MEMORANDUM

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CC: John J. Dodge, PG, Daniel B. Stephens & Associates, Inc.

DATE: June 18, 2009

SUBJECT: Tritium and Stable Isotope Sampling & Analysis, and Evaluation of Hydrogeologic Zone Connectivity, BMI Common Areas (Eastside), Clark County, Nevada

Introduction

Sampling and analysis of tritium and stable isotopes have been used to address the connectivity between the designated water-bearing zones at the Site: the Shallow Zone, the Middle Zone, and the Deep Zone. This technical memorandum presents the sampling data and interpretations regarding zone connectivity. This document addresses comments from the Nevada Division of Environmental Protection (NDEP) (Appendix A), dated April 24, 2009, to BRC's technical memorandum dated March 26, 2009, entitled *Tritium and Stable Isotope Sampling & Analysis, and Evaluation of Hydrogeologic Zone Connectivity, BMI Common Areas (Eastside), Clark County, Nevada*

Historical Groundwater Characterization Activities

As previously reported to NDEP, BRC has conducted the following activities to collect data upon which to base an evaluation of the connectivity between the Site water-bearing zones:

As part of investigations conducted in 2004, BRC and its consultants:

- Advanced 13 exploratory borings to a depth of approximately 400 feet bgs.
- Conducted geophysical logging of 13 borings to a depth of approximately 400 feet bgs.

- Collected continuous core soil samples from 3 of the 400-foot mud-rotary borings (locations 1, 4, and 6) and from all of the boreholes drilled with the rotary sonic drilling method (18 locations).
- Drilled 50 boreholes at 27 locations throughout the Site; 13 locations were drilled with mud rotary, 5 locations were drilled with hollow-stem auger, and 18 locations were drilled with rotary sonic drilling methods.
- Collected 94 saturated soil samples and 12 in-situ groundwater samples from the various water-bearing zones at the Site for fast turnaround analysis of perchlorate using U.S. Environmental Protection Agency (EPA) method 314.0.
- Installed 44 groundwater monitor wells, including 8 wells in the Qal and 27 wells in the Upper Muddy Creek Formation, 11 of which were screened below 335 feet bgs.

Since 2004, BRC has conducted the following activities:

- Reported on five groundwater monitoring events conducted between April to June, 2006 and April to July, 2008. The first monitoring event included collection and reporting of water elevations for 104 wells and water sample chemical analytic results for 53 wells. The monitoring scope has increased over the course of the five monitoring events. The fifth monitoring event included collection and reporting of water elevations for 155 wells and water sample chemical analytic results for 106 wells.
- Conducted and reported on an aquifer testing program conducted at the Site.
- Installation of numerous monitoring wells at upgradient and downgradient property boundary locations at the Site.
- Conducted analytic and numerical groundwater modeling.

Assessing Hydraulic Connectivity of the Site Water Bearing Zones

BRC and its consultant DBS&A have evaluated methods to assess the connectivity of the Site water bearing zones. The following is a discussion of the rationale that provides the basis for using tritium and stable isotopes to evaluate Site water bearing zone connectivity.

Injected Tracers

BRC does not believe that the use of injected tracer testing to directly assess the connectivity of the three water-bearing zones, or even the connectivity of the Upper Muddy Creek Formation (UMCf) with groundwater in the alluvium is practical for two main reasons:

- The travel time for a conservative tracer introduced in the upper portion of the UMCf to migrate upward into the alluvium where it could potentially be observed in a monitor well is at least on the order of several years, and quite possibly much longer.

- Due to what are expected to be heterogeneous and unidentified specific flow paths for tracer migration, appropriate target sampling location(s) are, as a practical matter, unknowable.

The following calculation is presented to illustrate what BRC believes is the main problem with using tracer injection to evaluate saturated zone connectivity at the Site. The 2004 groundwater well measurement data indicated that vertical hydraulic gradients were upward at most locations, downward in some, and ranged in magnitude from approximately 0.018 to 0.180. Assuming that the increased sand content of the Middle Zone lenses has an overall hydraulic conductivity of 1 x 10^{-4} centimeters per second (cm/s) and an effective porosity of 30 percent, the average groundwater velocity can be estimated using Darcy's Law:

$$v = \frac{Ki}{n_e}$$

where v = average groundwater pore velocity (cm/s)

K = saturated hydraulic conductivity (cm/s)

i = gradient (unitless, L/L)

n_e = effective porosity (unitless, L^3/L^3)

Using a gradient of 0.018 (MWH, 2008), the calculated average pore velocity would be:

$$v = 6 \times 10^{-6} \text{ cm/s} = 0.017 \text{ ft/d}$$

Using this average pore velocity, it would take a tracer about 5 years to travel 30 feet in the vertical direction, assuming no other retardation factors apply. Although other assumed values could be applied in the time of travel calculation, BRC believes that the main constraint will be the average hydraulic conductivity of the intervening materials between the tracer release point and the target reception point. The 1×10^{-4} cm/s value was selected to be on the expected high end of possibilities, and the actual hydraulic conductivity may be lower, perhaps by 10 to 100 times.

Furthermore, the sporadic nature of the UMCf sand lenses indicates that a straight-line path is not realistic and that the path is tortuous and longer, possibly much longer, than accounted for in the analysis above (i.e., the actual flow path is not likely to be only 30 feet). This would make the tracer travel time even longer. Although it is theoretically possible to reduce expected tracer travel times by inducing a higher hydraulic gradient by pumping or injection, BRC does not believe that this approach is appropriate because there is a significant likelihood that flow pathways would be opened where none existed prior to creation of the induced gradient. The results of such a study would therefore not be representative of the flow regime observed at the Site.

In addition to the travel time problem, insufficient data are currently available (and are not likely to be reasonably attainable) to characterize the location of the point of intersection and the area of intersection of the Middle Zone sand lenses with either the overlying Shallow Zone or the underlying Deep Zone. Therefore, it is not possible to confidently identify the proper location for a monitor well to capture the tracer as it discharges from the Middle Zone into either the Shallow Zone or the Deep Zone.

Historical Tracers

Use of historical tracers is a promising approach for application at the Site. Historical tracers result from human activities or events in the past, such as contaminant spills or atmospheric nuclear testing (^{3}H and ^{36}Cl). Known industrial chemical contaminants at the Site from previous operational activities, such as perchlorate and tetrachloroethylene, are evaluated in this memo, together with groundwater elevation data, to provide qualitative evidence of connectivity, or lack thereof, between the three Site water-bearing zones. Total dissolved solids (TDS) distribution is also evaluated. However, uncertainties with respect to source location, concentration, timing of chemical release, and the non-conservative behavior of some chemicals makes it difficult to use this information to quantify the connectivity in terms of groundwater flow between water-bearing zones.

The presence of an event marker, such as bomb tritium, in groundwater can provide evidence that a component of that water recharged during a particular time period. Because of tritium's short half-life (12.32 years), the use of bomb tritium as a hydrologic tracer is relatively temporary. Before significant amounts of tritium were injected into the atmosphere through nuclear activities, precipitation had an estimated natural background of approximately 5 to 10 tritium units (TU), (Illinois Environmental Protection Agency, 1997). Tritium content in precipitation in North America since the advent of atmospheric nuclear bomb testing in 1952 reached an atmospheric high in approximately 1963, diminishing significantly to the present atmospheric levels. In the southern hemisphere, the bomb pulse has already decayed to within 15 tritium units of natural background. Bentley et al. (1986) reported that bomb tritium will be difficult to detect in 10 to 20 years.

The actual tritium content varies widely with location (Illinois Environmental Protection Agency, 1997). The Santa Maria, California and the Albuquerque, New Mexico stations have tritium monitoring stations with some of the longest monitoring records in the U.S. (Figures 1 and 2, respectively). Santa Maria, California is located approximately 400 miles west-southwest of the Site; Albuquerque, NM is located approximately 490 miles east-southeast of the Site. At Santa Maria, peak atmospheric tritium concentrations of about 1,300 TU were recorded from 1962 through early 1964 and diminished to less than 400 TU in late 1964. Today, atmospheric background levels in the northern hemisphere are between about 5 and 30 TU (IAEA/WMO, 1998).

For its last reported record, the year 1976, 15.33 TU were reported as the average tritium atmospheric content from nine Santa Maria reporting stations (IAEA WISER, 2009). Albuquerque, New Mexico reported a mean atmospheric tritium content of 7.3 TU from 12 reporting stations in 2001. This data is in agreement with the statement by the IAEA (2009a) that, "Atmospheric tritium concentrations have been decreasing over the last 30 years and are currently almost at their low, natural levels, making tritium less useful as a hydrological tracer."

While tritium was sampled, chemically analyzed, and evaluated for the Site monitoring wells sampled, the evaluation is qualitative and based on the absence or presence of tritium. Nonetheless, it provides an additional useful line of evidence in the interpretation of the source and fate and transport of chemicals at the Site.

Stable Isotopes

Stable isotopes were sampled as an alternative means evaluation of the connectivity between the three water-bearing zones and to potentially gain insight as to the origin of the water in the individual zones.

An isotope is a variation of an element produced by differences in the number of neutrons in the nucleus of the element; hence, isotopes of an element have different masses. The two stable, or non-radioactive, isotopes of hydrogen (^{1}H and ^{2}H, or deuterium [D]) and the three stable isotopes of oxygen (^{16}O, ^{17}O, and ^{18}O) form part of the water molecule, and analyses of their concentrations in groundwater can be used to trace movement of water in the subsurface.

Laboratory analyses can determine the ratio of isotopes in a water sample. For the Site sample analyses, the isotopic ratios of $^{18}O/^{16}O$ and $^{2}H/^{1}H$ (D/H) are interpreted. The isotope ratio from a Site sample is compared to the isotopic ratio of standard mean ocean water (SMOW). The comparison is made by means of the parameter δ, defined as:

$$\delta^{18}O\ (‰) = \left[\frac{\left(^{18}O/^{16}O\right)_{sample}}{\left(^{18}O/^{16}O\right)_{SMOW}} - 1\right]10^{3}, \text{ and}$$

$$\delta^{2}H\ (‰) = \left[\frac{\left(^{2}H/^{2}H\right)_{sample}}{\left(^{2}H/^{2}H\right)_{SMOW}} - 1\right]10^{3},$$

for isotope ratios of oxygen and hydrogen, respectively (Fetter, 1988), expressed in parts per thousand (per mil). It is well established that the isotopic composition of precipitation at a particular location will vary seasonally and with individual storms. The isotopic composition of precipitation will also vary among locations depending upon climate and elevation. Nevertheless, the composition of all precipitation generally falls on a straight line of a plot of δD (shown as $\delta^{2}H$ in the equation above) versus $\delta^{18}O$. This line is called the Global Meteoric Water Line (GMWL).

The stable isotope concentration of the precipitation can be modified subsequent to infiltration; this signature of the soil water reveals origin of the water. Evaporation of soil water leads to a fractionation of the stable isotopes D and ^{18}O. When water evaporates, the heavier atoms tend to remain behind in the liquid phase, thus leading to an enrichment in the concentration of the heavier isotopes in the residual liquid, and lighter isotopes fractionate into the vapor phase.

During the fifth quarterly monitoring event, groundwater samples were collected from the three water-bearing zones for isotopic analysis. The results of the laboratory analyses were used to determine if the isotopic character of the water in the three water-bearing zones could be differentiated on the basis of their isotopic signature and to assess the connectivity between the three site water-bearing zones.

Isotope Sampling Collection and Results

Between April 22 and July 18, 2008 groundwater samples were collected and analyzed as part of a groundwater monitoring event conducted by MWH Americas, Inc (MWH). MWH reported that data in a report entitled, "Fifth Round Groundwater Monitoring Report (April - July 2008), BMI Common Areas (Eastside), Clark County, Nevada." Samples were collected and analyzed for the following constituents:

- $\delta^{18}O$ (Ratio of stable isotopes of oxygen (^{18}O to ^{16}O) relative to the SMOW standard)
- $\delta^{2}H$ (Ratio of stable isotopes of hydrogen (deuterium (^{2}H) to protium (^{1}H)) relative to the SMOW standard)
- Tritium (^{3}H) (radioactive isotope of hydrogen)

The samples were collected from the following monitoring well triplets (Figure 3):

<u>Northern Site Area (near Las Vegas Wash)</u> wells AA-08 (Shallow Zone), MCF-08B-R (Middle Zone), and MCF-17A (Deep Zone) were analyzed.

<u>Northern Site Area (upgradient of northern RIBs)</u> wells DM-5 (Shallow Zone) proposed but was not sampled due to lack of water, MCF-05 (Middle Zone), and MCF-20A (Deep Zone) were analyzed.

<u>Middle Site Area (near high perchlorate and TDS detections)</u> wells MCF-16C (Shallow Zone), MCF-16B (Middle Zone), and MCF-16A (Deep Zone) were analyzed.

<u>Southern Site Area (near plants sites)</u> wells AA-01 (Shallow Zone), MCF-02B (Middle Zone), and MCF-01A (Deep Zone) were analyzed.

The summary of isotope analyses is presented in Table 1. The analytical results of stable isotope sampling ($\delta^{18}O$ and $\delta^{2}H$) are plotted in Figure 4, along with results of the tritium (^{3}H) sample analyses. The isotopic values from these samples are co-plotted with the global meteoric water line (GMWL). As discussed above, the GMWL is defined by the annual average isotope compositions of precipitation at locations around the globe.

Data Interpretation

Tritium

Three Shallow Zone monitoring well samples were tested for tritium. Two of the samples (AA-08 and AA-01) were collected from wells screened in the Quaternary Alluvium (Qal) and contained tritium above the detection limit (1 TU) with concentrations of 5.18 and 9.88 TU, respectively. These sample results represent water that has recharged relatively recently. Theoretically, this water could have recharged a long time ago when atmospheric levels of tritium were much higher and the tritium concentrations then reduced in-situ, through radioactive decay, to present levels. However, Site data from aquifer testing indicates that water travel velocities within the Qal are relatively fast. For example, pumping tests conducted at well AA-08 yielded an average horizontal hydraulic conductivity (Kh) value of 510 feet per day (f/d) at this location (Kleinfelder, 2007). This Kh value is the highest measured at the Eastside Area. Using a groundwater gradient (i) estimate from the 5th round sampling event (MWH, 2009) (0.022 feet per foot near well AA-08), and an estimate for soil porosity (n) of 0.25, average groundwater velocity (v) in the vicinity of well AA-08 can be estimated by:

$$V = Ki/n = (510 \text{ f/d})(0.022)/(0.25) = 45 \text{ f/d}.$$

For example, based on this computed velocity and a travel distance of approximately 8,000 ft between the Southern RIBs and the Northern RIBs, groundwater traverses the distance in an average travel time of 178 days, or 0.49 years. This average travel time, when compared to a tritium half life of 12.42 years, leads to a conclusion that the most likely explanation is that the tritium concentrations in the samples collected from the Qal represent water with a component that has recharged relatively recently, within approximately the last decade.

All other samples were screened in the UMCf and were nondetect for tritium. As indicated in the discussion above, the current atmospheric tritium level is on the order of 5 to 10 TUs. While recognizing that the amount of data is limited, the tritium data is consistent with previous Site soil physical hydraulic data, post-purging well recovery data, and aquifer test data that demonstrate that there is a significant permeability contrast between the Qal and UMCf. The data indicates that the permeability of the UMCf is significantly lower (perhaps orders of magnitude lower) than the overlying Qal. Both of the samples collected from the Shallow Zone wells completed in the Qal are detect for tritium at levels that are within the range of current background.

The rest of the samples were nondetect and collected from wells having various screened interval depths within the UMCf. These data suggest either:

1) Groundwater that is on the order of at least 37 years old (assuming that three tritium decay half-lives are required to reduce atmospheric [assumed for this calculation to average 7.5 TUs] background concentrations of tritium to below the nondetect level of 1 TU), or

2) Vertical gradients (discussed below), has caused younger groundwater to mix with older groundwater resulting in diluted concentrations below the detection limit. For example, monitoring well MCF-16C is screened at the relatively shallow depth interval of 53 to 73 feet below ground surface (ft bgs). One of the strongest upward gradients at the Site has been measured between the Middle Zone and the Shallow Zone at Location 16 (Figure 5, Table 2). Shallow Zone water impacted by tritium at atmospheric concentrations that was mixed with enough water from a deeper zone that is nondetect for tritium could conceivably yield a sample result of nondetect for tritium.

This latter scenario is unlikely, however, because the relatively low UMCf permeability would tend to limit the flux of water that would contribute to mixing between waters in the Qal and those from the UMCf An estimate of flux from the UMCf was completed with the numerical flow model recently completed for the Eastside Area (for the current period (2007) simulation) (DBS&A, 2009). Simulated flow from the UMCf (shallow, model layer 2) to the Qal is 21,558 cubic feet per day (ft3/d). The total Qal lateral outflow to Las Vegas Wash gravels is 293,589 ft3/d (this does not include outflow at pumping wells). The fraction of Qal flow to the wash gravels that is attributable to the UMCf is therefore 21,558/293,589 or 7 percent (assuming complete mixing).

Using the value of 7 percent and assuming complete mixing, the resulting ratio of Qal water to UMCf water would be 14.3:1. Using the highest detected concentration of tritium in the Qal water (9.88 TU) at the mixing ratio of 14.3:1 would result in a diluted tritium concentration of

9.83 TU, only slightly different from the originally considered concentration. Thus, mixing of younger Qal water with older UMCf water is expected to have very little effect on the tritium concentration of sampled Qal waters.

Stable Isotopes

In general, and with the exception of the samples collected from monitoring wells MCF-05 and MCF-20A, the plot of $\delta^{2}H$ as a function of $\delta^{18}O$ forms a generally straight line parallel to but below the global meteoric water line. This is interpreted as a Local Meteoric Water Line. Other studies with similar results, as cited in Fetter (2001), provide the precedence for this interpretation.

The samples collected from monitoring wells MCF-05 and MCF-20A are isotopically heavier than, and distinct from, the other samples. Well MCF-20A is a Deep Zone well and has a screened interval from 360 to 380 ft bgs. Well MCF-05 is screened at a relatively deep depth interval within the Middle Zone at 221 to 231 ft bgs. These two well are located in the vicinity of the focus of high concentrations of total dissolved solids (TDS) that were reported for samples from the Deep Zone and the Middle Zone by MWH (2009). The data represent one line of evidence that the source of the elevated TDS in this area of the Deep and Middle Zone is the result of groundwater that is in contact with a paleo-evaporitic deposit.

The above interpretation is contrasted with an alternative hypothesis that postulates that high TDS process waters from historic Plants Area operations was disposed in the BMI Evaporation

Ponds and subsequently infiltrated and percolated into the Deep Zone where it is now detected. Several observations are inconsistent with this hypothesis but are consistent with the interpretation that considers evaporitic deposits as the source of high TDS in the Deep Zone. These are:

1. Shallow Zone TDS and perchlorate concentrations indicate the presence of these compounds in the vicinity of monitoring well MCF-16C. Darcy's Law was used to make a simple calculation of the average travel time from Location 16 to Location 20 within the Deep Zone. The calculation is simplified and does not account for dispersion or potential preferred pathways. The calculation assumes a gradient of .037 ft/ft, a Deep Zone hydraulic conductivity of 1 x 10^{-4} cm/sec, a porosity of 0.30, and a travel distance of 3,980 ft (the distance between Locations 16 and 20). Based on this calculation, the average travel time from Location 16 to Location 20 would be approximately 312 years. Even so, this calculation is highly conservative in that it does not account for the vertical travel time from the evaporation pond bottoms to the Deep Zone, a nominal distance of 350 feet through the low permeability sediments of the UMCf.

2. Based on review of the 5th round sampling data (MWH, 2009; Appendix B), other chemicals coincident with the high TDS area in the Shallow Zone are not found in the Deep Zone, suggesting that the Deep Zone high TDS concentrations are not related to the Shallow Zone high TDS concentrations at Location 16. The chemicals include arsenic, hexavalent chromium, and perchlorate. Tetrachloroethene (PCE) was also detected in Shallow Zone wells in the southwestern portion of the Site and not in any Deep Zone wells, also suggesting the lack of downward flow and transport from the Shallow Zone to the Deep Zone. The statement regarding arsenic is tentative because of the high detection limits for samples collected from the Middle and Deep Zones, and BRC is committed to obtaining better quality arsenic data in the future using different laboratory analysis methods.

3. Comparison of water quality between the Shallow and Deep Zones Stiff diagrams (Appendix C) suggests that the Shallow Zone and the Deep Zone have contrasting water quality.

4. Vertical gradient evaluations (BRC, 2008; (Appendix D) suggest that there is a general upward gradient, with groundwater movement from the Deep Zone to the Middle Zone. The movement of a TDS plume from the Evaporation Pond bottoms to the Deep Zone at any historical time would have likely had to overcome the upward vertical gradient. It is recognized, however, at Location 6 and 3 the gradient is downward. The gradient is variable between the Shallow Zone and the Middle Zone. Generally the gradient is upward. Significantly, however, the gradient is downward on the northern portion of the Site (excluding the western portion of the Western Hook).

5. Migration in the Deep Zone from upgradient offsite source(s) is indicated for hexavalent chromium (Cr VI). This is consistent with the hypothesis that the BMI Plants area impacts are loading the coarse-grained facies of the UMCf (UMCf cg) where this unit is present to the south of the Eastside Area.

For example, a simplified calculation of average travel time (t) in the UMCf cg (not accounting for longitudinal dispersion, which would reduce the value of (t) can be completed with the following estimates:

- Kh of the the UMCf cg assumed to be within the range of modeled values for the Qal (100 f/d) (DBS&A, 2009);
- Gradient (i) assumed to be on the order of 0.02 ft/ft;
- Porosity of 0.30;
- Travel distance of approximately 5,000 ft (approximate distance between the plants area and well AA-27 where Cr VI has been detected [MWH, 2008]).

Based on this calculation, the travel time from the plants area to AA-27 would be approximately:

- t = d/v;
- v = ki/n = (100 f/d x 0.02)/0.3 = approximately 7 f/d;
- t = (5,000 f)/(7 f/d) = 714 d = approximately 2 years.

Vertical Gradients

Vertical gradients, as measured in the five recent Eastside monitoring events, have been generally upward (Appendix D). This is a condition that is consistent with the position of the Site at the relatively distal end of two coalescing alluvial deposits from the McCollough and River Mountain Ranges. In general, high energy alluvial sediments are deposited near the source resulting in a geologic profile dominated by coarser textured soils that are conducive to downward recharge of precipitation and mountain runoff. At more distal locations, it is common to encounter lower energy alluvial sediments that result in a geologic profile dominated by finer textured soils. The distal portions of alluvial deposits often comprise pressure zones where confining, or semi-confining zones exist. Water in these zones is often laterally recharged at depth resulting in pressure build up that is sustained by the head of water created in the upslope vertical recharge zones.

At the Site, there are isolated locations where a downward gradient exists. For example, the fifth groundwater monitoring event (MWH, 2009) resulted in Site groundwater elevation data that indicated that small downward gradients between the Shallow Zone and the Middle Zone existed at Location 12 (.004) and Location 1 (.004). Downward gradients were also calculated between the Middle Zone and the Deep Zone at Locations 3 (.010) and Location 6 (.050). Downward gradients were also calculated between the Shallow Zone and the Deep Zone at Location 6 (.041). Location 6 is immediately adjacent to the site of a former gravel mining enterprise where most of the Qal had been removed at one time, exposing the UMCf at that location.

Anthropogenic Chemical Impacts

The distributions of chemicals produced by, or as byproducts of, mine processing and manufacturing and waste disposal activities in groundwater provide an indication of the connectivity of water bearing zones. Chemicals that have been evaluated here include those reported in the fifth groundwater monitoring event (MWH, 2009): arsenic (As), hexavalent chromium (Cr VI), perchlorate, TDS, tetrachloroethylene (PCE), and radium 226+228 (Ra226+228).

Though As was detected at elevated concentrations in the Shallow Zone, the data are inconclusive because of elevated laboratory analytic detection limits for samples collected in the Middle and Deep Zones. BRC is committed to obtaining better quality arsenic data in the future using different laboratory analysis methods.

Cr VI was detected at elevated concentrations in Shallow Zone groundwater . The data indicate that the Shallow Zone Cr VI appears to be sourced, at least in part, from an offsite sources where concentrations are as high as 1,300 micrograms per liter (ug/L) to the west and 28ug/L to the south. Cr VI concentrations in the Middle Zone are generally significantly less that those in the Shallow Zone and are typically less than 20 ug/L. Notable exceptions are MCF-06B (54 ug/L) and BEC-6 (160 ug/L). Cr VI concentrations in the Deep Zone are also significantly less that those in the Shallow Zone and typically less than 20 ug/L. Exceptions are MCF-27 (40 ug/L) where an offsite source to the south appears to be indicated, and MCF-22A (28 ug/L). For comparison, Eastside soil samples show Cr VI was detected at relatively low concentrations only at the upgradient well locations AA-UW-1 (0.25 mg/kg at 60 feet), AA-UW-3 (0.4 mg/kg at 30 feet), and AA-UW-4 (0.22 mg/kg at 10 feet) (ERM, 2009).

Perchlorate was detected at elevated concentrations in the Shallow Zone. The data indicate that the Shallow Zone perchlorate appears to be sourced from an offsite sources to the west (concentrations as high as 523,000 ug/L). An expanded discussion of this will be provided in the CSM update expected in the Summer of 2009. Perchlorate concentrations in the Middle Zone are generally significantly less that those in the Shallow Zone. Notable detections in the Middle Zone include monitoring wells MCF-06B (5,580 ug/L), MCF-12C (429 ug/L), and MCF-03B (93.3 ug/L). Perchlorate was also detected in well MCF-01B (672 ug/L), but this appears to be attributable to an offsite source to the southwest. Though perchlorate was not analyzed for samples from several locations, the data that was produced indicate that there were essentially no detections of perchlorate in the Deep Zone (only detected in well MCF-10A at 2.38 j); however some detection limits ranged up to 50 ug/L.

TDS in the Shallow Zone generally mimicked the distribution of perchlorate in the Shallow Zone. The data indicate that the Shallow Zone elevated TDS appears to be sourced, at least in part, from an offsite sources to the west (concentrations as high as 13,000 milligrams per liter [mg/L]) and potentially from the eastern portion of the Upper Ponds area on the Site where monitoring well MCF-16C had a locally elevated concentration of 16,000 mg/L. TDS at depth, however, shows a different distribution at depth than perchlorate. TDS concentrations in the northern area of the Middle Zone were as high as 165,000 mg/L at monitoring well MCF-05. In the Deep Zone TDS concentrations are also locally high in the northern area of the Deep Zone. The highest concentration was noted in well MCF-06A (215,000 mg/L). These elevated concentrations prompted further investigation using stable isotope techniques. This area of high TDS concentrations is interpreted as being caused by a separate source of salts where groundwater has encountered paleo evaporite deposits in the Deep Zone. This is consistent with the interpretation that the Site is located in the distal portion of the regional alluvial system. Boring logs also showed the presence of paleo evaporite deposits in the Deep Zone in this area.

PCE is generally at low to nondetect concentration in the Shallow Zone. Well AA-20 has a low concentration (5.1 ug/L), only slightly above the MCL for PCE. One exception, well AA-01 (54 ug/L) appears to indicate an offsite source to the south-southwest. Both the Middle Zone and Deep Zone well samples were nondetect (< 1 ug/L) for PCE.

A localized area of elevated Ra 226+228 activity was observed in the Shallow Zone vicinity of wells DBMW-3 (6.27 picocuries per liter [pCi/L]) and POD-2 (5.62 pCi/L). Middle Zone wells were generally below the MCL of 5 pCi/L with the exception of MCF-06B (11.43 pCi/L) and MCF-16B (9.37 pCi/L). Deep Zone wells showed some impact above the MCL, with at least partial sourcing of the impact indicated from an offsite source to the west. Notable Ra 226+228 detections included MCF-18A (36.5 pCi/L), MCF-08A (15.65 pCi/L), MCF-24A (13.95 pCi/L), MCF-21A (10.14 pCi/L), and MCF-16A (14.07 pCi/L).

Summary

Evaluation of the data indicates that only limited connectivity exits between the three water-bearing zones at the Site.

Analysis of tritium samples indicates that the water in the Qal is younger than water in the Middle or Deep Zones. Stable isotope analyses indicate that the elevated TDS in the Deep Zone is likely not sourced at the surface, but rather is present because of deep, isolated groundwater encountering and dissolving natural paleo-evaporite deposits. Previous analysis of Piper and Stiff diagrams indicated that general chemistry of water in the Shallow Zone is contrasted from that of the Deep Zone.

Vertical gradients between the Shallow and Deep Zones at the Site are generally upward, with a localized area of downward gradient at Location 6. (Location 6 is immediately adjacent to the site of a former gravel mining enterprise where most of the Qal had been removed at one time, exposing the UMCf at that location). Though no data is available to assess historical vertical gradients, it is expected that similar gradient conditions would have existed in the past based on the Site location as a pressure zone in the mixed alluvial fan and lacustrine depositional environment.

Chemical impacts to the Shallow Zone appear to be independent of those in the Deep Zone and vice versa. The Middle Zone wells appear to variously have impacts influenced by both those in the Shallow and in the Deep Zones. Though TDS and perchlorate chemical distribution signatures were very similar in the Shallow Zone, the respective impacts were much different in the Deep Zone. This indicates an origin for the Deep Zone TDS other than migration from the Shallow Zone.

It is interpreted that the Shallow Zone and the Deep Zone are largely isolated from one another at the Site. However, there is limited connection between the Shallow Zone and the Deep Zone through the Middle Zone. The large depth interval of the Middle Zone and the generally low permeability of the Middle Zone together serve to greatly modulate and buffer hydraulic variation and chemical transport between the Shallow and the Deep Zones.

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MWH, 2009. Fifth Round Groundwater Monitoring Report (April - July 2008), BMI Common Areas (Eastside), Clark County, Nevada.

Responsible CEM for this Project

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and, to the best of my knowledge, comply with all applicable federal, state, and local statutes, regulations, and ordinances.

Stephen J. Cullen

Stephen J. Cullen, PhD., C.E.M. (No. 1839, Exp. 11/12/09

Daniel B. Stephens & Associates, Inc.

Individuals Who Provided Technical Input to this Document

John J. Dodge

John J. Dodge, P.G.

Daniel B. Stephens & Asscociates, Inc.

Figures

Figure 1. Atmospheric Tritium Content, Santa Maria, California 1961-1976

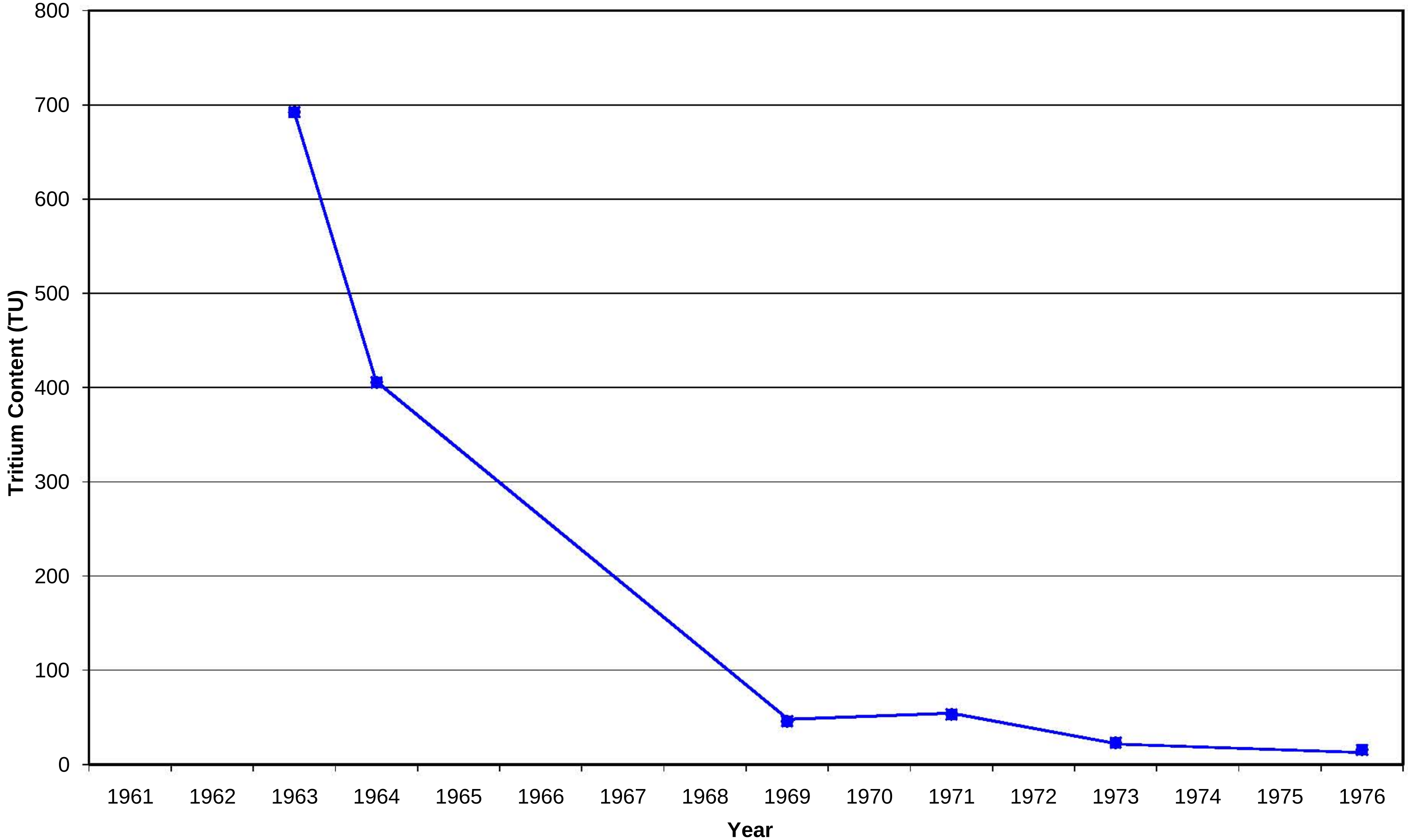
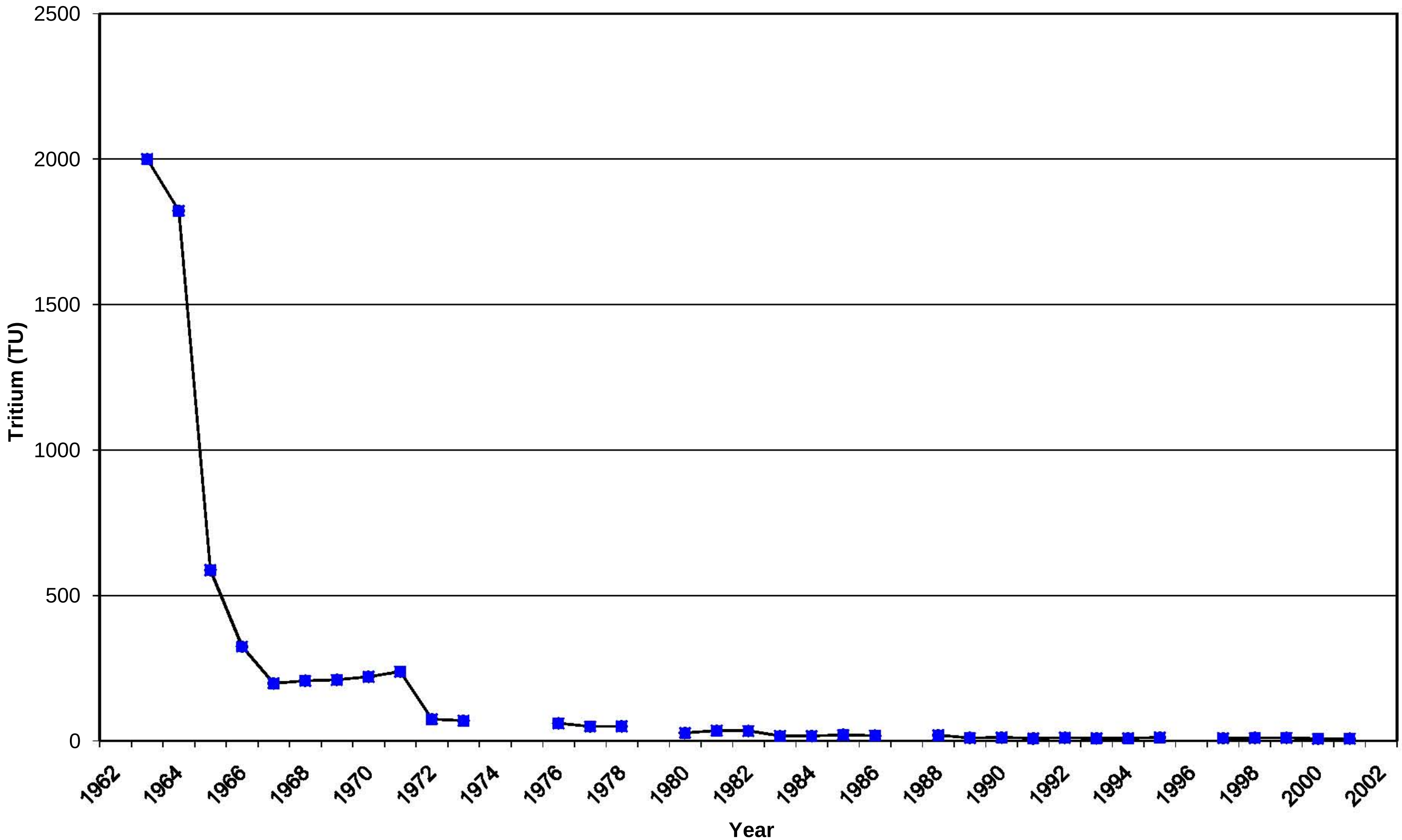
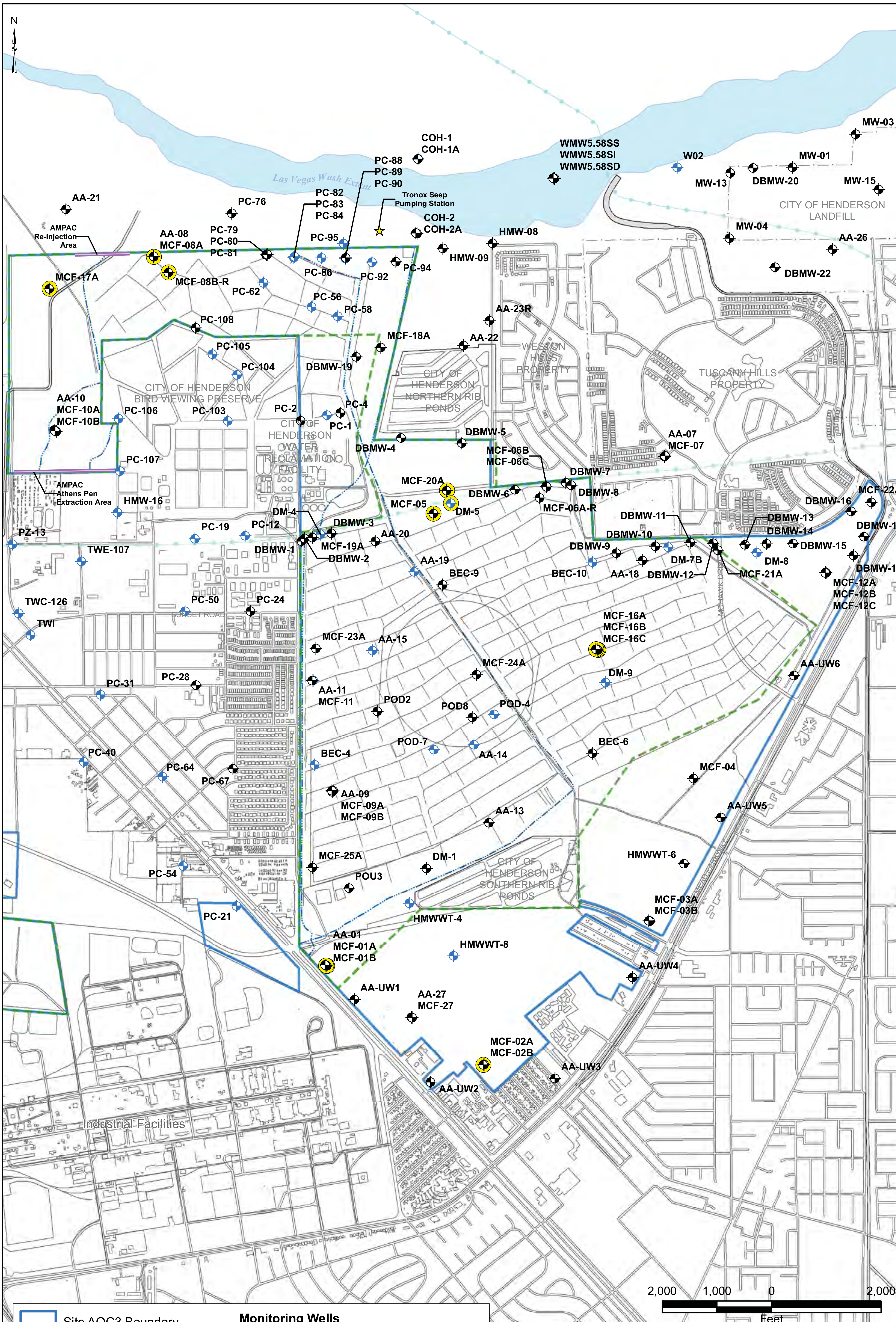


Figure 2. Atmospheric Tritium Content, Albuquerque, New Mexico 1963-2001





Site AOC3 Boundary

Site Soil Boundary

Ditches

Flood Conveyance Channels

Laterals

Monitoring Wells

Water Level Data Only

Water Quality and Water Level Data

Tracer Analyses Well Location

FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE 3

MONITORING WELL
LOCATIONS AND
ANALYTICAL SUITES

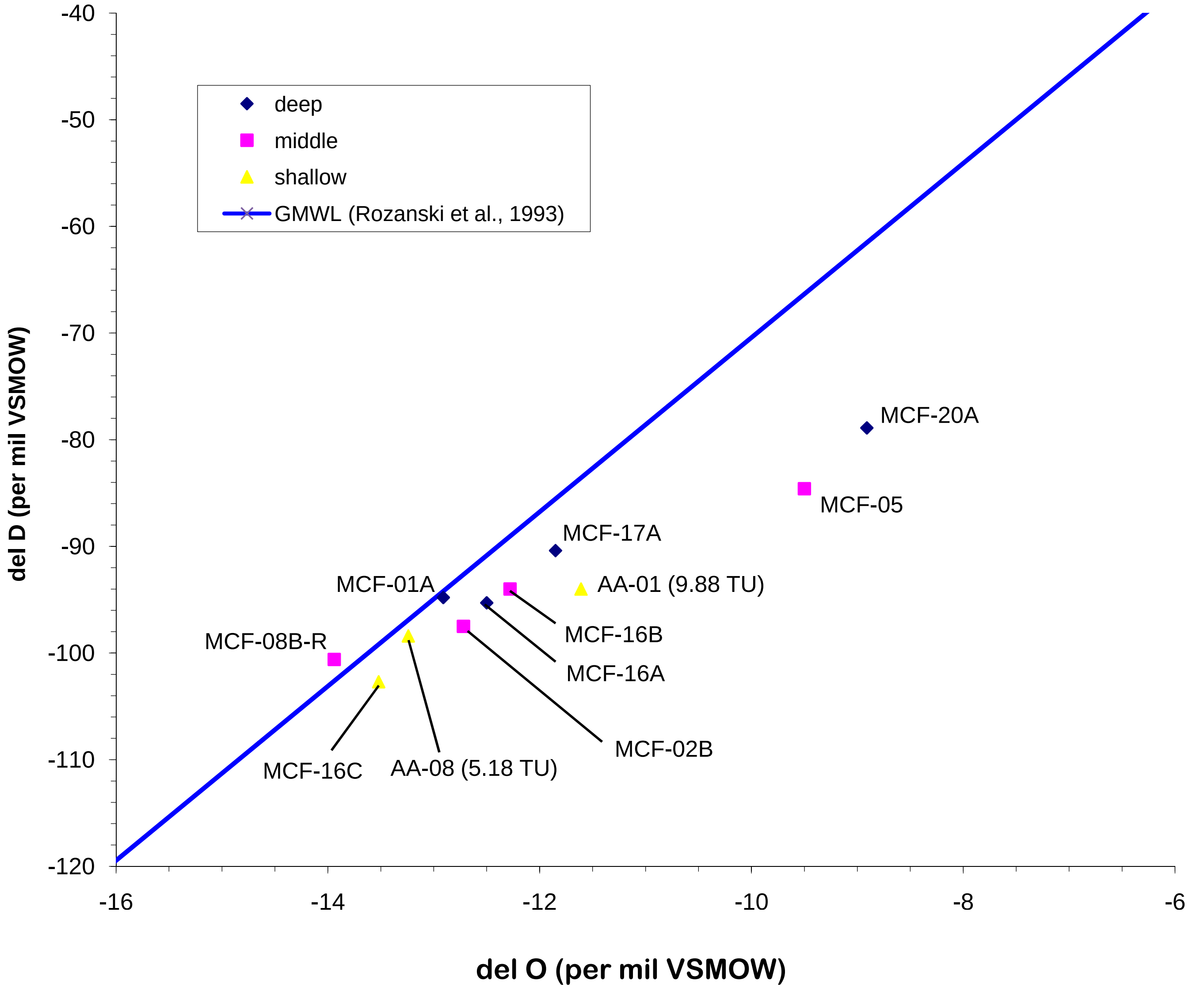
Basic Remediation Company

Prepared by: ERM MWH

Date 12/18/08

JOB No. 0064276
FILE: GIS/BRC/FIGURE_1-2.MXD

Figure 4 - Round 5 Groundwater Samples and GMWL



Table

Table 1
BMI Common Areas (Eastside) Groundwater Sampling
Isotopic Data Results Summary (April - July 2008)

Well	Location	Zone	Screen Interval (fbgs) Top - Bottom	Date	Delta-D per mil (ppt)	Delta-D Percent less than Standard VSMOW	Delta-D Ranking Light (1) to Heavy (11)	Delta-O per mil (ppt)	Delta-O Percent less than Standard VSMOW	Delta-O Ranking Light (1) to Heavy (11)	Tritium TU	Tritium pCi/L
AA-08	Western Hook	Shallow	5 - 35	5/16/2008	-98.4	9.84%	3	-13.24	1.32%	3	5.18	16.52
MCF-08B-R	Western Hook	Middle	116.5 - 136.5	7/23/2008	-100.6	10.06%	2	-13.94	1.39%	1	< 1	< 3.19
MCF-17A	Western Hook	Deep	367 - 387	7/21/2008	-90.4	9.04%	9	-11.85	1.19%	8	< 1	< 3.19
MCF-16C	East of Spray Wheel	Shallow	53 - 73	5/19/2008	-102.7	10.27%	1	-13.52	1.35%	2	< 1	< 3.19
MCF-16B	East of Spray Wheel	Middle	283.7 - 313.7	5/19/2008	-94	9.40%	8	-12.28	1.23%	7	< 1	< 3.19
MCF-16A	East of Spray Wheel	Deep	364.5 - 384.5	5/19/2008	-95.3	9.53%	5	-12.5	1.25%	6	< 1	< 3.19
MCF-05	Near Pittman lateral	Middle	221 - 231	4/30/2008	-84.6	8.46%	**10**	-9.5	0.95%	**10**	< 1	< 3.19
MCF-20A	Near Pittman lateral	Deep	360 - 380	7/18/2008	-78.9	7.89%	**11**	-8.91	0.89%	**11**	< 1	< 3.19
AA-01	Southwestern Site boundary	Shallow	29 - 49	4/22/2008	-94	9.40%	7	-11.61	1.16%	9	9.88	31.52
MCF-02B	Southern Site boundary	Middle	215 - 235	4/24/2008	-97.5	9.75%	4	-12.72	1.27%	5	< 1	< 3.19
MCF-01A	Southwestern Site boundary	Deep	335 - 355	4/28/2008	-94.8	9.48%	6	-12.91	1.29%	4	< 1	< 3.19

Notes:
< - Analyte Not Detected at indicated Reporting Limit
per mil - Parts per thousand (ppt) relative to Vienna Standard Mean Ocean Water (VSMOW); VSMOW = 0 mil.
Delta (per mil) (ppt) (‰) = (Rsample/Rstandard - 1)1000; R = ratio of heavy to light isotope.
Delta-D = Delta^{2}H - Ratio of stable Isotopes of Hydrogen (Deuterium [^{2}H]/Protium [^{1}H]); 2H/1H
Delta-O = Delta^{18}O - Ratio of stable Isotopes of oxygen (^{18}O/^{16}O); 18O/16O
Note: isotopically heavier = less negative values; isotopically lighter = more negative values.

TU - Tritium unit
One TU is approximately equivalent to 3.19 pCi/L

Example: A positive δ value means that the sample contains more of the heavy isotope than the standard; a negative δ value means that the sample contains less of the heavy isotope than the standard. A δ15N value of +30‰ (+30 per mil) means that there are 30 parts-per-thousand or 3% more 15N in the sample relative to the standard.

Rozanski, K., L. Araguás-Araguás, and R. Gonfiantini (1993), Isotopic patterns in modern global precipitation, in *Climate Change in Continental Isotopic Records*, *Geophysical Monograph No. 78*, edited by P. K. Swart, K. C. Lohmann, J. McKenzie, and S. Savin, pp.1-36, AGU, Washington, D. C.

Appendix A

Responses to Nevada Division of Environmental Protection (NDEP) Comments, dated April 24, 2009, to Tritium and Stable Isotope Sampling and Analysis, and Evaluation of Hydrogeologic Zone Connectivity, BMI Common Areas (Eastside), Clark County, Nevada, dated March 26, 2009
NDEP Facility ID# H-000688

1. General, where previous data, figures and tables are referenced, please reproduce and include as appendix materials (as feasible). Additionally, this document (once finalized and approved) should be incorporated in the conceptual site model (CSM) update expected in the summer of 2009.

> ***Response:*** In the revised document, applicable reference materials have been included in an appendix. Also, this document will be incorporated into the CSM as noted.

2. Page 11, first paragraph, please include referenced Quaternary alluvium (Qal) water travel velocity and residence time calculations.

> ***Response:*** An estimate for groundwater velocity has been added to the revised text. Residence time can be estimated using particle tracking, however, residence time is a relatively complex parameter that cannot be estimated, for example, without defining a recharge location as a starting point. The calculation of residence time is not necessary to evaluate the rate movement of a tracer within a system from a release point to a monitoring point. As a result, the text discussing residence time has been omitted from the text.

3. Page 11, second paragraph, NDEP concurs that the amount of data presented for tritium analysis is limited, however, NDEP is unsure that additional data will provide commensurate value.

> *Response:* Comment noted.

4. Page 11, number 2, BRC should also consider discussing (and presenting) information relating to vertical gradients at the Site.

> ***Response:*** The text (at "number 2" cited above) has been revised to reference the discussion of vertical gradients that occurs later in the document. In addition, the updated vertical gradient calculation figure and tables have been added as an appendix to the revised document.

5. Page 12, first paragraph, please provide mass flux/mixing calculations to support assertion of limited flux and mixing of Qal and Upper Muddy Creek formation (UMCf) waters.

> ***Response:*** An estimate of groundwater flux and mixing is presented in the revised text.

6. Page 12, third paragraph, NDEP concurs that the isotopically heavier signature of MCF-05 and MCF-20A may support the concept that the source of high total dissolved solids (TDS) in these locations is evaporitic deposits, however, the logical process appears to be incomplete, please

expand. For example, has the evaporitic deposit been characterized in terms of nature and extent? Have the mineral(s) of the deposit been identified? What are the basic geochemical reactions and kinetics, related to observed water chemistry? Do other wells screened within the conceptualized deposit exhibit isotope fractionation? Conversely, are the wells which plot on the "Local Meteoric Water Line" located within the same conceptual deposit? Can this theory be supported using Piper and Stiff diagrams?

Response: The CSM will include hydrogeologic cross-sections that illustrate the lateral and vertical extent of the evaporite deposits, to the extent known. The deposits have been characterized in boring logs as gypsum-bearing sediments.   The observed water chemistry, as it relates to the evaporite deposits rich in gypsum ($CaSO_4$), will be evaluated in the CSM. A discussion of evaporite dissolution will be included. The CSM will evaluate the spatial distribution of the conceptualized evaporite deposit relative to wells that plot on the Local Meteoric Water Line.

The 2009 Eastside groundwater sampling plan includes supplemental isotope sampling to further evaluate groundwater quality. Piper and Stiff diagrams will be used to evaluate if groundwater sampled from wells installed within the interpreted evaporite deposit have a unique geochemical signature. This evaluation will be presented in the CSM.

7. Page 12, number 1, the advective travel time calculation is presented as being conservative; NDEP has several exceptions with this statement as follows:

   a. The logical starting point for such transport calculation should be the former TIMET Spray Wheel or TIMET ponds rather than location 16 as these appear to be the primary potential Site source for water and TDS.

Response: A revised transport calculation, with the former TIMET Spray Wheel of the TIMET ponds as the starting point, will be evaluated and presented if appropriate in the CSM. In any case, this issue will be discussed.

   b. The calculation does not account for dispersion, and only provides an average seepage velocity rather than a more conservative "toe" travel time for solutes.

Response: Dispersion is not anticipated to significantly alter the conclusion that transport is relatively slow. The text will be revised to note that dispersion (and potential preferred pathways) is not accounted for in the estimate. If applicable, a revised calculation that includes dispersion will be presented in the CSM.

   c. The calculation does not account for preferential pathways; NDEP has observed boring cores from various locations at the Site, and has observed a natural cleavage plane especially in the presence of "evaporite" crystals within boring cores. Preferential pathways may also be present due to heterogeneity. Also, vertical preferential pathways, such as soil macro-structures, may dominate flow and transport, especially through media which has resided below paleosurfaces.

Response: As part of the calculation to be presented in the CSM, BRC will evaluate the evidence and potential for preferential flow pathways in both horizontal and vertical directions.

8. Page 13, number 2, as noted above, please include the referenced chemical maps as appendix material.

Response: Isopleth maps from the 5th round report (updated to include interpreted paleochannel locations) have been included in the revised technical memorandum.

9. Page 13, number 3, please discuss if the previous water quality data been quality control checked using standard operating procedures (SOPs) (e.g.: cation anion balance checks) and flagged accordingly. BRC should also discuss if the data is usable. Please include the most pertinent Piper and Stiff diagrams as appendix material.

Response: Cation anion balance checks have been completed for the data from each BRC groundwater monitoring event. The results of the CAB checks are currently in review with the laboratory to determine why some analyses do not meet the 5% balance criteria. The 2009 Eastside groundwater sampling plan includes specific field and laboratory tasks that will be included to evaluate the failing CABs. New CAB calculations will be completed with the new 2009 data. The results of the CAB analysis, and revised Piper and Stiff diagrams, if needed, will be included in the 2009 sampling report. Piper diagrams for the 5th round event are included in the revised tech memo for reference with 2004 Stiff diagrams. Stiff diagrams for the most recent data have not yet been completed pending the CAB issue.

10. Page 13, number 4, BRC assumes that the present-time observed general upward gradient was also the historical case. Please consider the degree of hydraulic gradient reversal which would be induced via TIMET Spray Wheel, evaporation pond, and rapid infiltration basin infiltration and mounding. Please account for density-driven flow in your consideration.

Response: This task is underway in preparation for inclusion in the CSM.

11. Page 13, number 5, the assertion of hexavalent chromium migration within the Deep Zone appears to be inconsistent with travel time calculations presented in page 12, number 1. Please support this assertion with similar calculations.

Response: The coarse-grained facies of the TMC (TMCcg or UMCf cg) is interpreted to be present to the south of the Eastside site, that is, sand lenses within the TMCcg are anticipated to be facilitating contaminant transport in this area. The CSM will discuss this concept in detail. The revised isotope tech memo includes a calculation to demonstrate the anticipated travel time in the TMCcg.

12. Page 14, Anthropogenic Chemical Impacts, the NDEP has the following comments:

    a. Iso-concentration maps need to be included with this discussion.

> ***Response:*** Iso-concentration maps from the 5th round monitoring event have been included as an appendix to the revised document.

    b. BRC refers to the elevated arsenic detection limits as a limiting factor. It appears that this document will need to be revisited after the next round of sampling when usable data is gathered.

> ***Response:*** Additional arsenic sampling has been proposed in the 2009 Eastside groundwater sampling plan. The new data will be incorporated as applicable into the interpretation of the isotopic data for the Eastside area as well as the overall Eastside CSM.

13. Page 15, first paragraph, hexavalent chromium concentrations are noted to have been present in the Middle and Deep Zones. What is the current conceptual model for these occurrences? Are soil analytical data available that can support or refute hexavalent chromium as an anthropogenic tracer?

> ***Response:*** The current hypothesis for the CrVI conceptual model is that sand lenses in the TMCcg are facilitating transport from the offsite area. This concept will be described in detail in the CSM along with supporting data. The soil data for CrVI have been cited in the text of the revised isotope tech memo.

14. Page 15, second paragraph, perchlorate concentrations are stated to have been "essentially" not detected in the Deep Zone. Does this mean that detections were made? If so, what is the current conceptual model for these occurrences? BRC also states that perchlorate was not analyzed for several locations; since perchlorate is among the most relevant anthropogenic tracers for the Site, please sample for perchlorate at all Middle and Deep Zone locations, including those of the most recent round of well installations. Also, please insure the use of the lowest possible laboratory detection limit. As discussed with BRC previously, it may be necessary to utilize a different analytical method to gather meaningful data.

> ***Response:*** In the 5th round groundwater sampling event, perchlorate was detected only in Western Hook area deep well MCF-10A at 2.38 J. Additional perchlorate sampling and analysis with a different laboratory method has been proposed in the 2009 Eastside groundwater sampling plan. The new data will be incorporated into the interpretation of the isotopic data for the Eastside area as well as the overall Eastside CSM.

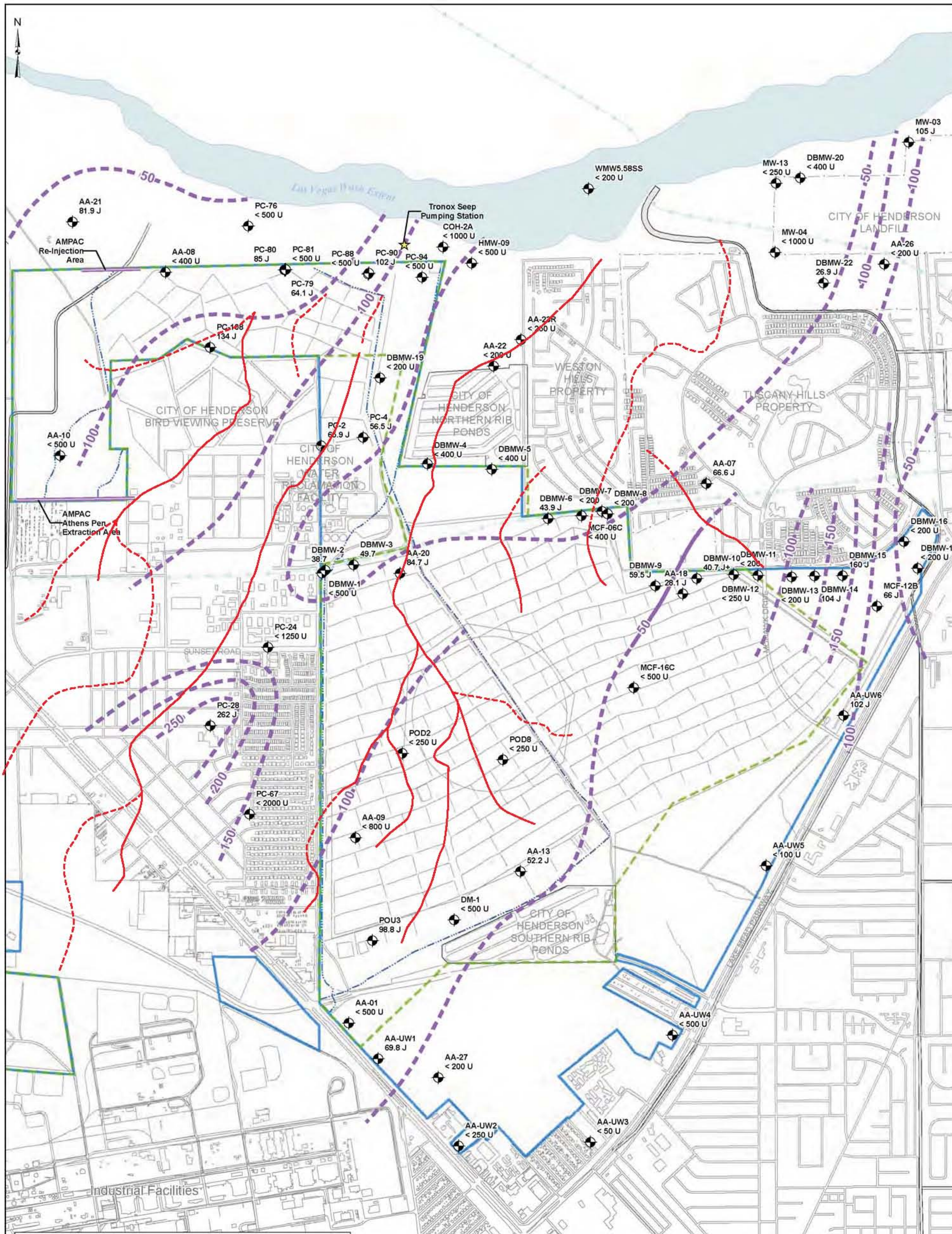
15. Page 16, Summary, second paragraph, as noted previously by NDEP, it appears that most of the data used to generate the referenced Piper and Stiff diagrams is unusable. This issue will need to be revisited once usable data is collected.

> ***Response:*** Please see the response to Comment No.9 above.

16. Page 16, fifth paragraph, the relationship between the former gravel mining operation, and the localized area of downward gradient at Location 6, is unclear. Please explain.

Response: Currently there is no clear relationship that is evident between the former mine and the gradient at Location 6. This information is included in the document as a matter of completeness. If a relationship is determined to be present it will be detailed in the revised document and in the CSM.

Appendix B



All results are in µg/L.

MCL = 10 µg/L.

Note: Data validation qualifiers
are defined in Table 3-2.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.

Site Soil Boundary
Site AOC3 Boundary
Laterals
Ditches
Flood Conveyance Channels
Monitoring Wells
Concentration Contour
(dashed where inferred)
Paleochannels
(dashed where inferred)

FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

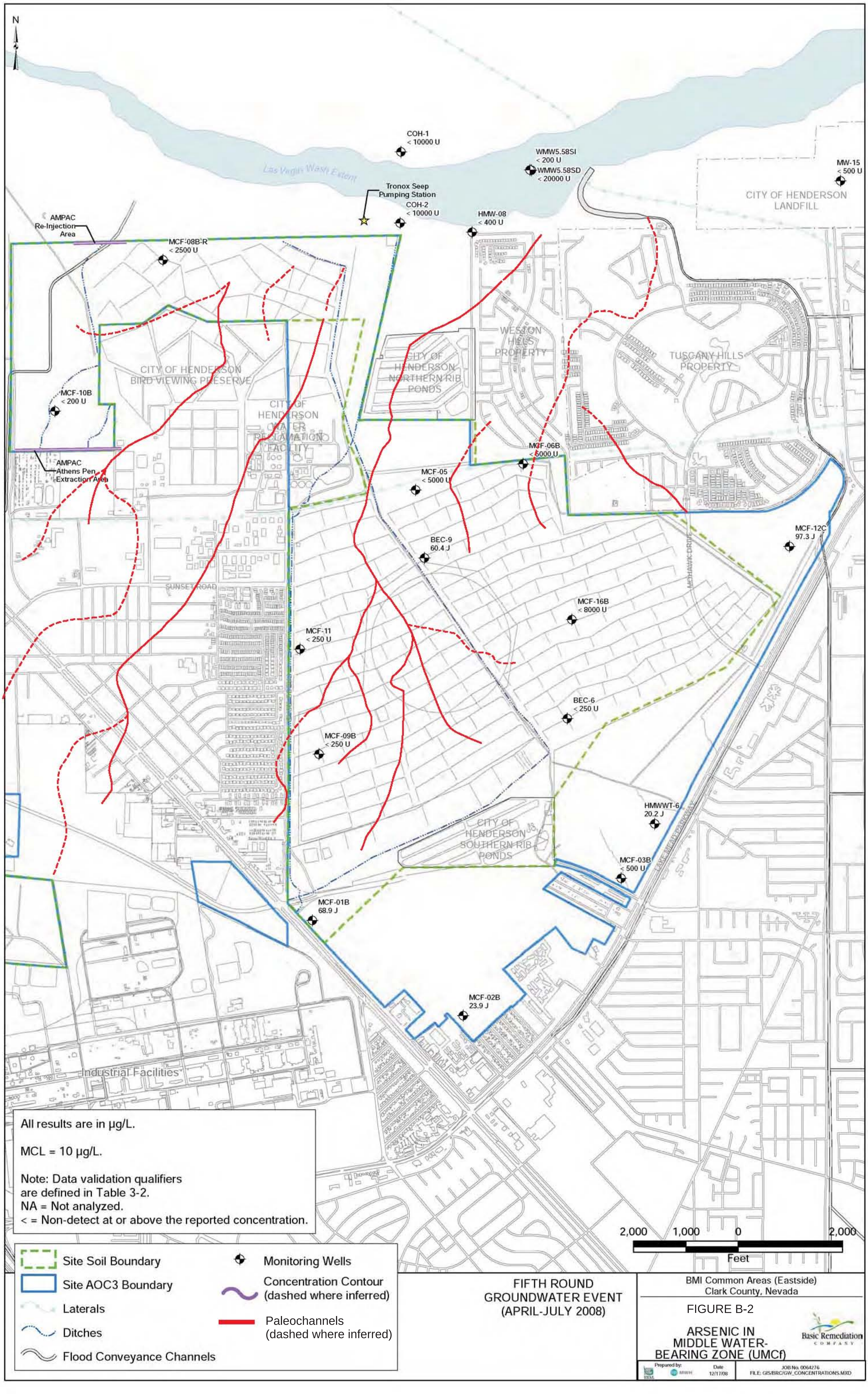
BMI Common Areas (Eastside)
Clark County, Nevada

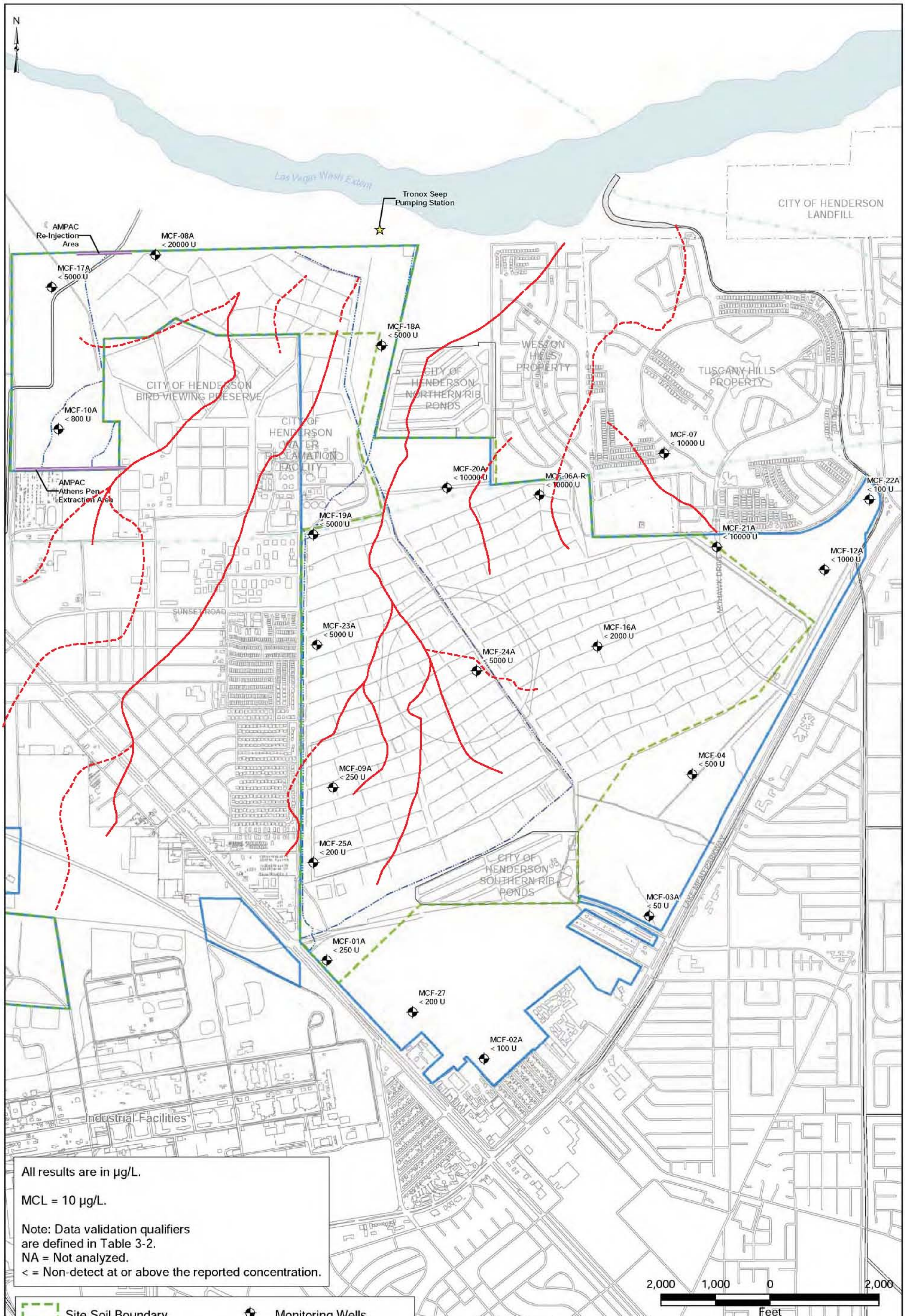
FIGURE B-1

ARSENIC IN
SHALLOW WATER-
BEARING ZONE

Basic Remediation
COMPANY

Prepared by: MWH
Date 12/17/08
JOB No. 0064276
FILE: GIS/BRC/GW_CONCENTRATIONS.MXD


N
COH-1
< 10000 U
WMW5.58SI
< 200 U
WMW5.58SD
< 20000 U
MW-15
< 500 U
Las Vegas Wash Extent
Tronox Seep
Pumping Station
COH-2
< 10000 U
CITY OF HENDERSON
LANDFILL
AMPAC
Re-Injection
Area
HMW-08
< 400 U
MCF-08B-R
< 2500 U
WESTON
HILLS
PROPERTY
TUSCANY HILLS
PROPERTY
CITY OF HENDERSON
NORTHERN RIB
PONDS
CITY OF HENDERSON
BIRD VIEWING PRESERVE
CITY OF
HENDERSON
WATER
RECLAMATION
FACILITY
MCF-10B
< 200 U
AMPAC
Athens Pen
Extraction Area
MCF-06B
< 6000 U
MCF-05
< 5000 U
BEC-9
60.4 J
MCF-12C
97.3 J
SUNSET ROAD
MOHAWK DRIVE
MCF-16B
< 8000 U
MCF-11
< 250 U
BEC-6
< 250 U
MCF-09B
< 250 U
HMWWT-6
20.2 J
CITY OF
HENDERSON
SOUTHERN RIB
PONDS
MCF-03B
< 500 U
LAKE MEAD PARKWAY
MCF-01B
68.9 J
MCF-02B
23.9 J
Industrial Facilities
All results are in µg/L.
MCL = 10 µg/L.
Note: Data validation qualifiers
are defined in Table 3-2.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.
2,000 1,000 0 2,000
Feet
Site Soil Boundary
Site AOC3 Boundary
Laterals
Ditches
Flood Conveyance Channels
Monitoring Wells
Concentration Contour
(dashed where inferred)
Paleochannels
(dashed where inferred)
FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)
BMI Common Areas (Eastside)
Clark County, Nevada
FIGURE B-2
ARSENIC IN
MIDDLE WATER-
BEARING ZONE (UMCf)
Basic Remediation
COMPANY
Prepared by:
MWH
Date
12/17/08
JOB No. 0064276
FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



All results are in µg/L.

MCL = 10 µg/L.

Note: Data validation qualifiers are defined in Table 3-2.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.

Site Soil Boundary
Site AOC3 Boundary
Laterals
Ditches
Flood Conveyance Channels
Monitoring Wells
Concentration Contour (dashed where inferred)
Paleochannels (dashed where inferred)

FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

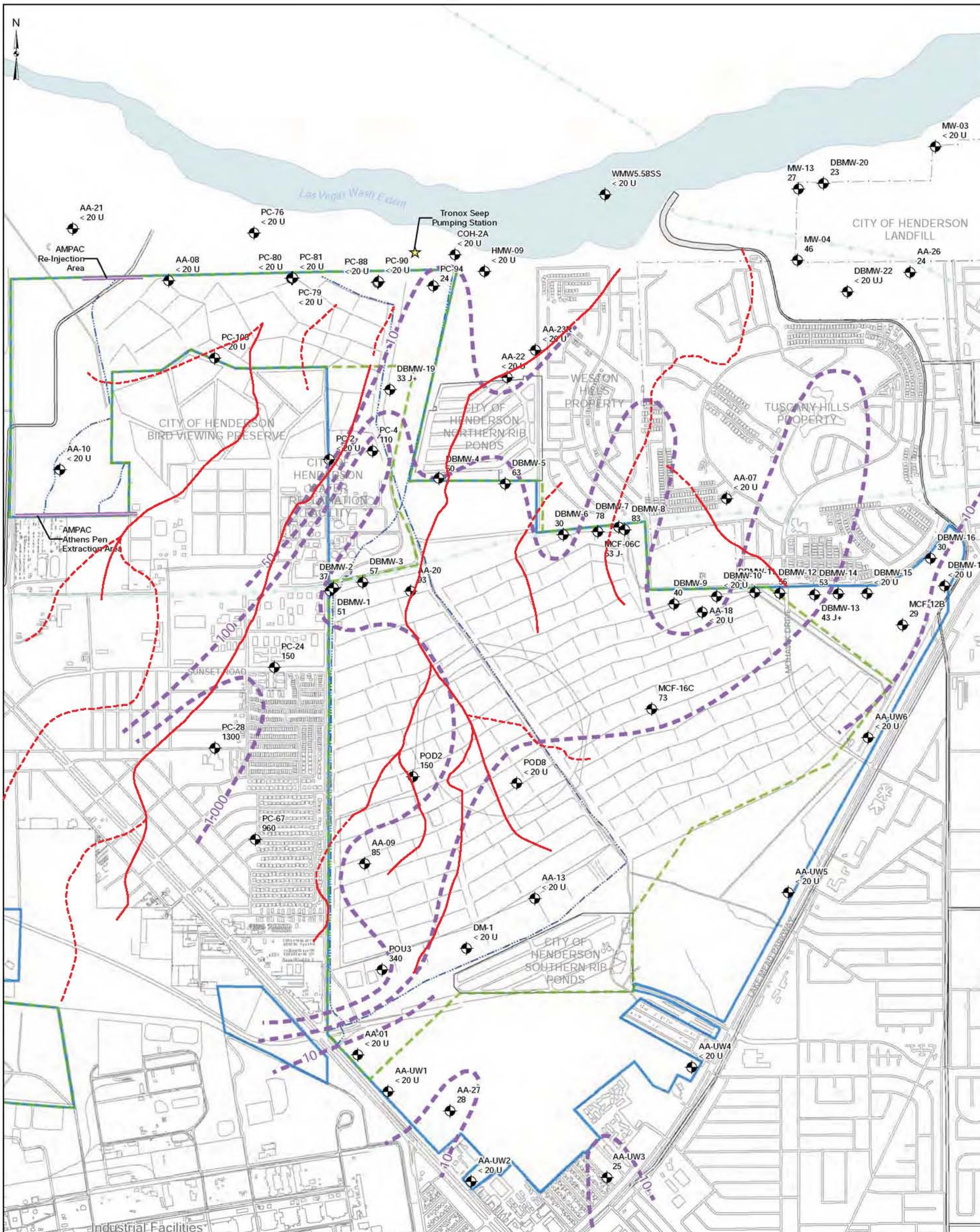
BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-3

ARSENIC IN DEEP WATER-BEARING ZONE (UMCf)

Basic Remediation Company

Prepared by: MWH | Date 12/17/08 | JOB No. 0064276 FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



All results are in µg/L.

An MCL has not been established for hexavalent chromium. MCL for total chromium is 100 µg/L.

Note: Data validation qualifiers are defined in Table 3-2.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.

- Site Soil Boundary
- Site AOC3 Boundary
- Laterals
- Ditches
- Flood Conveyance Channels
- Monitoring Wells
- Concentration Contour (dashed where inferred)
- Paleochannels (dashed where inferred)

FIFTH ROUND GROUNDWATER EVENT (APRIL-JULY 2008)

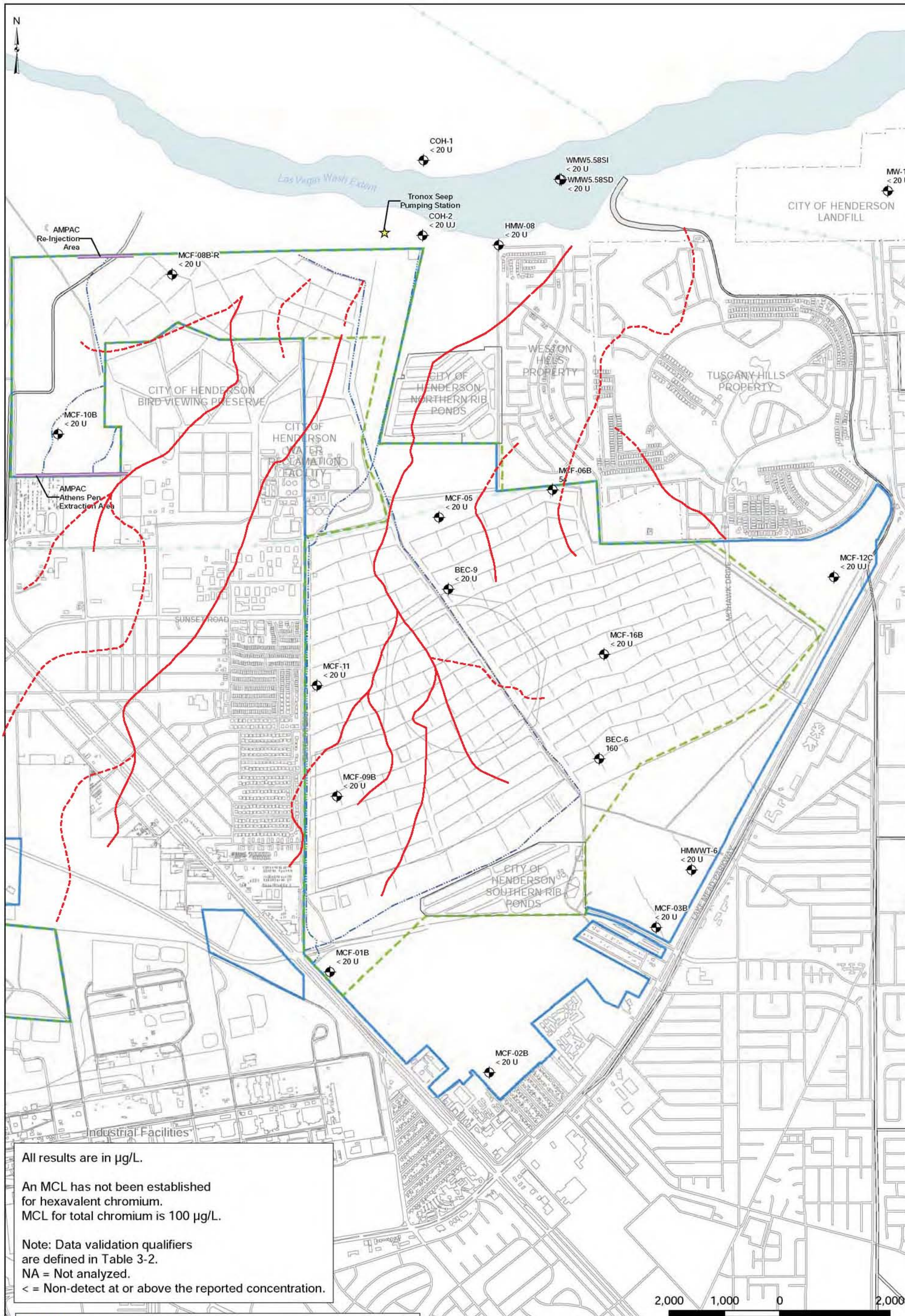
BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-4

HEXAVALENT CHROMIUM IN SHALLOW WATER-BEARING ZONE

Basic Remediation Company

Prepared by: MWH | Date 12/17/08 | JOB No. 0064276 | FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



All results are in µg/L.

An MCL has not been established for hexavalent chromium.
MCL for total chromium is 100 µg/L.

Note: Data validation qualifiers are defined in Table 3-2.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.

- Site Soil Boundary
- Site AOC3 Boundary
- Laterals
- Ditches
- Flood Conveyance Channels
- Monitoring Wells
- Concentration Contour (dashed where inferred)
- Paleochannels (dashed where inferred)

FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

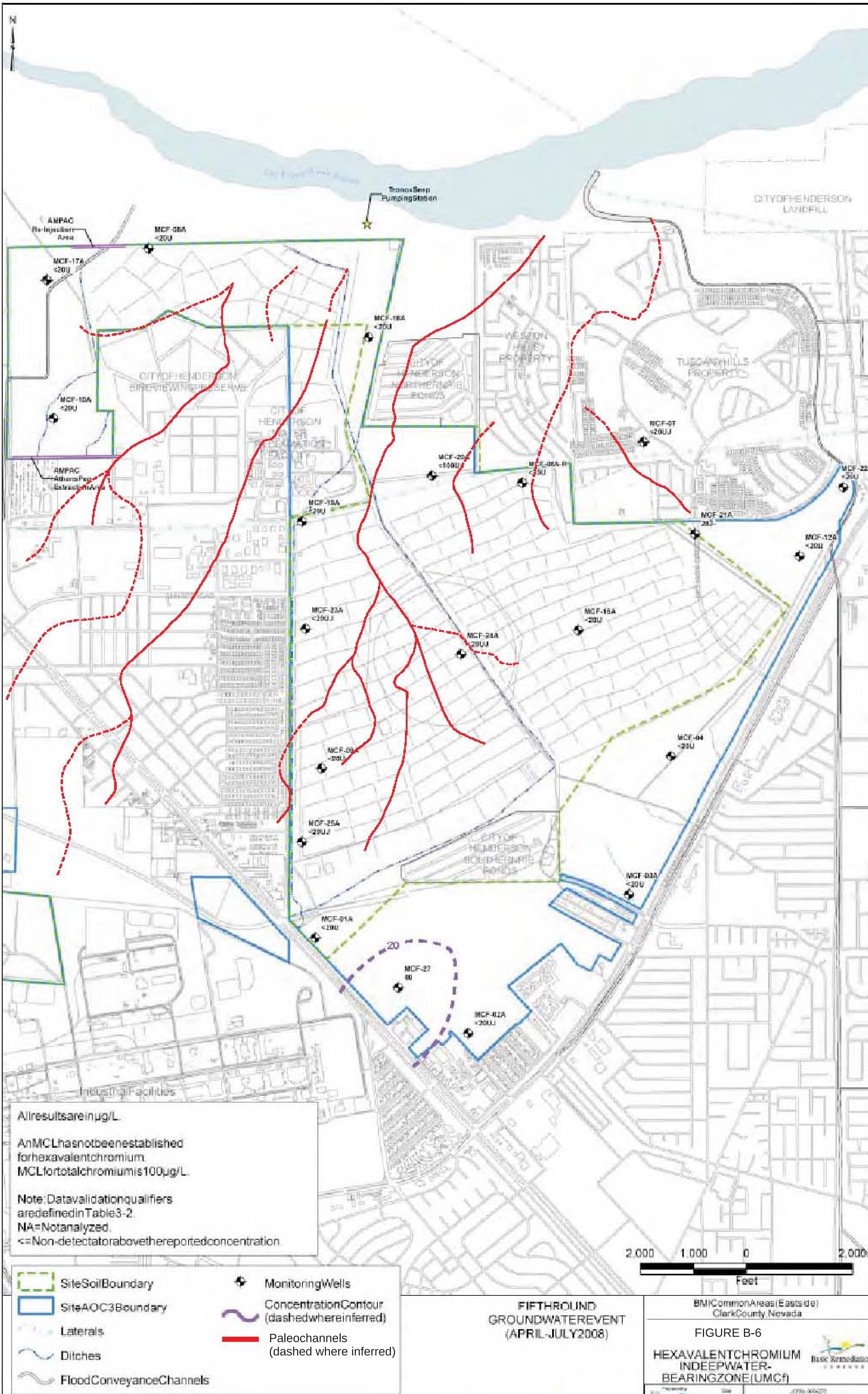
BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-5

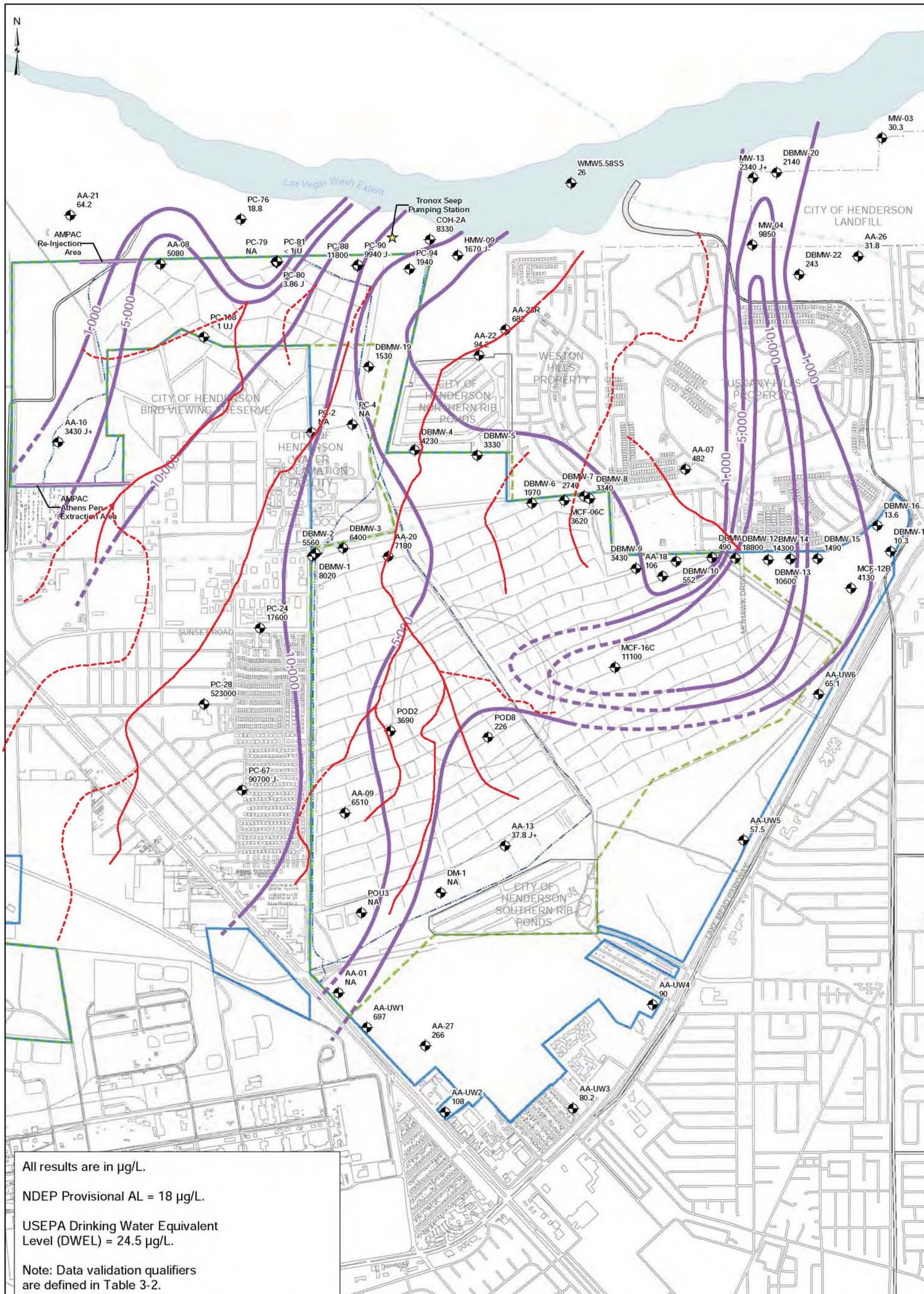
HEXAVALENT CHROMIUM IN MIDDLE WATER-BEARING ZONE (UMCf)

Basic Remediation Company

Prepared by: MWH | Date 12/17/08 | JOB No. 0064276 | FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



N
Tronox Seep Pumping Station
CITYOFHENDERSON LANDFILL
AMPAC Re-Injection Area
MCF-08A <20U
MCF-17A <20U
MCF-16A <20U
CITYOFHENDERSON BIRDVIEWINGPRESERVE
CITYOF HENDERSON NORTHERNRIB PONDS
WESTON HILLS PROPERTY
TUSCANHILLS PROPERTY
MCF-10A <20U
CITYOF HENDERSON WATER RECLAMATION FACILITY
MCF-07 <20UJ
AMPAC AthensRd Extraction Area
MCF-20A <100U
MCF-06A-R <20U
MCF-22A <20U
MCF-19A <20U
MCF-21A 26J
MCF-12A <20U
MCF-23A <20UJ
MCF-15A <20U
MCF-24A <20UJ
MCF-04 <20U
MCF-09A <20UJ
MCF-25A <20UJ
CITYOF HENDERSON SOUTHERNRIB PONDS
MCF-03A <20U
MCF-01A <20U
20
MCF-27 80
MCF-02A <20UJ
IndustrialFacilities
Allresultsareinμg/L.
AnMCLhasnotbeenestablished forhexavalentchromium. MCLfortotalchromiumis100μg/L.
Note:Datavalidationqualifiers aredefinedinTable3-2. NA=Notanalyzed. <=Non-detectatorabovethereportedconcentration.
2,000
1,000
0
2,000
Feet
SiteSoilBoundary
SiteAOC3Boundary
Laterals
Ditches
FloodConveyanceChannels
MonitoringWells
ConcentrationContour (dashedwhereinferred)
Paleochannels (dashed where inferred)
FIFTHROUND GROUNDWATEREVENT (APRIL-JULY2008)
BMICommonAreas(Eastside) ClarkCounty,Nevada
FIGURE B-6
HEXAVALENTCHROMIUM INDEEPWATER-BEARINGZONE(UMCf)
Basic Remediation



All results are in µg/L.

NDEP Provisional AL = 18 µg/L.

USEPA Drinking Water Equivalent Level (DWEL) = 24.5 µg/L.

Note: Data validation qualifiers are defined in Table 3-2.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.

Site Soil Boundary
Site AOC3 Boundary
Laterals
Ditches
Flood Conveyance Channels
Monitoring Wells
Concentration Contour (dashed where inferred)
Paleochannels (dashed where inferred)

FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

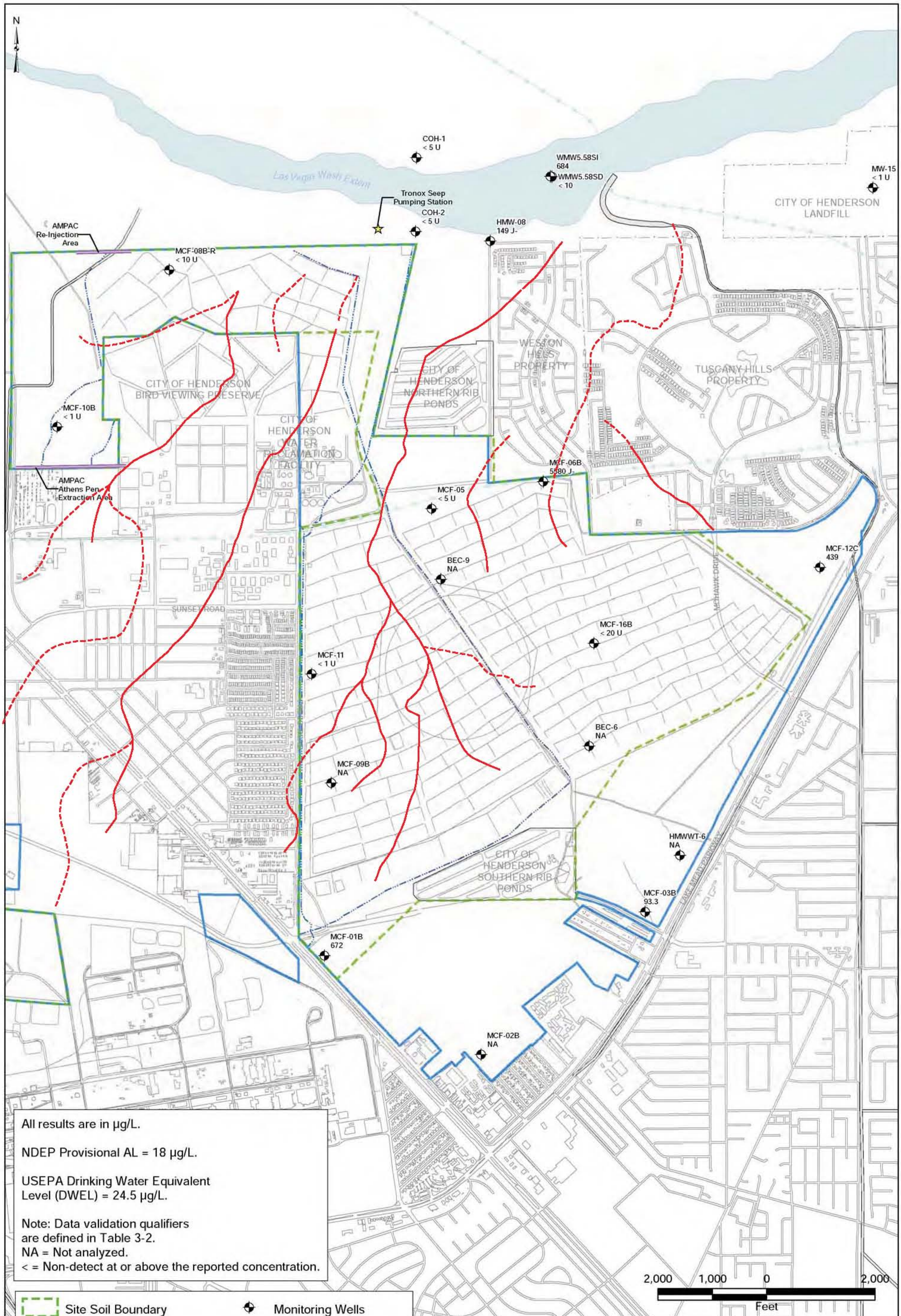
BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-7

PERCHLORATE IN SHALLOW WATER-BEARING ZONE

Basic Remediation Company

Prepared by: MWH
Date 12/17/08
JOB No. 0064276
FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



All results are in µg/L.

NDEP Provisional AL = 18 µg/L.

USEPA Drinking Water Equivalent Level (DWEL) = 24.5 µg/L.

Note: Data validation qualifiers are defined in Table 3-2.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.

Site Soil Boundary	Monitoring Wells
Site AOC3 Boundary	Concentration Contour (dashed where inferred)
Laterals	Paleochannels (dashed where inferred)
Ditches	
Flood Conveyance Channels	

FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

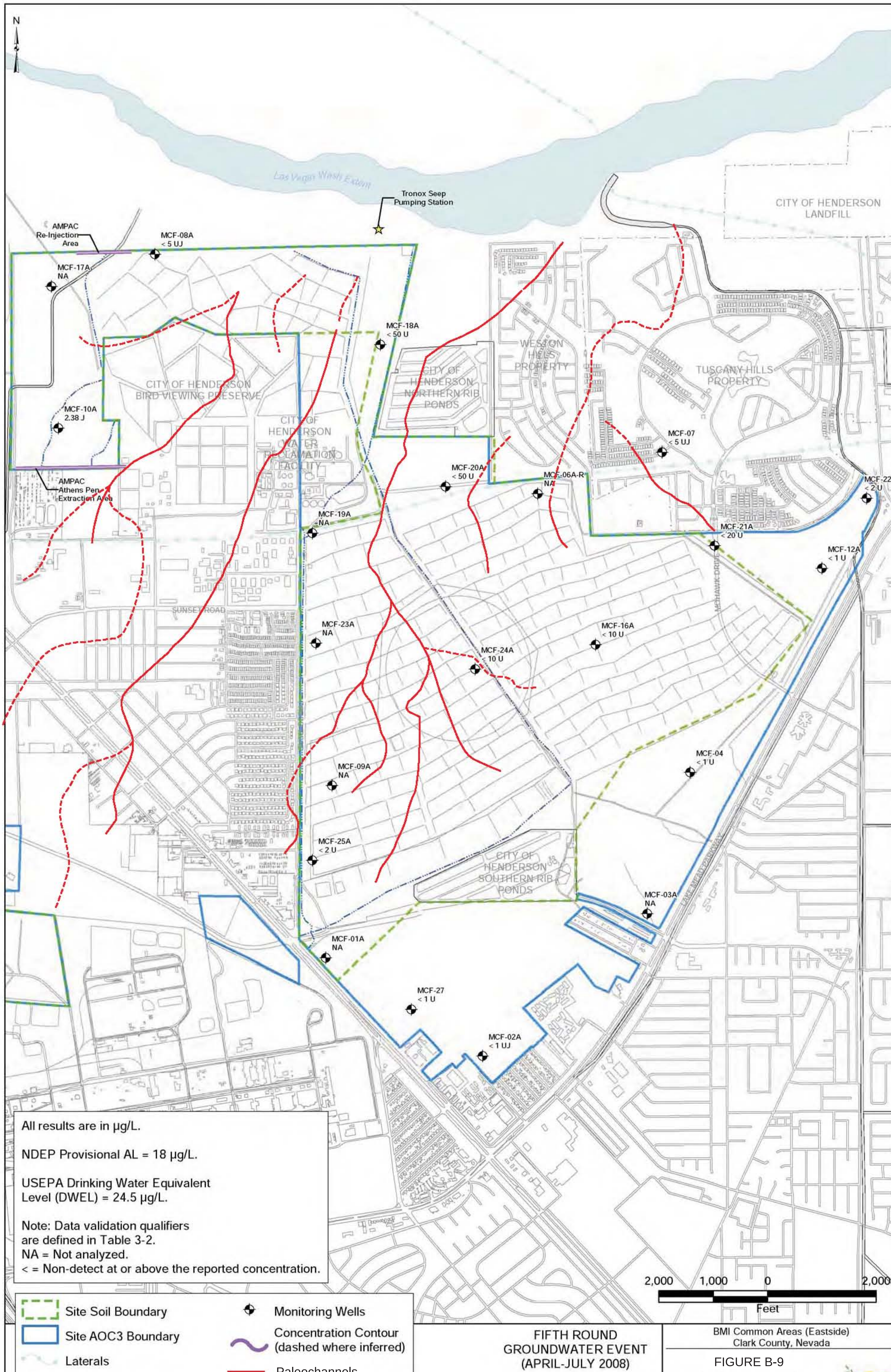
BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-8

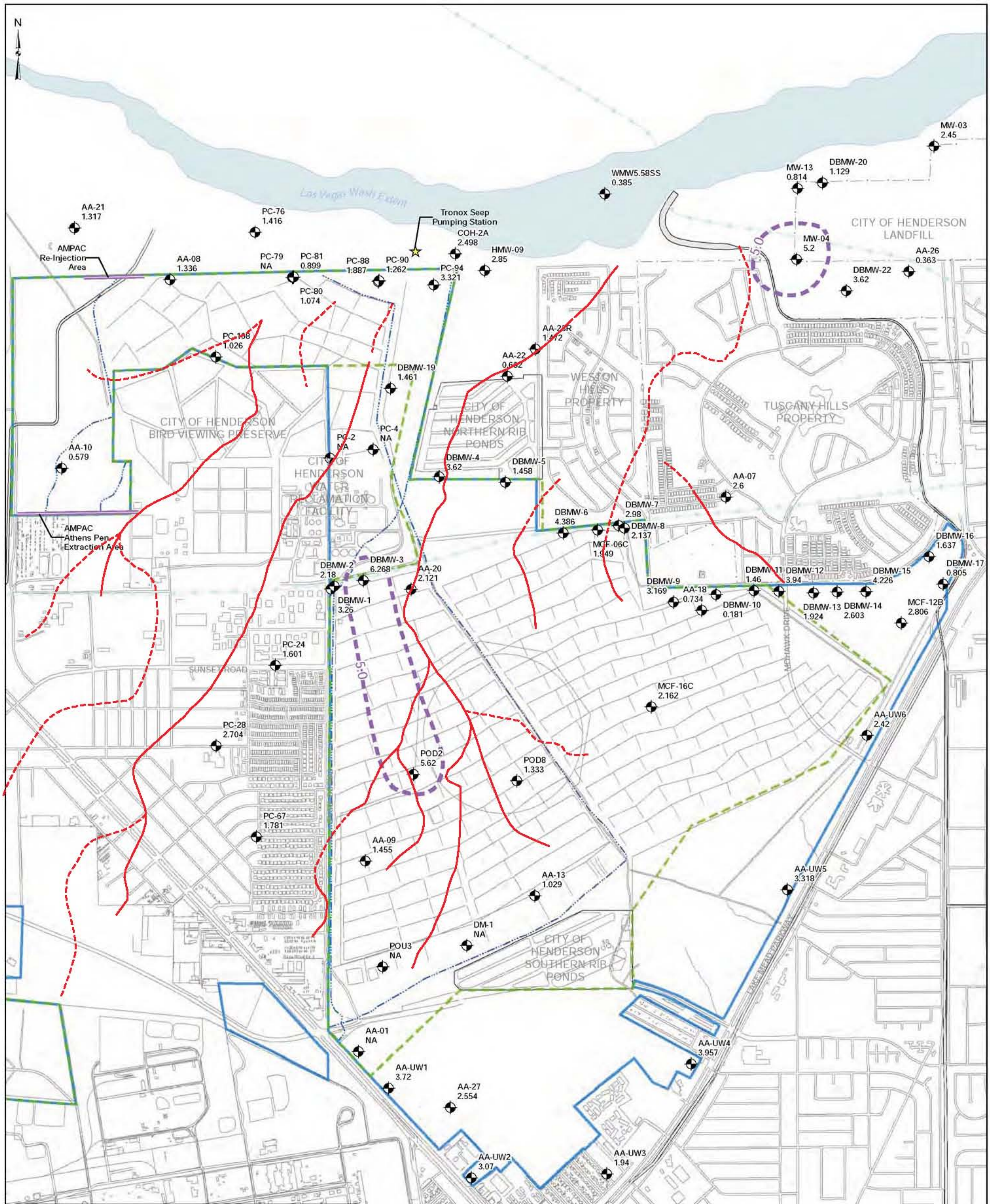
PERCHLORATE IN MIDDLE WATER-BEARING ZONE (UMCf)

Basic Remediation Company

Prepared by: MWH
Date 12/17/08
JOB No. 0064276
FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



N
Las Vegas Wash Extent
Tronox Seep Pumping Station
CITY OF HENDERSON LANDFILL
AMPAC Re-Injection Area
MCF-08A
< 5 UJ
MCF-17A
NA
MCF-18A
< 50 U
WESTON HILLS PROPERTY
TUSCANY HILLS PROPERTY
CITY OF HENDERSON NORTHERN RIB PONDS
CITY OF HENDERSON BIRD VIEWING PRESERVE
CITY OF HENDERSON WATER RECLAMATION FACILITY
MCF-10A
2.38 J
MCF-07
< 5 UJ
AMPAC Athens Pen Extraction Area
MCF-20A
< 50 U
MCF-06A-R
NA
MCF-22A
< 2 U
MCF-19A
NA
MCF-21A
< 20 U
MCF-12A
< 1 U
MOHAWK DRIVE
SUNSET ROAD
MCF-23A
NA
MCF-16A
< 10 U
MCF-24A
< 10 U
MCF-04
< 1 U
MCF-09A
NA
MCF-25A
< 2 U
CITY OF HENDERSON SOUTHERN RIB PONDS
LAKE MEAD PARKWAY
MCF-03A
NA
MCF-01A
NA
MCF-27
< 1 U
MCF-02A
< 1 UJ
All results are in µg/L.
NDEP Provisional AL = 18 µg/L.
USEPA Drinking Water Equivalent Level (DWEL) = 24.5 µg/L.
Note: Data validation qualifiers are defined in Table 3-2.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.
2,000 1,000 0 2,000
Feet
Site Soil Boundary
Site AOC3 Boundary
Laterals
Ditches
Flood Conveyance Channels
Monitoring Wells
Concentration Contour (dashed where inferred)
Paleochannels (dashed where inferred)
FIFTH ROUND GROUNDWATER EVENT (APRIL-JULY 2008)
BMI Common Areas (Eastside)
Clark County, Nevada
FIGURE B-9
PERCHLORATE IN DEEP WATER-BEARING ZONE (UMCf)
Basic Remediation Company
Prepared by:
MWH
Date
12/17/08
JOB No. 0064276
FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



All results are in pCi/L.

MCL = 5.0 pCi/L.

Sum of Ra-226 and Ra-228 results. The DL was used for non-detect results.

Note: No data validation qualifiers are included in summed results.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.

Site Soil Boundary
Site AOC3 Boundary
Laterals
Ditches
Flood Conveyance Channels
Monitoring Wells
Concentration Contour (dashed where inferred)
Paleochannels (dashed where inferred)

FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

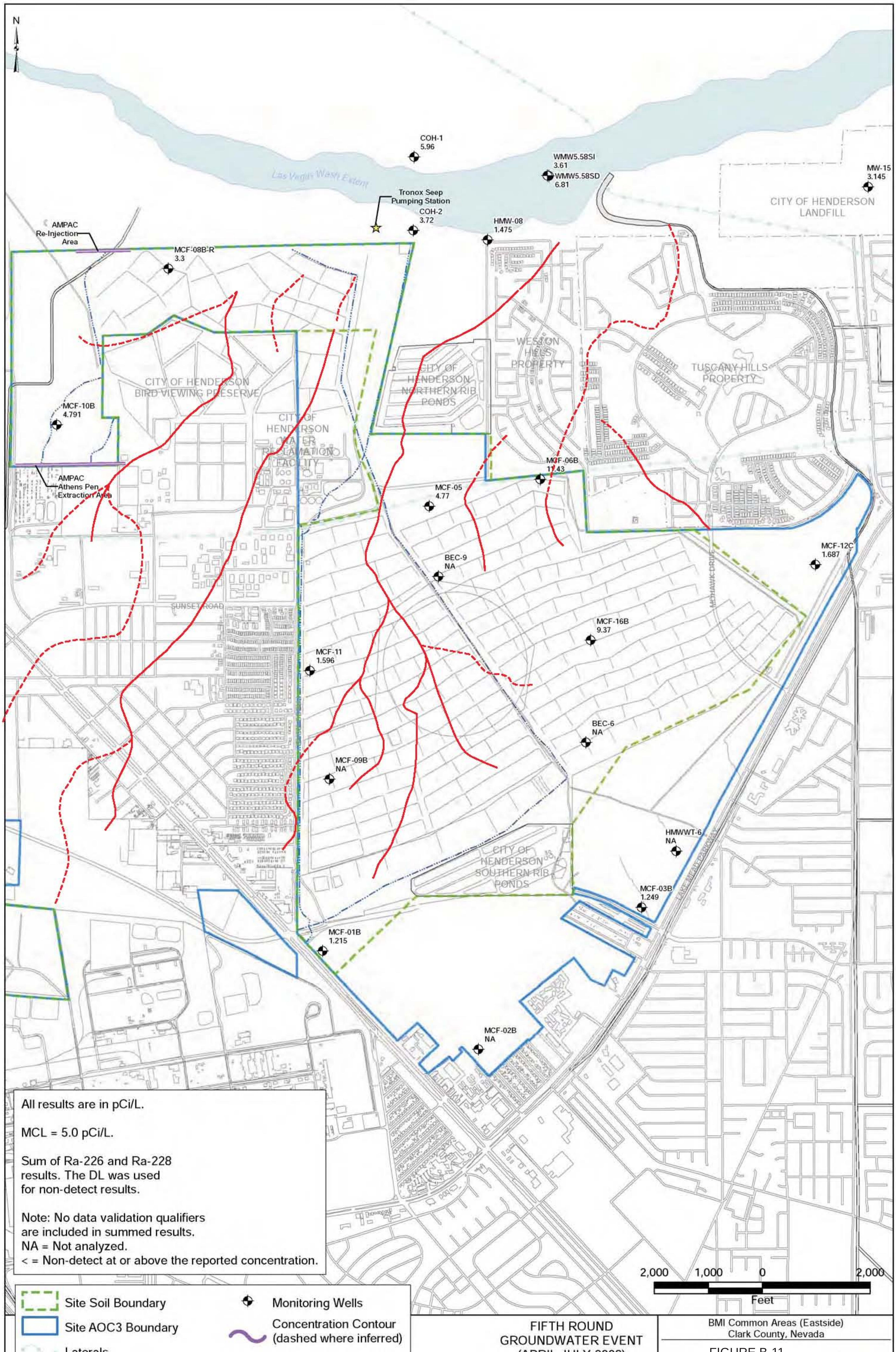
BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-10

RADIUM-226/228 IN SHALLOW WATER-BEARING ZONE

Basic Remediation Company

Prepared by: MWH
Date 12/17/08
JOB No. 0064276
FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



All results are in pCi/L.

MCL = 5.0 pCi/L.

Sum of Ra-226 and Ra-228 results. The DL was used for non-detect results.

Note: No data validation qualifiers are included in summed results.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.

- Site Soil Boundary
- Site AOC3 Boundary
- Laterals
- Ditches
- Flood Conveyance Channels
- Monitoring Wells
- Concentration Contour (dashed where inferred)
- Paleochannels (dashed where inferred)

FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

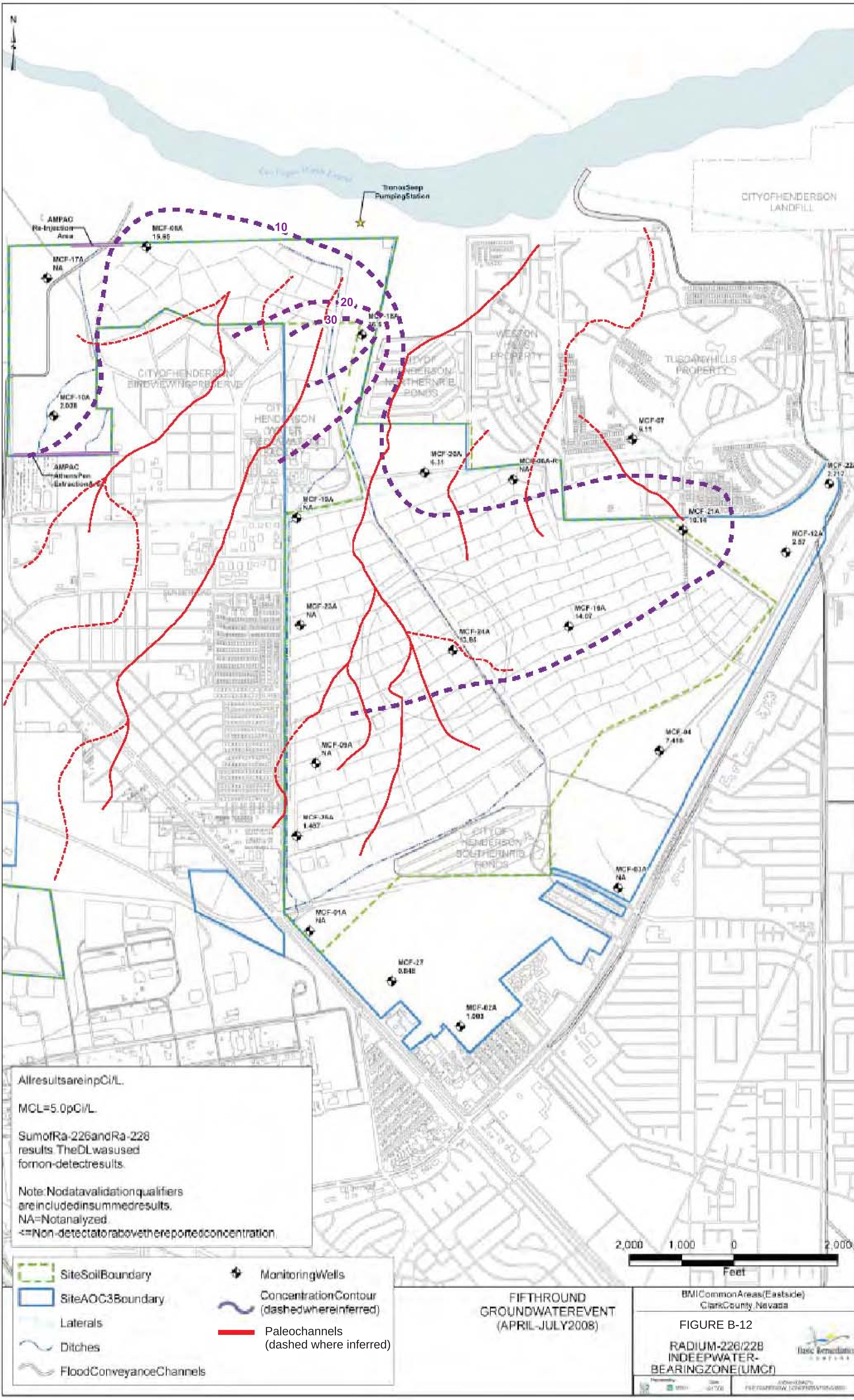
BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-11

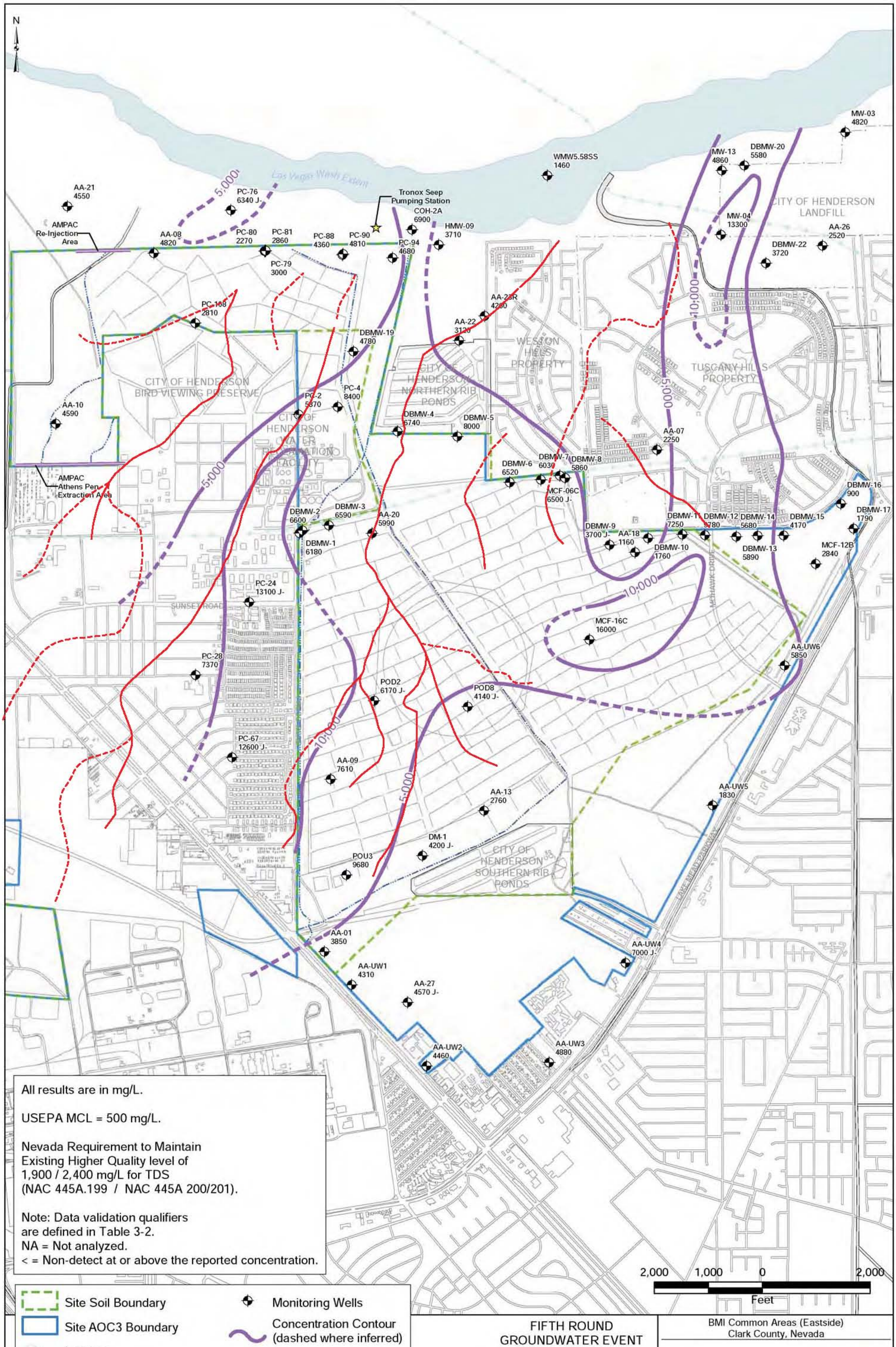
RADIUM-226/228 IN MIDDLE WATER-BEARING ZONE (UMCf)

Basic Remediation Company

Prepared by: MWH | Date 12/17/08 | JOB No. 0064276 FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



CITYOFHENDERSON LANDFILL
TronoxSeep PumpingStation
AMPAC Re-Injection Area
AMPAC AthensPen Extraction
CITYOFHENDERSON BIRDVIEWINGPRESERVE
CITYOF HENDERSON NORTHERNRIB PONDS
WESTON HILLS PROPERTY
TUSCANYHILLS PROPERTY
CITYOF HENDERSON SOUTHERNRIB PONDS
10
20
30
MCF-06A 19.95
MCF-17A NA
MCF-10A 2.038
MCF-19A NA
MCF-20A 6.31
MCF-08A-R NA
MCF-07 9.11
MCF-22A 2.217
MCF-21A 10.16
MCF-12A 2.57
MCF-16A 14.07
MCF-23A NA
MCF-24A 13.85
MCF-04 7.419
MCF-09A NA
MCF-25A 1.487
MCF-03A NA
MCF-01A NA
MCF-27 0.848
MCF-02A 1.003
AllresultsareinpCi/L.
MCL=5.0pCi/L.
SumofRa-226andRa-228 results.TheDLwasused fornon-detectresults.
Note:Nodatavalidationqualifiers areincludedinsummedresults.
NA=Notanalyzed.
<=Non-detectatorabovethereportedconcentration.
2,000 1,000 0 2,000
Feet
SiteSoilBoundary
SiteAOC3Boundary
Laterals
Ditches
FloodConveyanceChannels
MonitoringWells
ConcentrationContour (dashedwhereinferred)
Paleochannels (dashed where inferred)
FIFTHROUND GROUNDWATEREVENT (APRIL-JULY2008)
BMICommonAreas(Eastside)
ClarkCounty,Nevada
FIGURE B-12
RADIUM-226/228 INDEEPWATER-BEARINGZONE(UMCf)
Basic Remediation Company



FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

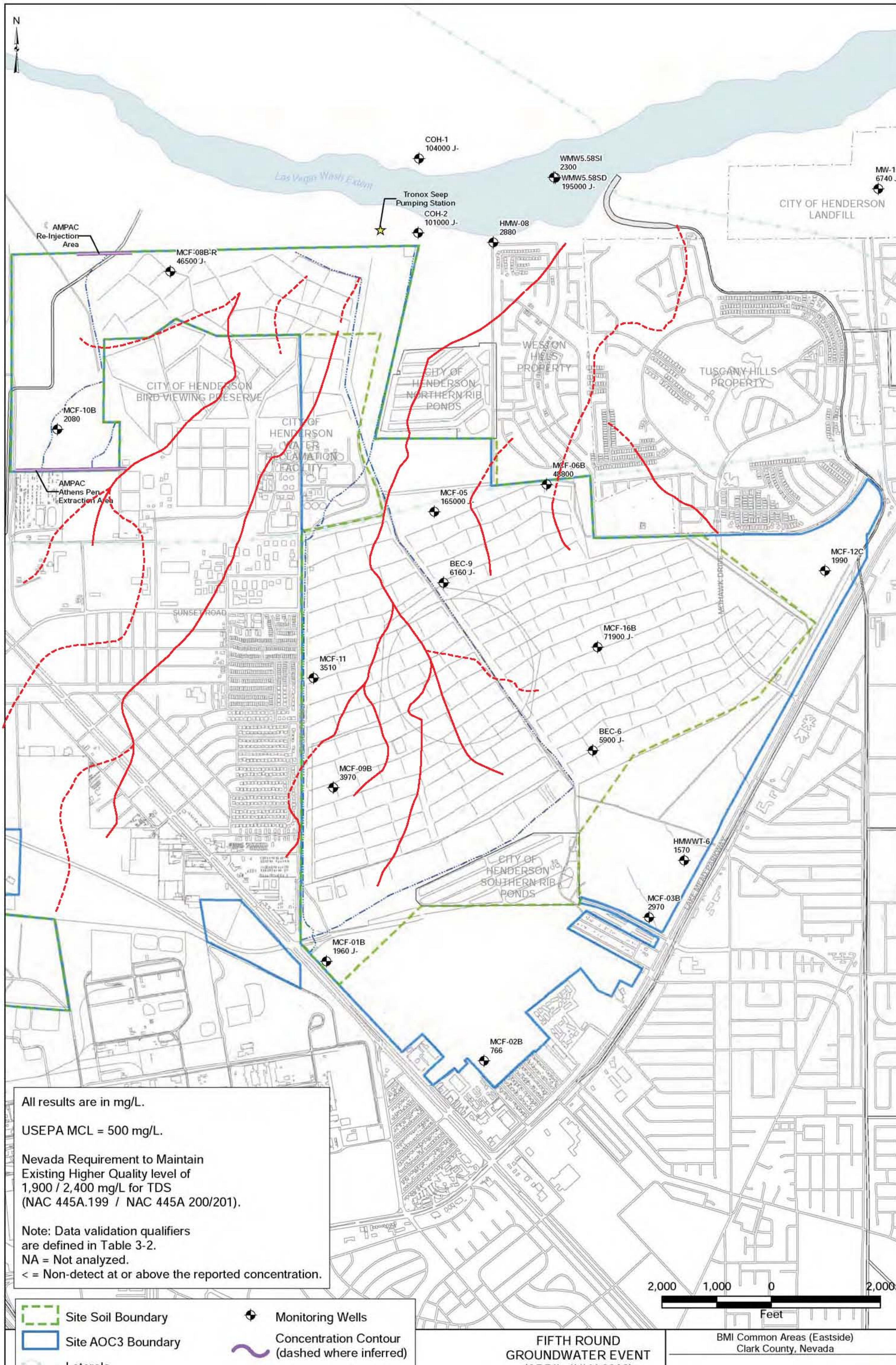
BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-13

TOTAL DISSOLVED SOLIDS
IN SHALLOW WATER-
BEARING ZONE

Basic Remediation Company

Prepared by: MWH | Date 12/17/08 | JOB No. 0064276 | FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

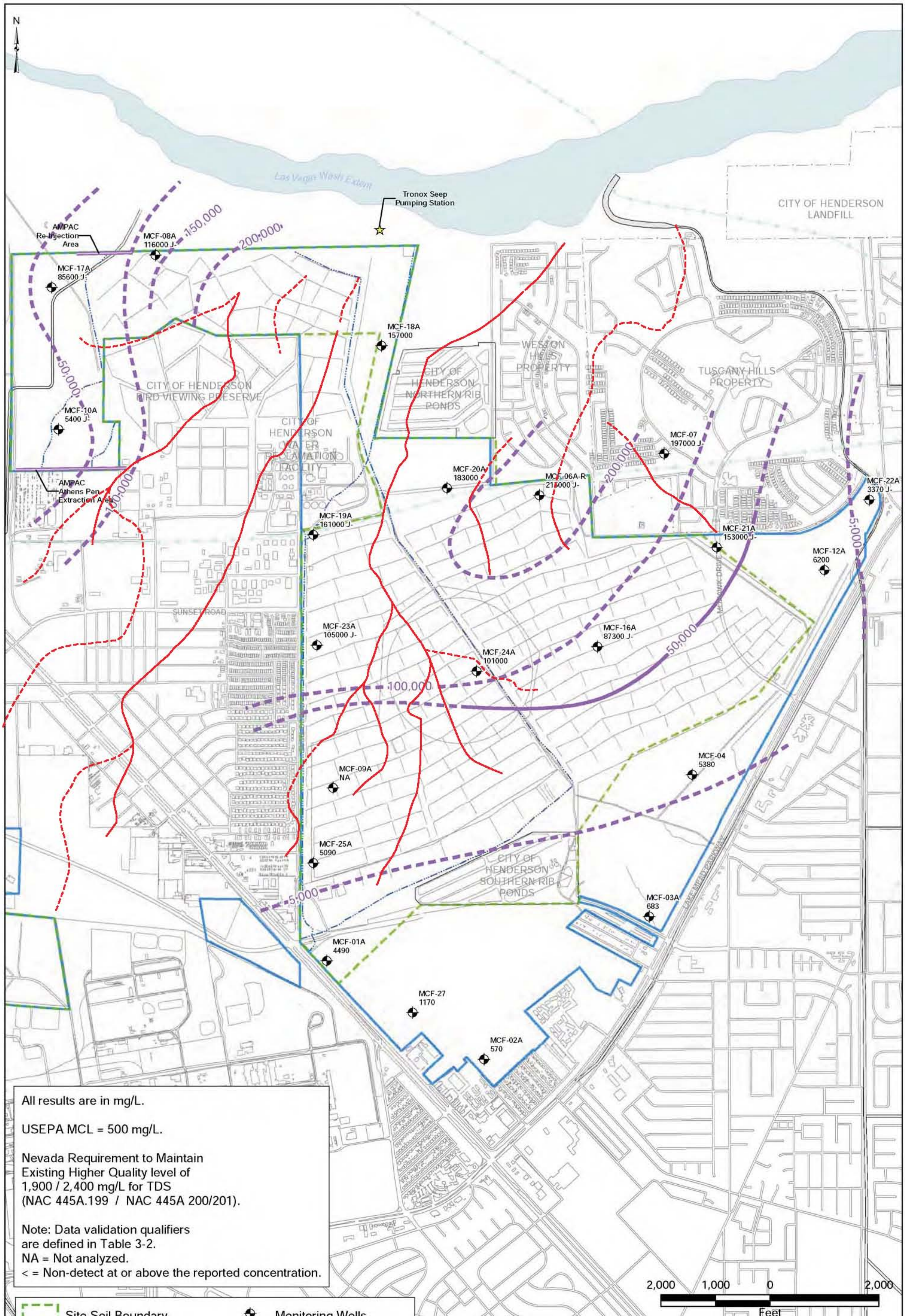
BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-14

TOTAL DISSOLVED SOLIDS
IN MIDDLE WATER-
BEARING ZONE (UMCf)

Basic Remediation Company

Prepared by: ERM MWH | Date 12/17/08 | JOB No. 0064276
FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



Site Soil Boundary
Site AOC3 Boundary
Laterals
Ditches
Flood Conveyance Channels
Monitoring Wells
Concentration Contour (dashed where inferred)
Paleochannels (dashed where inferred)

FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

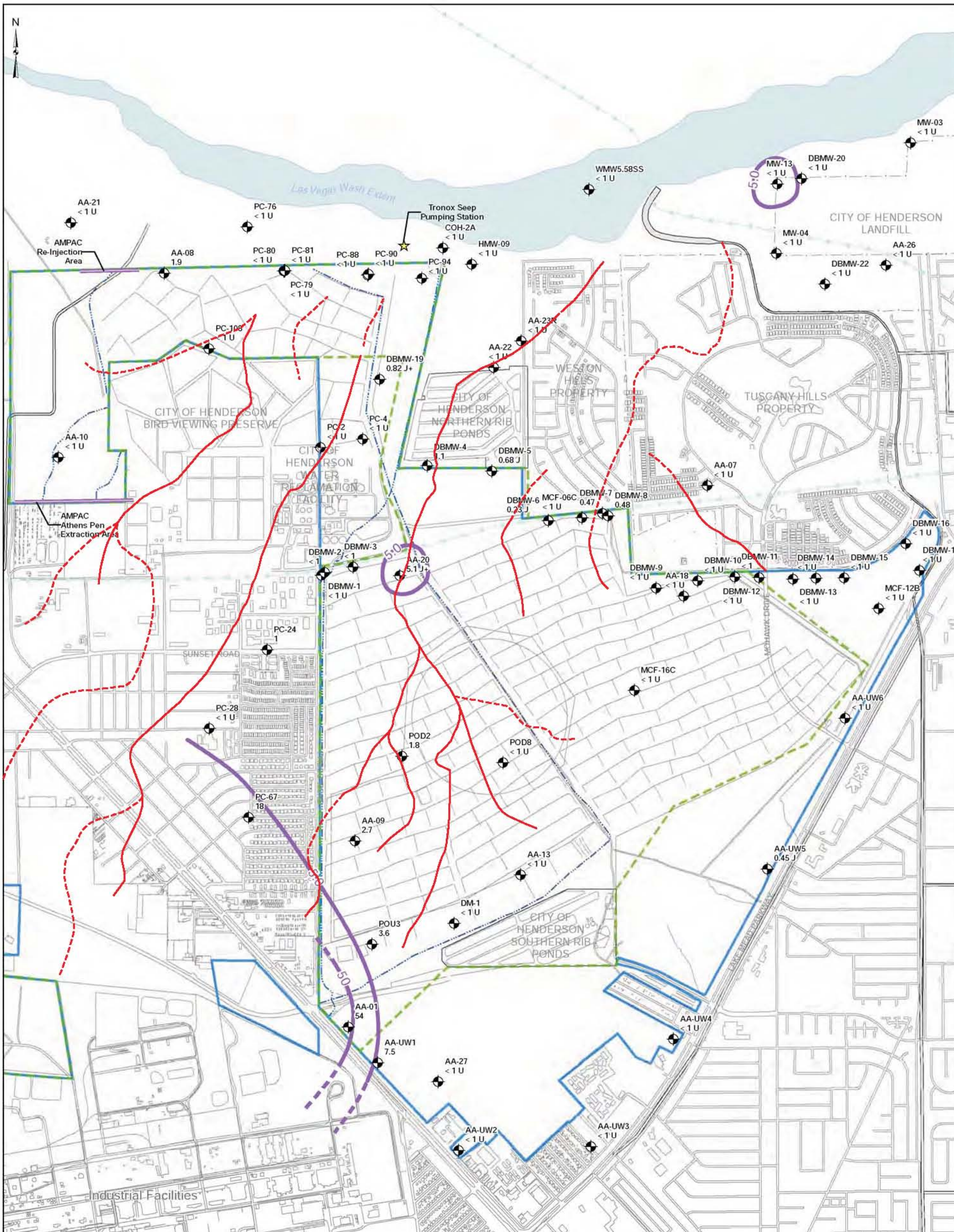
BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-15

TOTAL DISSOLVED SOLIDS
IN DEEP WATER-
BEARING ZONE (UMCf)

Basic Remediation Company

Prepared by: MWH | Date 12/17/08 | JOB No. 0064276 FILE: GIS/BRC/GW_CONCENTRATIONS.MXD



All results are in µg/L.

MCL = 5.0 µg/L.

Note: Data validation qualifiers are defined in Table 3-2.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.

- Site Soil Boundary
- Site AOC3 Boundary
- Laterals
- Ditches
- Flood Conveyance Channels
- Monitoring Wells
- Concentration Contour (dashed where inferred)
- Paleochannels (dashed where inferred)

FIFTH ROUND GROUNDWATER EVENT (APRIL-JULY 2008)

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-16

TETRACHLOROETHYLENE IN SHALLOW WATER-BEARING ZONE

Basic Remediation Company

Prepared by: MWH | Date 12/17/08 | JOB No. 0064276 | FILE: GIS/BRC/GW_CONCENTRATIONS.MXD

All results are in µg/L.

MCL = 5.0 µg/L.

Note: Data validation qualifiers
are defined in Table 3-2.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.

Site Soil Boundary

Site AOC3 Boundary

Laterals

Ditches

Flood Conveyance Channels

Monitoring Wells

Concentration Contour
(dashed where inferred)

Paleochannels
(dashed where inferred)

FIFTH ROUND
GROUNDWATER EVENT
(APRIL-JULY 2008)

BMI Common Areas (Eastside)
Clark County, Nevada

FIGURE B-17

TETRACHLOROETHYLENE
IN MIDDLE WATER-
BEARING ZONE (UMCf)

Basic Remediation Company

Prepared by: ERM MWH

Date 12/17/08

JOB No. 0064276
FILE: GIS/BRC/GW_CONCENTRATIONS.MXD

All results are in µg/L.

MCL = 5.0 µg/L.

Note: Data validation qualifiers are defined in Table 3-2.
NA = Not analyzed.
< = Non-detect at or above the reported concentration.

Site Soil Boundary
Site AOC3 Boundary
Laterals
Ditches
Flood Conveyance Channels
Monitoring Wells
Concentration Contour (dashed where inferred)
Paleochannels (dashed where inferred)

FIFTH ROUND GROUNDWATER EVENT (APRIL-JULY 2008)

BMI Common Areas (Eastside)
Clark County, Nevada

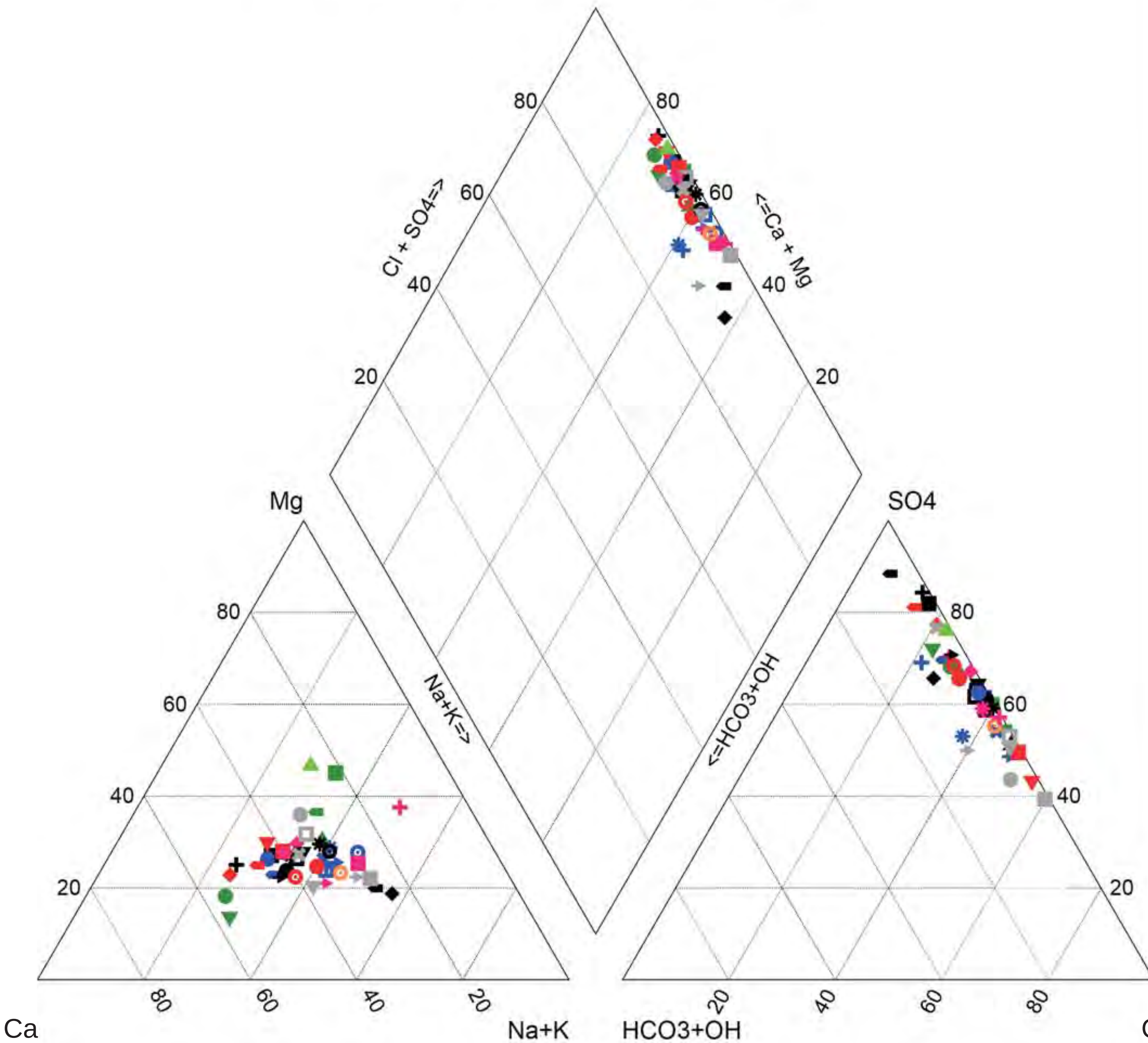
FIGURE B-18

TETRACHLOROETHYLENE IN DEEP WATER-BEARING ZONE (UMCf)

Basic Remediation Company

Prepared by: ERM MWH | Date 12/17/08 | JOB No. 0064276 FILE: GIS/BRC/GW_CONCENTRATIONS.MXD

Appendix C



Note: Data from 5th round sampling event (April-July 2008)
The PC well series is not included on this map for clarity.

BMI COMMON AREAS (EASTSIDE)
HENDERSON, NEVADA

Piper Trilinear Diagrams
Selected Shallow Zone Wells

Daniel B. Stephens & Associates, Inc.

6-18-09

JN ES09.0013

Figure C-1

S:\Projects\BRC\ES09.0013_BRC_RTCs_and_NDEP_Mtg\VR_Drawings\piper.CDR

Legend

DBMW-7
DBMW-13
DBMW-14
DBMW-15
DBMW-16
DBMW-17
DBMW-19
DBMW-2
DBMW-20
DBMW-22
DBMW-3
DBMW-4
DBMW-6
DBMW-10
DBMW-8
DBMW-9
DM-1
HMW-09
DBMW-5

AA-07
AA-08
AA-09
AA-10
AA-13
AA-18
AA-20
AA-21
AA-22
AA-23R
DBMW-12
DBMW-11
COH-2A
DBMW-1
AA-26
MW-04
MW-13
POD2
POD8

POD8
POU3
WMW5.58SS
MCF-12B
MCF-06C
MW-03
MCF-16C

BMI COMMON AREAS (EASTSIDE)
HENDERSON, NEVADA

Legend for Figure C-1

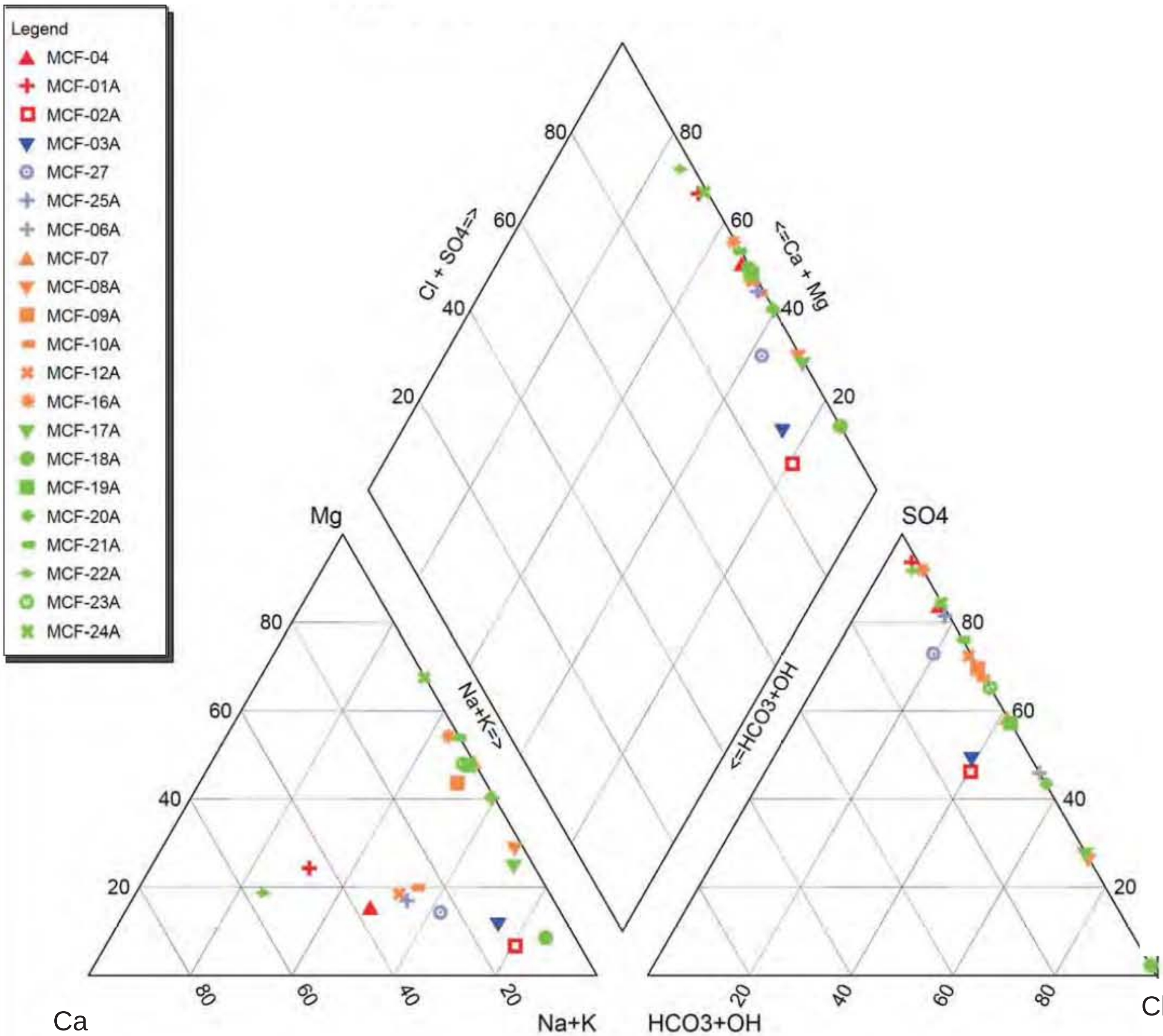
Daniel B. Stephens & Associates, Inc.

6-18-09

JN ES09.0013

Figure C-2

S:\Projects\BRC\ES09.0013_BRC_RTCs_and_NDEP_Mtg\VR_Drawings\piper.CDR



Note: Data from 5th round sampling event (April-July 2008)

BMI COMMON AREAS (EASTSIDE)
HENDERSON, NEVADA

Piper Trilinear Diagrams
Deep Zone Wells

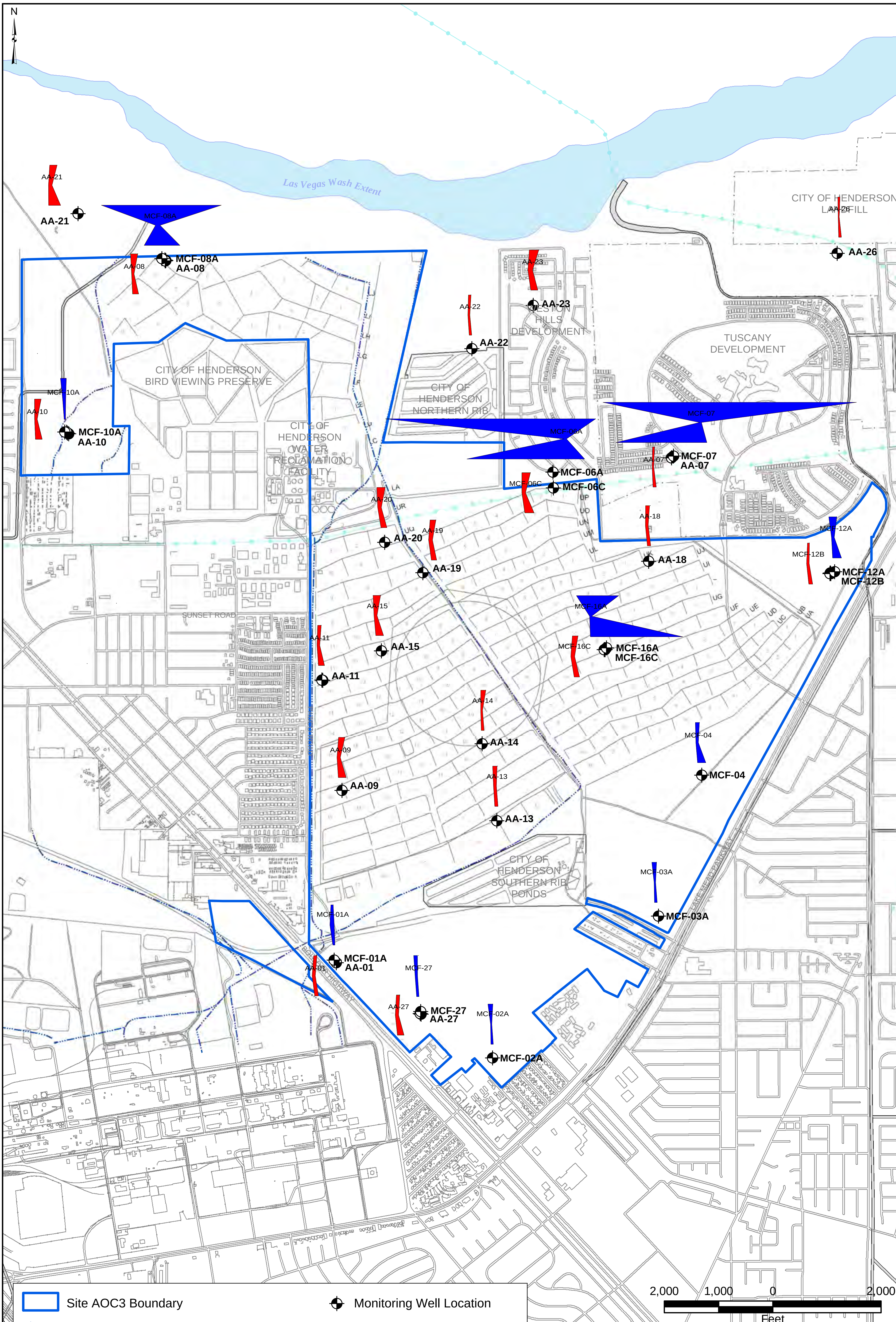
Daniel B. Stephens & Associates, Inc.

6-18-09

JN ES09.0013

Figure C-3

S:\Projects\BRC\ES09.0013_BRC_RTCs_and_NDEP_Mtg\VR_Drawings\piper.CDR



BMI Common Areas
Clark County, Nevada

FIGURE C-4

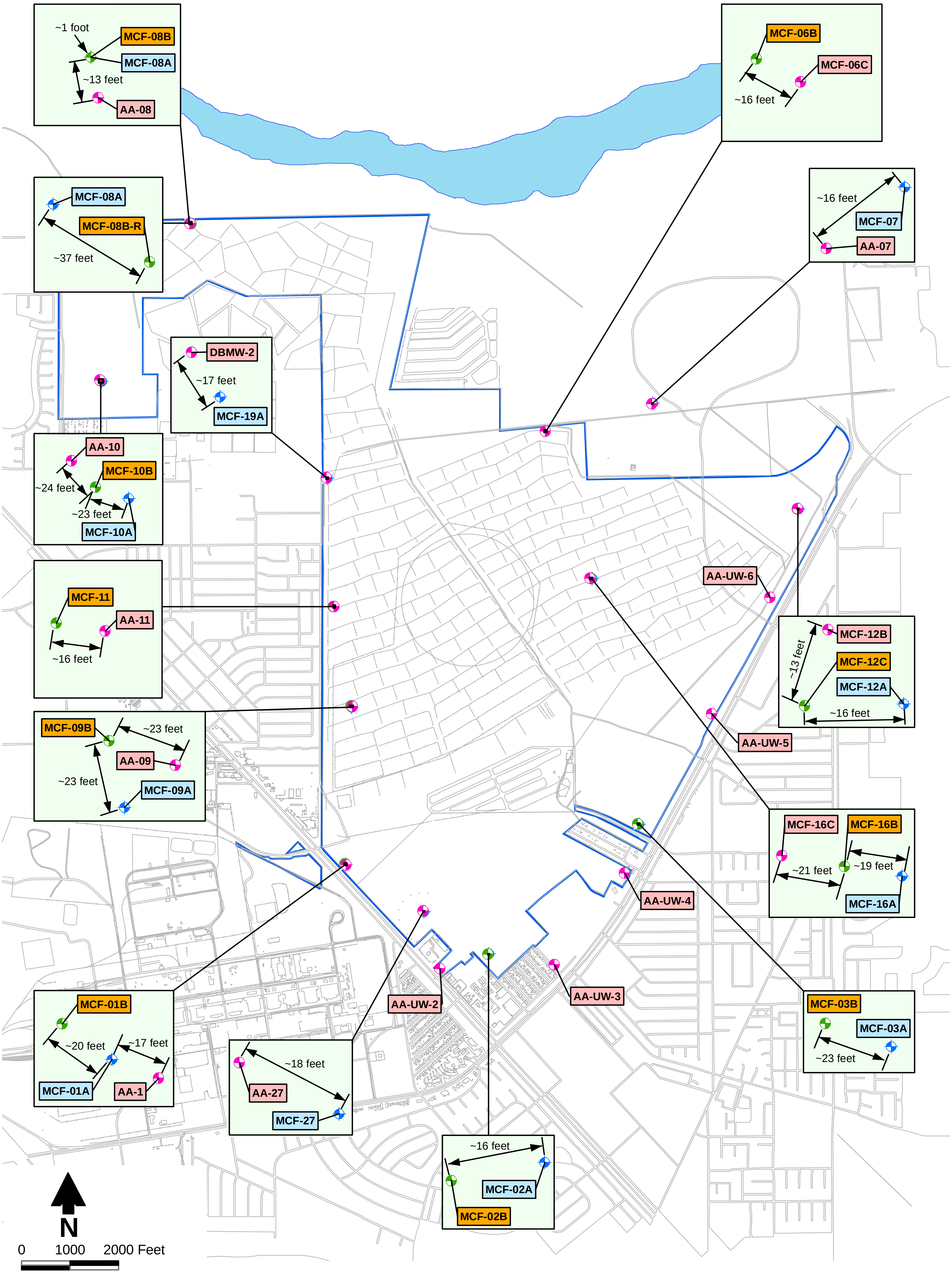
STIFF DIAGRAMS FOR THE Aa AND DEEP ZONES

Basic Remediation COMPANY

Prepared by MKJ (ERM) | Date 05/02/07 | JOB No. 0064276 FILE: GIS/BRC/FIGURE_4-7.MXD

Appendix D

S:/PROJECTS/BRC/ES08.0153_BRC_SITEWIDE_VERTICAL_GRADIENT/GIS/MXDS/EASTSIDE_VERTICAL_GRADIENT_WELLS_2.MXD 908160



Explanation

MCF-16C Shallow zone well

MCF-16B Intermediate zone well

MCF-16A Deep zone well

Site AOC3 boundary

BMI Common Areas (Eastside)
Henderson, Nevada

FIGURE D-1
EASTSIDE AREA VERTICAL GRADIENT WELLS

Basic Remediation COMPANY

Prepared by: DBS&A CRS

Date 6-18-09

S:/PROJECTS/BRC/ES08.0153_BRC_SITEWIDE_VERTICAL_GRADIENT/GIS/MXDS/EASTSIDE_VERTICAL_GRADIENT_WELLS_2.MXD 809090

Daniel B. Stephens & Associates, Inc.

Table D-1. Summary of Vertical Gradient Data
BRC Common Areas - Eastside

Deep/Shallow Well Pairs

Deep Well	Depth to Top of Screen (feet bgs)	Depth to Bottom of Screen (feet	Screen Length (ft)	Screen Midpoint (feet bgs) zi	Ground Surface elevation (ft AMSL)	Screen Midpoint (AMSL) (zi)	Groundwater Elevation (AMSL) (hi)	GW Elevation Date Measured	Groundwater TDS (mg/L)	TDS Date Measured	Groundwater Temperature (C)	GW Density (g/cm^3) (pi)	Fresh Water Head, (AMSL) (h(f)	Shallow Well	Depth to Top of Screen (feet bgs)	Depth to Bottom of Screen (feet bgs)	Screen Length (ft)	Screen Midpoint (feet bgs)	Screen Midpoint (AMSL) (zi)	Groundwater Elevation (AMSL) (hi)	GW Elevation Date Measured	Ground water TDS (mg/L)	TDS Date Measured	Groundwater Temperature (C)	GW Density (g/cm^3) (pi)	Fresh Water Head (AMSL) (hf)
MCF-01A	335	355	20	345	1754.44	1409.44	1720.21	7/25/04	---	---	---	---	---	AA-01	29	49	20	39	1715.93	1712.03	4/8/04	---	---	---	---	---
MCF-01A	335	355	20	345	1754.44	1409.44	1723.51	4/18/06	3570	05/30/06	27.72	0.999	1723.20	AA-01	29	49	20	39	1715.93	1712.35	4/18/06	3430	04/26/06	25.01	1.000	1712.35
MCF-01A	335	355	20	345	1754.44	1409.44	1726.61	7/27/06	4020	08/07/06	26.39	0.997	1725.66	AA-01	29	49	20	39	1715.93	1711.69	7/27/06	3930	08/01/06	24.84	1.000	1711.69
MCF-01A	335	355	20	345	1754.44	1409.44	1727.87	10/16/06	4060	10/24/06	26.01	1.000	1727.87	AA-01	29	49	20	39	1715.93	1711.50	10/16/06	3310	10/18/06	23.88	1.000	1711.50
MCF-01A	335	355	20	345	1754.44	1409.44	1726.47	1/22/07	3930	02/02/07	23.4	1.000	1726.47	AA-01	29	49	20	39	1715.93	1711.45	1/22/07	3730	01/25/07	24	1.000	1711.45
MCF-08A	350	370	20	360	1579.02	1219.02	**ARTESIAN**	4/7/04	---	---	---	---	---	AA-08	5	35	30	20	1558.46	1566.82	6/7/04	---	---	---	---	---
MCF-08A	350	370	20	360	1579.02	1219.02	**ARTESIAN**	4/21/06	110000	06/07/06	24.59	1.082	(a)	AA-08	5	35	30	20	1558.46	1567.69	4/21/06	5070	05/25/06	23.48	1.001	1567.70
MCF-08A	350	370	20	360	1579.02	1219.02	**ARTESIAN**	7/26/06	113000	08/23/06	23.8	1.084	(a)	AA-08	5	35	30	20	1558.46	1565.47	7/26/06	4390	08/14/06	23.3	1.001	1565.48
MCF-08A	350	370	20	360	1579.02	1219.02	**ARTESIAN**	10/17/06	113000	11/10/06	25.73	1.084	(a)	AA-08	5	35	30	20	1558.46	1568.82	10/17/06	4640	11/01/06	23.65	1.001	1568.83
MCF-08A	350	370	20	360	1579.02	1219.02	**ARTESIAN**	1/23/07	116000	02/08/07	22.5	1.087	(a)	AA-08	5	35	30	20	1558.46	1568.72	1/23/07	4700	02/08/07	23.4	1.001	1568.73
MCF-10A	365	385	20	375	1613.32	1238.32	1613.06	4/14/04	---	---	---	---	---	AA-10	10	40	30	25	1587.54	1595.91	7/9/04	---	---	---	---	---
MCF-10A	365	385	20	375	1613.32	1238.32	**ARTESIAN**	4/21/06	8080	05/31/06	24.96	1.003	(a)	AA-10	10	40	30	25	1587.54	1596.04	4/21/06	4880	05/12/06	23.36	1.001	1596.05
MCF-10A	365	385	20	375	1613.32	1238.32	1601.56	7/27/06	6800	08/21/06	24.3	1.002	1602.29	AA-10	10	40	30	25	1587.54	1596.97	7/27/06	4720	08/11/06	23.2	1.001	1596.98
MCF-10A	365	385	20	375	1613.32	1238.32	1607.46	10/17/06	7700	11/14/06	25.01	1.003	1608.57	AA-10	10	40	30	25	1587.54	1596.75	10/17/06	4770	10/27/06	22.63	1.001	1596.76
MCF-10A	365	385	20	375	1613.32	1238.32	1612.18	1/23/07	7270	02/16/08	22.51	1.003	1613.30	AA-10	10	40	30	25	1587.54	1596.89	1/23/07	4560	02/05/07	22.9	1.001	1596.90
MCF-12A	349.5	369.5	20	359.5	1713.68	1354.18	1658.06	7/22/04	---	---	---	---	---	MCF-12B	64	84	20	74	1638.74	1648.18	6/5/04	---	---	---	---	---
MCF-12A	349.5	369.5	20	359.5	1713.68	1354.18	1661.03	4/27/06	5950	05/18/06	28.13	1.003	1661.95	MCF-12B	64	84	20	74	1638.74	1649.08	4/27/06	2630	05/23/06	25.14	0.999	1649.07
MCF-12A	349.5	369.5	20	359.5	1713.68	1354.18	1661.21	7/27/06	5900	08/10/06	25.6	1.001	1661.52	MCF-12B	64	84	20	74	1638.74	1648.33	7/27/06	2520	08/09/06	26.7	0.999	1648.32
MCF-12A	349.5	369.5	20	359.5	1713.68	1354.18	1661.36	10/16/06	7580	01/25/00	24.64	1.003	1662.28	MCF-12B	64	84	20	74	1638.74	1648.20	10/16/06	2620	11/08/06	24.54	0.999	1648.19
MCF-12A	349.5	369.5	20	359.5	1713.68	1354.18	1661.54	1/24/07	6320	01/24/00	24.8	1.002	1662.15	MCF-12B	64	84	20	74	1638.74	1647.75	1/24/07	2760	02/15/07	21.19	1.000	1647.75
										01/24/00																
MCF-16A	364.5	384.5	20	374.5	1689.67	1315.17	1661.98	4/6/04	---	---	---	---	---	MCF-16C	53	73	20	63	1626.88	1629.98	6/11/04	---	---	---	---	---
MCF-16A	364.5	384.5	20	374.5	1689.67	1315.17	1643.84	4/20/06	81800	05/18/06	25.74	1.059	1663.23	MCF-16C	53	73	20	63	1626.88	1626.23	4/20/06	8150	05/22/06	23.3	1.004	1626.23
MCF-16A	364.5	384.5	20	374.5	1689.67	1315.17	1643.62	7/26/06	83800	08/21/06	24.0	1.061	1663.66	MCF-16C	53	73	20	63	1626.88	1625.88	7/26/06	8190	08/16/06	25.8	1.003	1625.88
MCF-16A	364.5	384.5	20	374.5	1689.67	1315.17	1643.84	10/17/06	86400	11/06/06	24.14	1.063	1664.55	MCF-16C	53	73	20	63	1626.88	1625.66	10/17/06	7010	11/06/06	23.53	1.003	1625.66
MCF-16A	364.5	384.5	20	374.5	1689.67	1315.17	1644.13	1/22/07	88300	02/16/07	23.2	1.065	1665.51	MCF-16C	53	73	20	63	1626.88	1625.51	1/22/07	6480	02/20/07	22.3	1.003	1625.51
MCF-27	361.5	381.5	20	371.5	1787.03	1415.53	1763.48	7/14/04	---	---	---	---	---	AA-27	61.5	81.5	20	71.5	1715.35	1729.98	7/13/04	---	---	---	---	---
MCF-27	361.5	381.5	20	371.5	1787.03	1415.53	1773.50	4/20/06	1460	05/19/06	26.42	0.998	1772.78	AA-27	61.5	81.5	20	71.5	1715.35	1723.58	4/19/06	4080	04/27/06	24.97	1.000	1723.58
MCF-27	361.5	381.5	20	371.5	1787.03	1415.53	1774.28	7/26/06	1260	08/02/06	25.58	0.998	1773.56	AA-27	61.5	81.5	20	71.5	1715.35	1722.66	7/26/06	4240	08/02/06	24.65	1.000	1722.66
MCF-27	361.5	381.5	20	371.5	1787.03	1415.53	1774.88	10/16/06	1170	10/20/06	25.41	0.998	1774.16	AA-27	61.5	81.5	20	71.5	1715.35	1722.61	10/16/06	4220	10/19/06	24.67	1.000	1722.61
MCF-27	361.5	381.5	20	371.5	1787.03	1415.53	1775.27	1/22/07	968	02/20/07	24.3	0.998	1774.55	AA-27	61.5	81.5	20	71.5	1715.35	1722.46	1/22/07	4340	02/02/07	24.9	1.000	1722.46
MCF-06A	373.5	393.5	20	383.5	1588.80	1205.3	1563.27	4/16/04	---	---	---	---	---	MCF-06C	44	59	15	51.5	1578.92	1584.17	7/15/04	---	---	---	---	---
MCF-06A	373.5	393.5	20	383.5	1588.80	1205.3	1519.38	4/20/06	186000	05/30/06	26.27	1.144	1564.61	MCF-06C	44	59	15	51.5	1578.92	1580.63	4/20/06	47600	05/22/06	24.09	1.033	1580.69
MCF-06A	373.5	393.5	20	383.5	1588.80	1205.3	1509.54	7/27/06	185000	08/21/06	25.1	1.143	1553.05	MCF-06C	44	59	15	51.5	1578.92	1579.38	7/26/06	6280	08/08/06	23.97	1.002	1579.38
MCF-06A	373.5	393.5	20	383.5	1588.80	1205.3	1512.00	10/16/06	205000	11/13/06	23.44	1.162	1561.68	MCF-06C	44	59	15	51.5	1578.92	1578.93	10/17/06	6720	10/30/06	23.57	1.002	1578.93
MCF-06A	373.5	393.5	20	383.5	1588.80	1205.3	1515.31	1/23/07	191000	02/23/07	20.4	1.151	1562.12	MCF-06C	44	59	15	51.5	1578.92	1578.09	1/23/07	6980	02/01/07	22.3	1.003	1578.09
MCF-07	350	370	20	360	1610.07	1250.07	1524.30	7/24/04	---	---	---	---	---	AA-07	30	50	20	40	1570.12	1570.81	7/23/04	---	---	---	---	---
MCF-07	350	370	20	360	1610.07	1250.07	(b)	5/24/06	---	---	---	---	---	AA-07	30	50	20	40	1570.12	1572.10	5/24/06	2030	06/06/06	23.99	0.999	1572.10
MCF-07	350	370	20	360	1610.07	1250.07	1523.04	8/30/06	174000	08/30/06	25.0	1.134	1559.62	AA-07	30	50	20	40	1570.12	1572.05	7/27/06	1990	08/16/06	23.58	0.999	1572.05
MCF-07	350	370	20	360	1610.07	1250.07	1532.33	10/16/06	182000	11/10/06	24.29	1.141	1572.13	AA-07	30	50	20	40	1570.12	1571.99	10/16/06	2120	11/03/06	23.63	0.999	1571.99
MCF-07	350	370	20	360	1610.07	1250.07	1530.38	1/23/07	193000	02/23/07	23.8	1.151	1572.71	AA-07	30	50	20	40	1570.12	1572.01	1/23/07	2170	02/26/07	23.3	0.999	1572.01
MCF-09A	270	290	20	280	1694.26	1414.26	1667.29	4/18/04	---	---	---	---	---	AA-09	30	65	35	47.5	1646.61	1663.46	7/7/04	---	---	---	---	---
MCF-09A	270	290	20	280	1694.26	1414.26	1657.36	4/20/06	---	---	---	---	---	AA-09	30	65	35	47.5	1646.61	1659.16	4/20/06	5670	05/01/06	25.3	1.001	1659.17
MCF-09A	270	290	20	280	1694.26	1414.26	1657.20	7/26/06	24800	08/21/06	25.93	1.015	1660.84	AA-09	30	65	35	47.5	1646.61	1658.64	7/26/06	5740	08/11/06	24.38	1.002	1658.66
MCF-09A	270	290	20	280	1694.26	1414.26	1657.30	10/17/06	26800	11/14/06	25.05	1.017	1661.43	AA-09	30	65	35	47.5	1646.61	1658.35	10/17/06	5890	10/23/06	24.52	1.002	1658.37
MCF-09A	270	290	20	280	1694.26	1414.26	1657.18	1/22/07	30700	02/16/07	25.53	1.020	1662.04	AA-09	30	65	35	47.5	1646.61	1658.48	1/22/07	6150	01/26/07	24.4	1.002	1658.50
MCF-19A	340	360	20	350	---	---	(c)	(c)	(c)	(c)	---	(c)	(c)	DBMW-2	20	40	20	30	---	(c)	(c)	(c)	(c)	---	(c)	(c)

Table C-1. Summary of Vertical Gradient Data
BRC Common Areas - Eastside

Deep/Shallow Well Pairs		Uncorrected for Groundwater Density			Corrected for Groundwater Density			Corrected for Equipotential Surface						
Deep Well	**Shallow Well**	Point Water Head Delta (ft)	Point Water Head Deep/Shallow Vertical Gradient (ft/ft)	Point Water Head Vertical Flow Direction	Fresh Water Head Delta (AMSL)	Fresh Water Head Deep/Shallow Vertical Gradient (ft/ft)	Vertical Flow Direction	Horizontal Gradient	Distance Between Wells Along Gradient	Well Name	Revised GW Elevation/ Head	Fresh Water Head Delta (AMSL)	Fresh Water Head Deep/Shallow Vertical Gradient (ft/ft)	Fresh Head Vertical Flow Direction
MCF-01A	AA-01	-8.18	0.03	UP	---	---	---	---	---	---	---	---	---	---
MCF-01A	AA-01	-11.16	0.04	UP	-10.85	0.04	UP	0.0165	8	AA-01	1712.22	-10.98	0.04	UP
MCF-01A	AA-01	-14.92	0.05	UP	-13.97	0.05	UP	0.0137	5	AA-01	1711.62	-14.04	0.05	UP
MCF-01A	AA-01	-16.37	0.05	UP	-16.37	0.05	UP	0.0086	8	AA-01	1711.43	-16.44	0.05	UP
MCF-01A	AA-01	-15.02	0.05	UP	-15.02	0.05	UP	0.0093	10	AA-01	1711.36	-15.11	0.05	UP
MCF-08A	AA-08	(a)	(a)	UP	(a)	(a)	UP	---	---	---	---	(a)	(a)	UP
MCF-08A	AA-08	(a)	(a)	UP	(a)	(a)	UP	---	---	---	---	(a)	(a)	UP
MCF-08A	AA-08	(a)	(a)	UP	(a)	(a)	UP	---	---	---	-	(a)	(a)	UP
MCF-08A	AA-08	(a)	(a)	UP	(a)	(a)	UP	---	---	---	---	(a)	(a)	UP
MCF-08A	AA-08	(a)	(a)	UP	(a)	(a)	UP	---	---	---	---	(a)	(a)	UP
MCF-10A	AA-10	-17.15	0.05	UP	---	---	---	---	---	---	---	---	---	---
MCF-10A	AA-10	(a)	(a)	UP	(a)	(a)	UP	0.0070	-12	AA-10	1596.13	(a)	(a)	UP
MCF-10A	AA-10	-4.59	0.01	UP	-5.31	0.02	UP	0.0138	-28	AA-10	1597.37	-4.92	0.01	UP
MCF-10A	AA-10	-10.71	0.03	UP	-11.81	0.03	UP	0.0105	0	AA-10	1596.76	-11.81	0.03	UP
MCF-10A	AA-10	-15.29	0.04	UP	-16.40	0.05	UP	0.0133	0	AA-10	1596.90	-16.40	0.05	UP
MCF-12A	MCF-12B	-9.88	0.03	UP	---	---	---	---	---	---	---	---	---	---
MCF-12A	MCF-12B	-11.95	0.04	UP	-12.88	0.05	UP	0.0168	-17	MCF-12B	1649.36	-12.60	0.04	UP
MCF-12A	MCF-12B	-12.88	0.05	UP	-13.20	0.05	UP	0.0821	-17	MCF-12B	1649.72	-11.80	0.04	UP
MCF-12A	MCF-12B	-13.16	0.05	UP	-14.09	0.05	UP	0.0118	-16.5	MCF-12B	1648.38	-13.90	0.05	UP
MCF-12A	MCF-12B	-13.79	0.05	UP	-14.40	0.05	UP	0.0254	-17	MCF-12B	1648.18	-13.97	0.05	UP
MCF-16A	MCF-16C	-32.00	0.10	UP	---	---	---	---	---	---	---	---	---	---
MCF-16A	MCF-16C	-17.61	0.06	UP	-37.00	0.12	UP	0.0181	28	MCF-16C	1625.72	-37.51	0.12	UP
MCF-16A	MCF-16C	-17.74	0.06	UP	-37.78	0.12	UP	0.0261	13	MCF-16C	1625.54	-38.12	0.12	UP
MCF-16A	MCF-16C	-18.18	0.06	UP	-38.89	0.12	UP	0.0134	21	MCF-16C	1625.37	-39.17	0.13	UP
MCF-16A	MCF-16C	-18.62	0.06	UP	-40.01	0.13	UP	0.0157	22	MCF-16C	1625.16	-40.35	0.13	UP
MCF-27	AA-27	-33.50	0.11	UP	---	---	---	---	---	---	---	---	---	---
MCF-27	AA-27	-49.92	0.17	UP	-49.20	0.16	UP	0.0112	-14	AA-27	1723.74	-49.05	0.16	UP
MCF-27	AA-27	-51.62	0.17	UP	-50.90	0.17	UP	0.0142	-9	AA-27	1722.79	-50.77	0.17	UP
MCF-27	AA-27	-52.27	0.17	UP	-51.55	0.17	UP	0.0093	-14.5	AA-27	1722.74	-51.42	0.17	UP
MCF-27	AA-27	-52.81	0.18	UP	-52.09	0.17	UP	0.0107	-14.5	AA-27	1722.61	-51.94	0.17	UP
MCF-06A	MCF-06C	20.90	-0.06	DOWN	---	---	---	---	---	---	---	---	---	---
MCF-06A	MCF-06C	61.25	-0.16	DOWN	16.08	-0.04	DOWN	0.0214		MCF-06C	1580.69	16.08	-0.04	DOWN
MCF-06A	MCF-06C	69.84	-0.19	DOWN	26.33	-0.07	DOWN	0.0074		MCF-06C	1579.38	26.33	-0.07	DOWN
MCF-06A	MCF-06C	66.93	-0.18	DOWN	17.25	-0.05	DOWN	0.0078		MCF-06C	1578.93	17.25	-0.05	DOWN
MCF-06A	MCF-06C	62.78	-0.17	DOWN	15.97	-0.04	DOWN	0.0086		MCF-06C	1578.09	15.97	-0.04	DOWN
MCF-07	AA-07	46.51	-0.15	DOWN	---	---	---	---	---	---	---	---	---	---
MCF-07	AA-07	(b)	(b)	(b)	(b)	(b)	(b)	---	---	---	---	(b)	(b)	(b)
MCF-07	AA-07	49.01	-0.15	DOWN	12.43	-0.04	DOWN	0.0102	15	AA-07	1571.89	12.28	-0.04	DOWN
MCF-07	AA-07	39.66	-0.12	**DOWN**	-0.14	0.0004	**UP**	0.0134	4.5	AA-07	1571.93	-0.20	0.00	**UP**
MCF-07	AA-07	41.63	-0.13	**DOWN**	-0.70	0.0022	**UP**	0.0188	7.5	AA-07	1571.87	-0.84	0.00	**UP**
MCF-09A	AA-09	-3.83	0.02	UP	---	---	---	---	---	---	---	---	---	---
MCF-09A	AA-09	1.80	-0.01	**DOWN**	---	---	---	0.0157	-14	AA-09	1659.38	-0.22	0.00	**UP**
MCF-09A	AA-09	1.44	-0.01	**DOWN**	-2.18	0.01	**UP**	0.0196	-19	AA-09	1659.04	-1.81	0.01	**UP**
MCF-09A	AA-09	1.05	-0.005	**DOWN**	-3.06	0.01	**UP**	0.0118	-18	AA-09	1658.59	-2.85	0.01	**UP**
MCF-09A	AA-09	1.30	-0.01	**DOWN**	-3.20	0.01	**UP**	0.0222	-15	AA-09	1658.84	-3.20	0.01	**UP**
MCF-19A	DBMW-2	(c)	(c)	(c)	(c)	(c)	(c)	---	---	---	---	(c)	(c)	(c)

Table D-1. Summary of Vertical Gradient Data
BRC Common Areas - Eastside

Intermediate/Shallow Well Pairs

Intermediate Well	Depth to Top of Screen (feet	Depth to Bottom of Screen	Screen Length (ft)	Screen Midpoint (feet bgs)	Ground Surface elevation (ft AMSL)	Screen Midpoint (AMSL) (zi)	Groundwater Elevation (AMSL) (hi)	Date Measured	Groundwater TDS (mg/L)	TDS Date Measured	Groundwater Temperature (C)	GW Density (g/cm^3) (pi)	Fresh Water Head, Hf (AMSL) (h(f)	Shallow Well	Depth to Top of Screen (feet bgs)	Depth to Bottom of Screen (feet	Screen Length ft	Screen midpoint ft	Screen Midpoint (AMSL) (zi)	Groundwater Elevation (AMSL) (hi)	Date Measured	Groundwater TDS (mg/L)	TDS Date Measured	Groundwater Temperature (C)	GW Density (g/cm^3) (pi)	Fresh Water Head, Hf (AMSL)
BEC-9	44	59	15	51.5	---	---	1570.98	7/27/06	6020	08/02/06	22.8	1.002	---	AA-19	22	42.0	20	32	1607.88	1,601.02	7/26/06	---	---	---	---	---
BEC-9	44	59	15	51.5	---	---	1570.20	10/16/06	5120	10/19/06	23.51	1.001	---	AA-19	22	42.0	20	32	1607.88	1,599.85	10/17/06	---	---	---	---	---
BEC-9	44	59	15	51.5	---	---	1569.15	1/22/07	5900	01/29/07	22.6	1.002	---	AA-19	22	42.0	20	32	1607.88	1,598.54	1/22/07	---	---	---	---	---
MCF-10B	84	104	20	94	1612.38	1518.38	1597.87	7/9/04	---	---	---	---	---	AA-10	10	40	30	25	1587.38	1595.91	7/9/04	---	---	---	---	---
MCF-10B	84	104	20	94	1612.38	1518.38	1597.92	4/21/06	2050	05/18/06	24.35	0.999	1597.84	AA-10	10	40	30	25	1587.38	1596.04	4/21/06	4880	05/01/06	23.36	1.001	1596.05
MCF-10B	84	104	20	94	1612.38	1518.38	1598.08	7/27/06	2030	08/15/06	23.75	0.999	1598.00	AA-10	10	40	30	25	1587.38	1596.97	7/27/06	4610	08/11/06	23.2	1.001	1596.98
MCF-10B	84	104	20	94	1612.38	1518.38	1598.81	10/17/06	2050	11/10/06	23.67	0.999	1598.73	AA-10	10	40	30	25	1587.38	1596.75	10/17/06	4770	10/23/06	22.63	1.001	1596.76
MCF-10B	84	104	20	94	1612.38	1518.38	1598.85	1/23/07	2150	02/27/07	23.0	0.999	1598.77	AA-10	10	40	30	25	1587.38	1596.89	1/23/07	4560	01/26/07	22.9	1.001	1596.90
MCF-11	93.5	103.5	10	98.5	1657.75	1559.25	1632.13	7/13/04	---	---	---	---	---	AA-11	9	29	20	19	1639	1632.84	4/15/04	---	---	---	---	---
MCF-11	93.5	103.5	10	98.5	1657.75	1559.25	1630.82	4/20/06	3470	05/16/08	25.11	1.000	1630.82	AA-11	9	29	20	19	1639	1630.62	4/20/06	---	---	---	---	---
MCF-11	93.5	103.5	10	98.5	1657.75	1559.25	1630.12	7/26/06	3250	08/16/08	24.4	1.000	1630.12	AA-11	9	29	20	19	1639	1629.96	7/26/06	---	---	---	---	---
MCF-11	93.5	103.5	10	98.5	1657.75	1559.25	1629.89	10/17/06	3350	10/27/08	24.01	0.999	1629.82	AA-11	9	29	20	19	1639	1629.74	10/17/06	---	---	---	---	---
MCF-11	93.5	103.5	10	98.5	1657.75	1559.25	1630.11	1/23/07	3520	02/23/07	23.7	1.000	1630.11	AA-11	9	29	20	19	1639	1629.87	1/23/07	---	---	---	---	---
MCF-12C	155	175	20	165	1713.03	1548.03	1647.56	7/21/04	---	---	---	---	---	MCF-12B	64	84	20	74	1638.74	1648.18	6/5/04	---	---	---	---	---
MCF-12C	155	175	20	165	1713.03	1548.03	1648.68	4/27/06	1690	05/22/06	24.97	0.998	1648.48	MCF-12B	64	84	20	74	1638.74	1649.08	4/27/06	2630	05/23/06	25.14	0.999	1649.07
MCF-12C	155	175	20	165	1713.03	1548.03	1647.97	7/27/06	1820	08/10/06	25.3	0.998	1647.77	MCF-12B	64	84	20	74	1638.74	1648.33	7/27/06	2520	08/09/06	26.7	0.999	1648.32
MCF-12C	155	175	20	165	1713.03	1548.03	1647.76	10/16/06	2010	11/03/06	24.35	0.999	1647.66	MCF-12B	64	84	20	74	1638.74	1648.20	10/16/06	2620	11/08/06	24.54	0.999	1648.19
MCF-12C	155	175	20	165	1713.03	1548.03	1647.28	1/24/07	2100	02/22/07	21.7	0.999	1647.18	MCF-12B	64	84	20	74	1638.74	1647.75	1/24/07	2760	02/15/07	21.19	1.000	1647.75
MCF-16B	283.7	313.7	30	298.7	1689.67	1390.97	1628.46	7/23/04	---	---	---	---	---	MCF-16C	53	73	20	63	1626.88	1629.98	6/11/04	---	---	---	---	---
MCF-16B	283.7	313.7	30	298.7	1689.67	1390.97	1626.55	4/20/06	64800	05/01/06	25.83	1.046	1637.39	MCF-16C	53	73	20	63	1626.88	1626.23	4/20/06	8150	05/22/06	23.3	1.004	1626.23
MCF-16B	283.7	313.7	30	298.7	1689.67	1390.97	1627.11	7/26/06	70000	08/23/06	24.31	1.050	1638.92	MCF-16C	53	73	20	63	1626.88	1625.88	7/26/06	8190	08/16/06	25.8	1.003	1625.88
MCF-16B	283.7	313.7	30	298.7	1689.67	1390.97	1626.95	10/17/06	72200	11/06/06	23.34	1.052	1639.22	MCF-16C	53	73	20	63	1626.88	1625.66	10/17/06	7010	11/06/06	23.53	1.003	1625.66
MCF-16B	283.7	313.7	30	298.7	1689.67	1390.97	1626.83	1/22/07	74400	02/20/07	19.50	1.055	1639.80	MCF-16C	53	73	20	63	1626.88	1625.51	1/22/07	6480	02/20/07	22.3	1.003	1625.51
MCF-1B	55	85	30	70	1753.95	1683.95	1713.88	6/7/04	---	---	---	---	---	AA-01	29	49	20	39	1715.96	1712.03	4/8/04	---	---	---	---	---
MCF-1B	55	85	30	70	1753.95	1683.95	1712.16	4/18/06	2000	05/11/06	24.89	0.999	1712.13	AA-01	29	49	20	39	1715.96	1712.35	4/18/06	3430	04/26/06	25.01	1.000	1712.35
MCF-1B	55	85	30	70	1753.95	1683.95	1711.50	7/27/06	2070	07/31/06	25.89	0.998	1711.44	AA-01	29	49	20	39	1715.96	1711.69	7/27/06	3930	08/01/06	24.84	1.000	1711.69
MCF-1B	55	85	30	70	1753.95	1683.95	1711.34	10/16/06	1980	11/06/06	23.67	0.999	1711.31	AA-01	29	49	20	39	1715.96	1711.50	10/16/06	3310	10/18/06	23.88	1.000	1711.50
MCF-1B	55	85	30	70	1753.95	1683.95	1711.28	1/22/07	1830	02/14/06	23.93	0.999	1711.25	AA-01	29	49	20	39	1715.96	1711.45	1/22/07	3730	01/25/07	24	1.000	1711.45
MCF-6B	67	82	15	74.5	1630.40	1555.9	1590.58	7/16/04	---	---	---	---	---	MCF-06C	44	59	15	51.5	1578.92	1584.17	7/15/04	---	---	---	---	---
MCF-6B	67	82	15	74.5	1630.40	1555.9	1581.18	4/20/06	31400	05/18/06	24.38	1.021	1581.71	MCF-06C	44	59	15	51.5	1578.92	1580.63	4/20/06	47600	05/22/06	24.09	1.033	1580.69
MCF-6B	67	82	15	74.5	1630.40	1555.9	1580.25	7/26/06	39700	08/09/06	24.02	1.027	1580.91	MCF-06C	44	59	15	51.5	1578.92	1579.38	7/26/06	6280	08/08/06	23.97	1.002	1579.38
MCF-6B	67	82	15	74.5	1630.40	1555.9	1579.92	10/17/06	38200	10/31/06	25.63	1.026	1580.54	MCF-06C	44	59	15	51.5	1578.92	1578.93	10/17/06	6720	10/30/06	23.57	1.002	1578.93
MCF-6B	67	82	15	74.5	1630.40	1555.9	1578.79	1/23/07	39700	02/01/06	19.3	1.029	1579.45	MCF-06C	44	59	15	51.5	1578.92	1578.09	1/23/07	6980	02/01/07	22.3	1.003	1578.09
MCF-8B	107.5	137.5	30	122.5	1578.43	1455.93	1570.59	6/9/04	---	---	---	---	---	AA-08	5	35	30	20	1558.46	1566.82	6/7/04	---	---	---	---	---
MCF-8B	107.5	137.5	30	122.5	1578.43	1455.93	1578.43	4/21/06	27100	05/23/06	23.45	1.018	1580.63	AA-08	5	35	30	20	1558.46	1567.69	4/21/06	5070	05/25/06	23.48	1.001	1567.70
MCF-8B	107.5	137.5	30	122.5	1578.43	1455.93	1576.89	7/26/06	26200	08/23/06	23.87	1.017	1578.95	AA-08	5	35	30	20	1558.46	1565.47	7/26/06	4390	08/14/06	23.3	1.001	1565.48
MCF-8B	107.5	137.5	30	122.5	1578.43	1455.93	1577.54	10/17/06	26800	11/10/06	23.80	1.018	1579.73	AA-08	5	35	30	20	1558.46	1568.82	10/17/06	4640	11/01/06	23.65	1.001	1568.83
MCF-8B	107.5	137.5	30	122.5	1578.43	1455.93	1578.59	1/23/07	28300	02/08/07	22.6	1.019	1580.92	AA-08	5	35	30	20	1558.46	1568.72	1/23/07	4700	02/08/07	23.4	1.001	1568.73
MCF-9B	105	125	20	115	1693.00	1578	1663.43	7/7/04	---	---	---	---	---	AA-09	30	65	35	47.5	1646.61	1663.46	7/7/04	---	---	---	---	---
MCF-9B	105	125	20	115	1693.00	1578	1660.14	4/20/06	3390	05/03/06	25.30	1.000	1660.14	AA-09	30	65	35	47.5	1646.61	1659.16	4/20/06	5670	05/01/06	25.3	1.001	1659.17
MCF-9B	105	125	20	115	1693.00	1578	1659.39	7/26/06	3510	08/04/06	25.99	0.999	1659.31	AA-09	30	65	35	47.5	1646.61	1658.64	7/26/06	5740	08/11/06	24.38	1.002	1658.66
MCF-9B	105	125	20	115	1693.00	1578	1659.21	10/17/06	3420	10/25/06	23.32	1.000	1659.21	AA-09	30	65	35	47.5	1646.61	1658.35	10/17/06	5890	10/23/06	24.52	1.002	1658.37
MCF-9B	105	125	20	115	1693.00	1578	1659.09	1/22/07	3620	02/12/06	20.74	1.001	1659.21	AA-09	30	65	35	47.5	1646.61	1658.48	1/22/07	6150	01/26/07	24.4	1.002	1658.50

Table C-1. Summary of Vertical Gradient Data
BRC Common Areas - Eastside

Intermediate/Shallow Well Pairs		Unocorrected for Groundwater Density			Corrected for Groundwater Density			Corrected for Equipotential Surface						
Intermediate Well	**Shallow Well**	Point Water Head Delta (AMSL)	Point Water Head Intermediate/Shallow Vertical Gradient (ft/ft)	Point Water Head Vertical Flow Direction	Fresh Water Head Delta (AMSL)	Fresh Water Head Intermediate/Shallow Vertical Gradient (ft/ft)	Fresh Head Vertical Flow Direction	Horizontal Gradient	Distance Between Wells Along Gradient	Well Name	Revised GW Elevation/ Head	Fresh Water Head Delta (AMSL)	Fresh Water Head Intermediate/Shallow Vertical Gradient (ft/ft)	Fresh Head Vertical Flow Direction
BEC-9	AA-19	30.04	---	DOWN	---	---	---	---	---	---	---	---	---	---
BEC-9	AA-19	29.65	---	DOWN	---	---	---	---	---	---	---	---	---	---
BEC-9	AA-19	29.39	---	DOWN	---	---	---	---	---	---	---	---	---	---
MCF-10B	AA-10	-1.96	0.03	UP	---	---	---	---	---	---	---	---	---	---
MCF-10B	AA-10	-1.88	0.03	UP	-1.79	0.03	UP	0.0070	-12	AA-10	1596.13	-1.71	0.02	UP
MCF-10B	AA-10	-1.11	0.02	UP	-1.02	0.01	UP	0.0138	-19	AA-10	1597.24	-0.76	0.01	UP
MCF-10B	AA-10	-2.06	0.03	UP	-1.97	0.03	UP	0.0105	-4	AA-10	1596.80	-1.93	0.03	UP
MCF-10B	AA-10	-1.96	0.03	UP	-1.87	0.03	UP	0.0133	-8	AA-10	1597.01	-1.76	0.03	UP
MCF-11	AA-11	0.71	-0.01	DOWN	---	---	---	---	---	---	---	---	---	---
MCF-11	AA-11	-0.20	0.00	UP	---	---	---	0.0118	-6	AA-11	1630.69	-0.07	0.001	UP
MCF-11	AA-11	-0.16	0.00	UP	---	---	---	0.0168	-6	AA-11	1630.06	-0.10	0.001	UP
MCF-11	AA-11	-0.15	0.00	UP	---	---	---	0.0235	-6	AA-11	1629.88	-0.14	0.002	UP
MCF-11	AA-11	-0.24	0.00	UP	---	---	---	0.0157	-4	AA-11	1629.93	-0.06	0.001	UP
MCF-12C	MCF-12B	0.62	-0.01	DOWN	---	---	---	---	---	---	---	---	---	---
MCF-12C	MCF-12B	0.40	0.00	DOWN	0.59	-0.01	DOWN	0.0168	-10	MCF-12B	1649.24	0.76	-0.01	DOWN
MCF-12C	MCF-12B	0.36	0.00	DOWN	0.55	-0.01	DOWN	0.0821	-8	MCF-12B	1648.98	1.21	-0.01	DOWN
MCF-12C	MCF-12B	0.44	0.00	DOWN	0.53	-0.01	DOWN	0.0118	-9	MCF-12B	1648.30	0.64	-0.01	DOWN
MCF-12C	MCF-12B	0.47	-0.01	DOWN	0.57	-0.01	DOWN	0.0254	-10	MCF-12B	1648.00	0.82	-0.01	DOWN
MCF-16B	MCF-16C	1.52	-0.01	DOWN	---	---	---	---	---	---	---	---	---	---
MCF-16B	MCF-16C	-0.32	0.00	UP	-11.16	0.05	UP	0.0181	13	MCF-16C	1625.99	-11.39	0.05	UP
MCF-16B	MCF-16C	-1.23	0.01	UP	-13.04	0.06	UP	0.0261	6	MCF-16C	1625.72	-13.20	0.06	UP
MCF-16B	MCF-16C	-1.29	0.01	UP	-13.56	0.06	UP	0.0134	12	MCF-16C	1625.49	-13.73	0.06	UP
MCF-16B	MCF-16C	-1.32	0.01	UP	-14.30	0.06	UP	0.0157	11	MCF-16C	1625.33	-14.47	0.06	UP
MCF-1B	AA-01	-1.85	0.06	UP	---	---	---	---	---	---	---	---	---	---
MCF-1B	AA-01	0.19	-0.01	**DOWN**	0.22	-0.01	**DOWN**	0.0165	24.8	AA-01	1711.94	-0.19	0.01	**UP**
MCF-1B	AA-01	0.19	-0.01	DOWN	0.25	-0.01	DOWN	0.0137	14	AA-01	1711.50	0.05	0.00	DOWN
MCF-1B	AA-01	0.16	0.00	DOWN	0.19	-0.01	DOWN	0.0086	21	AA-01	1711.32	0.01	0.00	DOWN
MCF-1B	AA-01	0.17	-0.01	**DOWN**	0.20	-0.01	**DOWN**	0.0093	24.9	AA-01	1711.22	-0.03	0.00	**UP**
MCF-6B	MCF-06C	-6.41	0.28	UP	---	---	---	---	---	---	---	---	---	---
MCF-6B	MCF-06C	-0.55	0.02	UP	-1.02	0.04	UP	0.0214	4	MCF-06C	1580.60	-1.11	0.05	UP
MCF-6B	MCF-06C	-0.87	0.04	UP	-1.53	0.07	UP	0.0074	0	MCF-06C	1579.38	-1.53	0.07	UP
MCF-6B	MCF-06C	-0.99	0.04	UP	-1.61	0.07	UP	0.0078	3	MCF-06C	1578.91	-1.64	0.07	UP
MCF-6B	MCF-06C	-0.70	0.03	UP	-1.37	0.06	UP	0.0086	6	MCF-06C	1578.04	-1.42	0.06	UP
MCF-8B	AA-08	-3.77	0.04	UP	---	---	---	---	---	---	---	---	---	---
MCF-8B	AA-08	-10.74	0.10	UP	-12.94	0.13	UP	0.0124	9	AA-08	1567.59	-13.05	0.13	UP
MCF-8B	AA-08	-11.42	0.11	UP	-13.47	0.13	UP	0.0138	6	AA-08	1565.39	-13.55	0.13	UP
MCF-8B	AA-08	-8.72	0.09	UP	-10.90	0.11	UP	0.0105	10	AA-08	1568.73	-11.00	0.11	UP
MCF-8B	AA-08	-9.87	0.10	UP	-12.19	0.12	UP	0.0105	8	AA-08	1568.65	-12.27	0.12	UP
MCF-9B	AA-09	0.03	0.00	DOWN	---	---	---	---	---	---	---	---	---	---
MCF-9B	AA-09	-0.98	0.01	UP	-0.97	0.01	UP	0.0157	7	AA-09	1659.06	-1.08	0.02	UP
MCF-9B	AA-09	-0.75	0.01	UP	-0.64	0.01	UP	0.0196	2	AA-09	1658.62	-0.68	0.01	UP
MCF-9B	AA-09	-0.86	0.01	UP	-0.84	0.01	UP	0.0118	5	AA-09	1658.31	-0.90	0.01	UP
MCF-9B	AA-09	-0.61	0.01	UP	-0.71	0.01	UP	0.0235	8	AA-09	1658.32	-0.89	0.01	UP

Table D-1. Summary of Vertical Gradient Data
BRC Common Areas - Eastside

Deep/Intermediate Well Pairs

Deep Well	Depth to Top of Screen (feet	Depth to Bottom of Screen	Screen Length (ft)	Screen Midpoint (feet bgs)	Ground Surface elevation (ft AMSL)	Screen Midpoint (AMSL) (zi)	Groundwater Elevation (AMSL) (hi)	GW Elevation Date Measured	Groundwater TDS (mg/L)	TDS Date Measured	Groundwater Temperature (C)	GW Density (g/cm^3) (pi)	Fresh Water Head, Hf (AMSL) (h(f))	**Intermediate Well**	Depth to Top of Screen (feet bgs)	Depth to Bottom of Screen (feet	Screen Length ft	Screen midpoint ft	Screen Midpoint (AMSL) (zi)	Groundwater Elevation (AMSL) (hi)	GW Elevation Date Measured	Ground water TDS (mg/L)	TDS Date Measured	Groundwater Temperature (C)	GW Density (g/cm^3) (pi)	Fresh Water Head, Hf (AMSL)
MCF-10A	365	385	20	375	1613.32	1238.32	1613.06	4/14/04	---	---	---	---		MCF-10B	84	104	20	94	1518.38	1597.87	7/9/04	---	---	---	---	---
MCF-10A	365	385	20	375	1613.32	1238.32	**ARTESIAN**	4/21/06	8080	05/31/06	24.96	1.003	---	MCF-10B	84	104	20	94	1518.38	1597.92	4/21/06	2050	05/18/06	24.35	0.999	1597.84
MCF-10A	365	385	20	375	1613.32	1238.32	1601.56	7/27/06	6800	08/15/06	24.3	1.002	1602.29	MCF-10B	84	104	20	94	1518.38	1598.08	7/27/06	2030	08/15/06	23.75	0.999	1598.00
MCF-10A	365	385	20	375	1613.32	1238.32	1607.46	10/17/06	7700	11/10/06	25.01	1.003	1608.57	MCF-10B	84	104	20	94	1518.38	1598.81	10/17/06	2050	11/10/06	23.67	0.999	1598.73
MCF-10A	365	385	20	375	1613.32	1238.32	1612.18	1/23/07	7270	02/27/06	22.51	1.003	1613.30	MCF-10B	84	104	20	94	1518.38	1598.85	1/23/07	2150	02/27/07	23.0	0.999	1598.77
MCF-12A	349.5	369.5	20	359.5	1713.68	1354.18	1658.06	7/222004	---	---	---	---		MCF-12C	155	175	20	165	1548.03	1647.56	7/21/04	---	---	---	---	---
MCF-12A	349.5	369.5	20	359.5	1713.68	1354.18	1661.03	4/27/06	5950	05/18/06	28.13	1.003	1661.95	MCF-12C	155	175	20	165	1548.03	1648.68	4/27/06	1690	05/22/06	24.97	0.998	1648.48
MCF-12A	349.5	369.5	20	359.5	1713.68	1354.18	1661.21	7/27/06	5900	08/10/06	25.6	1.001	1661.52	MCF-12C	155	175	20	165	1548.03	1647.97	7/27/06	1820	08/10/06	25.3	0.998	1647.77
MCF-12A	349.5	369.5	20	359.5	1713.68	1354.18	1661.36	10/16/06	7580	11/10/06	24.64	1.003	1662.28	MCF-12C	155	175	20	165	1548.03	1647.76	10/16/06	2010	11/03/06	24.35	0.999	1647.66
MCF-12A	349.5	369.5	20	359.5	1713.68	1354.18	1661.54	1/24/07	6320	02/23/07	24.8	1.002	1662.15	MCF-12C	155	175	20	165	1548.03	1647.28	1/24/07	2100	02/22/07	21.7	0.999	1647.18
MCF-16A	364.5	384.5	20	374.5	1689.67	1315.17	1661.98	4/6/04	---	---	---	---		MCF-16B	283.7	313.7	30	298.7	1391.05	1628.46	7/23/04	---	---	---	---	---
MCF-16A	364.5	384.5	20	374.5	1689.67	1315.17	1643.84	4/20/06	81800	05/18/06	25.74	1.059	1663.23	MCF-16B	283.7	313.7	30	298.7	1391.05	1626.55	4/20/06	64800	05/01/06	25.83	1.046	1637.38
MCF-16A	364.5	384.5	20	374.5	1689.67	1315.17	1643.62	7/26/06	83800	08/21/06	24.0	1.061	1663.66	MCF-16B	283.7	313.7	30	298.7	1391.05	1627.11	7/26/06	70000	08/23/06	24.31	1.050	1638.91
MCF-16A	364.5	384.5	20	374.5	1689.67	1315.17	1643.84	10/17/06	86400	11/06/06	24.14	1.063	1664.55	MCF-16B	283.7	313.7	30	298.7	1391.05	1626.95	10/17/06	72200	11/06/06	23.34	1.052	1639.22
MCF-16A	364.5	384.5	20	374.5	1689.67	1315.17	1644.13	1/22/07	88300	02/16/07	23.2	1.065	1665.51	MCF-16B	283.7	313.7	30	298.7	1391.05	1626.83	1/22/07	74400	02/20/07	19.50	1.055	1639.80
MCF-1A	335	355	20	345	1754.44	1409.44	1720.21	7/25/04	---	---	---	---		MCF-1B	55	85	30	70	1683.95	1713.88	6/7/04	---	---	---	---	---
MCF-1A	335	355	20	345	1754.44	1409.44	1723.51	4/18/06	3570	05/30/06	27.72	0.999	1723.20	MCF-1B	55	85	30	70	1683.95	1712.16	4/18/06	2000	05/11/06	24.89	0.999	1712.13
MCF-1A	335	355	20	345	1754.44	1409.44	1726.61	7/27/06	4020	08/07/06	26.39	0.997	1725.66	MCF-1B	55	85	30	70	1683.95	1711.50	7/27/06	2070	07/31/06	25.89	0.998	1711.44
MCF-1A	335	355	20	345	1754.44	1409.44	1727.87	10/16/06	4060	10/24/06	26.01	1.000	1727.87	MCF-1B	55	85	30	70	1683.95	1711.34	10/16/06	1980	11/06/06	23.67	0.999	1711.31
MCF-1A	335	355	20	345	1754.44	1409.44	1726.47	1/22/07	3930	02/02/07	23.4	1.000	1726.47	MCF-1B	55	85	30	70	1683.95	1711.28	1/22/07	1830	02/14/06	23.93	0.999	1711.25
MCF-2A	360	380	20	370	1816.44	1446.44	1770.22	3/24/04	---	---	---	---		MCF-2B	215	235	20	225	1591.36	1751.83	7/8/04	---	---	---	---	---
MCF-2A	360	380	20	370	1816.44	1446.44	1775.11	4/18/06	494	05/10/06	26.55	0.997	1774.12	MCF-2B	215	235	20	225	1591.36	1757.25	4/20/06	622	05/05/06	26.92	0.997	1756.75
MCF-2A	360	380	20	370	1816.44	1446.44	1775.80	7/27/06	560	08/04/06	26.66	0.997	1774.81	MCF-2B	215	235	20	225	1591.36	1757.40	7/27/06	620	08/21/06	26.2	0.997	1756.90
MCF-2A	360	380	20	370	1816.44	1446.44	1776.48	10/16/06	492	11/07/06	25.68	0.997	1775.49	MCF-2B	215	235	20	225	1591.36	1757.62	10/16/06	650	11/03/06	26.76	0.997	1757.12
MCF-2A	360	380	20	370	1816.44	1446.44	1776.98	1/22/07	623	02/15/07	25.54	0.997	1775.99	MCF-2B	215	235	20	225	1591.36	1757.59	1/22/07	638	02/20/07	25.3	0.997	1757.09
MCF-3A	364	384	20	374	1783.23	1409.23	1732.71	2/25/04	---	---	---	---		MCF-3B	57	77	20	67	1716.46	1741.72	7/9/04	---	---	---	---	---
MCF-3A	364	384	20	374	1783.23	1409.23	1736.73	4/20/06	694	06/07/06	26.0	0.997	1735.75	MCF-3B	57	77	20	67	1716.46	1742.02	4/20/06	2590	05/12/06	24.75	0.999	1741.99
MCF-3A	364	384	20	374	1783.23	1409.23	1737.12	7/27/06	631	08/14/06	25.09	0.998	1736.46	MCF-3B	57	77	20	67	1716.46	1741.80	7/27/06	2450	08/16/06	24.68	0.999	1741.77
MCF-3A	364	384	20	374	1783.23	1409.23	1737.57	10/16/06	627	11/02/06	24.21	0.998	1736.91	MCF-3B	57	77	20	67	1716.46	1741.56	10/16/06	2490	11/03/06	24.86	0.999	1741.53
MCF-3A	364	384	20	374	1783.23	1409.23	1737.81	1/22/07	640	02/27/07	21.8	0.998	1737.15	MCF-3B	57	77	20	67	1716.46	1741.61	1/22/07	2610	02/20/07	24.2	0.999	1741.58
MCF-6A	373.5	393.5	20	383.5	1588.80	1205.3	1563.27	4/16/04	---	---	---	---	---	MCF-6B	67	82	15	74.5	1555.9	1590.58	7/16/04	---	---	---	---	---
MCF-6A	373.5	393.5	20	383.5	1588.80	1205.3	1519.38	4/20/06	186000	05/30/06	26.27	1.144	1564.61	MCF-6B	67	82	15	74.5	1555.9	1581.18	4/20/06	31400	05/18/06	24.38	1.021	1581.71
MCF-6A	373.5	393.5	20	383.5	1588.80	1205.3	1509.54	7/27/06	185000	08/21/06	25.1	1.143	1553.05	MCF-6B	67	82	15	74.5	1555.9	1580.25	7/26/06	39700	08/09/06	24.02	1.027	1580.91
MCF-6A	373.5	393.5	20	383.5	1588.80	1205.3	1512.00	10/16/06	205000	11/13/06	23.44	1.162	1561.68	MCF-6B	67	82	15	74.5	1555.9	1579.92	10/17/06	38200	10/31/06	25.63	1.026	1580.54
MCF-6A	373.5	393.5	20	383.5	1588.80	1205.3	1515.31	1/23/07	191000	02/23/07	20.4	1.151	1562.12	MCF-6B	67	82	15	74.5	1555.9	1578.79	1/23/07	39700	02/01/06	19.3	1.029	1579.45
MCF-8A	350	370	20	360	1579.02	1219.02	**ARTESIAN**	4/7/04	---	---	---	---	---	MCF-8B	107.5	137.5	30	122.5	1455.93	1570.59	6/9/04	---	---	---	---	---
MCF-8A	350	370	20	360	1579.02	1219.02	**ARTESIAN**	4/21/06	110000	06/07/06	24.59	1.082	**---**	MCF-8B	107.5	137.5	30	122.5	1455.93	1578.43	4/21/06	27100	05/23/06	23.45	1.018	1580.64
MCF-8A	350	370	20	360	1579.02	1219.02	**ARTESIAN**	7/26/06	113000	08/23/06	23.8	1.084	**---**	MCF-8B	107.5	137.5	30	122.5	1455.93	1576.89	7/26/06	26200	08/23/06	23.87	1.017	1578.95
MCF-8A	350	370	20	360	1579.02	1219.02	**ARTESIAN**	10/17/06	113000	11/10/06	25.73	1.084	**---**	MCF-8B	107.5	137.5	30	122.5	1455.93	1577.54	10/17/06	26800	11/10/06	23.80	1.018	1579.73
MCF-8A	350	370	20	360	1579.02	1219.02	**ARTESIAN**	1/23/07	116000	02/08/07	22.5	1.087	**---**	MCF-8B	107.5	137.5	30	122.5	1455.93	1578.59	1/23/07	28300	02/08/07	22.6	1.019	1580.92
MCF-8A	350	370	20	360	1579.02	1219.02	(c)	(c)	(c)	(c)	(c)	(c)	(c)	MCF-8B-R	116.5	136.5	20	126.5	1451.93	(c)	(c)	(c)	(c)	(c)	(c)	(c)
MCF-9A	270	290	20	280	1694.26	1414.26	1667.29	4/18/04	---	---	---	---	---	MCF-9B	105	125	20	115	1578	1663.43	7/7/04	---	---	---	---	---
MCF-9A	270	290	20	280	1694.26	1414.26	1657.36	4/20/06	---	---	---	---	---	MCF-9B	105	125	20	115	1578	1660.14	4/20/06	3390	05/03/06	25.30	1.000	1660.14
MCF-9A	270	290	20	280	1694.26	1414.26	1657.20	7/26/06	24800	08/21/06	25.93	1.015	1660.84	MCF-9B	105	125	20	115	1578	1659.39	7/26/06	3510	08/04/06	25.99	0.999	1659.31
MCF-9A	270	290	20	280	1694.26	1414.26	1657.30	10/17/06	26800	11/14/06	25.05	1.017	1661.43	MCF-9B	105	125	20	115	1578	1659.21	10/17/06	3420	10/25/06	23.32	1.000	1659.21
MCF-9A	270	290	20	280	1694.26	1414.26	1657.18	1/22/07	30700	02/16/07	25.53	1.020	1660.84	MCF-9B	105	125	20	115	1578	1659.09	1/22/07	3620	02/12/06	20.74	1.001	1659.17

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Groundwater density (pi) values calculated from TDS and temperature data at http://www.earthwardconsulting.com/density_calculator.htm.

Table C-1. Summary of Vertical Gradient Data
BRC Common Areas - Eastside

Deep/Intermediate Well Pairs		Uncorrected for Groundwater Density			Corrected for Groundwater Density			Corrected for Equipotential Surface						
Deep Well	**Intermediate Well**	Point Water Head Delta (AMSL)	Point Water Head Deep/Intermediate Vertical Gradient (ft/ft)	Point Water Head Vertical Flow Direction	Fresh Water Head Delta (AMSL)	Fresh Water Head Deep/Intermediate Vertical Gradient (ft/ft)	Fresh Head Vertical Flow Direction	Horizontal Gradient	Distance Between Wells Along Gradient	Well Name	Revised GW Elevation/ Head	Fresh Water Head Delta (AMSL)	Fresh Water Head Deep/Intermediate Vertical Gradient (ft/ft)	Fresh Head Vertical Flow Direction
MCF-10A	MCF-10B	-15.19	0.05	UP	---	---	---	---	---	---	---			
MCF-10A	MCF-10B	(a)	(a)	UP	(a)	(a)	UP	---	---	---	---	(a)	(a)	UP
MCF-10A	MCF-10B	-3.48	0.01	UP	-4.29	0.02	UP	0.0118	-10	MCF-10A	1602.40	-4.40	0.02	UP
MCF-10A	MCF-10B	-8.65	0.03	UP	-9.84	0.04	UP	0.0047	-7	MCF-10A	1608.60	-9.87	0.04	UP
MCF-10A	MCF-10B	-13.33	0.05	UP	-14.53	0.05	UP	0.0118	-6	MCF-10A	1613.37	-14.60	0.05	UP
MCF-12A	MCF-12C	-10.50	0.05	UP	---	---	---	---	---	---	---	---	---	---
MCF-12A	MCF-12C	-12.35	0.06	UP	-13.47	0.07	UP	0.0181	7.5	MCF-12A	1661.81	-13.34	0.07	UP
MCF-12A	MCF-12C	-13.24	0.07	UP	-13.75	0.07	UP	0.0261	7	MCF-12A	1661.33	-13.56	0.07	UP
MCF-12A	MCF-12C	-13.60	0.07	UP	-14.62	0.08	UP	0.0118	6	MCF-12A	1662.21	-14.55	0.08	UP
MCF-12A	MCF-12C	-14.26	0.07	UP	-14.97	0.08	UP	0.0376	7	MCF-12A	1661.89	-14.71	0.08	UP
MCF-16A	MCF-16B	-33.52	0.44	UP	---	---	---	---	---	---	---	---	---	---
MCF-16A	MCF-16B	-17.29	0.23	UP	-25.15	0.33	UP	0.0357	19.6	MCF-16A	1662.53	-25.15	0.33	UP
MCF-16A	MCF-16B	-16.51	0.22	UP	-24.74	0.33	UP	0.0186	9	MCF-16A	1663.49	-24.58	0.32	UP
MCF-16A	MCF-16B	-16.89	0.22	UP	-25.33	0.33	UP	0.0235	10	MCF-16A	1664.31	-25.09	0.33	UP
MCF-16A	MCF-16B	-17.30	0.23	UP	-25.32	0.33	UP	0.0308	12.8	MCF-16A	1665.12	-25.32	0.33	UP
MCF-1A	MCF-1B	-6.33	0.02	UP	---	---	---	---	---	---	---	---	---	---
MCF-1A	MCF-1B	-11.35	0.04	UP	-11.06	0.04	UP	0.0157	20	MCF-1A	1722.88	-10.75	0.04	UP
MCF-1A	MCF-1B	-15.11	0.06	UP	-14.21	0.05	UP	0.0261	18	MCF-1A	1725.19	-13.74	0.05	UP
MCF-1A	MCF-1B	-16.53	0.06	UP	-16.56	0.06	UP	0.0188	19	MCF-1A	1727.51	-16.20	0.06	UP
MCF-1A	MCF-1B	-15.19	0.06	UP	-15.22	0.06	UP	0.0314	15	MCF-1A	1726.00	-14.75	0.05	UP
MCF-2A	MCF-2B	-18.39	0.13	UP	---	---	---	---	---	---	---	---	---	---
MCF-2A	MCF-2B	-17.86	0.12	UP	-17.37	0.12	UP	0.0196	-4.5	MCF-2A	1774.21	-17.46	0.12	UP
MCF-2A	MCF-2B	-18.40	0.13	UP	-17.91	0.12	UP	0.0038	-9	MCF-2A	1774.85	-17.94	0.12	UP
MCF-2A	MCF-2B	-18.86	0.13	UP	-18.37	0.13	UP	0.0152	-12	MCF-2A	1775.67	-18.55	0.13	UP
MCF-2A	MCF-2B	-19.39	0.13	UP	-18.90	0.13	UP	0.0103	-12	MCF-2A	1776.11	-19.02	0.13	UP
MCF-3A	MCF-3B	9.01	-0.03	DOWN	---	---	---	---	---	---	---	---	---	---
MCF-3A	MCF-3B	5.29	-0.02	DOWN	6.35	-0.02	DOWN	0.0108	9.7	MCF-3A	1735.64	6.35	-0.02	DOWN
MCF-3A	MCF-3B	4.68	-0.02	DOWN	5.31	-0.02	DOWN	0.0102	4	MCF-3A	1736.42	5.35	-0.02	DOWN
MCF-3A	MCF-3B	3.99	-0.01	DOWN	4.62	-0.02	DOWN	0.0078	8	MCF-3A	1736.85	4.68	-0.02	DOWN
MCF-3A	MCF-3B	3.80	-0.01	DOWN	4.55	-0.01	DOWN	0.0091	13.2	MCF-3A	1737.03	4.55	-0.01	DOWN
MCF-6A	MCF-6B	27.31	-0.08	DOWN	---	---	---	---	---	---	---	---	---	---
MCF-6A	MCF-6B	61.80	-0.18	DOWN	17.10	-0.05	DOWN	---	---	---	---	---	---	---
MCF-6A	MCF-6B	70.71	-0.20	DOWN	27.86	-0.08	DOWN	---	---	---	---	---	---	---
MCF-6A	MCF-6B	67.92	-0.19	DOWN	18.86	-0.05	DOWN	---	---	---	---	---	---	---
MCF-6A	MCF-6B	63.48	-0.18	DOWN	17.33	-0.05	DOWN	---	---	---	---	---	---	---
MCF-8A	MCF-8B	(a)	(a)	UP	---	---	---	---	---	---	---	---	---	---
MCF-8A	MCF-8B	(a)	(a)	UP	(a)	(a)	UP	---	---	---	---	(a)	(a)	UP
MCF-8A	MCF-8B	(a)	(a)	UP	(a)	(a)	UP	---	---	---	---	(a)	(a)	UP
MCF-8A	MCF-8B	(a)	(a)	UP	(a)	(a)	UP	---	---	---	---	(a)	(a)	UP
MCF-8A	MCF-8B	(a)	(a)	UP	(a)	(a)	UP	---	---	---	---	(a)	(a)	UP
MCF-8A	MCF-8B-R	(c)	(c)	(c)	(c)	(c)	(c)	---	---	---	---	(c)	(c)	(c)
MCF-9A	MCF-9B	-3.86	0.02	UP	---	---	---	---	---	---	---	---	---	---
MCF-9A	MCF-9B	2.78	-0.02	DOWN	---	---	---	0.0235	23	MCF-9A	1656.82	3.32	-0.02	DOWN
MCF-9A	MCF-9B	2.19	-0.01	**DOWN**	-1.54	0.01	**UP**	0.0147	23	MCF-9A	1660.51	-1.20	0.01	**UP**
MCF-9A	MCF-9B	1.91	-0.01	**DOWN**	-2.22	0.01	**UP**	0.0235	22	MCF-9A	1660.91	-1.70	0.01	**UP**
MCF-9A	MCF-9B	1.91	-0.01	**DOWN**	-1.67	0.01	**UP**	0.0078	23	MCF-9A	1660.66	-1.49	0.01	**UP**

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