Final Report

Evaluating Elevated Arsenic and Molybdenum Concentrations at the Pritcher Road Site, Lithia, Central Florida

Prepared for Florida Department of Environmental Protection, Site Investigation Section

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Executive Summary

Following the discovery of more than 300 µg/L As in a newly installed irrigation well near the village of Lithia in central Florida FDEP SIS sampled and analyzed approximately 100 private supply wells. Of these, 19 showed arsenic concentrations above the current drinking water standard of 10 µg/L. The highest value was 344 µg/L As. In addition many wells had molybdenum (Mo) concentrations above 40 µg/L (the US EPA recommended value). Besides As and Mo, all other parameters were as expected for central Floridan groundwater.

With no obvious anthropogenic or agricultural sources present, the As and Mo are likely of natural (geogenic) origin and released from the aquifer matrix due to a change in physicochemical conditions, such as the rapid infiltration of oxygen-rich surface water into the aquifer. To test this hypothesis 5 multi-level monitoring well clusters were installed in the Lithia are. The cores from 3 wells were logged and sampled for chemical and mineralogical analyses. The monitoring wells and a subset of 40 private supply wells were selected for a comprehensive chemical study, including As speciation, stable isotope analyses and tritium-helium dating.

The chemical study of the water revealed that most groundwater parameters in the monitoring wells and the private supply wells were as expected for central Florida. Only As and Mo showed a distinct pattern of (a) decreasing concentrations with depth and (b) a geographical distribution, with highest values in the center of the study area. A similar pattern could also be observed for $\delta^{18}O$ and δD, where lighter values were generally found at shallow depth. Isotope values for those private wells with elevated As and Mo fall into the same range as the shallow monitoring wells. Age dates for shallow groundwater samples were younger. Rapid infiltration is likely since the ages between waters collected from very shallow wells (approximately 30 ft) is basically are same ages as those for samples collected from at depth around 150 ft to170 ft, while samples from just 30 ft deeper are much older. This separation in age also correlates to a separation based on groundwater levels, which decrease with with depth.

In the 3 cores Mo and As varied significantly with depth and values were often significantly above the crustal average for As and Mo. Values were highest between approximately 130 and 250 ft, which is the interval that roughly corresponds to the Hawthorn and Tampa. Below 250 ft, which corresponds to the Suwannee Limestone values returned “normal”, i.e., expected values for crustal carbonate rocks. The mineral pyrite, which was identified in all cores, contained significant amounts of As and was thus identified as a potential source of As. In the core DEP-1 the calcium molybdate, powellite (CaMO4), was identified as a source of Mo and as a source of As, because powellite contained up to 18000 mg/kg As. In the subsurface As is elevated at three different depths and at each

of these depths it is associated with different elements. At 30 ft only As and Fe were elevated, while at 150 ft only As and Mo were elevated and at 200 ft only As, Fe and S were elevated. From this it is possible to deduce the mineralogical association of As. In the shallow subsurface where the conditions are still more oxygenated As is likely bound to hydrous ferric oxide (HFO). At the intermediate level off around 150 ft As seems to be more or less exclusively associated with powellite and at 200 ft where Fe and S were elevated, the source of As is likely As-rich pyrite. The inferred As mineralogy in the subsurface in the Lithia area follows an expected redox gradient for groundwater from oxygenated near the surface to more and more reducing conditions at depth.

There is no indication that Mo and As are of anthropogenic origin and thus they should be of geogenic origin and that a change in physicochemical conditions in the aquifer causes their release. However, what causes exactly this change in physicochemical conditions is still unclear. In summary, the combination of massive groundwater pumping to the west of Lithia combined with many private supply wells, which are open to several groundwater horizons in a karstic aquifer create an environment conducive to As and Mo release from the aquifer matrix.

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1. Introduction

During the past 20 to 30 years numerous occurrences of elevated arsenic (As) concentrations in groundwater were reported. With a few exceptions the source of As is geogenic, i.e., naturally occurring in the aquifer matrix. The release of As from the aquifer matrix, however, is generally caused by anthropogenic perturbations of the physicochemical conditions in the aquifer, such as a redox change. There are a multitude of scientific publications addressing the issue, including several excellent reviews (e.g., Amini et al., 2008; Ferguson and Gavis, 1972; Korte and Fernando, 1991; McNeill et al., 2002; Smedley and Kinniburgh, 2002). This type of As contamination is a public health issue world-wide. In particular the catastrophic problems in Bangladesh and West Bengal have been front-page stories in newspapers and scientific journals (e.g., Ahmed et al., 2006). Despite more than 20 years of ongoing research into the As problem in Bangladesh there is no consensus about the geochemical mechanisms of As mobilization. The dissolution of hydrous ferric oxide (HFO) is called upon, as well as the oxidation of pyrite (e.g., Polizzotto et al., 2005; Swartz et al., 2004; van Geen et al., 2008). Nevertheless, it is becoming clear that the problem of As release is a complex problem of agriculture, hydrogeology, microbiology and inorganic geochemical processes, which reaches far beyond the simple approach of oxic vs. anoxic (Dhar et al., 2008; Stute et al., 2007; Zheng et al., 2005).

Similar to the problem outlined for Bangladesh, there are many other locations where similar geogenic As contamination exist; independent of the aquifer matrix, whether fluvial sediments, marine shale or carbonate rocks. Surprisingly little is known about geogenic As contamination in limestone/carbonate aquifers. A thorough literature search provided only 5 references in addition to our own work (Armienta and Segovia, 2008; Gbadebo, 2005; Romero et al., 2004; Simsek et al., 2008; Vesper and White, 2003). Limestones, although excellent aquifers, are problematic because due to karstification contaminants can be easily transported over large distances, posing a threat to public and private water supplies (e.g., Ducci et al., 2008; Katz, 2004;

Kovacova and Malik, 2007; McMahon et al., 2008; Obeidat et al., 2008; Zhou and Beck, 2008). Groundwater can flow through conduits so that there is little opportunity for filtration or sorption of contaminants onto aquifer material. Thus it is important to assess and understand geogenic As contamination in limestone aquifers, where anthropogenic perturbations could cause the release of As from the limestone matrix at a large distance from the area where eventually elevated As values occur.

The Pritcher Road site near the village of Lithia in central Florida affords an exceptional field site to study the contamination of groundwater with geogenic As in a limestone aquifer. There, approximately 100 private supply wells were sampled for As, after the discovery of more than 300 µg/L As in a newly installed irrigation well. Similarly high As concentrations were detected in many of the private supply wells. Surprisingly there was no pattern recognizable and wells with low concentrations were adjacent to wells with extremely high concentrations (Fig. 1). Plots of As distribution in private supply wells in Bangladesh show the same enigma and thus new insights from this study may further progress unraveling the As disaster there. In particular, if excessive groundwater withdrawal from select aquifers may cause a sufficient change in phyisicochemical conditions across the system to cause the release of As (e.g., Ahmed et al., 2006).

Of the approximately 100 private supply wells, 19 wells showed arsenic concentrations above the current drinking water standard of 10 µg/L. The highest value was 344 µg/L. Several wells were also high in molybdenum (Mo), although of lesser concern because Mo is not regulated by the US EPA. Nevertheless there exists a recommended value of 40 µg/L. Besides As and Mo, all other parameters were as expected for central Floridan groundwater.

1.1. Working Hypothesis

With no obvious anthropogenic or agricultural sources present, the arsenic is likely of natural (geogenic) origin, i.e., present in the mineral pyrite, which is part of the aquifer matrix, but released into groundwater due to a change in

physicochemical conditions. The assumption that pyrite is the likely source of As to groundwater was based on detailed investigations about the mineralogical associations of As in the Intermediate Floridan Aquifer (IFA) and Upper Floridan Aquifer (UFA) (Lazareva, 2004; Lazareva and Pichler, 2007; Price, 2003; Price and Pichler, 2002, 2006). The key findings of those studies were that (1) As was only very slightly elevated in the aquifer matrix (3.5 mg/kg vs. 2.6 mg/kg world average in limestone) and (2) As was mostly associated with pyrite as a substitute element for sulfur in the FeS_2 structure. These studies in conjunction with geochemical modeling and observations from aquifer storage and recovery operation (ASR) provided insight into the question whether the interaction (reaction) of water with an aquifer matrix of normal As concentration that can generate high-As groundwater (Pichler and Jones, 2006). A change in physicochemical conditions that selectively affects the stability of pyrite is sufficient to increase As concentrations by several orders of magnitude (Jones and Pichler, 2007).

Assuming that pyrite is the source of arsenic, 4 scenarios (A-D) were considered to explain the high concentrations of arsenic. Each of these scenarios involves a change of hydraulic conditions in the Lithia area, causing the rapid introduction of oxygenated groundwater into the Upper Floridan aquifer where most of the supply wells are screened.

(A) The removal of clays during the phosphate mining process east of the Lithia area, which is hydraulically upgradient of the site, has allowed water with different geochemical characteristics from the surface/surficial aquifer to penetrate into the Suwannee Limestone.

(B) Water from a gypsum stack associated with the former phosphate plant is drained into a creek that straddles the up gradient extent of the site. This creek may be a surface reflection of a fracture that allows the drainage water with different characteristics to migrate quickly into the Suwannee Limestone.

(C) The extensive pumping from the well field located on the western portion of the site has significantly altered the difference in hydraulic head between the

surficial/Intermediate aquifer and the underlying Floridan providing more potential for waters from shallow intervals to migrate into the Suwannee Limestone.

(D) Combination of one or more of the scenarios from above.

2. Work Plan and Methods

To test these hypotheses, 40 private supply wells were selected for further study. Selection was based on the premise of geographical coverage, high As and low As concentrations. These wells were sampled a second time and in addition to the parameters of the previous sampling (turbidity, pH, conductivity, dissolved oxygen, oxygen reduction potential, alkalinity, Al, Sb, As, Br, Cd, Ca, Cl, Cr, Cu, F, Fe, Kie-N, Pb, Mg, Mn, Mo, Ni, N, K, Se, Si, Na, Sr, SO_4, S, P, V, Zn) the following were added: (1) As was speciated (As3+, As5+, DMA and MMA), (2) sulfide was determined in the field and (3) oxygen and hydrogen isotopes ($\delta^{18}O$ and δD). Those elements of particular interest, such as, sulfide, As, Sb and Mo were analyzed by the FDEP laboratory and also by EnChem for the purpose of quality control. The private supply wells provided only poor information about well depth and screened interval. Thus, FDEP installed 5 monitoring well clusters, each cluster consisting of four screened sampling intervals of 20 ft length at a depth of approximately 150 ft, 200 ft, 260 ft and 300 ft below surface. The cluster locations were chosen in order to represent geographical coverage, as well as high and low As areas (Fig. 2). The cluster DEP-5 was installed away from the area of high As to serve as a reference site. Subsequently the monitoring well clusters were sampled in May, June, October of 2008 and April 2009. The reason for the multiple sample collection was to establish a time series, allowing to observe a potential variation of groundwater chemistry based on: (1) well installation or (2) pumping in the well field to the west of the Pritcher Road site.

In order to test if infiltration of water from the phosphate mine to the east of the Pritcher Road site or infiltration of shallow groundwater (< 30 ft) is a source of As 8 shallow groundwater samples were collected by Geoprobe during the April 2009 sampling event (Fig. 3).

In addition 3 of the 5 geologic cores were described and sampled in detail to delineate the presence of arsenic in the aquifer matrix. This included: (1) the chemical analyses of at least 20 samples per core for As, Sb, Al, Si, Fe, Mg, Ca, P, Sr, S, Mo, and Mn content and (b) preparation of at least 10 thin sections per core for electron microprobe analyses of mineral phases to determine arsenic and antimony concentrations. Sampling consisted of a two-step process, were samples were collected randomly and from areas potentially higher in arsenic, such as fracture zones, framboidal pyrite, iron-oxyhydroxide coatings on limestone/dolostone grains, and high porosity zones containing molds, fractures and various other dissolution features. This sampling approach was successfully applied by Lazareva and Pichler (2007) and Price and Pichler (2006) to assess the importance of pyrite as the source of As in the Upper Floridan Aquifer.

Based on data collected until October 2008, 20 private supply wells and the FDEP monitoring wells were selected and sampled in April 2009 for groundwater dating using the using the tritium-helium method (T-He) to better assess key questions such as:

- ∞ Is there a correlation of age with predicted flow direction?
- ∞ Is there an increase of ages with depths in the deep aquifer?
- ∞ Is there a correlation of age with Arsenic concentration?
- ∞ Is there young water in deeper aquifer?
- ∞ Where are the pathways from upper to lower aquifer?

2.1. Analytical Methods: Water Chemistry

The FDEP staff and laboratories carried out the bulk of the field measurements and chemical analyses. Exceptions were As-speciation, total As, Sb, Mo, stable isotope and field-based sulfide analyses, which were provided by EnChem and by the University of California at Davis Stable Isotope Facility. The stable oxygen and hydrogen isotopes were determined by simultaneous analysis of $^{18}O/^{16}O$ and D/H isotope ratios in liquid water samples using an LGR DLT-100 instrument (Los Gatos Research, Inc., Mountain View, CA, USA). Each sample was injected 6 times, the first 3 injections are discarded to eliminate memory effects, and the

average of injections 4, 5 and 6 was used for isotope ratio calculations. Working standard waters calibrated against NIST standard reference materials (VSMOW, GISP, SLAP), were inserted in the sample sequence (usually before and after each group of 6 unknowns). Sample isotope ratios are adjusted to working reference waters. Results are given in delta notation ($\delta^{18}O$ and δD) relative to Vienna Standard Mean Ocean Water (VSMOW). Precision was better than 0.3 ‰ and 0.8 ‰ for $\delta^{18}O$ and δD, respectively.

Total As and Sb were concentrations were analyzed by hydride generation-atomic fluorescence spectrometry (HG-AFS) on a PSA Millenium instrument following procedures by (Price and Pichler, 2005, 2006). A 2% solution of potassium iodide was used to reduce As(V) to As(III) prior to hydride generation. The 4 arsenic species, As(III), DMA, MMA and As(V) were separated in a Hamilton PRP-X100 column using a potassium phosphate buffer prior to HG-AFS analysis. The quality of the speciation data was confirmed by comparing total As to the sum of As species. Molybdenum (Mo) was determined on a Perkin Elmer Optima 2000 DV inductively coupled plasma – optical emission spectrometer (ICP-OES). The accuracy and precision of the measurements were verified through the use of internal and external standards.

Sulfide was determined in the field by photo spectrometry using a HACH DR 2400 Portable Spectrophotometer following the USEPA approved Methylene Blue method.

2.2. Analytical Methods: Rock/Sediment Mineralogy and Chemistry

The cores from the well clusters DEP-1, DEP-2 and DEP-5 were described in hand sample, using hand lens and stereo-microscope. A total of 219 samples were selected for further chemical and mineralogical analyses: DEP-1 (56), DEP-2 (88) and DEP-5 (75). Those samples for chemical analyses were dried at room temperature and subsequently powdered by hand with an agate mortar and pestle, which was cleaned with pure quartz sand and rinsed with distilled water between samples to prevent cross contamination. Approximately 0.5 g ± .005 g of powdered sample was weighed into vials for digestion with aqua

regia, a 3:1 mixture of HCl and HNO_3. The samples were capped with a ribbed plastic watch glass to prevent the escape of arsine gas and placed on a hot block for 30 minutes at 80 ºC. The glasses were then removed and the condensation rinsed from each lid with DI. For each digestion batch, 54 samples, 2 internal standards (homogenous local limestone), 1 external standard (JLS-1), 2 spiked samples, and a blank were included for quality control. Once cooled the digestates were diluted to 50 mL with DI water and allowed to settle for at least 24 hours before being passed through a 2.0 µm Teflon. Two mL of the filtered samples were diluted with 8 mL of DI for the determination of on the Perkin Elmer Optima 2000 DV inductively coupled plasma – optical emission spectrometer (ICP-OES) for Al, Si, Fe, Mg, Ca, P, Sr, S, Mo, and Mn following procedures by (Price and Pichler, 2006).

A second aliquot of each sample was prepared for As and Sb analysis using hydride generation-atomic fluorescence spectrometry (HG-AFS) on a PSA 10.055 Millennium Excalibur instrument following procedures by (Price and Pichler, 2006). Ten (10) mL of digested sample were transferred to a new Teflon vial. Then 15 mL trace metal grade HCl and 1 mL saturated KI solution were added to reduce the As to As^{3+}. Each aliquot was finally diluted to 50 mL with DI water.

To assure quality control duplicate samples were randomly selected for approximately 10% of the samples and had a reproducibility of ≥ 95% on the ICP-OES and ≥ 90% on the HG-AFS. Sample blanks, which were added every 5 to 10 samples did not show detectable concentrations of As or Sb. To test for recovery, 2 samples from each batch were spiked with 25 mg/kg As before digestion. Recovery of As was always between 90 % and 110 %.

Polished thin sections were made for 20 samples high in As and Mo for further analyses of discrete mineral phases by transmitted and reflective light microscopy as well as electron microprobe analysis (EMPA). The thin sections were analyzed with a Nikon Eclipse LV100 POL petrographic microscope to determine the presence and mineral associations of pyrite and to delineate targets for EMPA. The individual pyrites and other targets were then analyzed for

As, Mo, Ca, Zn, Fe, S, and Sb with a JEOL JXA-8900R instrument. Reference materials consisted of natural and synthetic sulfide, sulfate, silicate, and oxide. Calcium was analyzed as an excitation-volume monitor during sulfide analysis as some samples were small, irregular, and thin. The analyses were corrected for electron beam and matrix effects, and instrumental drift and dead time using a Phi-Rho-Z algorithm supplied with the JEOL WDS electron microprobe (Armstrong, 1995). Relative accuracy of the analyses, based upon comparison between measured and published compositions of standard reference materials, is ~1-2 % for concentrations >1 wt. % and ~5-10% for concentrations <1 wt.%. Analyzed elements and oxides and their detection limits (wt.%) at 3 sigma (background) are as follows: Sb (0.02), As (0.05), Fe (0.03), S (0.03), Zn (0.07), Mo (0.08), FeO (0.05), SrO (0.09), MnO (0.04), BaO (0.04), CaO (0.04), As_2O_5 (0.09), MgO (0.03), SO_4 (0.08).

2.3. Analytical Methods: Tritium-Helium Dating

To avoid atmospheric contamination the samples were taken after excessive well purging. Conductivity, temperature, pH and oxygen content were monitored and sampling took place only once values were stable. The samples to be used for helium and neon analyses, and determination of the $^3He/^4He$ isotope ratio (δ^3He) of dissolved helium were collected (in duplicate) into specially prepared copper sample tubes. The copper tubes were flushed for 5 minutes prior to capping. During sampling, the copper tubes were attached with clear Tygon® tubing to visually observe whether air bubbles are present in the water line. The sample fraction to be used for tritium determination by helium ingrowth was collected in duplicate into Safety-coated 500 mL glass bottles with polycone seals.

Analysis of ^3H, He isotopes and Ne for ^3H-^3He dating was conducted at the noble gas laboratory of the Institute of Environmental Physics, University of Bremen. For the He and Ne isotope analysis all gases were extracted from water. He and Ne were separated from other gases with a cryo system kept at 25 K and 14 K and ^4He, ^{20}Ne and ^{22}Ne were measured with a quadrupole mass spectrometer. The helium isotopes were analyzed with a high-resolution sector

field mass spectrometer (MAP 215-50). The system was calibrated with atmospheric air and controlled for stable conditions for the He and Ne concentrations and the $^3He/^4He$ ratio. For groundwater samples, the precision of the He and Ne concentrations was better than 1 % and for the $^3He/^4He$ ratio better than 0.5 %.

Tritium (^3H) was analyzed with the ^3He-ingrowth method (Clarke et al. 1976). Samples of 500 g of water were degassed and stored to allow for the accumulation of the ^3He the ^3H decay product in dedicated He-free glass bulbs. After a period of 6 months ^3He was analyzed using the MAP 215-50 instrument. This method achieves a detection limit of 0.01 TU, which allowed the detection of the residue of pre-bomb ^3H. The uncertainty was typically less than 3 % for samples of > 1 TU and 0.01 TU for very low concentrations. For ideal samples, analytical conditions allow a time resolution of about 3 months for apparent ages of less than 10 years. Unknown hydrogeological conditions affecting gas exchange, as for example inaccurate temperatures assumed for gas exchange with the atmosphere (Solomon and Cook, 2000) lead to a time resolution of about 0.5 to 1.0 year (Kipfer et al., 2002). More details of the sampling, analysis and data evaluation of the method are given in (Sültenfuß et al., 2009).

3. Results and Discussion

3.1. Water Chemistry

The analytical quality of the data was very good. There is excellent agreement for As data between the EnChem and the FLDEP laboratories. This provides the necessary confidence for data interpretation, since the distribution of As, Sb and Mo did not show any logical pattern.

Sample duplicates and field blanks demonstrated good reproducibility and the absence of sampling related contamination. Major and trace elements and hydrogen and oxygen isotopes stayed well within their analytical uncertainty of around 3 to 5 %. With the exception of samples from well DEP-1-165 charge balances were better than 5 %. This well showed some grout problems, as indicated by low Mg values, high pH and high K values. However once OH^- was

added to the charge balance the error also dropped below 10 %. Based on the analyses of sample duplicates As speciation data was deemed reliable (better than 10 % deviation) for samples with total As concentrations of > 10 µg/L.

3.1.1. Monitoring Well Clusters DEP-1 to DEP-5

Following installation, the monitoring well clusters DEP-1, DEP-2, DEP-3, DEP-4 and DEP-5 were sampled in May, June, October of 2008 and April 2009. The water was of the HCO_3-Ca type and most monitored elements showed little variation (Fig. 4 and Table 1). Water Type and distribution in the Piper diagram were as expected for Floridan groundwater (compare to Fig. 10 in Sacks, 1996). Only those elements sensitive to changes in redox conditions, such as, sulfide, oxygen, iron and arsenic showed larger variations.

Field Measurements: Those measurements done in the field by electrode, such as, oxygen (DO), ORP and turbidity showed a somewhat erratic data distribution. Changing oxygen values, for example were not recorded in ORP and vice versa. Turbidity was low but also showed unexpected variation with time. One would have expected turbidity values to constantly drop with time. Only pH and conductivity showed stable readings.

Sulfide: There was excellent agreement between those sulfide measurements made in the field and those in the laboratory (r^2=0.89). This indicates that sulfide did not oxidize to sulfate from the time of sampling until its analysis in the laboratory. For all subsequent calculations the laboratory values will be used. All wells showed the same pattern of increasing sulfide concentrations with depth (Fig. 5). In wells DEP-1 and DEP-2, there was only very little variation with time, whereas the other three wells showed increasing or decreasing values of sulfide with time. This would indicate that the groundwater conditions were disturbed during well installation, but are slowly returning to pre-installation conditions. This is particularly evident in well DEP-4 and to a lesser degree in DEP-5 where sulfide and As are inversely correlated. This is an argument to use the data from the most recent sampling for further discussion of the site.

Vanadium (V): Vanadium concentrations remained below the detection limit of 5 µg/L, expept for the shallow interval in DEP-1 and DEP-2, where values were approximately 25 and 10 µg/L, respectively. However, only the value in DEP-1 could be verified by a second sampling.

Nickel (Ni): Nickel concentrations weakly correlated with those of Mo. Whenever Mo was substantially elevated above the assumed background concentration of approximately 0.5 µg/L Ni was detected at concentration above the detection limit of 0.25 µg/L. Values were never above a level considered detrimental to drinking water quality. It is likely that Ni is a minor element in the mineral powellite ($CaMO_4$) and released during powellite dissolution.

Arsenic (As): Arsenic values were generated by two laboratories, the FDEP laboratory and the USF Center for Water Analyses. There was good agreement between the two data sets (r^2=0.989). Arsenic showed a most erratic behavior and without confirmation by two independent laboratories there would have been doubt about the data quality. Generally those wells with high values had relatively stable As concentrations, some times they displayed a slight increase with time. Those samples with lower As concentrations often showed decreasing trends with time (see sulfide above). This trend was particularly strong for six monitoring intervals, DEP-1-270, DEP-2-276, DEP-4-228, DEP-4-275, DEP-5-173 and DEP-5-270 (Fig. 6). In this set of samples an even more pronounced trend of decreasing values could be observed for Mo (Fig. 6). With the exception of DEP-5-173 these observations are confined to the deeper intervals. The reason for the declining values could be that during well installation oxygenated surface water was introduced into the deeper aquifer where due to the associated change in groundwater conditions, powellite and pyrite became instable and released As and Mo. Once well installation was completed the groundwater conditions slowly returned to pre-installation, “normal” conditions. Hence, the observed decline in As and Mo concentrations.

There was no statistically significant linear correlation between sulfide and As, although those wells with high As concentrations (DEP-1, DEP-2 and DEP-3) showed a clear pattern of low sulfide and high As (Fig. 5). In well DEP-4 this

pattern is much less developed and it is absent in well DEP-5 (Fig. 5). Arsenic speciation data confirmed the presence of arsenate (As^{5+}) in the those samples collected from the shallow wells (Fig. 7), which would indicate either a redox disequilibrium with respect to As^{3+}/As^{5+}, but more likely that As was released under more oxygenated conditions as one would expect for groundwater from a depth of more than 150 ft. The deeper groundwater samples show virtually no As^{3+} These observations correlate well with the results for sulfide concentrations and the sulfate to sulfide (SO_4^{2-}/S^{2-}) ratio (Fig.8).

In summary, most groundwater parameters compared to those of the private supply wells and were as expected for central Florida (Sacks, 1996; Sacks et al., 1995; Sacks and Tihansky, 1996). Only As and Mo showed a distinct pattern of (a) decreasing concentrations with depth (Fig. 9) and (b) a geographical distribution, with highest values in the center of the study area (Fig. 1).

A similar pattern could also be observed for $\delta^{18}O$ and δD, where lighter values were generally found at shallow depth; thus low $\delta^{18}O$ and δD did correlate to some degree with As and Mo. This becomes particularly evident in a comparison of monitoring and private wells, where most of the elevated As and Mo values fall into the isotopic range of the shallow monitoring wells (Fig. 10). This indicates that those supply wells with high As and Mo concentrations are likely screened shallower than those wells with lower to “normal” concentrations.

The observed separation (based on As, Mo and isotope values) between the shallow sampling depth of approximately 145-165 ft and the deeper intervals was also observed in the height of the groundwater table. In all monitoring well clusters (DEP-1 to DEP-5, Fig. 2) the water level in the shallow interval was consistently 3 to 6 ft higher than in the deeper intervals, indicating two different aquifers (APPENDIX: Water Levels).

3.1.2. Surficial Monitoring Wells

The chemical composition for the surficial wells MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7 and MW-8 was as expected for water in the Surficial

Floridan Aquifer, where water composition is much more variable than in the confined Upper Floridan Aquifer (Table 2 and Fig. 4). The overall quality of the chemical analyses was excellent; all calculated charge balances were better than ± 5 %. Particularly the two wells, MW-2 and MW-3, which were located on the Mosaic Phosphates Company property showed extreme values for $\delta^{18}O$, δD, SO_4 and Fe (Table 2). These values are due to extreme evaporation in the clay settling area of the Mosaic property. The well MW-6, which is located in an agricultural area between the well clusters DEP-2 and DEP-1 (Fig. 2), showed the highest N and Cl concentrations. These concentrations are likely the result of fertilizer use. After exclusion of these three wells the remaining 5 wells are of a comparable water type to the DEP well clusters (Fig. 4). The surficial wells, with the exception of MW-2 and MW-3 show the lowest δD and $\delta^{18}O$ values. This fits well with the observed values for the DEP monitoring wells, where the shallow intervals had lower isotope values (Table 1).

In all MW samples As and Mo were below their recommended abundance of less than 10 µg/L and 40 µg/L, respectively. Thus infiltration of As or Mo from the Surficial into Upper Floridan Aquifer seems not to be a mechanism responsible for the elevated concentrations seen in the private supply wells in the Lithia area and in the monitoring well clusters, DEP-1 to DEP-5.

3.1.3. Private Supply Wells

Private supply wells were sampled up to two times (Table 3). Most measured parameters remained stable within their analytical uncertainty. Arsenic and Mo values varied more than other elements, but did not show a predictable pattern, values increased in some wells while they decreased in others. Some high values of Zn and V are likely a result of plumbing. Of real concern is the water quality at 8710 COUNTY LINE ROAD, where As is low, however, many other heavy metals were elevated. The second analyses of the subset of 40 private supply wells in December 2007 confirmed the values of the initial sampling in May 2007. Arsenic ranged from 0.1 to 350 µg/L and the correlation of the values between the two laboratories was excellent (r^2 = 0.998). The As speciation data was inconclusive; in some samples As^{3+} was the dominating species, while in

other As^{5+}. There was no correlation between As speciation and those of other redox indicators, such as ORP, DO, S^{2-} or the sulfide to sulfate ratio. This should indicate that the water samples, as collected, are out of redox equilibrium, which may be a result of sampling or alternatively that different water mix in the well itself during extraction (see the different water types determined in the DEP monitoring wells and the surficial wells). However, to some degree, total As concentration showed a positive correlation with total SO_4^{2-} and SO_4^{2-}/S^{2-} ratio (Fig. 11), indicating both the release of SO_4^{2-} from the aquifer matrix and potentially slightly oxygenated conditions, because under reducing conditions S released from the aquifer matrix would be present as S^{2-}. No reliable data for the screened interval was available for the private supply wells, this it is concluded that data from these wells is not beneficial to the interpretation of groundwater processes in the Lithia area.

Oxygen and hydrogen isotope data from the public supply wells, as well as the 5 monitoring well clusters indicate that the bulk of the contamination is confined to the shallow aquifer between 140 and 170 ft. Thus we can assume that those private supply wells high in As and Mo are open to that depth. Furthermore the final concentration of Mo and As in each well may be a result of what percentage of the total screen is between 140 and 170 ft

3.2. Rock/Sediment Chemistry and Mineralogy

After the petrographic examination of cores from wells DEP-1 and DEP-2 the lithological boundaries in the study area were determined as follows: Surficial Sediments 0 to 55 ft, Hawthorn Group 55 to 200 ft, Tampa 200 to 230 ft and Suwannee Limestone below 230 ft (down to the maximum well depths of approximately 350 ft). A detailed description is attached as APPENDIX (Core Description). With exception of the uppermost sediments, calcium carbonates were the main lithology. Occasionally dolomite and clay minerals were present.

This lithology was also observed in the bulk sediment chemical composition, where Ca was generally above 300 000 mg/kg. A detailed chemical composition is presented as an APPENDIX (Core Chemistry). Molybdenum and

As varied significantly with depth (Fig. 12) and values were significantly above the crustal average for Mo of approximately 1.1 mg/kg (Li, 2000). Values were highest between approximately 130 and 250 ft, which is the interval that roughly corresponds to the Hawthorn and Tampa. Below 250 ft, which corresponds to the Suwannee Limestone values returned “normal”, i.e., expected values for crustal carbonate rocks. DEP-5, which was the reference core outside of the immediate area of contamination did not differ from DEP-1 and DEP-2. Surprisingly DEP-5 had higher Mo and As values than DEP-2, which is the core from the monitoring well cluster with much higher Mo and As values. However it is not advisable to compare the abundance of Mo and As in the aquifer matrix directly to those in the groundwater. It has been shown that even small amounts in the aquifer matrix can cause high values in groundwater, if the physicochemical conditions are changed (Pichler and Jones, 2006).

The high concentrations of Mo and As were also confirmed during the mineralogical analysis of the core material from DEP-1 and DEP-2. During the description of hand specimens, pyrite was identified in both cores and later verified by reflected light microscopy. Pyrite was present in euhedral, massive and framboidal forms (Fig. 13 B-D). Electron microprobe analyses revealed variable concentrations of As in pyrite ranging from approximately 200 to 9 000 mg/kg (Table 5). These values are in the same range as those previously reported for the Hawthorn Group (Lazareva and Pichler, 2007) and Suwannee Limestone (Price and Pichler, 2006). Thus oxidation of pyrite has the potential to release large amounts of As to the groundwater in the Lithia area. The bulk concentration of Fe and S in the three cores correlated well and plotted along the “pyrite” line (Fig. 14), indicating that pyrite is ubiquitous in the aquifer matrix.

The calcium molybdate powellite ($CaMO_4$) was identified in DEP-1. It occurred as very small grains of approximately 20 µm diameter (Fig. 13A). Identification was made using EDX spectra obtained in the EMPA (Fig. 15). This is the first description of powellite in Florida and should be closely linked to the high Mo concentrations found in the monitoring and private supply wells. Powellite contained up to 18 000 mg/kg As (Table 5), which would explain the correlation

between Mo and As in the monitoring well water samples (r^2 = 0.91, Fig. 16), assuming that the dissolution of powellite is a possible source for elevated As and Mo in the private supply wells and the DEP monitoring wells. (Note: although powellite was only observed in the core form DEP-1 it is very likely that this mineral is present in all other cores where Mo concentrations are high.)

Taking a closer look at core DEP-2 (Fig. 12) it becomes evident that arsenic is elevated at three different depths, at around 30 ft (bls), at around 150 ft (bls) and at around 200 ft (bls). Surprisingly, at each of these depths arsenic is associated with different elements. At 30 ft only As and Fe were elevated, while at 150 ft only As and Mo were elevated and at 200 ft only As, Fe and S were elevated. From this it is possible to deduce the mineralogical association of As. In the shallow subsurface where the conditions are still more oxygenated As is likely bound to hydrous ferric oxide, which is common (Raven et al., 1998). At the intermediate level off around 150 ft As seems to be more or less exclusively associated with powellite and at 200 ft where Fe and S were elevated, the source of As is likely As-rich pyrite. Unfortunately the shallow sections were not analyzed in the cores from wells DEP-1 and DEP-5 and thus the presence of hydrous ferric oxide was not confirmed. Nevertheless, these two cores showed the same correlation of As and Mo at a depth of around 150 ft and Fe, S and As at a depth of approximately 200 ft. Interestingly the inferred As mineralogy in the subsurface in the Lithia area follows an expected redox gradient for groundwater from oxygenated near the surface to more and more reducing conditions at depth. Hydrous ferric oxides are generally stable under oxygen-rich conditions (Jambor and Dutrizac, 1998), while powellite is stable in intermediate conditions and pyrite under reducing conditions (Rickard, 1968).

In summary, stereo microscope and reflected light microscope analyses showed that pyrite was present in most samples, which were selected for microprobe analysis. The average concentration of As in approximately 90 pyrite crystals from all samples was more than 2000 mg/kg, which is more than sufficient As to account for the high As values seen in groundwater in the Lithia area. Those pyrites higher in the stratigraphy had generally higher As

concentrations. As part of this investigation the mineral powellite ($CaMoO_4$) was encountered in one core DEP-1. This mineral was not previously described in Florida. Although one of the more common molybdates, this is a relatively rare mineral. Its presence explains the extremely high Mo concentrations seen in the groundwater in the Lithia area, as well as the correlation between As and Mo for those samples high in the two elements. Arsenic concentrations in powellite were as high as 18,000 mg/kg. The occurrence of powellite correlated well with those sampling intervals highest in Mo in the monitoring wells and more importantly the ratios of As and Mo were similar in groundwater (18 to 25) and mineral (23). This indicates the likely dissolution of powellite as the source of Mo and As seen in those samples. The reverse that the high Mo values in groundwater cause the precipitation of powellite cannot be immediately ruled out, since evidently powellite is a very late phase (Fig. 15). However, unpublished data from a recent study of the Avon Park Formation showed the presence of powellite at a depth of more than 700 ft (bls). At this depth and location anthropogenic interference can be ruled out, therefore demonstrating the “natural” occurrence of powellite in the Floridan subsurface.

3.3. T-He Dating

The results of the Tritium-He dating should elucidate whether these changes in physicochemical conditions are caused by (a) forced lateral movement due to pumping or (b) forced vertical flow and the associated input of younger, potentially oxygen-rich water into the shallow aquifer.

In total 48 samples were analyzed for tritium (^3H) and for 39 samples Ne and He isotope data could be obtained. Most samples were analyzed twice and showed high reproducibility. Therefore the data was judged as very reliable. The focus was to use ^3H as a tracer for young water and the by alpha decay produced ^4He or so called radiogenic ^4He, as a tracer for old water. The achieved detection limit for ^3H was 0.025 TU (tritium units) and allowed to detect natural ^3H from before 1950. The precision for ^3He, ^4He and Ne was 1%. The resulting error for ^3He from ^3H decay (tritiogenic ^3He) was 0.5 to 1 TU. The uncertainty for the

calculated ^{3}H-^{3}He age resulting from analytical conditions was therefore about 1 to 2 years.

In general the calculated ages correlated with depth. All surficial wells, MW-1 to MW-8, displayed water ages of about 20 to 30 years (Table 6). The sum of ^{3}H (Fig. 17, red bars) and tritiogenic ^{3}He (blue bars) of the samples add up to the ^{3}H concentration in precipitation at the calculated infiltration time period. Thus a ^{3}H free component (older than 1950) can be ruled out.

The waters collected from the shallow interval in monitoring wells DEP-1, DEP-2, DEP-3 and DEP-5 were younger water in the range of about 30 to 40 years (Table 6). Nevertheless, those samples also contain an older ^{3}H-free water component. Decay corrected ^{3}H concentration in precipitation in Florida always exceeds 2 TU. Hence all samples with ^{3}H less than 2 TU contain older, ^{3}H-free waters. The ^{3}H concentrations of the deeper samples were below 1% of the concentration of ^{3}H in precipitation of the last decades, thus excluding an addition of younger water to those depths. Hence all samples with ^{3}H less than 2 TU contain older, ^{3}H-free waters. Because of the relatively short screen length that has was not expected for the shallow depths.

All surficial wells are free of radiogenic ^{4}He. From this we deduce a maximum ^{4}He accumulation rate 3E-8 ccSTP/kg/yr. Hence the high radiogenic concentration in the private wells must point to very old water (> 1000 yrs).

The predominant set of samples (Fig. 18, black diamonds) contained only atmospheric ^{4}He and Ne. Four samples displayed a significant concentration of radiogenic ^{4}He (Fig 14, no.: 39, 24, 27 & 21). Values of ^{4}He are used as an indicator for old water and typical ages derived from such ^{4}He values are some hundreds to some thousands years in age. Those 4 samples were all from private supply wells, which also contained significant concentrations of ^{3}H (0.65 – 1.63 TU). The presence of both, significant ^{3}H and 4He, in those wells can only be explained by mixing between very old and younger waters in the well itself, i.e., a long filter screen. On the other hand several samples had low ^{4}He concentration, but did not contain significant ^{3}H.

Only one of the private wells was virtually ^{3}H-free (< 0.025 TU), whereas all samples from DEP wells with depths below 215 ft were free of ^{3}H. The same deep DEP monitoring well samples also contained As below 0.5 µg/L.

3.4. Groundwater levels

The groundwater level measurements for the surficial monitoring wells and the DEP monitoring wells show a decrease of water level with depth, indicating three potential aquifers and a potential downward movement of groundwater (Appendix: Water Levels). Differences in water level between the surficial wells and the DEP wells are up to 30 ft, while the differences between the shallow and deep intervals in the DEP wells are only between 3 and 6 ft (Fig. 19). The well DEP-5 did not show the same separation. In DEP-5 the first two intervals showed more or less identical water levels, which were separated from the two deeper intervals by only 1 ft to 1.5 ft (Fig. 19). Despite this separation all DEP wells underwent the same water level fluctuation with time of up to 15 ft (Fig. 20), indicating that they are hydraulically connected. If the surficial wells undergo the same water level fluctuations remains unknown, because they were only measured once in April 2009. A natural process which would cause tese large fluctuations is hard to imagine, particularly in the Lithia area, which is topographically flat and removed from the ocean by more than 30 miles. Thus pumping in the well field to the west of the study area should be the cause.

4. Conclusions

The large fluctuations in groundwater level, which are up to 15 ft, may be a potential trigger of As release in the unconfined surficial aquifer: (1) during the drop in water level, conditions in the upper part of the aquifer may change from saturated to vadose, (2) pyrite oxidizes and As is being released, (3) ferrous iron (FeII), which is also released oxidizes to ferric iron (FeIII) and hydrous ferric oxide (HFO) precipitates, (4) As is adsorbed to the HFO, (5) HFO remains stable as long as conditions are of a vadose nature, (6) pumping stops/shifts and the conditions slowly change to saturated again, (7) in the absence of oxygen HFO becomes unstable and As is being released, (8) this time As remains in solution

because the formation of pyrite, which could immobilize As, is much slower than the precipitation of HFO. Those private supply wells, which are open to the surficial aquifer may tap into this As reservoir. While the DEP wells undergo the same fluctuations, it is not likely that the aquifer changes from saturated to vadose.

Based on the interpretation of available data it becomes evident that despite its relatively small area, the geochemical and hydrogeological setting in Lithia is very complex. The combination of extensive cyclical pumping in the well field to the east cause large fluctuations in groundwater levels and may activate fracture flow, thus (1) facilitating the rapid recharge of surface water into the aquifer or (2) causing the upward movement of deeper groundwater into the shallow regions of the aquifer. During both processes the result is a change in redox conditions, which affects the stability of minerals present in the aquifer matrix. The exchange between different groundwater bodies, i.e., deep and shallow, is potentially enhanced due to the installation of more than 100 private supply wells in the Lithia area. Most of these wells have large open screened intervals, which allow water movement between the different water bodies. With respect to arsenic (As), the already complex situation is further complicated by its mineralogical association in the aquifer matrix. In the shallow aquifer As is mainly bound to hydrous ferric oxides (HFO), while in the intermediate aquifer it is bound to the mineral powellite ($CaMoO_4$) and in the deeper portions of the aquifer its is bound to pyrite. Of these minerals particularly HFO and pyrite are greatly affected by a change in redox conditions, such as the movement of reducing groundwater into the shallow aquifer or movement of oxygenated groundwater into the deeper aquifer. The calcium molybdate, powelite, likely form under somewhat oxygenated conditions, because under reducing conditions the molybdenum sulfide, molybdenite (MoS_2) would form. However after precipitation, the stability of powellite is not as readily affected by a change in redox anymore. Its stability is now more or less controlled by the ion activity product (IAP) of Ca and Mo. Thus groundwater movement and mixing of different groundwaters are likely the largest impact on its stability. The large fluctuations in

groundwater level in combination with a karsitc aquifer and more than 100 private supply wells are thus the four processes noted above which cause the release of As from the aquifer matrix.

1) Movement of reducing water into the shallow aquifer causes the dissolution of HFO due to the reduction of ferric to ferrous iron. The As which was adsorbed to the surface of the HFO is released to the groundwater. Should the condition remain reducing and sulfide be present, then pyrite can form and scavenge As from the groundwater. While this reduces the As loading of the groundwater under reducing conditions it will oxidize and release the As once conditions change back to oxygenated.
2) Movement of oxygenated water into the deeper aquifer causes the dissolution of pyrite due to oxidation of ferrous to ferric iron. The As, which is present in the pyrite structure is released to the groundwater. Should conditions remain oxygenated, then HFO can form and scavenge As from the groundwater. While this reduces the As loading of the groundwater under oxygenated conditions it will oxidize and release the As once conditions change back to reducing.
3) Due to water movement, either up or down, powellite can become instable. With time the system will equilibrate with respect to powellite, meaning that neither powellite precipitation nor dissolution takes place. Under these conditions As is likely bound in the powellite structure. However, if the equilibrated water is removed and replaced with groundwater, which is undersaturated with respect to powellite, dissolution takes place and causes the release of As until equilibrium is attained once more.
4) Undersaturation or over saturation of powellite can also be caused by simple mixing of groundwaters with a different chemical composition. For example groundwater A contains elevated Ca^{2+}, but no MoO_4^{2-} and groundwater B contains elevated MoO_4^{2-}, but only little Ca^{2+}. Mixing of

these two waters can increase the IAP to the degree of powellite precipitation.

Arsenic levels in many of the private supply wells are much higher than those found in the DEP monitoring wells, while Mo value are more or less comparable. This could indicate the above-mentioned addition of As which was released in the surficial aquifer. There the aquifer matrix is relatively low in Mo (Fig. 12) and As is thought to be bound to HFO.

The true enigma, however is that DEP-4 and DEP-5, which are geographically removed from the Pritcher Road area where As levels are highest, undergo the same water level fluctuations, but show much lower Mo and As values. Arsenic and Mo values in core samples from DEP-5 did not differ from those in DEP-1 and DEP-2, although water samples from the DEP-5 cluster did not show any As values above 3 µg/L and only one sample had Mo above 40 µg/L. Considering that DEP-5 undergoes the same water level fluctuations as the other 4 wells it becomes evident that in the Pritcher Road area restricted geological, hydrological and physicochemical conditions occur, which promote the release of Mo and As. At this time it seems that the only difference is the amount of private supply wells, which is much higher in the area where As and Mo contamination is highest. Since these wells are likely open to all three groundwater horizons, vertical water movement is facilitated. The mixing of waters from different water horizons in the private supply wells is indicated by their position in the $\delta^{18}O$-δD plot (Fig. 10) and in the $\delta^{18}O$-TU plot (Fig. 21), where they plot intermediate between the shallow and deep samples.

There is no indication that Mo and As are of anthropogenic origin and thus they should be of geogenic origin and that a change in physicochemical conditions in the aquifer causes their release. However, what causes exactly this change in physicochemical conditions is still unclear.

In summary, the combination of massive groundwater pumping to the west of Lithia combined with many private supply wells, which are open to several

groundwater horizons in a karstic aquifer create an environment conducive to As and Mo release from the aquifer matrix.

5. Outlook and Recommendations

Installation of water level monitors in each of the DEP wells to investigate the hydraulic conductivity between the upper and lower aquifer. Expansion of a local groundwater model, which should include the data from the 5 monitoring well clusters.

A potential remedy for the As and Mo problem in the Lithia area may be to install wells with discrete screens in the Suwannee Limestone or deeper.

This study at the Pritcher Road site turned out to be more difficult than expected, BUT therein lies a great opportunity to further both, our practical and our scientific understanding of geogenic contamination scenarios. Eventually results from this study should be made available to a broader audience to aid such investigations across Florida, across the US and across the world. Thus I recommend FDEP to keep this site as a priority.

6. References

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7. Figures

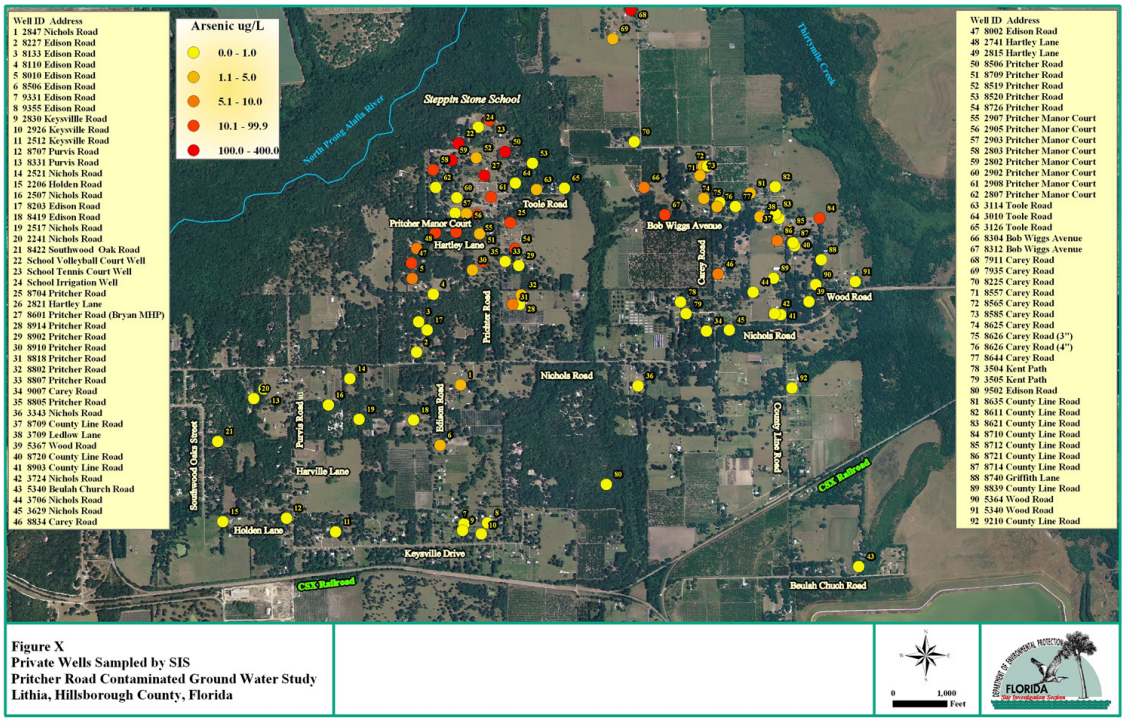


Figure X
Private Wells Sampled by SIS
Pritcher Road Contaminated Ground Water Study
Lithia, Hillsborough County, Florida

Fig.1 Location and distribution of private supply wells in the Lithia area, which were sampled in May 2007 by the Florida Department of Environmental Protection.

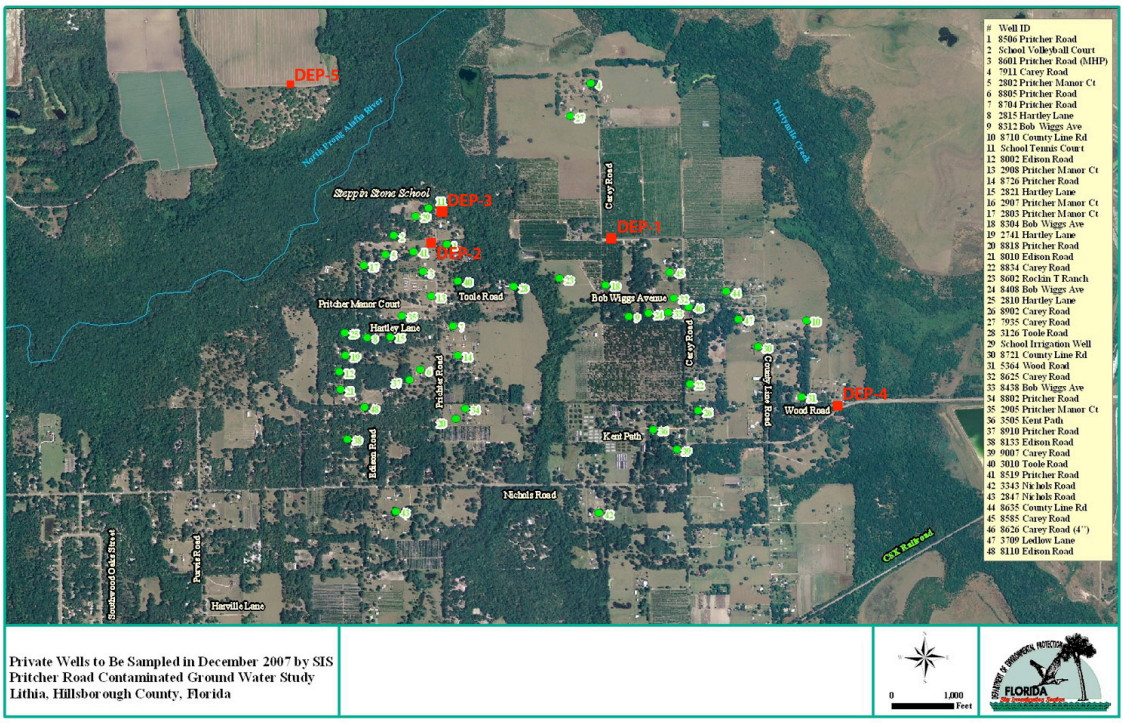


Fig.2 Location and distribution of those private supply wells, which were chosen for the second round of sampling, as well as the locations of the 5 monitoring well clusters DEP-1 to DEP-5.

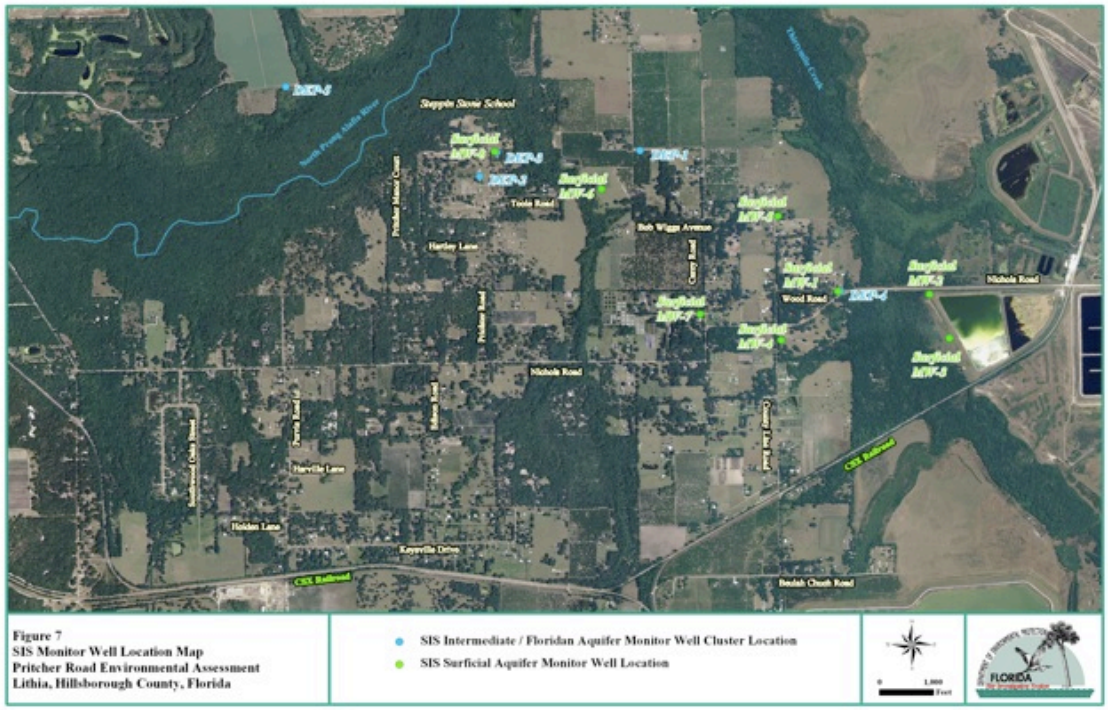


Fig.3 Location and distribution of the Surficial Aquifer Monitoring wells SW-1 to SW-5

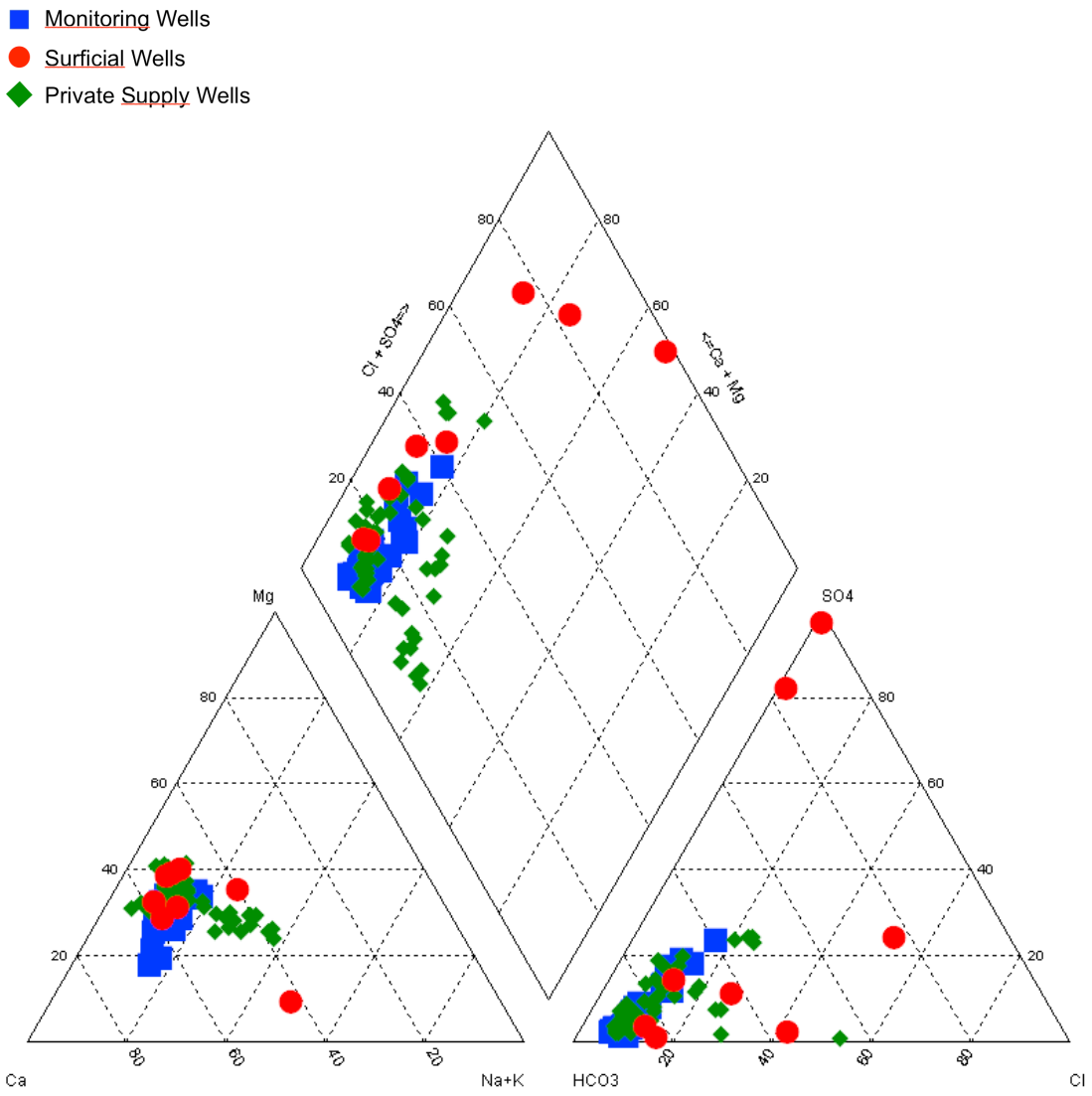


Fig. 4 Piper diagram of all water samples collected in from December 2007 until April 2009 from the DEP monitoring wells, private supply wells and shallow monitoring wells in the Lithia area.

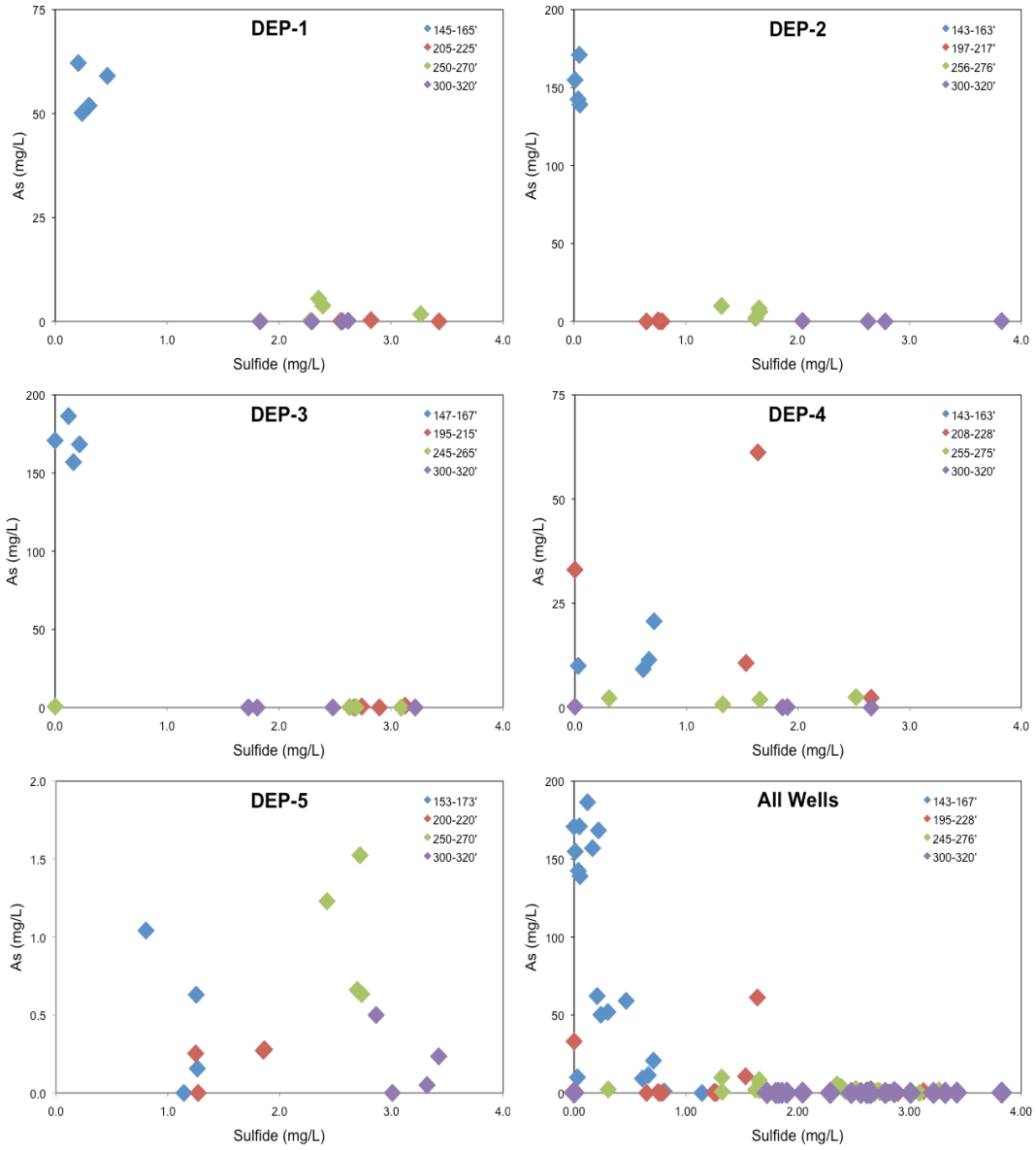


Fig. 5 Arsenic and sulfide concentrations for the 5 monitoring well clusters individually and for the whole data set.

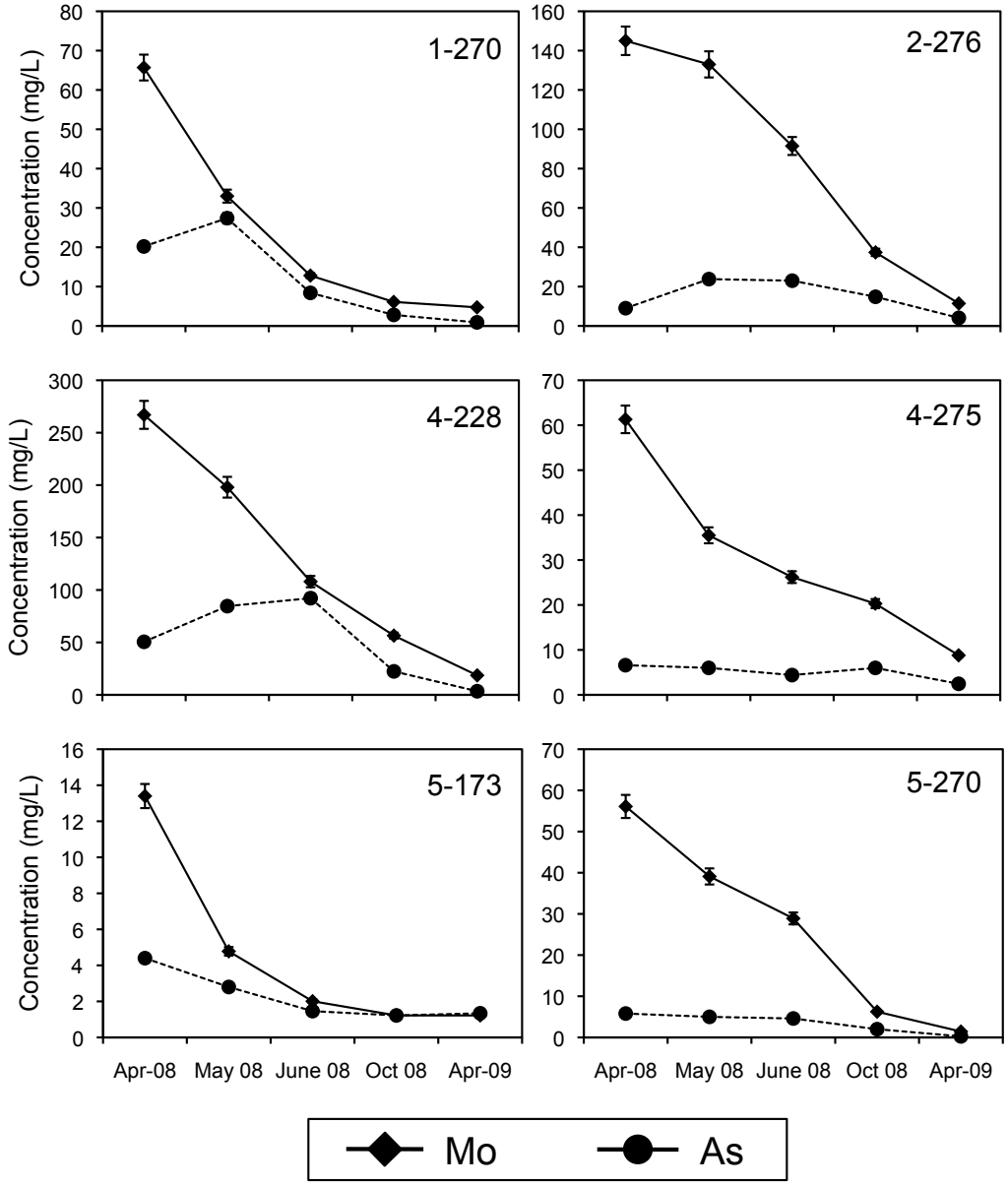


Fig. 6 Arsenic and Mo trends for selected DEP monitoring well intervals.

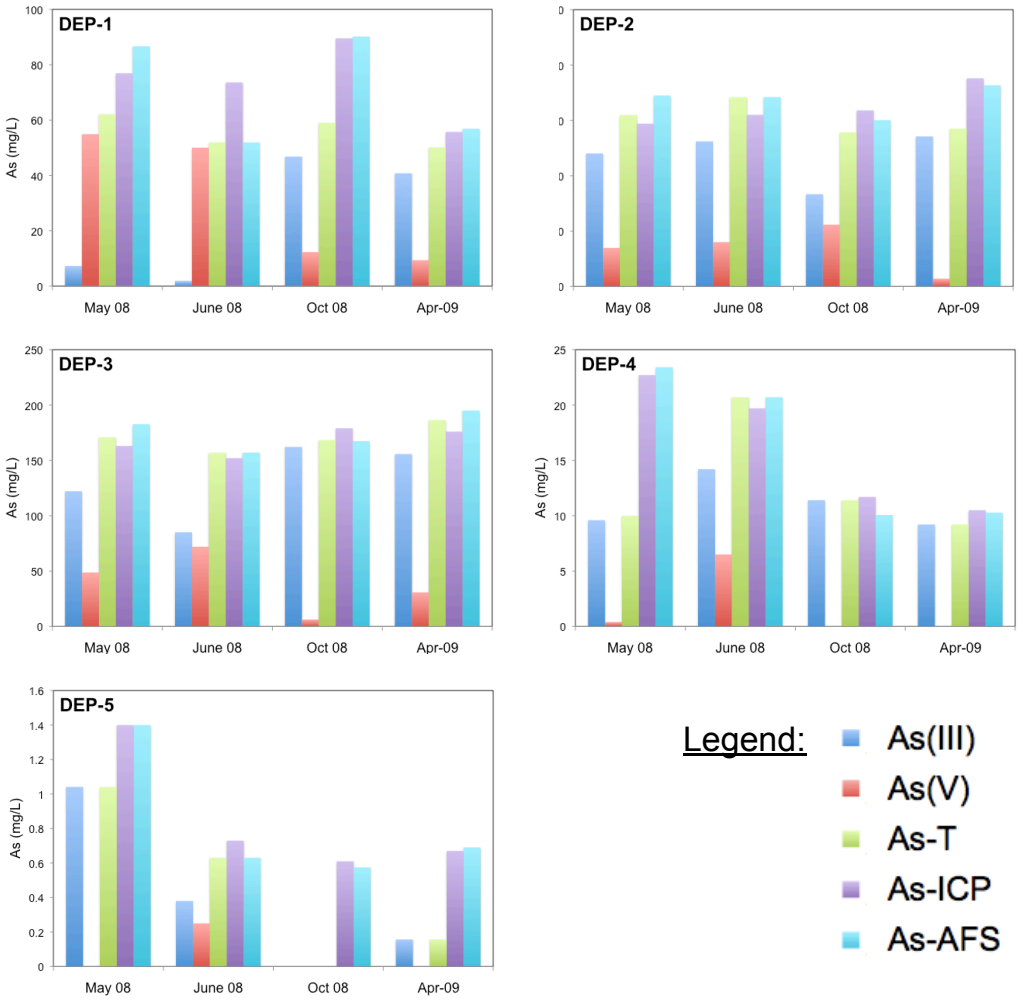


Fig. 7 Arsenic speciation results for As^{3+} and As^{5+} Results are also compared to total As concentration determined by ICP and AFS

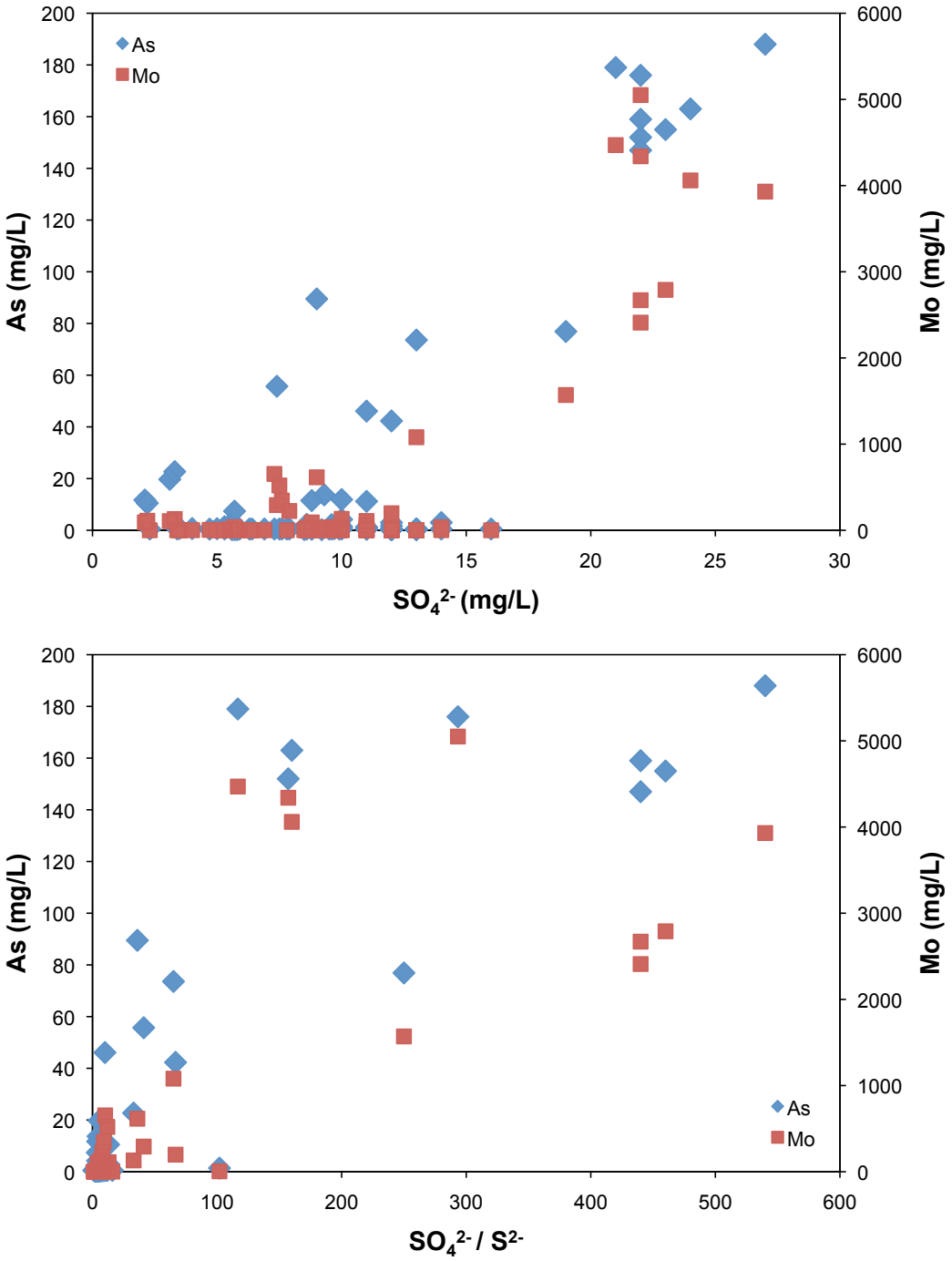


Fig. 8 Total sulfate and sulfate/sulfide ratios compared to As and Mo data in the DEP monitoring well clusters.

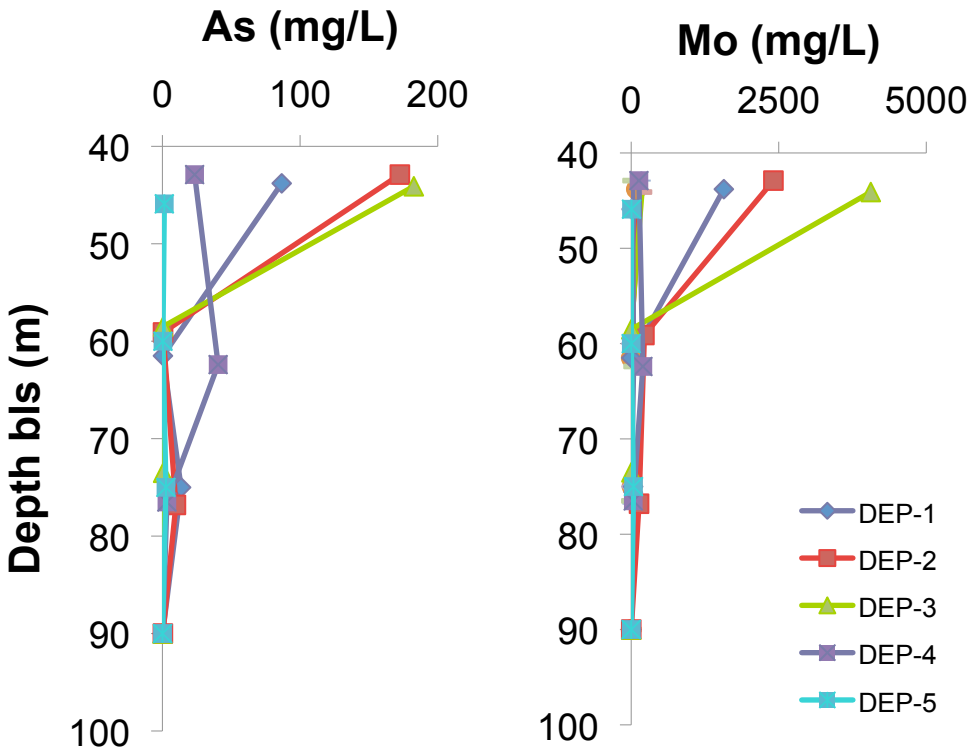


Fig. 9 As and Mo profiles with depth in the 5 monitoring well clusters in Lithia, Central Florida

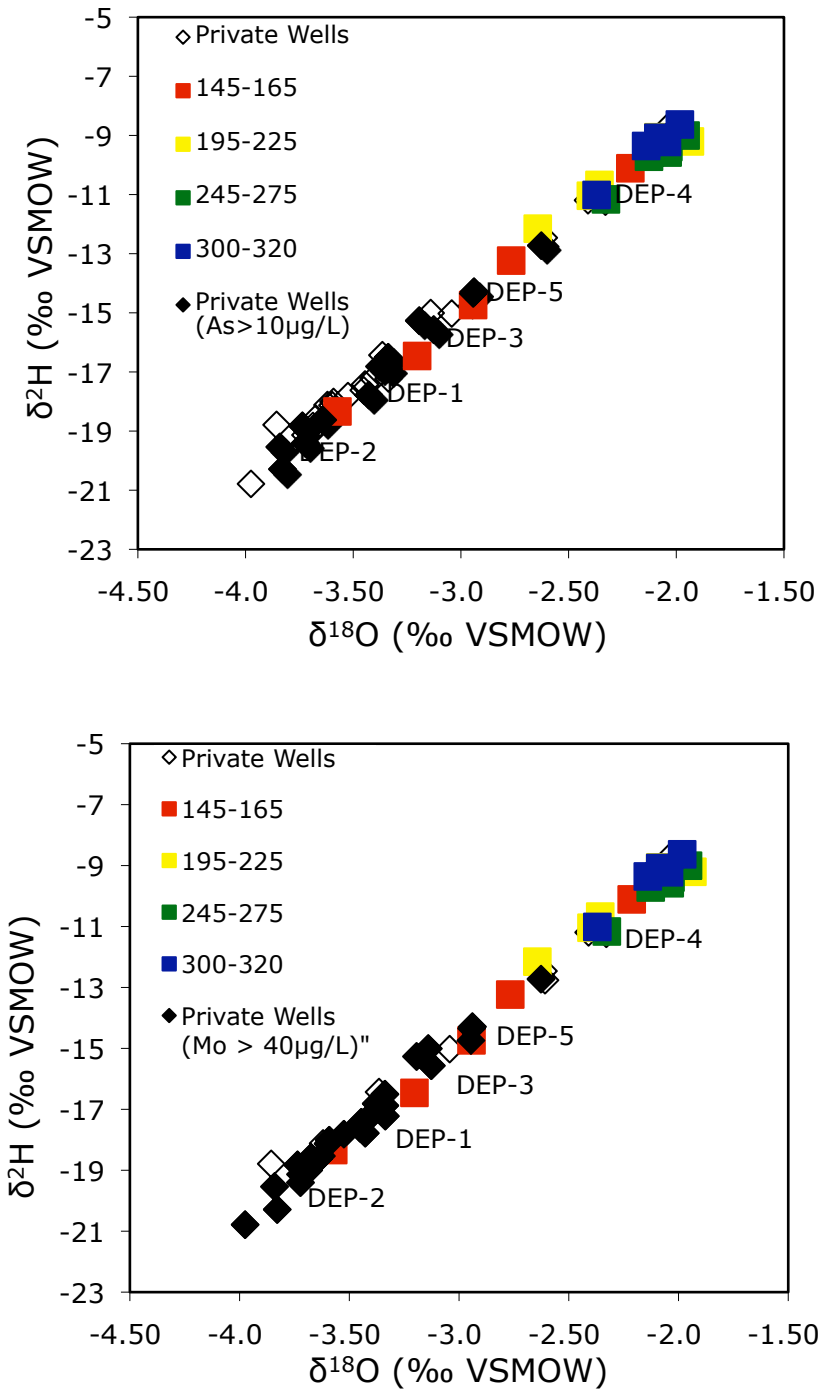


Fig. 10 Plot of $\delta^{18}O$ and δD for the 5 monitoring well clusters and 40 private supply wells in the Lithia area. The monitoring wells are color coded with depth. The private wells which show As values above the current drinking water standard are solid black. Most solid black diamonds fall within the range of the shallow interval in the monitoring wells (red color). Note: Well depths are in feet (ft).

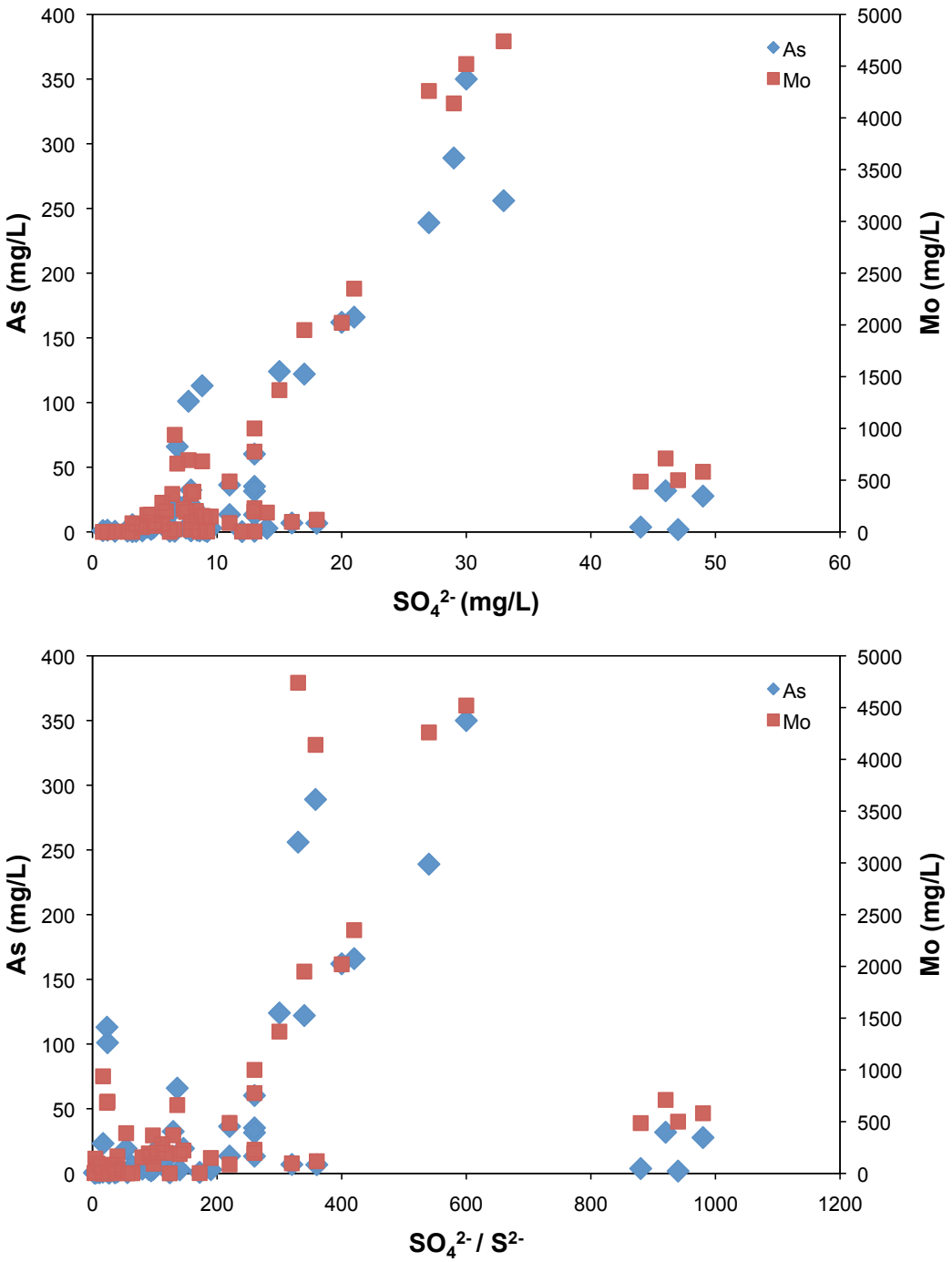


Fig. 11 Total sulfate and sulfate/sulfide ratios compared to As and Mo data in the private supply wells

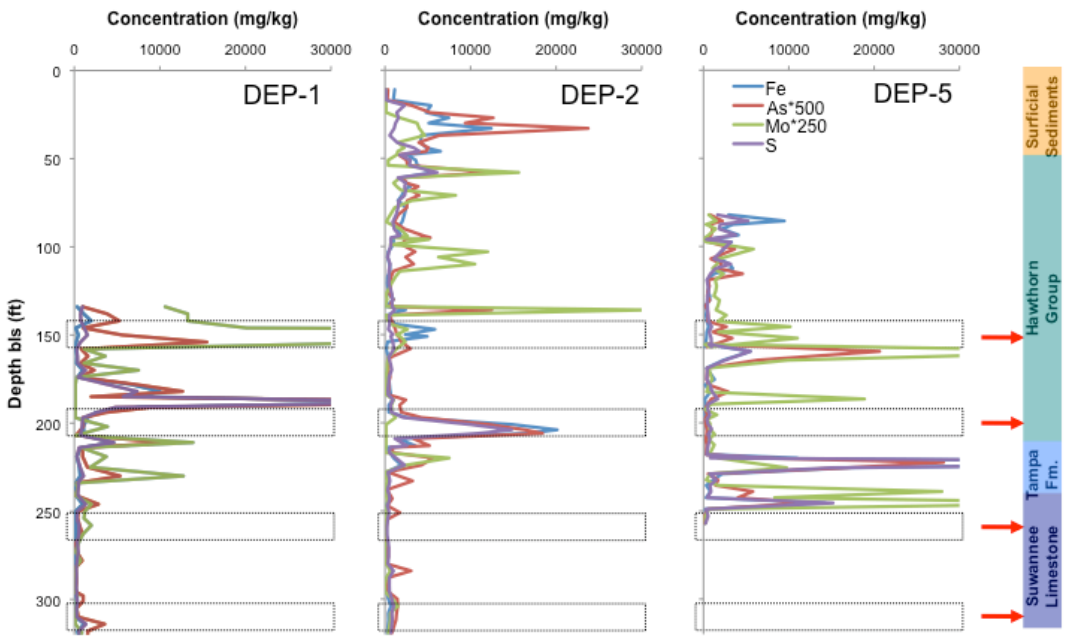


Fig. 12 Distribution of Mo and As with depth below surface (bls) for well clusters DEP-1, DEP-2 and DEP-5. The screened intervals are indicated by dashed boxes.

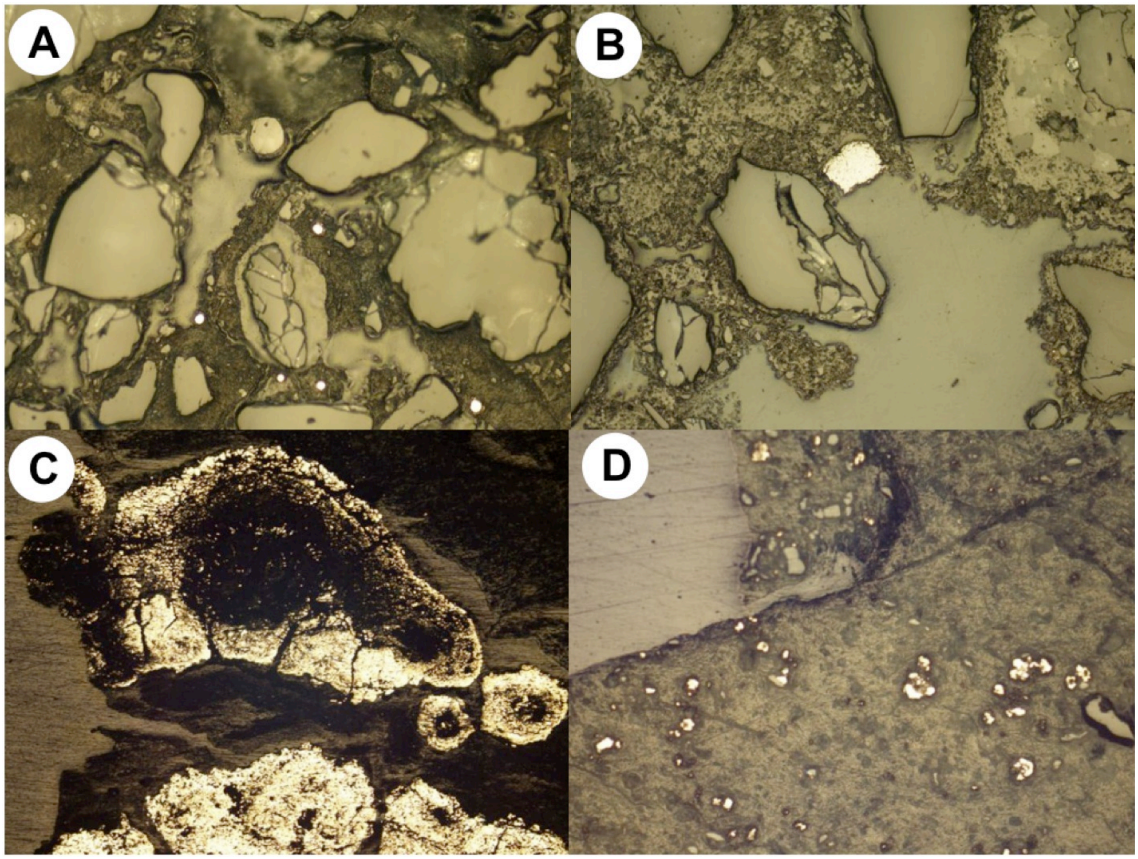


Fig. 13 Reflected light microsope images: (A) Small powellite crystals in a carbonate and clay matrix in core DEP-1 at 152 ft (20x magnification), (B) Larger euhedral pyrite in a carbonate and clay matrix in core DEP-1 at 156 ft (20x magnification), (C) Massive pyrite in core DEP-1 at 190 ft (2x magnification) and (D) Small framboidal pyrites in a carbonate matrix in core DEP-2 (20x magnification)

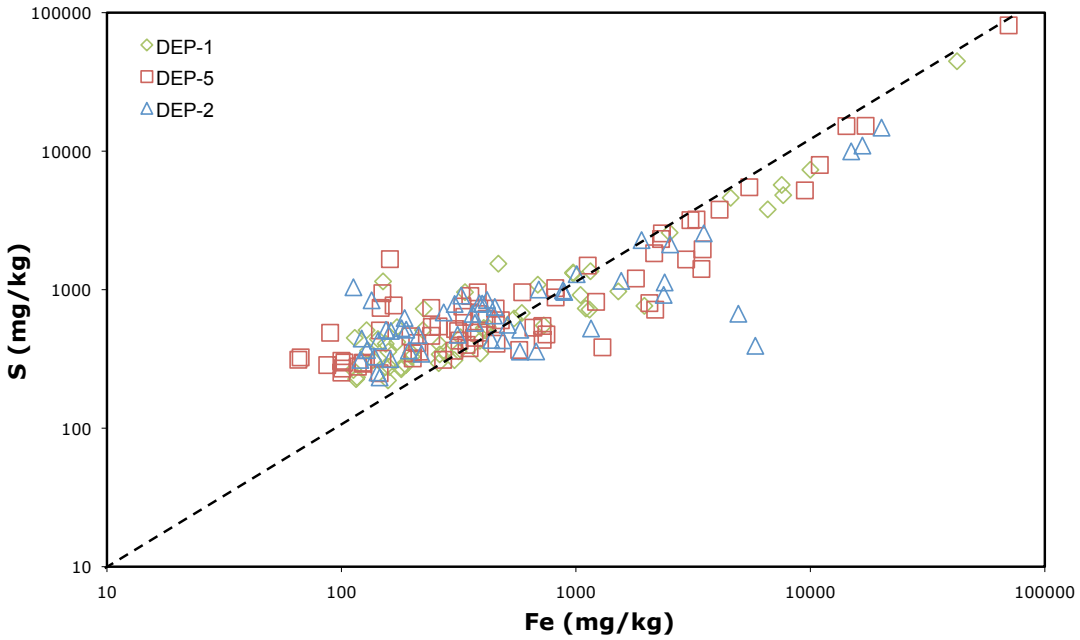


Fig. 14 Plot of Fe vs. S for the three monitoring well clusters DEP-1, DEP-2 and DEP-5. The dashed line represents the “pyrite line”, i.e., if pyrite would be the single source of Fe and S in a sample then all analyses would plot on this line.

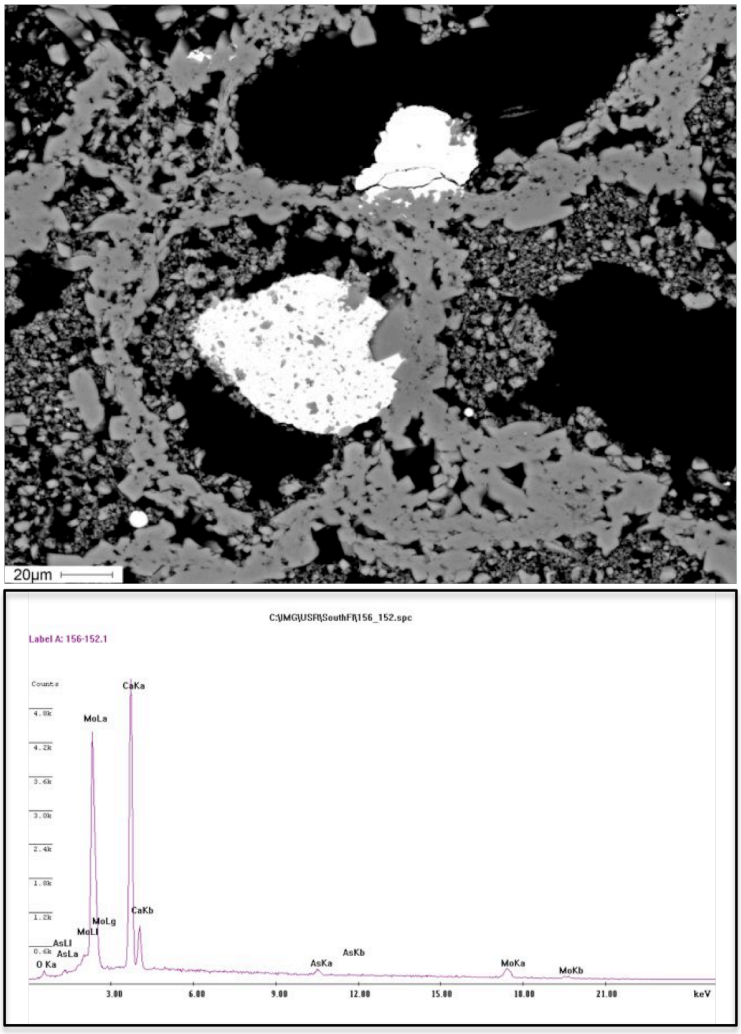


Fig. 15 Back scatter electron image from core DEP-1 (152 ft depth) of powellite in a clay/carbonate matrix. This type of image is based on density, the heavier a mineral phase the brighter it is displayed. Powellite is the latest stage of crystallization, not developing its own crystal shape, but filling pore space. The EDX spectra below was taken at a 5 µm-sized spot on the upper of the two powellites.

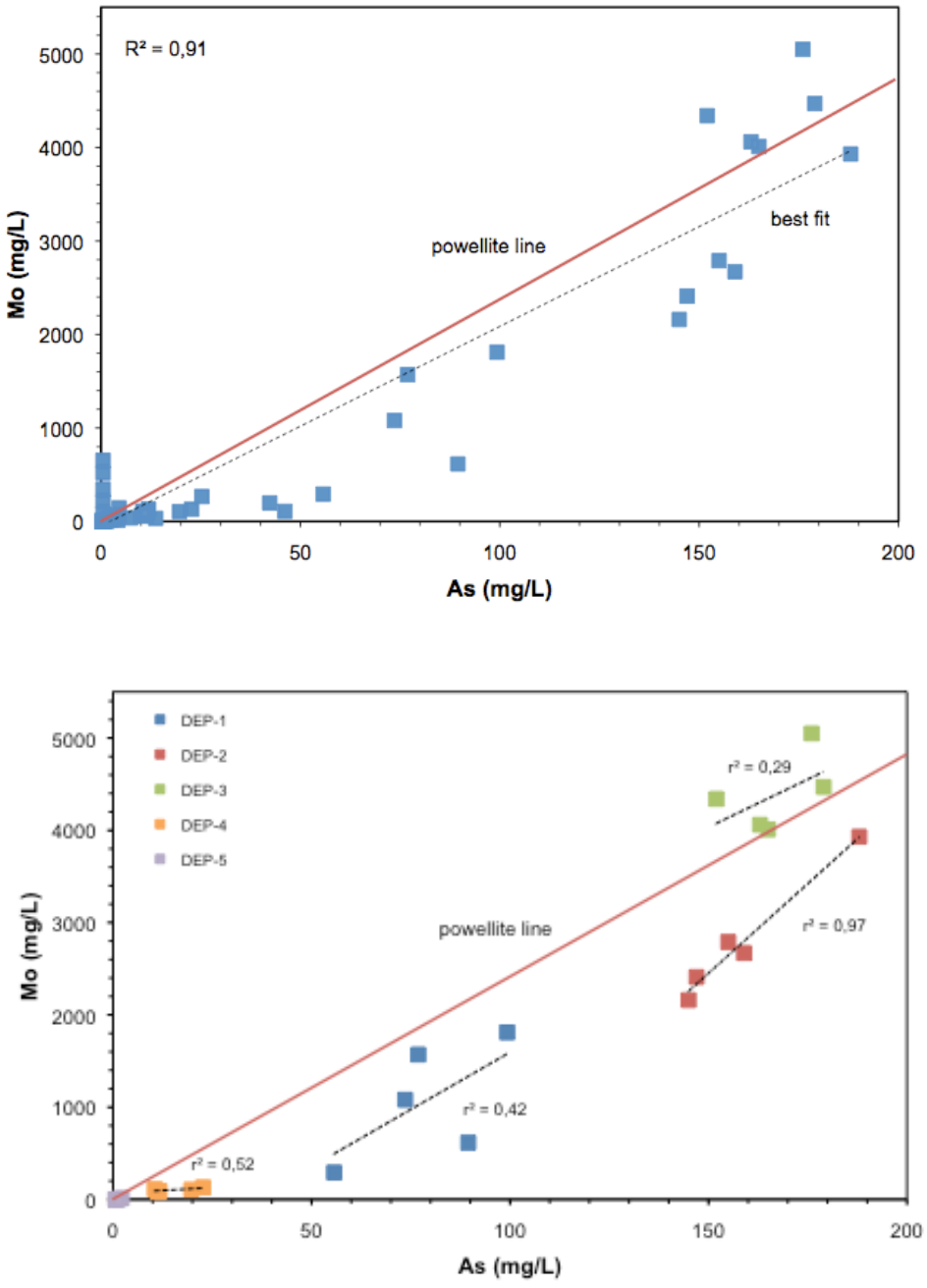


Fig. 16 Plot of As vs Mo for all FDEP monitoring well clusters. Above for the whole data set and below for the 5 well clusters individually. The powellite line was calculated based on the relative concentrations of Mo and As, which were determined by electron microprobe analysis (Table 5).

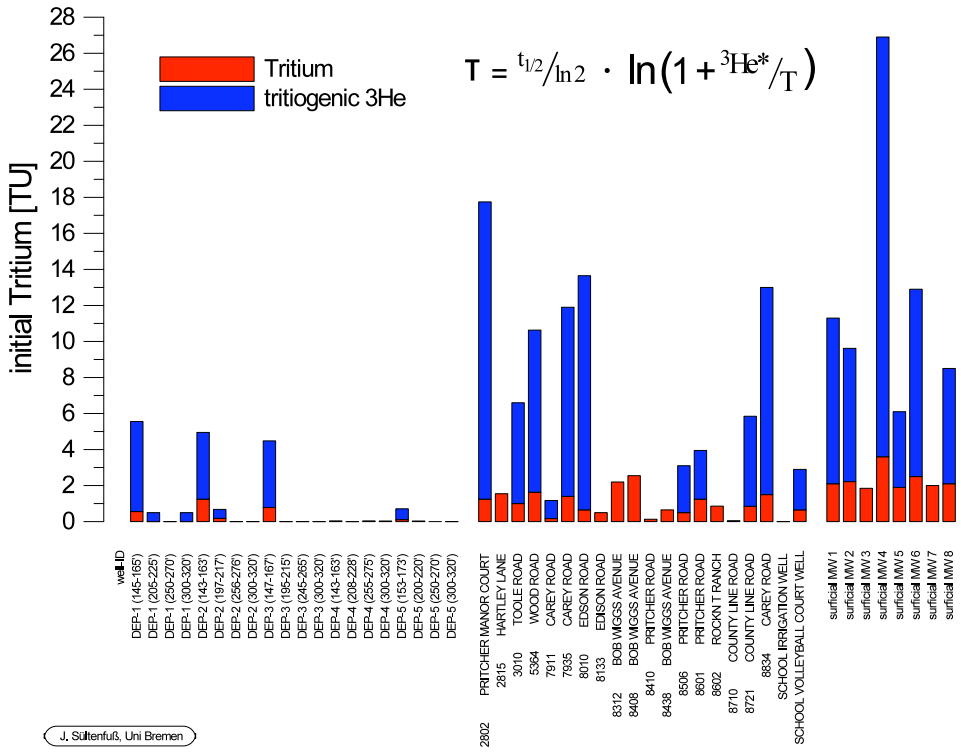


Fig. 17 Results of the tritium analyses and the calculated tritogenic ^{3}He for all samples. He isotopes were analyzed for samples where the blue bar on top of the red bar is missing.

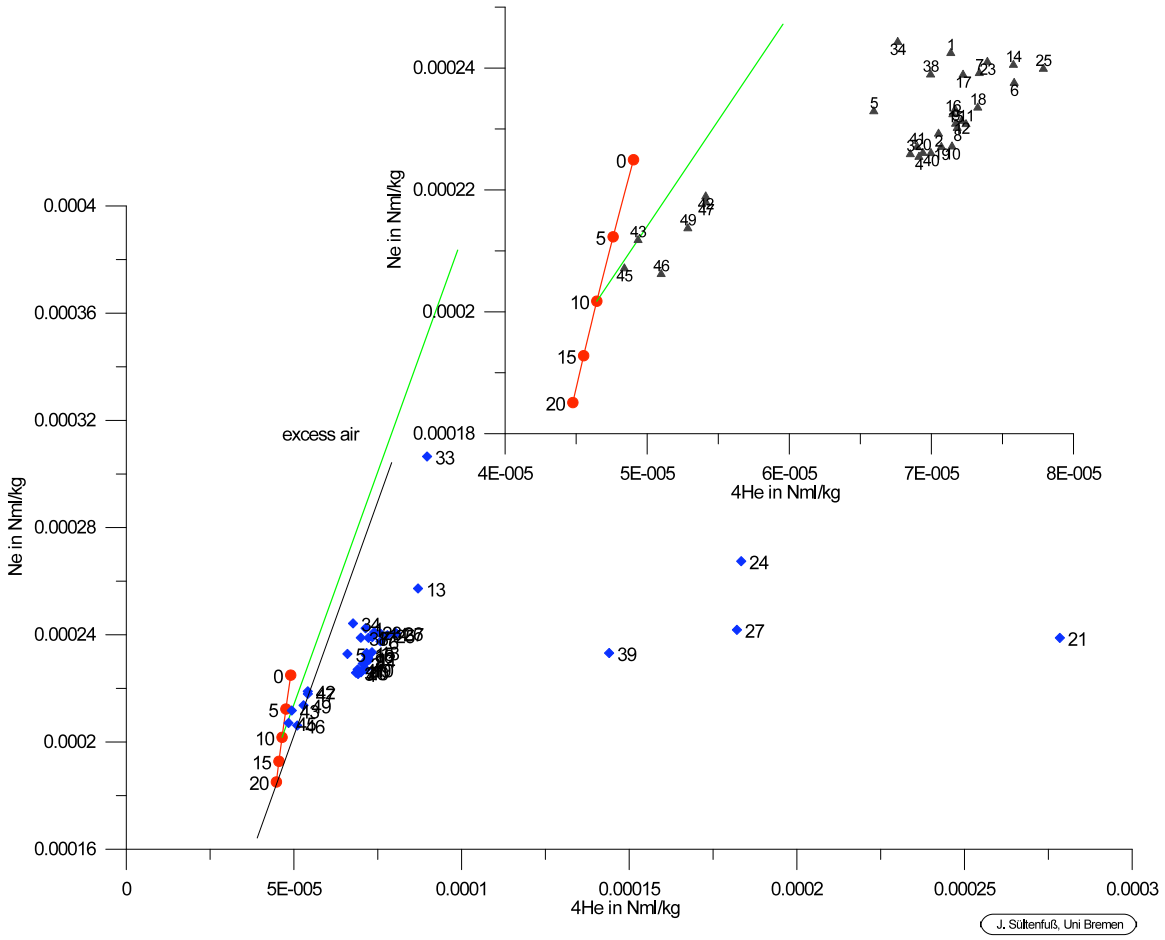
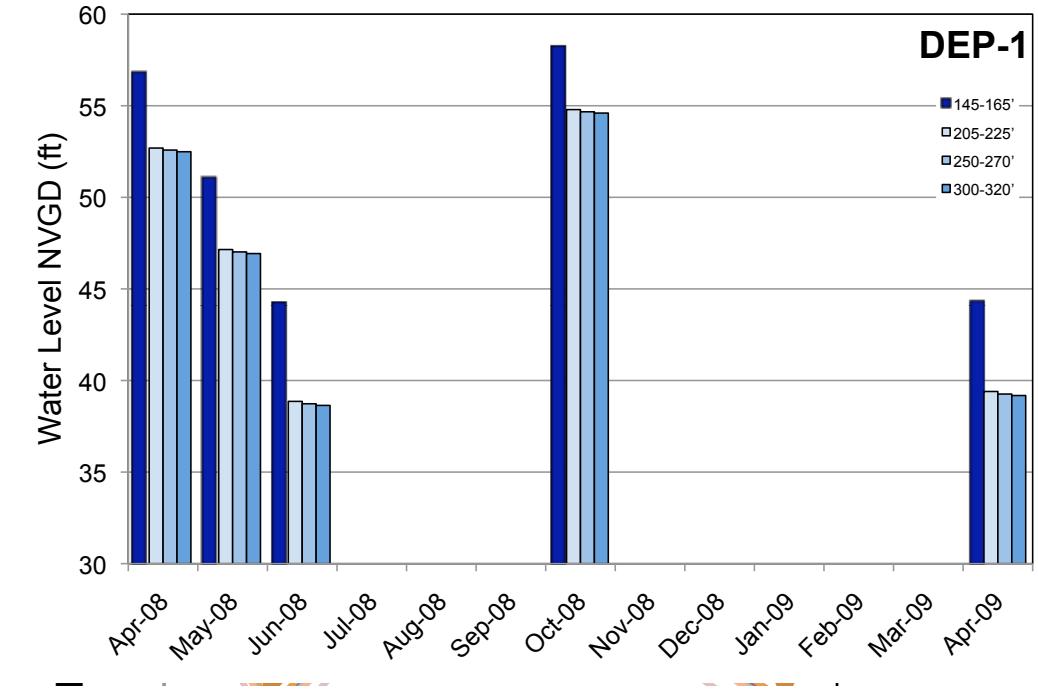


Fig. 18 Ne concentration vs. ^{4}He concentration. The upper right figure is an enlargement. Red line indicates solubility equilibrium concentration for different temperatures. Green line represents the addition of atmospheric air to a sample equilibrated at 10°C.



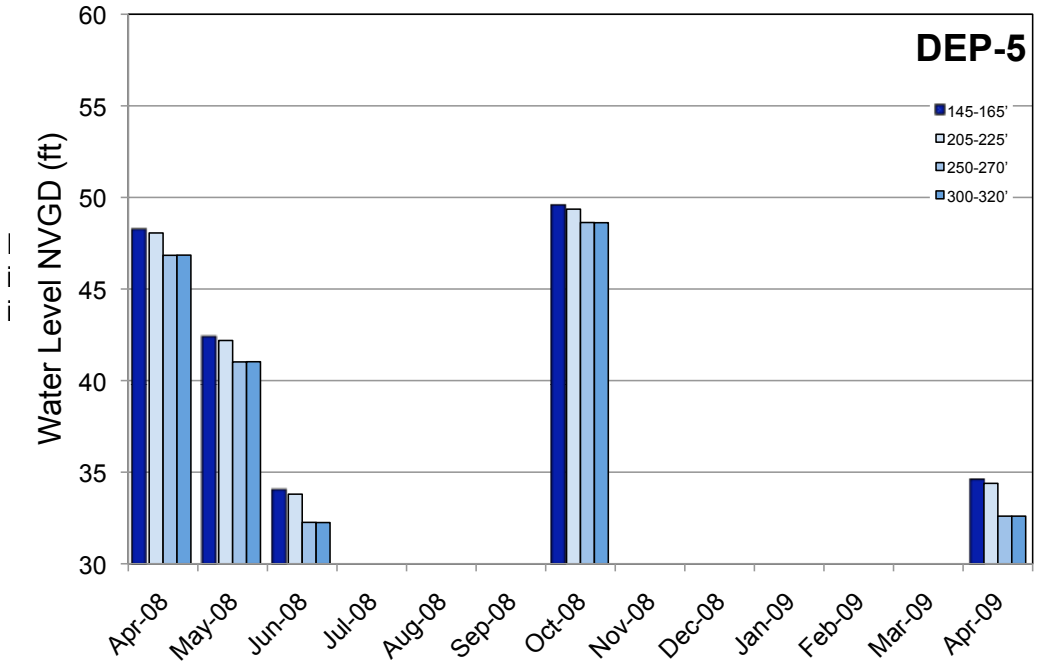


Fig. 19 Water level fluctuations with time in monitoring wells DEP-1 and DEP-5

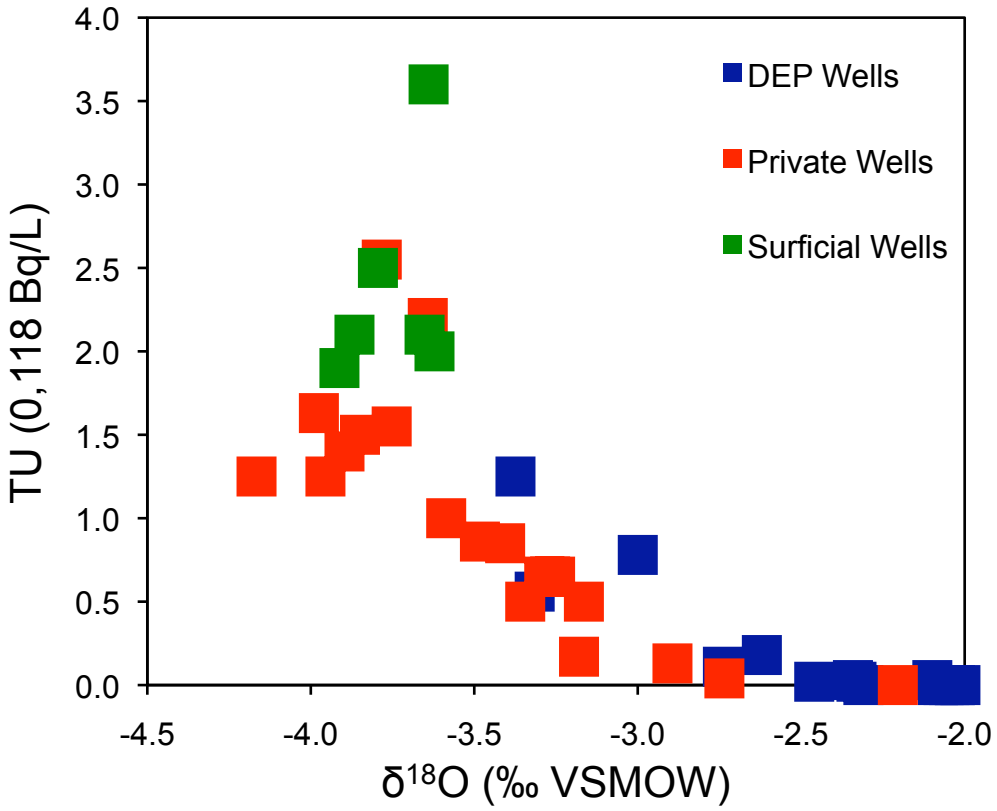


Fig. 21 $\delta^{18}O$ vs TU plot of private supply wells, DEP montoring wells and surficial monitoring wells.

8. Tables

Table 1 Field and laboratory measurements of groundwater samples collected from the 5 DEP monitoring well clusters in the Lithia area, Central Florida

Field ID	Sample ID	Date	Turbidity	pH	Conductivity mS/cm	DO %	DO mg/L	ORP	S mg/L	HCO_3 mg/L	Al ug/L	Sb ug/L	As ug/L	Br mg/L	Cd ug/L	Ca mg/L	Cl mg/L
DEP-1 (145-165')	1-165	Apr-08	4.7	9.9	290	1.5	0.1	-283				9.3	99				
DEP-1 (205-225')	1-225	Apr-08	10.8	7.6	346	1.9	0.1	-303				0.5	1				
DEP-1 (250-270')	1-270	Apr-08	5.4	7.3	352	1.9	0.2	-330				1.1	10				
DEP-1 (300-320')	1-320	Apr-08	5.4	7.3	354	2.0	0.2	-322				0.5	1				
DEP-2 (143-163')	2-163	Apr-08	8.1	7.7	256	1.4	0.1	-240				6.4	145				
DEP-2 (197-217')	2-217	Apr-08	1.5	7.4	305	2.2	0.2	-289				0.5	1				
DEP-2 (256-276')	2-276	Apr-08	0.7	7.4	345	1.3	0.1	-327				2.7	5				
DEP-2 (300-320')	2-320	Apr-08	12.4	7.3	347	1.6	0.1	-314				0.5	1				
DEP-3 (147-167')	3-167	Apr-08	0.9	7.6	334	2.3	0.2	-280				5.0	165				
DEP-3 (195-215')	3-215	Apr-08	0.7	7.4	337	1.7	0.1	-321				0.5	1				
DEP-3 (245-265')	3-265	Apr-08	0.4	7.3	339	1.3	0.1	-331				0.5	1				
DEP-3 (300-320')	3-320	Apr-08	0.7	7.4	348	1.6	0.1	-314				0.5	1				
DEP-4 (143-163')	4-163	Apr-08	1.9	7.4	357	3.4	0.3	-269				0.5	11				
DEP-4 (208-228')	4-228	Apr-08	9.6	7.4	370	3.6	0.3	-300				2.2	25				
DEP-4 (255-275')	4-275	Apr-08	1.0	7.3	352	0.7	0.1	-320				0.6	3				
DEP-4 (300-320')	4-320	Apr-08	18.4	7.4	386	3.8	0.3	-320				0.5	1				
DEP-5 (153-173')	5-173	Apr-08	8.2	7.3	342	2.6	0.2	-325				0.5	2				
DEP-5 (200-220')	5-220	Apr-08	5.5	7.2	379	2.5	0.2	-341				0.5	1				
DEP-5 (250-270')	5-270	Apr-08	2.5	7.2	380	3.3	0.3	-329				0.5	3				
DEP-5 (300-320')	5-320	Apr-08	10.2	7.2	357	4.3	0.4	-310				0.5	1				
DEP-1 (145-165')	1-165	May-08	5.5	9.9	285	0.5	0.0	-333	0.2	61		5.9	77	0.25	1.0	43	9.5
DEP-1 (205-225')	1-225	May-08	4.4	7.5	355	0.8	0.0	-299	2.6	192		0.5	1	0.25	0.0	43	12
DEP-1 (250-270')	1-270	May-08	2.9	7.6	347	0.6	0.1	-300	2.4	195		0.9	14	0.25	0.0	42	12
DEP-1 (300-320')	1-320	May-08	0.9	7.5	340	0.6	0.1	-286	2.3	196		0.5	1	0.25	0.0	42	12
DEP-2 (143-163')	2-163	May-08	1.7	7.7	246	2.2	0.2	-191	0.0	121		1.9	147	0.25	1.0	31	9.9
DEP-2 (197-217')	2-217	May-08	2.0	7.5	286	0.7	0.1	-230	0.8	177		0.5	1	0.25	0.5	37	10
DEP-2 (256-276')	2-276	May-08	3.5	7.5	423	1.0	0.1	-266	1.3	196		2.5	12	0.25	0.1	43	14
DEP-2 (300-320')	2-320	May-08	0.6	7.4	410	1.1	0.1	-257	2.0	196		0.5	1	0.25	0.0	44	13
DEP-3 (147-167')	3-167	May-08	1.3	7.8	447	1.6	0.1	-177	0.0	161		0.5	163	0.25	2.0	37	15
DEP-3 (195-215')	3-215	May-08	0.3	7.4	410	0.8	0.1	-296	2.7	194		0.5	1	0.25	0.0	44	12
DEP-3 (245-265')	3-265	May-08	0.3	7.4	436	1.0	0.1	-280		198		0.5	1	0.25	0.0	44	13
DEP-3 (300-320')	3-320	May-08	10.0	7.5	321	0.4	0.0	-280	1.7	200		0.5	1	0.25	0.0	45	13
DEP-4 (143-163')	4-163	May-08	2.0	7.5	316	0.7	0.1	-282	0.0	203		0.5	23	0.25	0.0	39	13
DEP-4 (208-228')	4-228	May-08	6.9	7.5	308	0.6	0.1	-296	0.0	189		2.7	42	0.25	0.0	41	12
DEP-4 (255-275')	4-275	May-08	1.1	7.5	310	0.4	0.0	-292	0.3	188		0.5	3	0.25	0.0	42	11
DEP-4 (300-320')	4-320	May-08	9.5	7.5	324	0.5	0.0	-296	0.0	198		0.5	1	0.25	0.0	46	11
DEP-5 (153-173')	5-173	May-08	1.8	7.6	325	1.7	0.1	-268	0.8	192		0.5	1	0.25	0.0	39	8.6
DEP-5 (200-220')	5-220	May-08	10.0	7.5	337	7.6	0.6	-279	1.3	199		0.5	1	0.25	0.0	44	13
DEP-5 (250-270')	5-270	May-08	10.5	7.4	445	2.1	0.2	-327	2.7	198		0.5	3	0.25	0.5	52	13
DEP-5 (300-320')	5-320	May-08	0.4	7.4	433	0.7	0.1	-299	2.9	199		0.5	1	0.25	0.0	45	13
DEP-1 (145-165')	1-165	Jun-08	2.7	10.1	252	3.2	0.3	-305	0.3	61	200	3.5	74			43.00	8.40
DEP-1 (205-225')	1-225	Jun-08	2.7	7.7	306	3.7	0.3	-262	2.6	192	60	0.5	1		0.025	47.30	11.00
DEP-1 (250-270')	1-270	Jun-08	2.6	7.5	303	2.5	0.2	-280	2.4	195	60	0.5	4		0.02	42.00	11.00
DEP-1 (300-320')	1-320	Jun-08	1.9	7.4	309	1.9	0.2	-290	2.6	198	60	0.5	1		0.02	42.00	11.00
DEP-2 (143-163')	2-163	Jun-08	4.7	7.9	277	0.4	0.0	n.d.	0.0	124	170	1.1	155			32.10	11.00
DEP-2 (197-217')	2-217	Jun-08	6.2	7.5	313	1.0	0.1	-226	0.8	176	60	0.5	1		0.02	36.20	9.60
DEP-2 (256-276')	2-276	Jun-08	2.7	7.3	354	2.4	0.2	-271	1.7	196	60	1.7	12		0.02	43.40	13.00
DEP-2 (300-320')	2-320	Jun-08	1.8	7.3	317	1.3	0.1	-300	2.6	199	60	0.5	1		0.02	43.50	12.00
DEP-3 (147-167')	3-167	Jun-08	1.9	7.7	301	2.5	0.2	-230	0.2	161	270	0.5	152			35.00	14.00
DEP-3 (195-215')	3-215	Jun-08	3.1	7.5	345	0.2	0.0	-293	2.7	196	60	0.5	1		0.023	42.20	12.00
DEP-3 (245-265')	3-265	Jun-08	4.0	7.5	347	0.2	0.0	-288	2.6	196	60	0.5	1		0.02	42.90	12.00
DEP-3 (300-320')	3-320	Jun-08	2.3	7.4	313	2.1	0.2	-294	1.8	195	60	0.5	1		0.02	41.40	12.00
DEP-4 (143-163')	4-163	Jun-08	3.2	7.6	344	0.4	0.0	-257	0.7	204	60	0.5	20		0.02	37.50	12.00
DEP-4 (208-228')	4-228	Jun-08	4.6	7.6	333	1.5	0.1	-258	1.6	188	60	0.8	46		0.02	40.60	11.00
DEP-4 (255-275')	4-275	Jun-08	1.7	7.5	302	2.2	0.2	-294	2.5	192	60	0.5	2		0.02	40.30	11.00
DEP-4 (300-320')	4-320	Jun-08	6.6	7.4	303	2.1	0.2	-295	1.9	195	60	0.5	1		0.02	42.50	11.00
DEP-5 (153-173')	5-173	Jun-08	6.8	8.0	368	1.8	0.1	-301	1.3	194	60	0.5	1		0.02	40.00	7.90
DEP-5 (200-220')	5-220	Jun-08	6.3	7.9	407	0.9	0.1	-310	1.9	205	60	0.5	1		0.02	45.00	12.00
DEP-5 (250-270')	5-270	Jun-08	3.8	7.4	310	1.8	0.2	-287	2.4	192	60	0.5	2		0.02	41.90	12.00
DEP-5 (300-320')	5-320	Jun-08	2.1	7.4	316	2.6	0.2	-278	3.0	201	60	0.5	1		0.02	44.30	11.00
DEP-1 (145-165')	1-165	Oct-08	1.8	9.8	263	2.3	0.2		0.5	73		1.1	90		0.2	39.6	8.2
DEP-1 (205-225')	1-225	Oct-08	1.0	7.5	344	2.5	0.2		3.4	185		0.5	1		0.02	43.1	11
DEP-1 (250-270')	1-270	Oct-08	1.2	7.5	343	2.3	0.2		3.3	187		0.5	1		0.02	42	11
DEP-1 (300-320')	1-320	Oct-08	0.5	7.5	347	2.1	0.2		2.6	195		0.5	1		0.02	41.1	11
DEP-2 (143-163')	2-163	Oct-08	1.9	7.8	265	3.1	0.3		0.1	115		3.1	159		1	32	10
DEP-2 (197-217')	2-217	Oct-08	1.4	7.6	309	12.8	1.1		0.8	168		0.5	1		0.2	36	9.8
DEP-2 (256-276')	2-276	Oct-08	1.7	7.5	350	19.0	0.2		1.7	192		0.5	7		0.02	43.7	13
DEP-2 (300-320')	2-320	Oct-08	1.5	7.5	360	2.7	0.2		2.8	190		0.5	1		0.028	47	12
DEP-3 (147-167')	3-167	Oct-08	4.2	7.7	338	2.7	0.2		0.2	155		0.5	179		1	36.2	14
DEP-3 (195-215')	3-215	Oct-08	0.2	7.5	349	8.1	0.7		2.9	190		0.5	1		0.02	43.9	12
DEP-3 (245-265')	3-265	Oct-08	1.8	7.5	350	2.9	0.2		2.7	189		0.5	1		0.02	43.6	12
DEP-3 (300-320')	3-320	Oct-08	2.5	7.5	357	2.6	0.2		2.5	194		0.5	1		0.02	43.9	12
DEP-4 (143-163')	4-163	Oct-08	2.2	7.5	350	2.9	0.2		0.7	196		0.5	12		0.02	37.6	13
DEP-4 (208-228')	4-228	Oct-08	6.6	7.6	330	2.3	0.2		1.5	176		0.5	11		0.02	39.6	11
DEP-4 (255-275')	4-275	Oct-08	0.5	7.5	341	2.1	0.2		1.7	187		0.5	3		0.02	41.7	11
DEP-4 (300-320')	4-320	Oct-08	10.2	7.5	338	2.4	0.2		1.9	177		0.5	1		0.022	44.4	11
DEP-5 (153-173')	5-173	Oct-08	11.6	7.5	321	2.0	0.2		1.1	185		0.5	1		0.02	41.6	8.2
DEP-5 (200-220')	5-220	Oct-08	12.9	7.5	361	15.3	1.3		1.9	195		0.5	1		0.02	45.6	12
DEP-5 (250-270')	5-270	Oct-08	4.3	7.5	343	4.1	0.3		2.7	178		0.5	1		0.02	42.2	12
DEP-5 (300-320')	5-320	Oct-08	3.9	7.4	354	2.7	0.2		3.4	193		0.5	1		0.02	46.2	12
DEP-1 (145-165')	1-165	Apr-09	0.4	9.4	227	1.7	0.1	-251	0.2	96	71	0.4	56		1	28.7	8.3
DEP-1 (205-225')	1-225	Apr-09	3.9	8.1	367	5.0	0.4	-315	2.8	188	60	0.3	0		1	41.4	11
DEP-1 (250-270')	1-270	Apr-09	1.4	7.4	342	3.7	0.3	-273	2.3	185	60	0.3	0		1	38.8	11
DEP-1 (300-320')	1-320	Apr-09	0.5	7.4	350	5.9	0.5	-283	1.8	192	60	0.3	0		1	39.3	12
DEP-2 (143-163')	2-163	Apr-09	2.2	7.7	303	1.4	0.1	-211	0.0	124	130	1.0	188		1	34.4	13
DEP-2 (197-217')	2-217	Apr-09	0.3	7.5	311	1.4	0.1	-199	0.6	170	60	0.3	1		1	34.8	9.8
DEP-2 (256-276')	2-276	Apr-09	1.2	7.9	355	5.6	0.5	-253	1.6	194	60	0.3	2		1	42	13
DEP-2 (300-320')	2-320	Apr-09	0.7	7.8	398	7.0	0.6	-257	3.8	190	60	0.3	0		1	45	13
DEP-3 (147-167')	3-167	Apr-09	1.7	7.9	339	0.6	0.1	-211	0.1	156	190	0.3	176		1	34.7	14
DEP-3 (195-215')	3-215	Apr-09	0.2	8.0	393	1.1	0.1	-315	3.1	188	60	0.3	0		1	41.7	12
DEP-3 (245-265')	3-265	Apr-09	1.7	8.0	387	0.1	0.0	-323	3.1	189	60	0.3	0		1	41.8	12
DEP-3 (300-320')	3-320	Apr-09	0.2	7.4	360	3.3	0.3	-233	3.2	195	60	0.3	0		1	40.8	13
DEP-4 (143-163')	4-163	Apr-09	7.3	7.5	353	3.1	0.3	-211	0.6	196	60	0.3	11		1	35.3	13
DEP-4 (208-228')	4-228	Apr-09	12.8	7.9	322	0.2	0.0	-289	2.7	171	60	0.3	2		1	36.7	11
DEP-4 (255-275')	4-275	Apr-09	1.2	7.4	343	3.1	0.3	-260	1.3	187	60	0.3	1		1	39.5	11
DEP-4 (300-320')	4-320	Apr-09	11.7	7.4	343	9.5	0.8	-274	2.7	187	60	0.3	0		1	40.5	11
DEP-5 (153-173')	5-173	Apr-09	9.0	8.0	329	8.9	0.7	-293	1.3	192	60	0.3	1		1	42	8.2
DEP-5 (200-220')	5-220	Apr-09	5.6	8.0	373	9.0	0.7	-297	1.3	200	60	0.3	0		1	42.7	12
DEP-5 (250-270')	5-270	Apr-09	2.8	7.4	350	3.1	0.3	-282	2.7	187	60	0.3	0		1	40.3	12
DEP-5 (300-320')	5-320	Apr-09	1.7	7.4	364	5.8	0.5	-283	3.3	192	60	0.3	0		1	43.6	12

Field ID	Cr ug/L	Cu ug/L	F mg/L	Fe ug/L	Kie-N mgN/L	Pb ug/L	Mg mg/L	Mn ug/L	Mo ug/L	Ni ug/L	N mgN/L	K mg/L	Se ug/L	Si mg/L	Na mg/L	Sr ug/L	SO_4 mg/L	S mg/L	P mg/L	V ug/L	Zn ug/L	$\delta^{18}O$ ‰	δD ‰	As^{3+} ug/L	As^{5+} ug/L	∑ As ug/L	As (AFS) ug/L	Sb (AFS) ug/L
DEP-1 (145-165')									1810																			
DEP-1 (205-225')									7																			
DEP-1 (250-270')									66																			
DEP-1 (300-320')									1																			
DEP-2 (143-163')									2160																			
DEP-2 (197-217')									100																			
DEP-2 (256-276')									145																			
DEP-2 (300-320')									4																			
DEP-3 (147-167')									4010																			
DEP-3 (195-215')									2																			
DEP-3 (245-265')									6																			
DEP-3 (300-320')									2																			
DEP-4 (143-163')									81																			
DEP-4 (208-228')									267																			
DEP-4 (255-275')									61																			
DEP-4 (300-320')									2																			
DEP-5 (153-173')									13																			
DEP-5 (200-220')									1																			
DEP-5 (250-270')									56																			
DEP-5 (300-320')									1																			
DEP-1 (145-165')			1.1	30	0.5		8		1570	0.25	0.33	4.0	1.0	20	11	680	19	0.1	0.02			-3.2	-17.1	7.3	54.9	62.1	86.6	5.1
DEP-1 (205-225')			0.4	30	0.3		14		2	0.25	0.01	1.1	1.0	23	10	540	10	2.5	0.02			-1.9	-10.1	0.0	0.0	0.0	0.4	0.0
DEP-1 (250-270')			0.4	46	0.3		13		33	0.25	0.01	1.3	1.0	23	11	520	9	2.1	0.03			-2.0	-10.5	5.5	0.0	5.5	13.6	0.8
DEP-1 (300-320')			0.4	52	0.3		13		0	0.25	0.01	1.0	1.0	23	11	520	8	1.9	0.02			-2.0	-9.7	0.0	0.0	0.0	0.1	0.0
DEP-2 (143-163')			0.6	150	0.1		11		2410	1.21	0.01	0.8	1.0	21	7	210	22	0.1	0.05			-3.6	-19.5	120.1	34.8	154.9	172.5	1.7
DEP-2 (197-217')			0.6	30	0.3		13		224	0.25	0.01	1.0	1.0	35	11	460	8	1.0	0.02			-2.6	-13.1	0.0	0.0	0.0	0.5	0.0
DEP-2 (256-276')			0.4	200	0.3		14		133	0.69	0.01	1.1	1.0	23	11	510	10	1.5	0.02			-2.2	-11.2	5.2	4.7	9.9	9.8	2.3
DEP-2 (300-320')			0.4	34	0.3		14		1	0.57	0.01	1.1	1.0	23	10	640	14	2.0	0.02			-2.1	-10.6	0.2	0.0	0.2	0.3	0.0
DEP-3 (147-167')			0.7	220	0.2		15		4060	0.25	0.01	1.1	1.0	27	14	300	24	0.2	0.04			-2.9	-15.4	122.1	48.7	170.8	182.6	0.3
DEP-3 (195-215')			0.4	30	0.4		14		2	0.25	0.00	1.3	1.0	24	11	620	13	2.6	0.02			-2.0	-10.1	0.6	0.0	0.6	0.5	0.0
DEP-3 (245-265')			0.4	45	0.3		14		2	0.25	0.01	1.2	1.0	24	11	530	12	2.6	0.02			-2.1	-10.6	0.3	0.4	0.7	0.5	0.1
DEP-3 (300-320')			0.4	450	0.3		14		2	0.25	0.01	1.1	1.0	22	14	590	11	2.0	0.06			-2.0	-9.5	0.0	0.1	0.1	0.1	0.0
DEP-4 (143-163')			0.7	250	0.3		17		131	0.25	0.01	1.2	1.0	34	15	320	3	0.1	0.04			-2.2	-10.9	9.6	0.4	10.0	23.4	0.2
DEP-4 (208-228')			0.4	170	0.3		14		198	0.25	0.01	1.2	1.0	24	12	490	12	0.2	0.04			-2.3	-12.0	18.1	14.9	33.1	40.5	1.8
DEP-4 (255-275')			0.4	44	0.3		14		36	0.25	0.01	0.9	1.0	24	11	470	14	1.1	0.03			-2.3	-11.8	0.4	1.9	2.2	3.3	0.3
DEP-4 (300-320')			0.4	330	0.2		14		2	0.25	0.01	1.0	1.0	22	11	450	6	0.8	0.04			-2.4	-12.0	0.2	0.0	0.2	0.3	0.1
DEP-5 (153-173')			0.4	180	0.2		14		5	0.25	0.01	1.1	1.0	26	9	250	5	0.1	0.03			-2.7	-14.8	1.0	0.0	1.0	1.4	0.1
DEP-5 (200-220')			0.5	310	0.3		15		1	0.25	0.01	1.3	1.0	22	11	710	11	0.7	0.07			-2.4	-11.7	0.0	0.0	0.0	0.4	0.0
DEP-5 (250-270')			0.4	72	0.3		13		39	2.19	0.01	1.0	0.5	22	12	680	10	1.9	0.02			-2.1	-10.4	1.5	0.0	1.5	2.6	0.2
DEP-5 (300-320')			0.4	48	0.3		13		0	0.25	0.01	0.9	0.5	23	10	640	6	1.5	0.02			-2.0	-9.8	0.2	0.3	0.5	0.1	0.0
DEP-1 (145-165')	1	0.5	1.1	33	0.5	0.2	7		1080	0.26	0.06	3.2	0.5	23	10	710	13	0.2	0.02	28	5	-3.2	-16.6	1.9	50.0	51.9	51.9	4.6
DEP-1 (205-225')	1	0.5	0.35	52	0.4	0.2	14		2	0.27	0.00	0.9	0.5	24	10	520	9.5	2.9	0.02	2	5	-2.0	-8.8	0.1	0.0	0.1	0.1	0.0
DEP-1 (250-270')	1	0.5	0.35	30	0.4	0.2	13		13	0.25	0.01	1.0	0.5	23	11	520	10	2.5	0.02	2	5	-2.0	-8.0	2.3	1.5	3.8	3.8	0.9
DEP-1 (300-320')	1	0.5	0.35	51	0.3	0.2	13		0	0.25	0.00	0.9	0.5	23	10	460	6.9	1.9	0.02	2	5	-2.0	-8.3	0.0	0.0	0.0	0.0	0.0
DEP-2 (143-163')	1	0.5	0.57	170	0.1	0.2	12		2790	0.97	0.01	0.7	0.5	22	7	110	23	0.1	0.04	10	5	-3.5	-17.2	131.0	40.0	171.0	171.0	1.6
DEP-2 (197-217')	1	0.5	0.6	30	0.3	0.2	12		345	0.48	0.00	0.8	0.5	35	11	340	7.6	0.8	0.02	2	5	-2.6	-11.7	0.1	0.0	0.1	0.1	0.0
DEP-2 (256-276')	1	0.52	0.36	170	0.2	0.2	14		92	0.38	0.01	0.9	0.5	24	11	580	8.8	1.1	0.02	2	5	-2.1	-9.3	4.7	3.6	8.3	8.3	2.9
DEP-2 (300-320')	1	0.5	0.34	30	0.3	0.2	14		1	0.25	0.00	0.8	0.5	23	10	630	13	2.9	0.02	2	5	-2.2	-9.2	0.0	0.0	0.1	0.1	0.0
DEP-3 (147-167')	1	0.72	0.64	220	0.3	0.2	15		4340	0.31	0.01	0.9	0.5	27	15	270	22	0.1	0.03	8	5	-2.9	-14.5	85.0	72.0	157.0	157.0	0.2
DEP-3 (195-215')	1	1.1	0.36	30	0.3	0.2	14		0	0.55	0.01	0.8	0.5	24	10	490	12	2.8	0.02	2	5	-2.1	-8.9	0.0	0.0	0.0	0.0	0.0
DEP-3 (245-265')	1	0.5	0.36	46	0.3	0.2	13		2	0.25	0.01	0.9	0.5	24	10	520	10	2.2	0.03	2	5	-2.1	-9.4	0.2	0.0	0.2	0.2	0.1
DEP-3 (300-320')	1	0.5	0.36	65	0.3	0.2	13		1	0.25	0.01	0.9	0.5	23	14	470	13	1.5	0.03	2	5	-2.1	-9.3	0.0	0.0	0.0	0.0	0.0
DEP-4 (143-163')	1	0.5	0.7	190	0.3	0.2	16		106	0.25	0.01	1.0	0.5	36	14	370	3.1	0.6	0.02	2	5	-2.3	-10.0	14.2	6.5	20.7	20.7	0.1
DEP-4 (208-228')	1	0.5	0.4	100	0.3	0.2	13		108	0.25	0.01	0.9	0.5	25	11	460	11	1.1	0.03	2	5	-2.3	-11.1	2.2	59.0	61.2	61.2	1.6
DEP-4 (255-275')	1	0.5	0.38	48	0.3	0.2	13		26	0.25	0.01	0.8	0.5	24	10	400	9.6	1.8	0.04	2	5	-2.4	-11.3	0.9	1.6	2.5	2.5	0.2
DEP-4 (300-320')	1	0.5	0.38	200	0.3	0.2	13		1	0.25	0.01	0.8	0.5	23	10	480	5.3	1.6	0.04	2	5	-2.4	-10.5	0.0	0.0	0.0	0.0	0.0
DEP-5 (153-173')	1	0.5	0.41	140	0.3	0.2	14		2	0.25	0.01	0.9	0.5	27	9	340	3.5	0.6	0.04	2	5	-2.8	-13.6	0.4	0.3	0.6	0.6	0.1
DEP-5 (200-220')	1	0.5	0.4	230	0.3	0.2	15		0	0.25	0.01	0.9	0.5	24	10	560	9.6	1.5	0.05	2	5	-2.4	-10.9	0.3	0.0	0.3	0.3	0.0
DEP-5 (250-270')	1	3	0.36	50	0.4	0.2	13		29	0.25	0.01	1.1	0.5	22	12	570	8.6	2.1	0.04	2	5	-2.0	-9.0	0.3	0.9	1.2	1.2	0.2
DEP-5 (300-320')	1	0.5	0.35	48	0.3	0.2	14		0	0.25	0.01	0.8	0.5	24	10	610	3.4	2.6	0.04	2	5	-2.1	-8.7	0.0	0.0	0.0	0.0	0.0
DEP-1 (145-165')			0.81	43	0.4		8		615	0.28	0.01	2.2	0.5	24	9	580	9	0.3	0.04			-3.2	-15.7	46.8	12.3	59.06	90.2	0.9
DEP-1 (205-225')			0.31	30	0.4		13		1	0.36	0.01	0.9	0.5	20	10	519	8.6	2.4	0.02			-1.9	-8.7	0.0	0.0	0.00	0.0	0.0
DEP-1 (250-270')			0.3	30	0.4		13		6	0.25	0.01	1.1	0.5	20	11	511	10	2.4	0.02			-1.9	-8.5	1.7	0.0	1.72	1.2	0.3
DEP-1 (300-320')			0.31	47	0.4		13		0	0.25	0.00	0.9	0.5	21	12	514	2.3	2.1	0.02			-2.0	-7.9	0.0	0.2	0.17	0.1	0.0
DEP-2 (143-163')			0.5	190	0.1		11		2670	1.33	0.01	0.6	0.5	19	7	161	22	0.1	0.09			-3.6	-18.3	83.3	55.8	139.09	150.2	2.6
DEP-2 (197-217')			0.56	30	0.4		12		520	0.25	0.01	1.0	0.5	32	11	404	7.5	0.6	0.02			-2.7	-11.6	0.4	0.2	0.59	0.2	0.0
DEP-2 (256-276')			0.33	170	0.4		14		37	0.25	0.00	0.9	0.5	22	11	566	5.7	1.5	0.02			-2.1	-8.6	6.2	0.0	6.17	4.9	0.3
DEP-2 (300-320')			0.32	31	0.3		14		0	0.62	0.01	0.9	0.5	21	10	655	16	2.4	0.02			-2.1	-8.3	0.0	0.0	0.00	0.0	0.3
DEP-3 (147-167')			0.6	250	0.3		15		4470	0.86	0.00	1.0	0.5	25	14	278	21	0.2	0.07			-3.0	-14.3	162.1	6.3	168.37	167.4	0.3
DEP-3 (195-215')			0.34	30	0.4		14		1	0.46	0.01	0.9	0.5	23	11	547	12	2.3	0.02			-2.1	-8.2	0.0	0.0	0.00	0.1	0.1
DEP-3 (245-265')			0.32	30	0.4		13		0	0.25	0.01	0.9	0.5	23	10	555	11	2.1	0.02			-2.0	-8.7	0.0	0.1	0.08	0.1	0.1
DEP-3 (300-320')			0.33	95	0.4		14		1	0.39	0.01	1.0	0.5	22	13	559	6.3	1.7	0.03			-2.1	-8.4	0.0	0.0	0.00	0.1	0.1
DEP-4 (143-163')			0.64	200	0.3		16		92	0.25	0.00	1.0	0.5	33	14	395	2.1	0.5	0.03			-2.2	-9.5	11.4	0.0	11.40	10.1	0.2
DEP-4 (208-228')			0.38	72	0.4		13		57	0.36	0.01	1.0	0.5	23	12	478	11	1.4	0.02			-2.4	-10.2	10.7	0.0	10.69	8.4	0.0
DEP-4 (255-275')			0.33	40	0.3		14		20	0.35	0.01	0.9	0.5	23	10	475	12	1.8	0.02			-2.3	-10.4	1.9	0.0	1.87	1.5	0.1
DEP-4 (300-320')			0.37	180	0.3		14		0	0.25	0.01	0.9	0.5	22	10	475	5.8	1.8	0.03			-2.4	-10.5	0.1	0.0	0.11	0.1	0.0
DEP-5 (153-173')			0.38	130	0.3		14		1	0.25	0.01	1.0	0.5	25	9	339	5	0.8	0.02			-2.8	-11.3	0.0	0.0	0.00	0.6	0.0
DEP-5 (200-220')			0.38	220	0.4		15		0	0.25	0.01	1.0	0.5	23	11	634	9.7	1.2	0.03			-2.3	-10.5	0.1	0.2	0.27	0.3	0.1
DEP-5 (250-270')			0.36	30	0.5		12		6	0.3	0.01	1.7	0.5	22	12	576	11	2.5	0.02			-2.0	-8.8	0.7	0.0	0.66	0.4	0.3
DEP-5 (300-320')			0.33	35	0.4		13		0	0.25	0.01	0.9	0.5	22	10	642	11	2.8	0.02			-2.0	-9.2	0.1	0.1	0.23	0.0	0.1
DEP-1 (145-165')	0.3	0.5	0.65	30	0.3	0.2	8	1.7	292	0.25	0.01	1.4	0.2	26	9	360	7.4	0.2	0.02	25	5	-3.3	-16.9	40.8	9.4	50.13	56.9	
DEP-1 (205-225')	0.3	0.52	0.34	30	0.3	0.2	13	0.75	0	0.34	0.01	1.0	0.2	23	9	489	9.2	2.4	0.01	2	5	-2.1	-9.7	0.3	0.0	0.29	0.5	
DEP-1 (250-270')	0.3	0.5	0.34	30	0.3	0.2	12	0.89	5	0.25	0.01	1.1	0.2	22	11	474	4.7	2.2	0.01	2	5	-2.0	-10.5	0.2	0.0	0.15	0.8	
DEP-1 (300-320')	0.3	0.5	0.34	30	0.4	0.2	13	8.3	0	0.25	0.00	0.9	0.2	23	11	483	5.6	1.7	0.01	2	5	-2.0	-11.0	0.0	0.0	0.00	0.3	
DEP-2 (143-163')	0.3	0.5	0.56	200	0.1	0.2	13	7.2	3930	0.97	0.00	0.8	0.2	21	8	186	27	0.1	0.05	2	5	-3.4	-21.3	135.5	7.0	142.47	181.7	
DEP-2 (197-217')	0.3	0.5	0.59	30	0.4	0.2	12	0.75	654	0.25	0.00	1.0	0.2	33	10	383	7.3	0.7	0.00	2	5	-2.6	-15.9	0.0	0.0	0.00	1.3	
DEP-2 (256-276')	0.3	0.5	0.34	110	0.4	0.2	14	2.8	11	0.25	0.01	0.9	0.2	23	10	535	5.5	1.7	0.01	2	5	-2.0	-12.0	2.1	0.0	2.12	2.2	
DEP-2 (300-320')	0.3	0.5	0.34	30	0.4	0.2	14	1.2	0	0.25	0.01	1.0	0.2	23	10	643	12	2.9	0.01	2	5	-2.0	-11.1	0.0	0.2	0.21	0.3	
DEP-3 (147-167')	0.3	0.5	0.64	190	0.3	0.2	15	5.7	5050	0.27	0.00	1.0	0.2	27	13	269	22	0.1	0.02	2	5	-3.0	-18.2	155.7	30.8	186.44	195.0	
DEP-3 (195-215')	0.3	0.5	0.35	30	0.4	0.2	13	0.75	1	0.25	0.00	0.9	0.2	25	10	519	12	2.9	0.01	2	5	-2.1	-10.9	1.2	0.0	1.16	0.7	
DEP-3 (245-265')	0.3	0.5	0.34	30	0.4	0.2	13	2.3	0	0.25	0.00	0.9	0.2	24	10	525	12	2.4	0.02	2	5	-1.8	-11.6	0.0	0.0	0.00	0.4	
DEP-3 (300-320')	0.3	0.5	0.35	33	0.4	0.2	13	3.7	1	0.25	0.00	0.9	0.2	24	12	525	5.7	2.7	0.02	2	5	-1.9	-13.5	0.0	0.0	0.02	0.3	
DEP-4 (143-163')	0.3	0.5	0.66	220	0.4	0.29	15	5.7	111	0.25	0.02	1.1	0.2	37	13	363	2.2	0.2	0.05	2	5	-2.1	-11.9	9.2	0.0	9.20	10.3	
DEP-4 (208-228')	0.3	0.5	0.39	45	0.4	0.2	12	1.8	19	0.25	0.01	1.5	0.2	24	11	429	12	1.6	0.02	2	5	-2.3	-13.2	1.4	0.9	2.34	2.3	
DEP-4 (255-275')	0.3	0.5	0.36	30	0.3	0.2	14	1.3	9	0.25	0.01	0.8	0.2	24	10	447	11	2.2	0.01	2	5	-2.3	-12.9	0.0	0.8	0.76	1.5	
DEP-4 (300-320')	0.3	0.5	0.36	89	0.3	0.2	13	3.3	0	0.25	0.01	0.9	0.2	24	9	444	5.8	2.0	0.02	2	5.3	-2.3	-12.7	0.0	0.0	0.00	0.2	
DEP-5 (153-173')	0.36	0.5	0.38	61	0.3	0.2	14	6	1	0.25	0.01	0.9	0.2	27	8	325	4	1.9	0.02	2	5	-2.7	-17.7	0.2	0.0	0.16	0.7	
DEP-5 (200-220')	0.6	0.5	0.38	240	0.4	0.2	14	8.2	0	0.25	0.01	1.0	0.2	23	10	578	8.8	1.2	0.06	2	5	-2.5	-14.2	0.1	0.1	0.25	0.6	
DEP-5 (250-270')	0.3	0.5	0.35	30	0.5	0.2	12	0.89	1	0.25	0.01	1.8	0.2	22	10	549	8.5	3.1	0.01	2	5	-2.0	-10.2	0.0	0.6	0.63	0.4	
DEP-5 (300-320')	0.3	0.5	0.33	30	0.4	0.2	13	0.96	0	0.25	0.00	0.9	0.2	23	10	606	13	2.4	0.01	2	5	-2.0	-10.6	0.0	0.0	0.05	0.1	

Table 2 Field and laboratory measurements of groundwater samples collected from the 8 shallow observation wells installed in April 2009 in the Lithia area, Central Florida

Field ID	Sample ID	Date	Turbidity	pH	Conductivity	DO	DO	ORP	S	HCO_3	Al	Sb	As	Cd	Ca	Cl	Cr	Cu	F	Fe	Kje-N	Pb	Mg	Mn	Mo	Ni	N	K	Se	Si	Na	Sr	SO_4	S	P	V	Zn	$\delta^{18}O$	δD	As^{3+}	As^{5+}	$\sum As$	As (AFS)	Sb (AFS)
					mS/cm	%	mg/L		mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	ug/L	mg/L	ug/L	mgN/L	ug/L	mg/L	ug/L	ug/L	ug/L	mgN/L	mg/L	ug/L	mg/L	ug/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	‰	‰	ug/L	ug/L	ug/L	ug/L	ug/L
SURFICIAL	MW-1	Apr-09	2.0	7.1	209	10.6	0.9	-192	24	106	60	0.25	1.5	1	20	12	0.3	0.5	0.3	440	0.08	0.2	10.1	21.2	2.8	0.9	0.2	0.4	3.76	14	4.9	26.9	0.9	0.05	0.18	19	5	-3.7	-20.9	1.8	0.5	2.3	1.5	2.9
SURFICIAL	MW-2	Apr-09	1.1	6.5	1625	15.3	1.3	-159	7	189	60	0.25	1.4	1	153	12	0.3	0.5	0.3	7680	0.31	0.2	81.6	614	3.3	13.9	0.0	2.4	0.2	27.8	108	157	750	0.05	0.27	2	5	-0.6	-5.4	0.5	0.1	0.5	1.7	2.6
SURFICIAL	MW-3	Apr-09	8.4	5.4	3406	12.5	1.0	2	20	38	60	0.25	0.4	1	339	22	0.9	0.7	0.4	79100	0.74	0.2	44.8	530	0.3	32.8	0.0	1.7	0.3	21.4	442	381	2000	0.05	2.5	2	66	2.2	10.9	0.8	0.0	0.8	1.6	2.5
SURFICIAL	MW-4	Apr-09	10.6	6.8	235	8.0	0.7	-98	55	105	480	0.25	0.3	1	26	11	2.1	0.5	0.4	1350	0.08	0.3	11.3	36	3.7	1.0	0.0	0.5	0.2	16	4.6	51.2	16	0.05	0.89	2	5	-3.6	-21.3	0.0	2.0	2.0	0.4	3.0
SURFICIAL	MW-5	Apr-09	7.6	6.6	163	60.9	5.1	-9.5	13	39	110	0.25	0.5	1	16	17	0.8	0.5	0.4	71	0.08	0.2	5.6	44.9	4.6	3.6	3.6	0.4	9.82	14.6	4.8	31.3	1.2	0.05	1.1	4.5	9	-3.9	-23.5	0.0	0.0	0.0	0.9	2.5
SURFICIAL	MW-6	Apr-09	7.4	6.3	346	86.7	7.2	72	33	24	220	0.25	1.3	1	36	32	1.3	0.5	0.3	81	0.16	0.4	10.6	17.9	3.9	5.5	17.0	2.6	0.58	17.2	7.5	43.6	20	0.05	0.76	12	5	-3.8	-23.1	0.2	0.0	0.3	1.2	2.7
SURFICIAL	MW-7	Apr-09	5.4	6.6	231	14.7	1.2	-144	83	78	160	0.25	0.3	1	25	19	1.3	0.5	0.9	3300	0.13	0.2	8.3	63.7	1.2	0.5	0.0	0.7	0.2	14.2	4.1	33	11	0.12	1.6	2.2	5	-3.6	-22.1	0.0	0.3	0.3	0.2	2.4
SURFICIAL	MW-8	Apr-09	2.8	7.1	157	69.0	5.7	17.5	11	79	60	0.25	1.0	1	17	7	0.9	3.0	0.3	54	0.08	0.2	7.6	23	4.1	1.0	0.7	0.4	0.46	10.9	3.3	36.2	2.6	0.11	0.12	2.9	5	-3.9	-23.6	4.0	0.0	4.0	6.9	3.8

Table 3 Field and laboratory measurements of groundwater samples collected from selected private supply wells in the Lithia area, Central Florida

FIELD ID	Date	Turbidity	pH	Cond	DO	DO	ORP	S	HCO_3	Al	Sb	As	Cd
				mS/cm	%	mg/L		ug/L	mg/L	ug/L	ug/L	ug/L	ug/L
2802 PRITCHER MANOR COURT	Apr 09	1.8	7.8	246	0.8	0.1	-96	27	117	67	0.42	122	1
2802 Pritcher Manor Court	May 08	n.d.	7.8	225	2.2	0.2	-168	24	112	n.d.	0.9	124	n.d.
2803 Pritcher Manor Court	May 08	n.d.	7.7	254	9.7	0.9	-122	31	153	n.d.	0.5	2	n.d.
2810 Hartley Lane	May 08	n.d.	7.8	231	2.7	0.2	-187	2	122	n.d.	0.5	2.9	n.d.
2815 HARTLEY LANE	Apr 09	1.5	7.6	354	1.1	0.1	-39	17	153	60	0.36	31.5	1
2815 Hartley Lane	May 08	n.d.	7.5	341	4.1	0.4	-81	11	154	n.d.	0.5	35.2	n.d.
2821 Hartley Lane	May 08	n.d.	7.3	253	NR	0.2	-67	4	133	n.d.	0.5	10.9	n.d.
2905 Pritcher Manor Court	May 08	n.d.	7.8	234	11.7	1.0	-76	0	126	n.d.	0.5	3.4	n.d.
2907 Pritcher Manor Court	May 08	n.d.	7.5	237	2.7	0.2	-91	0	117	n.d.	0.5	13.4	n.d.
2908 Pritcher Manor Court	May 08	n.d.	7.2	191	68	5.5	82	5	81	n.d.	0.5	19.3	n.d.
3010 TOOLE ROAD	Apr 09	3.6	7.9	247	0.9	0.1	-127	152	126	60	0.25	3.35	1
3010 Toole Road	May 08	n.d.	7.8	239	n.d.	0.1	-213	106	132	n.d.	0.5	3	n.d.
3505 Kent Path	May 08	n.d.	7.1	248	5.1	0.4	-192	16	129	n.d.	0.5	0.8	n.d.
5364 WOOD ROAD	Apr 09	3.6	6.2	330	25.8	2.2	141	17	71	60	0.25	1.02	1
5364 Wood Road	May 08	n.d.	6.4	197	52	4.4	148	0	66	n.d.	0.5	1.3	n.d.
7911 CAREY ROAD	Apr 09	1.5	7.5	301	6.1	0.5	-231	314	170	60	0.25	101	1
7911 Carey Road	May 08	n.d.	7.6	287	2	0.2	-212	360	170	n.d.	0.5	113	n.d.
7935 CAREY ROAD	Apr 09	15.6	7.8	209	13.9	1.2	-218	1515	116	60	0.25	1.3	1
7935 Carey Road	May 08	n.d.	7.8	242	2.2	0.2	-220	1250	129	n.d.	0.5	0.99	n.d.
8002 Edison Road	May 08	n.d.	7.3	240	1.4	0.1	-110	74	132	n.d.	0.5	15.7	n.d.
8010 Edison Road	May 08	n.d.	7.7	257	7.2	0.6	-190	47	132	n.d.	0.5	9.1	n.d.
8010 EDSON ROAD	Apr 09	0.6	7.7	249	1.1	0.1	-117	122	145	60	0.25	3.87	1
8133 EDISON ROAD	Apr 09	0.7	7.5	262	2.0	0.2	-132	133	153	60	0.25	0.25	1
8133 Edison Road	May 08	n.d.	7.9	228	1.9	0.2	-169	291	156	n.d.	0.5	0.5	n.d.
8304 Bob Wiggs Avenue	May 08	n.d.	7.8	240	2.1	0.2	-204	107	135	n.d.	0.5	8.3	n.d.
8312 BOB WIGGS AVENUE	Apr 09	1.3	7.1	429	26.7	2.3	4	10	139	60	8.31	31.8	1
8312 Bob Wiggs Avenue	May 08	n.d.	7.0	446	27.7	2.4	-16	0	133	n.d.	5.8	27.7	n.d.
8408 BOB WIGGS AVENUE	Apr 09	5.2	7.6	404	2.0	0.2	-95	11	128	60	0.25	3.75	1
8408 Bob Wiggs Avenue	May 08	n.d.	7.6	293	2	0.2	-62	9	131	n.d.	0.5	1.8	n.d.
8410 PRITCHER ROAD	Apr 09	7.8	7.5	346	0.5	0.0	-189	358	181	69	0.25	65.9	1
8438 BOB WIGGS AVENUE	Apr 09	1.0	7.6	304	2.7	0.2	-223	247	171	60	0.25	1.3	1
8438 Bob Wiggs Avenue	May 08	n.d.	7.6	293	2	0.2	-62	390	176	n.d.	0.5	1.1	n.d.
8506 PRITCHER ROAD	Apr 09	2.3	7.6	349	41.2	3.4	-19	15	153	170	2.1	350	1
8506 Pritcher Road	May 08	n.d.	7.7	330	33.5	2.8	-103	85	159	n.d.	3	289	n.d.
8601 PRITCHER ROAD	Apr 09	0.4	7.7	224	0.7	0.1	-41	18	111	89	8.46	166	1
8601 Pritcher Road	May 08	n.d.	7.7	221	8.1	0.7	-129	2	101	n.d.	13.7	162	n.d.
8602 ROCKN T RANCH	Apr 09	0.7	7.7	247	2.3	0.2	-187	118	133	60	0.25	32.4	1
8602 Rockn T Ranch Road	May 08	n.d.	7.7	251	2.9	0.2	-210	137	143	n.d.	0.5	19.1	n.d.
8625 Carey Road	May 08	n.d.	7.7	264	9.4	0.8	-165	104	133	n.d.	0.5	2.8	n.d.
8704 PRITCHER ROAD	Apr 09	1.1	8.0	261	10.4	0.9	13	14	101	60	2.04	36.3	1
8704 Pritcher Road	May 08	n.d.	7.9	223	7	0.6	-7	8	100	n.d.	3.6	60.2	n.d.
8710 COUNTY LINE ROAD	Apr 09	14.4	7.4	316	1.0	0.1	-189	442	199	4440	0.25	5.6	1
8710 County Line Road	May 08	n.d.	7.5	325	n.d.	0.2	-189	9	183	n.d.	0.5	0.61	n.d.
8721 COUNTY LINE ROAD	Apr 09	3.8	7.6	274	4.4	0.4	-230	301	156	60	0.25	4.7	1
8721 County Line Road	May 08	n.d.	7.7	265	n.d.	0.8	-167	175	150	n.d.	0.5	5.5	n.d.
8726 Pritcher Road	May 08	n.d.	7.6	216	1.7	0.1	-171	10	101	n.d.	0.5	13.3	n.d.
8805 Pritcher Road Well #2	May 08	n.d.	7.7	192	14	1.2	-80	0	109	n.d.	0.5	0.5	n.d.
8834 CAREY ROAD	Apr 09	2.7	7.5	293	3.4	0.3	-189	13	126	60	0.27	6.89	1
8834 Carey Road	May 08	n.d.	7.6	296	n.d.	0.1	-166	0.000	123	n.d.	0.5	6.7	n.d.
8902 Carey Road	May 08	n.d.	7.6	328	1.9	0.2	-263	39	137	n.d.	0.5	0.5	n.d.
8902 Pritcher Road	May 08	n.d.	7.6	328	1.9	0.2	-263	2205	189	n.d.	0.5	0.5	n.d.
8906 Pritcher Road	May 08	n.d.	7.7	232	2.4	0.2	-240	163	139	n.d.	0.5	0.85	n.d.
8914 Pritcher Road	May 08	n.d.	7.5	326	2	0.2	-272	2325	188	n.d.	0.5	0.5	n.d.
9007 Carey Road	May 08	n.d.	7.6	315	n.d.	0.1	-246	1590	179	n.d.	0.5	0.5	n.d.
SCHOOL IRRIGATION WELL	Apr 09	0.8	7.5	339	2.3	0.2	-231	2868	190	60	0.25	0.25	1
School Irrigation Well	May 08	n.d.	7.4	475	27.1	2.2	n.d.	3725	199	n.d.	0.5	0.5	n.d.
School Tennis Court Well	May 08	n.d.	7.4	321	n.d.	0.1	-175	386	182	n.d.	0.5	23.1	n.d.
SCHOOL VOLLEYBALL COURT WELL	Apr 09	1.2	7.7	301	1.3	0.1	-107	87	150	160	0.25	239	1
School Volleyball Court Well	May 08	n.d.	7.5	336	n.d.	0.2	-142	106	144	n.d.	0.5	256	n.d.

FIELD ID	Ca	Cl	Cr	Cu	F	Fe	K-N	Pb	Mg	Mn	Mo	Ni	N	K	Se	Si	Na
	mg/L	mg/L	ug/L	ug/L	mg/L	ug/L	mgN/L	ug/L	mg/L	ug/L	ug/L	ug/L	mgN/L	mg/L	ug/L	mg/L	mg/L
2802 PRITCHER MANOR COURT	28.5	8.5	0.3	2.57	0.52	30	0.2	0.2	9.9	0.8	1950	0.3	0.00	0.6	0.2	0.2	22.2
2802 Pritcher Manor Court	29.1	6.7	n.d.	n.d.	0.53	30	0.1	n.d.	9.7	n.d.	1370	n.d.	0.00	0.5	n.d.	20.2	5.3
2803 Pritcher Manor Court	31.5	7.1	n.d.	n.d.	0.62	30	0.2	n.d.	12	n.d.	164	n.d.	0.09	0.7	n.d.	33.4	9.6
2810 Hartley Lane	28.5	11	n.d.	n.d.	0.27	60	0.1	n.d.	13.3	n.d.	149	n.d.	0.00	0.4	n.d.	11.5	4.1
2815 HARTLEY LANE	40.1	35	0.3	7.74	0.42	30	0.1	1.8	15.2	2.3	229	0.7	0.34	0.9	0.2	0.2	25.7
2815 Hartley Lane	43.4	33	n.d.	n.d.	0.45	30	0.1	n.d.	16.3	n.d.	198	n.d.	0.31	0.8	n.d.	25.4	9.8
2821 Hartley Lane	30.5	11	n.d.	n.d.	0.59	30	0.2	n.d.	11	n.d.	199	n.d.	0.04	0.7	n.d.	27.9	9.1
2905 Pritcher Manor Court	44.8	11	n.d.	n.d.	0.45	2470	0.1	n.d.	13.1	n.d.	93.6	n.d.	0.23	0.6	n.d.	13.9	4.3
2907 Pritcher Manor Court	28.1	10	n.d.	n.d.	0.37	150	0.1	n.d.	12.9	n.d.	86.4	n.d.	0.01	0.5	n.d.	12.2	3.2
2908 Pritcher Manor Court	19.9	5.6	n.d.	n.d.	0.4	30	0.1	n.d.	8.8	n.d.	221	n.d.	2.20	0.5	n.d.	15.3	4.5
3010 TOOLE ROAD	25.2	6.4	0.3	12700	0.67	730	0.2	15.5	9.9	1.1	156	0.3	0.00	0.8	0.2	0.2	21.5
3010 Toole Road	28.5	6.2	n.d.	n.d.	0.67	30	0.2	n.d.	10.8	n.d.	193	n.d.	0.00	0.8	n.d.	27.2	7.9
3505 Kent Path	25.3	12	n.d.	n.d.	0.4	1790	0.1	n.d.	13.4	n.d.	2.95	n.d.	0.01	0.7	n.d.	21.1	6.6
5364 WOOD ROAD	30.3	48	0.48	2.88	0.26	34	0.2	0.5	11.7	1.2	0	1.0	5.70	0.3	3.8	3.8	14.2
5364 Wood Road	19.9	16	n.d.	n.d.	0.31	110	0.1	n.d.	7.7	n.d.	1	n.d.	3.90	0.3	n.d.	12.9	7.2
7911 CAREY ROAD	32.9	8.1	0.3	1.22	0.65	30	0.3	0.2	13.8	1.0	694	0.3	0.00	0.8	0.2	0.2	10.9
7911 Carey Road	34	8.2	n.d.	n.d.	0.67	30	0.2	n.d.	14	n.d.	682	n.d.	0.00	0.7	n.d.	28.7	10.5
7935 CAREY ROAD	27.8	5.3	0.3	9.32	0.42	35	0.1	3.7	10.6	7.0	143	0.3	0.02	0.6	0.2	0.2	15.5
7935 Carey Road	33.6	5.3	n.d.	n.d.	0.44	30	0.2	n.d.	10.7	n.d.	95	n.d.	0.02	0.6	n.d.	15.4	4.2
8002 Edison Road	28.9	7.5	n.d.	n.d.	0.57	30	0.2	n.d.	11.4	n.d.	367	n.d.	0.00	0.6	n.d.	24.1	7.6
8010 Edison Road	27.6	7.4	n.d.	n.d.	0.6	30	0.2	n.d.	10.9	n.d.	282	n.d.	0.00	0.6	n.d.	24.4	7.1
8010 EDSON ROAD	27.5	7.1	0.3	0.5	0.59	30	0.3	0.2	10.9	1.2	165	0.3	0.01	0.8	0.2	0.2	28.8
8133 EDISON ROAD	29.7	8.4	0.35	2.26	0.58	30	0.2	15.1	11.3	0.8	84	0.6	0.00	0.8	0.2	0.2	33.4
8133 Edison Road	32.2	7.3	n.d.	n.d.	0.58	30	0.3	n.d.	12.2	n.d.	66.7	n.d.	0.00	0.7	n.d.	32.7	9.5
8304 Bob Wiggs Avenue	28.7	8.4	n.d.	n.d.	0.63	30	0.1	n.d.	12.5	n.d.	203	n.d.	0.00	0.6	n.d.	21.9	7.2
8312 BOB WIGGS AVENUE	49.8	30	0.3	0.82	0.45	140	0.1	0.4	21.3	15.3	710	6.1	0.56	2.9	3.0	3.0	15.1
8312 Bob Wiggs Avenue	51.8	36	n.d.	n.d.	0.41	140	0.1	n.d.	21.9	n.d.	581	n.d.	7.40	2.9	n.d.	14.2	9.2
8408 BOB WIGGS AVENUE	41.3	36	0.3	0.5	0.48	550	0.1	0.3	19.7	18.8	486	1.4	0.08	1.4	0.2	0.2	10.8
8408 Bob Wiggs Avenue	41.7	34	n.d.	n.d.	0.49	110	0.1	n.d.	19.6	n.d.	500	n.d.	0.07	1.2	n.d.	13.7	10.2
8410 PRITCHER ROAD	33.3	9.9	0.3	31.1	0.68	100	0.4	0.9	13.9	1.3	660	0.3	0.00	0.8	0.2	0.2	36.5
8438 BOB WIGGS AVENUE	30.4	8.4	0.3	1.07	0.63	30	0.2	0.2	13.7	1.4	23	0.3	0.01	0.7	0.2	0.2	27.7
8438 Bob Wiggs Avenue	33	8.8	n.d.	n.d.	0.64	30	0.2	n.d.	15	n.d.	21.8	n.d.	0.00	0.8	n.d.	27.6	10
8506 PRITCHER ROAD	38.3	16	0.3	10.6	0.61	30	0.2	1.4	14.8	1.3	4520	0.5	0.03	0.8	0.2	0.2	26.6
8506 Pritcher Road	43.6	16	n.d.	n.d.	0.62	30	0.2	n.d.	16.6	n.d.	4140	n.d.	0.05	0.7	n.d.	26.1	10.7
8601 PRITCHER ROAD	28.7	8.4	0.3	1.64	0.49	30	0.1	0.3	10.0	1.0	2350	2.6	0.11	0.6	0.3	0.3	19.3
8601 Pritcher Road	30.2	6.2	n.d.	n.d.	0.48	30	0.1	n.d.	9.2	n.d.	2020	n.d.	0.22	0.5	n.d.	17.3	5.3
8602 ROCKN T RANCH	27.8	7.6	0.3	0.5	0.6	30	0.1	0.2	12.1	1.7	368	0.3	0.00	0.7	0.2	0.2	23.3
8602 Rockn T Ranch Road	30.1	7.8	n.d.	n.d.	0.63	30	0.1	n.d.	12.5	n.d.	389	n.d.	0.00	0.6	n.d.	22.9	7.6
8625 Carey Road	30.7	12	n.d.	n.d.	0.59	30	0.1	n.d.	13.4	n.d.	187	n.d.	0.00	0.6	n.d.	20.9	6.5
8704 PRITCHER ROAD	25.9	12	0.3	1.06	0.38	30	0.1	0.2	10.6	0.8	488	0.8	2.40	0.6	2.5	2.5	17.1
8704 Pritcher Road	26.8	11	n.d.	n.d.	0.48	30	0.1	n.d.	10.6	n.d.	1000	n.d.	1.50	0.7	n.d.	21.3	5.2
8710 COUNTY LINE ROAD	44.2	9.7	47.3	18.7	0.68	2480	0.5	0.8	19.0	8.5	2	4.3	0.00	1.7	1.3	1.3	38.5
8710 County Line Road	36.1	9.7	n.d.	n.d.	0.64	30	0.3	n.d.	15.1	n.d.	1.81	n.d.	0.07	0.8	n.d.	32.2	12
8721 COUNTY LINE ROAD	30.2	8.2	0.3	0.5	0.62	30	0.2	0.5	13.3	1.2	59	0.3	0.00	0.7	0.2	0.2	25.6
8721 County Line Road	30.4	8.2	n.d.	n.d.	0.62	30	0.1	n.d.	13.3	n.d.	77.3	n.d.	0.01	0.6	n.d.	23.1	8.1
8726 Pritcher Road	25.4	9.4	n.d.	n.d.	0.65	30	0.1	n.d.	9.6	n.d.	776	n.d.	0.00	0.6	n.d.	19.4	5.9
8805 Pritcher Road Well #2	22.5	7.8	n.d.	n.d.	0.24	53	0.1	n.d.	10.8	n.d.	2.57	n.d.	0.51	0.5	n.d.	16.1	3.4
8834 CAREY ROAD	31.9	20	0.3	0.5	0.42	41	0.1	0.2	12.9	28.5	97	1.9	0.09	1.1	0.5	0.5	13.9
8834 Carey Road	33.3	20	n.d.	n.d.	0.41	84	0.1	n.d.	13.5	n.d.	118	n.d.	0.27	1.2	n.d.	13.3	6
8902 Carey Road	28.2	13	n.d.	n.d.	0.36	1120	0.1	n.d.	13.5	n.d.	1.01	n.d.	0.01	0.6	n.d.	16.9	5
8902 Pritcher Road	43.2	12	n.d.	n.d.	0.42	30	0.3	n.d.	14.8	n.d.	6.74	n.d.	0.00	0.8	n.d.	24.3	10
8906 Pritcher Road	27.7	5.9	n.d.	n.d.	0.68	30	0.2	n.d.	10.7	n.d.	46.4	n.d.	0.00	0.7	n.d.	24.8	8.3
8914 Pritcher Road	43.1	12	n.d.	n.d.	0.42	30	0.4	n.d.	15.3	n.d.	5.6	n.d.	0.00	0.7	n.d.	25.2	10.1
9007 Carey Road	38.6	9.8	n.d.	n.d.	0.48	30	0.3	n.d.	14.1	n.d.	25.1	n.d.	0.00	0.7	n.d.	25	9.6
SCHOOL IRRIGATION WELL	40.8	12	0.3	0.5	0.33	30	0.4	0.2	12.7	0.8	3	0.3	0.01	0.9	0.2	0.2	23.5
School Irrigation Well	46.1	12	n.d.	n.d.	0.35	30	0.4	n.d.	14.1	n.d.	3.71	n.d.	0.01	0.8	n.d.	22.2	9.7
School Tennis Court Well	36.9	10	n.d.	n.d.	0.68	30	0.3	n.d.	15.8	n.d.	938	n.d.	0.00	0.8	n.d.	32.6	11.6
SCHOOL VOLLEYBALL COURT WELL	36.4	15	0.3	0.86	0.63	34	0.2	0.2	13.9	1.1	4260	0.3	0.00	0.8	0.2	0.2	25.9
School Volleyball Court Well	40.3	15	n.d.	n.d.	0.62	30	0.2	n.d.	15.3	n.d.	4740	n.d.	0.00	0.7	n.d.	24.8	9.4

FIELD ID	Sr	SO_4	S	P	V	Zn	$\delta^{18}O$	δD	As^{3+}	As^{5+}	∑ As	As (AFS)	Sb (AFS)	As
	ug/L	mg/L	mg/L	mg/L	ug/L	ug/L	‰	‰	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
2802 PRITCHER MANOR COURT	6.1	17.0	0.1	0.01	2.0	12.0	-4.2	-19.5	121.1	6.0	127.2	131.7	2.8	122
2802 Pritcher Manor Court	150	15	0.1	0.02	n.d.	n.d.	-3.7	-19.4	129	0.1	129	117	0.4	124
2803 Pritcher Manor Court	160	4.7	0.1	0.02	n.d.	n.d.	-3.1	-15.0	1.0	1.1	2.1	1.6	0.0	2
2810 Hartley Lane	80	9.5	0.1	0.02	n.d.	n.d.	-3.7	-18.6	2.3	1.9	4.2	2.5	0.0	2.9
2815 HARTLEY LANE	9.9	13.0	0.1	0.02	2.0	22.0	-3.8	-20.5	1.1	27.3	28.4	30.3	2.8	31.5
2815 Hartley Lane	130	13	0.1	0.02	n.d.	n.d.	-3.6	-18.1	2.8	35.2	38.0	35.2	0.3	35.2
2821 Hartley Lane	95	5.9	0.1	0.09	n.d.	n.d.	-3.4	-17.4	1.9	7.8	9.7	9.8	0.0	10.9
2905 Pritcher Manor Court	80	4.9	0.1	0.04	n.d.	n.d.	-3.7	-19.0	0.6	1.8	2.4	0.8	0.0	3.4
2907 Pritcher Manor Court	80	11	0.1	0.02	n.d.	n.d.	-3.7	-19.1	1.1	12.0	13.1	10.6	0.2	13.4
2908 Pritcher Manor Court	80	7.3	0.1	0.12	n.d.	n.d.	-4.0	-20.8	16.5	5.6	22.1	22.0	0.1	19.3
3010 TOOLE ROAD	6.7	8.8	0.1	0.00	2.0	42.0	-3.6	-18.8	0.5	0.8	1.3	2.5	2.3	3.35
3010 Toole Road	93	7.5	0.1	0.02	n.d.	n.d.	-3.4	-17.2	3.5	0.4	4.0	3.0	0.0	3
3505 Kent Path	80	8.6	0.1	0.41	n.d.	n.d.	-3.5	-17.6	1.1	0.8	1.9	0.7	0.0	0.8
5364 WOOD ROAD	9.9	0.8	0.1	0.91	2.3	6.4	-4.0	-21.7	0.6	0.0	0.6	1.3	2.6	1.02
5364 Wood Road	80	1.2	0.1	0.97	n.d.	n.d.	-3.9	-18.8	0.3	2.1	2.4	1.3	0.1	1.3
7911 CAREY ROAD	10.6	7.7	0.3	0.01	2.0	6.6	-3.2	-17.7	103.8	0.0	103.8	103.6	2.2	101
7911 Carey Road	210	8.8	0.4	0.02	n.d.	n.d.	-2.9	-14.3	129	0.1	129	112	0.0	113
7935 CAREY ROAD	4.1	9.0	2.0	0.01	2.0	220.0	-3.8	-22.0	0.1	0.0	0.1	1.1	2.2	1.3
7935 Carey Road	93	7.9	1.0	0.02	n.d.	n.d.	-3.7	-18.8	0.4	1.5	1.9	0.8	0.0	0.99
8002 Edison Road	130	6.4	0.1	0.02	n.d.	n.d.	-3.3	-16.5	10.1	2.5	12.6	14.9	0.0	15.7
8010 Edison Road	120	5.6	0.1	0.02	n.d.	n.d.	-3.3	-16.9	9.4	1.3	10.7	8.5	0.0	9.1
8010 EDSON ROAD	8.2	4.4	0.1	0.01	2.0	6.8	-3.3	-16.8	3.7	0.0	3.7	3.7	2.5	3.87
8133 EDISON ROAD	10.4	3.2	0.1	0.01	2.0	281.0	-3.2	-16.3	0.1	0.0	0.1	0.1	2.3	0.25
8133 Edison Road	230	3.5	0.3	0.02	n.d.	n.d.	-2.9	-14.7	0.8	0.7	1.5	0.0	0.0	0.5
8304 Bob Wiggs Avenue	150	8.3	0.1	0.02	n.d.	n.d.	-3.5	-17.8	8.5	0.0	8.5	9.0	0.0	8.3
8312 BOB WIGGS AVENUE	8.7	46.0	0.1	0.31	13.5	419.0	-3.6	-19.8	1.2	29.1	30.3	31.4	10.9	31.8
8312 Bob Wiggs Avenue	80	49	0.1	0.33	n.d.	n.d.	-3.4	-17.8	0.1	32.0	32.1	25.3	5.2	27.7
8408 BOB WIGGS AVENUE	10.8	44.0	0.1	0.01	2.0	75.0	-3.8	-21.2	2.2	0.0	2.2	3.6	2.7	3.75
8408 Bob Wiggs Avenue	80	47	0.1	0.02	n.d.	n.d.	-3.6	-18.6	0.7	0.5	1.2	1.0	0.0	1.8
8410 PRITCHER ROAD	11.1	6.8	0.1	0.06	2.0	301.0	-2.9	-15.0	46.9	3.2	50.1	64.9	2.7	65.9
8438 BOB WIGGS AVENUE	9.3	8.4	0.2	0.01	2.0	5.0	-3.3	-15.8	0.4	0.0	0.4	1.3	2.4	1.3
8438 Bob Wiggs Avenue	250	7.9	0.3	0.02	n.d.	n.d.	-3.0	-15.0	1.1	0.1	0.9	1.0	0.0	1.1
8506 PRITCHER ROAD	9.9	30.0	0.1	0.02	2.0	169.0	-3.3	-16.9	233.4	57.4	290.8	371.0	4.2	350
8506 Pritcher Road	250	29	0.1	0.02	n.d.	n.d.	-2.9	-14.3	220	105.3	325	308	0.6	289
8601 PRITCHER ROAD	6.0	21.0	0.1	0.03	2.2	8.4	-4.0	-20.9	6.3	132.8	139.2	176.1	10.7	166
8601 Pritcher Road	96	20	0.1	0.02	n.d.	n.d.	-3.8	-20.3	4	198.9	203	161	10.3	162
8602 ROCKN T RANCH	7.2	7.9	0.1	0.01	2.0	17.0	-3.5	-18.4	25.5	1.2	26.8	31.2	2.4	32.4
8602 Rockn T Ranch Road	170	8.1	0.2	0.02	n.d.	n.d.	-3.4	-16.8	17.0	0.2	17.2	17.4	0.0	19.1
8625 Carey Road	120	14	0.1	0.02	n.d.	n.d.	-3.6	-18.0	2.7	0.1	2.9	2.5	0.0	2.8
8704 PRITCHER ROAD	4.3	11.0	0.1	0.00	8.7	11.0	-3.9	-20.8	0.4	30.5	30.9	37.2	4.7	36.3
8704 Pritcher Road	80	13	0.1	0.02	n.d.	n.d.	-3.7	-18.8	0.0	6.6	6.6	53.5	3.0	60.2
8710 COUNTY LINE ROAD	12.6	3.2	0.1	1.70	21.3	1200.0	-2.7	-13.6	0.7	0.7	1.4			5.6
8710 County Line Road	250	2.8	0.1	0.02	n.d.	n.d.	-2.6	-12.5	0.1	0.0	0.1	0.4	0.0	0.61
8721 COUNTY LINE ROAD	8.7	5.0	0.4	0.01	2.0	11.0	-3.4	-19.0	4.2	0.5	4.7	4.6	2.3	4.7
8721 County Line Road	160	5.6	0.2	0.02	n.d.	n.d.	-3.3	-17.2	4.3	0.9	5.2	4.6	0.0	5.5
8726 Pritcher Road	80	13	0.1	0.02	n.d.	n.d.	-3.8	-19.5	12.6	6.2	18.9	12.3	0.1	13.3
8805 Pritcher Road Well #2	80	1.8	0.1	0.02	n.d.	n.d.	-3.7	-18.9	0.0	0.0	0.0	0.0	0.1	0.5
8834 CAREY ROAD	5.8	16.0	0.1	0.03	2.0	37.0	-3.9	-22.0	2.9	3.2	6.0	6.5	2.5	6.89
8834 Carey Road	80	18	0.1	0.02	n.d.	n.d.	-3.6	-18.5	1.5	6.9	8.4	5.8	0.3	6.7
8902 Carey Road	80	6.2	0.1	0.07	n.d.	n.d.	-3.6	-18.1	0.4	0.3	0.8	0.0	0.0	0.5
8902 Pritcher Road	400	9.2	2.4	0.02	n.d.	n.d.	-2.4	-11.2	0.8	2.3	3.2	0.1	0.0	0.5
8906 Pritcher Road	130	4	0.1	0.02	n.d.	n.d.	-3.4	-16.4	1.5	0.7	2.1	0.8	0.0	0.85
8914 Pritcher Road	420	9.2	2.4	0.02	n.d.	n.d.	-2.3	-11.2	0.5	1.8	2.4	0.0	0.0	0.5
9007 Carey Road	350	6.6	1.3	0.02	n.d.	n.d.	-2.6	-12.8	0.5	0.0	0.4	0.3	0.0	0.5
SCHOOL IRRIGATION WELL	9.2	12.0	3.3	0.01	2.0	17.0	-2.2	-11.3	0.0	0.0	0.0	0.1	2.3	0.25
School Irrigation Well	520	13	3.1	0.02	n.d.	n.d.	-2.0	-8.8	0.0	0.6	0.6	0.1	0.0	0.5
School Tennis Court Well	240	6.6	0.4	0.02	n.d.	n.d.	-2.6	-12.7	2.3	0.1	2.3	22.2	0.0	23.1
SCHOOL VOLLEYBALL COURT WELL	9.4	27.0	0.1	0.02	2.0	9.2	-3.3	-16.5	203.2	5.7	208.9	247.1	2.2	239
School Volleyball Court Well	240	33	0.1	0.02	n.d.	n.d.	-3.2	-15.3	248	0.1	248	246	0.0	256

Table 4 Average chemical compositions of pyrite in thin sections from cores DEP-1 and DEP-2

Mineral	Sample	Core	Fe	S	As	Sb	Zn	Mo	Ca	Total
			wt %	wt %	ppm	ppm	ppm	ppm	wt%	wt %
pyrite	152-149	DEP-1	42	52	8788	730	320	0	0,19	95
pyrite	152-149b	DEP-1	47	52	2113	0	48	0	0,53	99
pyrite	190-187	DEP-1	47	52	1281	18	40	0	0,04	99
pyrite	190-187	DEP-1	48	53	360	0	15	0	0,03	101
pyrite	213-209b	DEP-1	47	53	451	9	68	0	0,15	100
pyrite	213-209	DEP-1	46	52	1412	16	54	0	0,24	98
pyrite	60-57a	DEP-2	47	53	794	9	59	0	0,22	99
pyrite	60-57b	DEP-2	46	52	1164	11	806	0	0,39	98
pyrite	137-136	DEP-2	38	51	6597	57	19	0	0,52	90
pyrite	206-203d	DEP-2	47	53	1846	32	28	0	0,03	100
pyrite	207-206b	DEP-2	47	52	1713	25	98	0	0,11	99
pyrite	222-219	DEP-2	46	54	681	66	21	0	0,76	101
pyrite	226-222	DEP-2	48	53	285	13	6	0	0,06	101

Table 5 Average chemical compositions of powellite in thin sections from core DEP-1

Mineral	Sample	Core	Fe	S	As	Sb	Zn	Mo	Ca	Total
			ppm	ppm	ppm	ppm	ppm	wt%	wt%	wt %
powellite	152-149	DEP-1	5935	4690	15050	0	755	23	15	41
powellite	156-152	DEP-1	472	3216	17640	34	1312	42	21	66

Dr. Pichler reported that during the analysis of pyrite crystals found in cores DEP-1 and 2, the MDL for molybdenum was 30 ppm.

Table 6 Tritium (^{3}H) and Helium (^{3}He) Ages

Field ID	3H [TU]	3H-3He [TU]	Alter [Jahre]
DEP-1 (145-165')	0.56	5	40
DEP-1 (205-225')	0	0.5	>50
DEP-1 (250-270')	0	0	>50
DEP-1 (300-320')	0	0.5	>50
DEP-2 (143-163')	1.25	3.7	30
DEP-2 (197-217')	0.18	0.5	20
DEP-2 (256-276')	0	0	>50
DEP-2 (300-320')	0	0	>50
DEP-3 (147-167')	0.78	3.7	30
DEP-3 (195-215')	0	0	>50
DEP-3 (245-265')	0	0	>50
DEP-3 (300-320')	0	0	>50
DEP-4 (143-163')	0.03	0	>50
DEP-4 (208-228')	0	0	>50
DEP-4 (255-275')	0.03	0	>50
DEP-4 (300-320')	0.02	0	>50
DEP-5 (153-173')	0.11	0.6	32
DEP-5 (200-220')	0.02	0	>50
DEP-5 (250-270')	0	0	>50
DEP-5 (300-320')	0	0	>50
2802 PRITCHER MANOR COURT	1.25	16.5	46
2815 HARTLEY LANE	1.55		
3010 TOOLE ROAD	1	5.6	33
5364 WOOD ROAD	1.63	9	33
7911 CAREY ROAD	0.17	1	32
7935 CAREY ROAD	1.4	10.5	38
8010 EDSON ROAD	0.65	13	54
8133 EDISON ROAD	0.5		
8312 BOB WIGGS AVENUE	2.2		
8408 BOB WIGGS AVENUE	2.55		
8410 PRITCHER ROAD	0.13		
8438 BOB WIGGS AVENUE	0.65		
8506 PRITCHER ROAD	0.5	2.6	30
8601 PRITCHER ROAD	1.25	2.7	20
8602 ROCKN T RANCH	0.86		
8710 COUNTY LINE ROAD	0.04	0	
8721 COUNTY LINE ROAD	0.85	5	35
8834 CAREY ROAD	1.5	11.5	38
SCHOOL IRRIGATION WELL	0	0	>50
SCHOOL VOLLEYBALL COURT	0.65	2.25	27
SURFICIAL MW-1	2.1	9.2	30
SURFICIAL MW-2	2.22	7.4	26
SURFICIAL MW-3	1.85		
SURFICIAL MW-4	3.6	23.3	38
SURFICIAL MW-5	1.9	4.2	21
SURFICIAL MW-6	2.5	10.4	30
SURFICIAL MW-7	2		
SURFICIAL MW-8	2.1	6.4	25

Appendix: Enchem Tasks

To date EnChem Consulting has performed the following tasks:

December 2007
We analyzed of 40 supply well samples for total arsenic and antimony as well as arsenic speciation (arsenite and arsenate) and field measurements for sulfide (HS^-). Compilation and interpretation of oxygen and hydrogen isotope data.

February 2008
Carried out a detailed stratigraphic description of two cores (DEP-1 and DEP-2) to delineate the presence of arsenic in the aquifer matrix, which included (a) the chemical analyses of 144 core samples (arsenic, antimony, iron, sulfur, silica, calcium, magnesium, strontium, molybdenum and phosphorous).

April 2008
Completed the detailed description of samples taken from cores DEP-1 and DEP-2 by stereo microscope. Preparation of 18 thin sections for electron microprobe analyses of mineral phases to determine arsenic, antimony, calcium, molybdenum, zinc and sulfur concentrations. These samples were chosen based on their bulk chemical composition. Electron microprobe analyses of those samples.

May 2008
We analyzed 20 samples from well clusters DEP-1, DEP-2, DEP-3, DEP-4, and DEP-5 (4 per cluster) for total arsenic, arsenic speciation (arsenite and arsenate), antimony and molybdenum.

June 2008
We analyzed 20 samples from well clusters DEP-1, DEP-2, DEP-3, DEP-4, and DEP-5 (4 per cluster) for total arsenic, arsenic speciation (arsenite and arsenate), antimony and molybdenum.

October 2008
We analyzed 20 samples from well clusters DEP-1, DEP-2, DEP-3, DEP-4, and DEP-5 (4 per cluster) for total arsenic, arsenic speciation (arsenite and arsenate), antimony and molybdenum.

April 2009
We analyzed 40 samples from well clusters DEP-1, DEP-2, DEP-3, DEP-4, and DEP-5 (4 per cluster), as wells as 20 samples from private supply wells which were chosen based on As and Mo concentrations for total arsenic, arsenic speciation (arsenite and arsenate), antimony and molybdenum.
These 40 wells were also sampled for groundwater dating using the using the tritium-helium method (T-He). Data for the T-He samples will be available late 2009 or early 2010 since this type of analysis takes about 6 months to complete. Oxygen and hydrogen isotopes for these 40 samples are also in the process of being analyzed.

Appendix: Water Levels in DEP-1 to DEP-5

Well I.D.	Top-of-Casing Elevation (NGVD)1	Date	Time	Water Level Below Top-of-Casing	Water Level (NGVD)
DEP-1 (145-165')	110.35	04/18/08	923	53.65	56.70
		05.05.08	1544	59.36	50.99
		06.09.08	1419	66.13	44.22
		10/13/08	1714	52.25	58.10
		04/22/09	1029	66.07	44.28
DEP-1 (205-225')	110.40	04/18/08	921	57.71	52.69
		05.05.08	1541	63.25	47.15
		06.09.08	1417	71.54	38.86
		10/13/08	1716	55.61	54.79
		04/22/09	1027	71.00	39.40
DEP-1 (250-270')	110.21	04/18/08	920	57.63	52.58
		05.05.08	1539	63.19	47.02
		06.09.08	1416	71.48	38.73
		10/13/08	1718	55.54	54.67
		04/22/09	1023	70.95	39.26
DEP-1 (300-320')	110.25	04/18/08	918	57.76	52.49
		05.05.08	1537	63.32	46.93
		06.09.08	1415	71.61	38.64
		10/13/08	1719	55.65	54.60
		04/22/09	1020	71.07	39.18
DEP-2 (143-163')	91.11	04/18/08	853	38.73	52.38
		05.05.08	1524	45.08	46.03
		06.09.08	1436	51.66	39.45
		10/13/08	1645	37.15	53.96
		04/22/09	1013	51.47	39.64
DEP-2 (197-217')	92.33	04/18/08	849	42.21	50.12
		05.05.08	1526	48.05	44.28
		06.09.08	1435	56.37	35.96
		10/13/08	1648	40.24	52.09
		04/22/09	1009	55.43	36.90
DEP-2 (256-276')	91.43	04/18/08	846	42.73	48.70
		05.05.08	1528	48.51	42.92
		06.09.08	1433	56.98	34.45
		10/13/08	1643	40.70	50.73
		04/22/09	1005	56.50	34.93
DEP-2 (300-320')	91.48	04/18/08	844	42.77	48.71
		05.05.08	1529	48.51	42.97
		06.09.08	1431	57.02	34.46
		10/13/08	1647	40.75	50.73
		04/22/09	1007	56.52	34.96
DEP-3 (147-167')	84.45	04/18/08	907	32.40	52.05

		05.05.08	1517	38.59	45.86
		06.09.08	1447	45.55	38.90
		10/13/08	1703	30.63	53.82
		04/22/09	929	45.00	39.45
DEP-3 (195-215')	84.42	04/18/08	905	35.57	48.85
		05.05.08	1516	41.32	43.10
		06.09.08	1446	49.78	34.64
		10/13/08	1701	33.58	50.84
		04/22/09	934	49.21	35.21
DEP-3 (245-265')	84.08	04/18/08	902	35.17	48.91
		05.05.08	1514	40.92	43.16
		06.09.08	1445	49.36	34.72
		10/13/08	1659	33.17	50.91
		04/22/09	937	48.80	35.28
DEP-3 (300-320')	83.25	04/18/08	859	34.31	48.94
		05.05.08	1510	40.06	43.19
		06.09.08	1444	48.49	34.76
		10/13/08	1658	32.36	50.89
		04/22/09	944	47.97	35.28
DEP-4 (143-163')	99.82	04/18/08	939	40.89	58.93
		05.05.08	1559	45.21	54.61
		06.09.08	1402	52.96	46.86
		10/13/08	1729	38.41	61.41
		04/22/09	1037	53.02	46.80
DEP-4 (208-228')	99.53	04/18/08	938	45.57	53.96
		05.05.08	1557	50.90	48.63
		06.09.08	1401	59.21	40.32
		10/13/08	1731	42.68	56.85
		04/22/09	1035	58.85	40.68
DEP-4 (255-275')	99.51	04/18/08	941	45.55	53.96
		05.05.08	1556	50.88	48.63
		06.09.08	1400	59.19	40.32
		10/13/08	1733	42.66	56.85
		04/22/09	1032	58.93	40.58
DEP-4 (300-320')	99.11	04/18/08	934	45.13	53.98
		05.05.08	1550	50.46	48.65
		06.09.08	1359	58.76	40.35
		10/13/08	1735	42.25	56.86
		04/22/09	1030	58.37	40.74
DEP-5 (153-173')	86.87	04/18/08	1051	38.67	48.20
		05.05.08	1449	44.48	42.39
		06.09.08	1326	52.83	34.04
		10/13/08	1604	37.36	49.51
		04/22/09	1236	52.27	34.60
DEP-5 (200-220')	86.97	04/18/08	1050	38.91	48.06
		05.05.08	1447	44.78	42.19
		06.09.08	1325	53.17	33.80

		10/13/08	1606	37.61	49.36
		04/22/09	1233	52.58	34.39
DEP-5 (250-270')	87.12	04/18/08	1047	40.28	46.84
		05.05.08	1446	46.10	41.02
		06.09.08	1323	54.86	32.26
		10/13/08	1607	38.49	48.63
		04/22/09	1228	54.52	32.60
DEP-5 (300-320')	87.16	04/18/08	1045	40.31	46.85
		05.05.08	1445	46.13	41.03
		06.09.08	1320	54.91	32.25
		10/13/08	1609	38.54	48.62
		04/22/09	1225	54.56	32.60

Appendix: Core Description DEP-1

Bag	Core Interval	Footage	Color	Rock Type	Texture	Remarks	Fossils	Pyrite	Pyrite association	Phosphate	Ph-association	Moisture	Remarks
54	DEP1-136-132	132		clay-rich mudstone				very minor					
	DEP1-136-132	133		clay-rich mudstone				very minor					
	DEP1-136-132	134		clay-rich mudstone				very minor					
	DEP1-136-132	135		clay-rich mudstone				very minor					
53	DEP1-141-136	136		wackestone-mudstone		quartz	none	some		some			
	DEP1-141-136	137		wackestone-mudstone		quartz	none	some		some			
	DEP1-141-136	138		wackestone-mudstone		quartz	none	some		some			
	DEP1-141-136	139	black	chert				none					
	DEP1-141-136	140	black	chert				none					
52	DEP1-144-141	141	black	chert				none	Fe-oxides - from drilling?				
	DEP1-144-141	142	black	chert				none	Fe-oxides - from drilling?				
	DEP1-144-141	143	black	chert				none	Fe-oxides - from drilling?				
51	DEP1-149-144	144		wackestone-packstone			very small molds	minor					
	DEP1-149-144	145		wackestone-packstone			very small molds	minor					
	DEP1-149-144	146		wackestone-packstone			very small molds	minor					
	DEP1-149-144	147		wackestone-packstone			very small molds	minor					
	DEP1-149-144	148		wackestone-packstone			very small molds	minor					
50	DEP1-152-149	149		grainstone	well cemented	chert nodules	diverse skeletals, possibly concentration of long echinoid spines						
	DEP1-152-149	150		grainstone	well cemented	chert nodules	diverse skeletals, possibly concentration of long echinoid spines						
	DEP1-152-149	151		ca ?????						much			dark grey, black surfaces
49	DEP1-156-152	152		clay				some				dry	
	DEP1-156-152	153		clay				some				dry	
	DEP1-156-152	154		clay				some				dry	
	DEP1-156-152	155		quartz-sand rich packstone			mollusk, oyster fragm.			some			
48	DEP1-160-156	156		clay		quartz sand-rich		very minor	peppered throughout	much			
	DEP1-160-156	157		clay		quartz sand-rich		very minor	peppered throughout	much			
	DEP1-160-156	158		clay		quartz sand-rich		very minor	peppered throughout	much			
	DEP1-160-156	159		clay		quartz sand-rich		very minor	peppered throughout	much			
47	DEP1-164-160	160		quartz-rich wackestone or calcareous quartz sandstone				very minor	peppered throughout	much			
	DEP1-164-160	161		quartz-rich wackestone or calcareous quartz sandstone				very minor	peppered throughout	much			
	DEP1-164-160	162		quartz-rich wackestone or calcareous quartz sandstone				very minor	peppered throughout	much			
	DEP1-164-160	163		quartz-rich wackestone or calcareous quartz sandstone				very minor	peppered throughout	much			
46	DEP1-168-164	164		sandy packstone		some calcareous as	whole mollusk, large molds	minor		much	grains, nodules		
	DEP1-168-164	165		sandy packstone		some calcareous as	whole mollusk, large molds	minor		much	grains, nodules		
	DEP1-168-164	166		sandy packstone		some calcareous as	whole mollusk, large molds	minor		much	grains, nodules		
	DEP1-168-164	167		sandy packstone		some calcareous as	whole mollusk, large molds	minor		much	grains, nodules		
45	DEP1-172-168	168		sandy packstone		some calcareous as	whole mollusk, large molds	minor	associated w/ phosp.	much	grains, nodules		
	DEP1-172-168	169		sandy packstone		some calcareous as	whole mollusk, large molds	minor	associated w/ phosp.	much	grains, nodules		
	DEP1-172-168	170		sandy packstone		some calcareous as	whole mollusk, large molds	minor	associated w/ phosp.	much	grains, nodules		
	DEP1-172-168	171		sandy packstone		some calcareous as	whole mollusk, large molds	minor	associated w/ phosp.	much	grains, nodules		
44	DEP1-176-172	172		calcareous quartz sandstone or quartz-sand rich packstone			large mollusks	??	mottly porosity	some	*pecis		
	DEP1-176-172	173		calcareous quartz sandstone or quartz-sand rich packstone			large mollusks	??	mottly porosity	some	*pecis		
	DEP1-176-172	174		calcareous quartz sandstone or quartz-sand rich packstone			large mollusks	??	mottly porosity	some	*pecis		
	DEP1-176-172	175		calcareous quartz sandstone or quartz-sand rich packstone			large mollusks	??	mottly porosity	some	*pecis		
43	DEP1-180-176	176	green	clay		with cm-scale carbonate stringers		some					
	DEP1-180-176	177	green	clay		with cm-scale carbonate stringers		some					
	DEP1-180-176	178	green	clay		with cm-scale carbonate stringers		some					
	DEP1-180-176	179	green	clay		with cm-scale carbonate stringers		some					
42	DEP1-184-180	180	green	clay		with cm-scale carbonate stringers		some					
	DEP1-184-180	181	green	clay		with cm-scale carbonate stringers		some					
	DEP1-184-180	182	green	clay		with cm-scale carbonate stringers		some					
	DEP1-184-180	183	green	clay		with cm-scale carbonate stringers		some					
41	DEP1-187-184	184		clay				some	with Fe-oxides				
	DEP1-187-184	185		clay				some	with Fe-oxides				
	DEP1-187-184	186		clay				some	with Fe-oxides				
40	DEP1-190-187	187	blue	clay		*calcareous		much	with Fe-oxides			very dry	
	DEP1-190-187	188	blue	clay		*calcareous		much	with Fe-oxides			very dry	
	DEP1-190-187	189	blue	clay		*calcareous		much	with Fe-oxides			very dry	
39	DEP1-193-190	190	blue	clay		*calcareous		much				very dry	cm-scale wisps of white carb. mud within blue clays
	DEP1-193-190	191	blue	clay		*calcareous		much				very dry	cm-scale wisps of white carb. mud within blue clays
	DEP1-193-190	192	blue	clay		*calcareous		much				very dry	cm-scale wisps of white carb. mud within blue clays
38	DEP1-196-193	193	blue	clay				much	matrix plus Fe-oxides			dry	
	DEP1-196-193	194	blue	clay				much	matrix plus Fe-oxides			dry	
	DEP1-196-193	195	blue	clay				much	matrix plus Fe-oxides			dry	
37	DEP1-199-196	196		packstone-wackestone	very dense	quartz-rich, just a few chips						transitioning from dry to wet	
	DEP1-199-196	197		packstone-wackestone	very dense	quartz-rich, just a few chips						transitioning from dry to wet	
	DEP1-199-196	198		packstone-wackestone	very dense	quartz-rich, just a few chips						transitioning from dry to wet	
36	DEP1-205-199	199		packstone		few chips of limestone, small chert chips		some	lenses			transitioning from dry to wet	
	DEP1-205-199	200		packstone		few chips of limestone, small chert chips		some	lenses			transitioning from dry to wet	
	DEP1-205-199	201		packstone		few chips of limestone, small chert chips		some	lenses			transitioning from dry to wet	
	DEP1-205-199	202		packstone		few chips of limestone, small chert chips		some	lenses			wet?	
	DEP1-205-199	203		packstone		few chips of limestone, small chert chips		some	lenses				
	DEP1-205-199	204		packstone		few chips of limestone, small chert chips		some	lenses				
35	DEP1-209-205	205		wackestone		quartz-rich		very minor		rich			
	DEP1-209-205	206		wackestone		quartz-rich		very minor		rich			
	DEP1-209-205	207		wackestone		quartz-rich		very minor		rich			
	DEP1-209-205	208		clays, mud		increased organic matter							smell of asphalte
34	DEP1-213-209	209		wackestone		quartz-rich		very minor		rich			
	DEP1-213-209	210		chert in packstone									
	DEP1-213-209	211		packstone, clay-rich & w/ quartz sand		some organic layer							
	DEP1-213-209	212	black	chert				minor				dry	
33	DEP1-216-213	213		wackestone	dense	some quartz sand, chert nodules	small molds	??					
	DEP1-216-213	214		wackestone	dense	some quartz sand, chert nodules	small molds	??					
	DEP1-216-213	215		wackestone	dense	some quartz sand, chert nodules	small molds	??					
32	DEP1-222-216	216		wackestone	dense		small molds (mm-scale) - not large like in Suwannee			some			
	DEP1-222-216	217		wackestone	dense		small molds (mm-scale) - not large like in Suwannee			some			
	DEP1-222-216	218		wackestone	dense		small molds (mm-scale) - not large like in Suwannee			some			
	DEP1-222-216	219		wackestone	dense		small molds (mm-scale) - not large like in Suwannee			some			
	DEP1-222-216	220		wackestone	dense		small molds (mm-scale) - not large like in Suwannee			some			
	DEP1-222-216	221		wackestone	dense		small molds (mm-scale) - not large like in Suwannee			some			
31	DEP1-228-222	222		wackestone-mudstone	dense	quartz sand, chert		very minor					definitely Hawthorn-type limestone
	DEP1-228-222	223		wackestone-mudstone	dense	quartz sand, chert		very minor					definitely Hawthorn-type limestone
	DEP1-228-222	224		wackestone-mudstone	dense	quartz sand, chert		very minor					definitely Hawthorn-type limestone
	DEP1-228-222	225		wackestone-mudstone	dense	quartz sand, chert		very minor					definitely Hawthorn-type limestone
	DEP1-228-222	226		wackestone-mudstone	dense	quartz sand, chert		very minor					definitely Hawthorn-type limestone
	DEP1-228-222	227		wackestone-mudstone	dense	quartz sand, chert		very minor					definitely Hawthorn-type limestone
30	DEP1-232-228	228		wackestone		lots of quartz sand in limestone		some (visible)		some			definitely Hawthorn-type limestone
	DEP1-232-228	229		wackestone		lots of quartz sand in limestone		some (visible)		some			
	DEP1-232-228	230		clay				?		?			
	DEP1-232-228	231		wackestone-packstone			vugs with gray Hawth. sediment, rhizoliths in limestones; calcite cements in cracks						H2S smell
29	DEP1-236-232	232		grainstone				none				wet	**TOP SUWANNEE @ 231.5 FT**
	DEP1-236-232	233		grainstone				none				wet	
	DEP1-236-232	234		packstone-wackestone	dense	features in limestone, some w. Fe-oxide stained fill		very much	in molds porosity, broken sided surface w. FeS2 adjacent to it				cm-thick calcite cement fills irregular horizontal cracks (sheet cracks assoc. w top Suwannee exposure?)
	DEP1-236-232	235		grainstone				none				wet	
28	DEP1-238-236	236	tan	grainstone		tan carbonate with streaks of green (quartz sand) running through it		minor				wet	green sediment is Hawthorne infiltrated through dissolution voids?
	DEP1-238-236	237	tan	grainstone		tan carbonate with streaks of green (quartz sand) running through it		minor				wet	green material has slight H2S smell
27	DEP1-244-238	238		grainstone				minor				wet	
	DEP1-244-238	239		grainstone				minor				wet	
	DEP1-244-238	240		grainstone				minor				wet	
	DEP1-244-238	241		grainstone				minor				wet	
	DEP1-244-238	242		grainstone				minor				wet	
	DEP1-244-238	243		grainstone				minor				wet	
26	DEP1-248-244	244		packstone		well cemented ps		much				wet	
	DEP1-248-244	245		poorly lithified mud & clay		Hawthorn-like sediment interbedded w/ Suwanne rock		much				wet	clay is reduced -- paleo-land ???
	DEP1-248-244	246		poorly lithified mud & clay		Hawthorn-like sediment interbedded w/ Suwanne rock		much				wet	clay is red-ox'd -- paleo-land ???

	DEPI-248-244	247		packstone			well cemented p.s			much			wet		
25	DEPI-253-248	248		grainstone	well sorted and cemented	cm-scale vug cross cuts rock & is coated with?			very minor				wet		exact position of vug not recorded, is large dissolution void & deepest indicator of top Suwannee unconformity
	DEPI-253-248	249		grainstone	well sorted and cemented	cm-scale vug cross cuts rock & is coated with?			very minor				wet		
	DEPI-253-248	250		grainstone	well sorted and cemented	cm-scale vug cross cuts rock & is coated with?			very minor				wet		
	DEPI-253-248	251		grainstone	well sorted and cemented	cm-scale vug cross cuts rock & is coated with?			very minor				wet		
	DEPI-253-248	252		grainstone	well sorted and cemented	cm-scale vug cross cuts rock & is coated with?			very minor				wet		
24	DEPI-256-253	253		grainstone	fine-grained				minor				wet		
	DEPI-256-253	254		grainstone	fine-grained				minor				wet		
	DEPI-256-253	255		grainstone	fine-grained				minor				wet		
23	DEPI-261-256	256		grainstone		more larger core fragments than below		large molds and high moldic zones	very much				wet		
	DEPI-261-256	257		grainstone		more larger core fragments than below		large molds and high moldic zones	very much				wet		
	DEPI-261-256	258		grainstone		more larger core fragments than below		large molds and high moldic zones	very much				wet		
	DEPI-261-256	259		grainstone		more larger core fragments than below		large molds and high moldic zones	very much				wet		
	DEPI-261-256	260		grainstone		more larger core fragments than below		large molds and high moldic zones	very much				wet		
22	DEPI-266-261	261		grainstone	coarse grained	some core chunks			none				wet		
	DEPI-266-261	262		grainstone	coarse grained	some core chunks			none				wet		
	DEPI-266-261	263		grainstone	coarse grained	some core chunks			none				wet		
	DEPI-266-261	264		grainstone	coarse grained	some core chunks			none				wet		
	DEPI-266-261	265		grainstone	coarse grained	some core chunks			none				wet		
21	DEPI-271-266	266		grainstone					none				wet		
	DEPI-271-266	267		grainstone					none				wet		
	DEPI-271-266	268		grainstone					none				wet		
	DEPI-271-266	269		grainstone					none				wet		
	DEPI-271-266	270		grainstone					none				wet		
20	DEPI-276-271	271		grainstone					very minor				wet		
	DEPI-276-271	272		grainstone					very minor				wet		
	DEPI-276-271	273		grainstone					very minor				wet		
	DEPI-276-271	274		grainstone					very minor				wet		
	DEPI-276-271	275		grainstone					very minor				wet		
19	DEPI-280-276	276		grainstone		no core chips, no core fragments							wet		
	DEPI-280-276	277		grainstone		no core chips, no core fragments							wet		
	DEPI-280-276	278		grainstone		no core chips, no core fragments							wet		
	DEPI-280-276	279		grainstone		no core chips, no core fragments							wet		
18	DEPI-284-280	280		grainstone	fine-grained	little quartz		no molds	very minor				wet		
	DEPI-284-280	281		grainstone	fine-grained	little quartz		no molds	very minor				wet		
	DEPI-284-280	282		grainstone	fine-grained	little quartz		no molds	very minor				wet		
	DEPI-284-280	283		grainstone	fine-grained	little quartz		no molds	very minor				wet		
17	DEPI-288-284	284		grainstone					very minor				wet		
	DEPI-288-284	285		grainstone					very minor				wet		
	DEPI-288-284	286		grainstone					very minor				wet		
	DEPI-288-284	287		grainstone					very minor				wet		
16	DEPI-292-288	288		grainstone					minor				wet		
	DEPI-292-288	289		grainstone					minor				wet		
	DEPI-292-288	290		grainstone					minor				wet		
	DEPI-292-288	291		grainstone					minor				wet		
15	DEPI-296-292	292		grainstone-packstone				molds 25% less in size & abundance as below	very minor				wet		
	DEPI-296-292	293		grainstone-packstone				molds 25% less in size & abundance as below	very minor				wet		
	DEPI-296-292	294		grainstone-packstone				molds 25% less in size & abundance as below	very minor				wet		
	DEPI-296-292	295		grainstone-packstone				molds 25% less in size & abundance as below	very minor				wet		
14	DEPI-297-296	296		packstone		some gs chips, amount of gravel-sized core pieces > sand-sized pieces		high moldic porosity zones	minor				wet		
13	DEPI-300-297	297		packstone		big chunks of core in muddy paste							wet		
	DEPI-300-297	298		packstone		big chunks of core in muddy paste							wet		
	DEPI-300-297	299		wackestone		some fragments of ps			some	associated with moldic pores			wet		
12	DEPI-303-300	300		grainstone		big chunks of core in muddy paste							wet		
	DEPI-303-300	301		grainstone	very muddy	big core fragments, entire pieces of 4" core							wet		
	DEPI-303-300	302		grainstone		chunks of core with a lot of porosity			minor				wet		
11	DEPI-308-303	303		coarse grainstone					same as 308-312				wet		
	DEPI-308-303	304		coarse grainstone					same as 308-312				wet		
	DEPI-308-303	305		coarse grainstone					same as 308-312				wet		
	DEPI-308-303	306		coarse grainstone					same as 308-312				wet		
	DEPI-308-303	307		coarse grainstone					same as 308-312				wet		
10	DEPI-312-308	308		friable grainstone				large mollusk molds	less than below				wet		
	DEPI-312-308	309		friable grainstone				large mollusk molds	less than below				wet		
	DEPI-312-308	310		friable grainstone				large mollusk molds	less than before				wet		
	DEPI-312-308	311		friable grainstone				large mollusk molds	less than before				wet		
9	DEPI-316-312	312		friable grainstone	well lithified				lots	specks in matrix and widespread w/ moldic porosity			wet		
	DEPI-316-312	313		friable grainstone	well lithified				lots	specks in matrix and widespread w/ moldic porosity			wet		
	DEPI-316-312	314		friable grainstone	well lithified				lots	specks in matrix and widespread w/ moldic porosity			wet		
	DEPI-316-312	315		friable grainstone	well lithified				lots	specks in matrix and widespread w/ moldic porosity			wet		
8	DEPI-321-316	316	greenish gray	grainstone		large amount of quartz			some	specks in matrix, on clean surfaces			wet		
	DEPI-321-316	317	greenish gray	grainstone		large amount of quartz			some	specks in matrix, on clean surfaces			wet		
	DEPI-321-316	318	greenish gray	grainstone		large amount of quartz			some	specks in matrix, on clean surfaces			wet		
	DEPI-321-316	319	greenish gray	grainstone		large amount of quartz			some	specks in matrix, on clean surfaces			wet		
	DEPI-321-316	320	greenish gray	grainstone		large amount of quartz			some	specks in matrix, on clean surfaces			wet		
7	DEPI-326-321	321		grainstone		more core fragments							wet		slight H2S smell
	DEPI-326-321	322		grainstone		more core fragments							wet		slight H2S smell
	DEPI-326-321	323		grainstone		more core fragments							wet		slight H2S smell
	DEPI-326-321	324		grainstone		more core fragments							wet		slight H2S smell
	DEPI-326-321	325		grainstone		more core fragments							wet		slight H2S smell
6	DEPI-332-326	326		fine grainstone		few pebble-sized core fragments			minor				wet		H2S smell not pristine, drilled twice
	DEPI-332-326	327		fine grainstone		few pebble-sized core fragments			minor				wet		H2S smell not pristine, drilled twice
	DEPI-332-326	328		fine grainstone		few pebble-sized core fragments			minor				wet		H2S smell not pristine, drilled twice
	DEPI-332-326	329		fine grainstone		few pebble-sized core fragments			minor				wet		H2S smell not pristine, drilled twice
	DEPI-332-326	330		fine grainstone		few pebble-sized core fragments			minor				wet		H2S smell not pristine, drilled twice
	DEPI-332-326	331		fine grainstone		few pebble-sized core fragments			minor				wet		H2S smell not pristine, drilled twice
5	DEPI-336-332	332		grainstone		few small core fragments, quartz sand					minor	intergranular porosity	wet		not pristine, drilled twice
	DEPI-336-332	333		grainstone		few small core fragments, quartz sand					minor	intergranular porosity	wet		not pristine, drilled twice
	DEPI-336-332	334		grainstone		few small core fragments, quartz sand					minor	intergranular porosity	wet		H2S smell not pristine, drilled twice
	DEPI-336-332	335		grainstone		few small core fragments, quartz sand					minor	intergranular porosity	wet		not pristine, drilled twice
4	DEPI-339-336	336		grainstone							minor		wet		
	DEPI-339-336	337		grainstone							minor		wet		
	DEPI-339-336	338		grainstone							minor		wet		
3	DEPI-343-339	339		grainstone					minor, in moldic pores		minor		wet		
	DEPI-343-339	340		grainstone					minor, in moldic pores				wet		
	DEPI-343-339	341		grainstone					minor, in moldic pores				wet		
	DEPI-343-339	342		grainstone					minor, in moldic pores				wet		
2	DEPI-346-343	343		packstone									wet		
	DEPI-346-343	344		packstone									wet		
	DEPI-346-343	345		packstone				lager clams, echinoids	minor				wet		
	DEPI-351-346	346		grainstone				mollusk fragments					wet		
	DEPI-351-346	347		grainstone				mollusk fragments					wet		
	DEPI-351-346	348		grainstone				mollusk fragments					wet		
	DEPI-351-346	349		grainstone				mollusk fragments	minor pyrite @ 349.5				wet		
	DEPI-351-346	350		grainstone				mollusk fragments					wet		
	DEPI-351-346	351											wet		

Appendix: Core Description DEP-2

Bag	Core Interval	Footage	Color	Rock Type	Texture	Remarks	Fossils	Pyrite	Pyrite association	Phosphate	Ph-association	Moisture	Remarks
88	DEP2-16-6	6	orange	sandstone		organic matter, root hairs, & white fungal masses				minor			
	DEP2-16-6	7	orange	sandstone	fine to medium grained	unconsolidated				minor			
	DEP2-16-6	8	orange	sandstone	fine to medium grained	unconsolidated				minor			
	DEP2-16-6	9	orange	sandstone	fine to medium grained	unconsolidated				minor			
	DEP2-16-6	10	orange	sandstone	fine to medium grained	unconsolidated				minor			
	DEP2-16-6	11	orange	sandstone	fine to medium grained	unconsolidated				minor			
	DEP2-16-6	12	orange	sandstone	fine to medium grained	unconsolidated				minor			
	DEP2-16-6	13	orange	sandstone	fine to medium grained	unconsolidated				minor			
	DEP2-16-6	14	orange	sandstone	fine to medium grained	unconsolidated				minor			
	DEP2-16-6	15	orange	sandstone	fine to medium grained	unconsolidated				minor		clay	
87	DEP2-19-16	16	gray	sandstone	fine grained	unconsolidated				minor		very wet	
	DEP2-19-16	17	gray	sandstone	fine grained	unconsolidated				minor		very wet	
	DEP2-19-16	18	gray	sandstone	fine grained	unconsolidated				minor		very wet	
86	DEP2-22-19	19	gray	sandstone		some clay?		very minor		much	pebbles	damp	
	DEP2-22-19	20	gray	sandstone		some clay?		very minor		much	pebbles	damp	
	DEP2-22-19	21	gray	sandstone		some clay?		very minor		much	pebbles	damp	
85	DEP2-26-22	22	gray	calcareous sandstone or sandy packstone	clayey				trace Fe-oxides	some		wet	
	DEP2-26-22	23	gray	calcareous sandstone or sandy packstone	clayey				trace Fe-oxides	some		wet	
	DEP2-26-22	24	gray	calcareous sandstone or sandy packstone	clayey				trace Fe-oxides	some		wet	
	DEP2-26-22	25	gray	calcareous sandstone or sandy packstone	clayey		bioturbated	minor	lot of Fe-oxides	some		wet	
84	DEP2-29-26	26		calcareous sandstone or sandy packstone			bioturbated	minor	lot of Fe-oxides	some			
	DEP2-29-26	27		calcareous sandstone or sandy packstone			bioturbated	minor	lot of Fe-oxides	some			
	DEP2-29-26	28		calcareous sandstone or sandy packstone		increasing carb. & increasing clay upwards to 27ft	bioturbated	minor	lot of Fe-oxides	some			
83	DEP2-32-29	29		calcareous sandstone or sandy packstone		increasing carb. & increasing clay upwards to 27ft	bioturbated	minor	lot of Fe-oxides	some			
	DEP2-32-29	30		calcareous sandstone or sandy packstone		increasing carb. & increasing clay upwards to 27ft	bioturbated	minor	lot of Fe-oxides	some			
	DEP2-32-29	31		calcareous sandstone or sandy packstone		increasing carb. & increasing clay upwards to 27ft	bioturbated	minor	lot of Fe-oxides	some			
82	DEP2-35-32	32		calcareous sandstone or sandy packstone		increasing carb. & increasing clay upwards to 27ft	bioturbated	minor	lot of Fe-oxides	some			
	DEP2-35-32	33		calcareous sandstone or sandy packstone		increasing carb. & increasing clay upwards to 27ft	bioturbated	minor	lot of Fe-oxides	some			
	DEP2-35-32	34		calcareous sandstone or sandy packstone		increasing carb. & increasing clay upwards to 27ft	bioturbated	minor	lot of Fe-oxides	some			
81	DEP2-39-35	35	yellow	sandstone	calcite cemented			minor	lot of Fe-oxides				
	DEP2-39-35	36	yellow	sandstone	calcite cemented			minor	lot of Fe-oxides				
	DEP2-39-35	37	yellow	sandstone	calcite cemented			minor	lot of Fe-oxides				
	DEP2-39-35	38	yellow	sandstone	calcite cemented			minor	lot of Fe-oxides				
80	DEP2-43-39	39	gray-yellow	calcareous sandstone	fine grained			minor	lot of Fe-oxides				oxidized zone
	DEP2-43-39	40	gray-yellow	calcareous sandstone	fine grained			minor	lot of Fe-oxides				oxidized zone
	DEP2-43-39	41	yellow	sandstone	fine grained			minor	lot of Fe-oxides			damper	oxidized zone
	DEP2-43-39	42	gray-yellow	calcareous sandstone	fine grained			minor	lot of Fe-oxides				oxidized zone
79	DEP2-46-43	43		calcareous sandstone						minor			
	DEP2-46-43	44		calcareous sandstone						minor			
	DEP2-46-43	45		calcareous sandstone						minor			
78	DEP2-47-46	46	dark gray	sandy clay		quartz-rich				much			
77	DEP2-50-47	47	dark gray	calcareous sandstone				very minor		much	pebbles		
	DEP2-50-47	48	dark gray	calcareous sandstone				very minor		much	pebbles		
	DEP2-50-47	49	dark gray	calcareous sandstone	decreasing quartz upward			very minor		minor			
76	DEP2-53-50	50		calcareous sandstone	increasing quartz sand upward			minor					
	DEP2-53-50	51		calcareous sandstone	increasing quartz sand upward			minor					
	DEP2-53-50	52		calcareous sandstone	increasing quartz sand upward			minor					
75	DEP2-56-53	53		calcareous sandstone	increasing quartz sand upward			none					
	DEP2-56-53	54	dark gray	calcareous sandstone	increasing quartz sand upward			none		much	rounded		
	DEP2-56-53	55	gray	calcareous sandstone		Fe-oxid. Brown mud chips		none					
74	DEP2-57-58	56		calcareous sandstone	clayey			none					
73	DEP2-60-57	57		calcareous sandstone	silty			none		some			
	DEP2-60-57	58		calcareous sandstone	silty			none		some			
	DEP2-60-57	59		calcareous sandstone	silty			none		some			
72	DEP2-63-60	60		calcareous sandstone		few lithoclasts, bioturbated, phosphatic sand		none		much	pebbles		
	DEP2-63-60	61		calcareous sandstone		few lithoclasts, bioturbated, phosphatic sand		none		much	pebbles		
	DEP2-63-60	62		calcareous sandstone		few lithoclasts, bioturbated, phosphatic sand		none		much	pebbles		
71	DEP2-66-63	63		calcareous sandstone		burrows		none		much	pebbles		
	DEP2-66-63	64		calcareous sandstone		burrows		none		much	pebbles		
	DEP2-66-63	65		calcareous sandstone		burrows		none		much	pebbles		
70	DEP2-67-66	66	gray-green	mudstone	sandy-clayey	quartz-rich		none		much	lag of pebbles		
69	DEP2-70-67	67		mudstone	sandy-clayey	burrows		none					
	DEP2-70-67	68		mudstone	sandy-clayey	burrows		none					
	DEP2-70-67	69		mudstone	sandy-clayey	burrows		none					
68	DEP2-73-70	70		calcareous sandstone				none					
	DEP2-73-70	71		calcareous sandstone				none					
	DEP2-73-70	72		calcareous sandstone				none					
67	DEP2-76-73	73		calcareous sandstone		also small core chips of ps w/ little quartz		none					
	DEP2-76-73	74		calcareous sandstone		also small core chips of ps w/ little quartz		none					
	DEP2-76-73	75		calcareous sandstone		also small core chips of ps w/ little quartz		none					
66	DEP2-80-76	76		calcareous sandstone				none		much			
	DEP2-80-76	77		calcareous sandstone	dense	also small core chips of ps w/ little quartz	mollusk molds	none		much		damp	
	DEP2-80-76	78		calcareous sandstone				none		much			
	DEP2-80-76	79		calcareous sandstone				none		much			
65	DEP2-84-80	80		calcareous sandstone				none		much			
	DEP2-84-80	81		calcareous sandstone				none		much			
	DEP2-84-80	82		calcareous sandstone				none		much			
	DEP2-84-80	83		calcareous sandstone				none		much			
64	DEP2-88-84	84		calcareous sandstone				none	just Fe-oxides	much			
	DEP2-88-84	85		calcareous sandstone				none	just Fe-oxides	much			
	DEP2-88-84	86		calcareous sandstone				none	just Fe-oxides	much			
	DEP2-88-84	87		calcareous sandstone				none	just Fe-oxides	much			
63	DEP2-92-88	88		calcareous sandstone				none		much		dry	
	DEP2-92-88	89		calcareous sandstone				none		much		dry	
	DEP2-92-88	90		calcareous sandstone				none		much		dry	
	DEP2-92-88	91		calcareous sandstone				none		much		dry	
62	DEP2-96-92	92		sandy packstone	carb > quartz			much				dry	
	DEP2-96-92	93		sandy packstone	carb > quartz			much				dry	
	DEP2-96-92	94		sandy packstone	carb > quartz	laminated phosphate sand	molds	much		much		dry	
	DEP2-96-92	95		sandy packstone	carb > quartz			much				dry	
61	DEP2-97-96	96		mudstone	dense	fractured carb. chips						damp	
60	DEP2-101-97	97		sandy packstone or calcareous sandstone	laminated fine sand			much	w/ quartz	some			green=quartz; grey=carb.
	DEP2-101-97	98		sandy packstone or calcareous sandstone		little chert, organic matter		much					
	DEP2-101-97	99		sandy packstone or calcareous sandstone		little chert, organic matter		much					
	DEP2-101-97	100		sandy packstone or calcareous sandstone		little chert, organic matter		much					
59	DEP2-105-101	101		calcareous sandstone				minor	trace Fe-oxides				
	DEP2-105-101	102		calcareous sandstone				minor	trace Fe-oxides				

	DEP2-105-101	**103**		calcareous sandstone				minor	trace Fe-oxides				
	DEP2-105-101	**104**		calcareous sandstone				minor	trace Fe-oxides				
58	DEP2-108-105	**105**		mudstone	clay & quartz bearing, carb.>clay but variable			much	scattered				redox halos
	DEP2-108-105	**106**		mudstone	clay & quartz bearing, carb.>clay but variable			much	scattered				redox halos
	DEP2-108-105	**107**		mudstone	clay & quartz bearing, carb.>clay but variable			much	scattered				redox halos
57	DEP2-112-108	**108**		sandy packstone-wackestone or calcareous sandstone		clay, quartz bearing, carb.>clay but variable		minor	scattered	minor			redox halos
	DEP2-112-108	**109**		sandy packstone-wackestone or calcareous sandstone		clay, quartz bearing, carb.>clay but variable		minor	scattered	minor			redox halos
	DEP2-112-108	**110**		sandy packstone-wackestone or calcareous sandstone		clay, quartz bearing, carb.>clay but variable		minor	scattered	minor			redox halos
	DEP2-112-108	**111**		sandy packstone-wackestone or calcareous sandstone		clay, quartz bearing, carb.>clay but variable		minor	scattered	minor			redox halos
56	DEP2-116-112	**112**		packstone		quartz-rich with slightly increasing clay				some			
	DEP2-116-112	**113**		packstone		quartz-rich with slightly increasing clay				some			
	DEP2-116-112	**114**	light greenish-gray	calcareous sandstone		clay>>carb.		minor	scattered				
	DEP2-116-112	**115**		packstone		quartz-rich with slightly increasing clay				some			
55	DEP2-118-116	**116**		mudstone		lots of quartz, carb. martix has more clay than below		minor	scattered				
	DEP2-118-116	**117**		mudstone		lots of quartz, carb. martix has more clay than below		minor	scattered				
54	DEP2-125-118	**118**		mudstone				much	scattered				
	DEP2-125-118	**119**		mudstone				much	scattered				
	DEP2-125-118	**120**		mudstone				much	scattered				
	DEP2-125-118	**121**		mudstone				much	scattered				
	DEP2-125-118	**122**		mudstone				much	scattered				
	DEP2-125-118	**123**		mudstone				much	scattered				
	DEP2-125-118	**124**		mudstone				much	scattered				
53	DEP2-129-125	**125**	black	chert									
	DEP2-129-125	**126**	black	chert									
	DEP2-129-125	**127**	black	chert									
	DEP2-129-125	**128**		wackestone		minor quartz, chips of ws-ps with angular shape suggest fractures	small mollusks	minor	scattered	minor			smells
52	DEP2-132-129	**129**		calcareous sandstone								dry	
	DEP2-132-129	**130**	green	calcareous sandstone		lots of chert						dry	
	DEP2-132-129	**131**		calcareous sandstone				minor	scattered			dry	
51	DEP2-136-132	**132**		calcareous sandstone				minor	scattered				
	DEP2-136-132	**133**		calcareous sandstone				minor	scattered				
	DEP2-136-132	**134**		calcareous sandstone				minor	scattered				
	DEP2-136-132	**135**		calcareous sandstone		angular shape of chips suggests fractures		very minor					
50	DEP2-137-136	**136**		wackestone	not well lithified	chert chips, quartz		minor	scattered with oxidized bands	minor		wet	
49	DEP2-142-137	**137**		chert & dolomite ?	very dense			minor	scattered Fe-oxides				
	DEP2-142-137	**138**		chert & dolomite ?	very dense			minor	scattered Fe-oxides				
	DEP2-142-137	**139**		chert & dolomite ?	very dense			minor	scattered Fe-oxides				
	DEP2-142-137	**140**		chert & dolomite ?	very dense			minor	scattered Fe-oxides				
	DEP2-142-137	**141**		chert & dolomite ?	very dense			minor	scattered Fe-oxides				
48	DEP2-146-142	**142**		chert									
	DEP2-146-142	**143**		dolomite ?	very dense			none		much	laminations		
	DEP2-146-142	**144**		chert									
	DEP2-146-142	**145**		chert									
47	DEP2-148-146	**146**		chert				none	trace Fe-oxides				
	DEP2-148-146	**147**		chert		thin clay layer with a lot of Fe-oxides		none	trace Fe-oxides				
46	DEP2-152-148	**148**		wackestone-packstone	not well lithified	clay-rich, chert, carb>clay	minor	plus Fe-oxides					smells
	DEP2-152-148	**149**		wackestone-packstone	dense	minor quartz, possibly fractured				some			
	DEP2-152-148	**150**		wackestone-packstone	dense			minor	Fe-oxides too				
	DEP2-152-148	**151**		wackestone-packstone	dense			minor	Fe-oxides too				
45	DEP2-156-152	**152**		wackestone	dense	some quartz				some		damp	
	DEP2-156-152	**153**		wackestone	dense	some quartz				some		damp	
	DEP2-156-152	**154**		chert				minor					
	DEP2-156-152	**155**		wackestone	dense	some quartz				some		damp	
44	DEP2-161-156	**156**		sandstone									
	DEP2-161-156	**157**		chert									
	DEP2-161-156	**158**	gray	sandstone						minor		wet	
	DEP2-161-156	**159**	gray	sandstone						minor		wet	
	DEP2-161-156	**160**		wackestone-packstone			small molds	none		minor			
43	DEP2-165-161	**161**		sandstone	fine-grained								
	DEP2-165-161	**162**	gray	sandstone	fine-grained								
	DEP2-165-161	**163**	greenish	sandstone	fine-grained								
	DEP2-165-161	**164**		packstone			some	mold with framboiled pyrite					
42	DEP2-169-165	**165**	greenish	sandstone			some mollusk	none		some			H2S smell, grey-green
	DEP2-169-165	**166**	greenish	sandstone			some mollusk	none		some			H2S smell, grey-green
	DEP2-169-165	**167**	greenish	sandstone		a lot of carb.	some mollusk	none		some			H2S smell, grey-green
	DEP2-169-165	**168**	greenish	sandstone			some mollusk	none		some			H2S smell, grey-green
41	DEP2-172-169	**169**	greenish	sandstone-grainstone	no solids	quartz rich	shell fragments	some	on organic matter	much		damp	
	DEP2-172-169	**170**	greenish	sandstone-grainstone	no solids	quartz rich	shell fragments	some	on organic matter	much		damp	
	DEP2-172-169	**171**	greenish	sandstone-grainstone	no solids	quartz rich	shell fragments	some	on organic matter	much		damp	
39	DEP2-179-172	**172**		sandy wackestone-packstone				none		minor		dry	10' interval but = 15' core
	DEP2-179-172	**173**		sandy wackestone-packstone				none		minor		dry	10' interval but = 15' core
	DEP2-179-172	**174**		sandy wackestone-packstone				none		minor		dry	10' interval but = 15' core
	DEP2-179-172	**175**		sandy wackestone-packstone				none		minor		dry	10' interval but = 15' core
(40)	DEP2-179-172	**176**		sandstone-grainstone			large molds, many fossils but broken	none	some oxid.	much		dry	10' interval but = 15' core
	DEP2-179-172	**177**		sandy wackestone-packstone				none		minor		dry	10' interval but = 15' core
	DEP2-179-172	**178**		sandy wackestone-packstone				none		minor		dry	10' interval but = 15' core
37	DEP2-183-179	**179**		wackestone-packstone		quartz sand in carb. mud matrix; carb>clay		very minor	in oxid. Form?			very dry	
	DEP2-183-179	**180**		wackestone-packstone		quartz sand in carb. mud matrix; carb>clay		very minor	in oxid. Form?			very dry	
	DEP2-183-179	**181**		wackestone-packstone		quartz sand in carb. mud matrix; carb>clay		very minor	in oxid. Form?			very dry	
	DEP2-183-179	**182**		wackestone-packstone		quartz sand in carb. mud matrix; carb>clay		very minor	in oxid. Form?			very dry	
36	DEP2-186-183	**183**		sandy packstone-wackestone or calcareous sandstone		clay>carb.	no obvious	none				dry	
	DEP2-186-183	**184**		sandy packstone or calcareous sandstone		clay>carb.	no obvious	none				dry	
	DEP2-186-183	**185**		sandy packstone or calcareous sandstone		clay>carb.	no obvious	none				dry	
35	DEP2-187-186	**186**		sandy packstone or calcareous sandstone						some			
34	DEP2-188-187	**187**	green	sandstone				some					
33	DEP2-193-188	**188**		carb.rich sandstone-quartz-rich packstone				minor		more as below			
	DEP2-193-188	**189**		carb.rich sandstone-quartz-rich packstone				minor		more as below			
	DEP2-193-188	**190**		carb.rich sandstone-quartz-rich packstone				minor		more as below			
	DEP2-193-188	**191**		carb.rich sandstone-quartz-rich packstone				minor		more as below			
	DEP2-193-188	**192**		carb.rich sandstone-quartz-rich packstone				minor		more as below			
32	DEP2-196-193	**193**		carb.rich sandstone-quartz-rich packstone						some			
	DEP2-196-193	**194**		carb.rich sandstone-quartz-rich packstone						some			
	DEP2-196-193	**195**		carb.rich sandstone-quartz-rich packstone						some			
31	DEP2-199-196	**196**	grey-green	clay									
	DEP2-199-196	**197**	grey-green	clay									
	DEP2-199-196	**198**		sandstone		carbonate rich; sharp lower boundary		much	in matrix	much			
30	DEP2-203-199	**199**	grey-green	clay				much	smaller in matrix				
	DEP2-203-199	**200**	grey-green	clay				much	smaller in matrix				

	DEP2-203-199	201	grey-green	clay					much	smaller in matrix					
	DEP2-203-199	202	grey-green	clay					much	smaller in matrix					
29	DEP2-206-203	203	blue-green	clay					much	in clay					
	DEP2-206-203	204	blue-green	clay					much	in clay					
	DEP2-206-203	205	blue-green	clay					much	in clay					
28	DEP2-207-206	206	grey-blue	clay					some	wide-spread					
27	DEP2-211-207	207	green	soupy limey mud		small core chips of carb. Ms					some		wet		
	DEP2-211-207	208	green	soupy limey mud		small core chips of carb. Ms					some		wet		
	DEP2-211-207	209	green	soupy limey mud		small core chips of carb. Ms					some		wet		
	DEP2-211-207	210	green	soupy limey mud		small core chips of carb. Ms					some		wet		
26	DEP2-215-211	211		chert											
	DEP2-215-211	212		mudstone	fractured	quartz			some	grey clay	some				
	DEP2-215-211	213		chert											
	DEP2-215-211	214	grey	soft carbonate mud & clay	soft	chert chips							wet		
25	DEP2-219-215	215		grainstone	quartz sand-rich	a lot of chert									
	DEP2-219-215	216		grainstone	quartz sand-rich	a lot of chert									
	DEP2-219-215	217		chert											
	DEP2-219-215	218		grainstone	quartz sand-rich	a lot of chert									
24	DEP2-222-219	219		mud		clay and carb.	a few mollusks		much	in clay			damp		
	DEP2-222-219	220		mud		clay and carb.	a few mollusks		much	in clay			damp		
	DEP2-222-219	221		mud		clay and carb.	a few mollusks		much	in clay			damp		
23	DEP2-226-222	222	grey-blue	sandy wackestone or calcareous sandstone		increasing clay - decreasing carb. and quartz upwards			much	wide-spread in clay	much		very dry		
	DEP2-226-222	223	grey-blue	sandy wackestone or calcareous sandstone		increasing clay - decreasing carb. and quartz upwards			much	wide-spread in clay	much		very dry		
	DEP2-226-222	224	grey-blue	sandy wackestone or calcareous sandstone		increasing clay - decreasing carb. and quartz upwards			much	wide-spread in clay	much		very dry		
	DEP2-226-222	225	grey-blue	sandy wackestone or calcareous sandstone					much	wide-spread in clay	much		very dry		
22	DEP2-231-226	226		sandy wackestone or calcareous sandstone			some fossils, small molds		very minor		some		wet - H2S smell	Tampa facies	
	DEP2-231-226	227		sandy wackestone or calcareous sandstone			some fossils, small molds		very minor		some		wet - H2S smell	Tampa facies	
	DEP2-231-226	228		sandy wackestone or calcareous sandstone			some fossils, small molds		very minor		some		wet - H2S smell	Tampa facies	
	DEP2-231-226	229		sandy wackestone or calcareous sandstone			some fossils, small molds		very minor		some		wet - H2S smell	Tampa facies	
	DEP2-231-226	230		sandy wackestone or calcareous sandstone			some fossils, small molds		very minor		some		wet - H2S smell	Tampa facies	
21	DEP2-236-231	231		grainstone	cemented										
	DEP2-236-231	232		grainstone	cemented										
	DEP2-236-231	233		grainstone	cemented										
	DEP2-236-231	234	gray	sandy wackestone or calcareous sandstone			large mollusk molds		some					Tampa Lms	
	DEP2-236-231	235		packstone	cemented									**top of Suwannee Lms 235 ft**	
20	DEP2-241-236	236		grainstone		lots of chunks			some						
	DEP2-241-236	237		grainstone		lots of chunks			some						
	DEP2-241-236	238		grainstone		lots of chunks			some						
	DEP2-241-236	239		grainstone		lots of chunks			some						
	DEP2-241-236	240		grainstone		lots of chunks			some						
19	DEP2-246-241	241		grainstone	fine grained										
	DEP2-246-241	242		grainstone	fine grained										
	DEP2-246-241	243		grainstone	fine grained										
	DEP2-246-241	244		grainstone	fine grained										
	DEP2-246-241	245	gray	packstone	quartz rich	chips of wa			minor	specks	some		wet	Hawthorn facies in paleo-karst?	
18	DEP2-249-246	246		very friable grainstone					minor				wet		
	DEP2-249-246	247		very friable grainstone	coarsening grain size upwards				minor				wet		
	DEP2-245-246	248		very friable grainstone					minor				wet		
17	DEP2-253-249	249		friable grainstone	coarse-grained				very minor				wet		
	DEP2-253-249	250		friable grainstone	green clay plug at 250.5				minor	in clays			wet	clay plug is vug fill?	
	DEP2-253-249	251		friable grainstone	coarse-grained				very minor				wet		
	DEP2-253-249	252		friable grainstone	coarse-grained				very minor				wet		
16	DEP2-257-253	253		friable grainstone									wet		
	DEP2-257-253	254		friable grainstone									wet		
	DEP2-257-253	255		friable grainstone									wet		
	DEP2-257-253	256		grainstone	well cemented, coarse-grained				minor	on cement surface			wet		
15	DEP2-262-257	257		grainstone	coarse-grained				minor				wet		
	DEP2-262-257	258		grainstone	coarse-grained				minor				wet		
	DEP2-262-257	259		grainstone	coarse-grained				minor				wet		
	DEP2-262-257	260		grainstone	coarse-grained				minor				wet		
	DEP2-262-257	261		grainstone	fine-grained				minor				wet		
14	DEP2-266-262	262		friable grainstone	fine-grained				very minor				wet		
	DEP2-266-262	263		friable grainstone	coarse-grained				very minor				wet		
	DEP2-266-262	264		friable grainstone	fine-grained				very minor				wet		
	DEP2-266-262	265		friable grainstone	fine-grained				very minor				wet		
13	DEP2-269-266	266		grainstone	coarse-grained				none				wet		
	DEP2-269-266	267		grainstone	coarse-grained				none				wet		
	DEP2-269-266	268		grainstone	fine-grained				none				wet		
12	DEP2-274-269	269		friable grainstone	coarse-grained		few large molds		very minor				wet		
	DEP2-274-269	270		friable grainstone	coarse-grained		few large molds		very minor				wet		
	DEP2-274-269	271		grainstone	coarse-grained		few large molds		very minor				wet		
	DEP2-274-269	272		friable grainstone	coarse-grained		few large molds		very minor				wet		
	DEP2-274-269	273		grainstone-packstone			no large molds						wet		
11	DEP2-278-274	274		packstone			many large molds		some	moldic porosity			wet		
	DEP2-278-274	275		packstone			many large molds		some	moldic porosity			wet		
	DEP2-278-274	276		packstone			many large molds		some	moldic porosity			wet		
	DEP2-278-274	277		packstone			fewer molds		minor	moldic porosity			wet		
10	DEP2-282-278	278		packstone		well cemented where molds occur	many large molds		some	moldic porosity			wet		
	DEP2-282-278	279		packstone		well cemented where molds occur	many large molds		some	moldic porosity			wet		
	DEP2-282-278	280		packstone		well cemented where molds occur	many large molds		some	moldic porosity			wet		
	DEP2-282-278	281		packstone		well cemented where molds occur	many large molds		some	moldic porosity			wet		
9	DEP2-286-282	282		packstone			many large molds		some	moldic porosity			wet		
	DEP2-286-282	283		packstone			many large molds		some	moldic porosity			wet		
	DEP2-286-282	284		packstone			many large molds		some	moldic porosity			wet		
	DEP2-286-282	285		packstone			many large molds		some	moldic porosity			wet		
8	DEP2-290-286	286		grainstone					minor	flecks			wet		
	DEP2-290-286	287		grainstone					minor	flecks			wet		
	DEP2-290-286	288		grainstone					minor	flecks			wet		
	DEP2-290-286	289		grainstone					minor	flecks			wet		
7	DEP2-294-290	290		friable grainstone		varied grain size; few 6" zones of ps							wet		
	DEP2-294-290	291		friable grainstone		varied grain size; few 6" zones of ps							wet		
	DEP2-294-290	292		friable grainstone		varied grain size; few 6" zones of ps							wet		
	DEP2-294-290	293		friable grainstone		varied grain size; few 6" zones of ps							wet		
6	DEP2-298-294	294		friable packstone		increasing % carb sand upwards							wet	not pristine - drilled twice	
	DEP2-298-294	295		friable packstone		increasing % carb sand upwards							wet	not pristine - drilled twice	
	DEP2-298-294	296		very friable grainstone					minor	flecks throughout			wet	not pristine - drilled twice	
	DEP2-298-294	297		friable packstone									wet	not pristine - drilled twice	
5	DEP2-302-298	298		grainstone	coarse-grained								wet	not pristine - drilled twice	

	DEP2-302-298	299		grainstone	coarse-grained									wet	not pristine - drilled twice	
	DEP2-302-298	300		friable packstone	fine-grained	minor quartz sand								wet	not pristine - drilled twice	
	DEP2-302-298	301		grainstone	coarse-grained									wet	not pristine - drilled twice	
4	DEP2-306-302	302		grainstone	fine-grained				minor	flecks				wet		
	DEP2-306-302	303		grainstone	fine-grained				minor	flecks				wet		
	DEP2-306-302	304		grainstone	fine-grained				minor	flecks				wet		
	DEP2-306-302	305		grainstone	better cemented				minor	flecks				wet		
3	DEP2-310-306	306		friable grainstone	fine-grained				very minor					wet		
	DEP2-310-306	307		friable grainstone	fine-grained				very minor					wet		
	DEP2-310-306	308		friable grainstone	coarse-grained				very minor					wet		
	DEP2-310-306	309		friable grainstone	fine-grained				very minor					wet		
2	DEP2-315-310	310		grainstone, maybe packstone					very minor					wet		
	DEP2-315-310	311		grainstone, maybe packstone					very minor					wet		
	DEP2-315-310	312		grainstone, maybe packstone					very minor					wet		
	DEP2-315-310	313		grainstone, maybe packstone					very minor					wet		
	DEP2-315-310	314		grainstone, maybe packstone					very minor					wet		
1	DEP2-320-315	315		grainstone					minor					wet		
	DEP2-320-315	316		grainstone					minor					wet		
	DEP2-320-315	317		grainstone					minor					wet		
	DEP2-320-315	318		grainstone					minor					wet		
	DEP2-320-315	319		grainstone					minor					wet		
		320														

Appendix: Core Chemistry DEP-1

Sample ID	Sample Interval	Sample Depth (ft)	Al ICP* mg/kg	Si ICP mg/kg	Fe ICP mg/kg	Mg ICP mg/kg	Ca ICP mg/kg	P ICP mg/kg	Sr ICP mg/kg	S ICP mg/kg	Mo ICP mg/kg	As AFS* mg/kg	Sb AFS mg/kg	Stratigraphy
DEP-1-136-132	136-132	134	575	357	337	4482	402709	85	1516	959	43	2.0	3.14	Hawthorn
DEP-1-141-136	141-136	138	489	316	1102	3276	317728	113	664	732	53	7.7	9.50	
DEP-1-144-141	144-141	142	173	294	1960	1620	119487	3215	304	764	53	10.5	0.81	
DEP-1-149-144	149-144	146	-14	174	151	2202	413831	73	919	1147	81	2.1	9.54	
DEP-1-152-149	152-149	150	1235	1028	467	1423	215257	775	423	1540	880	11.1	5.23	
DEP-1-156-152	156-152	154	168	434	225	1319	316397	63	478	728	158	31.0	9.32	
DEP-1-160-156	160-156	158	297	402	160	1280	300095	63	356	277	5	1.6	0.06	
DEP-1-164-160	164-160	162	574	507	316	1876	302281	109	408	359	15	3.2	0.13	
DEP-1-168-164	168-164	166	618	501	263	1664	259601	1199	377	401	5	1.5	0.06	
DEP-1-172-168	172-168	170	408	464	976	1220	255371	802	302	1310	30	4.7	0.34	
DEP-1-176-172	176-172	174	616	500	390	1601	213118	1502	427	428	1	1.2	0.05	
DEP-1-180-176	180-176	178	7040	1052	6580	9405	227519	4709	617	3798	<0.5	14.1	0.23	
DEP-1-184-180	184-180	182	7490	841	10000	8285	46863	3967	176	7339	<0.5	25.3	0.20	
DEP-1-187-184	187-184	185	6940	886	7545	7695	23284	3903	156	5705	<0.5	3.9	0.12	
DEP-1-190-187	190-187	188	5460	759	42210	6185	118489	3069	238	44609	<0.5	101.9	0.33	
DEP-1-193-190	193-190	191	7345	836	7660	6900	172719	5140	498	4813	<0.5	18.2	8.22	
DEP-1-196-193	196-193	194	2236	848	2511	3956	281702	217	508	2580	<0.5	7.3	0.32	Tampa
DEP-1-199-196	199-196	197	3274	834	1517	6505	289829	132	845	972	<0.5	2.1	0.09	
DEP-1-205-199	205-199	202	1982	723	1047	7285	290922	69	639	915	16	2.1	0.05	
DEP-1-209-205	209-205	207	1002	933	1143	7325	282129	47	1025	719	<0.5	0.4	0.03	
DEP-1-213-209	213-209	211	4038	955	4573	26055	264306	94	827	4605	56	22.7	1.06	
DEP-1-216-213	216-213	214	409	548	730	3460	295437	24	716	551	4	1.9	3.84	
DEP-1-222-216	222-216	219	239	420	304	2292	405086	26	902	310	15	1.9	0.23	
DEP-1-228-222	228-222	225	283	386	588	2121	398479	39	592	679	8	3.1	0.21	
DEP-1-232-228	232-228	230	886	736	688	3123	377804	223	1253	1086	51	10.7	1.40	Suwannee
DEP-1-236-232	236-232	234	45	239	155	2853	409886	34	768	407	1	0.6	0.07	
DEP-1-236-232SP	236-232	235	41	190	223	2668	391207	36	775	510	1	0.9	8.59	
DEP-1-238-236	238-236	237	133	378	143	2555	417490	30	704	440	2	0.8	0.08	
DEP-1-244-238	244-238	241	103	318	173	2422	377567	43	660	419	<0.5	0.4	0.03	
DEP-1-248-244	248-244	246	647	630	974	2380	338118	34	626	1330	8	5.6	6.27	
DEP-1-253-248	253-248	250	33	199	159	2807	414211	41	807	357	5	0.9	0.09	
DEP-1-256-253	256-253	254	10	149	137	2687	397291	42	651	310	5	0.8	0.08	
DEP-1-261-256	261-256	258	33	187	173	2357	401521	51	523	536	8	1.2	0.20	
DEP-1-266-261	266-261	263	-2	123	128	2316	400713	54	500	510	4	1.9	5.26	
DEP-1-271-266	271-266	268	-10	119	130	2686	419534	41	474	363	2	0.3	0.01	
DEP-1-276-271	276-271	273	2	42	114	2199	394011	63	528	449	1	0.6	0.02	
DEP-1-280-276	280-276	278	58	130	200	2494	413165	70	581	328	3	1.9	2.60	
DEP-1-284-280	284-280	282	9	134	116	1954	386312	102	574	226	<0.5	0.3	0.01	
DEP-1-288-284	288-284	286	10	156	113	2095	383935	91	488	263	1	0.3	9.42	
DEP-1-292-288	292-288	290	-5	124	117	2136	376046	90	583	233	1	0.5	0.04	
DEP-1-296-292	296-292	294	13	123	158	2194	407985	100	620	221	<0.5	0.3	0.03	
DEP-1-297-296	297-296	296	-10	107	154	2292	414163	116	674	276	<0.5	0.5	0.01	
DEP-1-300-297	300-297	298	5	148	180	2139	396055	197	636	267	2	2.1	3.12	
DEP-1-303-300	303-300	301	116	307	277	2732	419677	116	628	356	1	2.1	2.49	
DEP-1-308-303	308-303	305	121	355	180	2682	405513	125	534	273	1	0.5	0.07	
DEP-1-312-308	312-308	310	62	253	188	2735	404943	181	572	286	1	0.9	0.13	
DEP-1-316-312	316-312	314	48	208	1154	2377	370913	155	568	1358	<0.5	7.1	0.18	
DEP-1-321-316	321-316	318	49	246	405	2389	368203	150	654	529	3	3.1	0.18	
DEP-1-321-316SP	321-316	319	46	206	421	2525	366920	150	629	537	4	3.2	8.45	
DEP-1-326-321	326-321	323	100	306	545	2147	383650	107	617	619	3	2.9	0.06	
DEP-1-332-326	332-326	329	42	215	322	2659	402899	119	526	454	3	1.0	7.53	
DEP-1-336-332	336-332	334	185	220	406	2696	391160	202	525	510	2	1.2	0.05	
DEP-1-339-336	339-336	337	111	204	391	2321	402139	83	557	346	4	1.6	0.06	
DEP-1-343-339	343-339	341	-38	47	199	2676	402662	68	627	351	1	1.0	0.04	
DEP-1-346-343	346-343	344	-31	66	263	2508	422861	75	866	341	3	1.3	0.07	
DEP-1-351-346	351-346	348	-17	96	260	2524	422766	104	528	295	<0.5	1.1	0.06	

Note: * ICP indicates elements analyzed by inductively coupled plasma-optical emission spectrometry and AFS indicates elements determined by atomic fluorescence spectrometry, yellow highlighted cell indicate the four depth intervalls which are monitored

Appendix: Core Chemistry DEP-2

Sample ID	Sample Interval	Sample Depth (ft)	Al	Si	Fe	Mg	Ca	P	Sr	S	Mo	As	Sb	Stratigraphy
			ICP* mg/kg	ICP mg/kg	ICP mg/kg	ICP mg/kg	ICP mg/kg	ICP mg/kg	ICP mg/kg	ICP mg/kg	ICP mg/kg	AFS* mg/kg	AFS mg/kg	
DEP-2-16-6	16-6	11	4906	331	1131	-384	3554	2878	126	104	<0.5	0.7	0.03	Surficial
DEP-2-19-16	19-16	17	9965	766	973	1726	18902	13105	644	155	<0.5	0.5	0.07	
DEP-2-22-19	22-19	20	7390	4680	5370	693	195817	70600	788	2281	<0.5	6.2	0.83	
DEP-2-26-22	26-22	24	7590	3125	4803	3054	140589	51000	319	1376	<0.5	10.6	0.90	
DEP-2-29-26	29-26	27	4711	1770	7450	63500	196530	29810	425	1579	7	25.3	0.93	
DEP-2-32-29	32-29	30	3653	1570	5115	71100	190779	23520	357	1235	15	18.8	0.66	
DEP-2-35-32	35-32	33	9030	1468	12410	62450	161407	22775	330	1069	16	47.5	2.06	
DEP-2-39-35	39-35	37	3239	1247	4241	68650	150285	9040	198	554	19	12.7	0.50	
DEP-2-43-39	43-39	41	2607	1537	4179	87950	193584	8840	273	1413	6	7.9	0.41	
DEP-2-46-43	46-43	44	4627	1458	4828	78550	167823	12340	261	3373	9	10.1	0.43	
DEP-2-47-46	47-46	46	6970	1290	6490	45050	123574	19815	319	4006	6	9.6	0.36	
DEP-2-50-47	50-47	48	2510	891	2555	96150	187643	3621	214	1722	6	3.2	0.20	
DEP-2-53-50	53-50	51	6145	1339	3597	21605	65637	17380	225	2953	2	5.0	0.35	
DEP-2-56-53	56-53	54	7165	1317	3780	27570	89924	17755	263	2854	2	5.3	0.82	
DEP-2-60-57	60-57	58	5360	1655	5535	73200	212405	32360	469	6100	63	25.5	1.61	Hawthorn
DEP-2-63-60	63-60	61	2280	1363	1865	108450	210171	8045	200	1520	7	4.2	0.29	
DEP-2-66-63	66-63	64	4662	1097	2520	85700	205656	24845	376	2413	4	5.0	0.19	
DEP-2-67-66	67-66	66	3988	1641	2952	99050	210551	15560	294	2297	6	7.7	0.35	
DEP-2-70-67	70-67	68	3118	1408	2237	88750	235504	25275	442	2406	8	6.1	0.55	
DEP-2-73-70	73-70	71	2735	1413	1982	98050	226854	18415	352	2296	33	7.9	0.87	
DEP-2-76-73	76-73	74	2843	1172	1525	98850	209553	9745	269	1617	13	5.2	0.57	
DEP-2-80-76	80-76	78	3443	1410	2448	92700	200856	15265	303	1523	5	5.1	0.73	
DEP-2-84-80	84-80	82	2638	1325	2258	94200	189544	9595	215	1304	3	3.1	0.29	
DEP-2-88-84	88-84	86	3376	1192	2003	83550	164591	7630	172	913	<0.5	2.2	0.20	
DEP-2-92-88	92-88	90	2533	909	1453	85550	173432	7235	170	1065	7	4.5	0.36	
DEP-2-96-92	96-92	94	2132	1216	1873	4275	182510	4144	93	1689	11	9.1	1.03	
DEP-2-97-96SP	97-96	95	1864	578	910	4198	327804	1246	320	699	4	10.6	1.55	
DEP-2-97-96	97-96	96	2354	1321	1009	3315	146483	1193	102	674	21	4.7	0.63	
DEP-2-101-97	101-97	99	1884	228	952	3556	312120	760	353	690	3	4.1	0.31	
DEP-2-105-101	105-101	103	794	837	387	3201	271483	931	323	463	48	7.0	0.85	
DEP-2-108-105	108-105	106	724	794	305	1662	192205	649	240	307	25	4.8	0.50	
DEP-2-112-108	112-108	110	1624	289	527	2567	329468	991	314	607	42	6.7	0.92	
DEP-2-116-112	116-112	114	2154	129	608	3218	279563	611	490	451	7	2.0	0.09	
DEP-2-118-116	118-116	117	832	579	315	2777	303755	550	811	491	5	1.5	0.06	
DEP-2-125-118	125-118	121	970	165	268	2979	349002	289	612	444	3	1.3	0.06	
DEP-2-129-125	129-125	127	801	241	429	2492	364829	358	739	820	<0.5	1.1	0.01	
DEP-2-132-129	132-129	130	899	434	1018	4801	379800	87	1086	836	1	1.9	0.05	
DEP-2-136-132	136-132	134	292	152	135	3846	401141	79	1371	838	0	1.0	0.00	
DEP-2-137-136	137-136	136	4564	189	2391	12280	251141	317	1167	1128	123	25.0	1.65	
DEP-2-142-137	142-137	139	158	81	155	898	223241	252	529	513	0	1.0	0.01	
DEP-2-146-142	146-142	144	391	567	1161	2323	226378	1249	533	525	3	1.9	0.04	
DEP-2-148-146	148-146	147	55	600	5825	686	100285	65	249	393	11	2.5	0.14	
DEP-2-152-148	152-148	150	98	565	2368	2620	325048	90	909	917	6	2.7	0.10	
DEP-2-152-148SP	152-148	151	267	603	4931	2403	254515	92	684	670	7	3.2	0.04	
DEP-2-156-152	156-152	154	384	232	325	4072	418061	63	1276	907	10	3.8	0.05	
DEP-2-161-156	161-156	158	-1	172	113	1214	392871	25	795	1041	6	5.9	0.06	
DEP-2-165-161	165-161	163	856	154	436	713	40504	14	53	433	2	1.2	0.03	
DEP-2-169-165	169-165	167	1022	386	363	1384	176996	51	296	669	1	0.8	0.02	
DEP-2-172-169	172-169	170	313	729	304	959	243061	50	387	789	1	0.8	0.01	
DEP-2-176-172	176-172	174	320	282	214	1072	224572	52	496	470	1	1.2	0.05	
DEP-2-179-176	179-176	177	1313	365	489	3470	276046	1298	927	431	<0.5	0.9	0.02	
DEP-2-183-179	183-179	181	1521	349	577	3694	256179	466	614	357	<0.5	0.9	0.01	
DEP-2-186-183	186-183	184	1683	286	677	3378	229468	825	618	358	<0.5	0.6	0.02	
DEP-2-188-186	188-186	187	988	120	892	1745	213783	388	283	963	4	4.8	0.21	
DEP-2-193-188	193-188	190	990	426	447	1960	243489	2608	637	651	3	3.4	0.13	
DEP-2-196-193	196-193	194	674	149	451	1630	256654	1271	359	751	3	3.8	0.22	
DEP-2-199-196	199-196	197	2322	1196	2523	5520	234743	2331	415	2123	5	8.4	0.17	
DEP-2-203-199	203-199	201	13640	325	14935	13345	168631	6135	429	9970	<0.5	24.2	0.58	
DEP-2-206-203	206-203	204	14680	723	20115	14070	30770	5235	197	14791	<0.5	32.7	0.67	
DEP-2-207-206	207-206	206	12430	368	16670	12135	30917	5445	213	10978	<0.5	36.8	0.62	Tampa
DEP-2-211-207	211-207	209	647	526	1561	4435	209553	24	452	1159	1	6.7	0.13	
DEP-2-215-211	215-211	213	3402	575	3511	4925	320010	1299	662	2550	<0.5	10.4	0.30	
DEP-2-215-211	215-211	214	89	158	186	3366	400523	30	1223	624	<0.5	1.5	0.01	
DEP-2-219-215	219-215	217	399	186	579	4337	365589	27	1036	514	0	2.0	0.09	
DEP-2-222-219	222-219	220	1097	440	1008	2699	362262	38	702	1295	30	11.2	1.19	
DEP-2-226-222	226-222	224	1325	1348	1906	3991	299762	308	532	2280	10	8.5	0.52	
DEP-2-231-226	231-226	228	181	283	194	2529	391778	33	613	364	0	0.7	0.02	
DEP-2-236-231	236-231	233	279	234	371	1791	386074	15	515	576	1	6.4	0.44	Suwannee
DEP-2-241-236	241-236	238	2	160	139	2251	406749	24	564	329	0	0.5	0.07	
DEP-2-246-241	246-241	243	145	335	512	1421	395247	88	453	558	1	1.7	0.14	
DEP-2-249-246	249-246	247	43	188	121	2601	407082	37	490	311	1	0.5	0.06	
DEP-2-253-249	253-249	251	610	299	313	2302	380323	55	478	473	1	3.5	0.12	
DEP-2-257-253	257-253	255	-25	93	162	2432	406084	27	549	315	1	0.4	0.04	
DEP-2-262-257	262-257	259	-10	130	146	2293	414734	61	502	233	<0.5	0.3	0.01	
DEP-2-266-262	266-262	264	1	135	143	2406	400238	63	469	253	<0.5	0.1	0.02	
DEP-2-269-266	269-266	267	44	208	129	3839	407985	119	492	367	1	0.4	0.02	
DEP-2-274-269	274-269	271	25	176	122	3931	394297	161	467	444	0	0.7	0.03	
DEP-2-278-274	278-274	276	62	196	144	4185	396625	148	562	428	0	0.8	0.04	
DEP-2-282-278	282-278	280	26	170	220	3001	397576	206	448	345	<0.5	0.4	0.01	
DEP-2-286-282	286-282	284	80	222	881	2877	396958	119	713	987	3	6.1	0.11	
DEP-2-290-286	290-286	288	102	195	189	4591	395675	144	519	514	<0.5	0.6	0.04	
DEP-2-294-290	294-290	292	93	224	163	4595	380941	162	496	504	0	0.4	0.05	
DEP-2-298-294	298-294	296	81	209	181	4210	364496	201	469	527	0	0.8	0.09	
DEP-2-302-298	302-298	300	100	173	399	4396	368346	330	537	793	4	2.9	0.23	
DEP-2-306-302	306-302	304	384	230	695	4299	362548	212	608	1003	6	3.0	0.17	
DEP-2-310-306	310-306	308	111	201	388	4348	379515	136	576	797	3	2.7	0.16	
DEP-2-315-310	315-310	312	105	207	418	4295	382890	114	565	843	3	2.6	0.19	
DEP-2-320-315	320-315	317	90	174	273	4567	375285	131	533	685	2	1.5	0.16	

Note: * ICP indicates elements analyzed by inductively coupled plasma-optical emission spectrometry and AFS indicates elements determined by atomic fluorescence spectrometry, yellow highlighted cell indicate the four depth intervalls which are monitored

Appendix: Core Chemistry DEP-5

Sample ID	Al ICP mg/kg	Si ICP mg/kg	Fe ICP mg/kg	Mg ICP mg/kg	Ca ICP mg/kg	P ICP mg/kg	Sr ICP mg/kg	S ICP mg/kg	Mo ICP mg/kg	As ICP mg/kg	As AFS mg/kg
84-80	4317	394	2953	95250	204950	13120	297	1653	-1	-2	1,52
87-84	10910	946	9475	30520	156200	53900	651	5210	-4	-10	4,43
88-87	5915	580	3473	60650	164700	22995	366	1956	-2	-3	1,38
92-88	3987	777	2157	45365	131450	18930	262	1833	3	-1	2,17
95-92	2687	310	4100	2171	13685	2878	65	3781	-2	-3	1,79
97-95	2242	313	573	2327	83000	1964	96	367	-1	-1	0,60
98-97	3307	529	3268	2639	18415	5870	99	3210	-2	-4	1,50
105-98A	2713	467	2308	2573	20730	3673	93	2321	22	14	7,32
109-105	1936	482	1803	2329	143100	3030	123	1205	6	1	1,73
111-109	2612	478	3080	2135	42360	5935	106	3178	3	2	4,27
114-111	7655	501	3431	6715	41350	14395	191	1411	0	-6	3,60
117-114	2861	246	1220	4953	224250	1244	466	817	9	17	9,17
121-117	1642	205	459	2907	188650	1067	372	408	5	2	1,04
124-121	1967	267	659	4536	321500	1567	926	532	4	2	1,37
127-124	1213	171	479	4076	357550	606	975	602	4	3	1,05
129-127	2130	169	749	5645	296400	316	677	475	5	0	0,90
132-129	2397	181	722	6030	254150	354	796	435	6	2	1,43
135-132	629	131	197	2619	309000	377	859	461	5	4	0,51
137-135	1206	81	386	3824	254250	552	610	490	6	2	0,91
141-137	1117	140	306	3475	273100	702	384	520	10	5	1,08
144-141A	1374	158	417	3923	320900	450	455	617	7	3	1,03
147-144	976	188	591	3103	318550	680	548	958	44	16	5,38
150-147	539	48	387	4496	284850	146	895	667	7	4	2,25
154-150	716	76	355	5580	293850	88	794	901	31	15	6,74
157	-1	-36	150	3174	410150	56	1195	944	-1	5	0,89
157-154	97	14	334	2213	325550	53	1035	637	2	4	0,84
162-157A	4624	364	5490	20205	196050	238	835	5490	225	77	41,29
167-162	1933	151	2328	10280	304600	130	994	2549	32	22	12,62
171-167	-28	190	370	1683	282500	26	946	449	1	4	0,91
177-174	132	207	1298	256	65700	88	264	384	3	3	0,77
180-177	84	-5	167	4208	388250	103	1707	770	2	7	1,25
185-180	1964	675	817	8795	143200	152	768	1027	94	10	5,81
188-185	200	76	161	4246	372900	89	1405	1661	4	5	1,86
191-188	639	46	243	1219	182550	51	294	539	3	3	0,97
194-191	356	270	146	3001	339200	388	585	508	0	3	0,44
197-194	268	212	147	2068	369500	100	554	739	6	3	0,92
199-197	377	146	211	2258	323500	132	486	412	4	5	0,35
202-199A	482	148	315	2486	327850	130	497	502	3	4	0,49
205-202	642	192	382	3430	340100	152	572	957	2	1	0,83
208-205	1567	159	720	6025	150150	831	423	547	4	-1	0,74
211-208A	415	71	242	2045	328350	377	438	738	2	4	0,56
214-211	1048	85	456	2469	210250	1438	329	563	4	2	0,78
219-217	865	185	342	3270	159000	1952	237	400	2	3	0,70
221-219 A	10455	383	10970	11650	113400	7085	271	7950	3	1	13,32
221-219 B	2544	285	2058	4025	149200	1379	298	800	4	-1	12,69
224-221	8910	411	70100	10185	42605	5555	216	80950	-56	-4	56,24
227-224A	10035	297	17200	10040	53650	6730	236	15235	20	37	33,85
231-227	1668	220	2179	1158	85350	2252	405	717	1	-4	1,10
234-231A	363	156	1123	2269	390600	58	708	1493	-1	8	3,40
237-234	368	226	328	2725	396600	53	1015	756	8	7	2,85
241-237	3234	278	820	5445	290650	31	563	880	111	19	11,58
244-241	947	429	319	1577	294200	23	296	429	32	18	8,06
247-244	3899	329	14255	3886	40375	11	114	15175	224	31	24,41
251-247	666	311	202	2405	375900	28	490	319	2	4	1,16
255-251	54	-44	260	2665	410100	34	506	543	3	2	0,08
259-255	296	299	146	1918	389450	56	325	250	-1	2	0,28
263-259A	-29	-119	101	3245	433950	18	523	270	5	3	0,08
269-263	79	139	150	2220	419700	27	471	318	-1	5	0,25
270-267	-27	-122	67	2004	406150	39	440	325	0	4	0,12
275-270	-32	-119	100	2118	418500	39	393	307	1	5	0,12
278-275	-35	-131	90	2363	417750	39	467	489	-1	4	0,13
281-278	17	-68	103	2622	415150	46	437	298	-1	3	0,14
284-281	2	-97	66	2206	408300	83	405	312	-1	1	0,09
287-284	-12	-96	100	2111	413950	75	410	252	-1	2	0,09
289-287	19	-44	118	2364	410350	105	403	278	1	2	0,12
291-289	14	-41	87	2451	397800	91	406	286	0	2	0,14
295-291	25	-60	242	2789	414950	105	404	465	7	5	0,32
299-295	4	-91	124	2369	407150	159	409	297	-1	3	0,21
303-299	41	-24	124	2336	421950	106	464	292	0	3	0,13
307-303	7	-47	202	2493	430500	122	530	347	0	4	0,28
309-307	37	-47	303	2493	404550	186	496	363	-1	3	3,66
312-309	23	-14	352	2378	400100	461	531	378	5	6	0,75
315-312	63	44	272	2669	415700	110	522	312	0	4	0,28
317-315	82	108	215	2427	393800	134	413	357	-1	5	0,42
320-317	79	123	455	3156	369250	165	408	731	-1	3	0,70