**Enclosure to EPA December 3, 2010 Letter to EnCana:**
**Pavillion VRP Pit Comments**

The comments are referring to EnCana reports submitted to Kathy Brown with the Wyoming Department of Environmental Quality on August 31, 2010:

- **REMEDIAL ALTERNATIVES EVALUATION - TRIBAL PAVILLION 14-11**
- **REMEDIAL ALTERNATIVES EVALUATION - TRIBAL PAVILLION 42-11**
- **REMEDIAL ALTERNATIVES EVALUATION - TRIBAL PAVILLION 24-3**

The following comments are presented starting with the more general discussion and moving to the specific comments on each report. There are many comments that apply to all of the documents throughout the review, beginning with general principles concerning remedy evaluation and selection. The comments have also been written with the consideration of developing a streamlined approach to reaching clean-up

## I. General Comments on Pit Remedy Selection

A. Th e primary concept of remedy selection is a process that determines the best approach for reaching clean-up goals. This process includes such evaluations as: 1) cost 2) time to reach goals 3) risks presented by each remedy and 4) the practicability of the remedies. The VRP pit evaluations have not addressed these basic principles. In order to support the selection of the best remedy, an evaluation of all potential remedies is needed with respect to cost, time frames needed to reach goals and ultimate risk presented; this should result in eliminating potential remedies that are not going to reach goals within a reasonable timeframe.

   a. There have been no attempts to evaluate or even mention other potential remedies that might apply at these sites. EPA, along with other federal agencies, developed the Treatment Technologies Screening Matrix[1] to assist with limiting the selection of remedies that would need to be evaluated. This is especially necessary for clean-up projects that can be streamlined.
   b. A remedy has been proposed prior to an evaluation of the practicability of the proposed remedy.
   c. Since contaminated soil has been left in place at all three locations soil remediation remedies need to be evaluated as well as groundwater remedies to address contaminants present in the dissolved phase.

B. Monitored natural attenuation (MNA)

   a. MNA is not a presumptive remedy for any situation. "EPA does not consider MNA to be a "presumptive" or "default" remedy—it is merely one option that should be evaluated with other applicable remedies."[2]
   b. "EPA does not view MNA to be a "no action" or "walk-away" approach, but rather considers it to be an alternative means of achieving remediation objectives that may be appropriate for specific, well-

documented site circumstances where its use meets the applicable statutory and regulatory requirements. As there is often a variety of methods available for achieving remediation objectives at any given site, MNA may be evaluated and compared to other viable remediation methods (including innovative technologies) during the study phases leading to the selection of a remedy. As with any other remedial alternative, MNA should be selected only where it meets all relevant remedy selection criteria, and where it will meet site remediation objectives within a timeframe that is reasonable compared to that offered by other methods. In the majority of cases where MNA is proposed as a remedy, its use may be appropriate as one component of the total remedy, that is, either in conjunction with active remediation or as a follow-up measure. MNA should be used very cautiously as the sole remedy at contaminated sites. Furthermore, the availability of MNA as a potential remediation tool does not imply any lessening of EPA's longstanding commitment to pollution prevention."[2]

c. The VRP pit documents discuss *"the reliance of natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remedial objectives within a time frame that is reasonable compare to that offered by other more active methods" (USEPA OSWER, 1997).* As the cited reference indicates, the expectation is that other remedies must be evaluated and compared.
d. "EPA expects that source control and long-term performance monitoring will be fundamental components of any MNA remedy."[2]
e. A remedial alternative that relies on monitored natural attenuation to attain site-specific remediation objectives is not the same as the "no action" alternative. Generally a no action alternative is selected when there is no current or potential threat to human health or the environment.[2] Since the aquifer in the Pavillion area is used extensively as a drinking water aquifer, a "no action remedy" is not an acceptable alternative.
f. "Use of MNA does not imply that activities (and costs) associated with investigating the site or selecting the remedy (*e.g.*, site characterization, risk assessment, comparison of remedial alternatives, performance monitoring, and contingency measures) have been eliminated."[2]
g. In general, the level of site characterization necessary to support a comprehensive evaluation of MNA is more detailed than that needed to support active remediation.[2] Site characterization for natural attenuation includes a quantitative understanding of:
    i. Source mass
    ii. Groundwater flow
    iii. Contaminant phase distribution and partitioning
    iv. Rates of biological and non-biological transformation
h. Collection of site-specific data sufficient to estimate with an acceptable level of confidence both the rate of attenuation processes and the

anticipated time required to achieve remediation objectives should include three tiers of site-specific information. Models such as EPA's Bioscreen or Bioplume are very useful in assisting with this evaluation. This information includes:

i. Historical groundwater and/or soil chemistry data that demonstrate a clear and meaningful trend of decreasing contaminant mass and/or concentration over time at appropriate monitoring or sampling points. (In the case of a groundwater plume, decreasing concentrations should not be solely the result of plume migration.)
ii. Hydrogeologic and geochemical data that can be used to demonstrate indirectly the type(s) of natural attenuation processes active at the site, and the rate at which such processes will reduce contaminant concentrations to required levels. For example, characterization data may be used to quantify the rates of contaminant sorption, dilution, or volatilization, or to demonstrate and quantify the rates of biological degradation processes occurring at the site.
iii. Data from field or microcosm studies (conducted in or with actual contaminated site media) which directly demonstrate the occurrence of a particular natural attenuation process at the site and its ability to degrade the contaminants of concern[2]

i. Timeframes for achieving remedial objectives with MNA should be comparable to active remedies in order to be considered "reasonable"

**VRP Site Specific Comments**

**REMEDIAL ALTERNATIVES EVALUATION - TRIBAL PAVILLION 14-11**

EPA sampled VRP 14X-11 monitoring well MW-6 during Phase II sampling conducted in January, 2010. EPA refers to MW-6 as PGMW02 in the Phase II Analytical Results Report.

A. Sources – General Comments

a. The VRP investigation should also consider other sources that may potentially exist. Additional sources may include spills or leakage from production water collection lines from the gas well heads to separators or lines from separators to tanks.
b. There are indicators that the historic pit and contaminated soils may not be the sole source of current contaminated groundwater in the pad area.
    i. The 14X-11 gas well was drilled in 1965 and therefore it is assumed that the pit contamination was introduced at that time. Forty-five years should allow for large reductions in organic hydrocarbon contaminant concentrations including benzene, to very low or non-detectable levels. If

one only considers dispersion, the groundwater plume of benzene should have been reduced to very low concentrations if the original pit is the sole source of contaminants.

ii. The VRP groundwater monitoring should have also been able to show dramatic reductions in contaminant concentrations since soils excavation and removal. That was not discussed in the report.

iii. A cursory review of the data does not indicate reductions in benzene concentrations in groundwater. Benzene concentrations in MW-3 for samples taken in the spring are increasing as are a comparison of samples collected in the fall. Benzene concentrations in MW-6 do not show a trend.

iv. Lack of plume concentration response to source removal could mean two things: 1) the soils removed were not the sole source or 2) not enough of the source material related to the pits was removed in order to elicit a response from plume concentrations.

v. 21 of 28 soil borings at 14X-11 show TPH levels above 1000 mg/kg with many field readings above 2000 mg/kg. Plotting TPH information demonstrates a very diffuse distribution of contaminated areas which may also indicate sources other than soils related to pit usage. Some of the high TPH soil concentrations occur "up gradient" of the pits, further indicating that other sources are or may be present. This is also true for benzene concentrations in MW-7 which is shown to be cross gradient from the pit area.

c. EPA sampling and analysis of MW-6 (PGMW02) detected dissolved methane concentrations up to 361 mg/l and chloride at 265 mg/l. Chloride concentrations are elevated beyond Wind River formation values found in USGS reports[3] and EPA sampling of other shallow wells. Surface water chloride values in USGS reports indicate that surface water used for irrigation should be below 20mg/l and likely even lower. In addition, chloride values in alluvium deposits and the Wind River formation in Fremont County rarely are found above 100 mg/l.

d. Dissolved methane, ethane and propane concentrations in MW-6 seem to be high and could indicate that recent production fluid releases could be responsible for these higher than expected concentrations.

e. Some of the monitoring that has been done indicates that other sources may be present beyond the 45 year-old drilling fluid or reserve pit. Chloride concentrations at MW-6 (PGMW02) seem to indicate the potential for very recent production fluid releases.

If these releases were in the past (45 years ago), advection and dispersion would have reduced the concentrations of chloride to much lower concentrations by now.

f. Benzene concentrations from a 45 year-old source should have been reduced to much lower levels.
g. High chloride concentrations (similar to the production fluids) also indicate a much more recent release of production water. EPA only sampled MW-6 so there is no additional information on chloride levels in other monitoring wells.

B. Groundwater flow direction and contaminant fate and transport

a. Recharge to MW-6 (PGMW02) subsequent to purging during EPA Phase II sampling was very slow indicating the screened interval for MW-6 appears to be located at or near the top of the water table or screened in low permeability sediments. In either case this situation is not ideal for measuring water levels that would be used for determining flow direction.
b. Water levels to determine groundwater flow direction should be collected several times a year to determine if flow directions and gradient depend on seasonal fluctuations.
c. Changes in water levels may be due to seasonal variations which are most likely dependent on flood irrigation. Flood irrigation is practiced from early May into September.
d. Also the shallow nature of the monitoring wells will not be able to detect and portray the plumes 3 dimensional nature. Deeper monitoring wells are especially needed in areas with flood irrigation practices that would potentially provide the hydraulic head to drive the dissolved portion of plume deeper into the aquifer to a point where shallow monitoring wells would not detect the plume at depth.[4]

C. Monitored Natural Attenuation (MNA) at VRP 14X-11 falls short of demonstrating the efficacy of natural attenuation.

a. Benzene concentrations in MW-6 do not show a stable or decreasing trend.
b. Natural attenuation indicators of petroleum hydrocarbon compounds in the dissolved phase are: decreases in $O^2$, $NO_3^-$, Fe(II), and $SO_4^-$, and increases in $H_2$, $H_2S$, and $CH_4$. None of these indicators have been mentioned or reported in the remedial action proposal document. These are the minimum indicators needed to demonstrate natural attenuation is a viable alternative.
c. MNA is dependent on decreasing the mass of contaminants in the source and in the plume. Decreases in concentration do not necessarily demonstrate a decrease in mass.

d. It is crucial to demonstrate that all sources that would contribute to the plume are removed or addressed so that continued releases are mitigated.

D. Comprehensive characterization of the nature and extent of the contaminated plume of groundwater is required.
   a. The installation of very shallow groundwater monitoring wells hinders the ability to determine both the vertical and horizontal components of the contaminated plume.
   b. Shallow well screens located at the water table are useful in situations with characterizing the petroleum for light non-aqueous phase liquid (LNAPL). However, dissolved constituents migrate with the flow of groundwater. As mentioned above, a diving plume as a result of flood irrigation could be undetected with a shallow monitoring well network.
   c. The monitoring well network needs to be designed in order to determine: 1) vertical component of contaminant migration; 2) horizontal extent of the plume; 3) isoconcentration contours of contaminants of concern and MNA indicators; and 4) the axis of the plume.

**REMEDIAL ALTERNATIVES EVALUATION - TRIBAL PAVILLION 42-11**

EPA sampled VRP 42X-11 monitoring well MW-4 during Phase II sampling conducted in January, 2010. EPA refers to MW-4 as PGMW03 in the Phase II Analytical Results Report. Many of the same comments germane to this pit location were identified in the previous pit review. However not all parameters were similar. For example chloride is more like the typical background values found through out the Wind River formation.

A. Sources – General Comments

a. The VRP investigation should also consider other sources that may potentially exist. Additional sources may include spills or leakage from production water collection lines from the gas well heads to separators or lines from separators to tanks.
b. There are indicators that the historic pit and contaminated soils may not be the sole source of current contaminated groundwater in the pad area. The 42X-11 gas well was drilled in 1973 and therefore it is assumed that the pit contamination was introduced at that time. Thirty seven years should allow for huge reductions in organic hydrocarbon contaminants including benzene to very low or non-detectable levels. If one only considers dispersion, the groundwater plumes should have been reduced to very low concentrations if the original pit is the sole source of contaminants.
c. The VRP monitoring should have also been able to show dramatic reductions in contaminant concentrations since soils excavation and removal. That was not discussed in the report.
d. EPA soil boring near this pit site determined that the potential for light non-aqueous phase liquid (LNAPL) exists. This borehole location was not located within the pit location that has been identified in the past, suggesting an additional source of dissolved phase contaminants.
e. A cursory review of the data does not indicate a downward trend in benzene concentrations at MW-4.
f. Lack of plume concentration response to source removal could indicate:
    i. the soils removed were not the source
    ii. not enough of the source material related to the pits was removed in order to elicit a response from plume concentrations; or
    iii. LNAPL remains in the vicinity of the pit.
g. 11 of 21 soil borings at 42X-11 show TPH levels above 1000mg/kg with many field readings above 2000mg/kg. Plotting TPH information demonstrates a very diffuse distribution which may also indicate sources other than contaminated soils related to pit usage. Some of the high TPH soil concentrations occur "cross-gradient" of the pit, further indicating that other sources are or may be present. This is also true for benzene concentrations in MW-2 which is shown to be cross-gradient from the pit area.

h. The chloride concentration from EPA sampling was similar to Wind River formation values found in USGS reports and EPA sampling of other shallow wells. Surface water chloride values in USGS reports indicate that surface water used for irrigation should be below 20mg/l and likely even lower. In addition, chloride values in alluvium and the Wind River formation in Fremont County rarely are found above 100 mg/l.
i. Since EPA only sampled MW-4, additional information on chloride levels in other monitoring wells at this pit site needs to be collected.
j. Although the concentration of chloride is within background values, EPA only sampled one monitoring well at this site. In order to verify that there are no current leaks in production water collection lines, additional chloride analysis needs to be done at the rest of the monitoring wells at this pit site.
k. Dissolved methane concentrations in MW-4 seem to be high for an older pit and could indicate that production fluids could be responsible for higher than expected methane concentrations. This well did not have ethane and propane detection but again further monitoring for hydrocarbon gases at all monitoring wells at this site should be done.
l. Benzene concentrations from a 27 year-old source should have been reduced to lower concentrations. However potential for LNAPL exists at this site, which could be a continuing source of dissolved contaminants. Analysis of soils for constituents such as benzene and the leachability tests of benzene will be necessary.

B. Groundwa ter flow direction and contaminant fate and transport

a. Recharge to MW-4 (PGMW03) subsequent to purging during EPA Phase II sampling was very slow indicating the screened interval for MW-4 appears to be located at or near the top of the water table or screened in low permeability sediments. In either case this situation is not ideal for measuring water levels that would be used for determining flow direction.
b. Water levels to determine groundwater flow direction should be collected several times a year to determine if flow directions and gradient depend on seasonal fluctuations.
c. Changes in water levels may be due to seasonal variations which are most likely dependent on flood irrigation. Flood irrigation is practiced from early May into September.
d. The shallow nature of the monitoring wells will not be able to detect and portray the plume's 3-dimensional nature. Deeper monitoring wells are especially needed in areas with flood irrigation practices, which could potentially provide the hydraulic head to drive the dissolved portion of plume deeper into the aquifer to a point where shallow monitoring wells would not detect the plume.

C. Monitored Natural Attenuation (MNA) at VRP 42X-11 falls short of demonstrating the efficacy of natural attenuation.
   a. Benzene concentrations in MW-4 do not show a stable or decreasing trend.
   b. Natural attenuation indicators of petroleum hydrocarbon compounds in the dissolved phase are decreases in $O^2$, $NO_3^-$, Fe(II), and $SO_4^-$, and increases in $H_2$, $H_2S$, and $CH_4$. None of these indicators have been mentioned or reported in the remedial action document. These are the minimum indicators needed to demonstrate natural attenuation is a viable alternative.
   c. MNA is dependent on decreasing the mass of contaminants in the source and in the plume. Decreases in concentration do not necessarily demonstrate a decrease in mass.
   d. It is crucial to demonstrate that all sources that would contribute to the plume are removed or addressed so that continued releases have been mitigated.

D. Comprehensive characterization of the nature and extent of the contaminated plume of groundwater is required.
   a. The installation of very shallow groundwater monitoring wells hinders the ability to determine both the vertical and horizontal components of the contaminated plume.
   b. Shallow well screens located at the water table are useful in situations with characterizing petroleum LNAPL. However, dissolved constituents migrate with the flow of groundwater. As mentioned above, a diving plume induced by flood irrigation could remain undetected with a shallow monitoring well network.
   c. The monitoring well network needs to be designed in order to determine: 1) vertical component of contaminant migration; 2) horizontal extent of the plume; 3) isoconcentration contours of contaminants of concern and MNA indicators; and 4) the axis of the plume.

**REMEDIAL ALTERNATIVES EVALUATION - TRIBAL PAVILLION 24-3**

EPA sampled VRP TP24-3 monitoring well MW-1 during Phase II sampling conducted in January, 2010. EPA refers to MW-1 as PGMW01 in the Phase II Analytical Results Report. Many of the same comments germane to this pit were identified in the previous pit reviews.

A. Sources – General Comments

a. The VRP investigation should also consider other sources that may potentially exist. Additional sources may include spills or leakage from production water collection lines from the gas well heads to separators or lines from separators to tanks.
b. There are indicators that the historic pit and contaminated soils may not be the sole source of current contaminated groundwater in the pad area.
c. The TP24-3 gas well was drilled in 1965 and therefore it is assumed that the pit contamination was introduced at that time. Forty five years should allow for large reductions in organic hydrocarbon contaminants including benzene to very low or non-detectable levels. If one only considers dispersion, the benzene groundwater plumes should have been reduced to very low concentrations if the original pit is the sole source of contaminants.
d. The VRP monitoring should have been able to show dramatic reductions in contaminant concentrations since soils excavation and removal. That was not discussed in the report.
e. EPA soil boring at pit site 42X-11 determined that the potential for LNAPL exists LNAPL should be monitored for at all pit sites.
f. A cursory review of the data does not indicate a downward trend in benzene concentrations at contaminated monitoring wells at this pit site.
g. Lack of plume concentration response to source removal could indicate:
    i. the soils removed were not the source or
    ii. not enough of the source material related to the pits was removed in order to elicit a response from plume concentrations or
    iii. LNAPL remains in the vicinity of the pit.
h. Benzene detections in monitoring wells up-gradient and cross-gradient to groundwater flow indicate additional sources may be present at this pit site. MW-1 which is located up-gradient from the pit area has the highest concentrations of benzene at this site. Additional monitoring wells must be placed up-gradient of this well to be able to determine if additional sources exist.
i. Dissolved methane concentrations in MW-4 seem to be high for an older pit source and could indicate that production fluids could be responsible for higher than expected methane

concentrations. This well did not have ethane and propane detection but again further monitoring for these gases at all monitoring wells at this site should be done.

j. Benzene concentrations from a 45 year-old source should have been reduced to lower concentrations. However the evaluation should consider the potential for an LNAPL to exist at this site and therefore it could be the continuing source.
k. Analysis of soils for constituents such as benzene and the leachability of benzene will be necessary.
l. The chloride concentration results from EPA sampling and analysis at TP24-3 was similar to Wind River formation values found in USGS reports and EPA sampling of other shallow wells. Surface water chloride values in USGS reports indicate that surface water used for irrigation should be below 20mg/l and likely even lower. In addition, chloride values in alluvium and the Wind River formation in Fremont County rarely are found above 100 mg/l. Although the concentration of chloride is within background values, EPA only sampled one monitoring well at this site. In order to verify that there are no current leaks in production water collection lines, additional chloride analysis needs to be completed at the rest of the monitoring wells at this pit site.

B. Groundwater flow direction and contaminant fate and transport

a. Recharge to MW-1 (PGMW01) subsequent to purging during EPA Phase II sampling was very slow indicating the screened interval for MW-1 appears to be located at or near the top of the water table or screened in low permeability sediments. In either case this situation is not ideal for measuring water levels that would be used for determining flow direction.
b. Water levels to determine groundwater flow direction should be collected several times a year to determine if flow directions and gradient depend on seasonal fluctuations.
c. Changes in water levels may be due to seasonal variations are most likely dependent on flood irrigation. Flood irrigation is practiced from early May into September.
d. Also the shallow nature of the monitoring wells will not be able to detect and portray the plume's 3-dimensional nature. Deeper monitoring wells are especially needed in areas with flood irrigation practices that would potentially provide the hydraulic head to drive the dissolved portion of plume deeper into the aquifer to a point where shallow monitoring wells would not detect the plume.

C. Monitored Natural Attenuation (MNA) at VRP TP24-3 falls short of demonstrating the efficacy of natural attenuation.

a. Benzene concentrations in monitoring wells do not show a stable or decreasing trend.
b. Natural attenuation indicators of petroleum hydrocarbon compounds in the dissolved phase are: decreases in $O^2$, $NO_3^-$, Fe(II), and $SO_4^-$, and increases in $H_2$, $H_2S$, and $CH_4$. None of these indicators have been mentioned or reported in the remedial action document. These are the minimum indicators needed to demonstrate natural attenuation is a viable alternative.
c. MNA is dependent on decreasing the mass of contaminants in the source and in the plume. Decreases in concentration do not necessarily demonstrate a decrease in mass.
d. It is crucial to demonstrate that all sources that would contribute to the plume are removed or addressed so that continued releases have been mitigated.

D. Comprehensive characterization of the nature and extent of the contaminated plume of groundwater is required.
   a. The installation of very shallow groundwater monitoring wells hinders the ability to determine both the vertical and horizontal components of the contaminated plume.
   b. Shallow well screens located at the water table are useful in situations with characterizing a petroleum LNAPL. However, dissolved constituents migrate with the flow of groundwater. As mentioned above, a diving plume as a result of flood irrigation could remain undetected with a shallow monitoring well network.
   c. The monitoring well network needs to be designed in order to determine: 1) vertical component of contaminant migration; 2) horizontal extent of the plume; 3) isoconcentration contours of contaminants of concern and MNA indicators; and 4) the axis of the plume.

## III. Recommendations – Applicable to all VRP sites

A. Monitoring Well Network – Review and Revise as Necessary

a. Evaluate monitoring well screen intervals relative to depth to groundwater.

i. Monitoring well networks should be able to accurately monitor water levels and contaminant movement.

ii. The monitoring grid should be able to accurately describe the plume horizontally and vertically.

iii. A system consisting solely of shallow monitoring is not appropriate in this situation and therefore should probably be expanded to include some wells screened deeper in the aquifer.

B. Water level measurements should be taken more often.

a. It is best to begin with a monthly water level measurements for one year. In addition, EPA would recommend water level measurements be taken just prior to beginning flood irrigation.

b. Water levels should then be evaluated to detect any changes to groundwater flow directions as a result of flood irrigation.

i. It is important to be able to determine if flow directions and gradients are consistent throughout the year or if there are perturbations that may impact plume flow direction. This could help explain why some wells positioned up-gradient or cross-gradient of pit locations have detections of contaminants.

ii. USGS reports have determined that flood irrigation has a major impact on groundwater levels which could cause changes in shallow groundwater flow directions.

iii. Reports also indicate that groundwater contributed base flow to Five Mile Creek also increased since flood irrigation began. This indicates that the general flow directions should be toward Five Mile Creek.

c. Fate and transport determinations are heavily dependent on good water level measurements. Therefore it is assumed that groundwater studies can improve information related to gradient and flow direction by adding wells throughout the study to increase the accuracy of information.

C. MNA determinations for all pit areas should <u>at a minimum</u> include:

a. At least three wells located within the plume along the axis of the plume,

b. One uncontaminated up-gradient well; and

c. Enough wells cross-gradient and down-gradient of the plume to support development of plume isoconcentration plots or well concentration vs. time plots. This of course means that any

seasonal changes in groundwater flow direction are being determined and accounted for in the placement of wells.

d. Analytes (in addition to those currently reported)
    i. Monitor for geochemical parameters for determining if "fresh" production fluids are a potential source including chloride, and dissolved methane and light gases
    ii. Age determinations of groundwater
    iii. Monitor for petroleum hydrocarbon natural attenuation primary geochemical indicators, dissolved $O^2$, redox potential, pH, specific conductivity, and temperature. Secondary geochemical indicators include $SO_4^{-2}$, $NO_3^-$, $Fe^{+2}$, $Mn^{+2}$, $CH_4$ and alkalinity.
e. Additional testing should include soil leachate specific testing for benzene.
f. Monitoring for LNAPLs should be conducted at each pit site

D. Approaches for evaluating restoration time for MNA.
    a. First order decay regression plots
    b. Point decay rate or bulk attenuation rate
    c. Biodegradation rate constant
    d. Solute transport and fate models
    e. Mass flux calculations
    f. Bioscreen is a good screening tool to help simulate natural attenuation of dissolved phase hydrocarbons.

References


1 Treatment Technologies Screening Matrix, Federal Remediation Technologies Screening Matrix and Reference Guide, Version 4.0.
2 EPA Directive 9200.4-17P, Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites, April 21, 1999
3 USGS Water-Resources Investigations Report 95-4095
4 Downward Solute Plume Migration: Assessment, Significance, and Implications for Characterization and Monitoring of "Diving Plumes", API Soil and Groundwater Technical Task Force, Bulletin 24, April 2006
5 WRS-19 Consumptive use of Irrigation Water in Wyoming
6 EPA Analytical Results Report, August 2010.