SUBJECT: Response to review comments for the Draft Site Characterization Report, Remedial Investigation, Part 1, at Acid Area 2 & 3, Former Plum Brook Ordnance Works (PBOW), Sandusky, OH, August 2005, Prepared by Jacobs Engineering Group, Inc., Contract Number DACW62-03-D-0004-0004

Reviewer: Ohio EPA

1. Jacobs states in Section 5.2.2, page 5-3, third paragraph of the August 2005 Acid Areas 2 and 3 Draft Site Characterization Report (report) that several constituents of concern (COCs) were detected in some bedrock wells at the two Acid Areas at concentrations above background values for organics and inorganics. At the current time, Ohio EPA is unaware of any established background concentrations for any inorganic or organic COC at NPBS. If background concentrations have been established by Jacobs in support of the sitewide ground water investigation (GWI), then they should be submitted to Ohio EPA for review and concurrence. The last document Ohio EPA reviewed concerning the development of background concentrations for the bedrock saturated zone is the Jacobs' October 19, 2004 document entitled, 'Background Monitoring Well Selection For the Phase II Groundwater Remedial Investigation'. Ohio EPA commented that the agency will anticipate a future submittal which contains background bedrock ground water concentrations, corresponding calculations with supporting documentation, and a more detailed approach as to how the evaluations will be used to characterize ground water quality upgradient and downgradient of the NPBS in support of the sitewide GWI.

Response: Background values for bedrock groundwater were calculated by Shaw and are reported in the 2004 Groundwater Data Summary and Evaluation Report (April 2005).

2. Jacobs proposes in Section 7.5, page 7-5 of the report to abandon bedrock monitoring well AA3-BEDGW-004 at Acid Area 3. The well was completed to a depth of 75.5 feet bls with an open borehole intake. During installation of the well, no significant ground water was encountered for monitoring purposes. Due to the fact that the well was neither surveyed nor developed and to date, has not provided adequate amounts of ground water for sampling, Ohio EPA concurs that this well should be properly abandoned.

Response: None Required.

3. The five temporary piezometers installed at each acid area have been properly abandoned by Jacobs.

Response: None Required.

4. **Ensure that the Region 9 PRGs are adjusted by 1/10th for the noncarcinogenic chemicals when screening. (Note: See attached Technical Compendium Document for more information.)**

Response:

5. Ohio EPA recommends evaluating ecological risks, especially since PCBs are one of the main contaminants detected at this AOC and are considered to be persisitent, bioaccumulative and toxic. Note: Please reference the "Ecological Risk Assessment" Draft Guidance Document dated March 14, 2001.

Response: An ecological risk assessment has been added to the recommendations.

6. Please specify the source of the background data set for soil. Are these Plum Brook specific background levels? Are these site-wide background values or AOC specific background values? Please provide a reference or citation directing readers to these background values and the details of how they were determined.

Response: The background values were calculated by Shaw and reported in the TNT A&C Risk Assessment. Citations have been provided in the text.

7. Tables 4-1 to 4-25: Please add the appropriate footnotes to the tables to define such things as "j" qualifier; "N1" and to indicate the source of the soil background values.

Response: Footnotes have been provided as requested

8. Section 7.5, Recommendations, second bullet - The Ohio EPA, DERR would prefer that the former waste water treatment plant be separated from the Acid Area 3 project and investigated as a new site investigation.

Response:

9. The Ohio EPA, DERR, concurs with the remainder of the recommendations presented in Section 7.5 of this document. Furthermore, Ohio EPA recommends that extent of contamination in soil and sediment be fully defined prior to conducting the baseline risk assessment.

Response:

SUBJECT: Draft Site Characterization Report, Remedial Investigation Part 1, at Acid Areas 2 & 3, Former Plum Brook Ordnance Works, Sandusky, Ohio, August 2005 – Review Comments

Reviewer: Frank Albert, USACE CELRH

1. List of Acronyms and Abbreviations, Title, It is noted that *Acronymns* (Acronyms) has been misspelled in the title.

Response: The spelling has been corrected.

2. List of Acronyms and Abbreviations, PBOSG. It is noted that the "O" should be defined as *Operations* and not "Operating".

Response: Operating has been changed to Operations.

3. List of Acronyms and Abbreviations, RBC. Please determine if *"RBC"* should be defined as *Risk-Based Concentration (or Risk-Based Screening Concentration)* rather than "*Criteria*". It is noted that RBSC is defined later in Section 1.1.3 as "Risk-based Screening *Concentration*".

Response: The correction has been made, criteria has been changed to concentration.

4. List of Acronyms and Abbreviations, General. You may want to add "*RBSC*" and "*Shaw (Shaw Environmental, Inc.)*" to the list of acronyms and abbreviations.

Response: RBSC has been revised to RBC to remain consistent. Shaw has been added to the acronym list

5. Executive Summary, 8th paragraph, 2nd sentence. It is noted that *"...threee"* has been misspelled.

Response: The spelling has been corrected.

6. Executive Summary, Bulleted items at end of ES. It appears that the Human Health Risk Assessment (HHRA) could be recommended or listed as first priority, rather than delineation of contamination extent, since the need for remedial action (RA) would be based upon the results of the HHRA, and there are adequate data to perform the HHRA.

Response: The human health risk assessment will be moved to the top of the recommendations list.

7. Section 1.1.3, last paragraph. It is noted that "*Risk-based Screening Concentration*" is defined here as "*(RBC)*"; however, RBC was defined differently in the list of acronyms.

Response: RBC has been revised for consistency.

8. Section 2.3.2 and Section 2.3.3. It is noted that Section 2.3.2 refers to the depth of groundwater during the *winter* and that Section 2.3.3 refers to that depth during *summer*. Please review these statements for correctness and consistency.

Response: Winter and summer have been changed to Spring, since the referenced depths for both sites were measured in April 2005.

9. Section 3.1, 2nd paragraph, 1st sentence. The word "*Operating*" should be revised to "*Operations*" for PBOSG.

Response: The correction has been made.

10. Section 3.2, 4th paragraph, next to last sentence. The word "*site*" should be revised to "*sight*".

Response: The correction has been made.

11. Section 3.3, 1st paragraph, 1st sentence. Please determine if registered names, such as Geoprobe and MacroCore, should be listed as Geoprobe® and MacroCore®. If so, please revise recurrences throughout the report for these and other such references.

Response: Geoprobe® is a trademark, while Macrocore is not. Geoprobe has been changed to include the trademark symbol for all occurrences.

12. Section 3.4.1. The extra spaces between the 2nd and 3rd paragraph should be deleted.

Response: The spaces have been deleted.

13. Section 3.5.2. Since the collocated surface water samples were taken several months following the sediment sampling, you may consider stating that the sediment sample locations were staked and/or surveyed for the later surface water sampling event.

Response: The suggested text has been added.

14. Section 3.8, bulleted list of IDW drums. Sample 6 should be revised from "*AA3*" to "*AA2*".

Response: The correction has been made.

15. Section 4.2.1, 1st paragraph, 1st sentence. For consistency with other sections, it is recommended that "*during the 2004 RI*" be revised to "*during this RI*".

Response: The text has been revised as requested.

16. Section 5.1.1, 1st paragraph, 2nd sentence. The statement "*...over a period of five month...*" should be revised to "*...over a period of six months...*"

Response: The text has been revised to reflect 6 months.

17. Section 7.5. Please refer to comment provided for the Executive Summary, regarding the list of recommendations.

Response: The human health risk assessment will be moved to the top of the recommendations list.

18. Figures 5-3, 5-4, 5-5, 6-1, and 6-2. In the legend, *"Surface Water Sampling Locations"* should be revised to *"Surface Water / Sediment Sampling Locations"*

Response: The legend for each figure will be revised to reflect sediment.

SUBJECT: Response to review comments for the al Draft Site Characterization Report, Remedial Investigation, Part 1, at Acid Area 2 & 3, Former Plum Brook Ordnance Works (PBOW), Sandusky, OH, August 2005, Prepared by Jacobs Engineering Group, Inc., Contract Number DACW62-03-D-0004-0004

Reviewer: Lannae Long, USACE CELRN

1. General, When referencing EPA Region 9 Residential or Tap Water PRGs, use 9, not IX. Also, please cite which date is being used. The most recent one at the time of report production is October 2004.

Response: Roman numerals will be discontinued and the publish date for the PRGs will be included.

2. Section 7.5 Recommendations, Ecological Risk Assessment needs to be included in the list of recommendations.

Response: Ecological risk will be included with the human health risk recommendation.

3. Tables 4-1 thru 6-11, Format these tables differently. See LRN's comment #27 from the draft Reservoir #2 Burning Ground RI Part 1. See PBOW Groundwater Summary Report, 2005 for more examples.

Response: The tables will be revised as requested for the final report.

4. Tables 4-1 thru 6-11, Footnote the tables. See LRN's comment #28 from the Reservoir #2 Burning Ground RI, Part 1. Footnote qualifiers, type, and cite PRGs.

Response: Footnotes for the data qualifiers will be provided at the bottom of each page.

5. Table 4-1 thru 6-11, When the tables are formatted differently, include columns with PRGs and a column with Max Detected.

Response: PRG and maximum detection values will be provided in the final tables.

Julie Weatherington-Rice, PhD, CPG, CSS
From Home
Phone: 614-436-5248; Fax: 614-436-5239,
weatheringtn-rice.1@osu.edu

Bennett & Williams Environmental Consultants Inc.

Memo

To: Mark Bohne & Members of the Plum Brook Ordnance Works RAB

From: Julie Weatherington-Rice, TAPP Support to the PBOW RAB

CC:

Date: December 3, 2005

Re: Review of the Draft Site Characterization Report Remedial Investigation Part 1, At Acid Areas 2 & 3

I have reviewed the Draft Site Characterization Report Remedial Investigation Part 1, At Acid Areas 2 & 3, Former Plum Brook Ordnance Works Sandusky Ohio at your request. I concur with the recommendations made for the soils and the sediments. I continue to be concerned about vegetative uptake, especially of heavy metals so wish to make that comment for the record. I know you mentioned that there has been testing of biologicals at the site but I feel that a comment to that effect should be documented each time for the record.

The major thrust of my comments to you and the RAB this time will be in regards to the subsurface conditions at the site. To begin with, I was able to load and open the SSURGO Digital Soil Survey 2.1 Erie County, Ohio that Eric Dodrill, Erie Soil & Water Conservation District passed out at the RAB meeting on the 15th. I had problems at first but called Eric and he talked me though the installation. The critical issue is to make certain that when you load it, you make certain that both files are installed. If you just install the first file, the data will not load and the program won't open. If you do it correctly, you should see a picture of the front cover and then an ARCView screen behind it. When the ARCView screen opens to a blue map with roads, take the zoom in tool (+), and make a box over the area of Plum Brook. Then hit the MC button on the right end of the tool bar and the aerial coverage for Plum Brook will pop up with the soil overlay. Using the pan control (looks like a little hand) you can move over the aerial photo to the area where we are working with this review. Turn on the county and state roads by clicking their boxes to help locate yourself. The roads at PBOW will show up in the aerial background. I found that it helped to center on the Reservoir No. 2 water pool. From there, Acid Area 2 is due west and Acid Area 3 is just to the northeast.

For the most part, the original soils at both sites are CmA and KbA. If you remember from the report on the No. 2 Burning Grounds, KbA is Kibbie fine sandy loam, 0-2 % slope. CmA

is Colwood loam 0-1 % slope. If you want to link into the 2002 text report of the Soil Survey, highlight the fifth button from the right and the Soil Survey Erie County will pop up in a PDF file. A quick discussion on the Colwood loam is found on page 42. The text notes that the Colwood loam is the lower lying of the Kibbie/Colwood Association. The quick discussion on the Kibbie fine sandy loam is on page 64. Kibbie fine sandy loam has an "apparent" water table as does the Colwood loam. This means that any water entering though the surface of the soil that is not removed by evapotranspiration, will continue to move down to recharge the shallow base flow of streams in the area (and tile drains if present) and also the bedrock ground water. The Erie County Ground Water Pollution Potential map (1990, report 1994) for these polygons (F712-158 for AA2 and 7F11-160 for AA3) show an annual ground water recharge rate of 4-7 inches per year with the aquifer in each location being the limestone. A GIS coverage of the map can be downloaded from the ODNR Division of Water web page. They also have a link for a free ESRI GIS viewer. I have not tried these links yet.

You can note from the Soil Survey that the Kibbie fine sandy loam are formed in deltas with stratified loamy and silty glaciofluvial deposits while the Colwood loam are formed in stratified lacustrine deposits. The Colwood loam is a hydric (wetland) soil with a seasonal high water table of 1 foot above to 1 foot below the surface of the ground. The Kibbie fine sandy loam has a high water table level of 1 to 2 feet below the surface in the winter and spring. I e-mailed these changes in soils to Mike Angle, ODNR-Division of Water, Water Resources Section and asked him to calculate new DRASTIC numbers for us for these sites. As soon as I have them, I will update the Power Point presentation with some more information on DRASTIC as well and send copies of the CD to you for the RAB and to Helen Owens to hang on the Plum Brook Web Site. Eric Dodrill, Erie SWCD asked for a copy and I told him that I didn't think there would be a problem if I sent him one as well. Is it OK?

Most of the Acid Area 2 and part of the Acid Area 3 are also mapped with the soil symbol UdB. If you remember from the No. 2 Burning Ground report, that is an Udorthents, loamy 0 to 6 % slope. These are areas that have been altered during construction. However, depending upon how deep the construction was, the lower horizons of the parent soils will remain and will connect to the same horizons in the neighboring soils. All of the Acid Area 3 will be either Kibbie fine sandy loam or Colwood loam. Acid Area 2 is a little bit more complicated. There is a small area of OaB projecting from the south side of Acid Area 2. This is an Oakville loamy fine sand, 0 to 6 % slope, it's an old sand dune or beach ridge and is very permeable with a seasonal high water table of greater than six feet below ground surface. This will be an area of high ground water recharge. The other symbol, ZuC2 is a Zurich silt loam, 6 to 12 % slope, eroded. This setting is an eroded back slope or side slope in a dissected area, parent materials are lacustrine deposits. Here it is the north and west bank of the Pipe Creek flood plain.

I continue to be concerned about the subsurface investigation issue of dry bedrock monitoring wells. I spoke at length on Friday with Rick Pavey, ODNR Division of Geological Survey. Rick, as I mentioned at the RAB meeting, was the source of the glacial and bedrock information for the new Soil Survey of Erie County. Rick mapped all of Plum Brook, both for surface glacial/lake plain features and for the bedrock. The ODNR maps that Shaw used in their earlier reports were based on Rick's work. Rick says we can expect a series of deltaic

and beach ridge/dune deposits formed as Ancestral Lake Erie shallowed. The source of the delta materials was the Ancestral Huron River. However, because the Huron River carried so much sand, there is a higher volume of sands and silts over much of the Plum Brook area than would typically be expected. Rick said to expect shallow lake formations over deeper lake clays over tills. This is pretty much the sequence I presented in the Power Point presentation. Furthermore, Rick says the ODNR Geo Survey Stack Maps of the unconsolidated materials are done for the area. He's just doing final edits to some of the surrounding area now.

I would consider him the expert in surface and subsurface geology for Plum Brook since he conducted the complete mapping effort alone. If anyone wants to talk to him about the geology of the site, they can send him an e-mail at rick.pavey@dnr.state.oh.us. I told him that someone from Army Corps of Engineers or one of the contractors may want to talk to him for information. I also asked him if he would be interested in participating in a Field Day this next summer, July or August, and he said he would be very interested. He said there are excellent outcrops of the Plum Brook Shale, the Prout Limestone, and the Ohio Shale with two contacts visible along the creek valleys at the site. He felt it would be an excellent location to hold a geologic – soils field day event. With Scott Brockman's retirement from ODNR, Rick becomes the point person for the Geo Survey with the Ohio Fracture Flow Working Group. I know Rick well and have for years. He also lives near us and his daughter went to the same grade school, junior high school and high schools as my kids did so we overlapped on outdoor and science educational efforts for the Worthington School District. He is a fine educator and understands how to simplify geological information for students of all ages.

Returning to the issue of the shallow unconsolidated and bedrock monitoring wells, I took a good look at the boring logs for the shallow piezometers and noted that at least some of the wells ended in a unit that sounded very much like a glacial till. The descriptions included notations of increased rockiness, an increase in stiffness and a reduction in moisture content 9although the lowering of the moisture content may also be a function of water wicking down into the underlying dewatered bedrock units). In addition, there were some notations in color change to "reddish gray" (AA2-PZ01, 15 feet) but the Munsell Color of 5YR 4/1 still codes out the "Dark Gray" of the section above so I'm not really certain what this means. The following piezometers and bedrock wells are some that appear to have a till intersection with depth:

AA2-PZ01 about 15 feet in depth,
AA2-PZ03 about 14 to 15 feet in depth,
AA2-PZ04 about 19.5 feet in depth,
IT-MW10 about 18 feet in depth,
AA3-PZ01 about 15 feet in depth,
AA3-PZ02 about 23 feet in depth,
AA3-PZ03 about 23 feet in depth,
AA3-PZ05 about 21 feet in depth,
AA3-GW-003 about 23 feet in depth.

However, there are other boring logs that seem to have only lacustrine deposits until they reach bedrock. An example of this would be AA2-PZ02 which has the description of "9.5 to 18 feet, CL, clay silty clay intervals throughout, dark to medium gray (10YR, 4/1 to 10YR 5/1), soft to firm, medium to medium-high plasticity, moist to wet." This description holds until the last 2 inches above bedrock where weathered bedrock fragments are found. This piezometer intersects bedrock at 18 feet below ground surface, so there may be a relationship between presence or absence of till and the depth to bedrock. I think it would be useful to explore this relationship in the future when new borings are made. If the geologist logging the holes would include depositional descriptions, if should be possible to sort this out. In addition, if old samples for the unconsolidated materials are still present at the site, it might be possible to look at them and tell, depending upon how dried out and oxidized they have become since drilling. The boring logs are found in Appendix E.

Nevertheless, the shallow piezometer monitoring logs and wells provide important information. Once the logs change from oxidized state of iron colors (browns) to unoxidized state or iron colors (grays) we know that we have passed from an area where the ground water recharge (and therefore contaminant transport) shifts from at least a partial "matrix flow" to a "fracture controlled" or "fracture only" transport system. This is important from the situation of contaminant transport but even more so for ground water recharge of the underlying Delaware Limestone aquifer.

The construction techniques used for the shallow piezometers manages to capture ground water flow and recharge in all three of the unconsolidated units. By extending the piezometer screen from the base of the well to about 8 feet below ground surface and continuing the sand pack up to 5 feet below grade, the ground water that has moved down past shallow tile drainage is measured in these piezometers. This water will continue to move down vertically until it recharges the bedrock aquifers and horizontally until it becomes base flow in the surrounding streams such as Pipe Creek. If the budget was there to do it, it would be really useful to put transducers into the piezometers (and the bedrock monitoring wells) to record changes in water levels over time and see how that relates to surface precipitation events. It should help to sort out how much ground water recharge to the bedrock is actually occurring. The ODNR DRASTIC recharge rate of 4 to 7 inches a year is an estimate. It would be very useful for the water budget for the ground water study to have a more refined input number.

The dry well at Acid Area 3, AA3-BEDGW-004 continues to puzzle me. I talked with Rick Pavey about flow through the Delaware Limestone and he assured me that all flow was through the fractures. Brian Webb of Bennett & Williams and I looked at the pictures of the cores for the bedrock wells at Acid Area 2 and Acid Area 3 and we just didn't see anything that was significantly different between the wells that made water and those that did not. There wasn't anything of special note on the boring logs, either, although it would be really helpful to have RQD information listed on the logs. (Since the cores are still on site, if they have been well preserved, it will still be possible to create a generalized RQD for the cores. If we hold the field day, this could be one of the field activities.) So if Army Corps and their contractors are absolutely certain that there were no problems in the installation, than something(s) else is(are) going on to control the presence or absence of water in those

bedrock wells and the fact that the water levels are so much deeper in some of the wells (but not in others) than the water levels measured in the unconsolidated piezemeters.

If you place a straight line on the regional map, the Acid Area 3 and the No. 2 Burning Grounds are on a northeast – southwest axis from the Pentolite Area. You can also place a straight line from AA3-BEDGW-004, the dry well, to the dry wells at the No. 2 Burning Grounds. Bedrock wells around them to either side in Acid Areas 2 and 3 make water. You can use Figure 1-2 to see this relationship.

There are several other pieces of evidence that support an hypothesis of dewatering of the bedrock aquifer from the reactor site. The Bedrock Groundwater Elevation map, Figure 5-5 has a very steep gradient from the ground water high at AA3-BEDGW-003 to AA3-BEDGW-001 and AA3-BEDGW-002. Both of those wells are at almost exactly the same elevation 608.13/15, but the higher AA3-BEDGW-003 is at 627.79. AA3-BEDGW-004 is too dry to measure. The water level in AA3-BEDGW-003 is only 8.13 feet below the ground surface, well up within the unconsolidated materials that are being recharged by seasonal recharge conditions (this is a January 2005 map). In fact the well lies just below the 631' contour for the Shallow Groundwater Elevation Map (Figure 5-4). The ground water gradient from AA3-BEDGW-003 to AA3-BEDGW-001 is approximately 0.03 ft/ft. That same distance measured on the shallow unconsolidated map is 0.003ft/ft so the gradient in the bedrock is ten times steeper than it is in the shallow unconsolidated materials. The bedrock gradient from AA3-BEDGW-003 to AA3-BEDGW-002 is 0.02 ft/ft. If we assume that AA3-BEDGW-004 is not dry, simply dewatered, then the bedrock gradient there is 0.056 ft/ft. Ground water gradients are figured by taking the difference in head in two wells and dividing that by the distance between the two. Figure 5.5 has all the information needed to make that calculation except for the surface and bottom elevations of AA3-BEDGW-004 which can be calculated from the information on the boring log.

The other really interesting piece to this puzzle is the comment on page 3-6 of the report which states:

> "Bedrock wells AA3-BEDGW-001 and PB-BED-MW19 exhibited well yields too low to meet purging requirements and sampling within a 10-hour period, while trying to maintain the initial state water level. These wells exhibited increased yields as the water was lowered. The increase in the yield prohibited a complete purging of the well; therefore the purging rate was reduced after approaching the purge volume requirements allowing water levels to recover and water parameters to stabilize."

I'm not really certain what conditions came into play for this situation to have occurred. It may have something to do with how the fractures are intersected in the side walls of the boring that allows water to move into the bore hole. It may also have something to do with the cycling on and off of the pumping well at the reactor. It also may be something else completely different that has not yet been identified.

The bedrock water levels in AA3-BEDGW-001 and 002 are more than 20 feet lower than the water levels in the shallow piezometers around them, AA3-BEDGW-004 is approximately 72 feet lower but AA3-BEDGW-003 is only about 4 feet lower. That's not the pattern you would expect to see if the bedrock aquifer was a sealed, confined aquifer. It's also not the pattern you would expect to see if the bedrock was impermeable. This issue is clearly going to need further investigation and I concur with Mark that the dewatering well at the reactor may very well have something to do with the situation. The conditions here bring two other bedrock pumping/dewatering studies in carbonate bedrock aquifers to mind. One is in the Olentangy Shale – Delaware Limestone-Columbus Limestone formation just south of Columbus, Ohio. The other is in Silurian carbonates in Van Wet, Ohio.

In 1982, the pumping at the American Aggregates Columbus Limestone quarry on State Route 104 and the Scioto River just south of the city of Columbus, had managed to dewater many of the homes several miles to the west of the quarry in Jackson Township west of I-71. It had also managed to dewater the bottom of the Model Landfill, a now closed solid waste landfill that is to the west across State Route 104 (and between the homes and the quarry) which can be seen from I-71 to the east, just before the southern I-270 outer belt. The landfill is now a golf course. The American Aggregates quarry, now owned by Martin Marietta, can be seen from I-270 as it crosses the Scioto River. The quarry is on the west side of the river, north of I-270.

The dewatering had occurred gradually as the quarry shifted from a wet extraction drag-line sand and gravel pit to the mining of the lower carbonate bedrock formations. When the houses were first built in the 1950s and before, there was plenty of ground water to supply them but as the quarry worked deeper, water levels to the west got lower and wells were deepened and/or replaced. Finally, many of the residents in an area several miles west were faced with water shortages and personal expenses to deepen their wells once again, so their sued. American Aggregates acknowledged that they were, indeed, dewatering everyone but that legally, they had no responsibility to replace the water supplies. Ohio was functioning under ground water case law going back to 1861, Frazer v. Brown, which basically said that whoever had the deepest well and the biggest pump was welcome to all the water they could take because the movements of ground water were "mysterious and occult". Since we had moved beyond "mysterious and occult" in our understanding of ground water flow in Ohio, the case, which I helped to set up, prevailed in the Ohio Supreme Court as (Rose) Cline (et al.) v. American Aggregates and Ohio ground water quantity law was rewritten by case law.

Since 1984, we have functioned under a "reasonable use" standard in Ohio, meaning that you cannot just blithely dewater your neighbor, especially if he was there first. Furthermore, anyone with a pump capable of pumping 100,000 gallons of water per day is supposed to report their volume of pumping to ODNR Division of Water yearly. That's only a 70 gallon per minute pump, so if NASA is using a 150 gallon per minute pump, they should be reporting the volume being pumped annually. In checking with Leonard Black who heads up the Water Withdrawal Registration program for Ohio, he found no record of the reactor dewatering efforts. This is not completely unexpected. While the program has been in place since 1990, we are still finding water withdrawal efforts that are not registered. For more information on this program and the program requirements, contact Leonard at

leonard.black@dnr.state.oh.us. The contact information is also on the DONR Division of Water web pages.

The other historical experience was the initial pumping test for the city of Van Wert in Van Wert County, Ohio, over on the Indiana State line. Because ODNR Division of Water has the responsibility to monitor and resolve ground water use conflicts, they were invited to participate in the initial pumping test of new public water supply wells for the city of Van Wert. Since most of Van Wert County is rural and agricultural, the City Public Water Department did not want to dewater surrounding farmsteads (and since this was after 1984, they would have had to replace the water if they did). They invited ODNR Division of Water, Water Resources Section to observe the initial pumping test. The well being tested was in a Silurian-age carbonate formation that also transmits most of its ground water through fracture flow. Monitoring wells were set up all around the area, some very close in and some miles away in areas where fracture trace analysis indicated that the wells would be in line with the pumping well. After 24 hours of pumping, there was drawdown in the fracture trace wells as far as a mile away but wells only a few hundred feet away that were in different fracture networks showed little or no drawdown. This great distance of influence in such a short period of time was a really unexpected results and the test was talked about at annual meetings of professional organizations in Ohio for several years.

The same separation of active verses separated fractures was seen around the same time in the Seneca County sink-hole dye test study. Here dye was added to one of the sink holes in the Devonian-aged limestone just southwest of Plum Brook in Seneca County. Again, rural wells miles away pumped up the dye long before wells much closer to the sinkhole saw the dye. If I remember correctly, Wayne Jones with ODNR Division of Water, Water Resources Section was involved in both of the tests. Wayne can be reached at wayne.jones@dnr.state.oh.us.

There is another reference in this report to free oil product in one of the site wells, this time AA3-BEDMW-004. On page 5-2, there is a comment that "approximately 6 inches of standing petroleum is present in the bottom of the well". I asked Rick Pavey, ODNR Geo Survey about the presence of hydrocarbons in the Delaware Limestone in this part of Erie County. He said that there have been numerous reports of "oil" in the Delaware Limestone and that the reports go back decades. He personally has been fielding questions on the subject since he mapped Erie County almost 20 years ago. He confirms that a light phase crude oil is often seen in the Delaware Limestone. However, he also discussed the historical land uses at the Plum Brook site. His recommendation was that if it had not already been done, the oil should be collected and fingerprinted to determine if it is naturally occurring crude and/or if it is escaped refined oil from underground and/or above ground storage tanks from the Plum Brook Ordnance Works heyday. Refined oil will have a different fingerprint than crude oil, even years later. I don't know if this has been done but maybe the RAB or ACOE knows. If not, that may be an activity to undertake at the AA3-BEDMW-004 boring since the oil has been encountered there.

Those are the main points I wanted to cover with these comments. I hope I have been able to clarify some of the confusing points in this report. We are rapidly coming up to date in

terms of general background information. I'll try the DRASTIC link and write about it as soon as I get new polygon values from Mike Angle. If you have any questions and/or need further information, please feel free to contact me.

SUBJECT: Response to review comments for the Draft Site Characterization Report, Remedial Investigation, Part 1, at Acid Area 2 & 3, Former Plum Brook Ordnance Works (PBOW), Sandusky, OH, August 2005, Prepared by Jacobs Engineering Group, Inc., Contract Number DACW62-03-D-0004-0004

Reviewer: Lannae Long, USACE CELRN

1. General, When referencing EPA Region 9 Residential or Tap Water PRGs, use 9, not IX. Also, please cite which date is being used. The most recent one at the time of report production is October 2004.

Response: Roman numerals have been discontinued and the publish date for the PRGs will be included.

2. Section 7.5 Recommendations, Ecological Risk Assessment needs to be included in the list of recommendations.

Response: Ecological risk has been included with the human health risk recommendation.

3. Tables 4-1 thru 6-11, Format these tables differently. See LRN's comment #27 from the draft Reservoir #2 Burning Ground RI Part 1. See PBOW Groundwater Summary Report, 2005 for more examples.

Response: The tables have been revised as requested for the final report.

4. Tables 4-1 thru 6-11, Footnote the tables. See LRN's comment #28 from the Reservoir #2 Burning Ground RI, Part 1. Footnote qualifiers, type, and cite PRGs.

Response: Footnotes for the data qualifiers have been provided at the bottom of each page.

5. Table 4-1 thru 6-11, When the tables are formatted differently, include columns with PRGs and a column with Max Detected.

Response: PRG and maximum detection values have been provided in the final tables.