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RESPONSES TO THE USEPA AND THE OEPA COMMENTS ON THE FEMP GLACIAL TILL/VADOS ZONE HYDRAULIC INVESTIGATIONS WORK PLAN

08/16/93

DOE-FN/EPA
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RESPONSES
OU5

Department of Energy
Fernald Environmental Management Project
P.O. Box 398705
Cincinnati, Ohio 45239-8705
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AUG 1 6 1993

DOE-2723-93

Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V - 5HRE-8J
77 W. Jackson Boulevard
Chicago, Illinois 60604-3590

Mr. Graham E. Mitchell, Project Manager
Ohio Environmental Protection Agency
40 South Main Street
Dayton, Ohio 45402-2086

Dear Mr. Saric and Mr. Mitchell:

RESPONSES TO THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY AND THE OHIO ENVIRONMENTAL PROTECTION AGENCY COMMENTS ON THE FERNALD ENVIRONMENTAL MANAGEMENT PROJECT GLACIAL TILL/VADOSE ZONE HYDRAULIC INVESTIGATIONS WORK PLAN

Reference: 1) Letter, J. A. Saric to J. R. Craig, "Disapproval of the Glacial Till/Vadose Zone Work Plan", dated July 6, 1993

2) Letter, G. E. Mitchell to J. R. Craig, dated June 7, 1993

Enclosed for your review are the Department of Energy (DOE) responses to the United States Environmental Protection Agency (U.S. EPA) and the Ohio Environmental Protection Agency (OEPA) comments on the Fernald Environmental Management Project (FEMP) Glacial Till/Vadose Zone Hydraulic Investigations Work Plan. The Work Plan will be revised upon final resolution of these comments.

If you or your staff have any questions, please contact Pete Yerace or Kathleen Nickel at (513) 648-3161 or 648-3166, respectively.

Sincerely,

Jack R. Craig
Fernald Remedial Action
Project Manager

FN:Nickel

Enclosure: As Stated

Recycled and Recyclable

cc w/ enc:

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RESPONSE TO U.S. AND OHIO EPA COMMENTS
ON THE
FEMP GLACIAL TILL/VADOSE ZONE HYDRAULIC INVESTIGATIONS
WORK PLAN

USEPA GENERAL TECHNICAL REVIEW COMMENTS:

USEPA COMMENT 1: "The work plan includes one section for each of the specific hydraulic investigations (e.g. slug tests, yield tests, and so on). Each section provides information on the location of the tests but does not provide any information on why these locations were selected. The work plan should provide the precise rationale for the location of the tests and the number of tests. The locations should be selected to provide specific information regarding the movement of ground water and contaminants from each operable unit (OU) to OU5, as well as movement within OU 5."

RESPONSE:
The DOE agrees that the work plan should provide rationale for the location of the tests and the number of tests described. As the work plan is currently written, familiarity with lithologic and depositional interpretation work presented in Preliminary Presentation of Geology and Hydrogeology of the Glacial Overburden, February 26, 1993, is needed to fully understand why test locations were selected, and why the number of tests were selected. The current work plan did not duplicate reporting of this work but referenced it instead (page 1-2, line 32) in an effort to lower work plan preparation costs. Based upon your comments, cross-sections and maps from this earlier work will be incorporated into the work plan to clarify the plan.

The objectives of this work are to collect additional information for the CRU5 RI on the integrity and barrier properties of the lower portion of the glacial overburden: to obtain additional hydraulic property data for the perched groundwater system contained within the glacial overburden: and to determine how the lithologic and hydrologic characteristics of the glacial overburden vary with total overburden thickness. This data will be used to supplement existing drilling, water quality, and water level data to support CRU5 risk assessment determinations and to help develop an improved flow and transport model for the glacial overburden. It will later be used to support remedy design and final remedy selection.

Sufficient drilling, water quality, and water level data exists to reasonably define the nature and extent of contamination within the Glacial Overburden for the CRU5 RI. Field programs are underway to collect the data needed to finalize the characterization. Additional hydraulic conductivity data is needed to characterize the potential for the rate of movement of fluids and contaminants in the glacial overburden. An understanding of the potential for fluid and contaminant movement will greatly enhance the conceptual model being used for flow and transport in the overburden material. Drilling data indicates that the Glacial Overburden is saturated with most of the saturation being detected in the coarser grained deposits (i.e., silty-sands and muddy-gravels). Drilling data and soil and water quality data indicates that the rate at which fluids and contaminants migrate in the overburden appears to be low.

Packer tests will be conducted and lysimeters installed in two areas where the glacial overburden is thin and one area where the glacial overburden is thick to see how the lithologic and hydrologic characteristics of the glacial overburden vary with total unit thickness. Once the integrity and barrier properties at these two thicknesses are determined, the integrity and barrier properties of intermediate thicknesses can be estimated by extrapolation.

Slug tests are planned for existing wells and piezometers which are completed in various lithologies within the glacial overburden. Only one silty-sand unit was identified as being of sufficient size and quality to yield quantifiable pump test results. Three pump test locations were selected within this silty-sand unit, one in the area where the unit is thickest, and two along what is believed to be the down-gradient portion of the depositional unit.

Yield tests will be attempted in several saturated zones which do not appear to be very extensive (i.e., large enough to support a multi-well pump test). Determining the yield of specific units will aid in further defining hydrostratigraphic units. While yield tests are being conducted, surrounding wells will be instrumented with transducers to determine if pressure changes can be detected due to the pumping. Information derived from the transducers will aid in the evaluation of interconnection between the saturated zones.

ACTION:
The explanation given above will be added to the introduction text of the plan, and additional clarification will be added to each of the test sections.

USEPA SPECIFIC TECHNICAL REVIEW COMMENTS

USEPA COMMENT 2: Section 2.2, Page 2-1, Line 13: The text refers to wells and piezometers to be used in the slug tests. However, Table 2-1 does not indicate the glacial till hydraulic unit within which the wells or piezometers are screened. This information is critical for evaluating whether enough tests are being performed and whether the test depths and locations are adequate to meet the objectives.

RESPONSE:
Attached to these responses is a revised Table 2-1. The revised table indicates what depositional unit and corresponding lithology each well is completed in.

Lithostratigraphic correlations presented in Geology and Hydrogeology of the Glacial Overburden, were used to determine the lithology and depositional unit at each candidate slug test location. Suitability for testing a particular location was based upon well construction, the lithology in which the well was screened, the depositional unit in which the well was screened, and the geographic location. Locations where previous slug tests had been performed were not considered for additional slug testing. The objective in location selection was to get the largest

ACTION:
The word "annulus" will be deleted from the sentence. The figure found in Attachment C2, page 27, will be added to Attachment B-1.

USEPA COMMENT 6: Section 2.3.2, Page 2-9, Line 6: The work plan provided a procedure for conducting a falling head test and then states that under many conditions, the test results will not be used to determine the hydraulic conductivity. The work plan should explain why the test is necessary if the data cannot be used.

RESPONSE:
The work plan states the limitations under which a reliable K_h can be calculated. If conditions cannot be met for a quantitative measurement of K_h, at least a qualitative assessment of the screened zone properties can be made.

ACTION:
None.

USEPA COMMENT 7: Section 4.1, Page 4-1, Line 15: The text states that the samples from the lysimeters will be analyzed for general chemistry and total uranium. However, Table 4-1 also lists volatile organic compounds (VOC). Since VOC analysis of the lysimeter samples will probably not be representative of the actual VOC concentrations, VOCs should not be analyzed for.

RESPONSE:
DOE agrees.

ACTION:
VOCs will be dropped from the sampling list per the comment. The reference to VOC collection will also be dropped in line 36 of page 1-4.

USEPA COMMENT 8: Section 4.1, Page 4-1, Line 20: The work plan provides the location of each of the six lysimeters but does not provide any rationale for these locations. The rationale should be provided. In addition, DOE should consider placing additional lysimeters in some areas where contaminant transport through the till and Great Miami Aquifer vadose zone is suspected (e.g., south field, waste pit area, and production area).

RESPONSE:
The DOE agrees that the rationale used for selecting lysimeter locations needs to be presented in the work plan. Text will be added to the work plan to clarify this rationale. The DOE feels that current monitoring efforts in the glacial overburden are adequate to detect contaminant transport in the south field, waste pit area, and the Great Miami Aquifer, and that additional lysimeters are not needed to support the RI.

The main objective of the lysimeters is to assess the degree of saturation in the basal clay layer and the upper sand and gravels of the Great Miami Aquifer and to obtain a water sample from these zones if possible.

The installation of lysimeters at the proposed depths is both difficult

found under the Production Area. If deemed appropriate, additional hydraulic tests could be performed at these new locations to further refine our understanding of the potential for fluid movement.

Table 6-1 has been revised to provide subsurface characterization data for each of the pumping wells and observation wells. Areas for the yield tests were selected using lithostratigraphic and depositional correlations presented in Geology and Hydrogeology of the Glacial Overburden.

ACTION:
The existing Table 6-1 will be replaced by the revised Table which is attached to these comment responses.

USEPA COMMENT 10: Section 6.2, Page -1, Table 6-1: The design of the yield tests appears inadequate to meet the stated objectives. Specifically, the locations of the observation wells seem too far from the test wells to provide significant information on the hydraulic conductivity or hydraulic connection between various sand units. Test wells 1274 and 1339 do not have any observation points within 200 feet of the test well. Drilling more suitably located replacement wells or using alternative existing wells should be considered to meet the objectives of the yield tests. Also, additional information should be provided on the pumping rate of the test wells.

RESPONSE:
The main objective of the yield tests is to stress several of the larger saturated units in the glacial overburden to determine the maximum sustainable yield. A secondary objective is to instrument the closest existing surrounding wells in the area of the pumping well with pressure transducers to determine if any pressure changes can be detected. Locations for the yield tests were selected from subsurface lithostratigraphic cross-sections presented in Geology and Hydrogeology of the Glacial Overburden. Groundwater modeling will take a conservative approach and model the saturated units as if they are communicating.

It is not known at this time if the locations of the observations wells are too far from the test wells or not to detect pressure changes. Conducting the yield test will answer this question. The yield tests are to be performed primarily as step drawdown tests. It is not known with certainty what rates will be used. The plan is to start out a very low rate and gradually increase the rate until the well goes dry or a sustained yield is achieved.

ACTION:
The explanation given above will be added to the text of the plan.

USEPA COMMENT 11: Section 6.2, Page 6-3, Table 6-1, Line 12: Table 6-1 lists test well 1077 and only 2 observation wells, whereas, Figure 6-1 displays test well 1076 and at least 10 observation wells. This discrepancy should be corrected.

OHIO EPA COMMENTS

FEMP Glacial Till/Vadose Zone Hydraulic Investigations Work Plan.
D # 531-0297, Hamilton County.

1. Commenting Organization: Ohio EPA Commentor: M. Proffitt
Section #: 1.1.1 Page #: 1-1 Line #: 1-4 Code:

Comment:
An additional item should be included which states that nature of contaminant migration in the till needs to be obtained. This includes fracture flow, constituent speciation, colloidal transport, and the attenuation/release characteristic of constituent species.

Response:
DOE agrees that the nature of contaminant migration in the glacial overburden needs to be considered for the RI/FS, but additional information concerning fracture flow, colloidal transport, and constituent speciation are not needed to support the RI. Additional information concerning attenuation/release characteristics of certain constituents is needed to support the RI. All of these issues, though, are outside the scope of work for this work plan.

The objectives of this work plan are to collect additional information for the CRU5 RI/FS on the integrity and barrier properties of the lower portion of the glacial overburden; to obtain an area-wide permeability distribution for the perched groundwater system contained within the glacial overburden; and to determine how the lithologic and hydrologic characteristics of the glacial overburden vary with total overburden thickness. Data will be used to support the CRU5 risk assessment and to help develop an improved flow and transport model for the glacial overburden.

Although outside the scope of work for the Glacial Till/Vadose Zone Hydraulic Investigations Work Plan, DOE's position on the need to investigate fracture flow, constituent speciation, colloidal transport, and attenuation/release characteristics are summarized below.

FRACTURE FLOW:
Additional information concerning fracture flow is not needed to support the RI. Conservative model assumptions rather than detailed field studies will be used in the RI/FS to account for possible impacts to contaminant migration caused by fracture flow. Work outlined within the hydraulic studies work plan focuses on the un-weathered portion of the overburden, but the potential existence of fractures within the oxidized overburden and its impacts on surface infiltration rates are recognized. It is very difficult to accurately define the nature of any large-scale unsaturated fracture flow close to ground surface. Therefore, a conservative modeling approach will be taken whereby the near surface fractured oxidized material will not be included in the model. Activities outlined in this work plan will provide bulk hydraulic properties for the overburden, including the impacts of any fractures which may be present given the scale of the test. This information will be sufficient to support all hydraulic and contaminant migration activities in the RI/FS.

sufficient to support the selection of remedial alternatives. DOE's position, as stated above, is that colloidal data is not required for determination of the nature and extent of groundwater contamination, for contaminant modeling, remedy selection, or for remedial design.

Based on the above and other conservative assumptions used during the risk assessment process, it is very unlikely that the CRU5 RI risk assessment will under-estimate the exposure risk without specifically quantifying colloidal transport. Other conservative approaches taken in the risk assessment process include:

- using 1,000-year time duration, which is a sufficient time for the contaminants of concern to reach the property line without including colloidal transport;
- using maximum groundwater concentrations as exposure concentrations;
- excluding the weathered till from the contaminant pathway;
- using saturated hydraulic conductivity for the overburden; and
- using a relatively low Kd for Uranium in the aquifer.

Although it is believed that additional work on colloidal transport is not needed to support the CRU5 RI/FS, DOE recognizes that the Ohio EPA has expressed strong concern over gaining some understanding of whether or not colloidal transport is a factor at the FEMP. A limited number of groundwater samples will be collected to determine if colloids are present. DOE would like to meet with the Ohio EPA to discuss the matter further.

CONSTITUENT SPECIATION:
Additional information concerning constituent speciation is not considered useful for the RI. The potential use of constituent speciation information is to "fingerprint" the origin of the contaminants found outside of source areas. Soil and groundwater mobilities of radionuclides differ greatly and this tends to negate the usefulness of the observed soil or groundwater isotopic ratios for identifying sources, especially at depth. Results from comparing isotopic ratios in environmental media to source materials for source identification purposes are considered questionable because of the mobility issue.

ATTENUATION/RELEASE CHARACTERISTICS:
The DOE is in the process of developing a site-wide strategy for addressing the attenuation/release characteristic of uranium. In addition to summarizing existing information from previous studies (e.g., EWMF and soil washing treatability studies), this strategy will define the overall approach and necessary laboratory experiments to delineate the following data:

"The improved vadose zone model will be used to provide better estimates of source concentrations and volume rates being transported to the Great Miami Aquifer from multiple source areas distributed across the site. The improved model will also be able to simulate two dimensional transport. The project currently uses an ODAST code, which is not designed to handle multiple source areas or two dimensional transport."

4. Commenting Organization: Ohio EPA Commentor: M. Proffitt
Section #: 1.1.3 Page #: 1-2 Line #: 10-11 Code:

Comment:
Ohio EPA recognizes the "averaging" effect which occurs in such a variable material as glacial till deposit. Based on this variability, Ohio EPA recommends an investigation designed to date the formation water in the base of the till. The use of tritium, O_{16}-O_{18}, Chloroflourocarbons (CFCs), or other sufficient methods should be applied to the site in order to characterize and quantify the hydraulic communication between the till and the sand and gravel aquifer.

The number and locations of lysimeter installation should be revised so that the glacial till at the site is adequately characterized in light of its variable nature. Because this investigation will yield critical data concerning the hydraulic communication between the till and the sand and gravel aquifer, it may be possible to scale down the hydraulic conductivity investigations scheduled in this work plan.

Response:
The DOE agrees that an understanding of how the overburden and the sand and gravel aquifer is communicating is needed to support the CRU5 RI. It is felt that much information already exists pertaining to how the glacial overburden is communicating with the Great Miami Aquifer. Work outlined in this workplan for the collection of hydraulic properties data will provide additional information needed to complete the CRU5 RI.

This additional hydraulic properties data will provide information on the degree of interconnection between the glacial overburden and the sand and gravel aquifer. The relative comparison of hydraulic conductivities in the glacial overburden will indicate the most probable potential pathways for fluid flow. This hydraulic information will be much more useful for modeling flow and transport than age dates would be. Hydraulic properties data will be used to support the modeling of flow and transport to make risk assessment predictions.

The strategy for addressing the variable nature of the overburden material is to determine how the lithologic and hydrologic characteristics of the glacial overburden varies with total thickness. Lysimeters will be installed in an area where the overburden is thin and in an area where it is thick. It is felt that this will be a cost effective way to address the variability issue, without resorting to a major drilling campaign, and will be sufficient to support the RI/FS. Another benefit in choosing this strategy over a more extensive installation program is that the

7. Commenting Organization: Ohio EPA Commentor: M. Proffitt
Section #: 2.3.2 Page #: 2-7 Line #: 1 Code:

Comment:
Data should be analyzed during field activities to see if the transducers were moved or damaged during the tests. If so. the test should be repeated.

Response:
Agreed. Efforts will be made to minimize the chance that transducers might move during slug tests.

Action:
The following text will be added to Section 2.4: "Data will be analyzed in the field to ensure that transducers were not inadvertently moved or damaged during the test."

8. Commenting Organization: Ohio EPA Commentor: M. Proffitt
Section #: 4.3 Page #: 4-1 Line #: Code:

Comment:
The lysimeter monitoring should be expanded so that the water dating investigation can characterize the till for the entire site. Though the slug and pump tests will yield useful and important information, the water dating investigation is needed to characterize the communication between the till and the sand and gravel aquifer.

Response:
DOE does not believe that water dating is needed to characterize communication between the till and the Great Miami Aquifer. Much information already exists pertaining to how the glacial overburden communicates with the Great Miami Aquifer. Additional hydraulic properties data. collected as part of this work plan. will provide information on the degree of interconnection between the glacial overburden and the sand and gravel aquifer. This hydraulic properties information will be much more useful for modeling flow and transport than age dates of the pore fluid would be.

Action:
None.

9. Commenting Organization: Ohio EPA Commentor: M. Proffitt
Section #: 5.2.1 Page #: 5-1 Line #: 37 Code:

Comment:
Why is a "spin casing" method proposed for the packer tests? This type of drilling maximizes the smearing and clogging of formation pores with silts and clays. Once this is done, it is often very difficult to "clean out" the borings so that they represent the formation. The Ohio EPA recommends the use of cable tool boring for this project. Cable tool minimizes the smearing of the bore, and due to the shallow nature of these borings, will not reasonably delay the project.

Table 2-1 - Proposed Wells for Slug Testing in Glacial Till

Well	Dia.	Pred.[1] Lith	Color	Dep.[2] Unit	Well	Dia.	Pred.[1] Lith	Color	Dep Uni
1019	4"	Clay	Brown	Till	1277	2"	Sand	Brown	Till
1020	4"	Clay	Brown	Till	1279	2"	Clay	Brown	Till
1024	4"	Gravel	Gray	Till	1283	2"	Clay	Brown	Til
1029	4"	Clay	Gray	Till	1293	2"	Sand	Brown	Til
1033	4"	4' Sand 12' Clay	Gray	Lacustrine	1299	2"	Clay	Gray	Til
1038	4"	4' Sand 10' Clay	Brown/ Gray	Till	1301	2"	Clay	Brown/ Gray	Ti
1039	4"	6' Sand 13' Clay	Brown/ Gray	Lacustrine	1304	2"	Clay	Brown	Ti
1045	4"	Clay	Alluvium	Alluvium	1317	2"	Clay	Gray	T
1047	4"	Clay	Brown/ Gray	Till	1324	2"	Clay	Brown/ Gray	T
1064	4"	Clay	Brown/ Gray	Till	1332	2"	3' Sand 4' Clay	Brown/ Gray	T
1072	4"	Clay	Gray	Till	1336	2"	Sand	Brown/ Gray	T
1075	4"	Clay	Fill/ Brown	Till	1338	2"	Sand	Brown	
1077	4"	12'S&G 6' Clay	Gray	Till	1346	2"	4' Sand 4' Clay	Brown/ Gray	
1081	4"	Clay	Brown	Till	1351	2"	5' Sand 4' Clay	Brown/ Gray	
1082	4"	Clay	Brown/ Gray	Till	1353	2"	4' Clay 3' Silt	Brown/	
1084	4"	Clay	Gray	Till	1420	2"	Clay	Brown	
1087	4"	Silt	Brown/ Gray	Till	1433	4"	Clay	Brown	
1111	2"	2'Gravel 6'Clay	Brown	Till	1444	2"	Clay	Brown	
1113	2"	Clay	Brown/ Gray	Till	1508	2"	Clay	Brown	

Table 6-1 - Proposed Wells for Yield Tests

Well	Radius from Pumped Well	Predominant Lithology	Color	Depositional Unit	Sandpack Elevation
1339	Test Well	Sand	Brown	Till	581.6-573.1
1055	235	?	Gray	Till	?
1336	312	Sand	Brown/Gray	Till	584.1-568.3
1338	225	Sand	Brown/Gray	Till	582.6-575.1
1340	230	5.5 Clay 6.5 Gravel	Gray	Till	580.0-568.0
1342	350	Clay 1-Foot of Silt	Brown	Till	574.1-567.1
1343	267	0.5' Gravel 7.5' Clay	Brown/Gray	Till	581.8-574.3
1344	337	Clay 3.5 Sand 1.5	Gray	Till	569.6-564.6
1077	Test Well	6.5' Clay 9.0' Gravel 3.0' Sand	Gray	Till	568.67-550.2
1030	233	Clay	Gray	Till	561.9-545.9
1076	66	Clay 1.2-Foot of Gravel	Gray	Till	567.5-550
1274	Test Well	6.0' Clay 2.5' Sand	Gray	Till	583.1-574.6
1088	225	Silt	Brown/Gray	Till	587.1-572.1

Well	Radius from Pumped Well	Predominant Lithology	Color	Depositional Unit	Sandpack Elevation
1261	65	2' Sand 9' Silt 3' Clay	Brown	Lacustrine	568.93-554.93
1265	65	Fill			574.61-568.61
1267	155	Silt	Brown/Gray	Lacustrine	570.52-560.02
1268	125	5.5' Clay 1.0' Sand 0.5' Silt	Brown/Gray	Lacustrine	571.08-562.08