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KOCH NITROGEN COMPANY LLC

October 6, 2010

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RE **Resubmittal of the Responses to EPA Comments to Koch Nitrogen Company's Phase II RFI Work Plan Addendum: Groundwater Characterization**
Koch Nitrogen Company, LLC
Dodge City, Kansas
EPA RCRA ID No. KSD044625010

Dear Ms. Stone:

As discussed during a phone conversation with you on October 6, 2010, Koch Nitrogen Company, LLC (KNC) is resubmitting complete responses to the U. S. Environmental Protection Agency (EPA) comments on the Phase II RFI Work Plan Addendum: Groundwater Characterization, submitted by KNC to the EPA and the Kansas Department of Health and Environment (KDHE) on October 28, 2009 (Attachment A). In our responses, we repeat each EPA comment, provide our response, and we

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identify where in the Phase II RFI Work Plan Addendum the text has been modified to address EPA's comments, or where we believe requested information is located. We previously submitted a revised Phase II RFI Work Plan Addendum that reflects these changes.

It is our intention to respond as thoroughly and specifically as possible to each comment provided. KNC is committed to working with the EPA and KDHE to produce a groundwater characterization work plan that meets the needs of all parties. In order to facilitate the review, KNC would be happy to meet with the agencies at any time to respond to any questions that may arise from this submittal.

Please call Elise Stucky-Gregg (620) 22708631 Ext. 350 if you have any questions or would like to schedule a meeting to discuss.

In accordance with Section B.22 of the Part II permit, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or other persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Very Truly Yours,

Gary J. LeRock

Gary J. LeRock
Plant Manager
KOCH NITROGEN COMPANY, LLC

Enclosure: Response to EPA's Comments

cc: Cory Zellers, KNC Dodge City Plant, Dodge City, Kansas (electronic)
Tom Siegrist, KMS, Wichita, Kansas (electronic)

RESPONSE TO EPA'S COMMENTS

Specific Comments on the Groundwater Characterization Addendum:

1. *Section 1.1.3 Hydrogeology, Page 2, Last Paragraph, Third Sentence: This sentence states, "The VOCs are associated with the production facilities in the north central portion of the site". Please provide additional details on the VOCs in the production facilities with your response, and modify this paragraph accordingly.*

Response: The third and fourth paragraphs of Section 1.1.3 have been deleted and a new section (1.1.4 Nature and Distribution of Groundwater Constituents) has been added as follows. "To date, VOCs detections have been limited to soil in select solid waste management units (SWMUs) sampled as part of assessment activities and a subset of monitoring wells in the central portion of the facility. The VOC compounds detected in groundwater include tetrachloroethene, 1,1,1-trichloroethane, trichloroethylene, 1,1-dichloroethane, and vinyl chloride. An update on the nature and distribution of VOCs in groundwater and a proposed sampling program to complete delineation of these constituents is provided in Section 4."

2. *Section 2.0, Scope of Work, Page 5, Third Paragraph, Last Sentence: In this sentence it discusses the field decision criteria that will be used to evaluate where the well screens will be placed and references a Section 3.1.3. There is no Section 3.1.3. Please correct.*

Response: Comment noted. The field decision criteria outlined by the EPA was revised in Section 3.1. Text of the work plan has been revised to refer the reader to Section 3.1, where appropriate, for discussion of the screen interval determination process.

3. *Section 3.1, Approach, Page 7, Second Paragraph, Second Sentence: This sentence states, "As the data are analyzed and additional access agreements finalized, KNC will continue with the drilling and installation of subsequent clusters". Please provide a status on the finalization of the access agreements, and modify this sentence, accordingly.*

Response: There are 3 neighbors with whom KNC is seeking access agreements to allow for the installation of the proposed cluster wells. Don Conrardy (property to the north) has verbally agreed to allow the new well cluster on his property as proposed. This permission needs to be finalized in writing. In May, KNC initiated preliminary discussions with The Dodge City / Ford County Development Corporation - Management Committee regarding access to the property west of the plant. KNC will continue working towards formal agreements with these two neighbors, as well as contact Dodge City Services (property to the east) to begin discussions regarding access for the proposed cluster locations.

4. *Section 3.3.1, Monitoring Well Construction, Page 11, First Paragraph, Second Sentence: In this sentence, it discusses filling the borehole with bentonite chips/pellets "to within approximately 3 feet of the base of the well screen". Does this mean there will be a "gap" between the bentonite and the base of the well screen? Please explain and provide additional detail to this section.*

Response: Text has been clarified with the addition of a sentence at the end of the paragraph discussing the bentonite plug that reads, "Sand will be tremied on top of the bentonite plug to the target depth of the bottom of the well screen."

<u>Geologist Comments on the Groundwater Characterization Addendum</u>:

1. *Page 5, Section 2.0, Second Paragraph: The work plan states that the shallow and deep monitoring wells for each cluster will be located within ten (10) feet of each other, and that this could result in grout infiltration from one well affecting the water quality of the other well.*

   There will likely not be a problem with grout migrating laterally affecting the water quality of a neighboring cluster well, based on observation of the lithology of the subsurface materials. In order to help ensure there is not a problem with grout contamination, the specification that the two wells in a cluster should be within ten (10) feet of each other should be changed to read that the two wells should be located within a range of 10-15 feet of each other. By specifying a minimum distance of ten feet, the problem of lateral grout migration will be alleviated. Please revise.

Response: The text in Section 2 has been revised to read, "shallow and deep monitoring wells will be drilled between 10 to 15 feet of each other (horizontal distance between well boreholes) if physically possible." The next sentence, "It should be noted that drilling wells within 10 feet of each other may impact the water quality" has been deleted.

2. *Page 5, Section 2.0, Second Paragraph: The work plan states that cement grout infiltrating a permeable zone of an adjacent well can impact the water quality by lowering the pH of the groundwater. Typically, cement and cement-bentonite grout contamination, such as occurs when the well seal is improperly installed, results in an* ***increase*** *of the pH of the groundwater due to the alkalinity of the grout. Please revise accordingly.*

Response: This sentence was deleted in the response to Geologist Comment 1.

3. *Pages 7-9, Section 3.1.1 – General Comment: This section of the work plan presents a methodology for the installation of the monitoring wells, with emphasis on the placement of the well screens in two (2) wells comprising each well cluster as recommended by the EPA in a letter to KNC dated April 2, 2009. The purpose*

of these well clusters, as explained in the April 2, 2009 letter (see Geologist Comment #2 on pages 4-6 of the enclosure included with the April 2, 2009 letter), is to provide a more thorough characterization of the horizontal and vertical extent and distribution of groundwater contamination, and to also provide a better understanding of three-dimensional groundwater flow within the area of groundwater contamination. The EPA believes this information is essential for designing and operating an effective and efficient groundwater remediation system.

In reviewing Section 3.1.1, the EPA is concerned that the methodology for locating the well screens as proposed will be very difficult and impractical to apply under field conditions. The EPA would like to clarify that its recommendation for the installation of these well clusters is based on the need for an accurate characterization of contaminant distribution and groundwater flow in three dimensions within the saturated portion of the unconsolidated Ogallala Formation, which is the interval bounded by the surface of the water table and the top of the Graneros Shale. The thickness of this saturated interval averages approximately fifty (50) feet in the vicinity of the facility, and this is why the use of two-well clusters was recommended. Also, the EPA believes that this entire unconsolidated saturated interval is interconnected, although there may be aerially discontinuous zones of variable permeability within the sequence. The EPA does not anticipate the use of these monitoring well clusters as recovery wells in the future, thus the ability of the wells to produce water is not a crucial factor. The purpose of the well clusters is to provide contaminant concentration data along with groundwater potentiometric data in the shallow and deeper portions of the unconsolidated aquifer. Please revise this methodology in accordance with the following specific comments.

Response: Comment noted and addressed by the specific comments that follow. An additional section (Section 2.1) has been added to the Work Plan to describe the sequencing of major groundwater delineation activities pursuant to EPA comments.

4. *Section 3.1.1, Page 8, Second Paragraph: The work plan states that it is difficult to determine the surface of the water table because of the operation of the many recovery wells (66) and that the water table surface estimate may be off by as much as ten (10) feet, since the water levels will have to be measured in the recovery wells themselves. The EPA agrees with this assessment of the difficulty in obtaining accurate water level measurements, which are important in locating the well screens of the shallow monitoring wells. This problem is well-illustrated in the groundwater surface contour maps which are included in the annual groundwater corrective action reports. The EPA believes the best solution to this problem would be to temporarily shut down all of the recovery wells. Immediately before the pumps are shut down, measurements of water levels should be made at selected non-pumping wells and recorded so that drawdown during pumping can be determined. After the pumps are shut down, water levels from key wells may then be measured in order to determine when recovery to*

static conditions has occurred. Once it has been determined that water levels have returned to static conditions, water levels can be obtained from the same set of wells from which water levels were obtained just prior to the shut down.

Two water surface elevation maps may then be produced from the pumping and non-pumping water levels, and these maps and water level data can be used to help determine the locations of the well screens in the shallow monitoring wells. KNC can then propose screened intervals for the shallow monitoring wells. KNC, KDHE and EPA will need to get together and discuss the proposed shutdown of the recovery wells at some point prior to doing it, since it will require regulatory approval. Please revise accordingly.

Response: An additional section (Section 2.1 Sequencing of Major Activities) has been added to the Work Plan to describe the sequencing of major activities. Specific procedures proposed for shut down of pumping wells are provided in Section 2.3 and provided below.

In support of determining the depths of the screened intervals for the new shallow monitoring wells a systematic study of pumping versus non-pumping water level conditions will be conducted. The study will involve turning off all of the recovery wells with measurement of water level changes in 10 select existing shallow monitoring wells (TW-10, TW-12, TW-24, TW-57, TW-60, TW-62, TW-71, TW-72, TW-80, and TW-85.) The EPA and KDHE will be notified in advance of the proposed system shutdown. Before turning the recovery wells off a round of water level measurements will be collected from the select wells mentioned above in addition to the monitoring wells normally used by the site for the construction of potentiometric maps (A-3B, B-1, C-3B, SIT-RG01, SIT-RG02, SIT-RG03, SIT-RG04, SIT-RG05, SIT-RG06, SIT-RG08, TW-05, TW-11, TW-12, TW-15, TW-22, TW-24, TW-25, TW-47, TW-59, TW-60, TW-61, TW-62, TW-63, TW-79, and TW-80.) These measurements will be used to establish the potentiometric surface under pumping conditions.

After the pumping wells have been turned off, water levels from the 10 select monitoring wells will be measured to track the rise and subsequent decline of water levels throughout the study. Water levels will be measured in the 10 select wells twice daily until the water level is considered stable. With the recovery wells turned off the water levels in the wells will begin to rise. The wells will be considered stable when the measured rise in water level does not exceed ten percent of the total rise in water level since the recovery wells were turned off. For instance, if the total water level rise occurring in well TW-72 was observed to be 10 feet over a 3 day period then the rise would have to be equal to or exceed one foot on the fourth day in order to continue the measurements. If the rise was less than one foot, the well would be considered sufficiently stabilized to static (non-pumping) conditions.

Once the 10 wells have stabilized a round of water levels measurements will be collected from monitoring wells normally used by the site for the construction of potentiometric maps. The pumping wells will then be placed back into operation.

The results of this study will be provided to the EPA and KDHE with potentiometric surface maps for pumping and non-pumping conditions. These and other site data (estimated saturated thickness maps, boring logs that identify the depth to water during drilling, etc.) will be reviewed with EPA and KDHE to determine the screen interval for shallow monitoring wells at each of the proposed location. Upon EPA concurrence on the appropriate screen interval, the new shallow monitoring wells will be drilled and installed.

5. *Section 3.1.1, Page 8, Second Paragraph: The EPA agrees with KNC in that it can be difficult to distinguish the boundary between a basal clay that is adjacent to the top of a shale bedrock. The top of the Graneros Shale will need to be carefully determined at each deep monitoring well location. KNC's approach in going by the logs of previous borings located near where the deep monitoring well will be placed is a good one. The EPA recommends that the first few deep wells drilled should be ones located peripherally around the edges of the study area, then this information can be used to locate the top of the Graneros Shale for the remaining wells. Please revise accordingly.*

Response: An additional section (Section 2.1 Sequencing of Major Activities) has been added to the Work Plan to describe the major activities and decision matrix for the groundwater delineation. The first major work activity consists of completing deep borings peripherally around the edges of the study area to better define the top of the Graneros Shale. These data will be used to assist with the completion of deep borings more toward the interior of the study area.

6. *Section 3.1.1, Page 8, Third Paragraph: The work plan states that if the well screens are not placed adjacent to units with good permeability it may not be possible to purge the wells sufficiently prior to sample collection due to inadequate recharge.*

   The EPA would like to again emphasize that the purpose of these monitoring wells is to determine contaminant concentrations and provide water level data. If a well is slow to recharge, it will be acceptable to purge the well to dryness, and then sample when recharge occurs. If samples are excessively turbid, both field-filtered and unfiltered samples can be collected to help determine the mobile fraction since the purpose is to determine the gross distribution of contamination throughout the plume and not to assess risk. For the purpose of collecting potentiometric data, once the water level has equilibrated over sufficient time, the water level data will be valid. Thus it is not essential that the monitoring wells are capable of producing significant amounts of water. Please revise accordingly.

Response: KNC has revised the approach (Section 3.1) for shallow well installation as follows, "The shallow well screens will be set approximately 5 feet below the water table surface, based on the evaluation described in Section 2.3"

7. *Section 3.1.1, Pages 8 and 9, Bulleted Items:*

- *First Bullet: The EPA recommended cluster wells at two depths based on an average saturated thickness of approximately fifty (50) feet at the site. If the saturated thickness is less than thirty (30) feet at a location based on high quality samples of the aquifer material, the EPA would recommend the installation of a single monitoring well with a 10-foot screen. Please revise accordingly.*

- *Second Bullet: Based on the lithologic properties of the unconsolidated aquifer at the facility, the EPA believes it may be very difficult to make a field determination of what constitutes "sufficiently permeable". The EPA recommends installing the wells in a prescriptive manner; i.e. the top of the shallow well screen approximately 5 feet below the water table surface, and the bottom of the deep well screen at or within 5 feet of the top of the Graneros Shale. Please revise accordingly.*

- *Third Bullet: The criteria that the permeable unit must be greater than 3 feet in length is likely to be difficult to discern under field conditions, again favoring a prescriptive approach to determining the screened intervals. Please revise accordingly.*

- *Fourth Bullet: As stated previously, it is likely that making a call during drilling as to whether a subsurface sample is sufficiently permeable based on field inspection techniques would be very difficult. Please revise accordingly.*

- *Fifth Bullet: The EPA believes it would be unproductive to install a shallow cluster well unless the base of the shallow well screen is a minimum of 15 feet above the top of the filter pack in the adjacent deep well. Please revise accordingly.*

Response: The Work Plan bullets have been deleted and replaced with the prescribed approach for monitoring well installation described by the EPA above. The revised bullets for this section are as follows:

- **If the saturated thickness is less than 30 feet at a location based on high quality samples of the aquifer material, only one well with a 10 foot screen interval will be installed.**
- **The deep wells will be screened at or within 5 feet of the top of the Graneros Shale.**

- **The shallow well screens will be set approximately 5 feet below the water table surface, based on the evaluation described in Section 2.3.**
- **KNC will attempt, to the extent possible, to maintain 15 feet of separation between shallow and deep monitoring wells screens at each cluster location"**

8. *Page 9, Next to Last Paragraph of Section 3.1.1: The EPA believes it would be very difficult to make these determinations in the field during drilling, such as estimating the percentage of sand content of samples in identifying what is considered to be permeable units. The EPA believes that following the relatively complex criteria outlined in this paragraph, based on the ability to make determinations of permeability based on visual inspection, would not be practical under field conditions. The EPA recommends that KNC install the monitoring well clusters in a prescriptive manner. Please revise accordingly.*

Response: This paragraph has been deleted from the Work Plan, as the revised bullets provide a prescriptive manner by which the well installation will progress.

9. *Page 9, Last Paragraph of Section 3.1.1: The EPA believes that previous subsurface investigations have not revealed the presence of clearly discernible, areally extensive units of low or high permeability at the site. While the EPA agrees with KNC's statement that, in general, the variability of natural subsurface materials does not allow a single well installation strategy to be applied to all field conditions, the EPA also believes that sufficient subsurface information has been gathered at this particular site to be able to result in a general characterization of the unconsolidated aquifer. The EPA believes the unconsolidated aquifer at this site consists of a heterogeneous material consisting of alternating layers of variable permeability and of variable thickness, but which, most importantly, are also interconnected. For this reason the EPA believes there is sufficient knowledge of the lithology of the unconsolidated aquifer at this particular site to enable installing the two-well clusters in the prescriptive manner previously discussed; i.e., the top of the shallow well screen approximately five feet below the surface of the water table, and the bottom of the deep well screen approximately five feet above the top of the shale bedrock. As stated previously, the EPA recommended the installation of the two-well clusters based on the thickness of the unconsolidated aquifer being approximately 50 feet, and in situations where it is* ***clearly*** *less than 30 feet thick based on logs of high quality samples, a single well with a 10-foot screen would be recommended. Please revise accordingly.*

Response: This paragraph has been deleted from the Work Plan, as the revised bullets provide a prescriptive manner by which the well installation will progress.

10. *Page 10, Last Paragraph of Section 3.2: The work plan states that vertical profiling (sampling) of groundwater during drilling was originally proposed in the sampling and analysis plan, and it was attempted during drilling and well*

installation in 2006. It is further stated that profiling (sampling) of groundwater could not be accomplished because there was not a continuous permeable zone of sufficient thickness at any of the well locations. This is another example of why the EPA believes the best approach is to install the monitoring well clusters in a prescriptive manner; i.e., the top of the shallow well screen approximately five feet below the surface of the water table, and the bottom of the deep well screen approximately five feet above the top of the shale bedrock. Please revise accordingly.

Response: This paragraph has been deleted from the Work Plan, as the revised bullets provide a prescriptive manner by which the well installation will progress.

11. *Page 10, Section 3.2.1, First Paragraph: In discussing drilling methods, the work plan states that KNC will consider rotasonic, rotary, and air percussion hammer drilling because these methods are commonly used to install monitoring wells because they are more time efficient and because rigs and crews are more readily available.*

    The EPA believes that much better site characterization would result from placing the emphasis on obtaining high-quality subsurface samples that are carefully examined and logged to a precision of 0.1-foot. Please revise accordingly.

Response: KNC agrees that high-quality subsurface samples should be the goal of this drilling program and agrees that the rotosonic drilling method provides the optimum methodology for deep drilling at the site. The text for Section 3.2.1 has been revised as follows. "In accordance with the SAP, rotasonic or an equivalent drilling method that provides continuous high-quality, minimally-disturbed soil samples will be utilized for monitoring well installation. If rig availability or other unforeseen condition suggests a drilling method other than the rotosonic drilling technique, KNC will notify EPA and KDHE, submit requested information (e.g., description of method, materials proposed for use, etc.), and obtain EPA approval prior to utilizing the alternative drilling method."

12. *Page 10, Section 3.2.1, Second Paragraph: The plan states that rotary drilling methods were used by Farmland to install the monitoring and recovery wells at the site, and that water and bentonite mud were used. The plan further states that bentonite mud can reduce the formation permeability, and therefore polymer mud additives are recommended.*

    The EPA disagrees. The goal of environmental drilling, not production drilling, should be to avoid adding substances to the subsurface environment which may adversely affect analytical results. Experienced environmental drillers can often drill in unconsolidated materials using mud rotary without adding anything, using only the natural mud produced from the soils to lift the fines. If the materials become more difficult to lift, such as coarse sands and fine gravel, high-grade

pure bentonite can be added sparingly and as needed to increase gel strength and lift the materials from the borehole.

There are many types of polymer drilling mud additives, and some require the addition of chemicals to break them down. Depending on the chemical composition of the additive and the breakdown material, analytical results may be adversely affected.

Certain common polymer-type additives, notably those that contain guar gum, can promote the growth of iron bacteria, which can severely foul wells. Also some states regulate the use of drilling mud additives and this must be considered.

The plan states that if rotary drilling is used at the site, KNC will require the drilling contractor to provide a site-specific mud program which identifies the mud products, properties, how to monitor the drilling fluid and how the mud should be broken down during well installation. The EPA would like to review this before KNC proceeds with the well drilling and installation. Please revise accordingly.

Response: KNC has deleted all references to the use of mud rotary drilling in Section 3.2.1. In the event that mud rotary drilling is proposed, KNC will provide additional supporting information to support this drilling technique to EPA and KDHE, and will obtain EPA approval prior to utilizing mud rotary and/or any other drilling technique other than rotosonic.

13. *Page 10, Section 3.1.1, Second Paragraph: The work plan states that the rotary boreholes would be logged by observing the drill cuttings and observing the drilling rate. Although it would be difficult enough to visually discern sufficiently permeable zones from insufficiently permeable zones in the field by inspecting high-quality, minimally-disturbed samples, it would be impossible to do so by logging drill cuttings.*

    The EPA recommends that KNC consider a drilling method that acquires continuous, high-quality samples of subsurface materials. Direct mud rotary drilling can be an excellent method for obtaining high-quality samples of subsurface materials, but only wit use of proper sampling equipment. The EPA can discuss various drilling methods with KNC if KNC desires to. Please revise accordingly.

Response: KNC has deleted all references to the use of mud rotary drilling in Section 3.2.1. In the event that mud rotary drilling is proposed, KNC will provide additional supporting information to support this drilling technique and obtain EPA approval prior to utilizing mud rotary and/or any other drilling technique other than rotosonic.

14. *Section 3.3.1, Third Complete Paragraph, Pages 11 and 12: The work plan proposes to use only single 10-foot well screens in proposed monitoring wells MW-23 through MW-32. As stated in previous comments, the actual thickness of the unconsolidated aquifer at any given location should be the determining factor insofar as whether a two-well cluster with 5-foot screens is installed or whether a single well with a 10-foot screen is installed. Also, the determination of the thickness and properties of the unconsolidated aquifer should be determined from carefully prepared logs base on high-quality samples of subsurface materials. Please revise accordingly.*
    In discussing monitoring wells MW-23 through MW-32, the work plan references Table 1, but these wells were not listed in Table 1. Please revise accordingly.

Response: In accordance with the prescriptive well screen procedures outlined by the EPA in earlier comments, all wells will be installed using the procedures outlined in the bullets at the end of revised Section 3.1. The paragraph description of monitoring well installation for proposed monitoring wells MW-23 through MW-32 in Section 3.3.1 has been deleted.

15. *Page 12, Third Paragraph: Centralizers should be used on the top and bottom of the well screen to ensure the maximum amount of filter pack surrounds the well screen. Please revise accordingly.*

Response: Text has been added to this paragraph that reads, "Centralizers will be placed on the top and bottom of the well screen to ensure the maximum amount of filter pack surrounds the well screen."

16. *Page 12, Third Paragraph: The last sentence is ambiguous. When a surge block is used during well development, along with pumping and bailing, the height of the top of the filter pack needs to be monitored for possible settlement using a weighed tape. If settlement of the filter pack occurs, additional filter pack material must be added to maintain the specified height of the filter pack above the top of the well screen before the seal is installed. Please revise accordingly.*

Response: Text revised to read, "After the filter pack is installed, the well screen will be surged with a dual disk surge block. During and after surge blocking, a weighted tape will be used to monitor sand settlement. If settlement of the filter pack is observed, additional filter pack material will be added to ensure that the filter pack extends above the top of the well screen.

17. *Page 12, Fourth Paragraph: The best seal for monitoring wells is produced from compressed and coated bentonite pellets. These pellets are able to fall through the water column without prematurely swelling and bridging in the wellbore as long as they are added slowly. Please revise accordingly.*

Response: Text revised to read, "A minimum 3 feet thick bentonite seal will be installed over the filter pack. The seal will be constructed with compressed and

coated bentonite pellets specifically designed for monitoring wells. Bentonite will be hydrated with potable water if placed above the water table and allowed to hydrate according to manufacturer specifications."

18. *Page 13, Last Paragraph of Section 3.3.1: The point on the well casing that is surveyed needs to be clearly marked so the sampling team knows where to measure the water levels from. Please revise accordingly.*

Response: Additional text added that states, "The surveyor will clearly mark the point where the top of casing elevation was surveyed such that the sampling team will know where to measure the water level during subsequent groundwater monitoring or water level gauging events."

19. *Page 13, Section 3.3.2: Monitoring wells must be developed <u>before</u> the bentonite seal is installed so that if the filter pack should settle, additional filter pack material may be added to bring it up to the specified height above the top of the well screen. Please revise accordingly.*

    Development by alternately surging with a surge block and pumping or bailing is the preferred method for well development, with this procedure continuing until acceptably clear water is produced. During this development process, the top of the filter pack needs to be monitored for potential settlement. Please revise accordingly.

Response: Text inserted in Section 3.3.1 (see comment 17) and 3.3.2 to document that development will be performed on the filter pack prior to placement of the bentonite seal. Text for section 3.3.2 revised to read, "The monitoring wells will be developed: i) immediately after placement of the well screen; and ii) after the well has been surface completed and the bentonite seal and grout have had time to settle. Development of the sand pack and final development after the well has been constructed will be initially performed by surging and bailing. A dual rubber disk surge block will be used to surge the well screen. A minimum 5 foot long bailer will also be used to remove turbid water and any sediment that accumulates at the bottom of the monitoring well. An electric submersible pump will then be used to complete development. Pumping will be continued until the purge water is sediment free (clear) and field water quality parameters (pH, conductivity, total dissolved solids, and temperature) are stable. During and after the initial sand pack development, a weighted tape will be used to monitor sand settlement. If settlement of the filter pack is observed, additional filter pack material will be added to ensure that the filter pack extends above the top of the well screen."

20. *Page 13, Section 3.3.2, Last Sentence: Please revise and explain the process of using filtered compressed air to surge and develop the wells.*

Response: Text revised and references to compressed air development deleted from the work plan in Section 3.3.2.

21. *Page 13, Section 3.4: The State of Kansas has regulations which specify well and borehole abandonment procedures. Please include these procedures in the Groundwater Characterization Addendum.*

Response: Text revised as follows, "Any boreholes deemed unsuitable for monitoring well installation will be abandoned in accordance with KDHE regulations (Article 30-7.d.2), which require the following:

- ***"The entire hole shall be plugged with an approved grouting material from bottom of the hole, up to within three feet of the ground surface, using a grout tremie pipe or similar method.***
- ***From three feet below ground surface to ground surface the plugged hole shall be covered over with compacted surface silts or clays."***

Boreholes will be abandoned by filling with cement/bentonite grout. The cement/bentonite grout will be mixed in the following proportions: 94 pounds of Type I or II Portland cement, not more than four pounds of 100 percent sodium bentonite powder, and 6.5 to 7 gallons of potable water. The grout will be tremied in from the bottom of the hole. Grouting will be considered complete when fresh grout is brought to within three feet of ground surface. The grouted boreholes will be inspected at least 24 hours after installation to check for settlement. If settlement has occurred, additional grout will be added to bring the seal to within 3 feet of the ground surface. The top three feet of the borehole will be plugged with bentonite chips, or compacted surface silts or clays."

22. *Page 14, Section 3.6: The new monitoring wells should not be sampled sooner than 30 days after completion of development of the last well because well development can significantly alter the distribution of contaminants in the plumes. Please revise accordingly.*

Response: First sentence of Section 3.6 revised to read, "Groundwater samples will be collected from all of the new monitoring well clusters approximately 30 days after development of the last well is completed or during the next quarterly groundwater sampling event."

23. *Page 14, Section 3.6: Monitoring wells adjacent to and surrounding the existing wells that have previously detected volatile organic compounds (VOCs) must also be sampled for VOCs. KNC should review this previous data and propose the wells to be sampled for VOCs to EPA before finalizing the Groundwater Characterization Addendum. Please revise accordingly.*

Response: An initial plan for delineation of previously detected VOCs is provided in Section 4 of the revised work plan. The proposed groundwater sampling program represents an initial step-out sampling of monitoring wells adjacent to

wells where VOCs were previously detected and includes new monitoring well clusters proposed in the Work Plan (e.g., MW-30, MW-31, and MW-32). Based on the results of this initial groundwater sampling, additional groundwater samples will be collected, as necessary, to complete groundwater VOC delineation.

24. *Page 14, Section 3.6, Last Sentence: The Groundwater Characterization Addendum states that KNC does not plan to sample monitoring wells MW-27 through MW-32. All of the new monitoring wells are essential in defining the three-dimensional configuration of the groundwater contaminant plumes and need to be sampled. Please revise accordingly.*

Response: First sentence of Section 3.6 revised to read, "Groundwater samples will be collected from all of the new monitoring well clusters approximately 30 days after development of the last well is completed or during the next quarterly groundwater sampling event." The sentence indicating that monitoring wells within the plant boundary (MW-27 through MW-32) will not be sampled has been deleted.

25. *Page 14, Section 3.6: The EPA believes that the recovery well system should be completely shut down for a period of time before sampling the monitoring wells. The operation of the recovery wells during groundwater sampling will significantly distort the configuration of the contaminant plumes, as can be seen from the quarterly groundwater potentiometric surface contour maps included in the groundwater corrective action reports. KNC, KDHE, and EPA will need to get together and discuss this issue since shutting the recovery wells down will require regulatory approval. Please revise accordingly.*

Response: An additional section (Section 2.1 Sequencing of Major Activities) has been added to the Work Plan to describe the sequencing of major activities. Specific procedures proposed for shut down of pumping wells are provided in Section 2.3 and provided below.

In support of determining the depths of the screened intervals for the new shallow monitoring wells a systematic study of pumping versus non-pumping water level conditions will be conducted. The study will involve turning off all of the recovery wells with measurement of water level changes in 10 select existing shallow monitoring wells (TW-10, TW-12, TW-24, TW-57, TW-60, TW-62, TW-71, TW-72, TW-80, and TW-85.) The EPA and KDHE will be notified in advance of the proposed system shutdown. Before turning the recovery wells off a round of water level measurements will be collected from the select wells mentioned above in addition to the monitoring wells normally used by the site for the construction of potentiometric maps (A-3B, B-1, C-3B, SIT-RG01, SIT-RG02, SIT-RG03, SIT-RG04, SIT-RG05, SIT-RG06, SIT-RG08, TW-05, TW-11, TW-12, TW-15, TW-22, TW-24, TW-25, TW-47, TW-59, TW-60, TW-61, TW-62, TW-63, TW-79, and TW-80.) These

measurements will be used to establish the potentiometric surface under pumping conditions.

After the pumping wells have been turned off, water levels from the 10 selected monitoring wells will be measured to track the rise and subsequent decline of water levels throughout the study. Water levels will be measured in the 10 select wells twice daily until the water level is considered stable. With the recovery wells turned off the water levels in the wells will begin to rise. The wells will be considered stable when the measured rise in water level does not exceed ten percent of the total rise in water level since the recovery wells were turned off. For instance, if the total water level rise occurring in well TW-72 was observed to be 10 feet over a 3 day period then the rise would have to be equal to or exceed one foot on the fourth day in order to continue the measurements. If the rise was less than one foot, the well would be considered sufficiently stabilized to static (non-pumping) conditions.

Once the 10 wells have stabilized a round of water levels measurements will be collected from monitoring wells normally used by the site for the construction of potentiometric maps. The pumping wells will then be placed back into operation.

The results of this study will be provided to the EPA and KDHE with potentiometric surface maps for pumping and non-pumping conditions. These and other site data (estimated saturated thickness maps, boring logs that identify the depth to water during drilling, etc.) will be reviewed with EPA and KDHE to determine the screen interval for shallow monitoring wells at each of the proposed location. Upon EPA concurrence on the appropriate screen interval, the new shallow monitoring wells will be drilled and installed.

<u>EPA's Responses to KNC's June 12, 2009, responses to EPA's comments of April 2, 2009</u>:

1. *Page 2, KNC Specific Response 2:In clarifying what was meant by the phrase "operational flexibility", KNC describes this as being able to modify the groundwater recovery system by turning the pumps in select wells on or off, and increasing or decreasing the pumping rates.*

   The EPA is concerned that experimenting with different pumping configurations before the three dimensional extent of contamination has been accurately determined could be detrimental in that it could result in unwanted movement of the plume. The EPA believes that current operation of the recovery system should be continued as it is since neighboring water supply wells are not being impacted by the contamination.

   Once the configuration of the plume has been conclusively determined, then adjustments to the system may be considered.

Response: KNC concurs with the EPA. The only modifications to the groundwater pumping system, at this time, are associated with temporary system shut down to evaluate the potentiometric surface of groundwater under non-pumping conditions in support of shallow monitoring well installation (Section 2.3).

2. *Page 2, KNC Specific Response 3: The EPA agrees with KNC that currently active subsurface utilities and piping in the area of AOC 1 prevent further delineation of subsurface contamination at AOC 1, and also agrees with the proposal by KNC to resample in the previously sampled areas in order to determine the concentrations of both hexavalent and trivalent chromium, and also nitrate/nitrite levels, which was not done during the original sampling. Please indicate what the current status of this work is.*

Response: The additional assessment activities in the area of AOC 1 were discussed further with the EPA during a 15 May 2009 meeting. The sampling program was completed shortly after the meeting with the EPA. The status and results of this assessment were provided to the EPA in the 2nd Quarterly Progress Report 2009 (dated 29 July 2009).

3. *Pages 3 and 4, KNC Specific Response 11: KNC states that they redeveloped well TW-80 by pumping approximately 1000 gallons of groundwater over a 5-hour period, and that they sampled the well immediately afterwards. KNC then states that the analyte concentrations were lower than the previous quarterly sampling event by approximately one order of magnitude.*

   The EPA believes that after extensive pumping such as this, the well should not be sampled for a minimum of thirty (30) days to allow the aquifer and containment plume to stabilize. The lower concentrations often seen when wells, especially those located at the edge of a plume, are sampled immediately after extensive pumping are usually the result of water flowing to the well from many directions and therefore not representative of concentrations at that particular point (where the well is screened) in the plume.

Response: Comment noted.

4. *Pages 8 and 9, KNC Response to Geologist Comment 5: The EPA requested that detailed information regarding wells located on neighboring properties should be collected and included in the Groundwater Characterization Addendum. KNC had indicated this information would be collected and included in the revised Groundwater Characterization Addendum, but it was not included. KNC did; however, include this information in the Quarterly Progress Report for Fourth Quarter 2009 dated January 27, 2010, in Table PW-01 and Figure No. PW-01. Please include this Table and Figure in the revised Groundwater Characterization Addendum.*

Response: Additional text describing this information is included in Section 2.2. Table PW-01 and Figure PW-01 from the Quarterly Progress Report for Fourth Quarter 2009 (January 27, 2010) have been incorporated into the Work Plan as Table 1 and Figure 8, respectively.

5. *Page 10, KNC Response to Geologist Comment 9: KNC stated they would include a modified Figure B-4 in the Groundwater Characterization Addendum showing the results from sampling the private water supply wells for chromium, nitrate, and nitrite, but this figure was not included in the Groundwater Characterization Addendum. Please include this Figure and supporting text in the revised Groundwater Characterization Addendum.*

Response: Additional text describing sampling of private water supply wells is provided in Section 1.1.4 and updated figures that depict the distribution of these constituents is provided in the revised work plan. Figures 5 and 6 have been updated to provide the results of on-site and private water supply well sampling and analysis results for 2006, 2008, 2009, and 2010 for chromium and nitrate, respectively. The all well sampling events in 2006 and 2008 were conducted separately from the quarterly sampling events. Because of this, private water supply wells were not sampled during these 2006 and 2008 all well sampling events. The 2009 and 2010 all well sampling events were conducted in conjunction with the 2nd quarter semi-annual sampling event. Private water supply well sampling data from these events were included in these figures. Figure 7 provides a summary of on-site and private water supply well hexavalent chromium and nitrate plus nitrite results from groundwater sampling during 2009 and 2010.

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