul-87	0.00	3258.5
06-Jul-87	0.05	3258.5
07-Jul-87	0.00	3258.7
08-Jul-87	0.00	3258.4
09-Jul-87	0.00	3258.4
10-Jul-87	0.09	3258.7
11-Jul-87	0.00	3258.8
12-Jul-87	0.00	3258.8
13-Jul-87	0.00	3258.5
14-Jul-87	0.00	3258.5
15-Jul-87	0.00	3258.3
16-Jul-87	0.00	3258.3
17-Jul-87	0.10	3258.5
18-Jul-87	0.17	3258.6
19-Jul-87	0.39	3258.7
20-Jul-87	0.00	3258.6
21-Jul-87	0.00	3258.3
22-Jul-87	0.53	3258.3
23-Jul-87	0.04	3258.2
24-Jul-87	0.00	3258.1
25-Jul-87	0.00	3258.2
26-Jul-87	0.00	3258.3
27-Jul-87	0.00	3258.1
28-Jul-87	0.00	3258.1
29-Jul-87	0.00	3258.2
30-Jul-87	0.00	3258.4
31-Jul-87	0.21	3258.3

AUGUST/87	PPT (INCHES)	STAGE (FEET)
01-Aug-87	0.00	3257.9
02-Aug-87	0.00	3257.9
03-Aug-87	0.00	3257.9
04-Aug-87	0.00	3258.1
05-Aug-87	0.00	3257.9
06-Aug-87	0.00	3258.0
07-Aug-87	0.00	3258.0
08-Aug-87	0.00	3258.0
09-Aug-87	0.00	3258.4
10-Aug-87	0.00	3258.3
11-Aug-87	0.00	3258.2
12-Aug-87	0.00	3257.9
13-Aug-87	0.00	3257.9
14-Aug-87	0.49	3258.1
15-Aug-87	0.05	3258.1
16-Aug-87	0.11	3258.4
17-Aug-87	0.00	3258.4
18-Aug-87	0.00	3258.5
19-Aug-87	0.00	3258.3
20-Aug-87	0.00	3258.1
21-Aug-87	0.00	3258.1
22-Aug-87	0.00	3258.2
23-Aug-87	0.00	3258.4
24-Aug-87	0.11	3258.4
25-Aug-87	0.12	3258.5
26-Aug-87	0.00	3258.7
27-Aug-87	0.00	3258.0
28-Aug-87	0.00	3258.6
29-Aug-87	0.00	3258.6
30-Aug-87	0.00	3258.6
31-Aug-87	0.00	3258.6

TABLE C: This table contains all vertical gradient calculations. Change in head (dh) was calculated by subtraction of head in the upper piezometer from head in the lower piezometer. For vertical gradients, flow path length (dl) was calculated as the distance between the midpoints of the saturated screen intervals. All values were rounded to the nearest 0.1 foot prior to calculation. Negative gradients indicate that head decreases in the direction shown.

Vertical gradients were calculated between adjacent piezometers. "OVERALL" is the cumulative gradient at each site. The error tolerance for calculations yielding a non-zero vertical gradient which could have been generated through a cumulative measurement error of 0.1 or 0.2 feet are noted as follows:

( ) = could have generated zero vertical gradient given a cumulative measurement error of 0.1 foot.

(( )) = could have generated zero vertical gradient given a cumulative measurement error of 0.2 feet.

Reservoir stage is corrected to USGS datum, and is shown in feet.

GRADIENT BETWEEN	DH/DL 07/30/86	DH/DL 08/15/86	DH/DL 08/27/86	DH/DL 09/16/86
101B->101A	0.0958	0.0815	0.0782	0.0702
114->139	NA	((0.0364))	NA	((0.0385))
118C->118B	NA	NA	NA	NA
118B->118A	-0.3947	NA	-0.5143	-0.3714
118 OVERALL:	-0.3947	NA	-0.5143	-0.3714
119C->119B	-0.4038	NA	NA	NA
119B->119A	-0.2807	-0.3158	-0.2807	-0.1228
119 OVERALL:	-0.3394	-0.3158	-0.2807	-0.1228
120A->120B	NA	NA	NA	NA
121B->121D	-0.4500	NA	NA	NA
121D->121E	-0.4561	-0.8846	-0.8846	-0.5500
121E->121A	-1.2308	-0.2727	0.0000	-0.1053
121A->121F	(0.0588)	((-0.1176))	0.0000	(0.0588)
121 OVERALL:	-0.4713	-0.5185	-0.4423	-0.2366
122B->122D	-0.1250	-0.0930	-0.1500	-0.2222
122D->122E	-0.6452	-0.7097	-0.7419	-0.6452
122E->122A	-0.5238	-0.4286	-0.4286	-0.3810
122 OVERALL:	-0.4474	-0.4490	-0.4861	-0.4571
123C->123E	NA	NA	NA	NA
123C->123F	NA	NA	NA	NA
123C->123B	NA	NA	NA	NA
123E->123D	-0.9032	-0.7581	-0.9194	-0.8871
123D->123A	-0.6000	(-0.2000)	((-0.4000))	((-0.4000))
123E->123A	-0.8806	-0.7164	-0.8806	-0.8507
123 OVERALL:	-0.8806	-0.7164	-0.8806	-0.8507
124A->124B	-0.2609	NA	NA	NA
124B->124C	-0.1702	((-0.0500))	((-0.0556))	((-0.0625))
124C->124D	((0.0667))	((-0.0667))	((-0.0667))	(-0.0333)
124D->124E	((-0.0714))	0.0000	0.0000	0.0000
124C->124E	0.0000	((-0.0345))	((-0.0345))	(-0.0172)
124 OVERALL:	-0.0753	-0.0385	-0.0395	-0.0270
125A->125B	NA	NA	NA	NA
126A->126B	NA	NA	NA	NA
128A->128B	NA	NA	NA	NA
137A->137B	-0.1333	-0.2439	-0.2162	NA
137B->137C	-1.0164	-0.8197	-0.8525	-0.7667
137C->137D	-0.5714	-0.7619	-0.6984	-0.6667
137 OVERALL:	-0.6154	-0.6545	-0.6460	-0.7154
138A->138B	-0.2745	-0.3333	-0.3182	-0.3415
138B->138C	-0.9655	-1.1034	-1.1379	-1.0690
138C->138D	-0.3226	-0.1935	-0.1613	(0.0323)
138 OVERALL:	-0.5263	-0.5476	-0.5488	-0.4596
RESERVOIR STAGE	3251.1	3250.3	3250.0	3249.5

GRADIENT BETWEEN	DH/DL 10/20/86	DH/DL 11/14/86	DH/DL 12/18/86	DH/DL 01/30/87
101B->101A	-0.0624	-0.2360	0.0583	0.0284
114->139	NA	-0.1639	-0.0968	((0.0635))
118C->118B	NA	NA	NA	NA
118B->118A	-0.3881	0.4058	(0.0263)	-0.1316
118 OVERALL:	-0.3881	0.4058	(0.0263)	-0.1316
119C->119B	NA	NA	NA	NA
119B->119A	-0.0702	((0.0351))	0.1930	0.0526
119 OVERALL:	-0.0702	((0.0351))	0.1930	0.0526
120A->120B	NA	NA	NA	NA
121B->121D	NA	NA	NA	NA
121D->121E	NA	((0.0588))	((-0.0588))	-0.1053
121E->121A	-0.1250	0.0769	-0.0769	0.0000
121A->121F	((0.1176))	-2.0000	0.0000	0.0000
121 OVERALL:	0.0400	-1.1000	((-0.0333))	0.0000
122B->122D	NA	-0.6522	-0.2273	-0.2000
122D->122E	-1.2346	-0.5000	-0.7097	-0.4516
122E->122A	-0.7826	-1.6667	-0.4762	-0.3810
122 OVERALL:	-1.1346	-0.9000	-0.5000	-0.3611
123C->123E	NA	NA	NA	NA
123C->123F	NA	NA	NA	NA
123C->123B	NA	NA	NA	NA
123E->123D	-0.8871	-0.8618	-0.8548	-0.7581
123D->123A	-0.6000	0.8000	(-0.2000)	(-0.2000)
123E->123A	-0.8657	-0.7368	-0.8060	-0.7164
123 OVERALL:	-0.8657	-0.7368	-0.8060	-0.7164
124A->124B	NA	NA	NA	NA
124B->124C	((-0.0667))	NA	-0.1667	((-0.0625))
124C->124D	((-0.0667))	(-0.0333)	(-0.0333)	0.0000
124D->124E	0.0000	(-0.0357)	(-0.0357)	(-0.0357)
124C->124E	((-0.0345))	((-0.0345))	((-0.0345))	(-0.0172)
124 OVERALL:	-0.0411	-0.0345	-0.0658	-0.0270
125A->125B	NA	NA	NA	NA
126A->126B	NA	NA	NA	NA
128A->128B	NA	NA	NA	NA
137A->137B	-0.5000	NA	NA	NA
137B->137C	-0.8000	-0.5957	-1.0164	-0.6316
137C->137D	-0.6349	-1.2381	-0.2540	-0.2222
137 OVERALL:	-0.6582	-0.9636	-0.6290	-0.4167
138A->138B	-0.3158	NA	NA	NA
138B->138C	-1.1034	-0.4000	-0.5818	-0.4561
138C->138D	((-0.0645))	-0.2903	-0.2258	-0.1290
138 OVERALL:	-0.5063	-0.3393	-0.3932	-0.2857
RESERVOIR STAGE	3249.6	3249.3	3249.6	3249.8

GRADIENT BETWEEN	DH/DL 02/27/87	DH/DL 03/26/87	DH/DL 04/21/87	DH/DL 05/14/87
101B->101A	0.0800	0.0505	-0.0382	0.0153
114->139	NA	NA	(-0.0317)	(-0.0317)
118C->118B	NA	NA	-0.1087	-0.1522
118B->118A	-0.3582	-0.4375	0.0789	-0.1316
118 OVERALL:	-0.3582	-0.4375	((-0.0238))	-0.1429
119C->119B	-0.5577	-0.5385	NA	-0.0862
119B->119A	-0.1930	-0.3333	0.4737	0.2807
119 OVERALL:	-0.3670	-0.4312	0.4737	0.0957
120A->120B	NA	NA	-0.4673	-0.4643
121B->121D	NA	NA	-1.2083	-0.2083
121D->121E	-0.8846	NA	0.2759	-0.3793
121E->121A	0.0000	0.0000	0.0000	0.0000
121A->121F	0.4118	0.0000	0.0000	(-0.0588)
121 OVERALL:	0.3111	0.0000	-0.2530	-0.2048
122B->122D	NA	-0.1463	-0.1250	((-0.0833))
122D->122E	-0.7541	-0.9032	-0.4516	-0.2581
122E->122A	-0.3810	-0.6667	-0.4762	-0.3810
122 OVERALL:	-0.6019	-0.6207	-0.3553	-0.2368
123C->123E	NA	NA	-0.0750	0.0000
123C->123F	NA	NA	-0.9512	(-0.0244)
123C->123B	NA	NA	-0.1702	-0.1064
123E->123D	-0.8926	-1.0161	-0.8065	-0.6290
123D->123A	-1.0000	-0.6000	0.0000	(-0.2000)
123E->123A	-0.9008	-0.9851	-0.7463	-0.5970
123 OVERALL:	-0.9008	-0.9851	-0.4953	-0.3738
124A->124B	NA	NA	0.0000	0.0000
124B->124C	((-0.0667))	0.0000	(-0.0364)	(-0.0364)
124C->124D	((-0.0667))	-0.1000	((-0.0667))	(-0.0333)
124D->124E	0.0000	(-0.0357)	0.0000	(-0.0357)
124C->124E	((-0.0345))	-0.0690	((-0.0345))	((-0.0345))
124 OVERALL:	-0.0411	-0.0519	-0.0284	-0.0284
125A->125B	NA	NA	-1.2537	NA
126A->126B	NA	NA	-0.2439	NA
128A->128B	NA	NA	(-0.0206)	NA
137A->137B	NA	NA	-0.1667	((0.0667))
137B->137C	-0.9583	-1.1228	-0.2623	-0.3279
137C->137D	-0.2857	-0.5397	-0.5397	-0.3492
137 OVERALL:	-0.5766	-0.8167	-0.3261	-0.2065
138A->138B	NA	NA	-0.1935	-0.1935
138B->138C	-1.0000	-1.0638	-0.4138	-0.2759
138C->138D	-0.0968	(-0.0323)	((-0.0645))	((-0.0645))
138 OVERALL:	-0.4909	-0.4771	-0.2198	-0.1758
RESERVOIR STAGE	3249.7	3249.7	3258.9	3259.1

GRADIENT BETWEEN	DH/DL 06/13/87	DH/DL 07/11/87	DH/DL 08/11/87
101B->101A	0.0382	0.0725	-0.1374
114->139	0.0000	0.0000	((0.0635))
118C->118B	((-0.0435))	(-0.0217)	((0.0435))
118B->118A	-0.1842	(-0.0263)	-0.1316
118 OVERALL:	-0.1071	((-0.0238))	-0.0357
119C->119B	((-0.0345))	0.0000	(0.0177)
119B->119A	((0.0351))	0.1053	0.1053
119 OVERALL:	0.0000	0.0522	0.0617
120A->120B	-0.2500	0.1607	0.2453
121B->121D	-0.1667	-0.1667	((-0.0833))
121D->121E	-0.1379	-0.4483	-0.3103
121E->121A	-0.6923	0.0000	0.0000
121A->121F	(-0.0588)	0.0000	0.0000
121 OVERALL:	-0.2169	-0.2048	-0.1325
122B->122D	-0.1250	((0.0833))	(-0.0417)
122D->122E	-0.2581	-0.2258	-0.0968
122E->122A	-0.3810	-0.2381	((-0.0952))
122 OVERALL:	-0.2500	-0.1316	-0.0789
123C->123E	-0.5250	0.0750	0.1000
123C->123F	((-0.0488))	((0.0488))	0.0976
123C->123B	-0.1064	-0.0638	0.0000
123E->123D	-0.3226	-0.7419	-0.7419
123D->123A	(-0.2000)	-0.8000	((-0.4000))
123E->123A	-0.3134	-0.7463	-0.7164
123 OVERALL:	-0.3925	-0.4393	-0.4112
124A->124B	0.0000	0.0000	(0.0500)
124B->124C	(-0.0364)	0.0000	0.0000
124C->124D	0.0000	((-0.0667))	(-0.0333)
124D->124E	0.0000	0.0000	0.0000
124C->124E	0.0000	((-0.0345))	(-0.0172)
124 OVERALL:	(-0.0095)	((-0.0190))	0.0000
125A->125B	NA	NA	-0.1017
126A->126B	NA	NA	-0.0789
128A->128B	NA	(-0.0206)	((0.0426))
137A->137B	-0.2000	-0.1333	((-0.0667))
137B->137C	-0.3607	-0.4918	-0.4262
137C->137D	-0.3175	-0.3492	-0.3492
137 OVERALL:	-0.2935	-0.3261	-0.2826
138A->138B	-0.1290	((-0.0645))	0.0000
138B->138C	-0.3103	-0.1724	-0.1379
138C->138D	0.0000	(-0.0323)	0.0000
138 OVERALL:	-0.1429	-0.0879	-0.0440
RESERVOIR STAGE	3259.0	3258.8	3258.2

TABLE D: This table contains the field data and calculations of hydraulic conductivity (K) for slug removal tests performed at Sites 123 and 124. Tests were conducted for at least forty minutes, or until head stabilized. Pressure transducer volts were converted to head data by least-squares fit with measurements taken using a steel tape. These data, plus the regression analysis used to generate head values, are tabulated following a summary of the hydraulic conductivity calculations for each site. Hydraulic conductivities were determined using the Bouwer and Rice method (1976). Hydraulic conductivity values generated by multiple tests are averaged below:

PIEZOMETER	TEST #	CALCULATED K (cm/day)	AVERAGE K (cm/day)
123D	1	9.08	9.08
123E	1	115.78	
123E	2	107.13	111.46
123F	1	284.25	
123F	2	254.13	269.11
124B	1	9.94	
124B	2	9.67	9.81
124C	1	240.25	
124C	2	253.90	
124C	3	240.33	
124C	4	245.44	244.98
124D	1	547.63	
124D	2	500.99	524.31
124E	1	7.68	
124E	2	11.63	9.66

Aquifer test analysis   Well 123d   Test #1   Bouwer & Rice method

Variable	FEET	METERS	
L	2.68	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	8.75	2.67	Static head - elev. of bottom perf.
Yo	1.850	0.56	Initial drawdown, from semilog plot.
Y at 30 sec.	1.795	0.55	Drawdown at 30 seconds.

BEST APPROXIMATION:
(1/t)ln(Yo/Yt)= 0.001006
L/Rw= 32.17
therefore, A= 2.55
and B= 0.35
ln((D-H)/Rw)= 5.71
1.1/(ln(H/Rw))= 0.24
ln (Re/Rw)= 2.65
K = 1.05E-06 meters/second, which = 9.08 cm/day.

Aquifer test analysis   Well 123e   Test #1   Bouwer & Rice method

Variable	FEET	METERS	
L	2.68	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	8.51	2.59	Static head - elev. of bottom perf.
Yo	1.56	0.48	Initial drawdown, from semilog plot.
Y at 30 sec.	1.06	0.32	Drawdown at 30 seconds.

BEST APPROXIMATION:
(1/t)ln(Yo/Yt)= 0.012881
L/Rw= 32.17
therefore, A= 2.55
and B= 0.35
ln((D-H)/Rw)= 5.72
1.1/(ln(H/Rw))= 0.24
ln (Re/Rw)= 2.64
K = 1.34E-05 meters/second, which = 115.78 cm/day.

Aquifer test analysis   Well 123e   Test #2   Bouwer & Rice method

Variable	FEET	METERS	
L	2.68	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	8.50	2.59	Static head - elev. of bottom perf.
Yo	1.53	0.47	Initial drawdown, from semilog plot.
Y at 30 sec.	1.07	0.33	Drawdown at 30 seconds.

BEST APPROXIMATION:
(1/t)ln(Yo/Yt)= 0.011920
L/Rw= 32.17
therefore, A= 2.55
and B= 0.35
ln((D-H)/Rw)= 5.72
1.1/(ln(H/Rw))= 0.24
ln (Re/Rw)= 2.64
K = 1.24E-05 meters/second, which = 107.13 cm/day.

Aquifer test analysis   Well 123f   Test #1 Bouwer & Rice method

Variable	FEET	METERS	
L	2.68	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	8.57	2.61	Static head - elev. of bottom perf.
Yo	3.07	0.94	Initial drawdown, from semilog plot.
Y at 30 sec.	1.19	0.36	Drawdown at 30 seconds.

BEST APPROXIMATION:
(1/t)ln(Yo/Yt)= 0.031591
L/Rw= 32.17
therefore, A= 2.55
and B= 0.35
ln((D-H)/Rw)= 5.72
1.1/(ln(H/Rw))= 0.24
ln (Re/Rw)= 2.64
K = 3.29E-05 meters/second, which = 284.25 cm/day.

Aquifer test analysis   Well 123f   Test #2 Bouwer & Rice method

Variable	FEET	METERS	
L	2.68	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	8.57	2.61	Static head - elev. of bottom perf.
Yo	1.12	0.34	Initial drawdown, from semilog plot.
Y at 30 sec.	0.48	0.15	Drawdown at 30 seconds.

BEST APPROXIMATION:
(1/t)ln(Yo/Yt)= 0.028243
L/Rw= 32.17
therefore, A= 2.55
and B= 0.35
ln((D-H)/Rw)= 5.72
1.1/(ln(H/Rw))= 0.24
ln (Re/Rw)= 2.64
K = 2.94E-05 meters/second, which - 254.13 cm/day.

Aquifer test analysis   Well 124b   Test #1   Bouwer & Rice method

Variable	FEET	METERS	
L	2.68	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	6.57	2.00	Static head - elev. of bottom perf.
Yo	1.77	0.54	Initial drawdown, from semilog plot.
Y at 30 sec.	1.71	0.52	Drawdown at 30 seconds.

BEST APPROXIMATION:
(1/t)ln(Yo/Yt)= 0.001150
L/Rw= 32.17
therefore, A= 2.55
and B= 0.35
ln((D-H)/Rw)= 5.80
1.1/(ln(H/Rw))= 0.25
ln (Re/Rw)= 2.54
K = 1.15E-06 meters/second, which = 9.94 cm/day.

Aquifer test analysis   Well 124b   Test #2   Bouwer & Rice method

Variable	FEET	METERS	
L	2.68	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	6.61	2.01	Static head - elev. of bottom perf.
Yo	1.82	0.55	Initial drawdown, from semilog plot.
Y at 30 sec.	1.76	0.54	Drawdown at 30 seconds.

BEST APPROXIMATION:
(1/t)ln(Yo/Yt)= 0.001117
L/Rw= 32.17
therefore, A= 2.55
and B= 0.35
ln((D-H)/Rw)= 5.80
1.1/(ln(H/Rw))= 0.25
ln (Re/Rw)= 2.54
K = 1.12E-06 meters/second, which = 9.67 cm/day.

Aquifer test analysis   Well 124c   Test #1   Bouwer & Rice method

Variable	FEET	METERS	
L	2.68	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	9.21	2.81	Static head - elev. of bottom perf.
Yo	2.32	0.71	Initial drawdown, from semilog plot.
Y at 30 sec.	1.05	0.32	Drawdown at 30 seconds.

BEST APPROXIMATION:
(1/t)ln(Yo/Yt)= 0.026426
L/Rw= 32.17
therefore, A= 2.55
and B= 0.35
ln((D-H)/Rw)= 5.70
1.1/(ln(H/Rw))= 0.23
ln (Re/Rw)= 2.67
K = 2.78E-05 meters/second, which = 240.25 cm/day.

Aquifer test analysis   Well 124c   Test #2 Bouwer & Rice method

Variable	FEET	METERS	
L	2.68	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	9.21	2.81	Static head - elev. of bottom perf.
Yo	2.45	0.75	Initial drawdown, from semilog plot.
Y at 30 sec.	1.06	0.32	Drawdown at 30 seconds.

BEST APPROXIMATION:

(1/t)ln(Yo/Yt)=	0.027927
L/Rw=	32.17
therefore, A=	2.55
and B=	0.35
ln((D-H)/Rw)=	5.70
1.1/(ln(H/Rw))=	0.23
ln (Re/Rw)=	2.67

K = 2.94E-05 meters/second, which = 253.90 cm/day.

Aquifer test analysis   Well 124c   Test #3 Bouwer & Rice method

Variable	FEET	METERS	
L	2.68	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	9.21	2.81	Static head - elev. of bottom perf.
Yo	2.63	0.80	Initial drawdown, from semilog plot.
Y at 30 sec.	1.19	0.36	Drawdown at 30 seconds.

BEST APPROXIMATION:

(1/t)ln(Yo/Yt)=	0.026434
L/Rw=	32.17
therefore, A=	2.55
and B=	0.35
ln((D-H)/Rw)=	5.70
1.1/(ln(H/Rw))=	0.23
ln (Re/Rw)=	2.67

K = 2.78E-05 meters/second, which = 240.33 cm/day.

Aquifer test analysis   Well 124c   Test #4 Bouwer & Rice method

Variable	FEET	METERS	
L	2.68	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	9.26	2.82	Static head - elev. of bottom perf.
Yo	3.01	0.92	Initial drawdown, from semilog plot.
Y at 30 sec.	1.34	0.41	Drawdown at 30 seconds.

BEST APPROXIMATION:

(1/t)ln(Yo/Yt)=	0.026976
L/Rw=	32.17
therefore, A=	2.55
and B=	0.35
ln((D-H)/Rw)=	5.69
1.1/(ln(H/Rw))=	0.23
ln (Re/Rw)=	2.67

K = 2.84E-05 meters/second, which = 245.44 cm/day.

Aquifer test analysis Well 124d Test #1 Bouwer & Rice method

Variable	FEET	METERS	
L	2.69	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	12.09	3.69	Static head - elev. of bottom perf.
Yo	4.80	1.46	Initial drawdown, from semilog plot.
Y at 30 sec.	0.84	0.26	Drawdown at 30 seconds.

BEST APPROXIMATION:
(1/t)ln(Yo/Yt)= 0.058099
L/Rw= 32.29
therefore, A= 2.55
and B= 0.35
ln((D-H)/Rw)= 5.57
1.1/(ln(H/Rw))= 0.22
ln (Re/Rw)= 2.78
K = 6.34E-05 meters/second, which = 547.63 cm/day.

Aquifer test analysis Well 124d Test #2 Bouwer & Rice method

Variable	FEET	METERS	
L	2.69	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	12.09	3.69	Static head - elev. of bottom perf.
Yo	1.33	0.41	Initial drawdown, from semilog plot.
Y at 30 sec.	0.27	0.08	Drawdown at 30 seconds.

BEST APPROXIMATION:
(1/t)ln(Yo/Yt)= 0.053150
L/Rw= 32.29
therefore, A= 2.55
and B= 0.35
ln((D-H)/Rw)= 5.57
1.1/(ln(H/Rw))= 0.22
ln (Re/Rw)= 2.78
K = 5.80E-05 meters/second, which = 500.99 cm/day.

Aquifer test analysis Well 124e Test #1 Bouwer & Rice method

Variable	FEET	METERS	
L	2.69	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	14.93	4.55	Static head - elev. of bottom perf.
Yo	2.56	0.78	Initial drawdown, from semilog plot.
Y at 30 sec.	2.50	0.76	Drawdown at 30 seconds.

BEST APPROXIMATION:
(1/t)ln(Yo/Yt)= 0.000791
L/Rw= 32.29
therefore, A= 2.55
and B= 0.35
ln((D-H)/Rw)= 5.43
1.1/(ln(H/Rw))= 0.21
ln (Re/Rw)= 2.86
K = 8.88E-07 meters/second, which = 7.68 cm/day.

Aquifer test analysis   Well 124e   Test #2   Bouwer & Rice method

Variable	FEET	METERS	
L	2.69	0.82	Screen length
D	34.00	10.36	Saturated aquifer thickness
Rw (=Re)	0.08	0.03	Well radius
H	14.92	4.55	Static head - elev. of bottom perf.
Yo	2.55	0.78	Initial drawdown, from semilog plot.
Y at 30 sec.	2.46	0.75	Drawdown at 30 seconds.

BEST APPROXIMATION:

(1/t)ln(Yo/Yt)=	0.001198
L/Rw=	32.29
therefore, A=	2.55
and B=	0.35
ln((D-H)/Rw)=	5.43
1.1/(ln(H/Rw))=	0.21
ln (Re/Rw)=	2.86

K = 1.35E-06 meters/second, which = 11.63 cm/day.

Aquifer test results | Well 123D, Test #1
Static head: 3252.08 feet | Elevation at top of casing: 3260.85
Short slug out | Test Date: 14-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0						
10	1.396				3249.86	2.22
15	1.494				3250.28	1.80
25	1.495				3250.28	1.80
35	1.496				3250.28	1.80
50	1.497				3250.29	1.79
85	1.498				3250.29	1.79
192	1.499	11.00	0.45	3250.30	3250.30	1.78
360	1.500	11.00	0.45	3250.30	3250.30	1.78
450	1.501				3250.31	1.77
545	1.502	11.00	0.45	3250.30	3250.31	1.77
640	1.503				3250.31	1.77
735	1.504	11.00	0.46	3250.31	3250.32	1.76
870	1.505				3250.32	1.76
965	1.506	11.00	0.48	3250.33	3250.33	1.75
1074	1.507	11.00	0.48	3250.33	3250.33	1.75
1218	1.508	11.00	0.49	3250.34	3250.34	1.74
1303	1.509				3250.34	1.74
1440	1.510	11.00	0.49	3250.34	3250.34	1.74
1547	1.511				3250.35	1.73
1672	1.512	11.00	0.50	3250.35	3250.35	1.73
1810	1.513	11.00	0.51	3250.36	3250.36	1.72
1915	1.514	11.00	0.51	3250.36	3250.36	1.72

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
192	1.499	11.00	0.45	3250.30
735	1.504	11.00	0.46	3250.31
965	1.506	11.00	0.48	3250.33
1218	1.508	11.00	0.49	3250.34
1672	1.512	11.00	0.50	3250.35
1810	1.513	11.00	0.51	3250.36
1915	1.514	11.00	0.51	3250.36

Regression Output:

Constant		-756.91
Std Err of Y Est		0.0011
R Squared		0.9635
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	0.2333	
Std Err of Coef.	0.0203	

Aquifer test results Well 123E, Test #1
Static head: 3258.03 feet Elevation at top of casing: 3262.60
Short slug out Test Date: 14-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0						
5	1.575				3256.56	1.47
10	1.597				3256.66	1.37
15	1.617				3256.75	1.28
20	1.636				3256.83	1.20
25	1.654				3256.91	1.12
30	1.670				3256.97	1.06
35	1.685				3257.04	0.99
40	1.699				3257.10	0.93
45	1.712				3257.16	0.87
50	1.725				3257.21	0.82
55	1.736				3257.26	0.77
60	1.746				3257.30	0.73
65	1.756				3257.35	0.68
70	1.766				3257.39	0.64
75	1.774				3257.42	0.61
80	1.782				3257.46	0.57
85	1.789				3257.49	0.54
90	1.797				3257.52	0.51
95	1.804				3257.55	0.48
100	1.810				3257.58	0.45
105	1.815				3257.60	0.43
110	1.820				3257.62	0.41
115	1.825				3257.64	0.39
120	1.830				3257.66	0.37
130	1.839				3257.70	0.33
140	1.846				3257.73	0.30
150	1.853	6.00	1.16	3257.76	3257.76	0.27
160	1.859				3257.79	0.24
170	1.864				3257.81	0.22
180	1.868				3257.83	0.20
190	1.872				3257.85	0.18
200	1.876				3257.86	0.17
210	1.879	5.00	0.28	3257.88	3257.88	0.15
220	1.882				3257.89	0.14
230	1.884				3257.90	0.13
240	1.887				3257.91	0.12
250	1.889				3257.92	0.11
260	1.891				3257.93	0.10
270	1.892	5.00	0.34	3257.94	3257.93	0.10
280	1.893				3257.94	0.09
300	1.895				3257.94	0.09
315	1.897				3257.95	0.08
330	1.899	5.00	0.36	3257.96	3257.96	0.07
351	1.900				3257.97	0.06
380	1.901				3257.97	0.06
423	1.902				3257.97	0.06
456	1.903	5.00	0.37	3257.97	3257.98	0.05
537	1.904	5.00	0.37	3257.97	3257.98	0.05

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
150	1.853	6.00	1.16	3257.76
210	1.879	5.00	0.28	3257.88
270	1.892	5.00	0.34	3257.94
330	1.899	5.00	0.36	3257.96
456	1.903	5.00	0.37	3257.97

Aquifer test results Well 123E, Test #1 continued

Regression Output:

Constant		-753.89
Std Err of Y Est		0.0018
R Squared		0.9938
No. of Observations		5
Degrees of Freedom		3
X Coefficient(s)	0.2320	
Std Err of Coef.	0.0105	

Aquifer test results Well 123E, Test #2
Static head: 3258.02 feet Elevation at top of casing: 3262.60
Short slug out Test Date: 14-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0						
5	1.529				3256.56	1.46
10	1.555				3256.66	1.36
15	1.574				3256.73	1.29
20	1.594				3256.80	1.22
25	1.615				3256.88	1.14
30	1.633				3256.95	1.07
35	1.649				3257.01	1.01
40	1.665				3257.07	0.95
45	1.680				3257.13	0.89
50	1.693				3257.18	0.84
55	1.706				3257.23	0.79
60	1.718				3257.28	0.74
65	1.729				3257.32	0.70
70	1.739				3257.36	0.66
75	1.749				3257.39	0.63
80	1.758				3257.43	0.59
85	1.767				3257.46	0.56
90	1.774				3257.49	0.53
95	1.781				3257.52	0.50
100	1.785				3257.53	0.49
105	1.794				3257.57	0.45
110	1.800				3257.59	0.43
115	1.807				3257.62	0.40
120	1.812				3257.64	0.38
130	1.822				3257.67	0.35
140	1.830				3257.70	0.32
150	1.839	5.00	0.14	3257.74	3257.74	0.28
160	1.845				3257.76	0.26
170	1.851				3257.78	0.24
180	1.856				3257.80	0.22
190	1.861				3257.82	0.20
200	1.865				3257.84	0.18
210	1.869	5.00	0.25	3257.85	3257.85	0.17
220	1.872				3257.86	0.16
230	1.875				3257.88	0.14
240	1.878				3257.89	0.13
250	1.880				3257.89	0.13
260	1.882	5.00	0.30	3257.90	3257.90	0.12
270	1.884				3257.91	0.11
280	1.885				3257.91	0.11
290	1.887	5.00	0.32	3257.92	3257.92	0.10
300	1.888				3257.92	0.10
315	1.889				3257.93	0.09
330	1.890	5.00	0.34	3257.94	3257.93	0.09
345	1.892				3257.94	0.08
360	1.893				3257.94	0.08
372	1.894				3257.95	0.07
390	1.895	5.00	0.35	3257.95	3257.95	0.07
440	1.897	5.00	0.36	3257.96	3257.96	0.06
518	1.898				3257.96	0.06
570	1.899	5.00	0.37	3257.97	3257.97	0.05

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
150	1.839	5.00	0.14	3257.74
210	1.869	5.00	0.25	3257.85
260	1.882	5.00	0.30	3257.90
290	1.887	5.00	0.32	3257.92
390	1.895	5.00	0.35	3257.95
440	1.897	5.00	0.36	3257.96
570	1.899	5.00	0.37	3257.97

Regression Output:

Constant		-853.02
Std Err of Y Est		0.0006
R Squared		0.9993
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	0.2624	
Std Err of Coef.	0.0031	

Aquifer test results — Well 123F, Test #1
Static head: 3257.95 feet — Elevation at top of casing: 3260.84
Short slug out — Test Date: 14-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0						
10	1.645				3255.81	2.14
15	1.671				3256.04	1.91
20	1.703				3256.31	1.64
25	1.733				3256.57	1.38
30	1.755				3256.76	1.19
35	1.776				3256.94	1.01
40	1.790				3257.06	0.89
45	1.804				3257.19	0.76
50	1.816				3257.29	0.66
55	1.827				3257.38	0.57
60	1.835				3257.45	0.50
65	1.842				3257.51	0.44
70	1.849				3257.57	0.38
75	1.853				3257.61	0.34
80	1.859				3257.66	0.29
85	1.862				3257.69	0.26
90	1.865				3257.71	0.24
95	1.868				3257.74	0.21
100	1.871				3257.76	0.19
105	1.874				3257.79	0.16
110	1.876				3257.81	0.14
115	1.878				3257.82	0.13
120	1.879				3257.83	0.12
130	1.882				3257.86	0.09
140	1.884				3257.88	0.07
150	1.885	4.00	1.05	3257.89	3257.88	0.07
160	1.887				3257.90	0.05
170	1.888				3257.91	0.04
180	1.889	4.00	1.07	3257.91	3257.92	0.03
208	1.891	4.00	1.10	3257.94	3257.94	0.01
250	1.892				3257.94	0.01
275	1.893	4.00	1.10	3257.94	3257.95	0.00

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
150	1.885	4.00	1.05	3257.89
180	1.889	4.00	1.07	3257.91
208	1.891	4.00	1.10	3257.94

Regression Output:

Constant		-375.34
Std Err of Y Est		0.0013
R Squared		0.9098
No. of Observations		3
Degrees of Freedom		1
X Coefficient(s)	0.1158	
Std Err of Coef.	0.0365	

Aquifer test results — Well 123F, Test #2
Static head: 3257.95 feet — Elevation at top of casing: 3260.84
Short slug out — Test Date: 14-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0						
5	1.606				3256.97	0.98
10	1.647				3257.10	0.85
15	1.682				3257.22	0.73
20	1.713				3257.32	0.63
25	1.739				3257.40	0.55
30	1.761				3257.47	0.48
35	1.779				3257.53	0.42
40	1.794				3257.58	0.37
45	1.806				3257.62	0.33
50	1.820				3257.66	0.29
55	1.829				3257.69	0.26
60	1.837				3257.72	0.23
65	1.845				3257.75	0.20
70	1.852				3257.77	0.18
75	1.856				3257.78	0.17
80	1.861				3257.80	0.15
85	1.865				3257.81	0.14
90	1.869				3257.82	0.13
95	1.872				3257.83	0.12
100	1.875				3257.84	0.11
105	1.878				3257.85	0.10
110	1.880				3257.86	0.09
115	1.881				3257.86	0.09
120	1.883				3257.87	0.08
130	1.886				3257.88	0.07
140	1.887				3257.88	0.07
150	1.889	4.00	1.05	3257.89	3257.89	0.06
160	1.890				3257.89	0.06
170	1.892				3257.90	0.05
180	1.892	4.00	1.06	3257.90	3257.90	0.05
190	1.893				3257.90	0.05
198	1.894	4.00	1.06	3257.90	3257.91	0.04
225	1.895	4.00	1.07	3257.91	3257.91	0.04
267	1.896	4.00	1.07	3257.91	3257.91	0.04
402	1.898	4.00	1.08	3257.92	3257.92	0.03

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
150	1.889	4.00	1.05	3257.89
267	1.896	4.00	1.07	3257.91
402	1.898	4.00	1.08	3257.92

Regression Output:

Constant		-998.75
Std Err of Y Est		0.0008
R Squared		0.9856
No. of Observations		3
Degrees of Freedom		1
X Coefficient(s)	0.3071	
Std Err of Coef.	0.0371	

Aquifer test results — Well 124B, Test #1
Static head: 3258.12 feet — Elevation at top of casing: 3259.89
Short slug out — Test date: 01-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0						
5	1.218				3256.36	1.76
10	1.223				3256.38	1.74
15	1.226				3256.39	1.73
20	1.228				3256.39	1.73
25	1.231				3256.41	1.71
30	1.232				3256.41	1.71
35	1.234				3256.42	1.70
40	1.237				3256.43	1.69
45	1.238				3256.43	1.69
50	1.240				3256.44	1.68
55	1.243				3256.45	1.67
60	1.244	4.00	0.55	3256.44	3256.45	1.67
70	1.249				3256.47	1.65
80	1.254				3256.49	1.63
90	1.257				3256.50	1.62
100	1.262				3256.52	1.60
110	1.265				3256.53	1.59
120	1.268	4.00	0.63	3256.52	3256.54	1.58
130	1.272				3256.55	1.57
140	1.276				3256.57	1.55
150	1.278				3256.57	1.55
160	1.286				3256.60	1.52
170	1.287				3256.61	1.51
180	1.287				3256.61	1.51
210	1.288				3256.61	1.51
240	1.296	4.00	0.77	3256.66	3256.64	1.48
300	1.312	4.00	0.85	3256.74	3256.69	1.43
360	1.315				3256.71	1.41
420	1.365	4.00	0.98	3256.87	3256.88	1.24
480	1.383				3256.95	1.17
600	1.412	4.00	1.14	3257.03	3257.05	1.07
720	1.437				3257.14	0.98
840	1.461	4.00	1.32	3257.21	3257.23	0.89
960	1.482				3257.30	0.82
1080	1.501				3257.37	0.75
1200	1.519	4.00	1.55	3257.44	3257.43	0.69
1500	1.555	4.00	1.68	3257.57	3257.56	0.56
1800	1.584	4.00	1.78	3257.67	3257.67	0.45

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
60	1.244	4.00	0.55	3256.44
120	1.268	4.00	0.63	3256.52
240	1.296	4.00	0.77	3256.66
300	1.312	4.00	0.85	3256.74
420	1.365	4.00	0.98	3256.87
600	1.412	4.00	1.14	3257.03
840	1.461	4.00	1.32	3257.21
1200	1.519	4.00	1.55	3257.44
1500	1.555	4.00	1.68	3257.57
1800	1.584	4.00	1.78	3257.67

Regression Output:

Constant		-910.26
Std Err of Y Est		0.0063
R Squared		0.9977
No. of Observations		10
Degrees of Freedom		8
X Coefficient(s)	0.2799	
Std Err of Coef.	0.0048	

Aquifer test results — Well 124B, Test #2
Static head: 3258.16 feet — Elevation at top of casing: 3259.89
Short slug out — Test date: 08-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0						
5	1.397				3256.35	1.81
10	1.400				3256.36	1.80
15	1.403				3256.37	1.79
20	1.406				3256.38	1.78
25	1.409				3256.39	1.77
30	1.411				3256.40	1.76
35	1.413				3256.41	1.75
40	1.415				3256.41	1.75
45	1.418				3256.42	1.74
50	1.421				3256.43	1.73
55	1.423				3256.44	1.72
60	1.425				3256.45	1.71
65	1.427				3256.45	1.71
70	1.429				3256.46	1.70
75	1.431				3256.47	1.69
80	1.433				3256.47	1.69
85	1.435				3256.48	1.68
90	1.438				3256.49	1.67
100	1.442				3256.50	1.66
110	1.446				3256.52	1.64
120	1.450				3256.53	1.63
130	1.454				3256.54	1.62
140	1.457	4.00	0.70	3256.57	3256.55	1.61
150	1.461				3256.57	1.59
160	1.466				3256.58	1.58
170	1.469				3256.59	1.57
180	1.473	4.00	0.75	3256.62	3256.61	1.55
190	1.477				3256.62	1.54
200	1.481				3256.63	1.53
210	1.484	4.00	0.78	3256.65	3256.64	1.52
220	1.488				3256.66	1.50
230	1.491				3256.67	1.49
240	1.495	4.00	0.80	3256.67	3256.68	1.48
250	1.498				3256.69	1.47
260	1.502				3256.70	1.46
270	1.505				3256.71	1.45
280	1.509				3256.73	1.43
290	1.512				3256.74	1.42
300	1.515	4.00	0.88	3256.75	3256.75	1.41
315	1.521				3256.77	1.39
330	1.526	4.00	0.90	3256.77	3256.78	1.38
345	1.530				3256.80	1.36
360	1.535				3256.81	1.35
375	1.540	4.00	0.96	3256.83	3256.83	1.33
390	1.544				3256.84	1.32
405	1.549				3256.86	1.30
420	1.553	4.00	1.00	3256.87	3256.87	1.29
435	1.558				3256.89	1.27
450	1.562	4.00	1.03	3256.90	3256.90	1.26
465	1.567				3256.92	1.24
480	1.571	4.00	1.07	3256.94	3256.93	1.23
495	1.575				3256.95	1.21
510	1.579	4.00	1.09	3256.96	3256.96	1.20
525	1.583				3256.97	1.19
540	1.587	4.00	1.12	3256.99	3256.99	1.17
555	1.592				3257.00	1.16
570	1.596	4.00	1.14	3257.01	3257.02	1.14
585	1.599				3257.03	1.13
600	1.603	4.00	1.17	3257.04	3257.04	1.12
630	1.610	4.00	1.20	3257.07	3257.06	1.10
660	1.618	4.00	1.22	3257.09	3257.09	1.07
690	1.625				3257.11	1.05
720	1.632	4.00	1.27	3257.14	3257.14	1.02

Aquifer test results Well 124B, Test #2 continued

750	1.639	4.00	1.29	3257.16	3257.16	1.00
780	1.646	4.00	1.31	3257.18	3257.18	0.98
840	1.659	4.00	1.35	3257.22	3257.23	0.93
900	1.671	4.00	1.39	3257.26	3257.27	0.89
960	1.684	4.00	1.44	3257.31	3257.31	0.85
1020	1.695	4.00	1.47	3257.34	3257.35	0.81
1080	1.705	4.00	1.50	3257.37	3257.38	0.78
1140	1.714	4.00	1.54	3257.41	3257.41	0.75
1200	1.724	4.00	1.57	3257.44	3257.44	0.72
1260	1.733	4.00	1.60	3257.47	3257.47	0.69
1320	1.742	4.00	1.63	3257.50	3257.50	0.66
1380	1.750	4.00	1.66	3257.53	3257.53	0.63
1440	1.758	4.00	1.69	3257.56	3257.56	0.60
1500	1.765	4.00	1.72	3257.59	3257.58	0.58
1560	1.772	4.00	1.74	3257.61	3257.60	0.56
1620	1.780	4.00	1.76	3257.63	3257.63	0.53
1680	1.786	4.00	1.78	3257.65	3257.65	0.51
1740	1.791	4.00	1.80	3257.67	3257.67	0.49
1800	1.796				3257.68	0.48
1920	1.807	3.00	0.85	3257.72	3257.72	0.44
2040	1.818	3.00	0.89	3257.76	3257.76	0.40
2160	1.827	3.00	0.92	3257.79	3257.79	0.37
2280	1.834	3.00	0.95	3257.82	3257.81	0.35
2370	1.840	3.00	0.97	3257.84	3257.83	0.33

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
140	1.457	4.00	0.70	3256.57
180	1.473	4.00	0.75	3256.62
210	1.484	4.00	0.78	3256.65
240	1.495	4.00	0.80	3256.67
300	1.515	4.00	0.88	3256.75
330	1.526	4.00	0.90	3256.77
375	1.540	4.00	0.96	3256.83
420	1.553	4.00	1.00	3256.87
450	1.562	4.00	1.03	3256.90
480	1.571	4.00	1.07	3256.94
510	1.579	4.00	1.09	3256.96
540	1.587	4.00	1.12	3256.99
570	1.596	4.00	1.14	3257.01
600	1.603	4.00	1.17	3257.04
630	1.610	4.00	1.20	3257.07
660	1.618	4.00	1.22	3257.09
720	1.632	4.00	1.27	3257.14
750	1.639	4.00	1.29	3257.16
780	1.646	4.00	1.31	3257.18
840	1.659	4.00	1.35	3257.22
900	1.671	4.00	1.39	3257.26
960	1.684	4.00	1.44	3257.31
1020	1.695	4.00	1.47	3257.34
1080	1.705	4.00	1.50	3257.37
1140	1.714	4.00	1.54	3257.41
1200	1.724	4.00	1.57	3257.44
1260	1.733	4.00	1.60	3257.47
1320	1.742	4.00	1.63	3257.50
1380	1.750	4.00	1.66	3257.53
1440	1.758	4.00	1.69	3257.56
1500	1.765	4.00	1.72	3257.59
1560	1.772	4.00	1.74	3257.61
1620	1.780	4.00	1.76	3257.63
1680	1.786	4.00	1.78	3257.65
1740	1.791	4.00	1.80	3257.67
1920	1.807	3.00	0.85	3257.72
2040	1.818	3.00	0.89	3257.76
2160	1.827	3.00	0.92	3257.79
2280	1.834	3.00	0.95	3257.82
2370	1.840	3.00	0.97	3257.84

Aquifer test results   Well 124B, Test #2 continued

Regression Output:

Constant		-975.08
Std Err of Y Est		0.0020
R Squared		0.9997
No. of Observations		40
Degrees of Freedom		38
X Coefficient(s)	0.2999	
Std Err of Coef.	0.0008	

Aquifer test results   Well 124C, Test #1
Static head: 3258.03 feet   Elevation at top of casing: 3260.31
Long slug out   Test date: 01-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0						
5	1.819				3255.97	2.06
10	1.894				3256.25	1.78
15	1.951				3256.46	1.57
20	2.003				3256.66	1.37
25	2.050				3256.83	1.20
30	2.090	5.00	1.67	3256.98	3256.98	1.05
35	2.120				3257.09	0.94
40	2.150				3257.20	0.83
45	2.180				3257.32	0.71
50	2.200				3257.39	0.64
55	2.220				3257.47	0.56
60	2.230				3257.50	0.53
65	2.250				3257.58	0.45
70	2.260				3257.62	0.41
75	2.270				3257.65	0.38
80	2.280				3257.69	0.34
85	2.290				3257.73	0.30
90	2.300	5.00	2.46	3257.77	3257.77	0.26
95	2.300				3257.77	0.26
100	2.310				3257.80	0.23
105	2.320				3257.84	0.19
110	2.320				3257.84	0.19
115	2.330				3257.88	0.15
120	2.330				3257.88	0.15
130	2.340				3257.91	0.12
140	2.340				3257.91	0.12
150	2.350	5.00	2.64	3257.95	3257.95	0.08
160	2.350				3257.95	0.08
170	2.360				3257.99	0.04
180	2.360	5.00	2.67	3257.98	3257.99	0.04
240	2.360	5.00	2.70	3258.01	3257.99	0.04
300	2.370	5.00	2.71	3258.02	3258.03	0.00
360	2.370	5.00	2.71	3258.02	3258.03	0.00
450	2.370	5.00	2.71	3258.02	3258.03	0.00

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
30	2.090	5.00	1.67	3256.98
90	2.300	5.00	2.46	3257.77
150	2.350	5.00	2.64	3257.95
180	2.360	5.00	2.67	3257.98
240	2.360	5.00	2.70	3258.01
300	2.370	5.00	2.71	3258.02

Aquifer test results Well 124C, Test #1 continued

Regression Output:		
Constant		-869.44
Std Err of Y Est		0.0035
R Squared		0.9992
No. of Observations		6
Degrees of Freedom		4
X Coefficient(s)	0.2676	
Std Err of Coef.	0.0039	

Aquifer test results Well 124C, Test #2
Static head: 3258.03 feet Elevation at top of casing: 3260.31
Long slug out Test date: 01-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0	1.610					
5	1.786				3255.93	2.10
10	1.860				3256.20	1.83
15	1.928				3256.45	1.58
20	1.982				3256.64	1.39
25	2.030				3256.82	1.21
30	2.070	5.00	1.65	3256.96	3256.97	1.06
35	2.100				3257.08	0.95
40	2.130				3257.18	0.85
45	2.160				3257.29	0.74
50	2.180				3257.37	0.66
55	2.200				3257.44	0.59
60	2.220				3257.51	0.52
65	2.230				3257.55	0.48
70	2.250				3257.62	0.41
75	2.260				3257.66	0.37
80	2.270				3257.70	0.33
85	2.280				3257.73	0.30
90	2.280	5.00	2.45	3257.76	3257.73	0.30
95	2.290				3257.77	0.26
100	2.300				3257.81	0.22
105	2.300				3257.81	0.22
110	2.310				3257.84	0.19
115	2.310				3257.84	0.19
120	2.320				3257.88	0.15
130	2.330				3257.92	0.11
140	2.330				3257.92	0.11
150	2.340	5.00	2.63	3257.94	3257.95	0.08
160	2.340				3257.95	0.08
170	2.340				3257.95	0.08
180	2.340	5.00	2.66	3257.97	3257.95	0.08
190	2.350				3257.99	0.04
200	2.350				3257.99	0.04
210	2.350	5.00	2.68	3257.99	3257.99	0.04
240	2.350	5.00	2.69	3258.00	3257.99	0.04
270	2.350	5.00	2.70	3258.01	3257.99	0.04
360	2.360	5.00	2.71	3258.02	3258.03	0.00

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
30	2.070	5.00	1.65	3256.96
90	2.280	5.00	2.45	3257.76
150	2.340	5.00	2.63	3257.94
210	2.350	5.00	2.68	3257.99
360	2.360	5.00	2.71	3258.02

Aquifer test results   Well 124C, Test #2 continued

Regression Output:

Constant		-887.75
Std Err of Y Est		0.0048
R Squared		0.9988
No. of Observations		5
Degrees of Freedom		3
X Coefficient(s)	0.2732	
Std Err of Coef.	0.0054	

Aquifer test results   Well 124C, Test #3
Static head: 3258.03 feet   Elevation at top of casing: 3260.31
Long slug out   Test date: 01-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0	1.695					
5	1.750				3255.73	2.30
10	1.829				3256.02	2.01
20	1.948				3256.46	1.57
25	2.000				3256.66	1.37
30	2.050				3256.84	1.19
35	2.110				3257.07	0.96
40	2.140				3257.18	0.85
45	2.160	5.00	1.94	3257.25	3257.26	0.77
50	2.180				3257.33	0.70
55	2.210				3257.44	0.59
60	2.220				3257.48	0.55
65	2.240				3257.55	0.48
70	2.250				3257.59	0.44
75	2.260				3257.63	0.40
80	2.280				3257.70	0.33
85	2.290	5.00	2.45	3257.76	3257.74	0.29
95	2.300				3257.78	0.25
105	2.310				3257.82	0.21
115	2.320				3257.85	0.18
120	2.330				3257.89	0.14
130	2.340				3257.93	0.10
150	2.350	5.00	2.64	3257.95	3257.96	0.07
180	2.360				3258.00	0.03
300	2.360	5.00	2.71	3258.02	3258.00	0.03
444	2.370	5.00	2.71	3258.02	3258.04	-0.01

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
45	2.160	5.00	1.94	3257.25
85	2.290	5.00	2.45	3257.76
150	2.350	5.00	2.64	3257.95

Regression Output:

Constant		-870.78
Std Err of Y Est		0.0067
R Squared		0.9977
No. of Observations		3
Degrees of Freedom		1
X Coefficient(s)	0.2680	
Std Err of Coef.	0.0130	

Aquifer test results — Well 124C, Test #4

Static head: 3258.08 feet — Elevation at top of casing: 3260.31

Long slug out — Test date: 08-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0						
5	1.357				3255.28	2.80
10	1.369				3255.36	2.72
20	1.521				3256.32	1.76
25	1.555				3256.54	1.54
30	1.587				3256.74	1.34
35	1.612				3256.90	1.18
40	1.635				3257.04	1.04
45	1.654				3257.16	0.92
55	1.687				3257.37	0.71
60	1.700				3257.45	0.63
65	1.711				3257.52	0.56
70	1.722				3257.59	0.49
75	1.731				3257.65	0.43
80	1.740				3257.71	0.37
90	1.751				3257.78	0.30
95	1.756				3257.81	0.27
100	1.760				3257.83	0.25
105	1.765				3257.87	0.21
110	1.767				3257.88	0.20
115	1.771				3257.90	0.18
120	1.774				3257.92	0.16
130	1.779	4.00	1.65	3257.96	3257.95	0.13
140	1.782				3257.97	0.11
142	1.784				3257.99	0.09
161	1.787				3258.01	0.07
171	1.789				3258.02	0.06
178	1.790				3258.02	0.06
192	1.792	4.00	1.72	3258.03	3258.04	0.04
209	1.793			.	3258.04	0.04
242	1.795	4.00	1.74	3258.05	3258.06	0.02
281	1.796	4.00	1.75	3258.06	3258.06	0.02
300	1.797	4.00	1.77	3258.08	3258.07	0.01

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
130	1.779	4.00	1.65	3257.96
192	1.792	4.00	1.72	3258.03
242	1.795	4.00	1.74	3258.05
281	1.796	4.00	1.75	3258.06
300	1.797	4.00	1.77	3258.08

Regression Output:

Constant		-512.92
Std Err of Y Est		0.0014
R Squared		0.9719
No. of Observations		5
Degrees of Freedom		3
X Coefficient(s)	0.1580	
Std Err of Coef.	0.0155	

Aquifer test results — Well 124D, Test #1
Static head: 3257.92 feet — Elevation at top of casing: 3260.32
Long slug out — Test date: 14-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0						
5	1.671				3254.11	3.81
10	1.751				3255.18	2.74
15	1.809				3255.95	1.97
20	1.846				3256.44	1.48
25	1.878				3256.87	1.05
30	1.894				3257.08	0.84
35	1.909				3257.28	0.64
40	1.920				3257.43	0.49
45	1.930				3257.56	0.36
50	1.935				3257.63	0.29
55	1.938				3257.67	0.25
60	1.943				3257.74	0.18
65	1.946				3257.78	0.14
70	1.948				3257.80	0.12
75	1.949				3257.82	0.10
80	1.951				3257.84	0.08
85	1.952				3257.86	0.06
90	1.953	4.00	1.55	3257.87	3257.87	0.05
95	1.954				3257.88	0.04
120	1.955				3257.90	0.02
144	1.956	3.00	0.59	3257.91	3257.91	0.01

Data for linear calculations:

time (sec)	Volts	Hold	Cut	head(tape)
90	1.953	4.00	1.55	3257.87
144	1.956	3.00	0.59	3257.91

Straight-line calculation results:
Slope = 0.075
Y intercept = -242.387

Aquifer test results — Well 124D, Test #2
Static head: 3257.92 feet — Elevation at top of casing: 3260.32
Long slug out — Test date: 14-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0						
5	1.664				3256.79	1.13
10	1.750				3257.11	0.81
15	1.804				3257.31	0.61
20	1.847				3257.47	0.45
25	1.873				3257.56	0.36
30	1.897				3257.65	0.27
35	1.913				3257.71	0.21
40	1.922				3257.75	0.17
45	1.933				3257.79	0.13
50	1.941				3257.82	0.10
55	1.945	4.00	1.51	3257.83	3257.83	0.09
60	1.948				3257.84	0.08
65	1.951				3257.85	0.07
70	1.954				3257.86	0.06
75	1.955				3257.87	0.05
80	1.957				3257.87	0.05
85	1.958				3257.88	0.04
95	1.959				3257.88	0.04
100	1.960				3257.89	0.03
119	1.961	3.00	0.57	3257.89	3257.89	0.03
162	1.963	3.00	0.58	3257.90	3257.90	0.02
195	1.967	3.00	0.59	3257.91	3257.91	0.01
232	1.968	3.00	0.60	3257.915	3257.92	0.00

Aquifer test results   Well 124D, Test #2 continued

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
55	1.945	4.00	1.51	3257.83
119	1.961	3.00	0.57	3257.89
162	1.963	3.00	0.58	3257.90
195	1.967	3.00	0.59	3257.91
232	1.968	3.00	0.60	3257.915

Regression Output:

Constant		-877.39
Std Err of Y Est		0.0006
R Squared		0.9973
No. of Observations		5
Degrees of Freedom		3
X Coefficient(s)	0.2699	
Std Err of Coef.	0.0081	

Aquifer test results   Well 124E, Test #1
Static head: 3257.90 feet   Elevation at top of casing: 3260.43
Long slug out   Test date: 01-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0	1.505					
5	1.528				3255.19	2.71
10	1.548				3255.34	2.56
15	1.549				3255.35	2.55
20	1.551				3255.37	2.53
25	1.553				3255.38	2.52
30	1.555	6.00	0.95	3255.38	3255.40	2.50
35	1.556				3255.41	2.49
40	1.558				3255.42	2.48
45	1.559				3255.43	2.47
50	1.561				3255.44	2.46
55	1.562				3255.45	2.45
60	1.564				3255.47	2.43
70	1.567				3255.49	2.41
80	1.569				3255.50	2.40
90	1.572	6.00	1.10	3255.53	3255.53	2.37
100	1.575				3255.55	2.35
110	1.578				3255.57	2.33
120	1.581	6.00	1.18	3255.61	3255.60	2.30
135	1.584				3255.62	2.28
150	1.587				3255.64	2.26
165	1.592				3255.68	2.22
180	1.596	6.00	1.28	3255.71	3255.71	2.19
195	1.599				3255.73	2.17
210	1.603				3255.76	2.14
225	1.607				3255.79	2.11
240	1.610	6.00	1.38	3255.81	3255.82	2.08
255	1.613				3255.84	2.06
270	1.617				3255.87	2.03
285	1.620				3255.89	2.01
300	1.624	6.00	1.50	3255.93	3255.92	1.98
330	1.630				3255.97	1.93
360	1.636	6.00	1.59	3256.02	3256.02	1.88
420	1.648	6.00	1.69	3256.12	3256.11	1.79
450	1.654				3256.15	1.75
480	1.660	6.00	1.77	3256.20	3256.20	1.70
510	1.665				3256.24	1.66
540	1.670	6.00	1.85	3256.28	3256.28	1.62
570	1.676				3256.32	1.58
600	1.681	6.00	1.94	3256.37	3256.36	1.54
630	1.686				3256.40	1.50

Aquifer test results Well 124E, Test #1 continued

660	1.691	6.00	2.00	3256.43	3256.44	1.46
690	1.695				3256.47	1.43
720	1.700	6.00	2.07	3256.50	3256.51	1.39
750	1.704				3256.54	1.36
780	1.709	6.00	2.13	3256.56	3256.57	1.33
810	1.713				3256.60	1.30
840	1.718	6.00	2.21	3256.64	3256.64	1.26
870	1.721				3256.67	1.23
900	1.725	6.00	2.27	3256.70	3256.70	1.20
930	1.729				3256.73	1.17
960	1.733	6.00	2.33	3256.76	3256.76	1.14
990	1.736				3256.78	1.12
1020	1.740				3256.81	1.09
1050	1.743	4.00	0.40	3256.83	3256.83	1.07
1080	1.746	4.00	0.43	3256.86	3256.86	1.04
1110	1.750				3256.89	1.01
1140	1.753	4.00	0.48	3256.91	3256.91	0.99
1170	1.756				3256.93	0.97
1200	1.759	4.00	0.53	3256.96	3256.96	0.94
1260	1.765	4.00	0.58	3257.01	3257.00	0.90
1320	1.771	4.00	0.61	3257.04	3257.05	0.85
1380	1.776	4.00	0.65	3257.08	3257.09	0.81
1440	1.781	4.00	0.69	3257.12	3257.12	0.78
1500	1.785	4.00	0.73	3257.16	3257.15	0.75
1560	1.790	4.00	0.76	3257.19	3257.19	0.71
1680	1.798	4.00	0.83	3257.26	3257.25	0.65
1800	1.805	4.00	0.88	3257.31	3257.31	0.59
2100	1.821	4.00	1.00	3257.43	3257.43	0.47
2400	1.833	4.00	1.09	3257.52	3257.52	0.38
2700	1.842	4.00	1.16	3257.59	3257.59	0.31

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
30	1.555	6.00	0.95	3255.38
90	1.572	6.00	1.10	3255.53
120	1.581	6.00	1.18	3255.61
180	1.596	6.00	1.28	3255.71
240	1.610	6.00	1.38	3255.81
300	1.624	6.00	1.50	3255.93
360	1.636	6.00	1.59	3256.02
420	1.648	6.00	1.69	3256.12
480	1.660	6.00	1.77	3256.20
540	1.670	6.00	1.85	3256.28
600	1.681	6.00	1.94	3256.37
660	1.691	6.00	2.00	3256.43
720	1.700	6.00	2.07	3256.50
780	1.709	6.00	2.13	3256.56
840	1.718	6.00	2.21	3256.64
900	1.725	6.00	2.27	3256.70
960	1.733	6.00	2.33	3256.76
1050	1.743	4.00	0.40	3256.83
1080	1.746	4.00	0.43	3256.86
1140	1.753	4.00	0.48	3256.91
1200	1.759	4.00	0.53	3256.96
1260	1.765	4.00	0.58	3257.01
1320	1.771	4.00	0.61	3257.04
1380	1.776	4.00	0.65	3257.08
1440	1.781	4.00	0.69	3257.12
1500	1.785	4.00	0.73	3257.16
1560	1.790	4.00	0.76	3257.19
1680	1.798	4.00	0.83	3257.26
1800	1.805	4.00	0.88	3257.31
2100	1.821	4.00	1.00	3257.43
2400	1.833	4.00	1.09	3257.52
2700	1.842	4.00	1.16	3257.59

Aquifer test results Well 124E, Test #1 continued

Regression Output:

Constant		-424.50
Std Err of Y Est		0.0009
R Squared		0.9999
No. of Observations		32
Degrees of Freedom		30
X Coefficient(s)	0.1309	
Std Err of Coef.	0.0003	

Aquifer test results Well 124E, Test #2
Static head: 3257.89 feet Elevation at top of casing: 3260.43
Long slug out Test date: 14-Nov-87

time (sec)	Volts	Hold	Cut	head(tape)	HEAD(v)	s(feet)
0	1.633					
5	1.636				3255.35	2.54
10	1.639				3255.37	2.52
20	1.643				3255.40	2.49
25	1.645				3255.42	2.47
30	1.647				3255.43	2.46
35	1.650				3255.45	2.44
40	1.653				3255.47	2.42
45	1.654				3255.48	2.41
50	1.657				3255.50	2.39
55	1.659				3255.52	2.37
60	1.662				3255.54	2.35
65	1.665				3255.56	2.33
70	1.667				3255.58	2.31
75	1.669				3255.59	2.30
80	1.671				3255.60	2.29
85	1.673				3255.62	2.27
90	1.676				3255.64	2.25
95	1.678				3255.65	2.24
105	1.682				3255.68	2.21
110	1.684				3255.70	2.19
115	1.686				3255.71	2.18
120	1.689	5.00	0.30	3255.73	3255.73	2.16
130	1.693				3255.76	2.13
140	1.697				3255.79	2.10
150	1.701				3255.82	2.07
160	1.705				3255.85	2.04
170	1.709				3255.88	2.01
180	1.712	5.00	0.48	3255.91	3255.90	1.99
190	1.716				3255.93	1.96
200	1.720				3255.96	1.93
210	1.723	5.00	0.56	3255.99	3255.98	1.91
220	1.727				3256.01	1.88
230	1.731				3256.04	1.85
240	1.734				3256.06	1.83
250	1.738	5.00	0.65	3256.08	3256.09	1.80
260	1.741				3256.11	1.78
270	1.745				3256.14	1.75
280	1.748				3256.16	1.73
290	1.752	5.00	0.75	3256.18	3256.19	1.70
300	1.754				3256.20	1.69
315	1.759				3256.24	1.65
330	1.764				3256.28	1.61
345	1.768				3256.30	1.59

Aquifer test results Well 124E, Test #2 continued

360	1.773	5.00	0.91	3256.34	3256.34	1.55
390	1.781				3256.40	1.49
405	1.785	5.00	1.10	3256.53	3256.43	1.46
420	1.790				3256.46	1.43
435	1.793				3256.48	1.41
450	1.798				3256.52	1.37
465	1.801				3256.54	1.35
480	1.805	5.00	1.15	3256.58	3256.57	1.32
495	1.809				3256.60	1.29
510	1.812				3256.62	1.27
525	1.816				3256.65	1.24
540	1.819	5.00	1.24	3256.67	3256.67	1.22
570	1.826				3256.72	1.17
585	1.829				3256.74	1.15
600	1.832				3256.77	1.12
615	1.836				3256.80	1.09
630	1.838				3256.81	1.08
645	1.841				3256.83	1.06
660	1.844	5.00	1.42	3256.85	3256.85	1.04
690	1.850				3256.90	0.99
720	1.855				3256.93	0.96
750	1.860				3256.97	0.92
780	1.865				3257.00	0.89
810	1.870				3257.04	0.85
840	1.875	5.00	1.64	3257.07	3257.08	0.81
900	1.883				3257.13	0.76
930	1.887				3257.16	0.73
960	1.891				3257.19	0.70
990	1.895				3257.22	0.67
1020	1.898				3257.24	0.65
1050	1.902				3257.27	0.62
1080	1.905	5.00	1.87	3257.30	3257.29	0.60
1148	1.912				3257.34	0.55
1200	1.917				3257.38	0.51
1260	1.922				3257.42	0.47
1320	1.927	5.00	2.01	3257.44	3257.45	0.44
1380	1.932				3257.49	0.40
1440	1.935				3257.51	0.38
1500	1.940				3257.55	0.34
1560	1.942	5.00	2.13	3257.56	3257.56	0.33
1620	1.946				3257.59	0.30
1680	1.949				3257.61	0.28
1740	1.951	5.00	2.21	3257.64	3257.63	0.26
1800	1.954	5.00	2.215	3257.645	3257.65	0.24

Regression data:

time (sec)	Volts	Hold	Cut	head(tape)
120	1.689	5.00	0.30	3255.73
180	1.712	5.00	0.48	3255.91
210	1.723	5.00	0.56	3255.99
250	1.738	5.00	0.65	3256.08
290	1.752	5.00	0.75	3256.18
360	1.773	5.00	0.91	3256.34
480	1.805	5.00	1.15	3256.58
540	1.819	5.00	1.24	3256.67
660	1.844	5.00	1.42	3256.85
840	1.875	5.00	1.64	3257.07
1080	1.905	5.00	1.87	3257.30
1320	1.927	5.00	2.01	3257.44
1560	1.942	5.00	2.13	3257.56
1740	1.951	5.00	2.21	3257.64
1800	1.954	5.00	2.215	3257.645

Regression Output:

Constant		-449.27
Std Err of Y Est		0.0012
R Squared		0.9999
No. of Observations		15
Degrees of Freedom		13
X Coefficient(s)	0.1385	
Std Err of Coef.	0.0005	

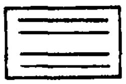
APPENDIX # 3

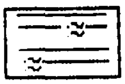
This appendix contains all stratigraphic data collected and analyzed for this study.

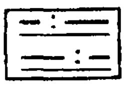
List of contents:

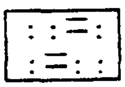
TABLE A: This table contains stratigraphic logs of cores collected during this study at the geochemical study sites. Cores were collected with a four-inch hand auger.

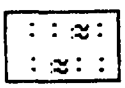
Milltown Cores
Stratigraphic key

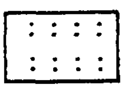
 Clay

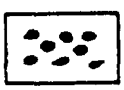
 Silty clay

 Sandy clay

 Clayey sand

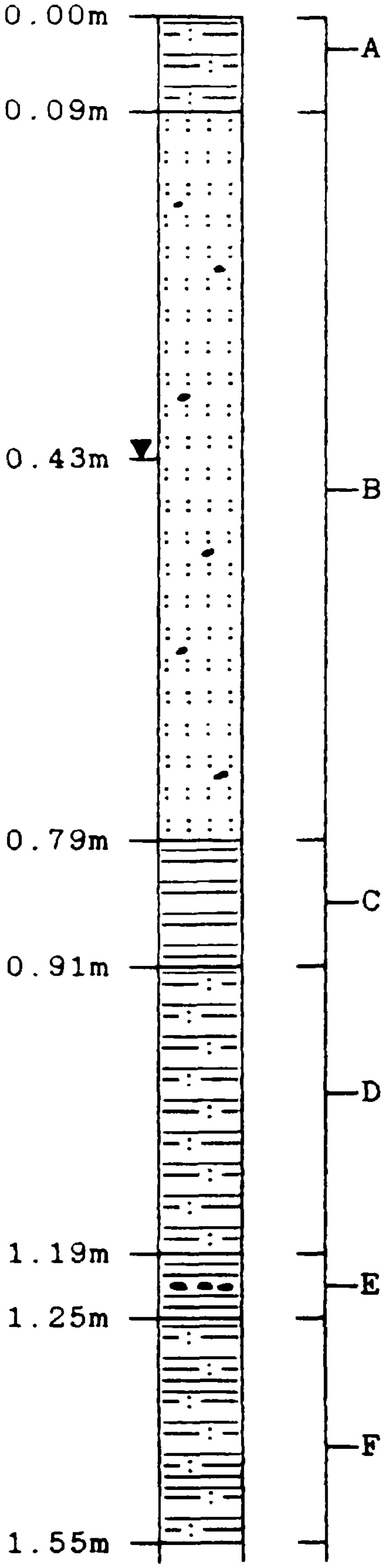
 Silty sand

 Sand

 Organic material (leaves, twigs, bark)

 Peat

Core log, Site 121
Elevation: 993.38m
3259.11'



A: Grey and brown sandy clays, numerous fine and medium roots, numerous 5 mm. orange mottles.

B: Grey coarse and medium sand, clean, bimodal, quartz-rich. Common 5-10 mm. orange mottles. Roots common, decrease to few with depth. Occasional black organic material.

WATER TABLE: 0.43 meters.

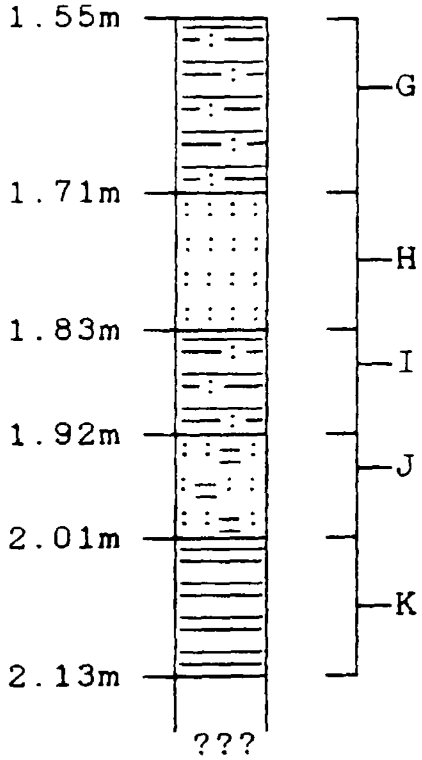
C: Abrupt upper contact. Grey clay with few 5 mm. orange and black mottles. Few roots.

D: Grey sandy clay, sand decreases with depth.

E: Horizontally bedded grey clay with fine black organic material.

F: Pale green sandy clay, intimately interbedded with beds of Unit E. Beds from 1-3 cm. thick.

Core log, Site 121
continued



G: Grey sandy clay with common 5 mm. black mottles.

H: Medium sand, well-sorted, very clean, quartz-rich.

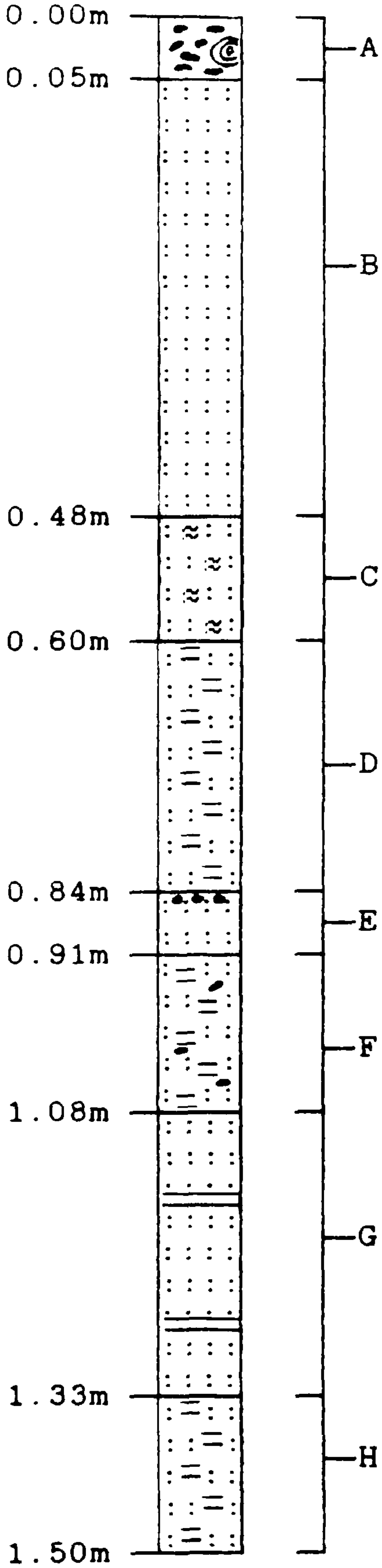
I: Gray sandy clay, very similar to Unit G.

J: Brown medium sand mixed with grey clay.

K: Black clay.

Below: Hole caves.

Core log, Site 122
Elevation: 993.15m
3258.37'



A: Black humus, abundant grass roots, and a large piece of rotting log.

B: Light brown fine sand with 5 mm. grey and orange mottles. Includes small percentage of medium sand, silts and clay. Micaceous.

C: Thin (to 1 mm.) grey and black laminae of fine sand and silty clay. Micaceous, with 5 mm. grey and orange mottles.

D: Thin (1-3 mm.) laminae of fine sands and grey clay. Darker color and more clay-rich than Unit C. Micaceous, with 5 mm. orange mottles.

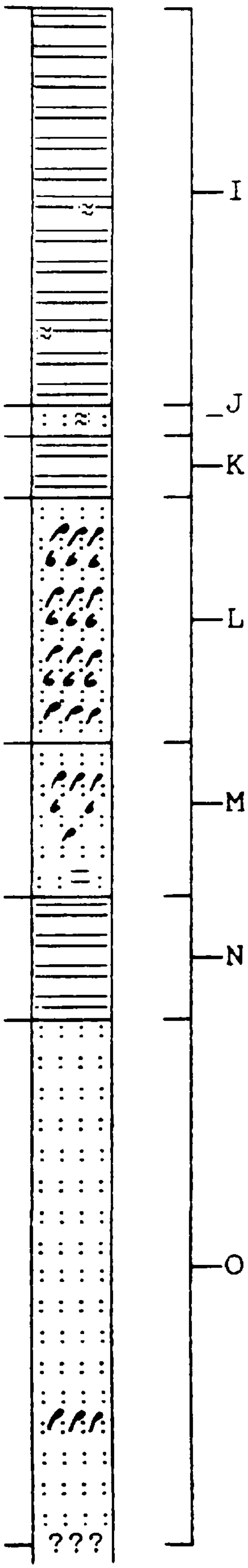
E: Upper contact abrupt, marked by dark brown organic material. Dark brown medium sand with large (2 cm.) orange mottles. Micaceous.

F: Dark grey/black fine sand. Clayey and micaceous. Occasional organic material. No orange mottles.

G: Dominantly black fine and very fine sand with occasional lighter grey, clay rich laminae to 2 mm.

H: Dark grey clayey very fine sand with 1-5 mm. black mottles.

Core log, Site 122
continued



1.50m

I: Dominantly massive light grey, plastic, sticky clay. Occasional thin (1-2 mm.) layers of coarser silty black clay.

1.88m

J: Dark greenish black fine-grained silty sand.

1.93m

K: Light grey clay.

1.98m

L: Abrupt upper contact. Sandy peat. Contains 5 cm. layer of peat.

2.21m

M: Gradational upper contact. Dominantly fine sands, peat-rich towards top, grading downward into clay-rich fine sands.

2.39m

N: Gradational upper contact. Light grey clay.

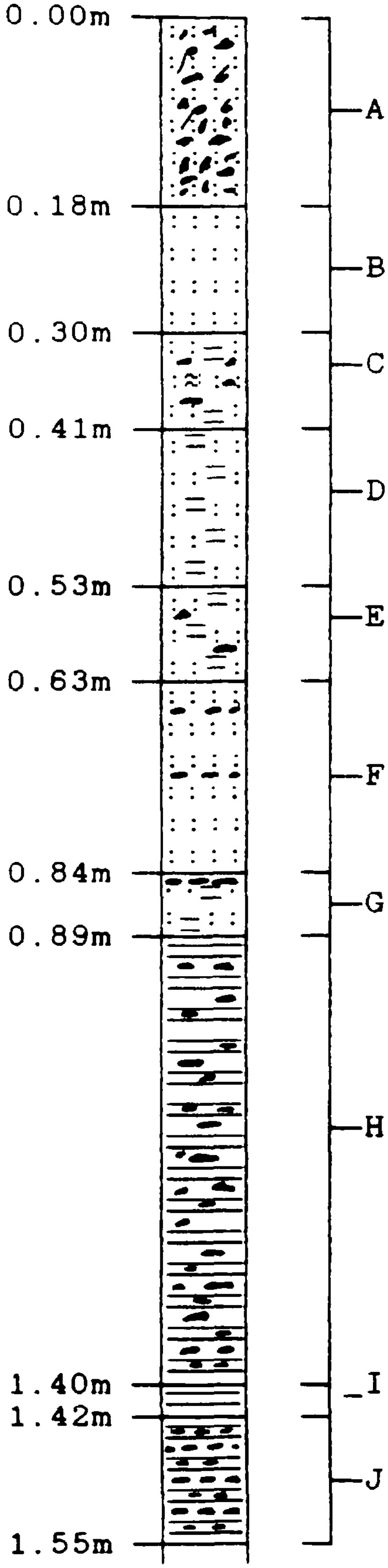
2.51m

O: Dark grey fine sand. Peaty layer with grey root channel at 2.90 meters. Rare 5 mm. green/grey mottles.

3.02m

Below: Hole caves.

Core log, Site 123
Elevation: 993.46m
3259.37'



A: Humus, sandy, abundant dark brown organic material, abundant roots.

B: Light brown well sorted medium sand. Grey and orange mottles. Roots common.

C: Dark brown medium sand with clay and silt. Orange and grey mottles. Roots and semi-decayed plant material (including twigs and roots) common.

D: Dark brown clayey medium sand with grey and orange mottles. Very moist.

E: Dark grey clay-rich fine sand with common 5 mm. orange mottles. Occasional black organic material which appears charred.

F: Medium sand with thin (1 cm.) strata of black organic material. Orange mottles to 5 mm. common.

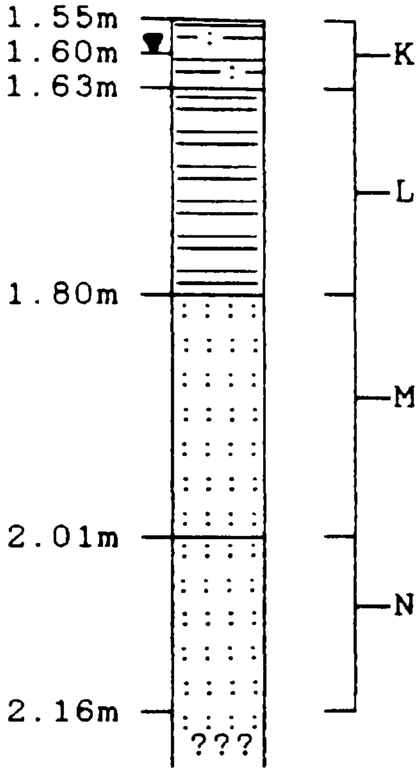
G: Moist medium sand with slightly more clay than Unit F. Abrupt upper contact marked by unreduced organic material (leaves and twigs). Redox boundary.

H: Dark grey/black clay. Reduced, very moist, with abundant black organic material.

I: Light grey clay.

J: Interbedded micaceous grey clay and black organic material. Laminae 1-3 mm.

Core log, Site 123
continued



K: Micaceous sandy clay.

WATER TABLE: 1.60 meters.

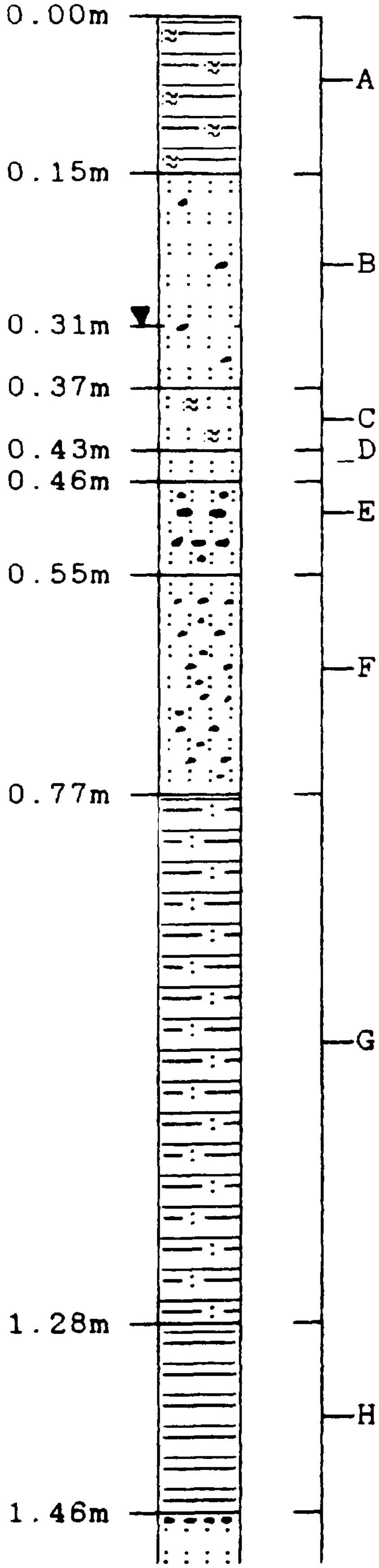
L: Abrupt upper contact. Massive, sticky, plastic grey clay.

M: Abrupt upper contact. Greenish micaceous medium sand with black mottles. Roots common just below upper contact.

N: Gradational upper contact. Coarse, well sorted quartz-rich sand. Lacks organic material.

Below: Hole caves.

Core log, Site 124
Elevation: 993.28m
3258.79'



A: Abundant fine and medium roots, densely intergrown, to 0.107 m. Fine and medium roots common below. Grey clay and silty clay with common 5 mm. brown mottles.

B: Fine and medium roots common. Medium and fine sand, grey with common 5-10 mm. orange mottles, occasional black organic matter.

WATER TABLE: 0.31 meters.

C: Grey fine sand and silt with occasional 5-10 mm. orange mottles.

D: Grey medium and fine sand with occasional 1.0 cm. orange mottles, roots rare.

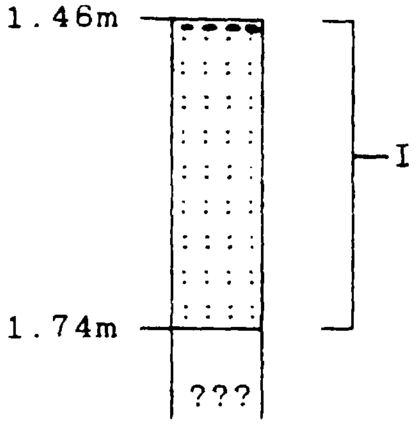
E: Grey medium sand with abundant fine black organic material and common 5 mm. orange mottles.

F: Well-sorted grey medium sand grading down to fine sand. Common black organic material, common orange mottles to 1.0 cm.

G: Grey sandy clay with occasional 5-10 mm. orange mottles. Sand increases and coarsens from fine to medium as depth increases.

H: Green clay. No organic material or mottles. Contains numerous thin (to 1 mm.) interbeds of clays, silts, and fine sands.

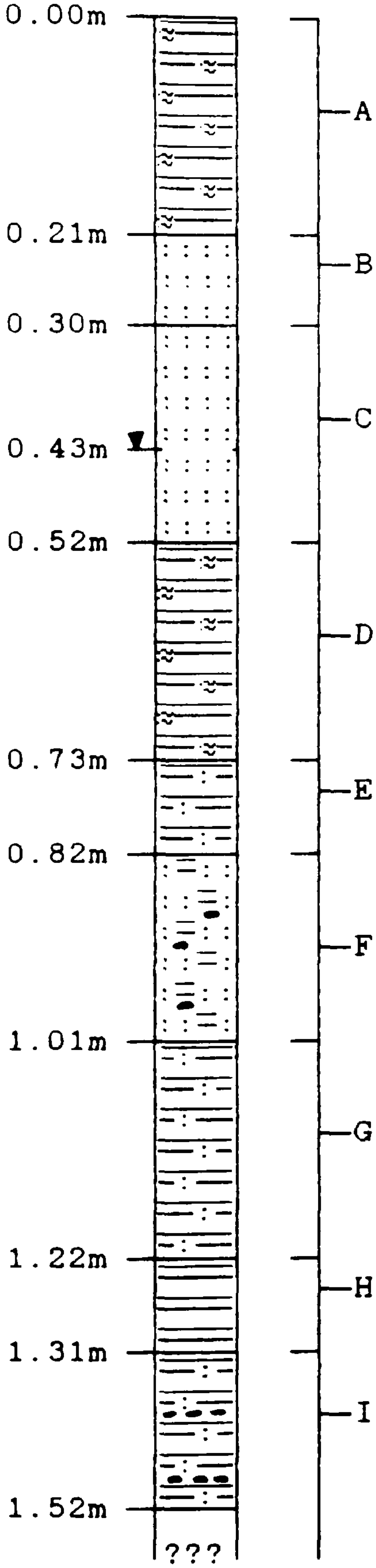
Core log, Site 124
continued



I: Grey medium and fine sand. Abrupt upper contact defined by thin (1-2 mm.) layer of fine black organic material.

Below: Hole caves.

Core log, Site 137
Elevation: 993.39m
3259.16'



A: Brown silty clay with occasional 5 mm. grey and orange mottles. Roots abundant.

B: Grey medium and fine sand with occasional 5 mm. orange mottles. Roots common.

C: Grey medium sand with occasional 5 mm. orange mottles. Roots common.

WATER TABLE: 0.43 meters.

D: Grey silty clay with common 5 mm. orange mottles. Roots common. Sand content increases with depth, grades into Unit E.

E: Gradational upper contact. Grey sandy clay with common 5 mm. orange mottles. Roots common.

F: Gradational upper contact. Grey clayey sand with common 5 mm. orange mottles. Occasional black organic material. Roots common.

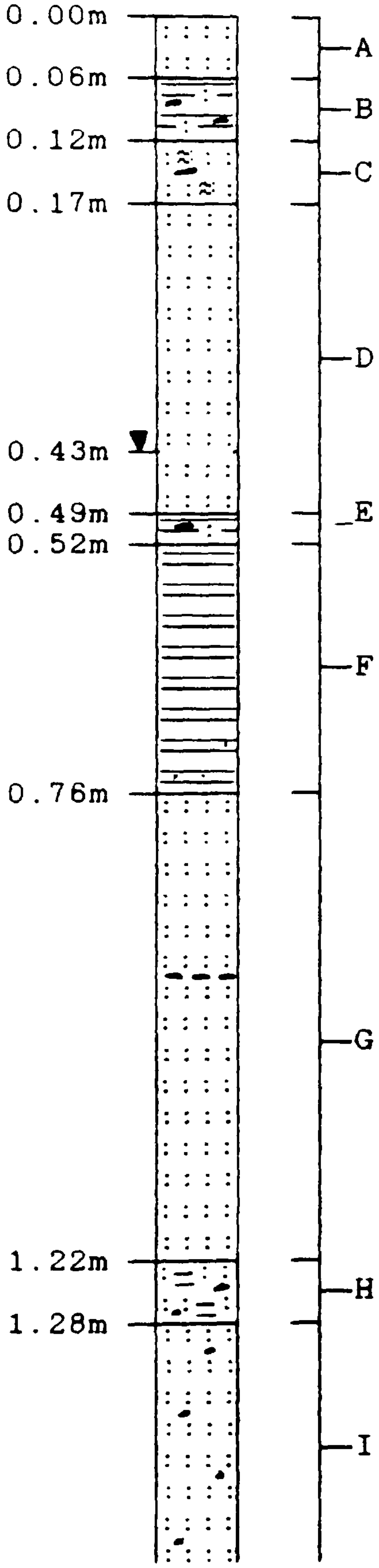
G: Grey sandy clay with rare orange mottles.

H: Abrupt upper contact. Grey micaceous clay, extremely sticky and plastic.

I: Micaceous grey sandy clay with thin (1 mm.) layers of black organic material.

Below: Hole caves.

Core log, Site 138
Elevation: 993.21m
3258.55'



A: Brown, well-sorted fine sand. Fine roots abundant.

B: Brown sandy clay with brown organic material. Fine sand. Fine roots abundant.

C: Grey silts and fine sands with common 5 mm. orange mottles. Micaceous. Occasional black or brown organic material. Roots common.

D: Grey medium and fine sands with occasional 5 mm. orange mottles. Well-sorted, no grading. Roots uncommon, becoming rare with depth.

WATER TABLE: 0.43 meters.

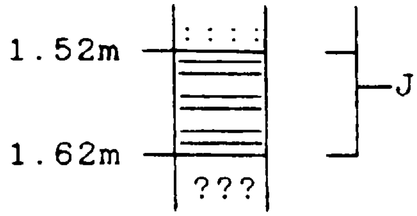
E: Grey sandy clay with occasional 5 mm. orange mottles and occasional black organic material.

F: Firm grey clay with large (to 1.0 cm.) orange concretions. Roots rare. Color grades to black with depth. Rare medium sand grains occur in blacker clay.

G: Abrupt upper contact. Grey fine and medium sand, well-sorted, very clean, with occasional 5 mm. orange mottles. A bed of horizontally layered black organic material occurs at 0.94-1.01 meters.

H: Grey fine clayey sand with occasional black organic material and rare 5 mm. orange mottles.

I: Grey medium sand with occasional black organic material and rare 5 mm. orange mottles. Darker and coarser than Unit H.



J: Grey micaceous clay, extremely plastic and sticky. Very well-sorted.

Below: Hole caves.

TABLE B: This table summarizes boring logs from Rosasco and Catts (1985). Borings were made with a portable two-inch solid stem auger drill rig (Hydrodrill 201P). The depth of "auger refusal" was recorded as "gravel" in all logs, although it is unclear whether bedrock or some other obstruction may have actually been encountered. In all cases, datum for the boring was taken as 993.6 meters (3260 feet). Other surveys indicate that elevations of 993.0 to 993.3 meters (3258 to 3259 feet) are more common in the study area, which would render these elevations 0.3 to 0.6 meters too high (relative to the elevations of the wells installed by University of Montana). Nevertheless, Rosasco and Catts' records have been used exclusively. Borings which were made within the immediate study area have been marked with an asterisk (*).

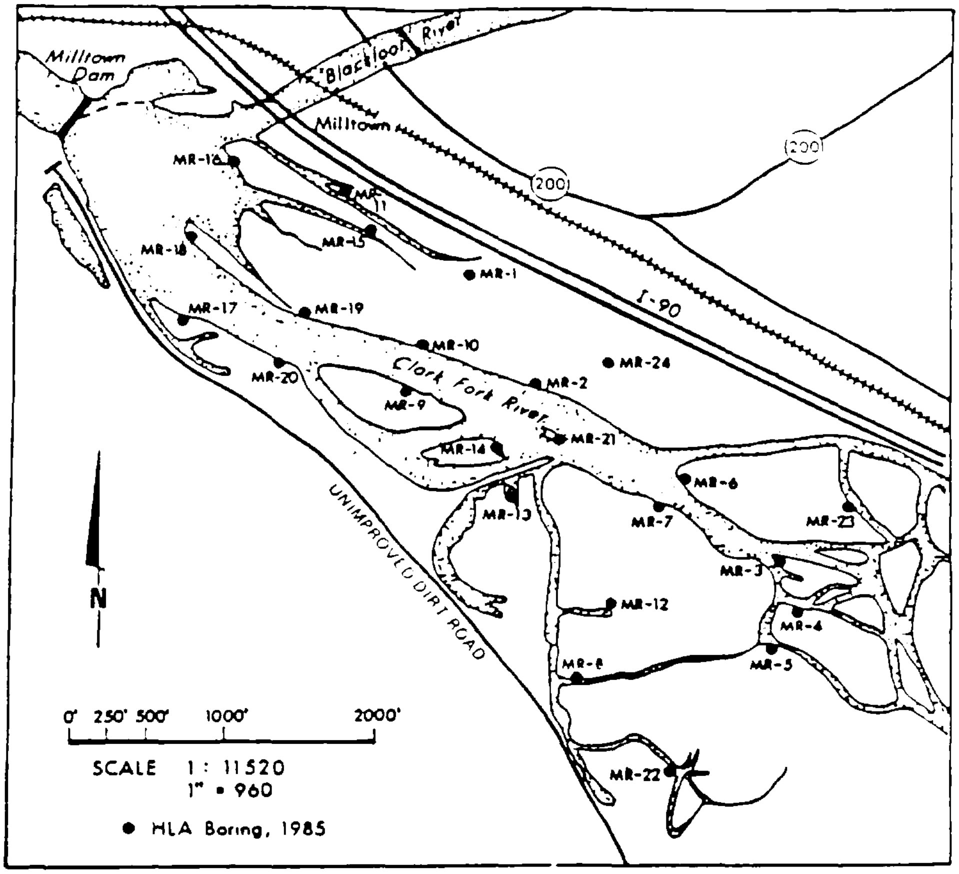
Auger Boring #	Sediment thickness (in meters)	Elevation of top of "gravel" (in meters)
MR-1 *	5.79	987.86
MR-2 *	5.49	988.16
MR-3	0.91	992.73
MR-4	0.91	992.73
MR-5	1.22	992.43
MR-6	3.66	989.99
MR-7	2.74	990.90
MR-8	3.35	990.30
MR-9	5.49	988.16
MR-10 *	5.79	987.86
MR-11 *	7.32	986.33
MR-12	2.44	991.21
MR-13	3.66	989.99
MR-14	4.27	989.38
MR-15 *	6.40	987.25
MR-16 *	3.66	989.99
MR-17	4.57	989.08
MR-18 *	7.62	986.03
MR-19 *	5.49	988.16
MR-20	0.91	992.73
MR-21	5.49	988.16
MR-22	0.91	992.73
MR-23	3.05	990.60
MR-24 *	4.27	989.38

Logs for wells drilled for Montana Power Company in 1984 in the study area indicate the following sediment thicknesses and depths to a gravel-containing unit (Montana Power Company, 1985):

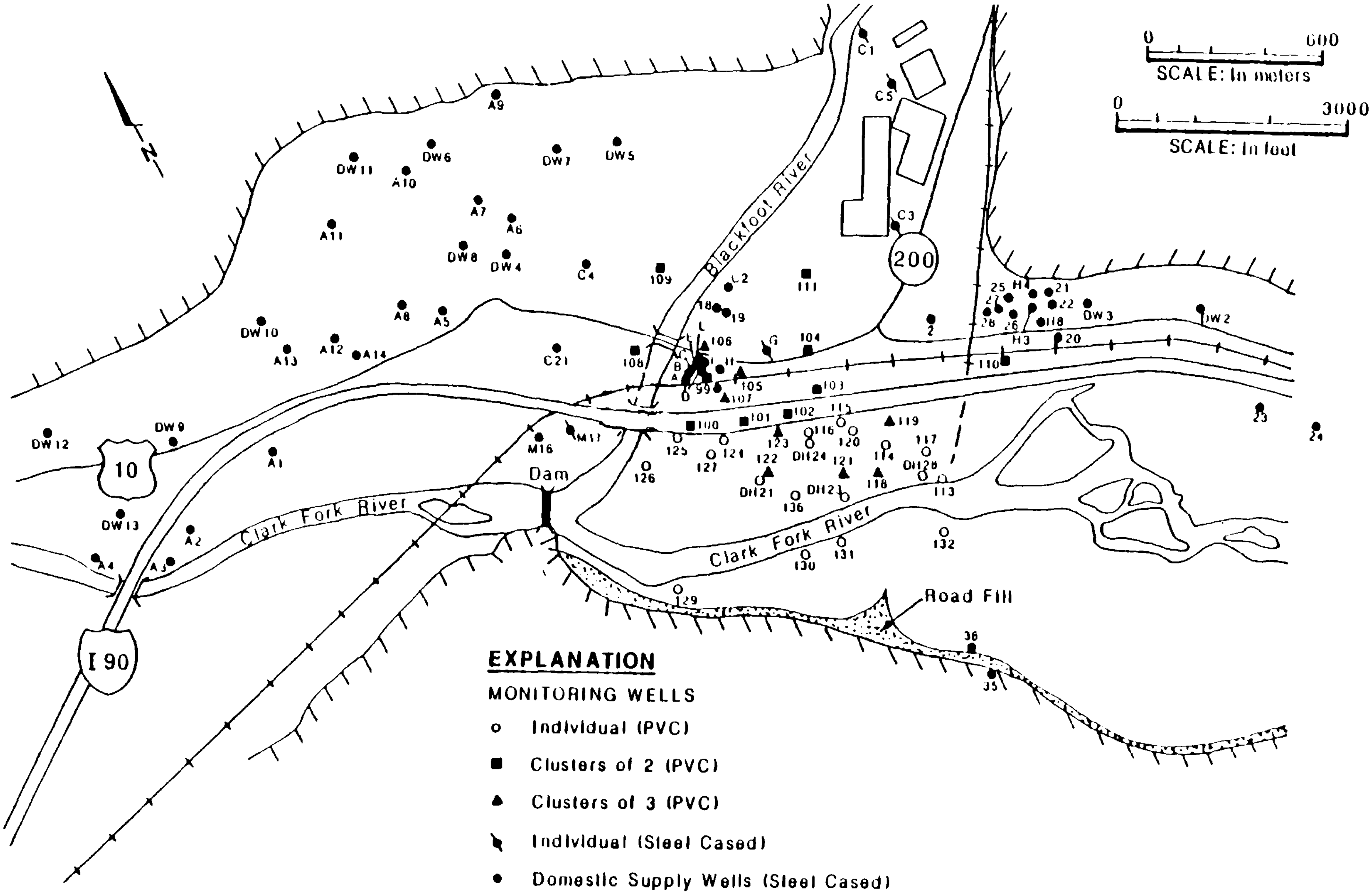
Well #	Sediment thickness (in meters)	Elevation of top of "gravel" (in meters)
DH-21	5.91	987.73 ("sand & gravel")
DH-23	6.25	987.52 ("sand & gravel")
DH-24	5.85	988.16 ("gravel in sandy matrix")
DH-28	4.82	988.98 ("gravel & sand")

Logs for wells drilled by Woessner (1984) in the Milltown aquifer north of the study site typically penetrated a zone of gravel. The elevations of several gravel zones are listed below. This listing is not exhaustive.

Well #	Elevation of top of "gravel" (in meters)	Elevation of bottom of "gravel" (in meters)
100	988.25	984.05
101A	985.51	979.11
102A	987.55	980.25
103A	984.14	982.64
105A	987.89	966.29
106A	987.69	960.00
107A	1002.15	974.35
110A	997.10	959.00
111A	1002.46	971.96



Site map showing boring locations, from Rosasco and Catts (1985), Figure 1.



Site map showing well locations, from Montana Power Company (1985), Figure 10.