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Miscellenous Chemical Basin Expedited Site Characterization Report (U)

by

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MASTER

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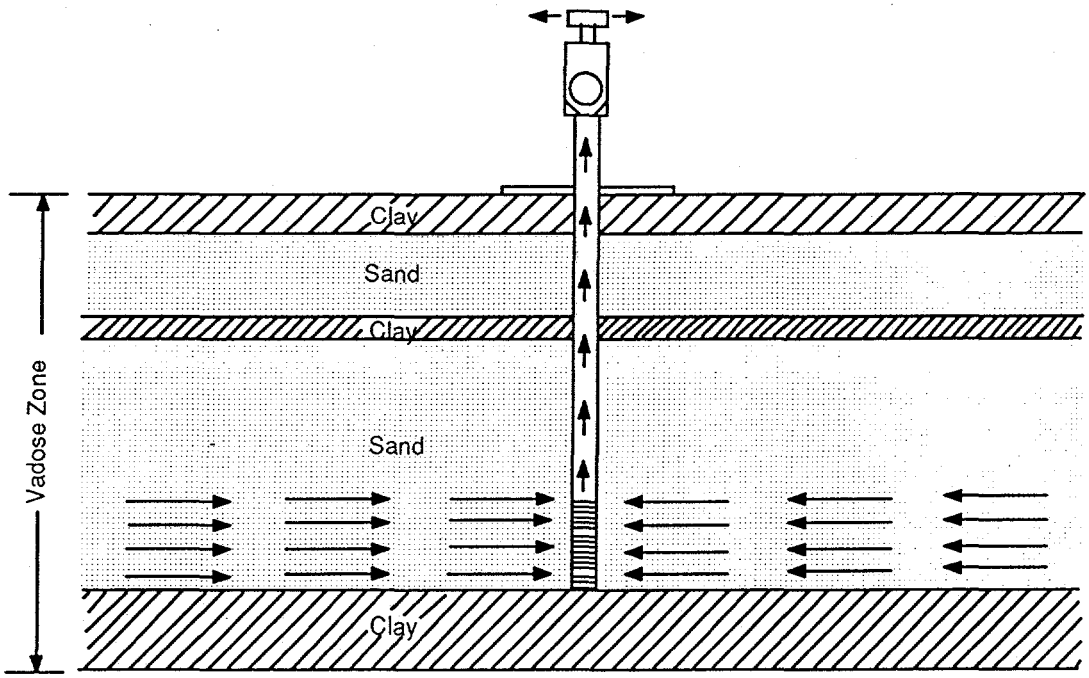

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Miscellaneous Chemical Basin Expedited Site Characterization Report

Introduction

A total of twenty nine cone penetrometer test (CPT) pushes in three weeks were conducted for vadose zone characterization of the Miscellaneous Chemical Basin (MCB) waste unit at the Savannah River Site. The shallow, unlined basin received liquid chemical wastes over an 18 year period beginning in 1956. This characterization was initiated to determine the vertical and lateral extent of contamination in the vadose zone and to install vadose zone wells for remediation by barometric pumping or active vapor extraction to help prevent further contamination of groundwater. The CPT locations within the waste site were selected based on results from previous shallow soil gas surveys, groundwater contamination data, and the suspected basin center.

Geophysical data and soil gas samples were collected at twenty five locations and twenty five vadose zone wells were installed. The wells were screened to target the clay zones and areas of higher soil gas concentrations. The well construction diagrams are provided in Appendix B. Baro-Ball™ valves for enhanced barometric pumping were installed on each well upon completion to immediately begin the remediation treatability study at the site.

Continuous core in 2 ft sections was collected at MCB-CPT-S1 with the CPT truck to a depth of 82 feet for head space analysis of VOC contaminants. Soil samples targeting the fine grained sediments were collected at four other locations and analyzed. In the vadose zone, the coarse grained sediments generally contain far less contaminants than the fine grained sediments because of capillary retention of the liquid contaminants. The well and soil boring locations are shown on Figure 1.

Soil gas samples were collected during the CPT geophysical characterization pushes using the Cone-Sipper™. Sample depths were selected in the permeable zones adjacent to fine grain zones. A soil gas plume center was defined with the highest soil gas concentrations located within 20 feet of the surface. Soil sediment contaminants were mainly located within the fine grained sediments. Two relatively continuous fine grained layers in the vadose zone are located at approximately 0-15 ft (330 ft msl) and 75-85 ft (260 ft msl) below ground surface. The layers range in thickness from 5 to 15 ft and have multiple clay laminates and interbedded sand and clay based on CPT logs and preliminary core inspections.

A brief discussion of the sampling, analysis, and construction methods is provided below, followed by a discussion of the results, conclusions, and recommendations.

Background

The Miscellaneous Chemical Basin waste unit is located in the northwest portion of SRS, approximately 1.5 miles south of the 3/700 Area operations and 3 miles east of the SRS boundary. The basin received liquid chemical wastes over an 18 year period and was located in a shallow borrow pit covering a small portion of the waste site. Little information is available on the origin, original purpose, or historical operations of the basin. It is thought to have received liquid wastes from the 3/700 Area operations, consisting of waste solvent and used oil. It is also believed that partially full drums were emptied at this site.

The exact boundaries of the basin have not been determined, however, the location has been estimated based on site photographs. The MCB was approximately 20 by 20 feet in length and width, and approximately 1 foot deep. Photographs indicate that the basin was in use from about 1956 to 1974. In 1974 the basin was regraded and the original near-surface basin sediments were distributed in a field at the site with approximate dimensions of 350 by 350 feet. The site is currently covered by weeds, grasses and small pine trees. The surface of the waste unit exhibits a slight slope of approximately 3 percent to the east-southeast

Previous screening activities conducted at the MCB include soil gas surveys, soil confirmation sampling, and groundwater monitoring. Two phases of shallow soil vapor sampling were conducted in 1986; sampling results indicate the presence of trichloroethylene (TCE) and perchloroethylene (PCE) in concentrations up to 5,520 ppb and 44,800 ppb, respectively at a depth of 1.5 to 2 feet below surface. Trichloromethane and cis-1,2 dichloroethylene (cis-1,2 DCE) were also detected at concentrations up to 18.2 ppb and 295 ppb, respectively. The highest concentrations were detected north of the basin and contaminant migration appeared to be in a north-northeasterly direction. In 1987 and 1989, soil samples collected from soil borings, monitoring wells, and test pits were analyzed and found to contain VOCs (e.g. TCE, PCE, chlorobenzene, chloroform, and trans-1,2-DCE) from just below surface (0-2 feet) to depths of approximately 225 feet. However, the highest concentrations appear to occur within the upper 120 feet (vadose zone). Inorganics (e.g. metals such as aluminum, lithium and lead) have also been detected at levels in excess of drinking water standards. Analysis of the groundwater since 1985 show TCE and PCE levels in excess of the EPA Maximum Contaminant Levels (MCLs) for drinking water standards in 9 of the 13 monitoring wells which surround the basin. Depth to the water table in the vicinity of the MCB is approximately 120 feet below surface; therefore removal of the VOCs within the vadose zone is considered a priority.

Methods

CPT Technology Description

The cone penetrometer test (CPT) is a proven method for rapidly providing depth-discrete soil classification based on the ratio of sleeve friction to tip resistance measurements. This technique has been successfully applied at SRS and has provided detailed information on the

distribution and nature of the sediments in the subsurface during several hundred pushes across the site. The CPT is conducted continuously from the surface to the desired depth or until further penetration is impossible and is capable of defining lithology with a resolution on the order of 2 cm. This detail is generally not possible using standard drilling techniques.

The CPT data collected were tip pressure, sleeve resistance, pore pressure, and electrical resistivity. The ratio of the sleeve resistance to tip pressure provides the friction ratio where a higher ratio indicates finer grained sediments. The ratio was used to define the sandy and clayey layers during each push. Soil gas samples were collected in the sand layers close to sand and clay layer interfaces. The ratio was also used to target the sediment sampling in the fine grained sediments. CPT refusal (the point where the force of the truck can no longer advance the push rods) occurred between approximately 80 and 110 ft below surface.

Soil gas samples and CPT data were collected during the same push using the Cone-Sipper™ designed and developed by SRTC (Savannah River Technical Center) and ARA (Applied Research Associates). The gas lift pump lines in the Cone-Sipper™ were used for soil gas collection in the unsaturated zone.

Soil Gas Sampling and Analysis Methods

Soil gas samples were collected in 1 liter Tedlar bags. These bags have both a stainless steel valve and a septum port. The bags were purged with nitrogen, evacuated, and filled with soil gas from the Cone-Sipper™. A Teflon diaphragm pump was used to bring the soil gas to the surface for field validation and collection. A Bruel & Kjaer (B&K) Model 1302 gas monitor was used to measure the soil gas for TCE, PCE, and CO_2 before sample collection. At least 10 volumes were purged through the sampling system to clean the lines between sampling depths. This validation step helps to insure a representative soil gas sample is collected by allowing contaminant concentrations to reach a steady state and by using CO_2 as an indicator of soil gas. This method reduces the problem of inaccurate soil gas measurements due to leaking sample lines and non-steady-state values. Soil gas CO_2 levels are orders of magnitude higher than ambient CO_2 levels and are strongly correlated to contaminant concentrations since the CO_2 is produced by biological oxidation of carbon (contaminants).

Once the samples were validated with the B&K, the sample bags were purged with soil gas three times, filled with approximately one liter of gas, and taken to the field lab trailer at the Integrated Demonstration Site for analysis. The samples were stored at constant temperature and analyzed within 4 hours of sampling to avoid sample loss or degradation. Each sample was analyzed on the HP 5890 Series or the SRI 8610 gas chromatograph (GC) using a 300 µL direct injection. The gas chromatograph was calibrated using certified gas standards containing the compounds of interest (Cis-DCE, CCL_4, Freon-11, $CHCl_3$, Freon-113, Freon-12, PCE, TCA, TCE, and Vinyl Chloride). The soil gas concentration results from the GC and B&K are listed in Table 1.

Sediment Sampling and Analysis Methods

One continuous core in 2 foot sections was collected from MCB-CPT-S1 (well location MCB-CPT-4) to a depth of 82 feet using the CPT truck. This location corresponds to the

highest soil gas concentrations found during the current CPT soil gas characterization. Four other locations were sampled at various depths based on results from the soil gas sampling and the fine grained sediment layers indicated by the CPT logs. At each soil sampling depth, a core sample of approximately 1" in diameter and 24" long was collected by the cone penetrometer truck using a MOSTAP® soil sampler. Once the sample was brought to the surface, a 2cc plug sample was collected using a modified plastic syringe. The plug was transferred to a 22 ml vial containing 5 ml of nano-pure water and the vial was sealed with a crimped septum top for later head space analysis. Duplicate samples were collected at each depth and all samples were stored at 4°C until analysis.

Each sample was weighed and then analyzed on the HP 5890 Series gas chromatograph using an automated head space sampler for equilivent water concentrations. Mass soil concentrations (ppb, µg/kg) were calculated based on an equal head space volume from 7 ml of water standards and 7 ml of water/soil matrix and were corrected for the mass difference between the soil and water. The gas chromatograph was calibrated using stock solutions of neat (pure) solvents diluted to specific concentrations. The standard concentrations used for each head space sample run were 3, 5, 10, 50, 100, 500, 1,000, and 10,000 ppb (µg/ml). The samples were analyzed for Vinyl Chloride, Freon-11, Freon-113, 1,1-DCE, Trans-DCE, Cis-DCE, $CHCl_3$, TCA, CCl_4, TCE, and PCE. The record of the brand name and lot number of the standards were logged in the GC log book along with the amount used, date and person making the stock solutions. The soil concentration results are listed in Table 2.

Soil samples were also collected at 27 locations to determine soil moisture content. Approximately 4 cc of soil were place in pre-weighed 40 ml vials and sealed. The vials were weighed at the end of each sampling day and the wet soil weight was recorded. The samples were then dried for 24 hours at 60 C and then weighed for dry soil content. Moisture content is expressed as a percentage of water by weight in the soil sample. Duplicates were collected for 12 samples to verify the accuracy of the sampling and laboratory methods. Soil moisture contents are reported in Table 3.

Well Installation Method

Vadose zone wells were installed in the same push hole from the CPT geophysical and soil gas pushes. The wells were installed by threading a steel push tip onto the PVC screen and pushing the tip with the steel CPT rods in the center of the PVC, effectively pulling the PVC well down with the push tip. The steel push tip remained in the ground.

The wells were installed so the formation was compressed against the outer surface of the casing and screen, leaving no annular space. The potential for vertical migration is minimal because the well material provides no capillary channels to transport liquids. The compression of the formation against the walls of the well does not allow gravity flow along the casing in contrast with the flow processes occurring in the natural materials of the formation. All vadose zone wells were installed to a depth which did not breach the water table; the maximum termination depth of the vadose zone wells was greater than 10 feet above the water table. Concrete pads were installed around the wells at the surface to prevent contamination by spills at the surface.

Results and Discussion

Geology

The Savannah River Site is underlain by a thick wedge (approximately 300 m) of unconsolidated Tertiary and Cretaceous sediments consisting primarily of sands, clayey sands, and sandy clays. Two significant clayey layers in the vadose zone at the Miscellaneous Chemical Basin are located at approximately 0-15 ft (330 ft msl) and 75-85 ft (260 ft msl) below ground surface. The water table at the site is at approximately 120 ft (220 ft msl) below the ground surface.

The CPT friction ratio logs indicate a significant fine grained sediment layer 10 to 15 ft thick near the surface. Below this layer is a course grained (sandy) layer approximately 50 ft thick with a few narrow silty layers. Below the sandy layer is an interbedded clayey/silty/sandy zone ranging in thickness from 5 ft on the northwest to 15 ft on the southeast of the investigated area. The sediment layering dips to the southeast and tends to follow the surface contour.

Sections displaying the friction ratio logs of 12 CPT pushes with one line running approximately east-west and one line running approximately north-south are provided in Figures 2-4.

Soil Gas Samples

A total of 128 soil gas samples were collected at varying depths at 25 locations by following the procedure described in the methods section above. Sampling depths were chosen during the CPT push by analyzing the friction ratio logs and determining permeable locations near the clayey zones. The contaminants were expected to be located in the fined grained sediments but it is difficult to obtain sufficient soil gas flows for sampling in these zones. A soil gas sample was also taken near the center of the 50 ft thick sandy zone to determine the vertical distribution of soil gas concentrations.

The results from the gas chromatograph and B&K gas analysis are presented in Table 1. Information in this table includes GC contaminant concentrations for the seven compounds found at the site, the GC used (either HP or SRI), and PCE, TCE, and CO_2 concentrations from the B&K. Only PCE and TCE were quantified using the SRI GC. Chlorinated compound contaminants other than TCE and PCE were less than 10% of the TCE and PCE concentrations. Concentrations ranged from 28.7 ppmv CCL4, 140 ppmv TCE and 99.5 ppmv PCE in the vicinity of CPT-MCB-4 to non detect levels at the outer perimeter of the basin. The center of the soil gas plume is located near CPT-MCB-4. CPT-MCB-22 was the exception with CCl_4 concentrations equal to approximately 25% of TCE and PCE.

TCE and PCE soil gas concentration profiles for each push are presented in Appendix A. These plots also include CPT friction ratio, well screen locations, and CO_2 concentrations.

Contour plots for four depth ranges are provided in Figures 5-10. The depth ranges are 10-20 ft (gas from the upper clay layer), 30 to 40 ft and 50 ft (gas in the middle sand layer), and 75-90 ft (gas from the lower clay layer). Soil gas concentrations are the highest within the upper 20 ft at the site. Concentrations are highest for TCE and the center of the plume is located around CPT-MCB-4, 13, and 22. Soil gas concentrations decrease and spread laterally with depth. The lateral soil gas migration tends toward the southeast away from CPT-MCB-4.

Well Installation

Wells were installed at the CPT location if the soil gas concentrations were greater than 10 ppmv; screen zones and lengths were chosen based on lithology and soil gas concentrations. Screen sections were either placed in higher permeable (sandy) zones near the fine sediment layers or placed across the fine sediment zones since it was expected that the contaminants were trapped in the fine sediments. Longer screened sections (or alternating 5 foot sections of screen and riser) were used where soil gas concentrations were elevated throughout the vertical extent of the push. All screens were placed below the upper-most low permeability zone (15 ft below surface) to enable effective barometric pumping. Well configurations in conjunction with friction ratio and soil gas concentrations are shown on the plots in Appendix A and the well construction diagrams are provided in Appendix B. Baro-Ball valves for enhanced barometric pumping were installed on each well upon completion to begin the remediation treatability study at the site. The target depth was not achieved for wells CPT-MCB-10 and 16 because the push tip separated from the PVC. Termination depth was within 10 ft of the projected depth for these two wells.

Sediment Samples

Five locations at the MCB were sampled for sediment analyses. Continuous 2 foot long core samples were collected at CPT-MCB-S1 to a depth of 82 ft to determine the vertical extent of the sediment contamination. This location corresponds to the highest soil gas concentrations during the current characterization effort. Well CPT-MCB-4 was installed in this borehole. The core was also inspected visually and compared to the CPT logs which provided a good correlation for lithology determination with CPT logs at the site. Sediment contaminant concentrations for CCl_4, TCE, and PCE are provided in Table 2.

CPT-MCB-S1 concentration depth profiles with friction ratio are provided in Figure 11. The concentrations shown in the figure represent the maximum VOC concentrations. Contaminants appear primarily in the two zones of fine grained sediments. The highest concentrations were measured in the lower layer (74-80 ft) which has a higher clay content than the upper zone at 15 ft. Lower concentrations of TCE were also measured in the sandy/silty layers.

Sediment VOC concentrations at CPT-MCB-S2 were high in the upper clay layer in the 4-8 ft depth (231 - 10,735 µg/kg PCE). Duplicate samples in this range did not correlate well which may be attributed to the interbedded nature of the sediments. Additional shallow sampling in this area is recommended. Concentrations in the lower clay layer (74-80 ft) are 123 µg/kg TCE indicating the contaminants are still trapped in the upper clay layer (0-15 ft). Sediment concentrations in CPT-MCB-S3 follow a similar trend with higher concentrations in the

shallow clays (0-15 ft) and lower concentrations in the deeper clays (74-80 ft). CPT-MCB-S2 and CPT-MCB-S3 concentration depth profiles with friction ratio are provided in Figure 12.

Sediment concentrations at CPT-MCB-S4 and S5 are higher in the deeper clayey zone (74-80 ft). The highest VOC sediment concentration in CPT-MCB-S4 was 5,325 µg/kg PCE at 69 ft. However, VOC contaminants in the duplicate sample were not detected. This discrepancy may be attributed to the sand/silt/clay layers in this region. CPT-MCB-S4 and CPT-MCB-S5 concentration depth profiles with friction ratio are provided in Figure 13.

The results from the sediment samples indicate a liquid contaminant source was released in the area near CPT-MCB-S2 and CPT-MCB-4. Sediment VOC contamination is consistent with releases of PCE and TCE to the subsurface over an 18 year period. The contaminants have migrated down through the upper clay layer and to the southeast into the lower clay layer. Additional sediment sampling is required to refine the conceptual contamination model of the site.

Duplicate sample results are missing for CPT-MCB-S4-4, 21, 33, 74 ft and CPT-MCB-S5-4, 21, and 33 ft due to a problem with the analysis instrument.

Soil Gas and Sediment Sample Correlation

Organic contaminants released to the vadose zone tend to accumulate in fine grained sediments. These partially saturated zones generally have high capillary pressures that draw liquids in more readily than do coarse sediments. Once the contaminants have lodged in these fine grained materials, they are released slowly by individual or combinations of mass transfer processes controlled mainly by liquid and gas diffusion at the pore scale. The contaminants are primarily released as a gas phase in the available pore space or to the aqueous phase during infiltration events, thereby serving as long term sources of dissolved contamination to the water table aquifer below. Coarse grain sediments in the vadose zone generally have low concentrations of VOCs in the liquid phase (because of weak capillary forces). However, these sediments may have high VOC concentrations in the gas phase as a result of relatively rapid equilibrium partitioning between gas and liquid phases, gas diffusion and proximity to sources (fine grained sediments).

Sediment and soil gas concentrations for CPT-MCB-S1, 22, and 13 are shown in Figure 13. Contaminants in the upper clay appear to be moving down by gravity into the more sandy/silty zones which will produce higher soil gas concentrations. The lower layer (74-80 ft) has a higher clay content as depicted by the higher friction ratio. As a result, the finer grained sediments will trap the liquid contaminants in the pore spaces and produce lower soil gas concentrations.

Sediment and soil gas concentration comparisons for CPT-MCB-S2 through S5 are shown in Figures 15-18. High soil gas concentrations correspond to the more permeable zones near high sediment concentrations in the fine layers with the exception of CPT-MCB-S4 (Figure 17). However, the high PCE sediment concentration in the lower clay layer (74-80 ft) does not produce the anticipated soil gas concentrations. Furthermore, the sediment sample

duplicate analysis was below detection limits so the analysis results may be an anomaly. Another possibility is that the contaminants are collecting within the interbedded clays in this zone.

Conclusions

A total of 128 soil gas samples were collected at twenty five locations and 69 soil samples at five locations within Miscellaneous Chemical Basin. At the twenty five soil gas locations, a 2" direct push vadose zone well was installed targeting permeable zones adjacent to the clay zones and areas with the higher soil gas concentrations. The results of the soil gas samples, compiled in Table 1, indicate the presence of CCL4, TCE and PCE in the soil gas. Concentrations ranged from 28.7 ppmv CCL4, 140 ppmv TCE and 99.5 ppmv PCE in the vicinity of MCB-4 to non detect levels at the outer perimeter of the basin. The center of the soil gas plume is located near MCB-4. The results of the soil samples, compiled in Table 2, indicate the presence of CCL4, TCE and PCE in the sediments. Concentrations ranged from 24.7 µg/kg CCL4, 371.6 µg/kg TCE and 10,736 µg/kg PCE to non detect levels in the coarse grain sediments. The sediment concentrations indicate the contaminants have migrated down and southeast from the source near CPT-MCB-S2. The clay layers tend to dip down from west to east and from north to south. Based on the sediment and soil gas analysis, the majority of the contaminants are collecting in the fined grained sediment layers located at approximate depths of 0-15 ft (330 ft msl) and 75-85 ft (260 ft msl) below ground surface.

Recommendations

The recommendations include a list of further characterization required to determine the boundaries of the soil gas plume and to clarify some discrepancies in the sediment sample duplicates and to further characterize the extent of sediment contamination.

1. Perform 8 CPT and soil gas characterization pushes on the east and west sides of the site and install vadose zone wells if TCE soil gas concentrations are above 10 ppmv. Based on the soil gas contour maps, the soil gas plume is beyond the effective vapor extraction coverage area at the deeper levels (50-90 ft). If concentrations drop in these wells after remediation is started, the wells can be used as barometric pumping injection wells (ambient air injection) to provide a barrier to the soil gas plume. The additional push locations are shown in Figure 19.

2. Perform five shallow (7 ft) soil borings near CPT-MCB-S2 and S3 to determine the extent of the shallow soil contamination. Approximately three depths in the upper clay layer will be sampled at each location. The sampling can be done with a hand auger and tube sampler at these shallow depths. Duplicate headspace analyses will be performed on the samples.

3. Perform three deep soil borings (CPT) into the lower clay layer to determine the extent of the deeper contamination. At least one boring will provide a continuous core of the clayey layer approximately 10-15 ft thick. This core will aid in determining the transmission of the contaminants through this lower layer. Approximately 3 depths will be sampled in the clay layer at the other two locations. The additional sediment sampling locations are shown in Figure 19.

References

Table 1 - Soil Gas Sample Data

		Gas Chromatograph Data (ppmv)									B&K Data (ppmv)		
Push		Depth	C-DCE	CCL4	CFC11	CHCL3	FR12	PCE	TCE		CO2	PCE	TCE
MCB	2	13	nd	0.00	0.00	0.00	0.00	0.02	nd	HP	4,060	0.50	1.30
MCB	2	35	nd	0.04	0.01	0.00	0.00	0.06	0.23	HP	6,020	0.20	1.14
MCB	2	67	nd	0.05	0.01	0.00	0.00	0.08	0.38	HP	6,100	0.26	1.24
MCB	2	80	nd	0.06	0.01	0.00	0.00	0.09	0.46	HP	5,440	0.28	1.13
MCB	2	88	nm	nm	nm	nm	nm	nm	nm		4,900	0.27	1.54
MCB	3	15	nd	0.07	0.01	nd	nd	0.08	0.46	HP	15,600	0.57	2.31
MCB	3	35.5	nd	0.17	0.02	nd	nd	0.20	1.88	HP	14,600	0.46	2.76
MCB	3	71	nm	nm	nm	nm	nm	nm	nm		10,200	0.95	3.34
MCB	5	15									4,730	6.04	4.94
MCB	5	35	nd	1.27	0.17	0.06	0.17	3.48	16.01	HP	12,000	3.24	18.20
MCB	5	50	nd	2.27	0.34	0.13	0.29	5.93	32.01	HP	11,600	3.61	21.80
MCB	5	67	nd	1.97	0.28	0.12	0.25	5.33	28.16	HP	11,700	3.78	23.30
MCB	5	85	nd	2.31	0.31	0.10	0.26	5.25	35.92	HP	10,100	4.35	34.00
MCB	6	9	nd	4.61	1.98	0.43	0.80	44.71	37.83	HP	21,800	46.40	51.60
MCB	6	12	nd	4.08	1.49	1.01	0.63	42.61	55.22	HP			
MCB	6	15	1.25	14.30	5.22	2.66	0.02	99.53	133.82	HP	16,200	58.10	83.90
MCB	6	35	nd	2.27	1.10	0.85	0.49	27.37	47.24	HP	12,100	31.10	58.90
MCB	6	53	nd	1.87	0.97	0.70	0.49	21.62	40.73	HP	12,100	24.10	54.50
MCB	6	75	nd	3.71	1.39	0.95	0.61	33.96	51.41	HP	11,100	18.80	47.20
MCB	6	84	nd	2.55	0.48	0.56	0.30	17.92	45.57	HP	9,430	13.80	39.30
MCB	6	95	nd	2.04	0.35	0.45	0.26	14.65	38.71	HP	9,170	13.80	38.80
MCB	7	15	nd	3.18	5.05	0.49	1.04	26.56	36.37	HP	17,300	20.40	59.70
MCB	7	30.5	nd	2.20	4.21	0.71	1.73	26.09	43.89	HP	13,100	21.40	53.40
MCB	7	74.5	nd	2.30	0.78	0.58	0.39	13.27	35.58	HP	11,200	13.20	41.20
MCB	7	91.5	nd	1.68	0.29	0.47	0.22	9.98	34.28	HP	9,560	10.50	36.20
MCB	8	17	nd	0.57	0.15	nd	0.17	3.19	4.28	HP	11,500	3.12	7.08
MCB	8	25	nd	0.66	0.17	nd	0.18	3.56	4.65	HP	10,100	3.52	7.68
MCB	8	50	nd	0.65	0.15	0.06	0.15	3.66	6.22	HP	8,320	3.58	8.55
MCB	8	79	nd	0.85	0.18	0.09	0.19	4.97	8.78	HP	8,460	4.40	10.50
MCB	9	15	nd	1.39	0.00	0.06	0.00	6.21	9.18	HP	15,600	5.72	13.60
MCB	9	35	nd	1.84	0.50	0.15	0.38	8.49	17.31	HP	10,800	8.99	21.60
MCB	9	55	nd	2.10	0.59	0.22	0.41	10.74	22.83	HP	10,400	9.91	26.40
MCB	9	76	nd	2.22	0.62	0.27	0.42	11.64	25.87	HP	10,200	10.60	28.50
MCB	9	85	nd	1.65	0.27	0.20	0.24	8.50	24.31	HP	8,460	8.80	26.70

Table 1 - Soil Gas Sample Data (continued)

		Gas Chromatograph Data (ppmv)									B&K Data (ppmv)		
Push		Depth	C-DCE	CCL4	CFC11	CHCL3	FR12	PCE	TCE		CO2	PCE	TCE
MCB	10	15	nd	3.88	1.16	0.76	0.51	18.62	94.96	HP	15,600	16.80	90.30
MCB	10	20	nd	3.53	1.07	0.75	0.50	17.89	80.07	HP	13,600	17.60	82.50
MCB	10	30	nm	nm	nm	nm	nm	nm	nm		11,700	16.30	71.80
MCB	10	51	nm	nm	nm	nm	nm	nm	nm		11,400	16.10	68.20
MCB	10	70	nd	2.01	0.74	0.66	0.39	13.30	52.26	HP	11,300	15.60	65.50
MCB	10	87									8,550	11.30	52.30
MCB	11	21	nd	1.17	0.14	0.05	0.15	2.04	13.18	HP	13,800	2.42	16.90
MCB	11	35	nd	1.18	0.14	0.06	0.14	2.32	15.13	HP	12,700	2.71	18.80
MCB	11	51	nd	1.33	0.16	0.09	0.16	2.72	18.34	HP	13,200	3.19	22.10
MCB	11	65	nd	1.34	0.16	0.09	0.17	2.76	18.78	HP	13,100	3.28	22.60
MCB	11	81.5	nd	2.06	0.22	0.14	0.19	3.95	36.83	HP	11,400	4.13	42.30
MCB	11	94	nd	1.65	0.18	0.10	0.18	3.60	31.29	HP	10,800	3.71	34.20
MCB	12	22	nd	1.63	0.17	0.34	0.16	5.74	18.70	HP	13,700	3.08	21.10
MCB	12	35	nd	1.58	0.19	0.13	0.18	3.53	23.23	HP	13,100	4.08	25.90
MCB	12	50	nd	1.72	0.21	0.17	0.20	6.77	26.73	HP	12,900	4.64	29.90
MCB	12	67	nd	1.85	0.23	0.20	0.21	4.75	29.93	HP	13,100	4.60	33.70
MCB	12	83	nd	1.46	0.15	0.22	0.14	6.39	34.06	HP	7,750	6.84	36.90
MCB	12	86	nd	2.21	0.25	0.22	0.21	5.02	45.32	HP	10,600	5.33	46.50
MCB	13	12	4.67	7.79	9.79	2.26	1.51	59.50	124.56	HP	21,200	51.60	167.00
MCB	13	16	5.22	8.88	9.40	2.44	1.53	69.70	139.98	HP	20,200	54.50	170.00
MCB	13	35	1.03	3.00	1.92	1.40	0.63	27.99	70.70	HP	10,900	24.90	77.10
MCB	13	62	nd	1.52	0.27	0.66	0.19	10.76	32.07	HP	5,900	11.70	35.20
MCB	13	73	nd	1.57	0.61	0.76	0.35	13.57	42.33	HP	8,050	12.20	43.80
MCB	14	18	nd	0.56	0.06	0.06	0.00	1.75	8.51	HP	13,300	2.29	10.30
MCB	14	33	nd	0.96	0.10	0.09	0.09	2.05	12.60	HP	12,700	2.78	16.10
MCB	14	50	nd	1.07	0.12	0.13	0.10	2.51	15.81	HP	12,400	3.03	18.90
MCB	14	71.5	nd	1.16	0.13	0.16	0.12	2.83	18.08	HP	13,100	3.15	21.40
MCB	14	87.5	nd	1.32	0.15	0.12	0.14	3.61	25.00	HP	10,600	3.87	28.90
MCB	15	15	nd	1.34	0.21	0.09	0.17	5.22	17.18	HP	11,700	4.95	19.10
MCB	15	35	nd	1.86	0.55	0.19	0.31	10.05	30.21	HP	10,000	6.88	31.00
MCB	15	50	nd	2.10	0.41	0.21	0.31	8.87	31.02	HP	10,400	9.29	34.80
MCB	15	67.5	nd	2.13	0.41	0.26	0.31	8.49	32.73	HP	10,200	10.10	39.40
MCB	15	77.5	nd	2.09	0.34	0.25	0.27	9.61	37.08	HP	7,370	7.92	31.90
MCB	15	95	nd	1.87	0.53	0.29	0.35	11.26	51.51	HP	9,820	9.54	46.10

Table 1 - Soil Gas Sample Data (continued)

		Gas Chromatograph Data (ppmv)									B&K Data (ppmv)		
Push		Depth	C-DCE	CCL4	CFC11	CHCL3	FR12	PCE	TCE		CO2	PCE	TCE
MCB	16	15	nm	nm	nm	nm	nm	5.07	10.63	sri	18,200	5.73	18.70
MCB	16	30	nm	nm	nm	nm	nm	4.25	14.78	sri	14,500	3.92	25.80
MCB	16	50	nm	nm	nm	nm	nm	4.85	17.04	sri	13,200	4.43	29.20
MCB	16	71.5	nm	nm	nm	nm	nm	5.51	20.36	sri	12,600	4.43	29.10
MCB	16	85.5	nm	nm	nm	nm	nm	5.02	19.82	sri	10,400	4.68	29.30
MCB	16	88.5	nm	nm	nm	nm	nm	3.94	13.94	sri	10,600	4.02	28.80
MCB	17	15	nd	6.29	0.45	1.69	0.24	8.02	93.04	HP	22,100	10.10	93.50
MCB	17	35	nd	2.67	0.53	0.83	0.29	9.09	62.22	HP	13,500	10.20	65.90
MCB	17	50	nd	2.40	0.64	0.80	0.34	10.45	63.00	HP	12,300	9.96	57.90
MCB	17	70	nd	1.92	0.56	0.66	0.32	10.23	54.63	HP	12,200	9.17	53.20
MCB	18	24.5	nd	1.33	0.14	0.21	0.12	6.87	30.40	HP	6,240	7.82	31.60
MCB	18	39.5	nd	2.49	0.36	0.40	0.27	6.94	42.80	HP	12,600	6.94	47.50
MCB	18	51	nd	2.04	0.27	0.38	0.23	6.37	37.75	HP	11,900	6.82	45.50
MCB	18	67	nd	1.33	0.16	0.25	0.15	4.63	25.44	HP	7,630	4.96	29.70
MCB	19	12	nd	1.82	1.41	0.21	0.43	9.06	21.24	HP	15,100	8.54	32.00
MCB	19	35	nd	2.45	0.77	0.47	0.34	11.00	31.32	HP	10,400	10.50	37.30
MCB	19	50	nd	2.56	0.80	0.49	0.36	10.96	34.42	HP	11,500	11.80	42.70
MCB	19	80	nd	1.89	0.43	0.42	0.27	10.11	31.71	HP	12,900	10.10	44.20
MCB	19	90	nm	nm	nm	nm	nm	nm	nm		9,700	7.95	33.30
MCB	20	20	nd	nd	nd	nd	nd	5.32	24.28	HP	14,500	6.64	33.10
MCB	20	30	nd	2.15	0.32	0.21	0.27	6.21	32.38	HP	12,800	7.59	38.20
MCB	20	53.5	nd	2.34	0.35	0.29	0.29	6.69	37.43	HP	12,700	7.46	44.60
MCB	20	67	nd	2.56	0.38	0.30	0.31	7.30	41.99	HP	12,500	7.25	46.40
MCB	20	79	nm	nm	nm	nm	nm	nm	nm		9,680	8.19	53.50
MCB	21	20	nd	2.91	0.46	0.34	0.31	7.37	45.38	HP	14,300	8.11	49.90
MCB	21	50	nd	1.61	0.05	0.22	nd	8.37	47.32	HP	1,620	9.86	47.50
MCB	21	53	nd	1.75	0.23	0.36	0.20	6.02	33.65	HP	8,530	6.77	39.10
MCB	22	15	nd	28.66	1.66	3.84	0.52	19.01	124.99	HP	22,400	19.30	127.00
MCB	22	20	nd	12.15	1.50	2.75	0.51	16.94	101.68	HP	18,100	18.40	111.00
MCB	22	30	nd	5.35	1.21	1.47	0.48	15.30	78.22	HP	14,300	15.40	85.30
MCB	22	50									12,600	14.30	67.80
MCB	22	69	nd	2.40	0.89	0.86	0.43	13.74	59.67	HP	12,300	13.20	61.00
MCB	22	90	nd	2.23	0.30	0.48	0.23	9.31	49.65	HP	9,490	9.44	49.10
MCB	22	98	nm	nm	nm	nm	nm	nm	nm		8,710	10.20	47.00

Table 1 - Soil Gas Sample Data (continued)

		Gas Chromatograph Data (ppmv)									B&K Data (ppmv)		
Push		Depth	C-DCE	CCL4	CFC11	CHCL3	FR12	PCE	TCE		CO2	PCE	TCE
MCB	23	20	nd	1.58	0.25	0.07	0.22	4.15	17.34	HP	13,900	4.95	22.60
MCB	23	35	nd	1.79	0.28	0.10	0.25	5.17	22.81	HP	12,000	5.18	26.90
MCB	23	50	nd	1.99	0.32	0.13	0.28	5.70	27.52	HP	13,300	6.48	34.90
MCB	23	68	nd	2.05	0.32	0.15	0.28	6.20	30.22	HP	12,300	6.60	36.00
MCB	23	83	nd	1.16	0.12	0.14	0.13	6.21	23.43	HP	6,040	6.91	25.20
MCB	24	17	nm	nm	nm	nm	nm	4.69	3.98	sri	13,700	4.44	10.40
MCB	24	30.5	nm	nm	nm	nm	nm				12,600	6.57	18.10
MCB	24	50	nm	nm	nm	nm	nm	8.39	15.17	sri	10,900	7.64	22.10
MCB	24	70	nm	nm	nm	nm	nm	6.61	10.62	sri	11,100	7.20	23.20
MCB	24	80	nm	nm	nm	nm	nm	4.95	10.76	sri	10,200	7.69	22.70
MCB	24	88	nm	nm	nm	nm	nm	6.68	14.13	sri	10,300	6.60	22.60
MCB	25	17	nd	3.11	0.86	0.41	0.48	16.45	38.56	HP	14,600	17.10	45.10
MCB	25	30	nd	3.09	0.86	0.54	0.49	17.13	43.08	HP	12,600	18.20	52.40
MCB	25	50	nd	3.11	0.90	0.64	0.50	18.17	48.18	HP	11,800	17.70	54.40
MCB	25	71.5	nd	3.15	0.69	0.55	0.41	17.24	49.57	HP	11,600	17.00	52.80
MCB	25	80	nm	nm	nm	nm	nm	nm	nm		10,500	17.30	56.00
MCB	25	92.5	nd	2.67	0.44	0.44	0.31	13.59	48.66	HP	9,990	13.00	49.00
MCB	25	97.5	nd	2.63	0.41	0.39	0.29	13.57	49.76	HP	9,610	12.90	48.70
MCB	25	100									9,970	11.70	48.30
MCB	26	17	nm	nm	nm	nm	nm	63.49	55.79	sri	19,100	50.10	63.50
MCB	26	24.5	nm	nm	nm	nm	nm	63.86	65.80	sri	17,700	52.70	72.00
MCB	26	35	nm	nm	nm	nm	nm	36.73	32.89	sri	13,600	30.70	56.60
MCB	26	50	nm	nm	nm	nm	nm	30.54	31.26	sri	13,000	25.20	52.50
MCB	26	76.5	nm	nm	nm	nm	nm	21.30	27.09	sri	11,800	17.50	43.10
MCB	26	86.5	nm	nm	nm	nm	nm	21.50	24.88	sri	9,090	19.00	37.90
MCB	26	93	nm	nm	nm	nm	nm	nm	nm		9,780	12.10	36.30

nd: not detected

nm: not measured

Table 2 - Sediment Concentrations (µg/kg)

Run	Sample-Depth(ft)	CCL4	TCE	PCE
101796r	CPT-MCBS1-002	<6.6	<6.6	<6.6
110496r	CPT-MCBS1-002	<6.6	<6.6	<6.6
101596r	CPT-MCBS1-004	<6.6	<6.6	<6.6
110496r	CPT-MCBS1-004	<6.6	<6.6	<6.6
101596r	CPT-MCBS1-006	<6.6	<6.6	<6.6
110496r	CPT-MCBS1-006	<6.6	<6.6	<6.6
101596r	CPT-MCBS1-008	<6.6	<6.6	<6.6
110496r	CPT-MCBS1-008	<6.6	<6.6	<6.6
101596r	CPT-MCBS1-010	<6.6	13.44	<6.6
110496r	CPT-MCBS1-010	<6.6	16.41	<6.6
101796r	CPT-MCBS1-012	<6.6	9.17	<6.6
110496r	CPT-MCBS1-012	<6.6	18.40	<6.6
101796r	CPT-MCBS1-014	<6.6	<6.6	<6.6
102596b	CPT-MCBS1-014	<6.6	16.02	<6.6
101596r	CPT-MCBS1-015.5	<6.6	162.80	41.95
110496r	CPT-MCBS1-015.5	<6.6	157.17	37.78
101796r	CPT-MCBS1-018	<6.6	48.24	7.51
110496r	CPT-MCBS1-018	<6.6	18.78	<6.6
101596r	CPT-MCBS1-020	<6.6	59.76	12.19
110496r	CPT-MCBS1-020	<6.6	128.59	27.57
101796r	CPT-MCBS1-022	<6.6	60.02	8.19
110596b	CPT-MCBS1-022	<6.6	64.84	9.93
101596r	CPT-MCBS1-024	<6.6	88.94	16.67
110496r	CPT-MCBS1-024	<6.6	41.28	7.36
101796r	CPT-MCBS1-026	<6.6	60.43	8.32
110496r	CPT-MCBS1-026	<6.6	67.52	11.56
101796r	CPT-MCBS1-028	<6.6	18.06	<6.6
110496r	CPT-MCBS1-028	<6.6	<6.6	<6.6
101596r	CPT-MCBS1-030	<6.6	<6.6	<6.6
110496r	CPT-MCBS1-030	<6.6	23.98	<6.6
101796r	CPT-MCBS1-032	<6.6	14.46	<6.6
111396r	CPT-MCBS1-032	<6.6	7.91	<6.6
101596r	CPT-MCBS1-034	<6.6	<6.6	<6.6
110496r	CPT-MCBS1-034	<6.6	15.09	<6.6
101796r	CPT-MCBS1-036	<6.6	<6.6	<6.6
111396r	CPT-MCBS1-036	<6.6	<6.6	<6.6
101796r	CPT-MCBS1-038	<6.6	<6.6	<6.6
111396r	CPT-MCBS1-038	<6.6	<6.6	<6.6
101796r	CPT-MCBS1-040	<6.6	6.64	<6.6
111396r	CPT-MCBS1-040	<6.6	<6.6	<6.6
101796r	CPT-MCBS1-042	<6.6	<6.6	<6.6
110596b	CPT-MCBS1-042	<6.6	9.15	<6.6
101796r	CPT-MCBS1-044	<6.6	<6.6	<6.6
110596b	CPT-MCBS1-044	<6.6	<6.6	<6.6

Run	Sample-Depth(ft)	CCL4	TCE	PCE
101896r	CPT-MCBS1-046	<6.6	10.21	<6.6
110596b	CPT-MCBS1-046	<6.6	7.52	<6.6
101596r	CPT-MCBS1-048	<6.6	<6.6	<6.6
110496r	CPT-MCBS1-048	<6.6	<6.6	<6.6
101896r	CPT-MCBS1-050	<6.6	31.23	<6.6
111396r	CPT-MCBS1-050	<6.6	73.62	8.76
101596r	CPT-MCBS1-052	<6.6	18.21	<6.6
110496r	CPT-MCBS1-052	<6.6	9.78	<6.6
101896r	CPT-MCBS1-054	<6.6	15.94	<6.6
111396r	CPT-MCBS1-054	<6.6	31.26	<6.6
101896r	CPT-MCBS1-056	<6.6	<6.6	<6.6
111396r	CPT-MCBS1-056	<6.6	7.92	<6.6
101896r	CPT-MCBS1-058	<6.6	<6.6	<6.6
111396r	CPT-MCBS1-058	<6.6	<6.6	<6.6
101896r	CPT-MCBS1-060	<6.6	<6.6	<6.6
111396r	CPT-MCBS1-060	<6.6	<6.6	<6.6
101896r	CPT-MCBS1-064	<6.6	<6.6	<6.6
111396r	CPT-MCBS1-064	<6.6	<6.6	<6.6
101896r	CPT-MCBS1-066	<6.6	<6.6	<6.6
111396r	CPT-MCBS1-066	<6.6	<6.6	<6.6
101896r	CPT-MCBS1-068	<6.6	<6.6	<6.6
111396r	CPT-MCBS1-068	<6.6	12.28	<6.6
101896r	CPT-MCBS1-070	<6.6	<6.6	<6.6
111396r	CPT-MCBS1-070	<6.6	<6.6	<6.6
101896r	CPT-MCBS1-072	<6.6	<6.6	<6.6
102596b	CPT-MCBS1-072	<6.6	<6.6	<6.6
102596b	CPT-MCBS1-074	<6.6	242.14	28.03
110796r	CPT-MCBS1-074	<6.6	220.72	39.49
101596r	CPT-MCBS1-076	<6.6	371.63	99.22
110796r	CPT-MCBS1-076	<6.6	238.62	44.46
101896r	CPT-MCBS1-078	<6.6	88.58	11.52
111396r	CPT-MCBS1-078	<6.6	131.44	20.74
101596r	CPT-MCBS1-080	<6.6	73.34	12.37
110796r	CPT-MCBS1-080	<6.6	50.20	8.63
101896r	CPT-MCBS1-082	<6.6	154.66	18.70
111896r	CPT-MCBS1-082	<6.6	87.53	9.82
101696r	CPT-MCBS2-004	10.86	56.53	6023.62
102596b	CPT-MCBS2-004	30.95	105.73	10735.89
101896r	CPT-MCBS2-005	<6.6	<6.6	<6.6
110796r	CPT-MCBS2-005	<6.6	67.23	3671.53
101696r	CPT-MCBS2-008	6.82	126.25	231.42
110796r	CPT-MCBS2-008	<6.6	<6.6	7.65
102596b	CPT-MCBS2-029	<6.6	28.96	13.69
110796r	CPT-MCBS2-029	<6.6	8.10	6.90

Table 2 - Sediment Concentrations (µg/kg)

Run	Sample-Depth(ft)	CCL4	TCE	PCE
101696r	CPT-MCBS2-033	<6.6	<6.6	<6.6
110796r	CPT-MCBS2-033	<6.6	<6.6	<6.6
101696r	CPT-MCBS2-077	<6.6	<6.6	<6.6
111896r	CPT-MCBS2-077	<6.6	9.70	<6.6
101696r	CPT-MCBS2-081	<6.6	123.11	33.03
111896r	CPT-MCBS2-081	<6.6	111.14	30.02
101896r	CPT-MCBS3-004	<6.6	229.86	25.17
110796r	CPT-MCBS3-004	<6.6	<6.6	<6.6
101696r	CPT-MCBS3-006	<6.6	<6.6	<6.6
110796r	CPT-MCBS3-006	<6.6	<6.6	<6.6
101696r	CPT-MCBS3-017	<6.6	<6.6	<6.6
110796r	CPT-MCBS3-017	<6.6	<6.6	<6.6
101696r	CPT-MCBS3-035	<6.6	<6.6	<6.6
110796r	CPT-MCBS3-035	<6.6	<6.6	<6.6
101896r	CPT-MCBS3-073	<6.6	<6.6	<6.6
102196r	CPT-MCBS3-073	<6.6	<6.6	<6.6
101696r	CPT-MCBS3-075	<6.6	90.86	14.94
110796r	CPT-MCBS3-075	<6.6	85.47	14.03
101696r	CPT-MCBS3-080	<6.6	57.13	8.72
110796r	CPT-MCBS3-080	<6.6	64.21	11.91
101896r	CPT-MCBS4-003	<6.6	<6.6	<6.6
110596b	CPT-MCBS4-003	<6.6	<6.6	<6.6
101696r	CPT-MCBS4-004	<6.6	9.80	<6.6
101696r	CPT-MCBS4-021	<6.6	<6.6	<6.6
101696r	CPT-MCBS4-033	<6.6	14.75	<6.6
101896r	CPT-MCBS4-069	24.70	146.51	5324.95
102596b	CPT-MCBS4-069	<6.6	<6.6	<6.6
101896r	CPT-MCBS4-074	<6.6	<6.6	<6.6

Run	Sample-Depth(ft)	CCL4	TCE	PCE
102196r	CPT-MCBS5-003	<6.6	<6.6	<6.6
110596b	CPT-MCBS5-003	<6.6	<6.6	<6.6
110596b	CPT-MCBS5-004	<6.6	12.14	<6.6
102196r	CPT-MCBS5-005	<6.6	<6.6	<6.6
110596b	CPT-MCBS5-005	<6.6	<6.6	<6.6
102196r	CPT-MCBS5-010	<6.6	<6.6	<6.6
110596b	CPT-MCBS5-010	<6.6	<6.6	<6.6
110596b	CPT-MCBS5-021	<6.6	17.15	<6.6
110596b	CPT-MCBS5-033	<6.6	<6.6	<6.6
102196r	CPT-MCBS5-035	<6.6	<6.6	<6.6
110596b	CPT-MCBS5-035	<6.6	<6.6	<6.6
102196r	CPT-MCBS5-055	<6.6	9.03	<6.6
110596b	CPT-MCBS5-055	<6.6	9.61	<6.6
102196r	CPT-MCBS5-069	<6.6	<6.6	<6.6
110596b	CPT-MCBS5-069	<6.6	<6.6	<6.6
102196r	CPT-MCBS5-071	<6.6	<6.6	<6.6
110596b	CPT-MCBS5-071	<6.6	<6.6	<6.6
102196r	CPT-MCBS5-074	<6.6	111.81	10.89
110596b	CPT-MCBS5-074	<6.6	124.46	16.57
102196r	CPT-MCBS5-076	<6.6	54.47	11.66
110596b	CPT-MCBS5-076	<6.6	58.55	15.38

Table 3 - Sediment Moisture Content

Push-Depth	Water % by wt	Soil Description
CPT-MCB-S5-3	10.35	clay
CPT-MCB-S5-3	10.50	clay
CPT-MCB-S5-5	16.90	clay
CPT-MCB-S5-5	14.69	clay
CPT-MCB-S5-10	10.94	silt/sand
CPT-MCB-S5-10	32.87	silt/sand
CPT-MCB-S5-35	8.26	fine sand/silt
CPT-MCB-S5-35	6.81	fine sand/silt
CPT-MCB-S5-55	5.91	silt/sand
CPT-MCB-S5-55	6.39	silt/sand
CPT-MCB-S5-69	7.09	silt/sand
CPT-MCB-S5-69	7.66	silt/sand
CPT-MCB-S5-71	8.25	silt/sand
CPT-MCB-S5-71	7.94	silt/sand
CPT-MCB-S5-74	32.89	clay
CPT-MCB-S5-74	31.54	clay
CPT-MCB-S5-76	16.78	sand/clay
CPT-MCB-S5-76	15.88	sand/clay
CPT-MCB-S2-4	17.30	silt/clay
CPT-MCB-S2-4	17.45	silt/clay

Push-Depth	Water % by wt	Soil Description
CPT-MCB-S2-5	16.00	silt/clay
CPT-MCB-S2-5	15.49	silt/clay
CPT-MCB-S2-8	13.82	silt/clay
CPT-MCB-S2-8	14.40	silt/clay
CPT-MCB-S2-29	8.15	fine sand/silt
CPT-MCB-S2-33	8.14	fine sand/silt
CPT-MCB-S2-77	6.03	sand
CPT-MCB-S2-81	21.64	clay/silt
CPT-MCB-S3-6	12.93	clay/silt
CPT-MCB-S3-4	12.46	clay/silt
CPT-MCB-S3-35	7.29	sand/silt
CPT-MCB-S3-73	7.09	sand/silt
CPT-MCB-S3-75	14.25	silty sand
CPT-MCB-S3-80	14.58	sand/silt
CPT-MCB-S4-3	9.54	silty clay
CPT-MCB-S4-4	12.84	silty clay
CPT-MCB-S4-33	7.78	silt/sand
CPT-MCB-S4-69	6.38	sand/silt
CPT-MCB-S4-74	23.04	clay/silt

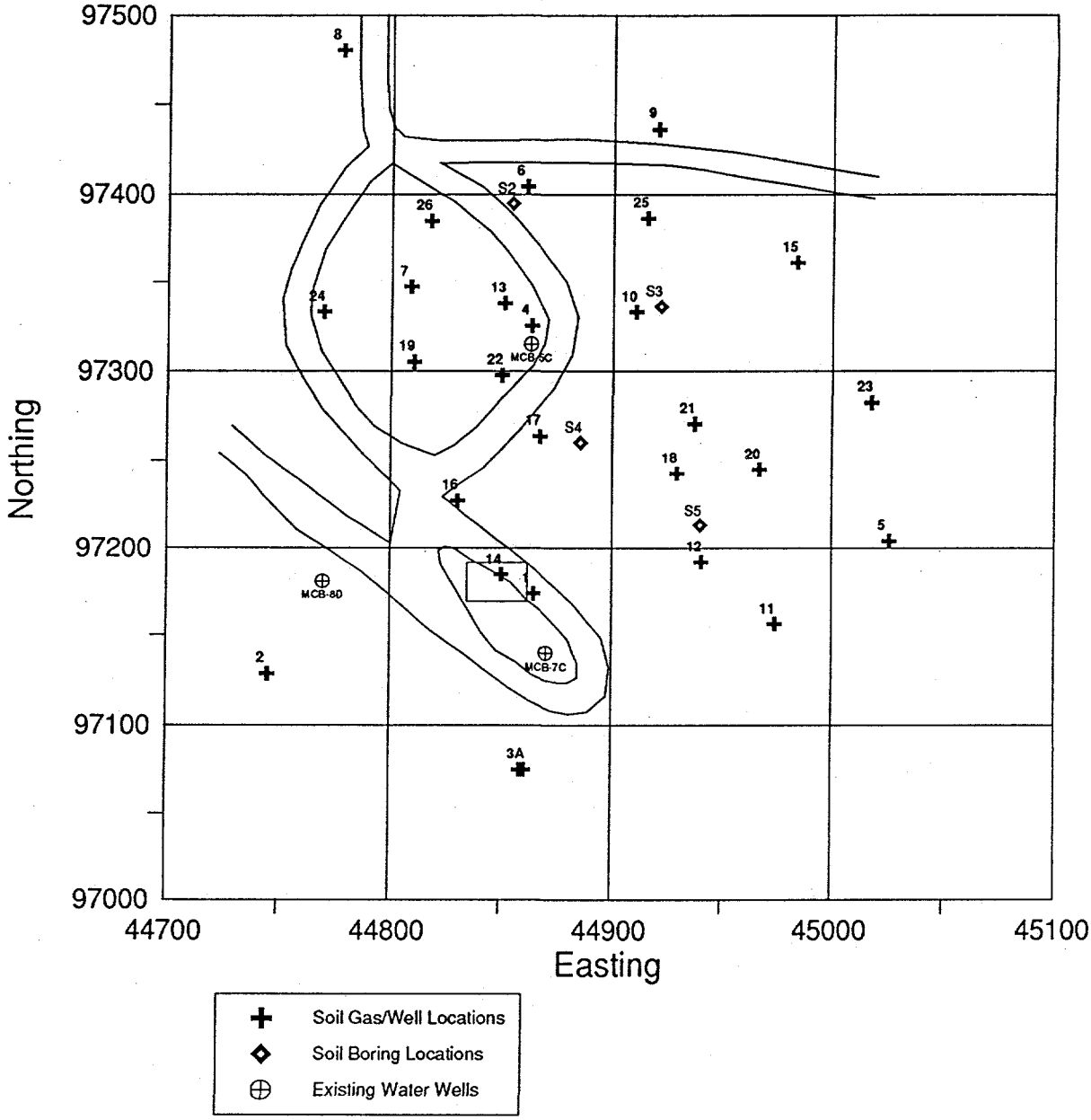


Figure 1: Miscellaneous Chemical Basin Vadose Zone Well and Soil Boring Locations

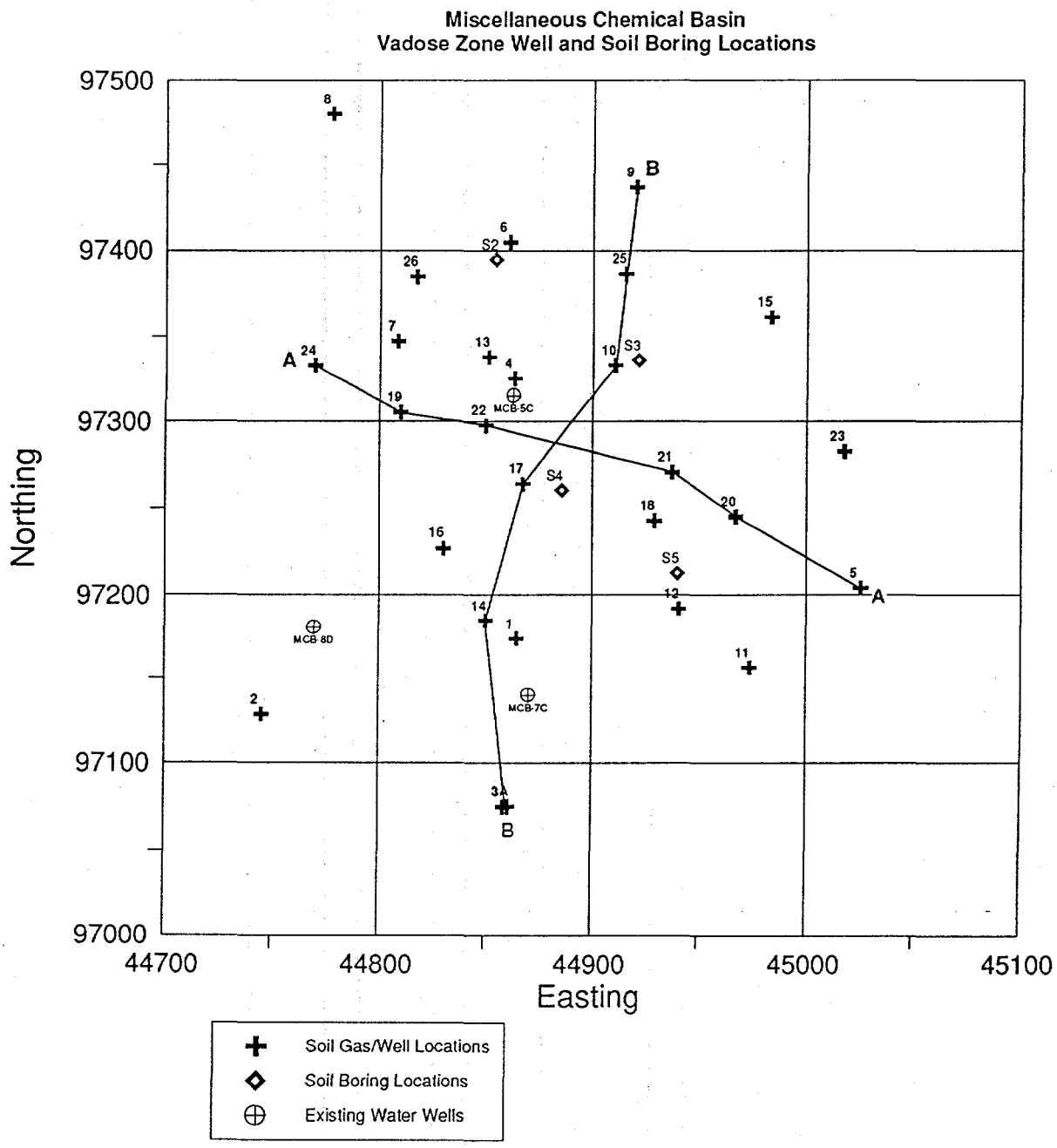


Figure 2: CPT Friction Ratio Section Map

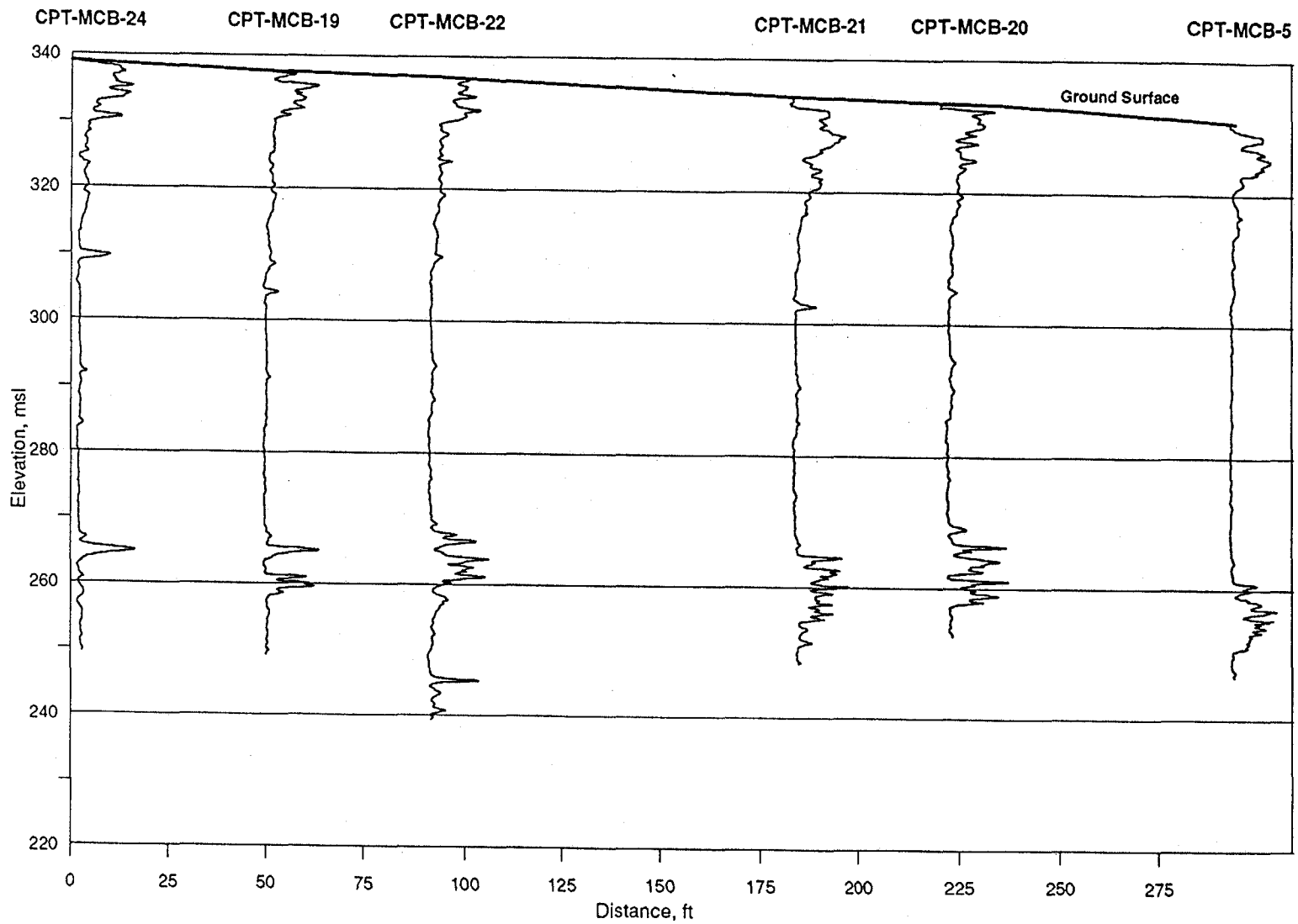


Figure 3 - CPT Friction Ratios: Section AA

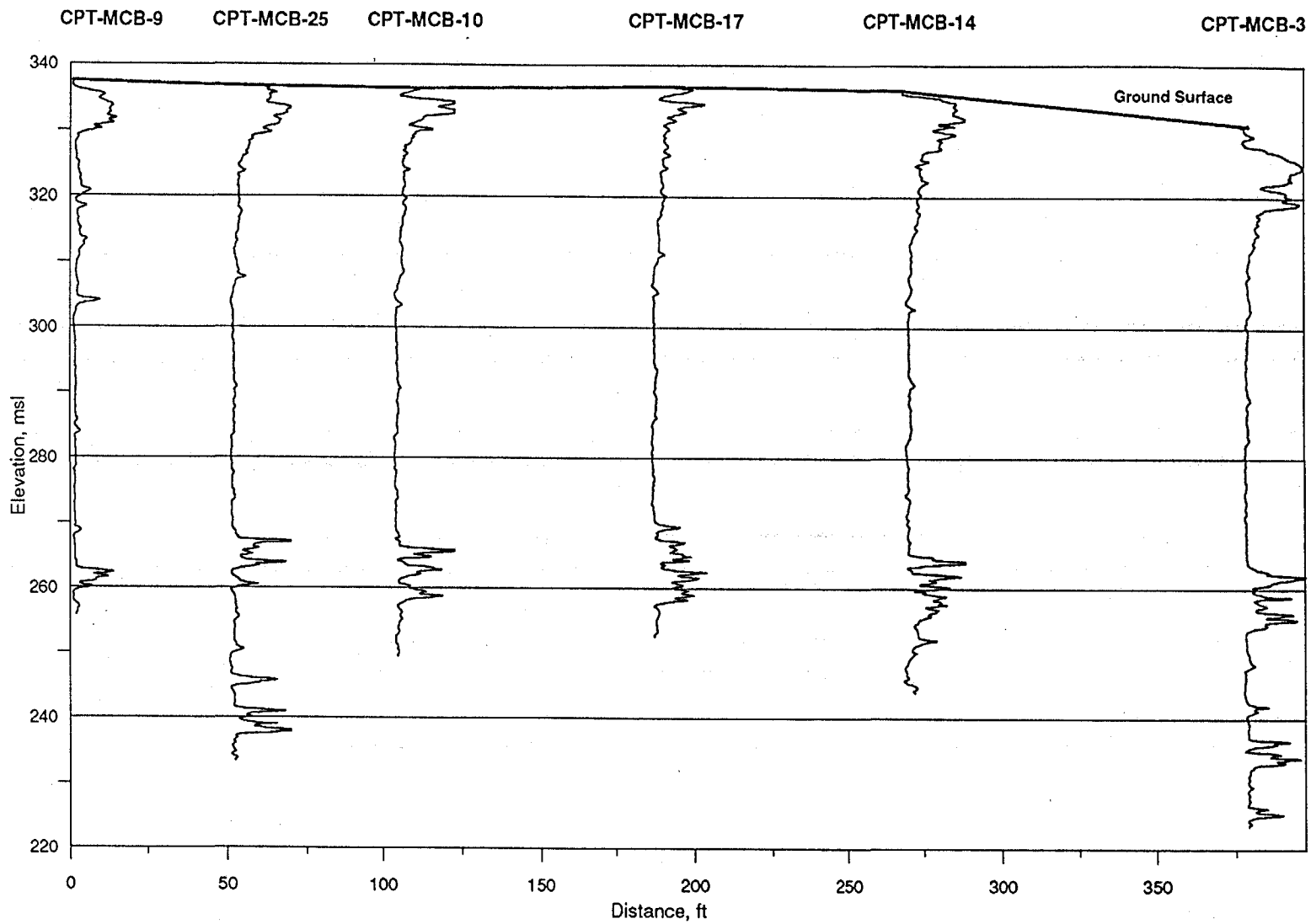


Figure 4 - CPT Friction Ratios: Section BB

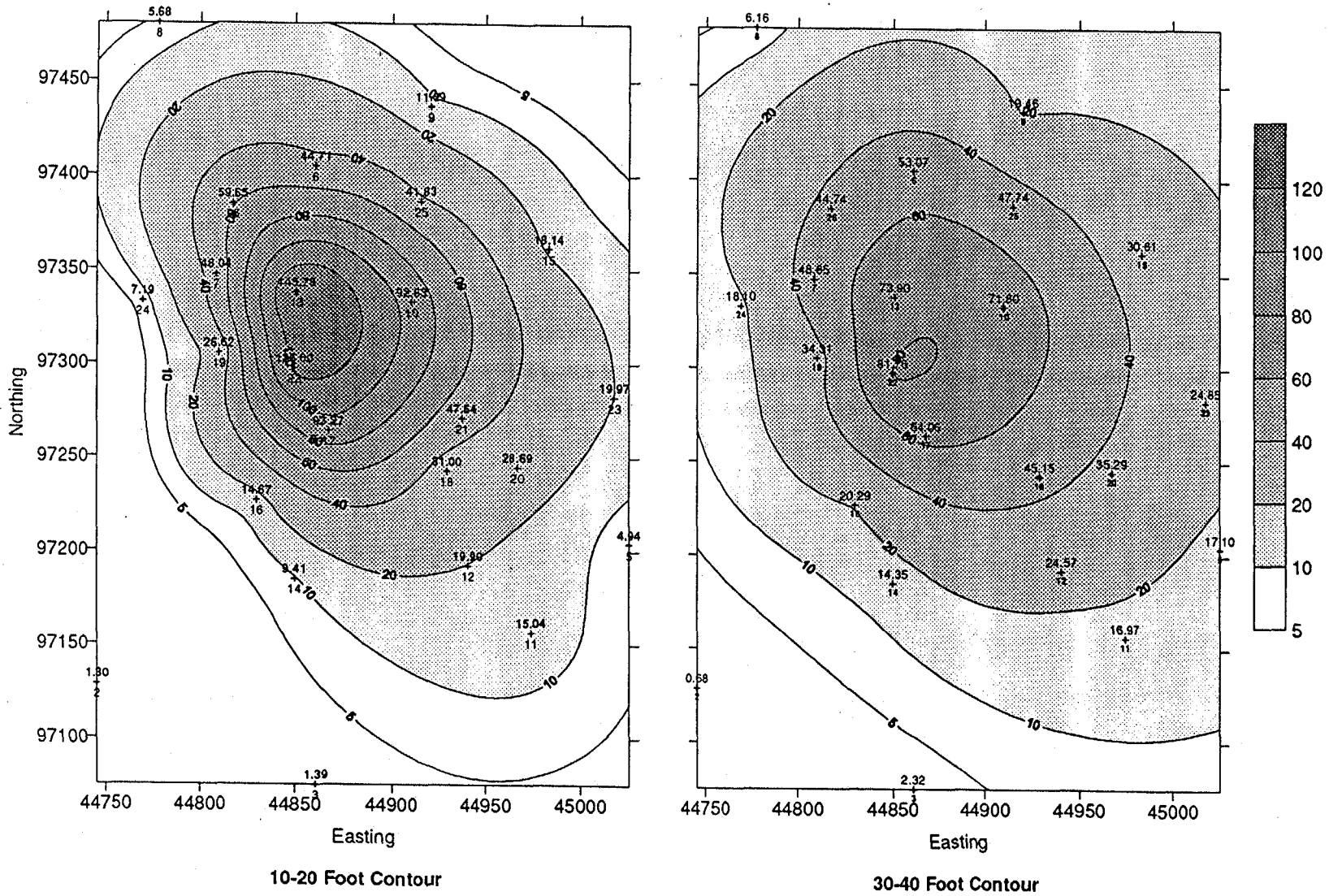


Figure 5: Miscellaneous Chemical Basin TCE Soil Gas Concentration (ppmv)

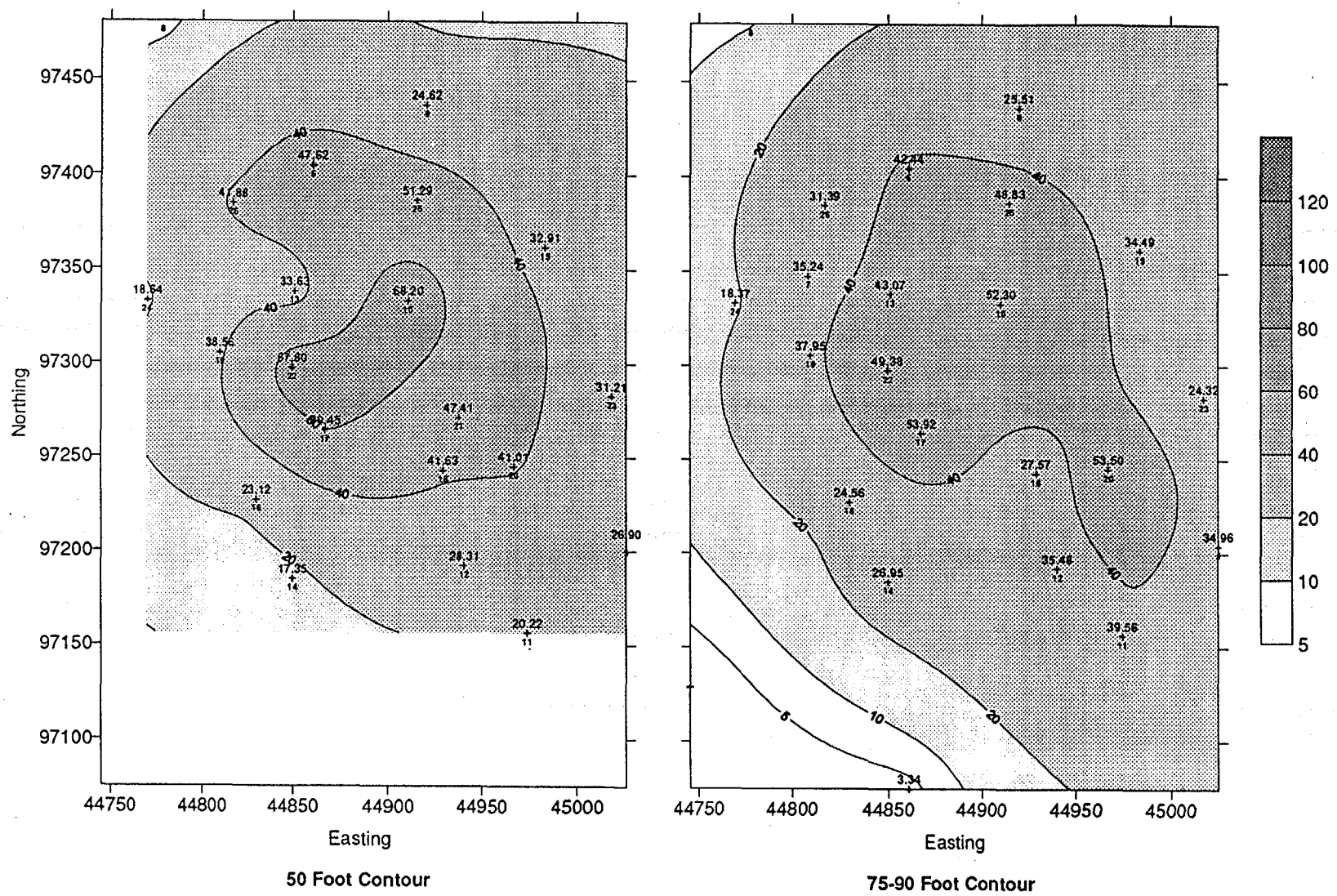


Figure 6: Miscellaneous Chemical Basin TCE Soil Gas Concentration (ppmv)

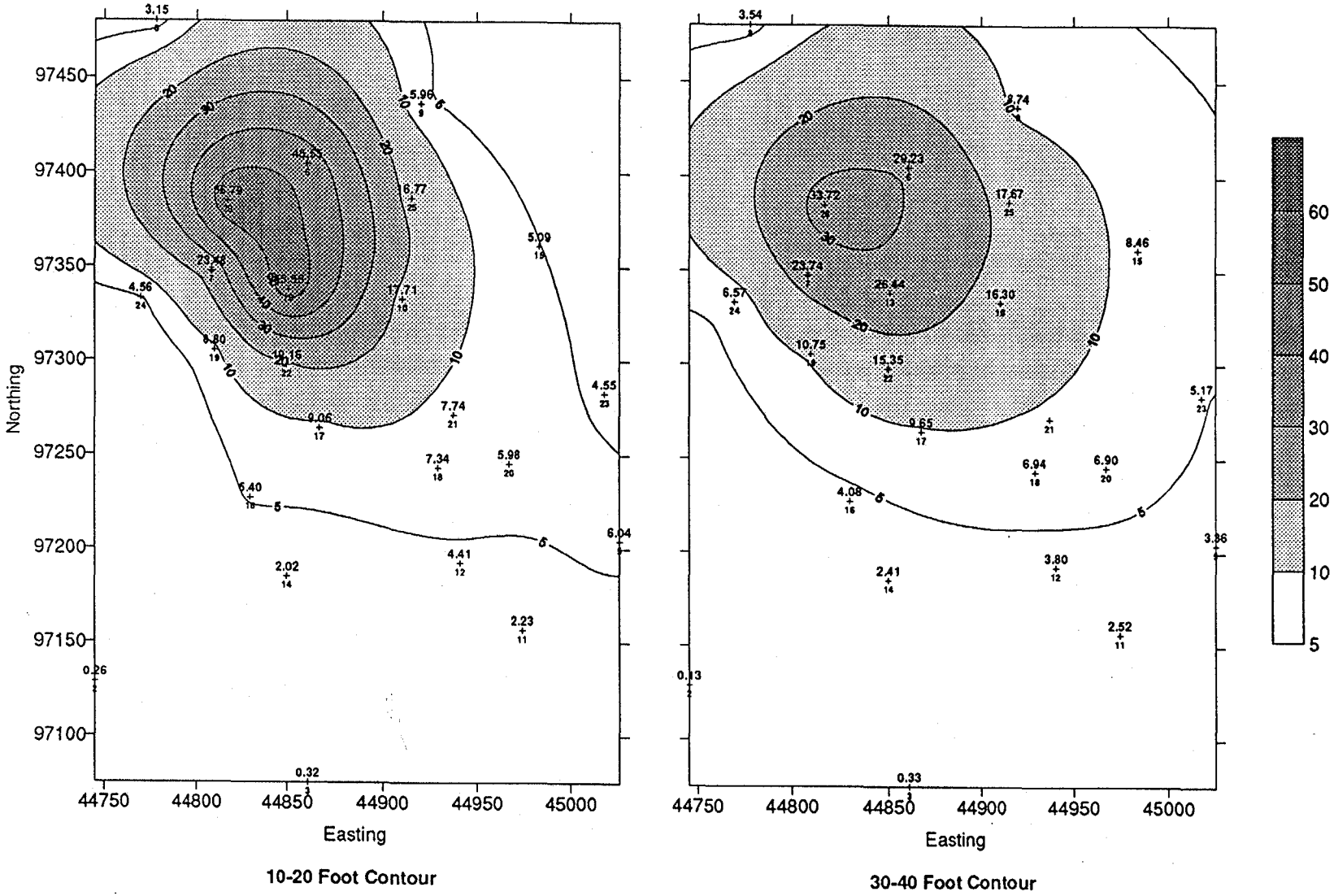


Figure 7: Miscellaneous Chemical Basin PCE Soil Gas Concentration (ppmv)

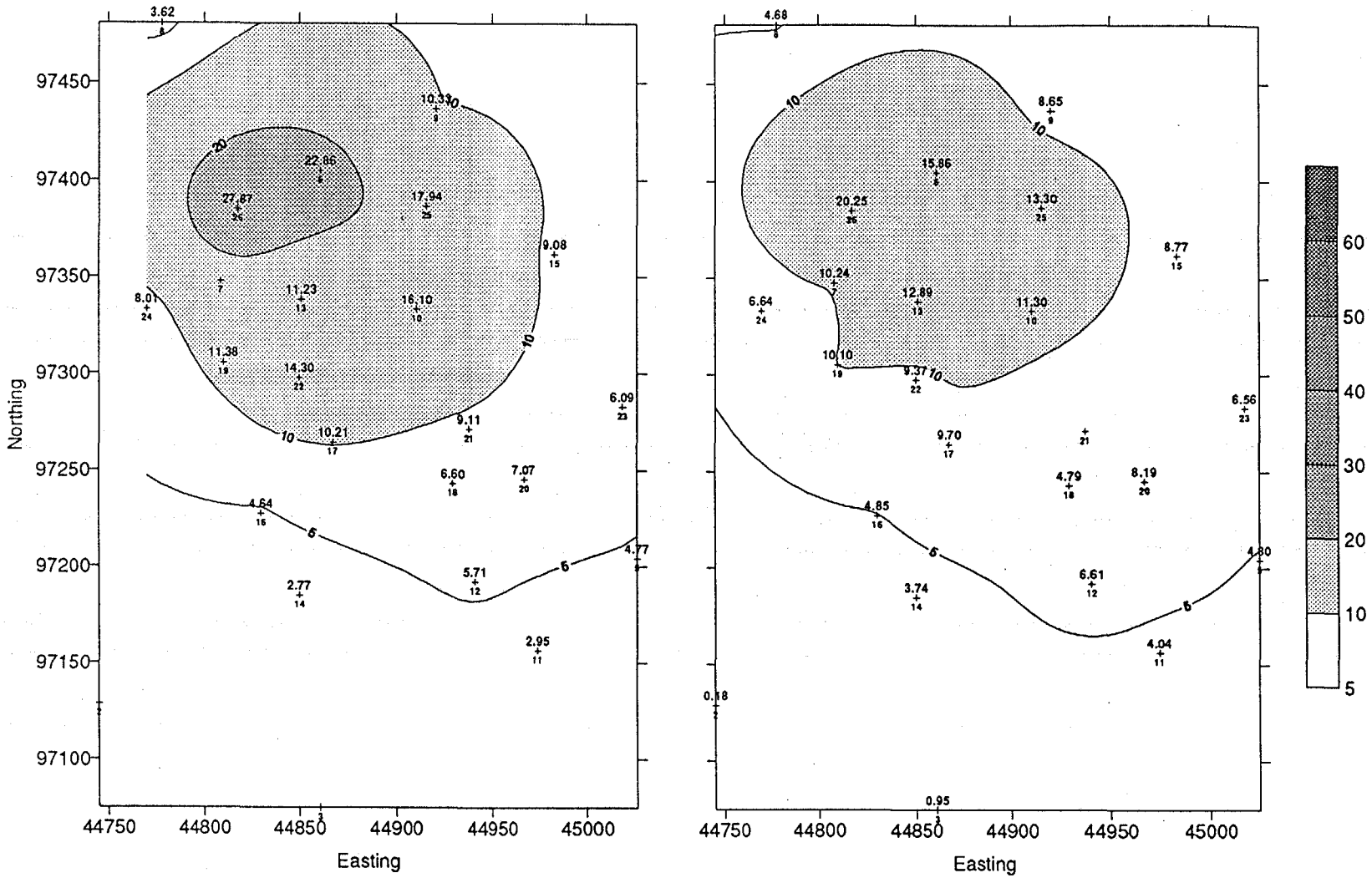
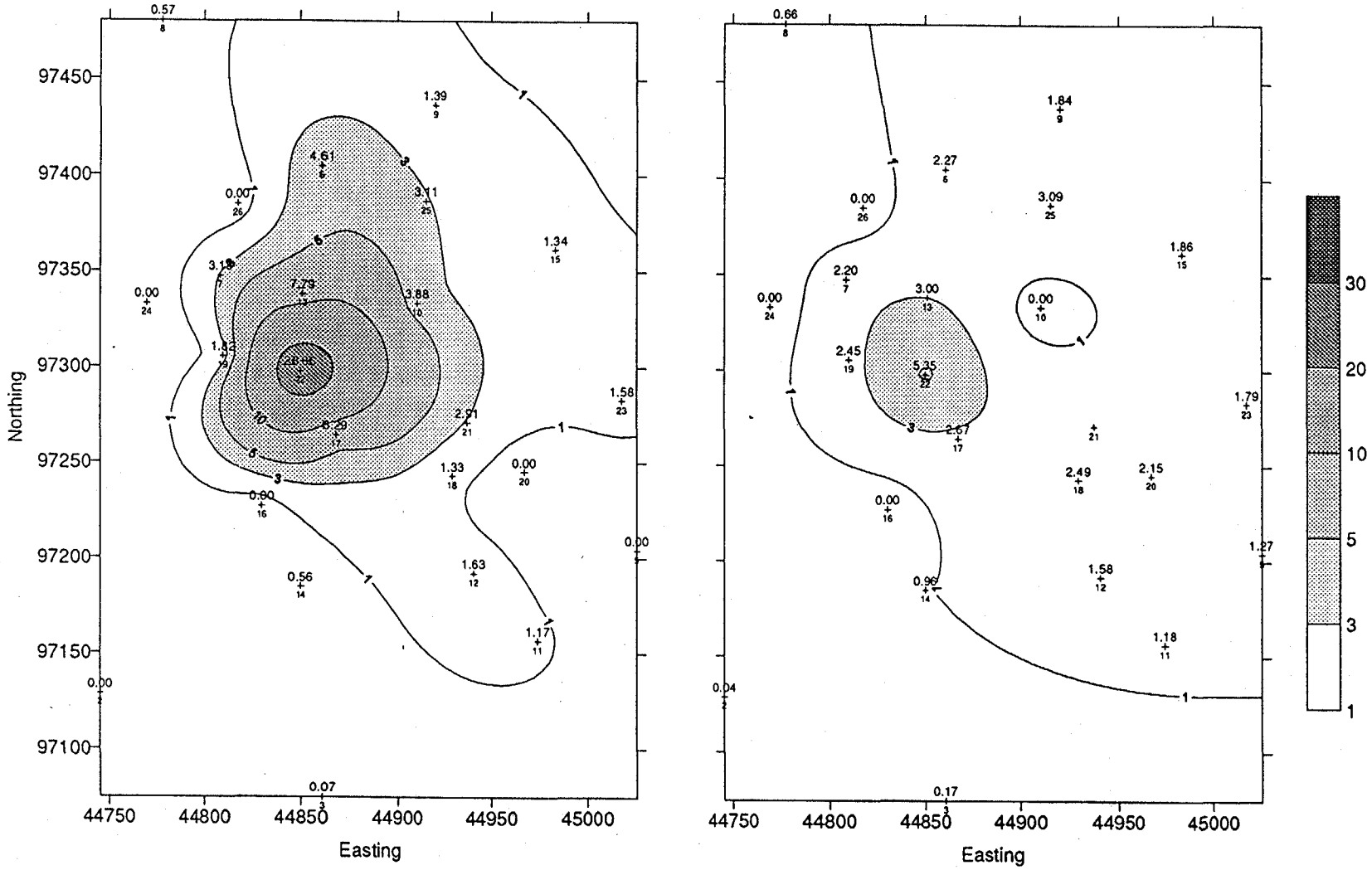


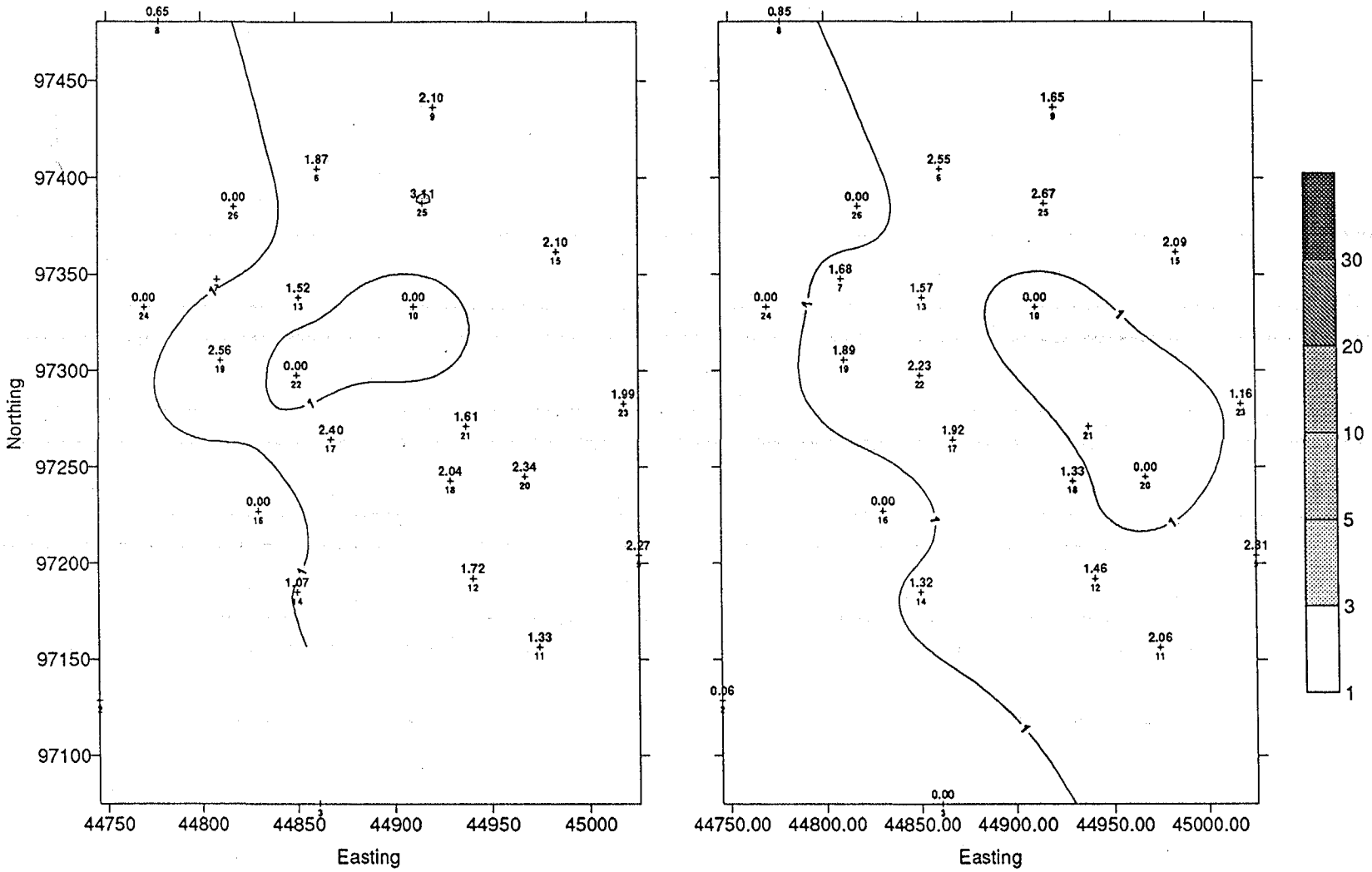
Figure 8: Miscellaneous Chemical Basin PCE Soil Gas Concentration (ppmv)



10-20 Foot Contour

30-40 Foot Contour

Figure 9: Miscellaneous Chemical Basin CCL4 Soil Gas Concentration (ppmv)



50 Foot Contour **75-90 Foot Contour**

Figure 10: Miscellaneous Chemical Basin CCL4 Soil Gas Concnetration (ppmv)

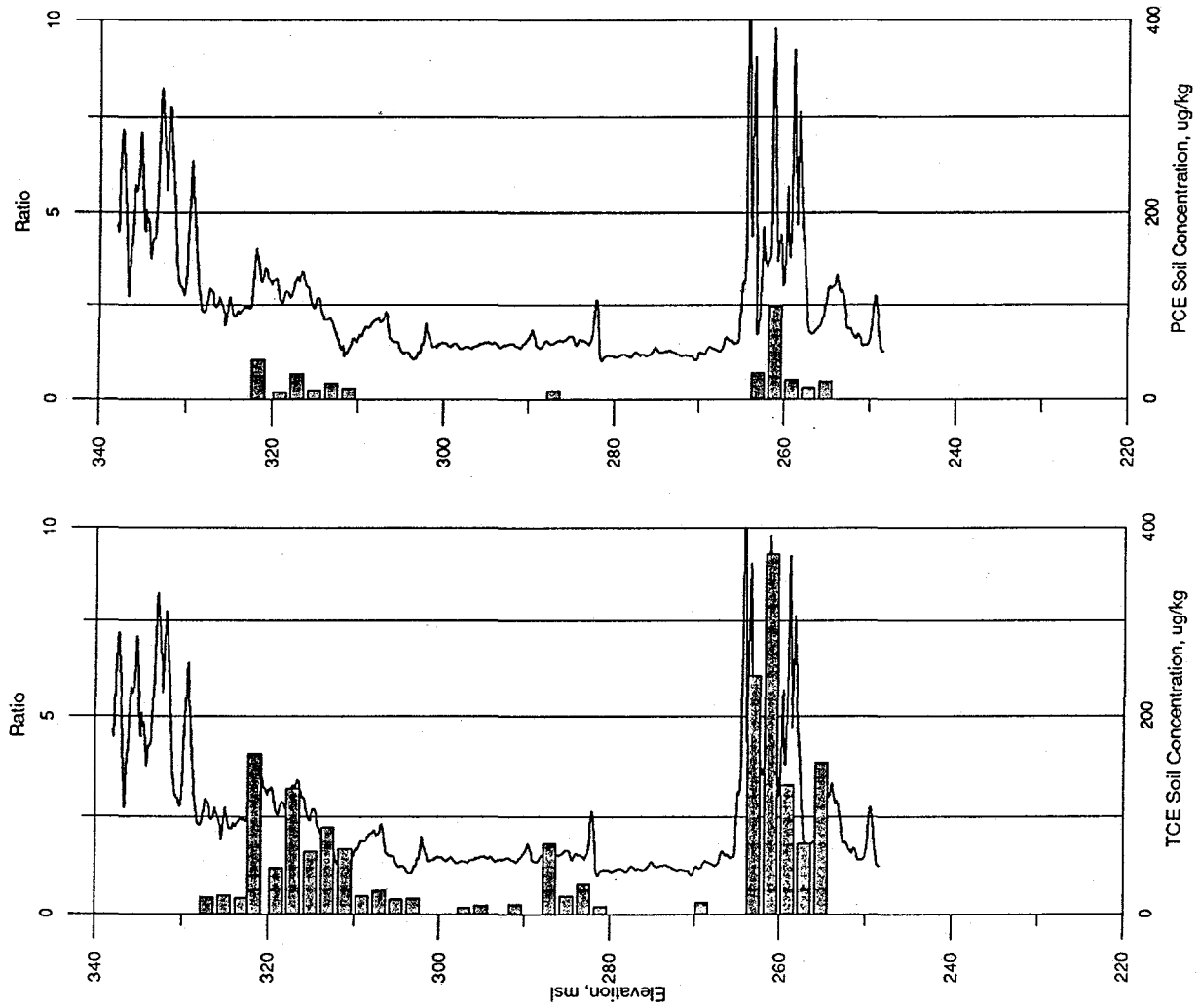


Figure 11: CPT-MCB-S1 TCE and PCE Sediment Concentration

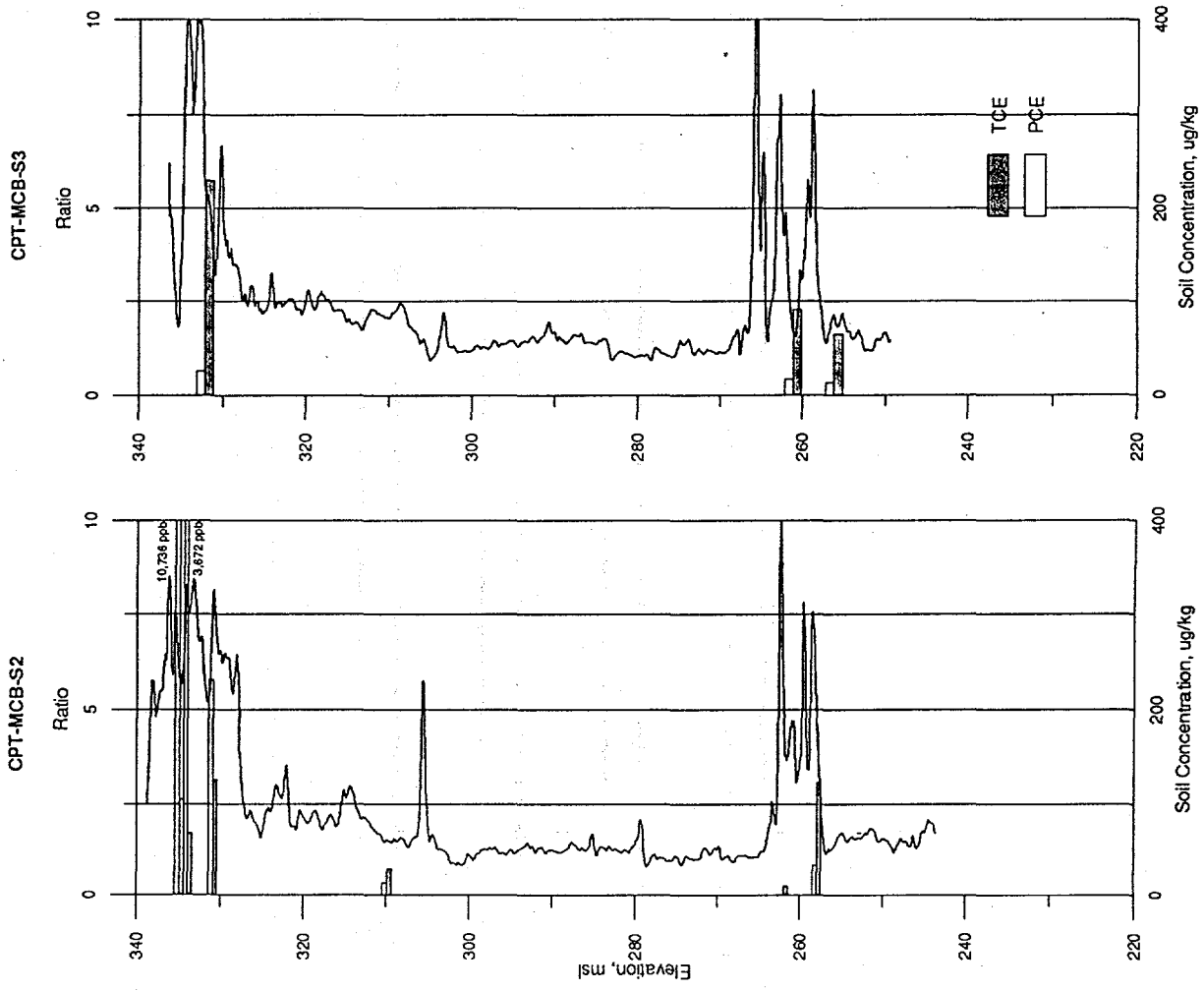


Figure 12: CPT-MCB-S2 and CPT-MCB-S3 TCE and PCE Sediment Concentration

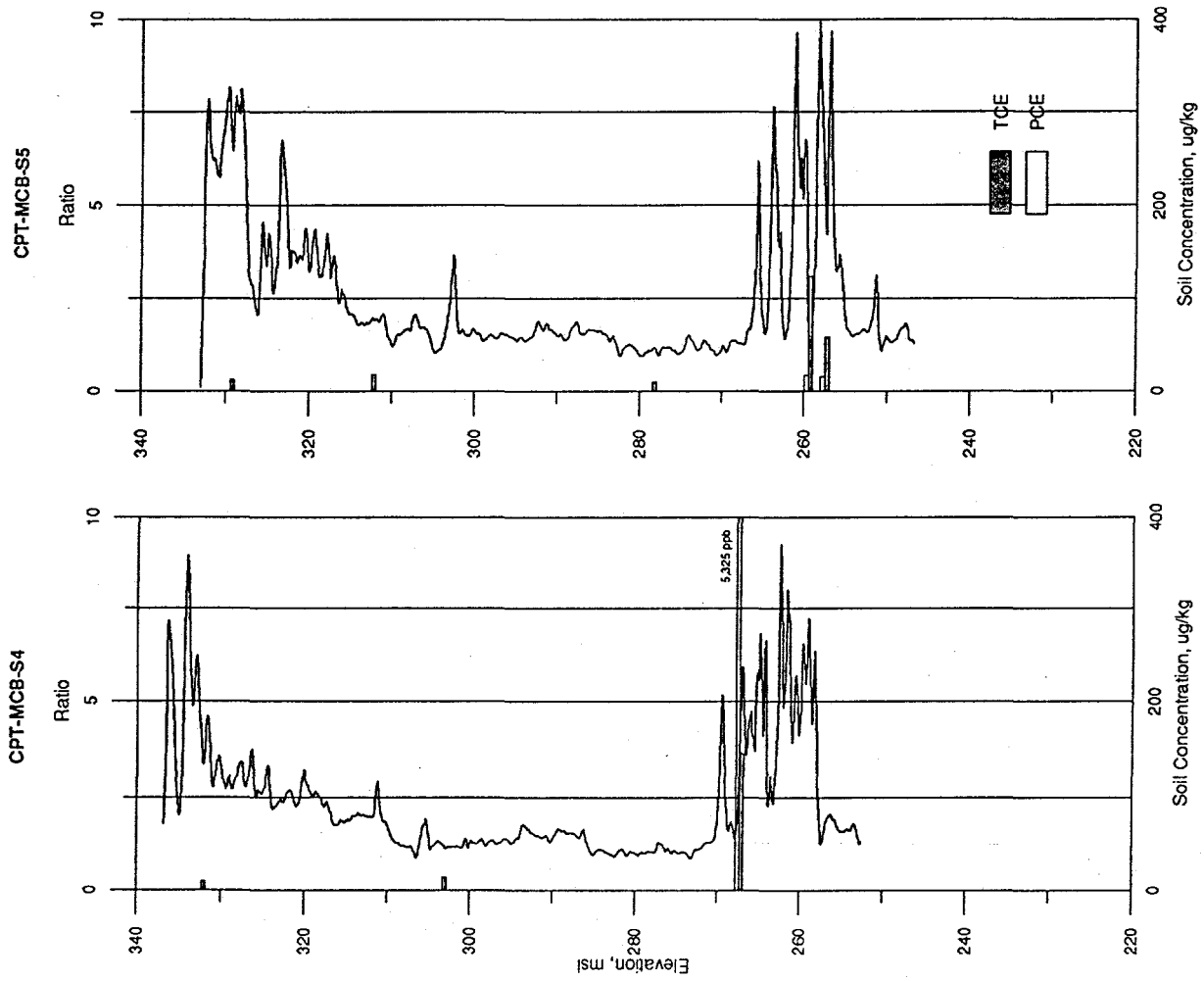


Figure 13: CPT-MCB-S4 and CPT-MCB-S5 TCE and PCE Sediment Concentration

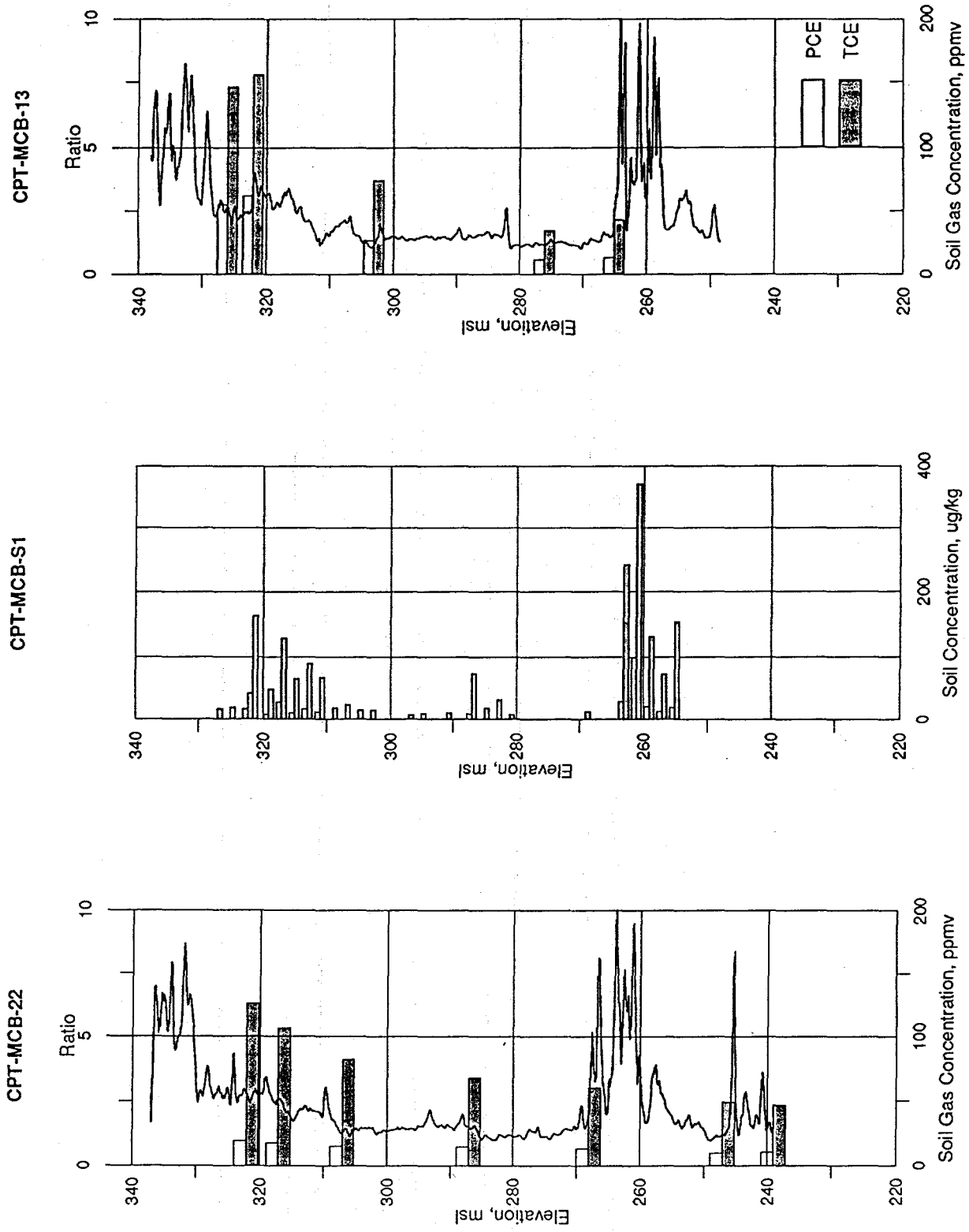


Figure 14: Sediment and Soil Gas Correlation for CPT-MCB-S1

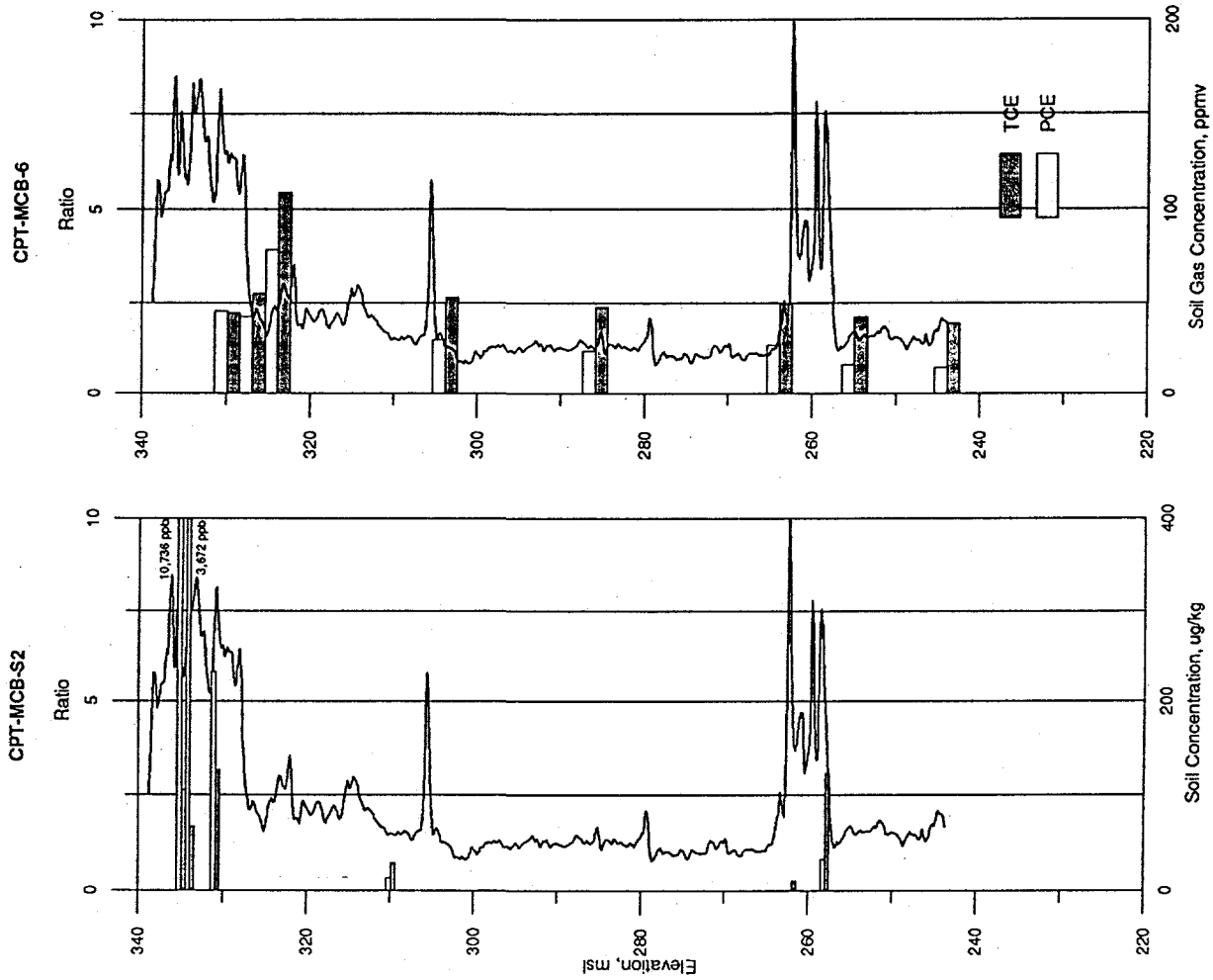


Figure 15: Sediment and Soil Gas Correlation for CPT-MCB-S2

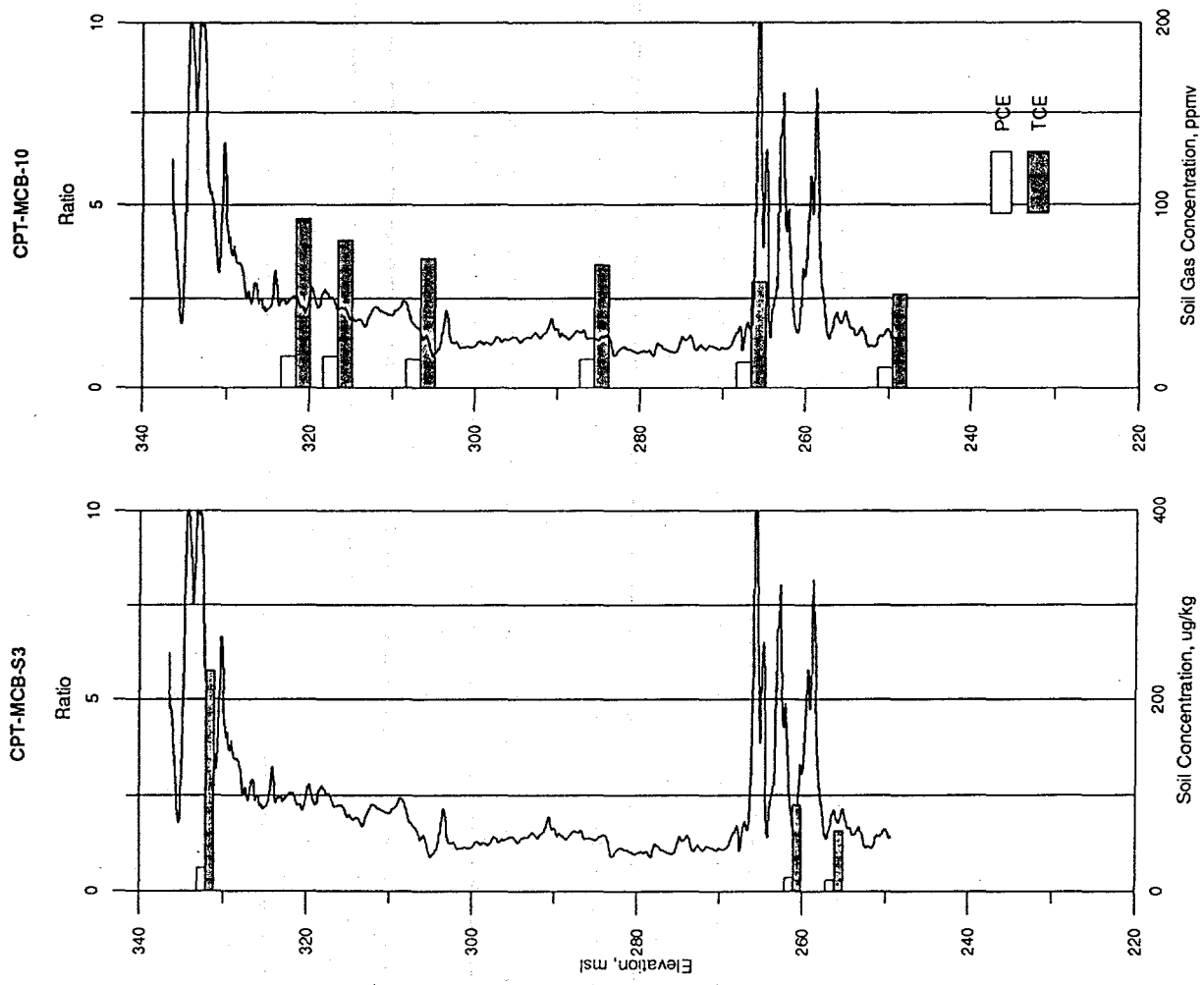


Figure 16: Sediment and Soil Gas Correlation for CPT-MCB-S3

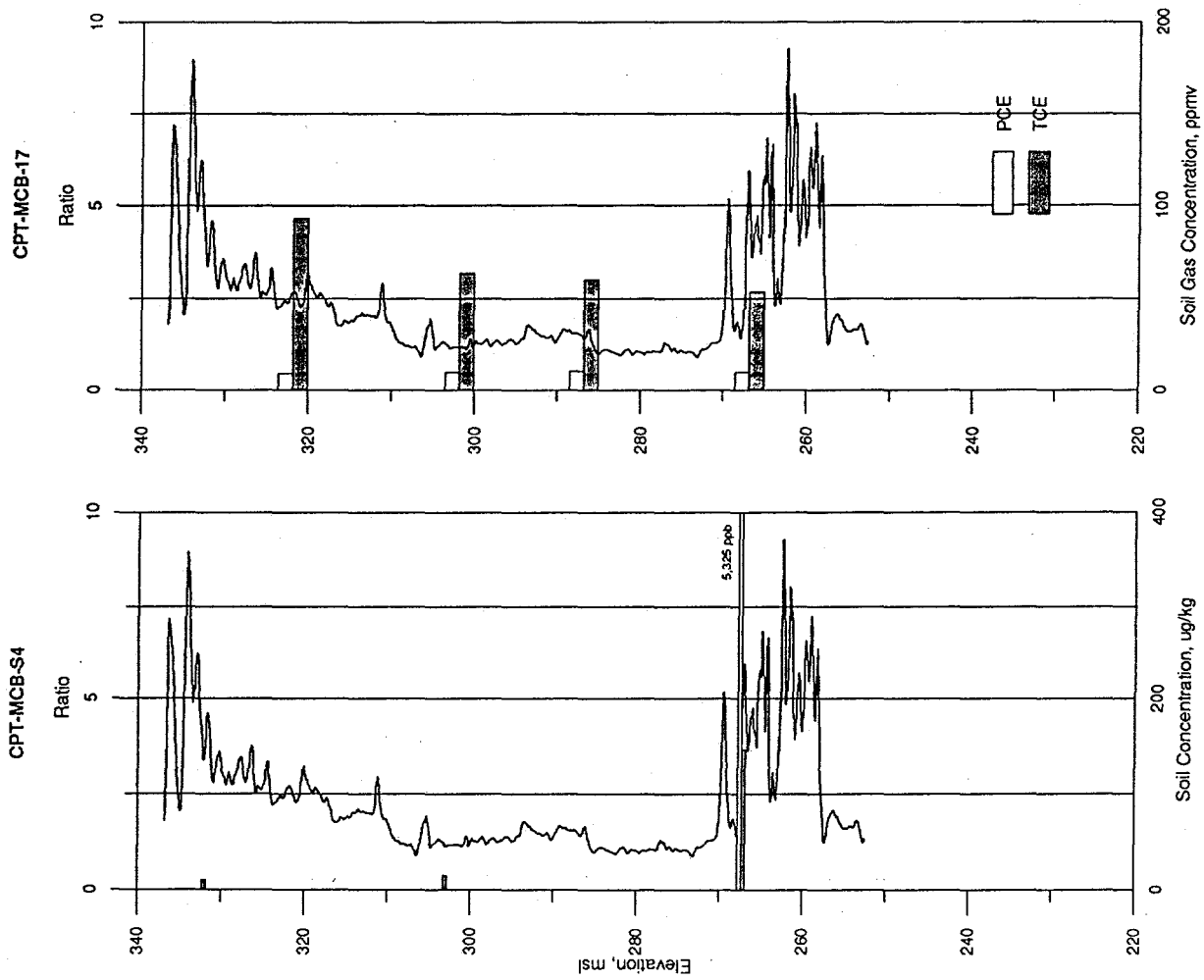


Figure 17: Sediment and Soil Gas Correlation for CPT-MCB-S4

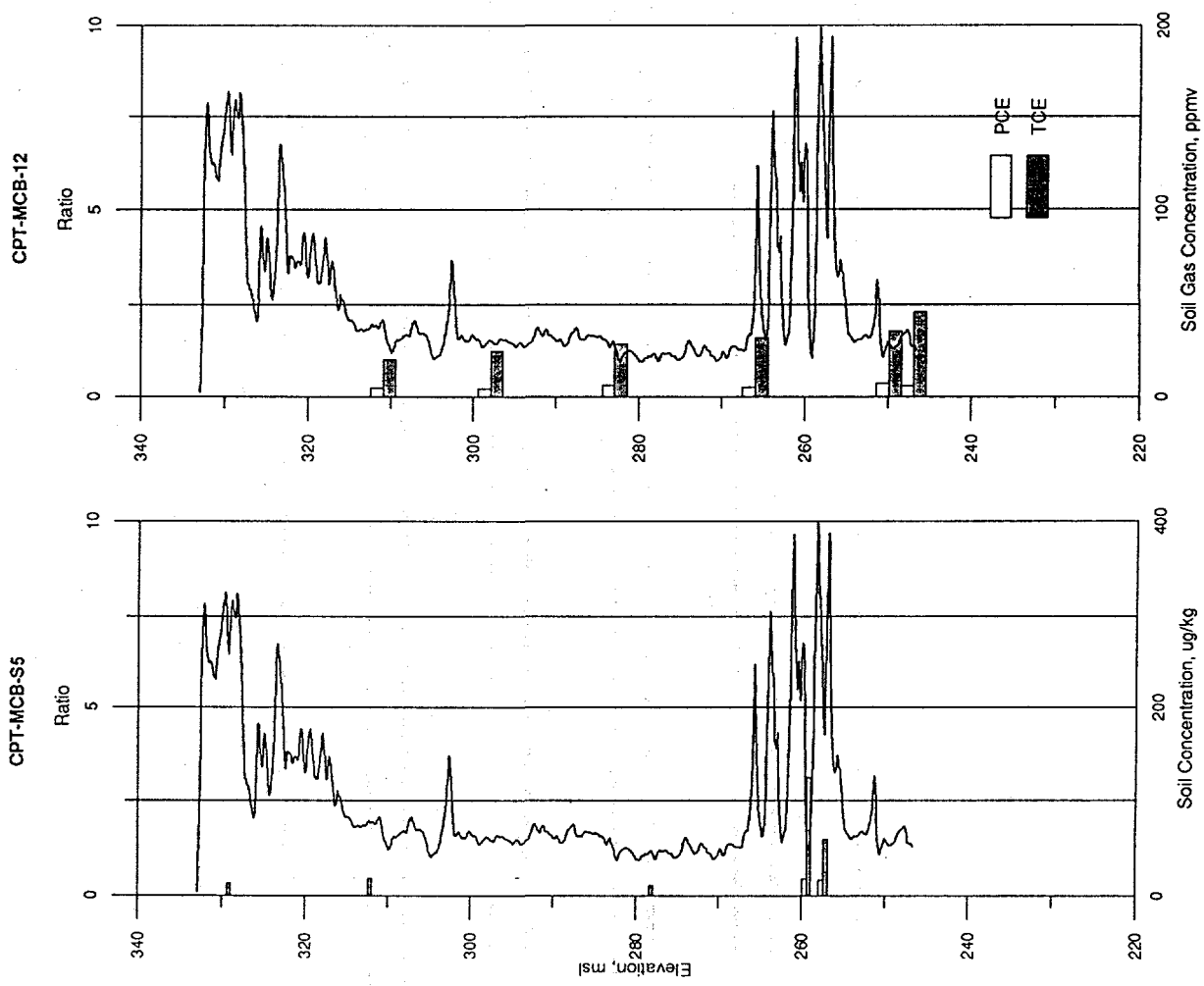


Figure 18: Sediment and Soil Gas Correlation for CPT-MCB-S5

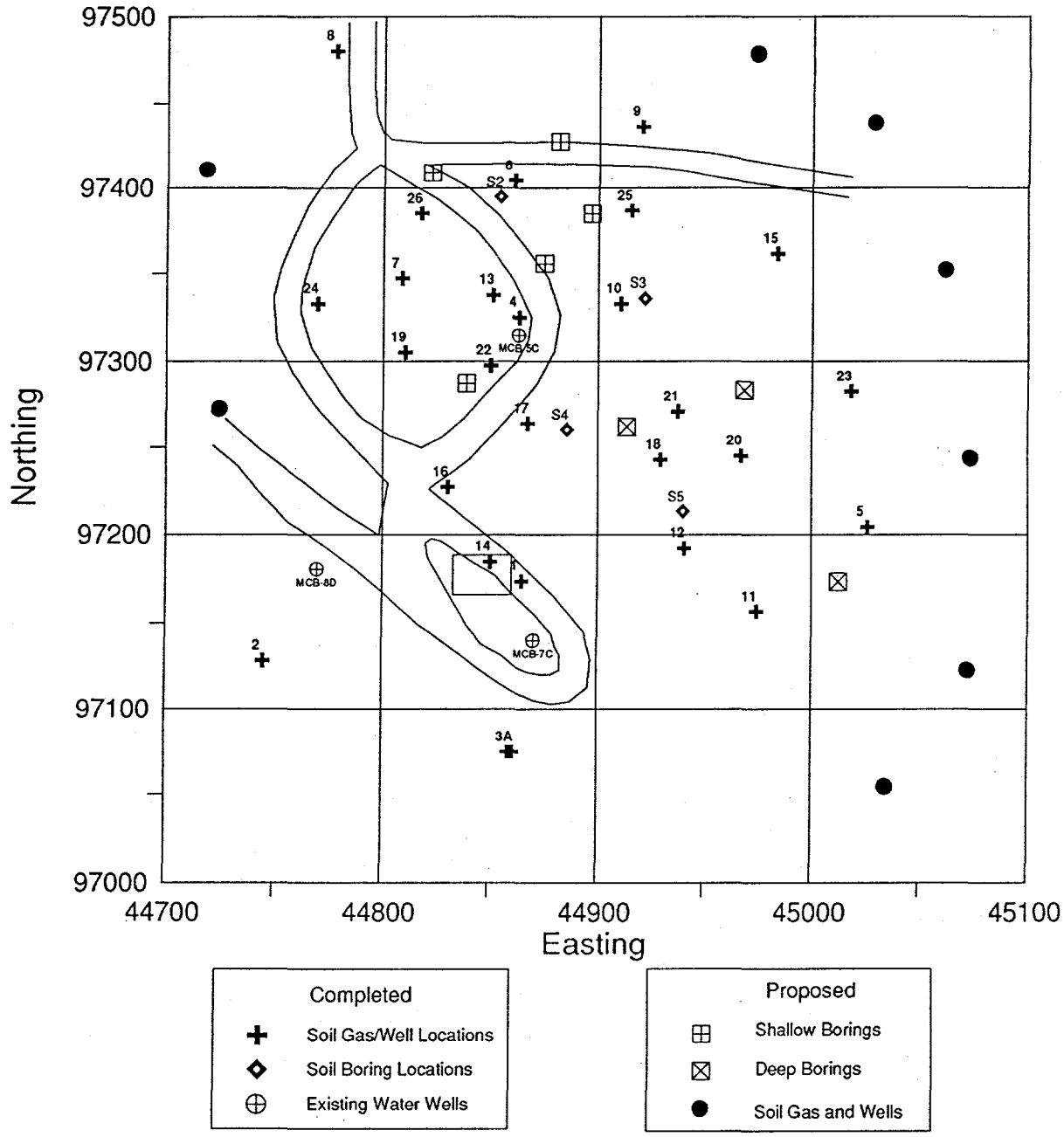
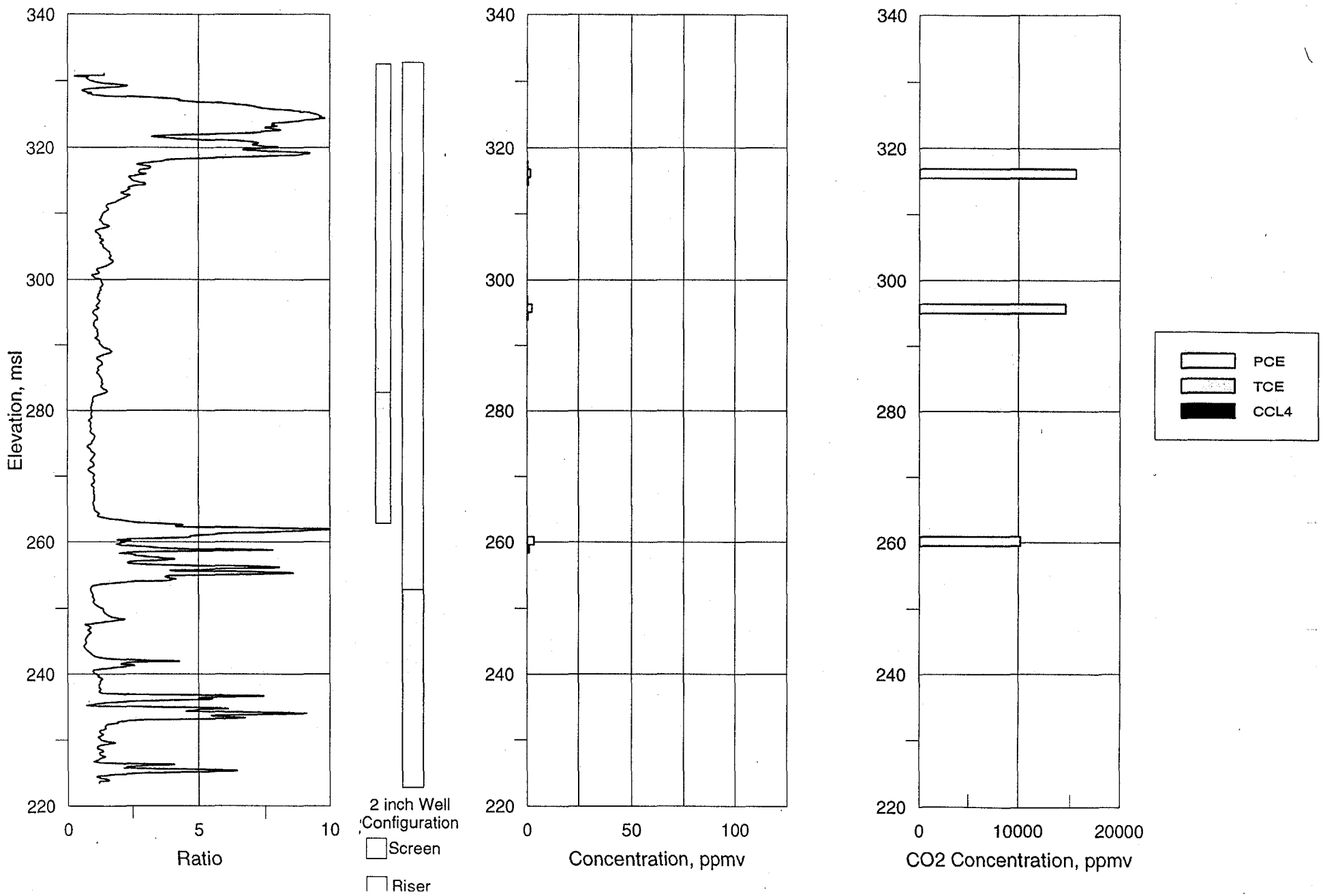


Figure 19: Proposed Additional Characterization Locations

APPENDIX A

CPT Ratio and Soil Gas Profile Plots

CPT-MCB-3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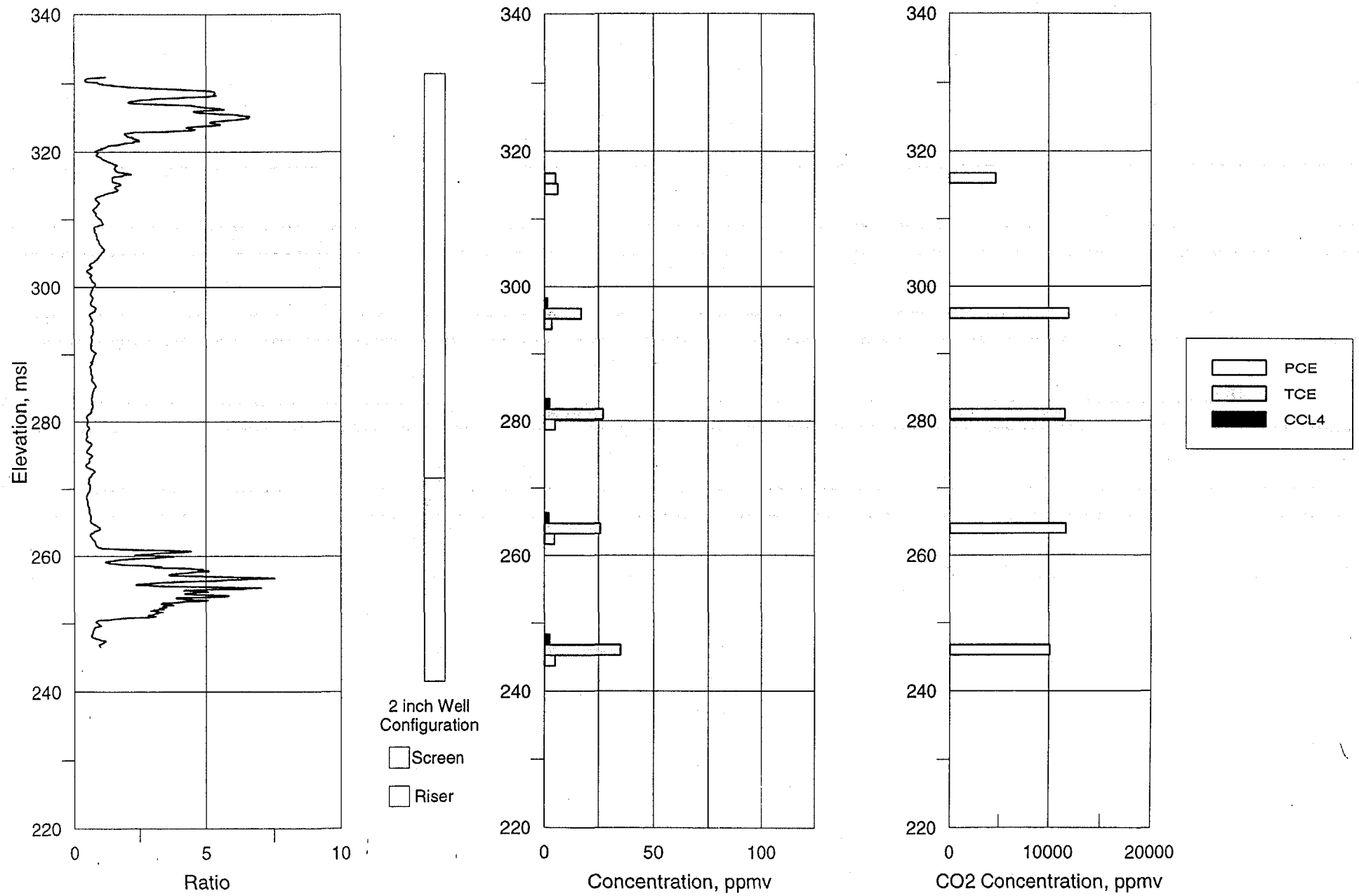
CO2 Concentration, ppmv
PCE
TCE
CCL4

CPT-MCB-5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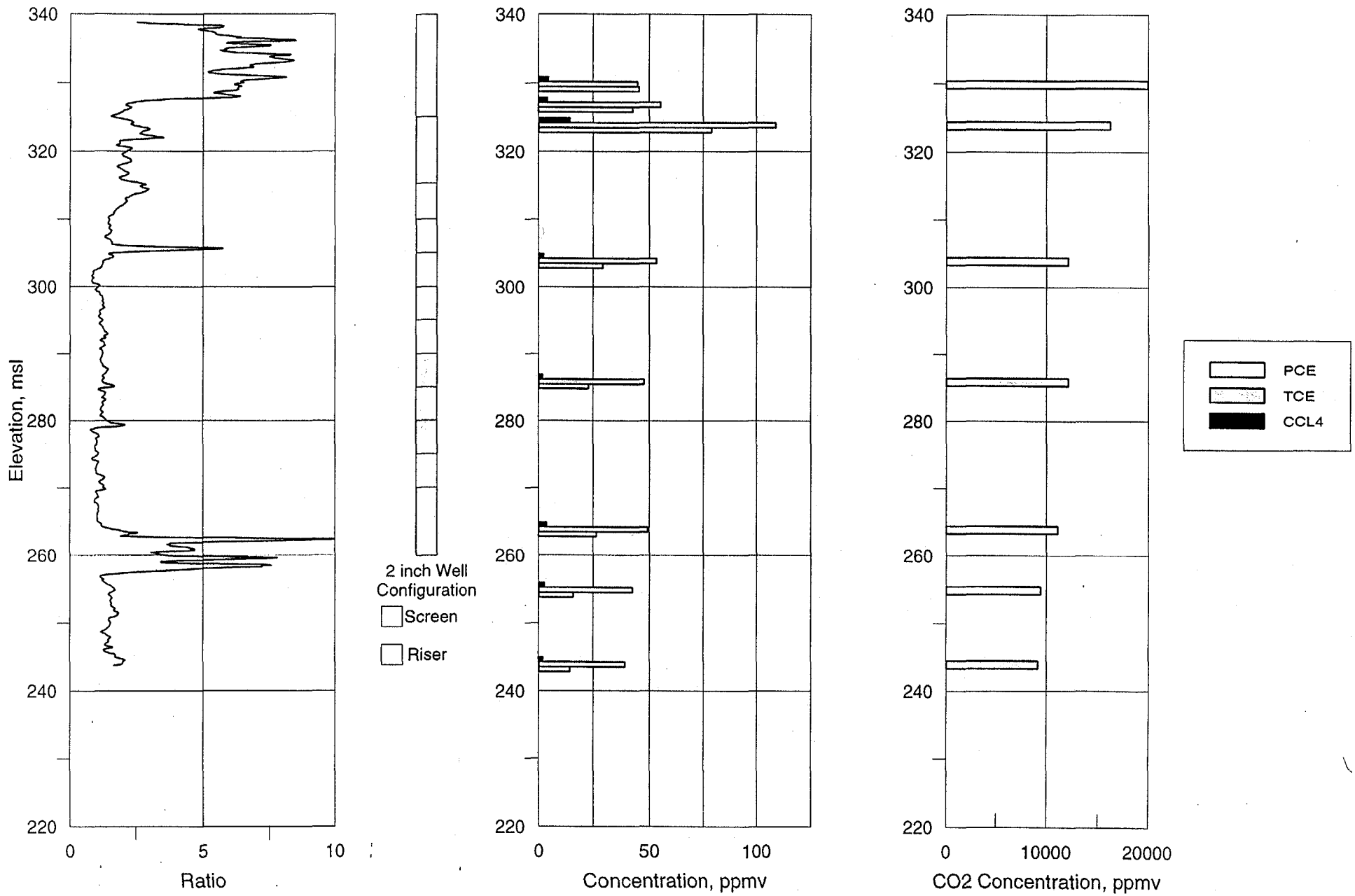
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CO2 Concentration, ppmv
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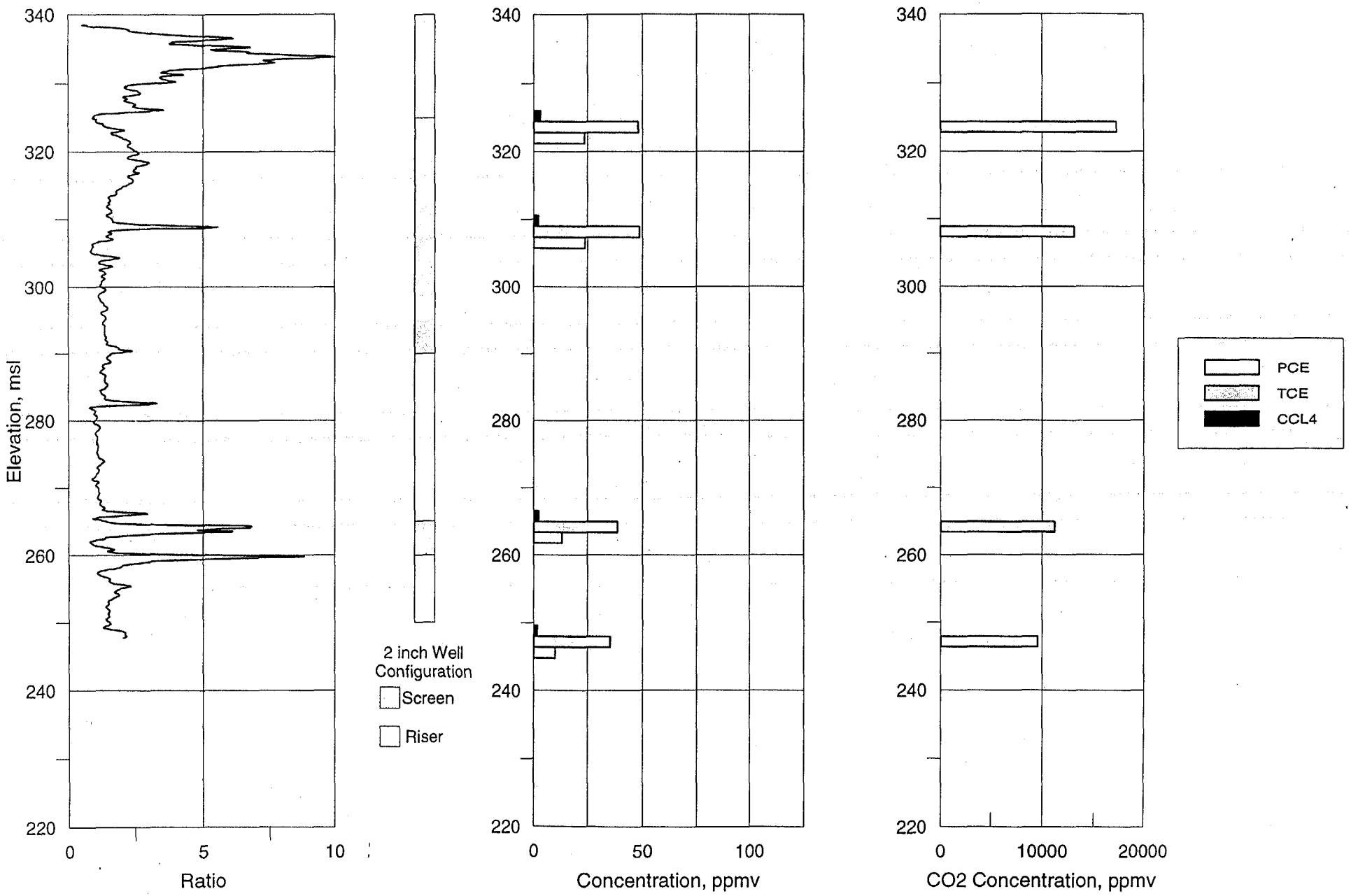
TCE
CCL4

CPT-MCB-7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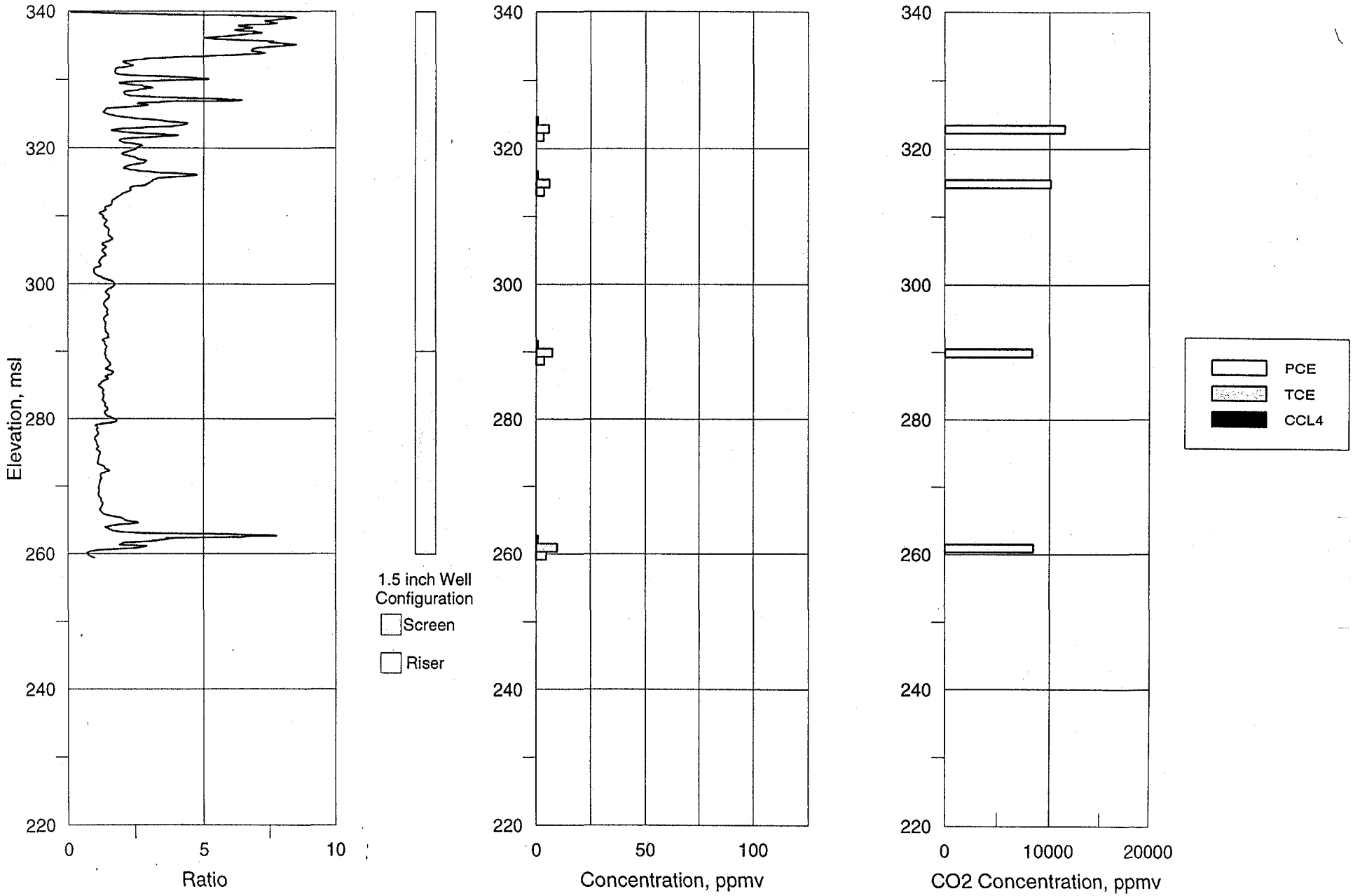
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CO2 Concentration, ppmv
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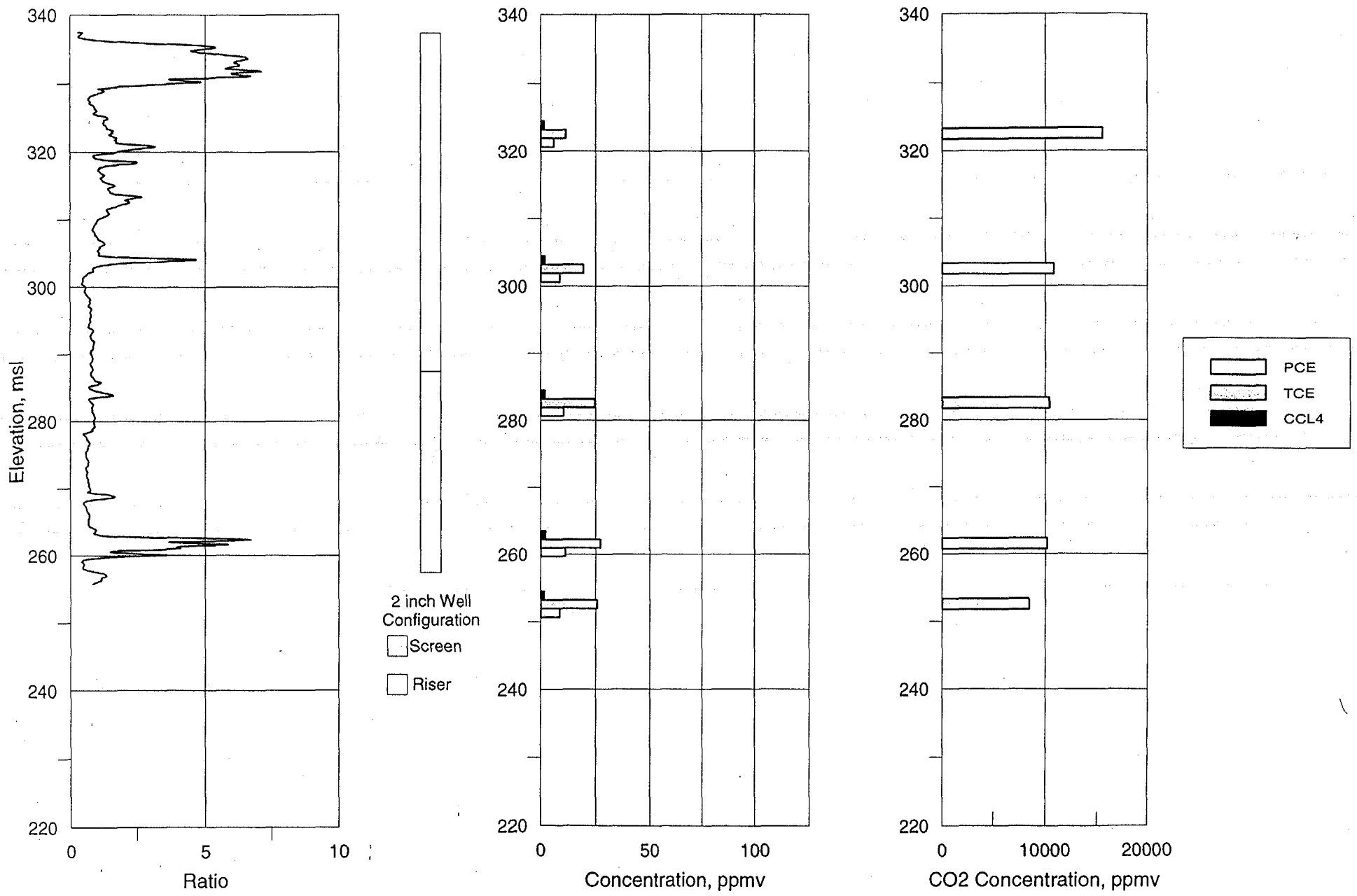
CPT-MCB-9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TCE
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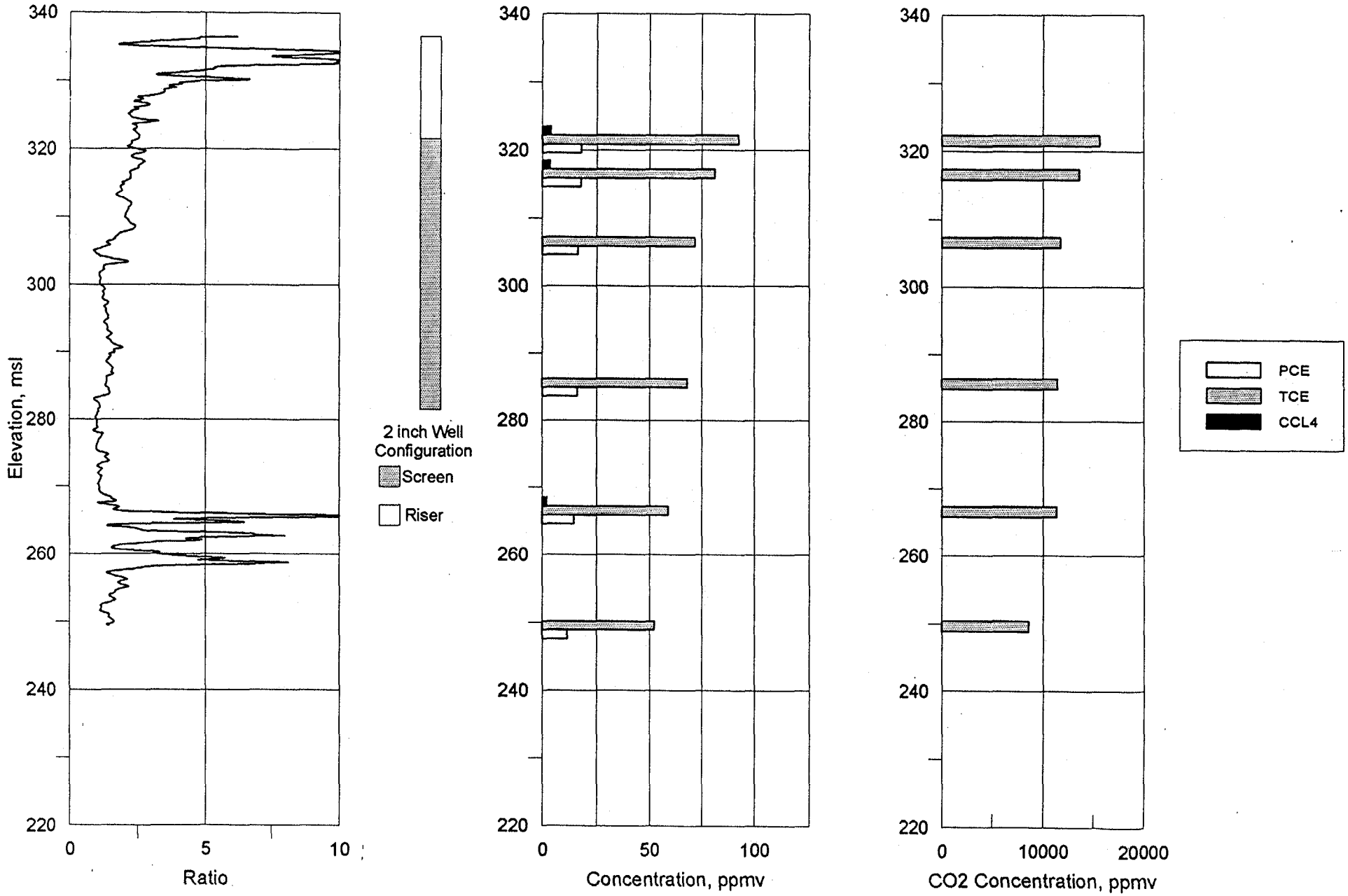
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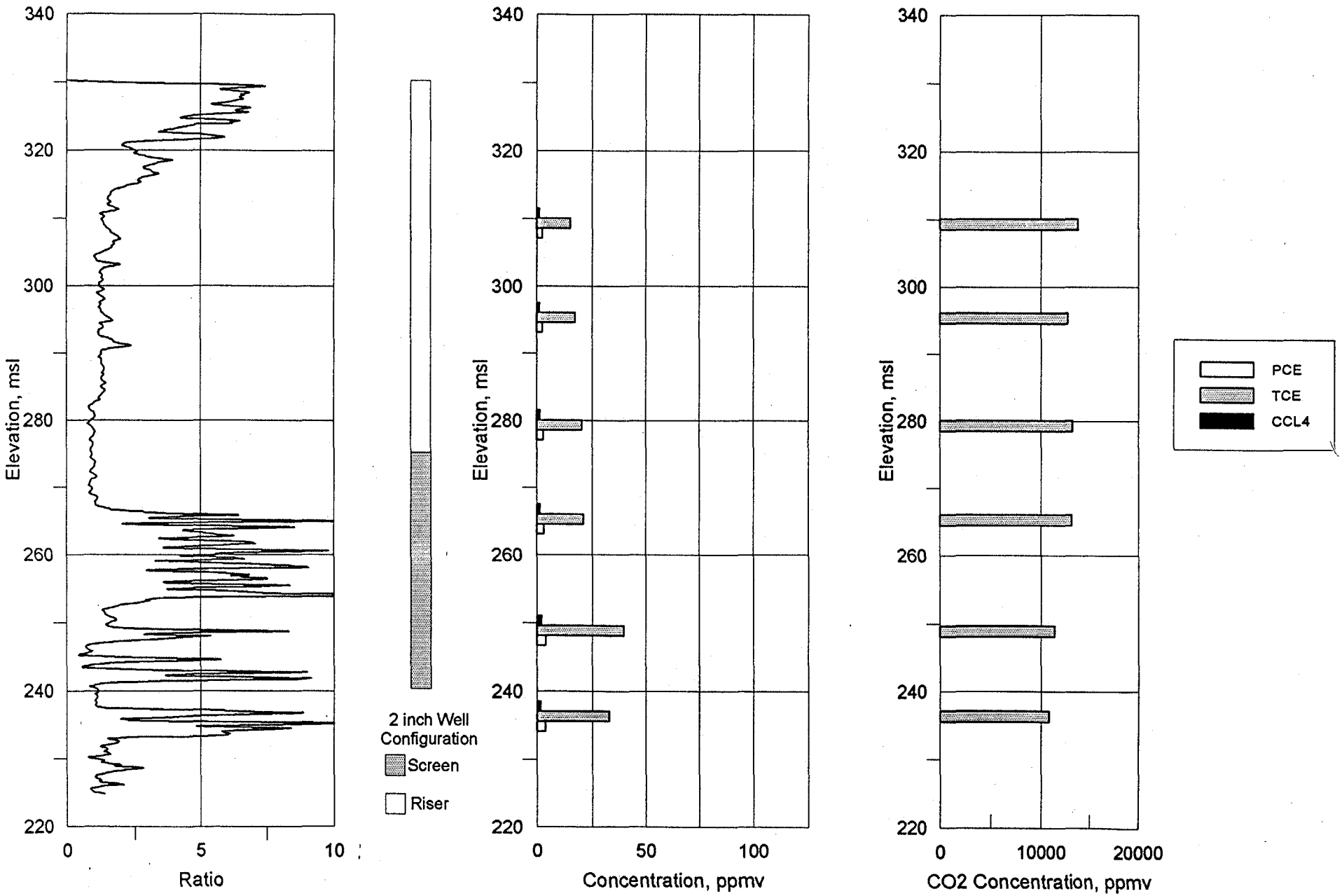
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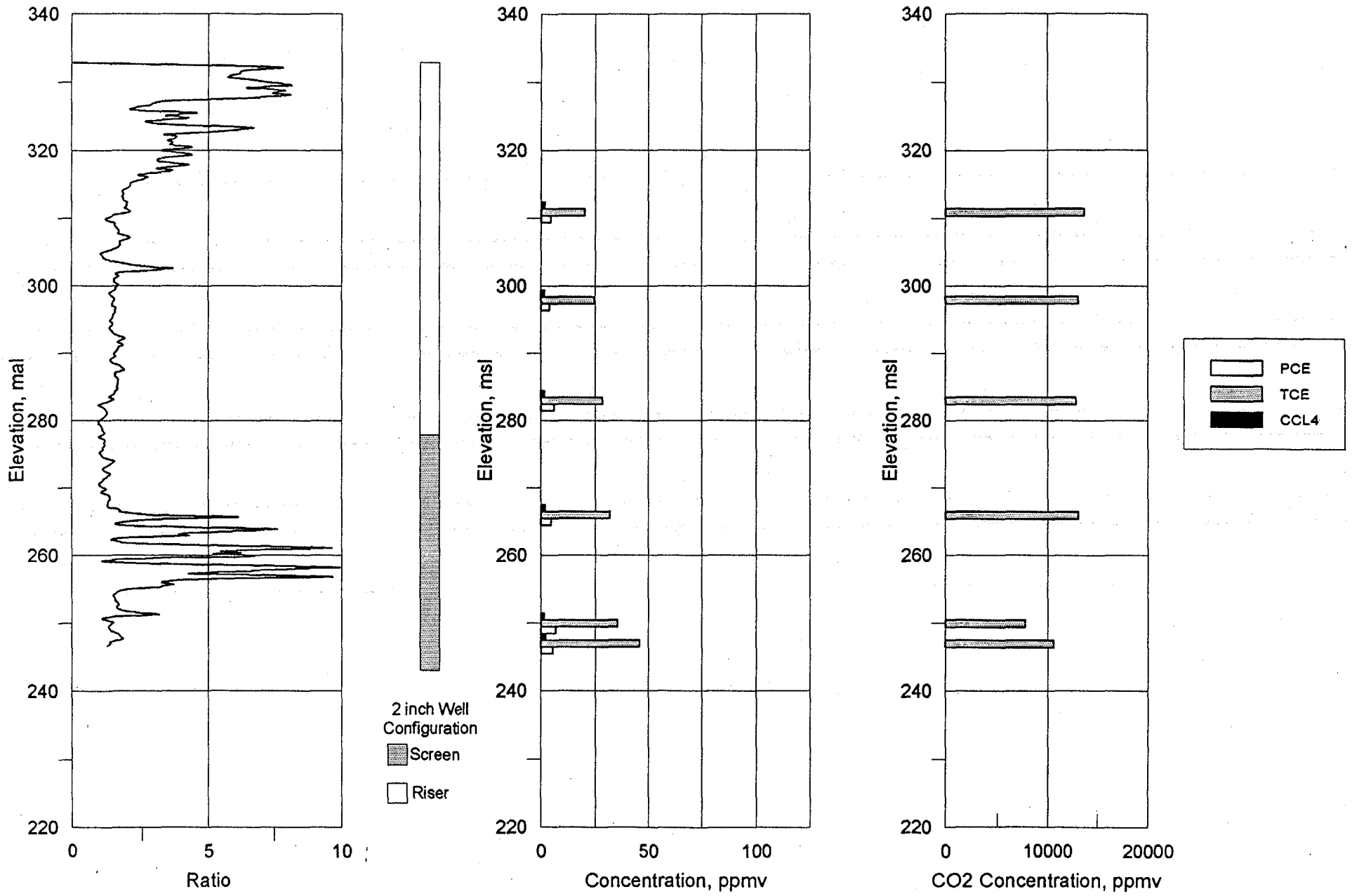
CO2 Concentration, ppmv
PCE
TCE
CCL4

CPT-MCB-12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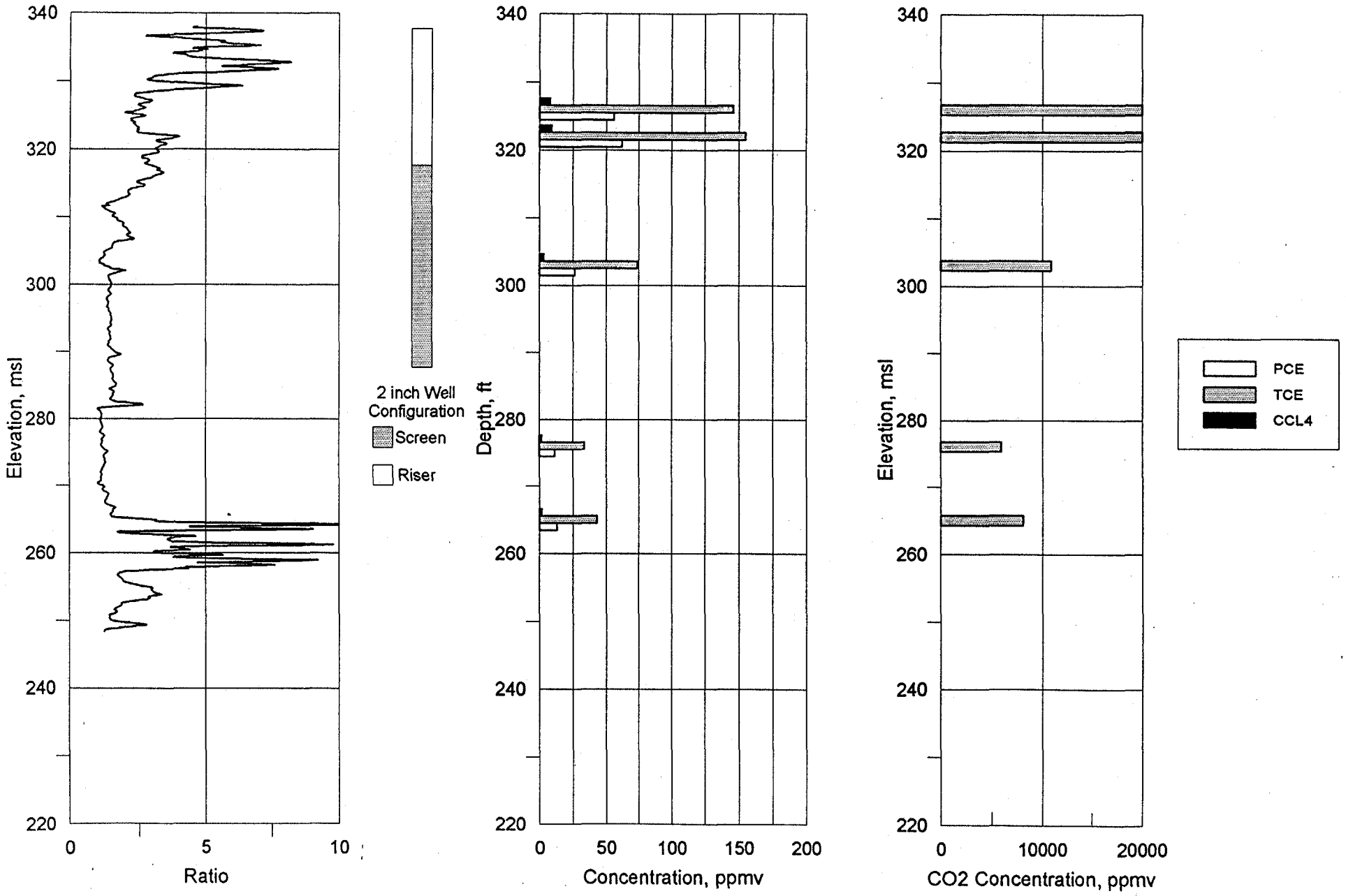
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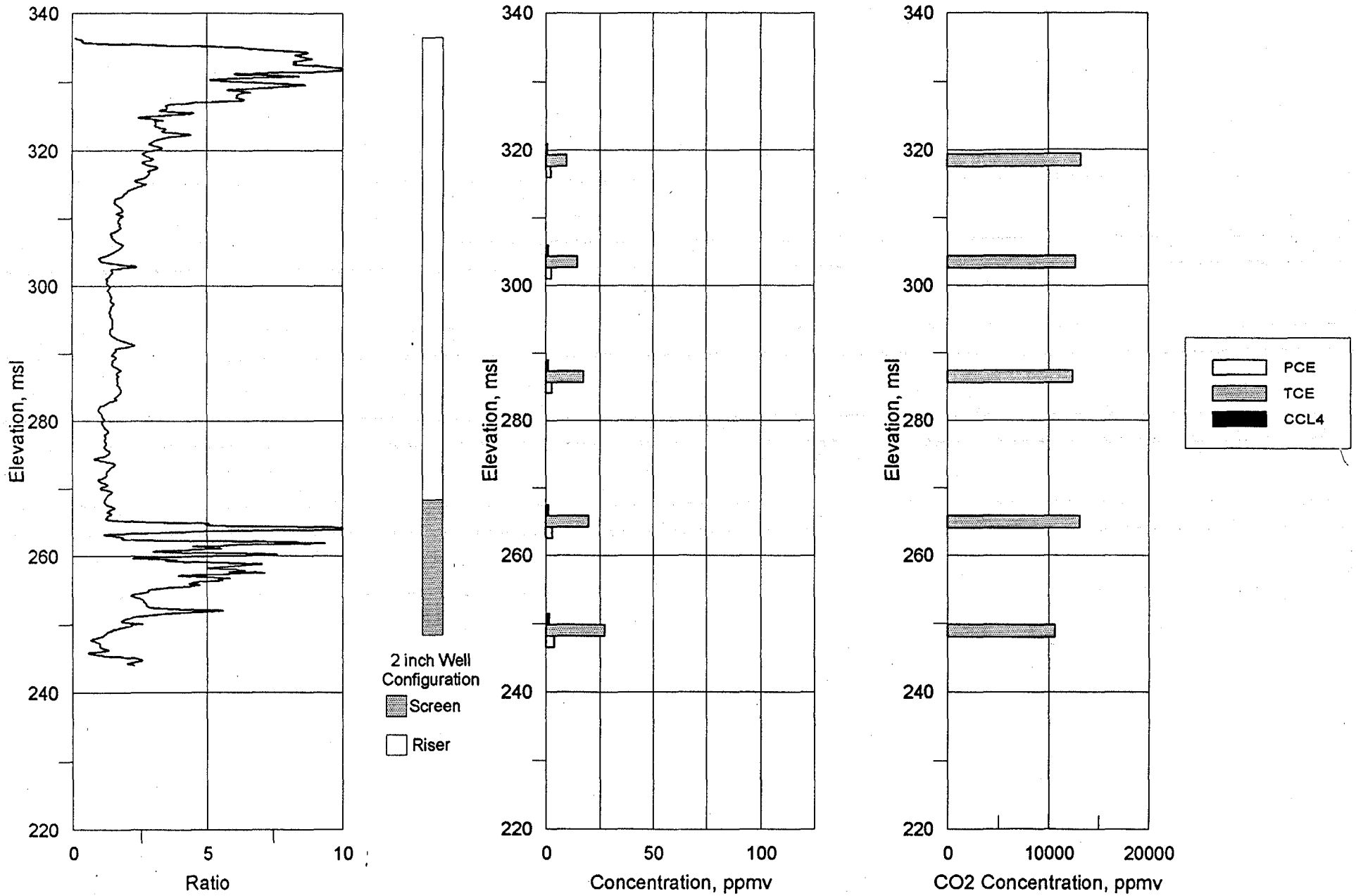
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CO2 Concentration, ppmv
PCE
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CCL4

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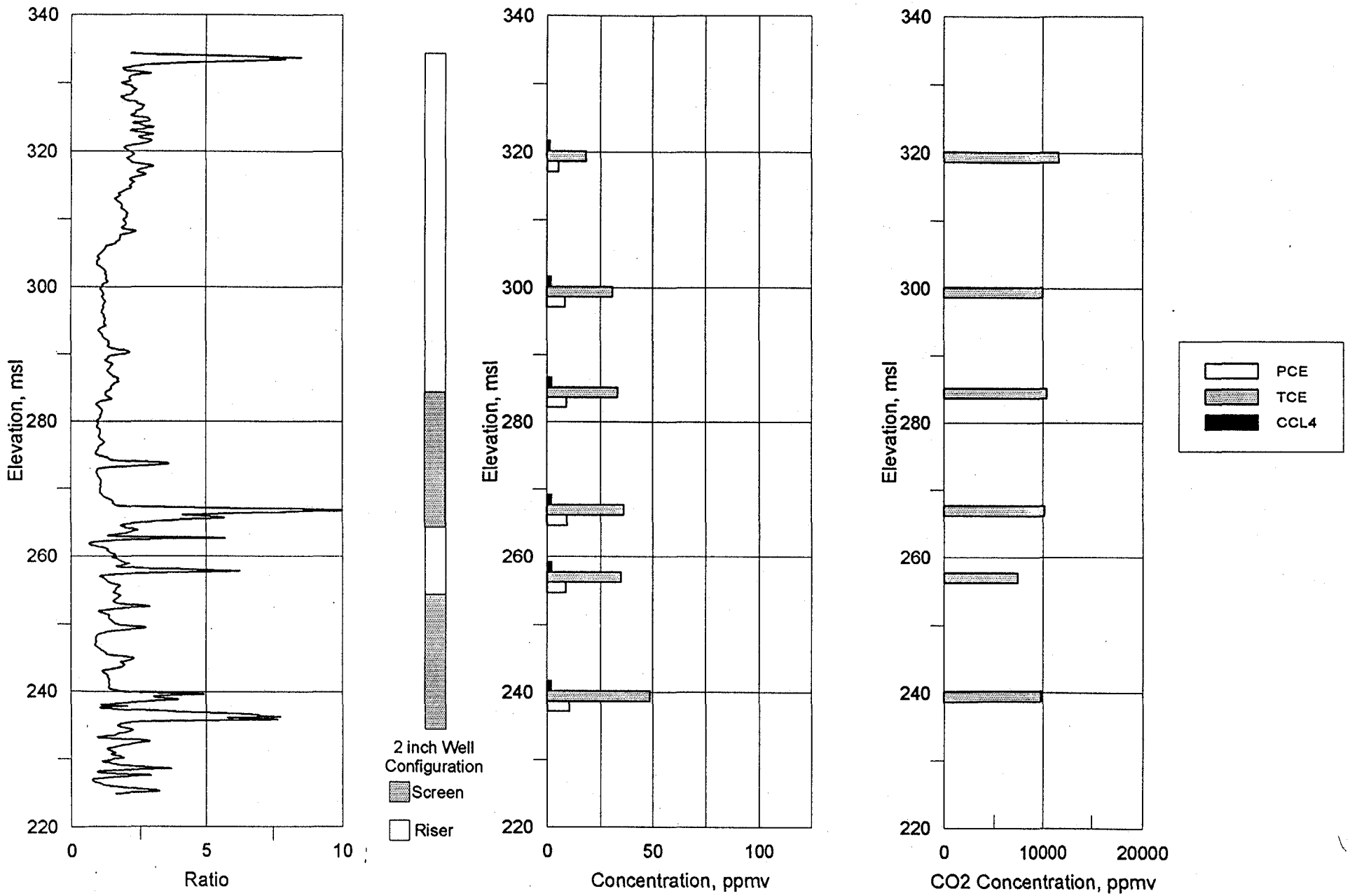
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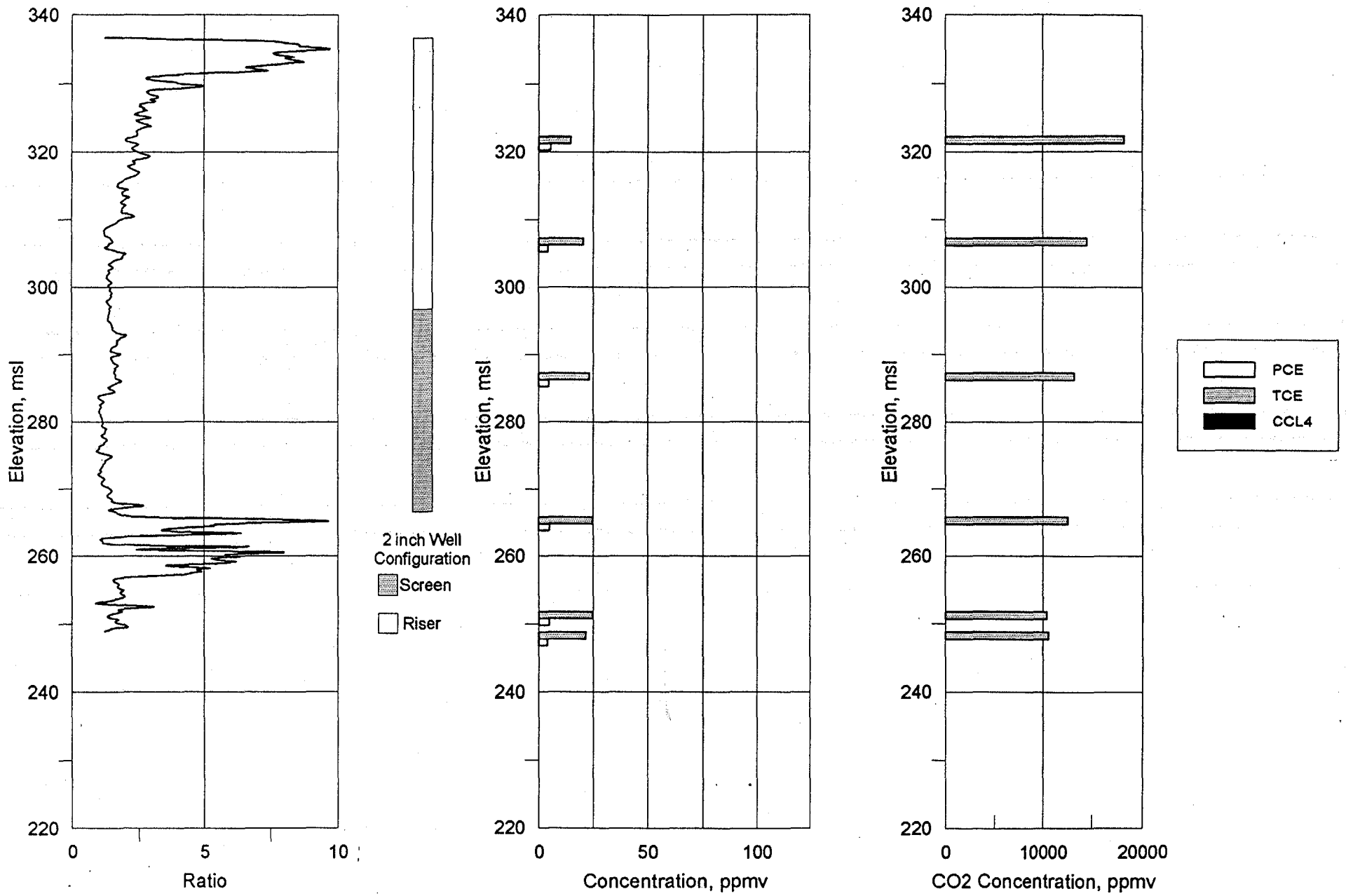
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PCE
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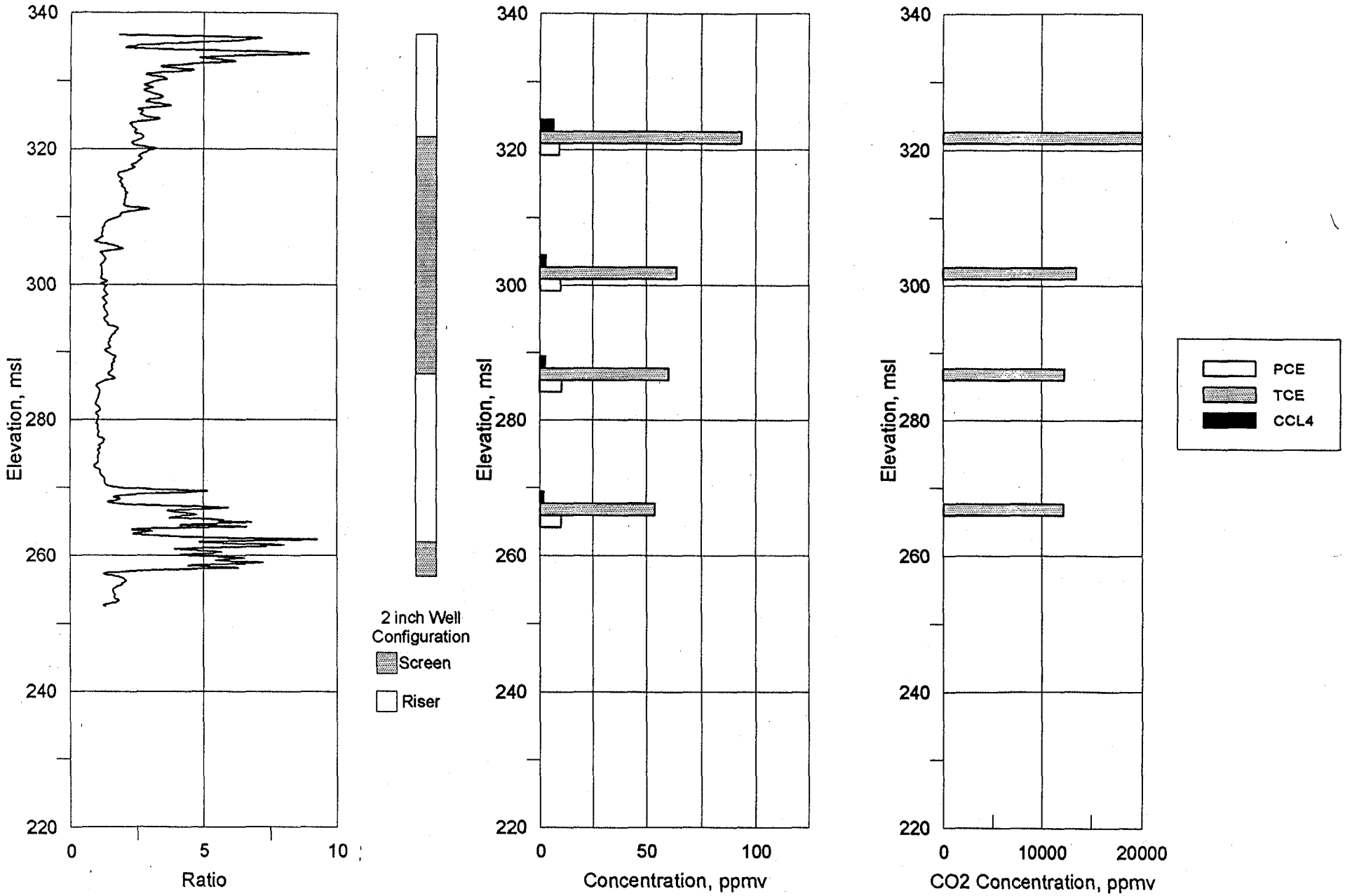
CPT-MCB-17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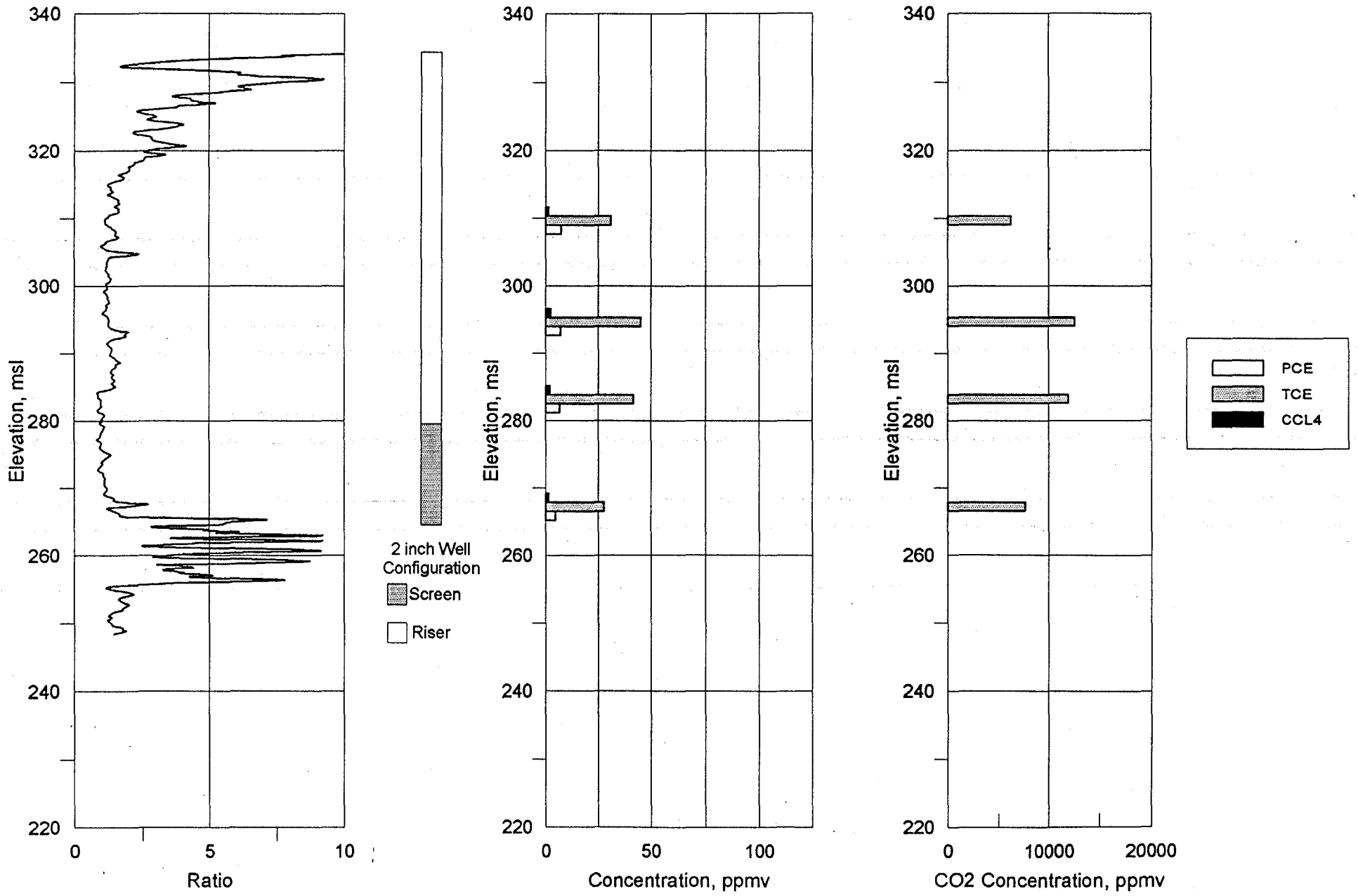
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Elevation, msl
0
5
10
Ratio
2 inch Well Configuration
Screen
Riser
0
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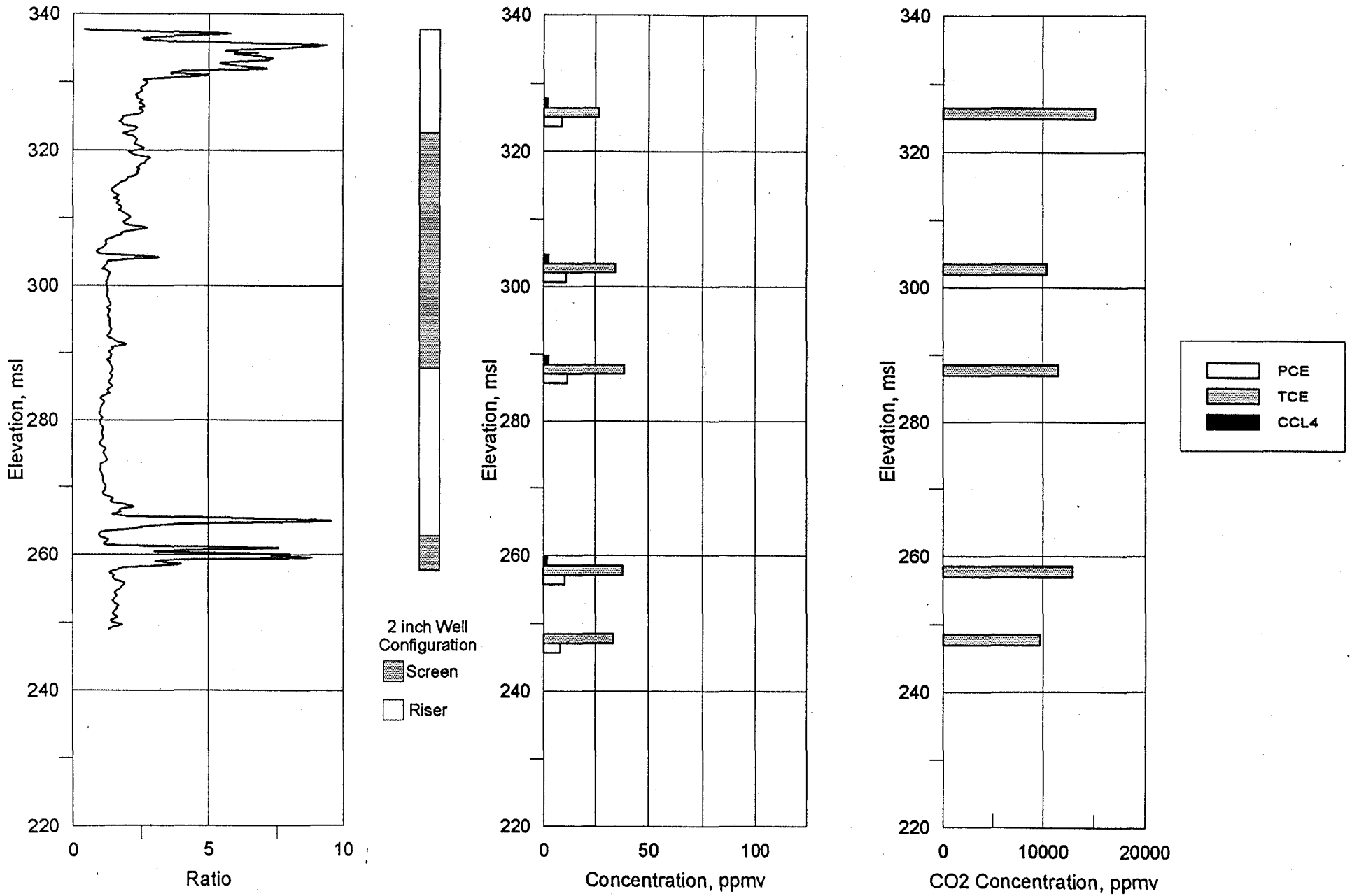
100
Concentration, ppmv
0
10000
20000
CO2 Concentration, ppmv
PCE
TCE
CCL4

CPT-MCB-19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Ratio
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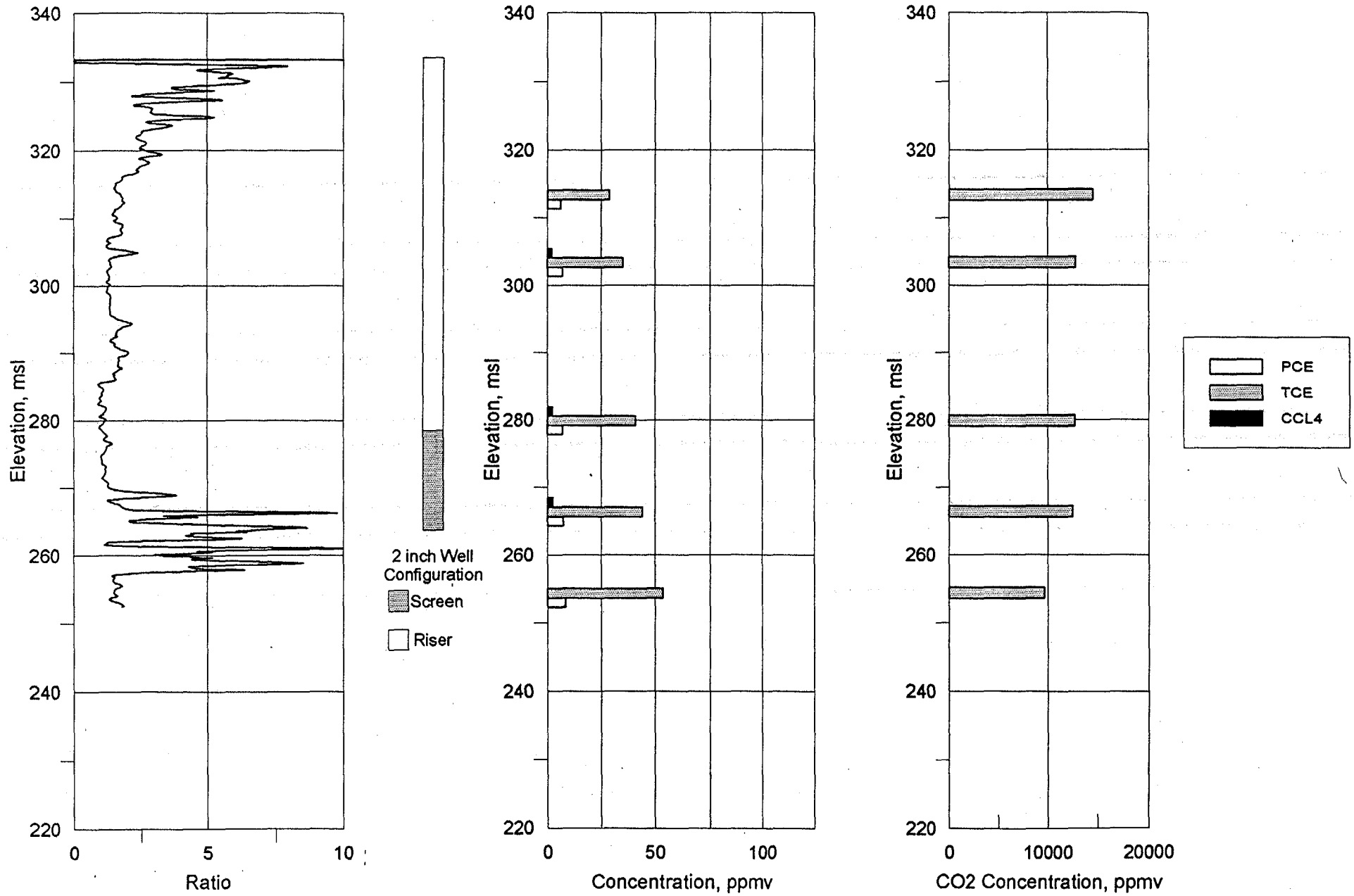
10000
20000
CO2 Concentration, ppmv
PCE
TCE
CCL4

CPT-MCB-20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Elevation, msl
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10
Ratio
2 inch Well Configuration
Screen
Riser
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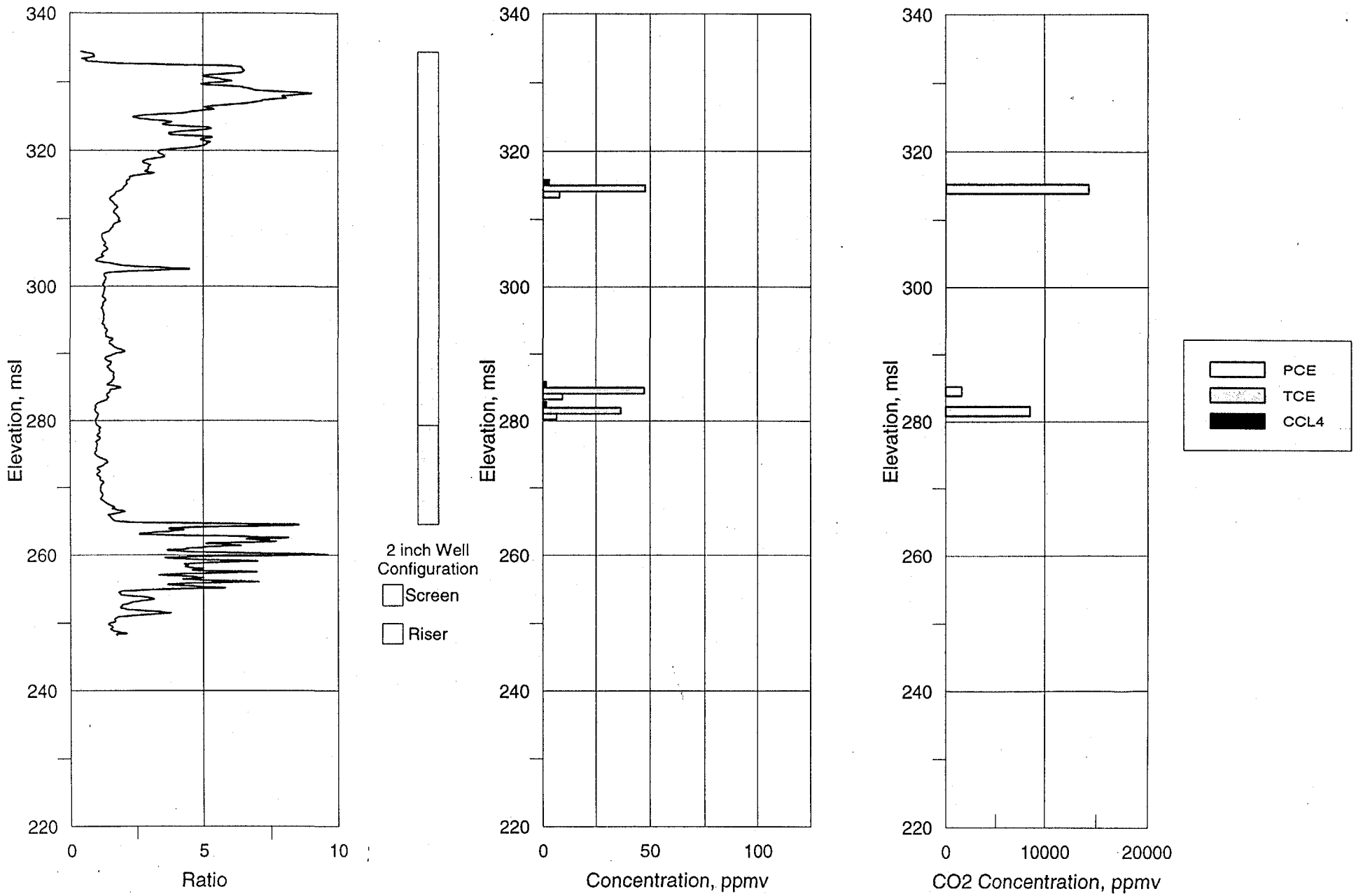
Concentration, ppmv
0
10000
20000
CO2 Concentration, ppmv
PCE
TCE
CCL4

CPT-MCB-21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Elevation, msl
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10
Ratio
2 inch Well Configuration
Screen
Riser
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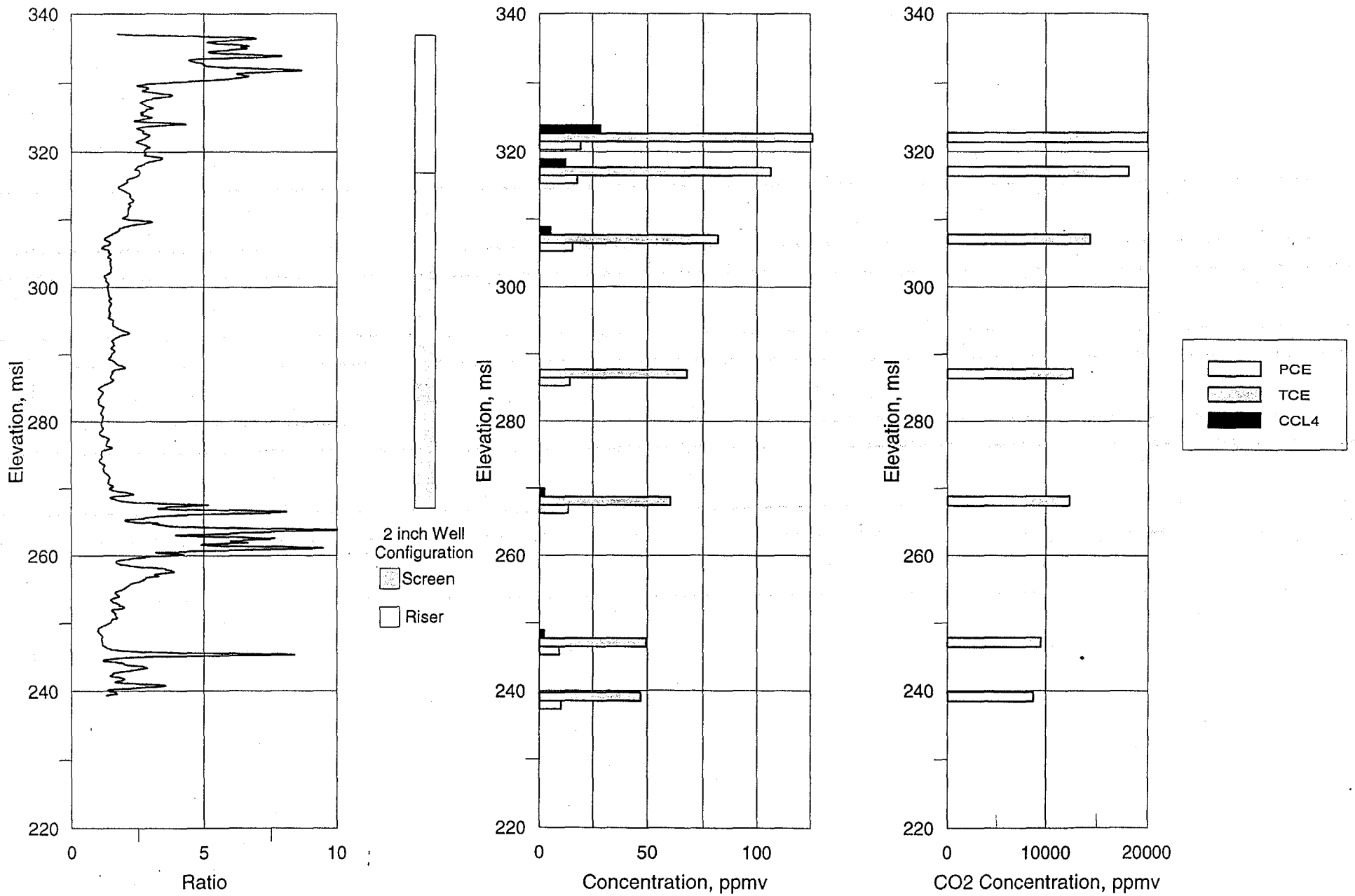
100
Concentration, ppmv
0
10000
20000
CO2 Concentration, ppmv
PCE
TCE
CCL4

CPT-MCB-22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240
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Elevation, msl
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10
Ratio
2 inch Well Configuration
Screen
Riser
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Concentration, ppmv
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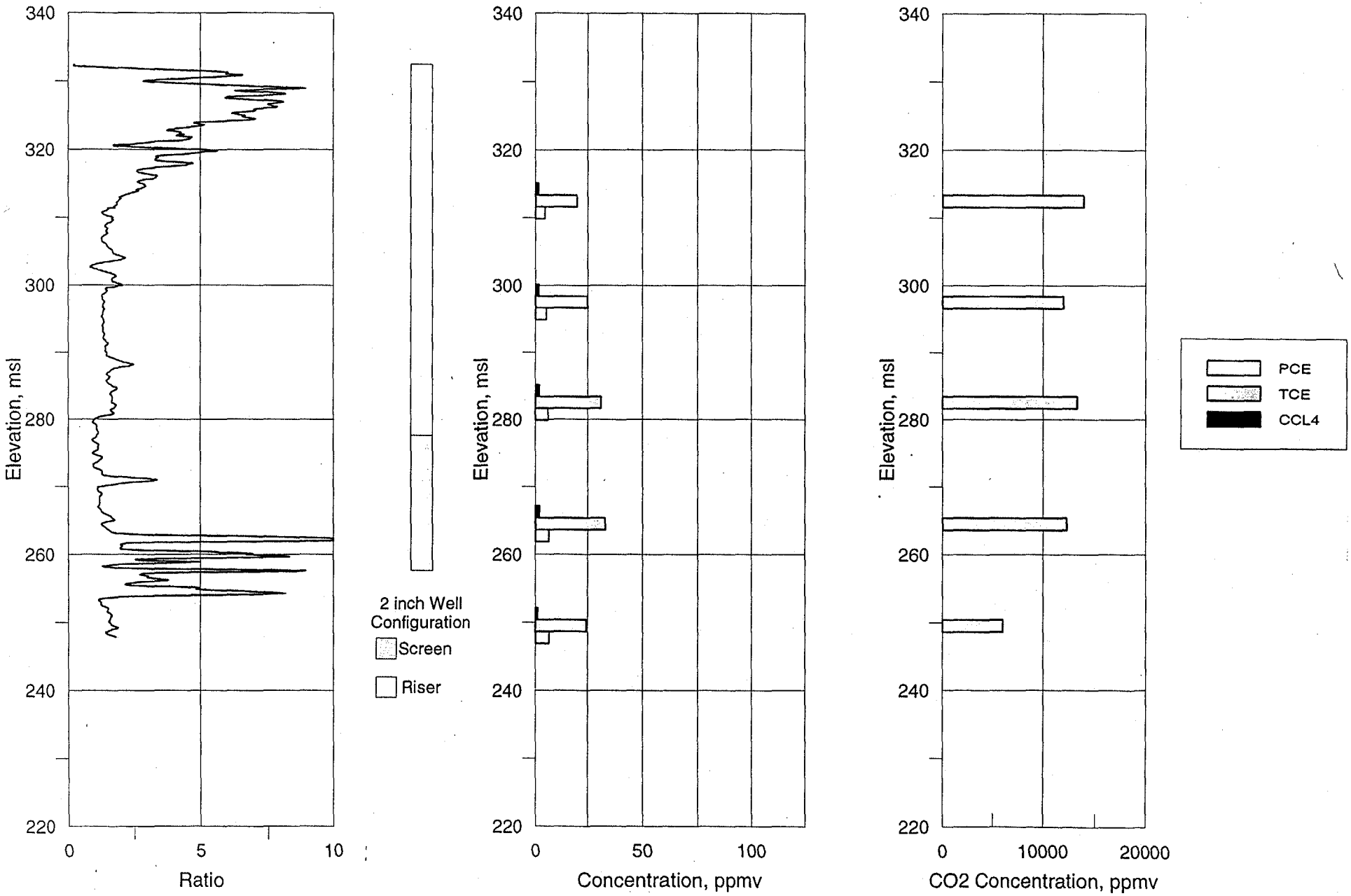
10000
20000
CO2 Concentration, ppmv
PCE
TCE
CCL4

CPT-MCB-23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240
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Elevation, msl
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5
10
Ratio
2 inch Well Configuration
Screen
Riser
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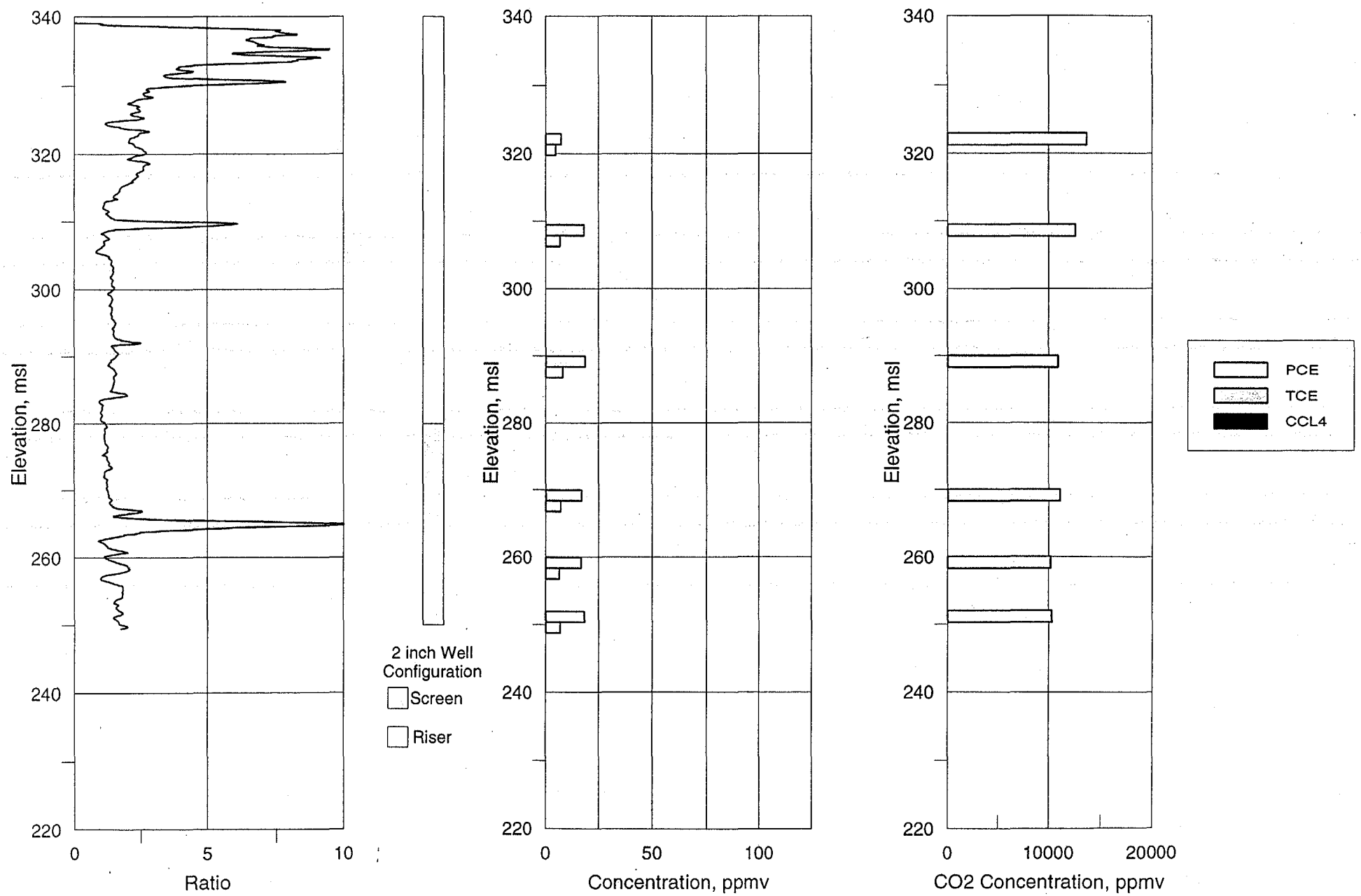
100
Concentration, ppmv
0
10000
20000
CO2 Concentration, ppmv
PCE
TCE
CCL4

CPT-MCB-24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320
300
280
260
240
220
Elevation, msl
0
5
10
Ratio
2 inch Well Configuration
Screen
Riser
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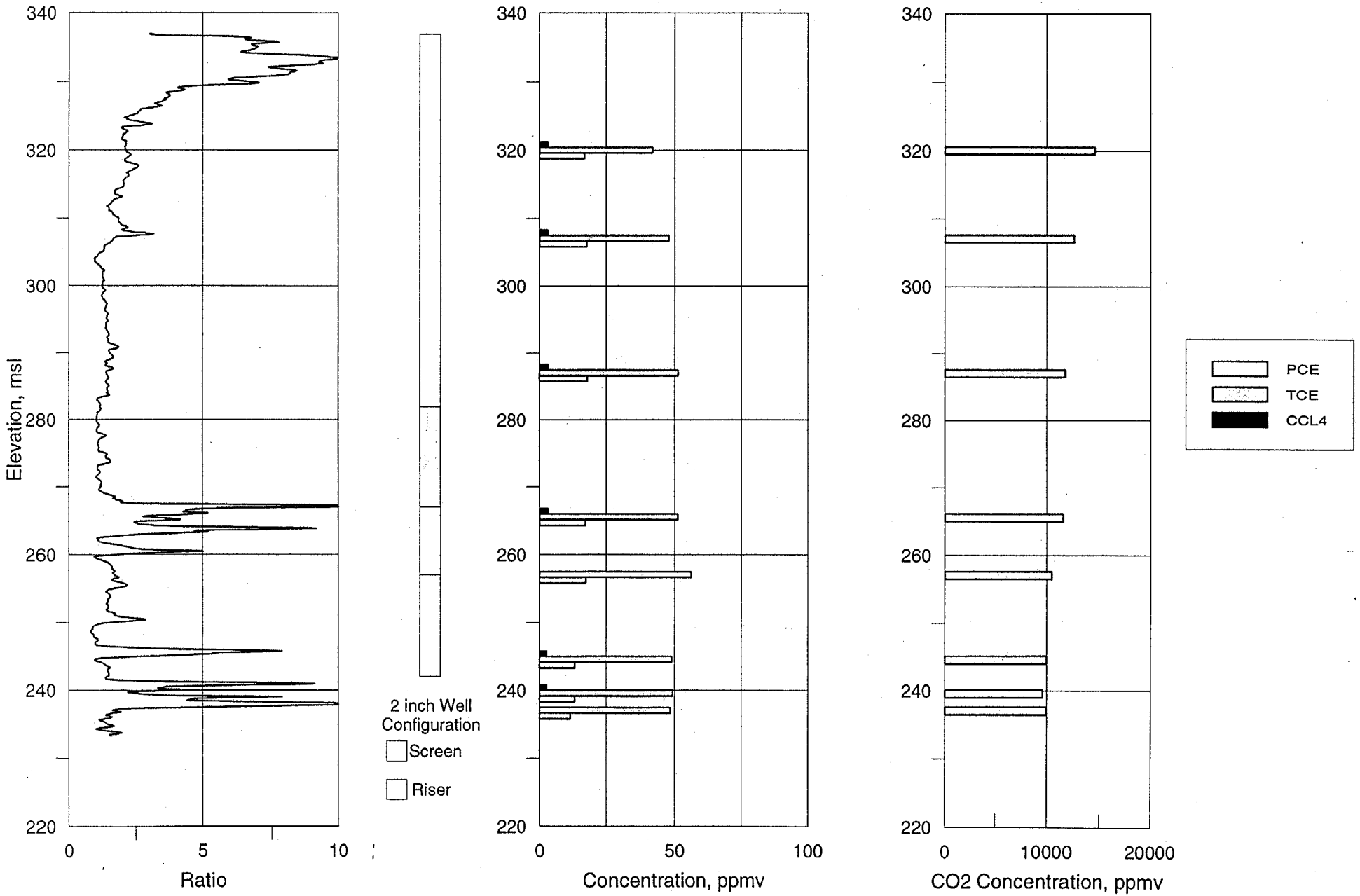
50
100
Concentration, ppmv
0
10000
20000
CO2 Concentration, ppmv
PCE
TCE
CCL4

CPT-MCB-25


Elevation, msl
340
320
300
280
260
240
220
0
5
10
Ratio
2 inch Well Configuration
Screen
Riser
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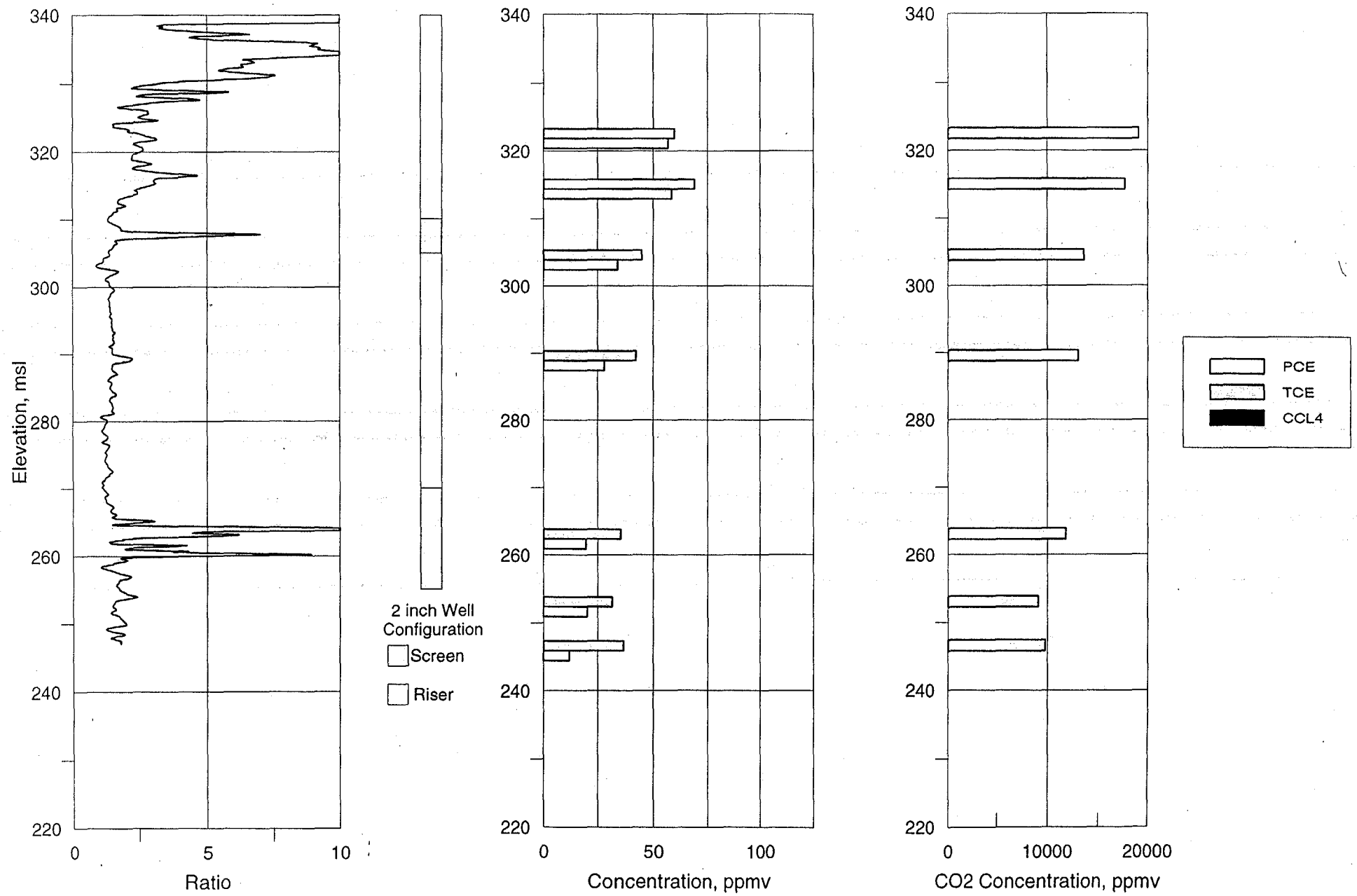
50
100
Concentration, ppmv
0
10000
20000
CO2 Concentration, ppmv
PCE
TCE
CCL4

CPT-MCB-26


Elevation, msl
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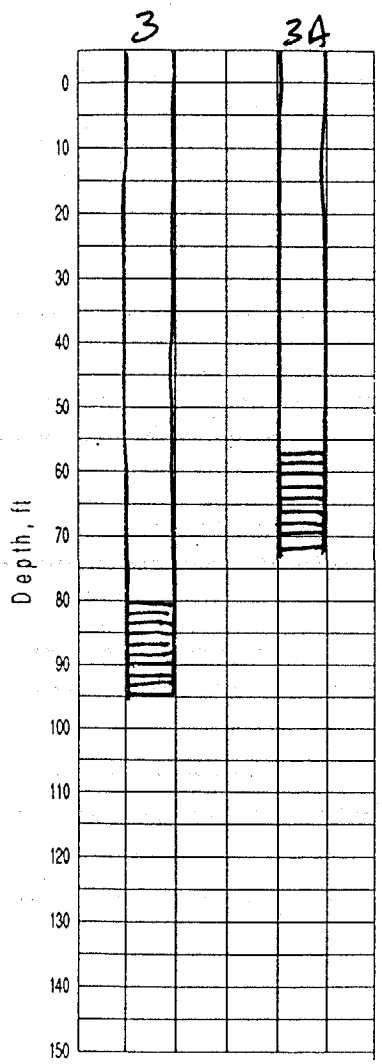
320
300
280
260
240
220
0
5
10
Ratio
2 inch Well Configuration
Screen
Riser
0
50
100
Concentration, ppmv
0
10000
20000
CO2 Concentration, ppmv
PCE
TCE
CCL4

APPENDIX B

CPT Vadose Zone Direct Push Well Construction Diagrams

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-3 & 3A

Installation Date 9/6/96

CPT Truck FUGRO

Push Tip Total Depth (ft) 3: 95' / 3A: 72'

Pipe Type/Size(in) 3: PVC 2" / 3A: 1.5"

Screen 10 slot

Screen Locations (ft) 3: 80-95' / 3A: 57-72'

Riser Above Ground (ft)

Coordinates

Easting 44858.64 Latitude

Northing 97074.80 Longitude

Elevation (ft) 331.169

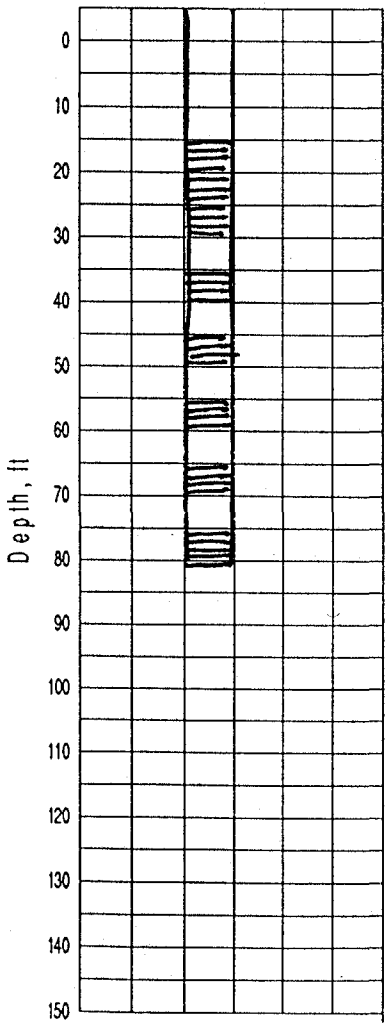
Pad Description 1'x1' concrete

Over Site Riha

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-4

Installation Date

CPT Truck SCAPS

Push Tip Total Depth (ft) 82'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 15-30', 35-40'
45-50', 55-60',
65-70', 75-80'

Riser Above Ground (ft)

Coordinates

Easting 44863.326 Latitude

Northing 97325.321 Longitude

Elevation (ft) 337.083

Pad Description 1'x1' Concrete

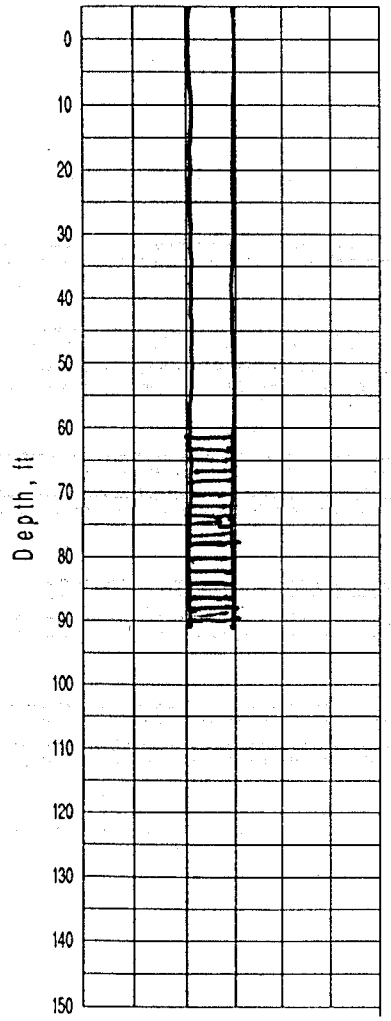
Over Site Riha

Comments

same push hole as
CPT-MCB-S1
(Soil boring)

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-5

Installation Date 9/24/96

CPT Truck Fugro

Push Tip Total Depth (ft) 90'

Pipe Type/Size(in) PVC /2"

Screen 10 slot

Screen Locations (ft) 60-90

Riser Above Ground (ft)

Coordinates

Easting 45025.539 Latitude

Northing 97204.187 Longitude

Elevation (ft) 330.978

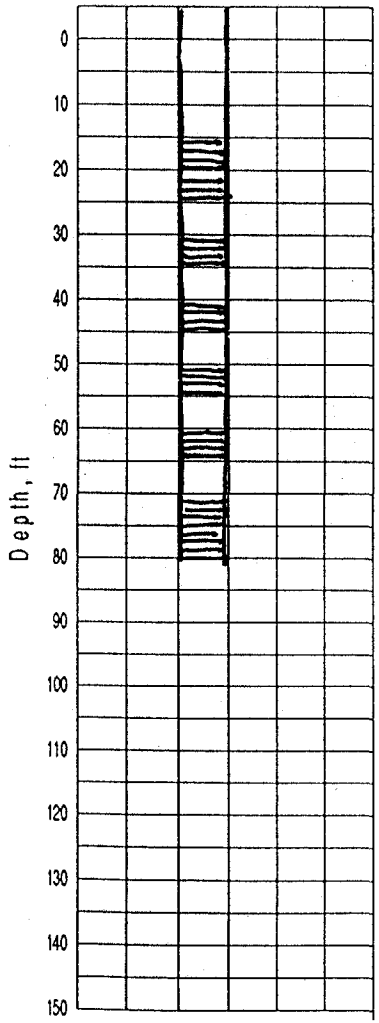
Pad Description 1'x1' concrete

Over Site Rika

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-6

Installation Date 9/20/96

CPT Truck FUGRO

Push Tip Total Depth (ft) 80'

Pipe Type/Size(in) ~~2"~~ PVC/2"

Screen 10 slot

Screen Locations (ft) 15-25, 30-35
40-45, 50-55
60-65, 70-80

Riser Above Ground (ft)

Coordinates

Easting 44860.832 Latitude

Northing 97404.718 Longitude

Elevation (ft) 338.850

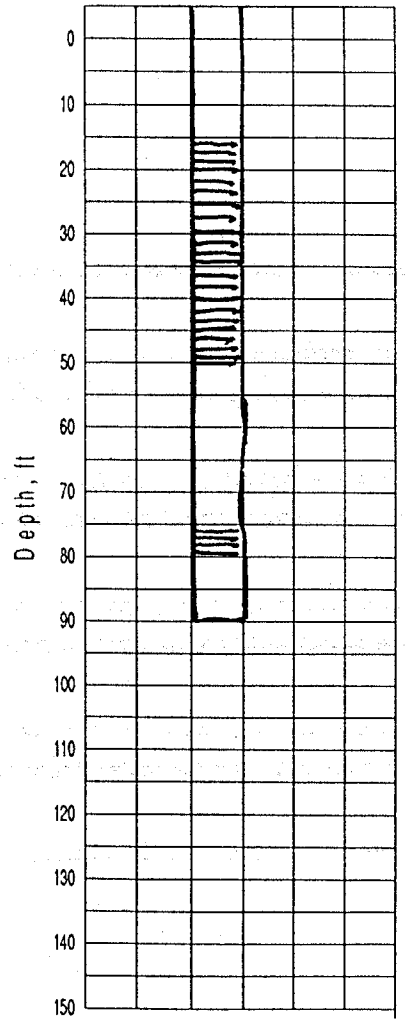
Pad Description 1'x1' concrete

Over Site Riha

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-7

Installation Date 9/17/96

CPT Truck Fugro

Push Tip Total Depth (ft) 90'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 15-50'
75-80'

Riser Above Ground (ft)

Coordinates

Easting 44808.5489 Latitude

Northing 97347.3877 Longitude

Elevation (ft) 338.620

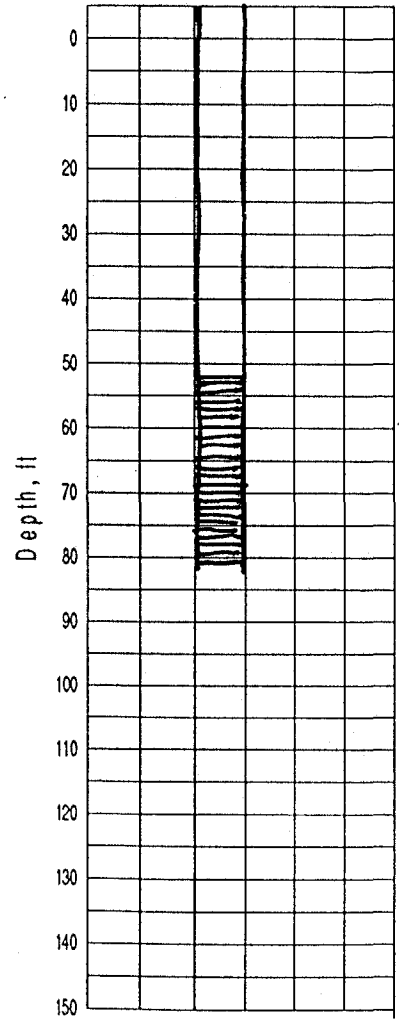
Pad Description 1'x1' concrete

Over Site Rika

Comments
out of bentonite
crumbles - used riser
to bottom of hole

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-8

Installation Date 9/14/96

CPT Truck Fugro

Push Tip Total Depth (ft) 81'

Pipe Type/Size(in) PVC / 1.5"

Screen 10 slot

Screen Locations (ft) 51-81'

Riser Above Ground (ft)

Coordinates

Easting 44777.6584 Latitude

Northing 97480.0177 Longitude

Elevation (ft) 339.887

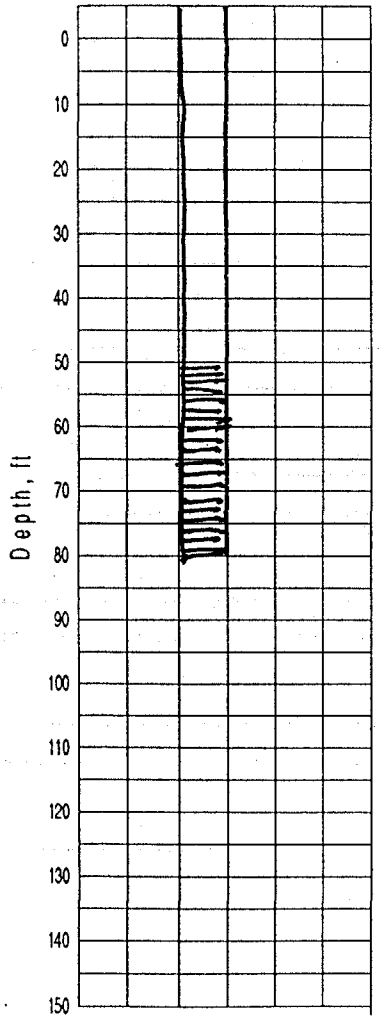
Pad Description 1'x1' concrete

Over Site Rina

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-9

Installation Date 9/25/96

CPT Truck Fugro

Push Tip Total Depth (ft) 80

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 50-80'

Riser Above Ground (ft)

Coordinates

Easting 44920.3380 Latitude

Northing 97436.4931 Longitude

Elevation (ft) 337.550

Pad Description 1'x1' concrete

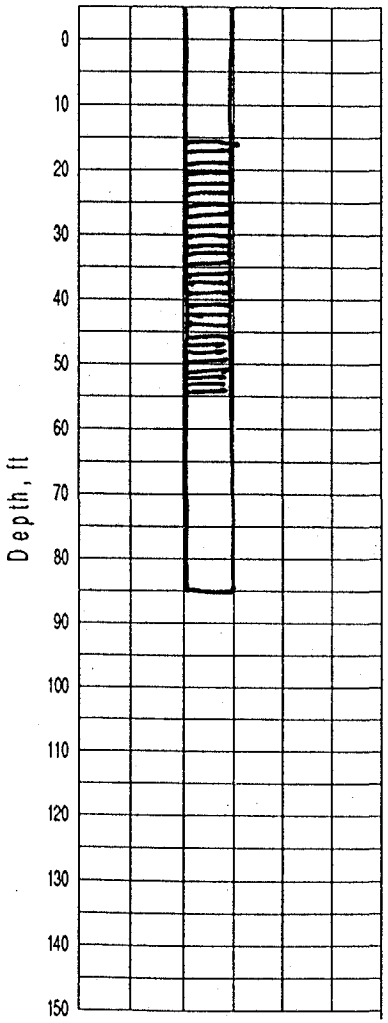
Over Site Riha

Comments

Environmental Sciences Section

GROUNDWATER

CPT Direct Push Vadose Zone Well Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-10

Installation Date 9/16/96

CPT Truck Fugro

Push Tip Total Depth (ft) 85'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 15-55

Riser Above Ground (ft)

Coordinates

Easting 44910.5513 Latitude

Northing 97333.0945 Longitude

Elevation (ft) 336.564

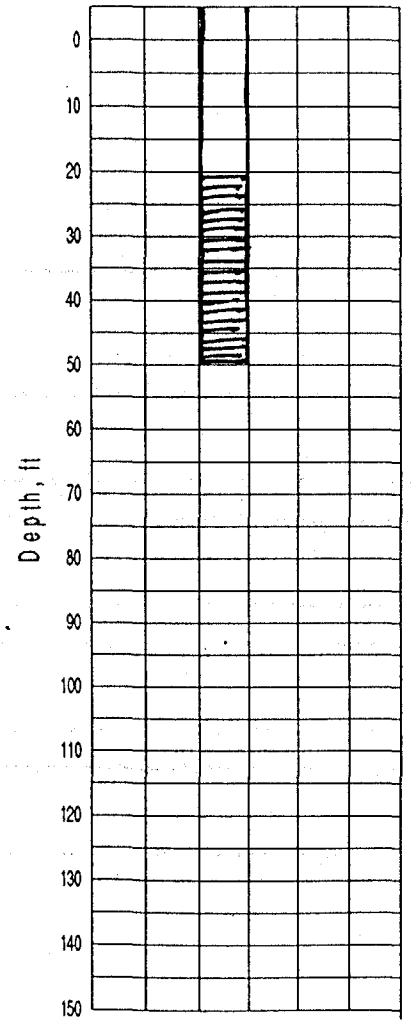
Pad Description 1'x1' concrete

Over Site Riha

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-13

Installation Date 9/14/96

CPT Truck Fugro

Push Tip Total Depth (ft) 50'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 20-50'

Riser Above Ground (ft)

Coordinates

Easting 44851.0342 Latitude

Northing 97337.9591 Longitude

Elevation (ft) 338.071

Pad Description 1'x1' Concrete

Over Site Riha

Comments

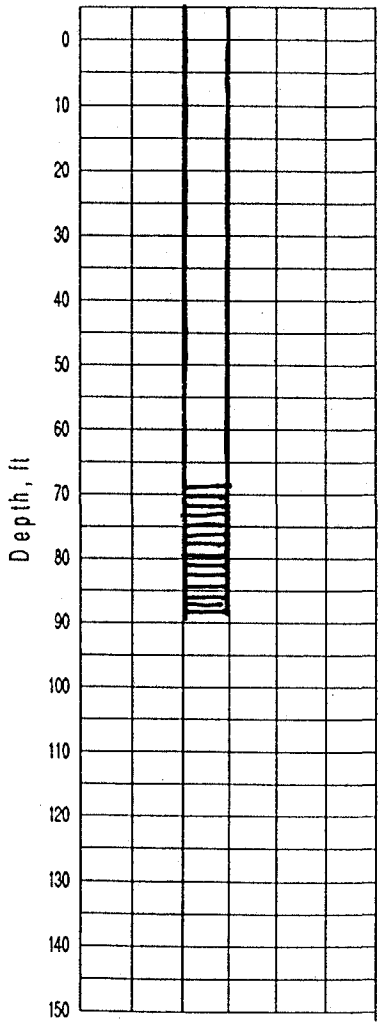
Tremied 50-90'

with bentonite crumbles

Environmental Sciences Section

GROUNDWATER

CPT Direct Push Vadose Zone Well Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-14

Installation Date 9/13/96

CPT Truck Fugro

Push Tip Total Depth (ft) 88'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 68-88'

Riser Above Ground (ft)

Coordinates

Easting 44850.03 Latitude

Northing 97184.81 Longitude

Elevation (ft) 336.498

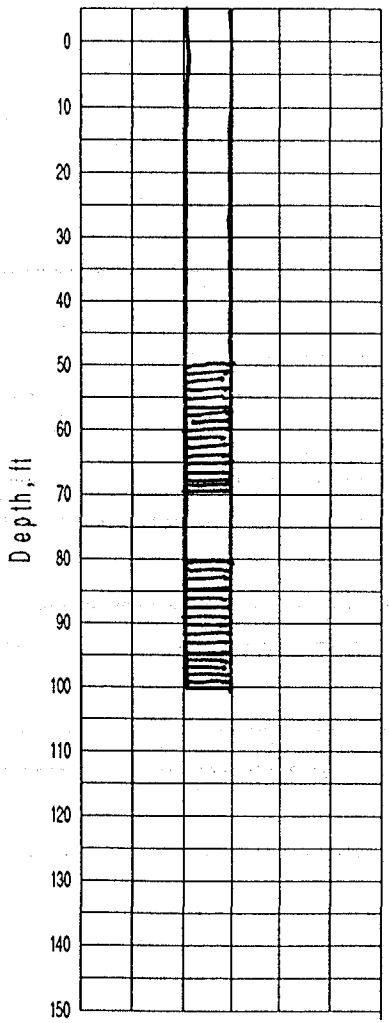
Pad Description 1'x1' concrete

Over Site Rich

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-15

Installation Date 9/19/96

CPT Truck Fugro

Push Tip Total Depth (ft) 100'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 50-70'
80-100'

Riser Above Ground (ft)

Coordinates

Easting 44983.41 Latitude

Northing 97361.55 Longitude

Elevation (ft) 334.411

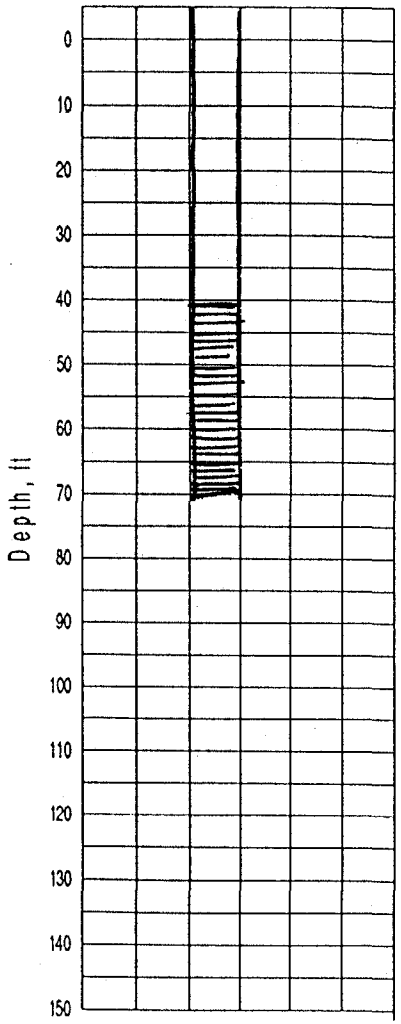
Pad Description 1'x1' concrete

Over Site Riha

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-16

Installation Date 9/11/96

CPT Truck Fugro

Push Tip Total Depth (ft) 70'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 40-70'

Riser Above Ground (ft)

Coordinates

Easting 44830.18 Latitude

Northing 97227.09 Longitude

Elevation (ft) 336.761

Pad Description 1'x1' concrete

Over Site Rita

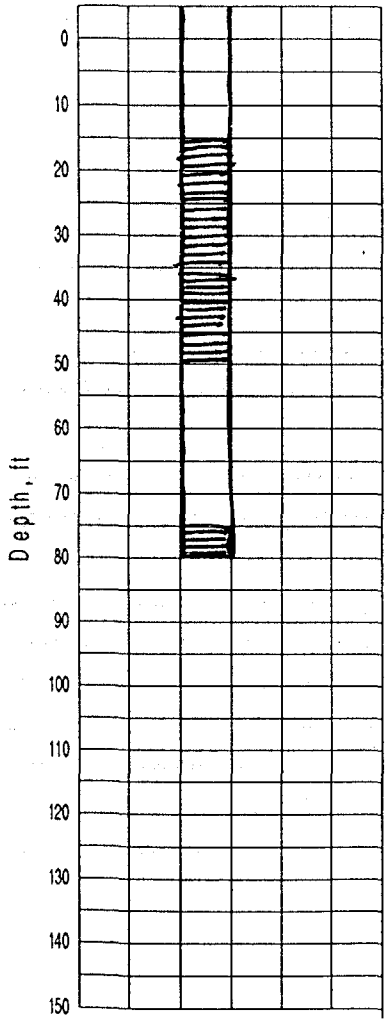
Comments

Tip separated from PVC. Target depth of 80' not made.

Environmental Sciences Section

GROUNDWATER

CPT Direct Push Vadose Zone Well Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-17

Installation Date 9/18/96

CPT Truck Fugro

Push Tip Total Depth (ft) 80'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 15-50'
75-80'

Riser Above Ground (ft)

Coordinates

Easting 44867.45 Latitude

Northing 97264.23 Longitude

Elevation (ft) 336.821

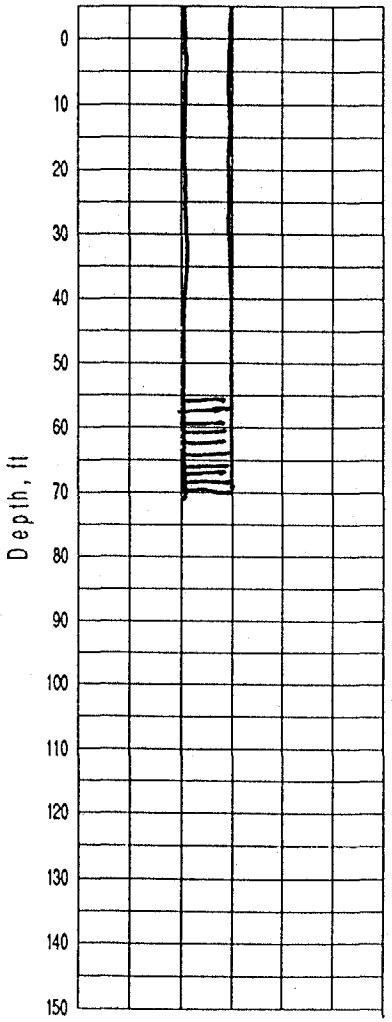
Pad Description 1'x 1' concrete

Over Site Riha

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-18

Installation Date 9/7/96

CPT Truck Fugro

Push Tip Total Depth (ft) 70'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 55'-70'

Riser Above Ground (ft)

Coordinates

Easting 44929.36 Latitude

Northing 97242.91 Longitude

Elevation (ft) 334.199

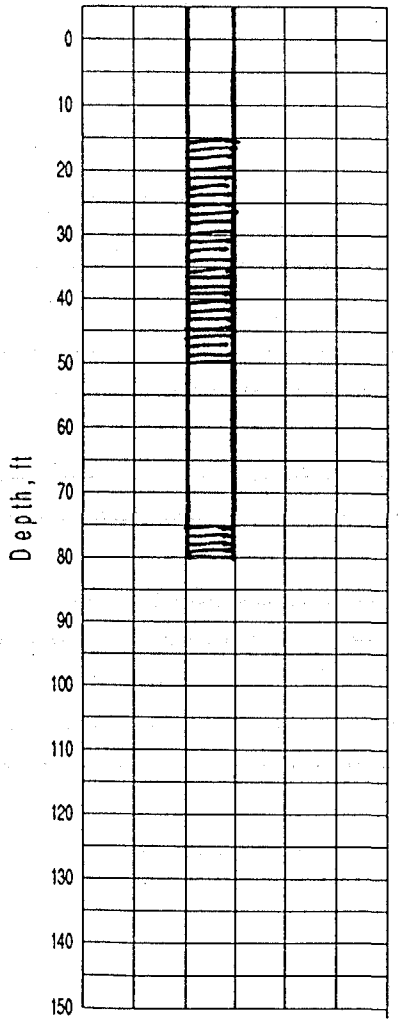
Pad Description 1'x1' concrete

Over Site Riha

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-19

Installation Date 9/18/96

CPT Truck Fugro

Push Tip Total Depth (ft) 80'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 15'-50'
75'-80'

Riser Above Ground (ft)

Coordinates

Easting 44810.03 Latitude

Northing 97305.39 Longitude

Elevation (ft) 337.746

Pad Description 1'x1' concrete

Over Site Riha

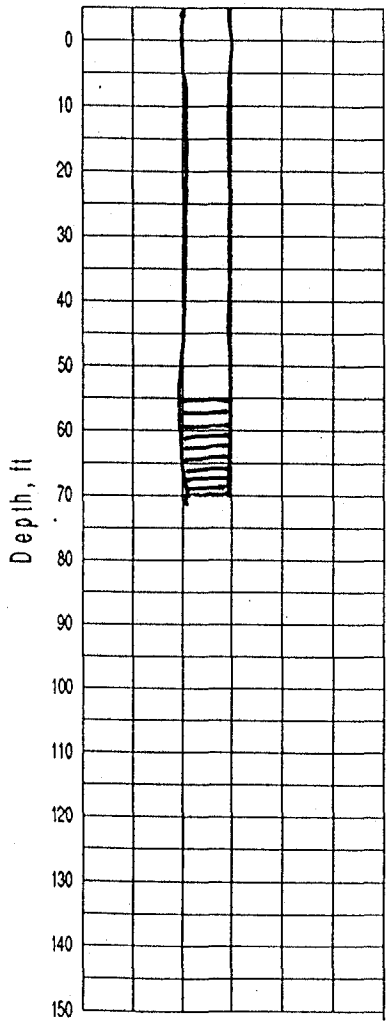
Comments

Tremied bentonite crumbles from 80-90'

Environmental Sciences Section

GROUNDWATER

CPT Direct Push Vadose Zone Well Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-20

Installation Date 9/9/96

CPT Truck Fugro

Push Tip Total Depth (ft) 70'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 55-70'

Riser Above Ground (ft)

Coordinates

Easting 44967.14 Latitude

Northing 97245.11 Longitude

Elevation (ft) 333.381

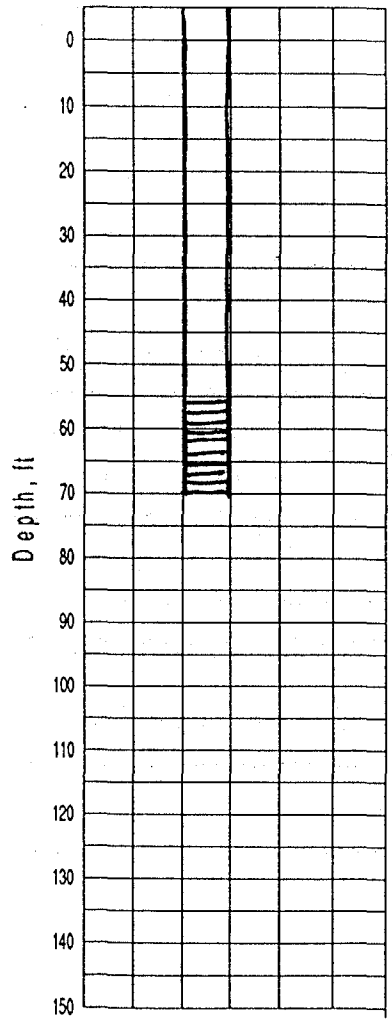
Pad Description 1'x1' Concrete

Over Site Rio

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-21

Installation Date 9/7/96

CPT Truck Fugro

Push Tip Total Depth (ft) 70'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 55'-70'

Riser Above Ground (ft)

Coordinates

Easting 44937.5 Latitude

Northing 97271.02 Longitude

Elevation (ft) 334.523

Pad Description 1'x1' concrete

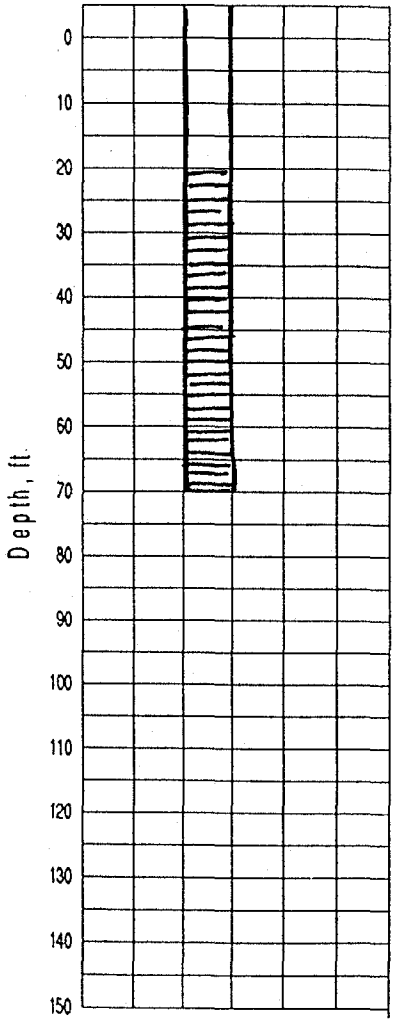
Over Site Rile

Comments

Environmental Sciences Section

GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem Basin

Well Identification CPT-MCB-22

Installation Date 9/16/96

CPT Truck Fugro

Push Tip Total Depth (ft) 70'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 20-70'

Riser Above Ground (ft)

Coordinates

Easting 44849.85 Latitude

Northing 97297.65 Longitude

Elevation (ft) 337.088

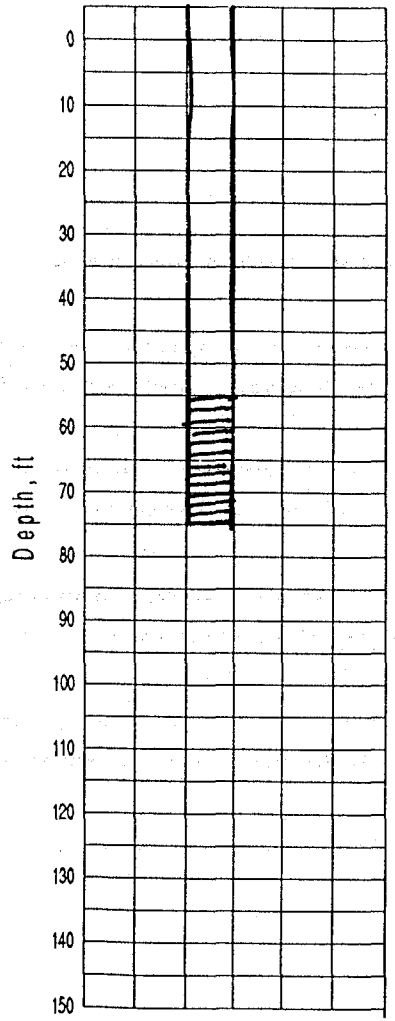
Pad Description 1'x1' concrete

Over Site Rio

Comments 70'-98' filled (tremied) with bentonite crumbles

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-23

Installation Date 9/13/96

CPT Truck Fugro

Push Tip Total Depth (ft) 75'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 55-75'

Riser Above Ground (ft)

Coordinates

Easting 45017.86 Latitude

Northing 97282.77 Longitude

Elevation (ft) 332.497

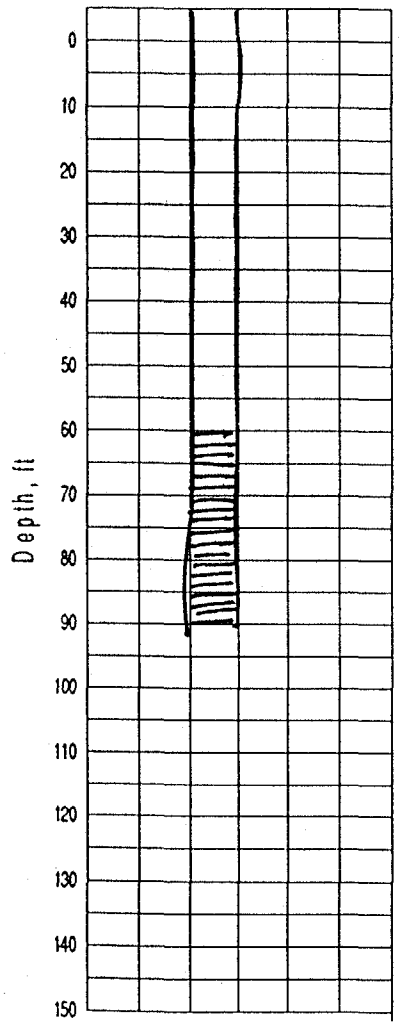
Pad Description 1'X1' concrete

Over Site Rich

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-24

Installation Date 9/11/96

CPT Truck Fugro

Push Tip Total Depth (ft) 90'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 60-90'

Riser Above Ground (ft)

Coordinates

Easting 44769.63 Latitude

Northing 97332.94 Longitude

Elevation (ft) 339.139

Pad Description 1'x1' concrete

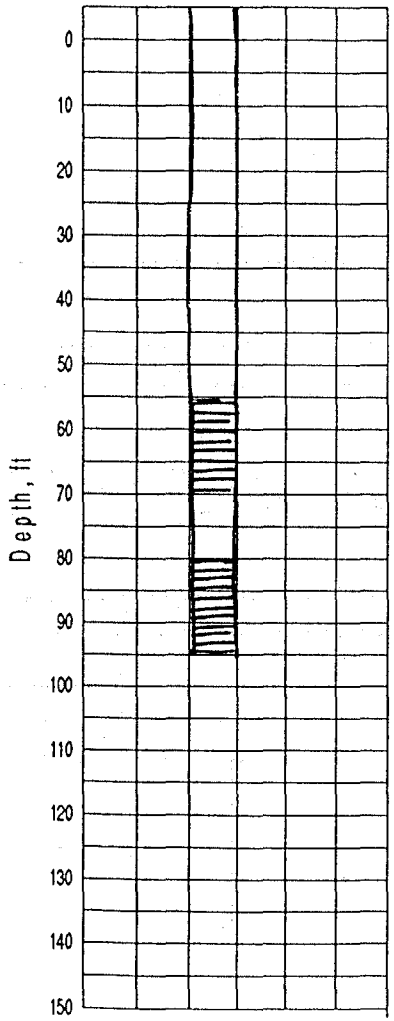
Over Site Rich

Comments

Environmental Sciences Section

GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-2S

Installation Date 9/12/96

CPT Truck Fugro

Push Tip Total Depth (ft) 95'

Pipe Type/Size(in) 2" / PVC

Screen 10 slot

Screen Locations (ft) 55'-70'
80-95'

Riser Above Ground (ft)

Coordinates

Easting 44915.51 Latitude

Northing 97386.5 Longitude

Elevation (ft) 337.024

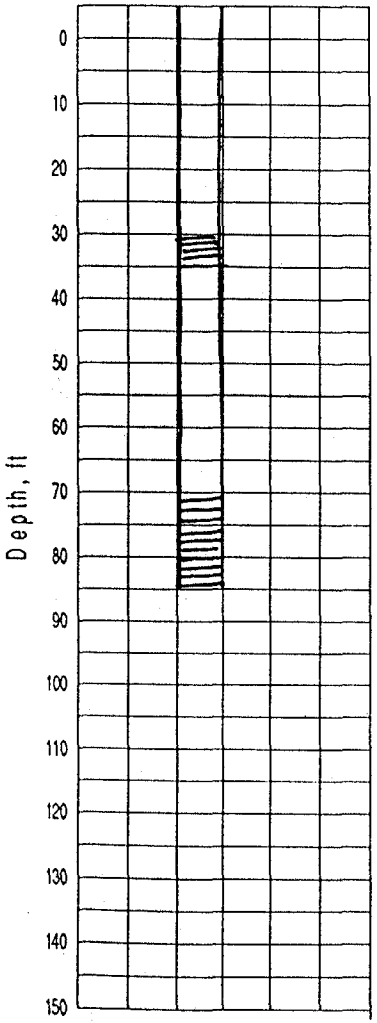
Pad Description 1'x1' Concrete

Over Site Rita

Comments

Environmental Sciences Section
GROUNDWATER

CPT Direct Push Vadose Zone Well
Construction Diagram



Location Misc. Chem. Basin

Well Identification CPT-MCB-26

Installation Date 9/10/96

CPT Truck Fugro

Push Tip Total Depth (ft) 85'

Pipe Type/Size(in) PVC/2"

Screen 10 slot

Screen Locations (ft) 30-35'
70-85'

Riser Above Ground (ft)

Coordinates

Easting 44817.39 Latitude

Northing 97384.88 Longitude

Elevation (ft) 339.546

Pad Description 1' x 1' Concrete

Over Site Rite

Comments

Environmental Sciences Section
GROUNDWATER