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U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Director, Office of Nuclear Material Safety and Safeguards  
Washington, DC 20555-0001

Pathfinder Generating Station  
Docket No. 30-05004  
License No. 22-08799-02

Response to Request for Additional Information Regarding License Termination of  
Pathfinder Facility Located in Sioux Falls, South Dakota License 22-08799-02

- References:
- 1) Letter from Xcel Energy to the U. S. Nuclear Regulatory Commission, "Termination of Pathfinder Generating Plant Materials License 22-08799-02", (L-HU-07-007) dated February 26, 2007.
  - 2) Letter from NRC to Xcel Energy, "Request for Additional Information (RAI) Regarding License Termination of Pathfinder Facility Located in Sioux Falls, South Dakota", dated April 19, 2007 (ADAMS Ascension No. ML071070445).

On February 26, 2007, Xcel Energy requested termination of Pathfinder's By Product Material License Number 22-08799-02. On April 19, 2007, the U.S. Nuclear Regulatory Commission (NRC) issued a request for additional information (RAI) concerning the Final Status Survey Report developed in support of Pathfinder Facility License Termination. The response to this RAI and related supplements are enclosed.

This letter contains no new commitments and no revisions to existing commitments. No license amendment is being made as a result of this letter.

If you have any questions, please contact the undersigned at (720) 497-2020 or James Holthaus, Radiation Safety Officer, at (715) 377-3380.



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Enclosures (4)

- Enclosure 1, Responses to Request for Additional Information – 15 pages
- Enclosure 2, Xcel Energy TENORM Work Plan – 5 pages
- Enclosure 3, Settling Basin Wells - Water Sample Results – 10 pages
- Enclosure 4, Replacement Sample Location Maps - 11 pages

cc: Administrator, USNRC Region IV  
D. Blair Spitzberg, Chief, Fuel Cycle & Decommissioning Branch, USNRC, Region IV  
Chad Glenn, Project Manager, Division of Waste Management and Environmental Protection, USNRC  
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**REQUEST FOR ADDITIONAL INFORMATION**  
PATHFINDER GENERATING STATION  
FINAL STATUS SURVEY REPORT DOCKET NO, 030-05004

**Enclosure 1**

Responses to Request for Additional Information

## Request for Additional Information Number 1

Topic: Scanning Measurements

Reference: NUREG 1757, Vol. 2, Appendix E, Section E.3 Scanning Measurements

### Issue:

There was no scan data with the Final Status Survey Report (FSSR). Please provide scan data. The scan data can be in the form of a summary for each survey unit package. The summary should include a range that extends from the minimum value to the maximum value for each survey unit package.

### Response

*The final status survey of the Pathfinder site employed the scanning process as described in NUREG 1575, Section 2.2 and 6.7.2.1. All beta scans were performed using an appropriate detector and a Ludlum 2350 data logger. During the scans, the data logger recorded the gross counts observed over a pre defined count time. The count times associated with the scans were based on the size of the survey unit and its classification.*

*For the 126 cm<sup>2</sup> gas flow proportional detector typically used for the beta scans, the detector was moved at a rate of approximately 1 detector width per second at a height of 0.5 inches above the surface being scanned. During the scans the count time was set between 90 and 300 seconds. Thus, the recorded counts correspond to the average count rate observed over an area of approximately 1.0 m<sup>2</sup> to 3.8 m<sup>2</sup>.*

*The software used to download the recorded counts obtained during the beta scans converts the counts to an activity concentration in units of dpm/100 cm<sup>2</sup>. The downloaded scan results were reviewed to ensure that the required scans had been performed and to possibly identify areas of elevated activity missed by the surveyor performing the scans who was monitoring the audible output of the survey meter. It should be noted that the scanning results in units of dpm/100 cm<sup>2</sup> represent an average activity observed during the count time used during the scan. The scanning results are not directly comparable to a total beta activity measurement collected with the detector held in a fixed location.*

*The reviews performed of the beta scanning results did not identify any areas of elevated activity in excess of the criteria for release for unrestricted use. The total beta activity measurement results, which are documented in Appendix 2 of the Final Status Survey Report, confirmed that no activity in excess of the criteria for release for unrestricted use was present at the time of the final status survey.*

## Request for Additional Information Number 2

Topic: Clarification of inconsistencies related to sampling or counting methodologies

Reference: NUREG 1757, Vol. 2, Section 4.5.3.2 Detailed Technical Review

### Issue:

There are several direct beta measurements in Appendix 2 where the count time differs from the typical 30 second count time. Please provide an explanation for these differences. See Appendix 2, (Book 3 of 5). See Package 14 (page 6 of 14), Package 15 (page 5 of 9), Package 21 (page 16 of 38), Package 21 (page 31 of 38). Package 27 (page 5 of 16), Package 39 (See Comment #3), and Package 52 (page 10 of 11 ).

### Response

*The count times associated with Survey Package 39 were increased in order to lower the minimum detectable activity, MDA, associated with the total beta activity measurements. For the remaining survey packages, the surveyor inadvertently obtained total beta activity measurements using a longer count times than required. The use of longer than required count times does not invalidate the measurements. Therefore, the measurement results associated with the longer count times were presented along with the measurement results associated with the standard count times in Appendix 2.*

*In general, increasing the count time associated with a total beta activity measurement decreases the statistical uncertainty associated with the measurement result and also lowers the MDA associated with the measurement.*

### Request for Additional Information Number 3

Topic: Nonconformance relating to sampling or counting methodologies.

Reference: NUREG 1757, Vol. 2, Section 4.5.3.2 Detailed Technical Review

#### Issue:

According to Section 8.3, page 22 of 92, (Book 1 of 5), it states that the MDAs for total beta activity measurements were set at less than 1000 dpm/100 cm<sup>2</sup>. For Survey Unit Package No. 39, the MDA values, with the exception of one, exceeded this limit. Please provide technical justification for using paired measurements defined in the Survey Package Worksheet for Package Identification No. 39. Please re-evaluate Survey Unit Package 39, specifically PK039PIPE1, using more appropriate background values and give consideration to a dose assessment methodology if you cannot meet the DCGLw release criteria and MDAs.

#### Response

*Survey Package 39 was prepared to facilitate the survey of several Class 1 embedded pipes. The total beta measurements associated with this survey were performed using a cylindrical gas flow proportional counter centered within the pipes. The counting efficiency of this detector was approximately 3.5%. In an attempt to meet a minimum detectable activity of 1000 dpm/100 cm<sup>2</sup> the count times associated with these measurements were increased to 300 seconds.*

*While an MDA of 1000 dpm/100 cm<sup>2</sup> was not achieved, the increased count times did result in MDAs that were less than 50% of the criteria for release for unrestricted use. Given that the pipes associated with Package 39 were classified as Class 1 a MDA of less than 50% of the criteria for release for unrestricted use was deemed acceptable considering the unique challenges associated with surveying an embedded pipe.*

*Following an initial decon of the embedded pipes using knotted rags, knotted chains, and chimney sweeping brushes, the total beta activity measurements within the pipes revealed count rates that were highly variable. Several additional decon attempts had no effect on the observed count rates. In order to address the variable count rates within the embedded pipes, paired measurements were taken at each of the total beta activity measurement locations. At each total beta activity measurement location, a shielded and an unshielded measurement were collected. The shielded measurement was subtracted from the unshielded measurement resulting in a net count for the associated count time which was converted into units of activity concentration.*

## Request for Additional Information Number 4

Topic: Clarification of investigations

Reference: NUREG 1757, Vol. 2, Section 4.5.3.2 Detailed Technical Review

Issue:

4a) Section 11.7 Water Treatment Building (Book 1 of 5). Please explain the correlation between the samples collected from the drums and the elevated readings, including the exposure rate reading, in the structures. Also explain why samples and/or analysis could not be conducted at the point of elevated readings. 4b) In Section 11.4 Concrete Block Walls, and Section 11.6, Administration Building, please provide analytical data or technical references supporting statements that elevated levels were due to natural radioactivity not licensed activity.

*Response*

*a) Water Treatment System is impacted by natural occurring radioactive materials. First, well water processed in the treatment system is known to contain low concentrations of naturally occurring radioactive materials. Second, a potassium permanganate pretreatment includes natural occurring Potassium -40. These materials contribute variation in background readings in the water treatment building and elevated readings on reverse osmosis filtration system. The potassium permanganate is used with Greensand Filters to pretreat the water to remove iron. The filtration system, (5 micron pre-filter, 100 gpm reverse-osmosis membrane and post-filter) is effective in concentrating natural occurring radioactive materials.*

*b) In making the statement that the slightly elevated total beta activity measurements associated with the concrete blocks in the concrete block walls and the tiled surfaces were due to natural activity we relied on past experience, the associated total beta activity measurement results, and investigatory measurements obtained using a portable gamma spectroscopy system.*

*In order to more clearly demonstrate that the slightly elevated total beta activity measurements associated with the concrete blocks in the concrete block walls and the tiled surfaces were due to natural activity, several samples were collected and analyzed by an off site laboratory using high purity germanium detectors.*

*Three samples were obtained from the concrete block walls within the Turbine Building, two samples from tiled surfaces associated with the Administration Building, and one sample from poured concrete floor in the basement of the Turbine Building. The sample analysis results are presented in the following Table 4-1.*

Table 4-1  
Gamma Spectral Results for Selected Radionuclides

<u>Isotope</u>	<u>Result</u> pCi/g	<u>Uncertainty</u> pCi/g	<u>MDA</u> pCi/g	<u>Matrix</u>	<u>Sample Location</u>
AC-228	<b>1.04</b>	0.4	0.6	Concrete Block	Turbine Building Basement Bathroom
BI-214	<b>1.55</b>	0.32	0.31		
K-40	<b>22.45</b>	3.72	1.43		
PA-234M	0.69	11.13	20.58		
PB-212	<b>1.26</b>	0.21	0.21		
PB-214	<b>1.39</b>	0.27	0.31		
TH-234	2.32	2.31	2.37		
TL-208	<b>1.36</b>	0.35	0.48		
AC-228	<b>1.58</b>	0.35	0.46	Concrete Block	Turbine Building Mezzanine Battery Room
BI-214	<b>2.09</b>	0.29	0.22		
K-40	<b>26.64</b>	3.25	0.97		
PA-234M	-0.78	8.47	14.78		
PB-212	<b>1.57</b>	0.22	0.18		
PB-214	<b>1.92</b>	0.25	0.23		
TH-234	<b>3.04</b>	2.55	2.52		
TL-208	<b>1.2</b>	0.24	0.33		
AC-228	<b>0.74</b>	0.27	0.53	Concrete Block	Turbine Deck East Wall
BI-214	<b>1.36</b>	0.22	0.19		
K-40	<b>23.14</b>	2.75	1.02		
PA-234M	-3.81	6.28	10.65		
PB-212	<b>1.11</b>	0.16	0.13		
PB-214	<b>1.52</b>	0.22	0.17		
TH-234	1.86	1.11	1.95		
TL-208	<b>0.92</b>	0.2	0.28		
AC-228	<b>3.24</b>	0.33	0.36	Tile/Concrete	Admin Building, First Floor Supply Room
BI-214	<b>2.69</b>	0.27	0.2		
K-40	<b>16.84</b>	2.08	0.86		
PA-234M	5.91	6.49	12.21		
PB-212	<b>3.02</b>	0.24	0.16		
PB-214	<b>2.85</b>	0.24	0.19		
TH-234	<b>2.68</b>	2.24	2.39		
TL-208	<b>2.57</b>	0.29	0.27		

<u>Isotope</u>	<u>Result</u> pCi/g	<u>Uncertainty</u> pCi/g	<u>MDA</u> pCi/g	<u>Matrix</u>	<u>Sample Location</u>
AC-228	<b>3.09</b>	0.34	0.41	Tile	Wall Outside Admin Building
BI-214	<b>2.55</b>	0.29	0.22		
K-40	<b>33.43</b>	3.52	0.9		
PA-234M	-1.05	7.66	13.33		
PB-212	<b>3.03</b>	0.26	0.18		
PB-214	<b>2.76</b>	0.26	0.21		
TH-234	2.82	2.45	2.94		
TL-208	<b>2.6</b>	0.3	0.32		
AC-228	<b>0.53</b>	0.18	0.21	Poured	Turbine Building Basement Concrete Form Floor
BI-214	<b>0.44</b>	0.1	0.1	Concrete	
K-40	<b>5.8</b>	1.09	0.56		
PA-234M	1.04	3.32	6.69		
PB-212	<b>0.35</b>	0.08	0.09		
PB-214	<b>0.31</b>	0.1	0.11		
TH-234	<b>1.04</b>	1.07	0.91		
TL-208	<b>0.4</b>	0.11	0.14		

Note: Bolded values exceed MDA

*In all cases, no radionuclides attributable to licensed activities were identified. It should also be noted that the K-40 activity concentration associated with the samples of the concrete blocks and the tiled surfaces was a factor of three to four higher than the K-40 activity concentration associated with the poured concrete which supports the finding that the slightly elevated total beta activity measurements associated with the concrete blocks in the concrete block walls and the tiled surfaces were due to natural activity.*

*When considering the significance of the slightly elevated total beta activity measurements associated with the concrete blocks in the concrete block walls and the tiled surfaces, it should be noted that none of the measurement results have been corrected to account for the natural radioactivity in various materials of construction and that the measurement results were all less than the criteria for release for unrestricted use.*

## Request for Additional Information Number 5

Topic: TENORM

Reference: Section 11.1, Outfall to Settling Basin (Book 1 of 5).

Issue:

This section indicates that Xcel Energy is preparing a detailed plan for further investigation of the extent of the TENORM contamination for the State of South Dakota. Please provide any additional sample results from the settling basin to help facilitate the license termination, We also request that a copy of the final report be provided to the NRC when it is available.

*Response*

*Xcel Energy is committed to conducting samples and providing a final report to the state of South Dakota concerning TENORM. The final report is scheduled to the state by July 30, 2007. Problems have occurred due to lack of sufficient frost to support heavy sampling equipment in the settling basin and early spring rains. The number one pond has been isolated from plant discharges to allow the sample area to drain. The identified sample area is approximately a 40 x 20-foot area beginning at the plant's water discharge piping. Ground water samples were collected and analyzed for TENORM. See Enclosure 2, "Xcel Energy TENORM Work Plan" for work plan. See Enclosure 3 for Sampling Basin Water Sample Results.*

*Upon completion of the sampling a copy of the final report will be provided to the NRC.*

## Request for Additional Information Number 6

Topic: Editorial

Reference: Package 43 (Book 2 of 5 and Book 3 of 5).

Issue:

This package is confusing. First, maps in Book 2 do not have identifiers that match data in Book 3. Second, location numbers used in Book 3 do not match location numbers on maps in Book 2. For example, on page 4 of 5 in Book 3 for PK043STO02, location numbers start at 6 and end with 15. The only map that had location numbers from 6 thru 15 was the elevator. Also see page 2 of 5 and 5 of 5 in Book 3. There appears to be a transcribing error. Please correct this error.

*Response*

*The L2 Codes specified in Survey Package 43 were F0001, ST001, ST002, and ST003. The L2 code F0001 was defined in the Survey Package 43 as applying to the interior surfaces of the elevator. Unfortunately the surveyor when surveying these surfaces used a location code of PK043ELEVA instead of PK043F0001. While the location code PK043ELEVA may have been more descriptive it was not consistent with previously established protocols.*

*The nomenclature used in the drawings of the elevator, elevator room, and the non permanent structures in the elevator room associated with Survey Package 43 in Book 2 of 5 does not match the Location Numbers associated with the survey of the surface provided in Book 3 of 5. However, if the location numbers were to begin at 1 and increase sequentially the Location Numbers would match the nomenclature used in the drawings.*

## Request for Additional Information Number 7

Topic: Classification

Reference: NUREG 1757, Vol. 2, Detailed Technical Review

### Issue:

Re-classification-Several survey unit packages failed the Class 2 and Class 3 criteria for reclassification. Below is a list of survey unit packages that failed the classification criteria: Survey Unit Package #5, (Paved Areas), survey Unit Package #10 (Fuel Handling Building - Lower Basement), Survey Unit Package #12 (Fuel Storage Building - Upper 2 meters), Survey Unit Package #14 (Turbine Deck), Survey Unit Package #15 (Control Room), Survey Unit package #16 (Administrative Building - First Floor), Survey Unit Package #17 (Administrative Building -- Second Floor), Survey Unit Package #28 (Turbine Building - Basement), Survey Unit Package #36 (Machine, Electrical, Instrument Calibration), Survey Unit Package #38 (Water Treatment Facility), Survey Unit Package #42 ( Fuel Handling Building - Lower Basement), Survey Unit Package #45 (Turbine Building Mezzanine - Upper 2 meters), Survey Unit Package #47 (Water Treatment Overhead). Please provide further explanation as to why these areas do not need to be reclassified and resurveyed (See Comment 4b), reclassify and resurvey these areas to demonstrate that these areas are still below the DCGLw, or demonstrate with supporting data that these elevated readings are not licensed material.

### Response

*These survey units were not reclassified and resurveyed since the slightly elevated total beta activity measurement results associated with the final status surveys of these areas were due to natural activity. In making the claim that the slightly elevated total beta activity measurements were due to natural activity we relied on past experience, the associated total beta activity measurement results, and investigatory measurements obtained using a portable gamma spectroscopy system.*

*In order to more clearly demonstrate that the slightly elevated total beta activity measurements associated with these materials were due to natural activity several samples were collected and analyzed by an off site laboratory using high purity germanium detectors. In addition to the samples collected as discussed in the response to RAI #4, two samples were collected from within the Fuel Storage Building and two samples from within the Water Treatment Building. Two of the samples; one from within the Fuel Handling Building and one from within the Water Treatment Building were also analyzed for Ra-226 by alpha spectroscopy. These sample analysis results are presented in Table 7-1.*

Table 7-1  
Gamma Spectral Results for Selected Radionuclides

<u>Isotope</u>	<u>Result</u> pCi/g	<u>Uncertainty</u> pCi/g	<u>MDA</u> pCi/g	<u>Matrix</u>	<u>Sample Location</u>
AC-228	0.09	0.39	0.80	Fiber Filter	First Floor of Water Treatment Building RO System Pre Filter
BI-214	<b>1.40</b>	0.39	0.28		
K-40	-0.09	1.09	2.34		
PA-234M	2.57	13.54	26.91		
PB-212	-0.06	0.20	0.30		
PB-214	<b>1.36</b>	0.38	0.31		
TH-234	0.03	1.93	3.63		
TL-208	-0.09	0.33	0.62		
AC-228	<b>7.42</b>	1.67	2.33	Filter Media	Fuel Building, Second Floor , Barrel Storage Area Used Filter Media
BI-214	<b>151.00</b>	7.77	1.15		
K-40	<b>28.90</b>	6.96	5.89		
PA-234M	-21.32	43.97	64.75		
PB-212	<b>10.80</b>	1.00	1.03		
PB-214	<b>155.10</b>	6.83	1.30		
TH-234	11.76	7.71	12.17		
TL-208	<b>8.70</b>	1.05	1.75		
AC-228	-0.07	0.29	0.49	Filter Media	Fuel Building, Second Floor , Barrel Storage Area New Filter Media
BI-214	0.08	0.12	0.22		
K-40	<b>247.60</b>	20.32	0.73		
PA-234M	2.42	10.10	17.15		
PB-212	-0.02	0.10	0.16		
PB-214	0.03	0.12	0.20		
TH-234	-0.70	1.17	2.03		
TL-208	0.09	0.18	0.32		
AC-228	0.10	0.29	0.49	Filter Media	Water Treatment Building New Filter Media
BI-214	0.22	0.20	0.23		
K-40	<b>250.00</b>	20.52	0.87		
PA-234M	-6.02	9.99	16.46		
PB-212	-0.03	0.11	0.17		
PB-214	0.05	0.12	0.20		
TH-234	0.89	1.17	2.09		
TL-208	0.02	0.18	0.31		

RA-226	<b>0.85</b>	0.30	0.05	Fiber Filter	First Floor of Water Treatment Building RO System Pre Filter
RA-226	<b>417.50</b>	30.58	0.51	Filter Media	Fuel Building, Second Floor , Barrel Storage Area

*Note: Bolded values exceed MDA*

*In all cases no radionuclides attributable to licensed activities were identified. The samples from within the Fuel Handling Building were associated with an abandoned water treatment skid. Samples of new and used filter media were obtained. The new sample media showed elevated levels of K-40 while the used filter media showed elevated levels of Ra-226. The finding of elevated Ra-226 is consistent with the sample analysis results associated with the NRC split samples presented in the Final Status Survey Report.*

*The sample from within the Water Treatment Building was of new filter media associated with the water treatment skid. The new sample media showed elevated levels of K-40 which is consistent with results associated with the investigatory samples presented in the Final Status Survey Report.*

*While it was not possible to obtain a sample of used filter media from within the water treatment skid in the Water Treatment Building it is expected that the media would have contained elevated levels of Ra-226. The periodic flushing of these filters is thought to be the source of the elevated Ra-226 activity concentrations within the settling basin (see RAI #5).*

## Request for Additional Information 8

Topic: Clarification

Reference: NUREG 1757, Vol. 2, Section 4.5.2 Acceptance Criteria

### Issue:

Sample locations can not be determined from the four Sample Location Maps provided for Packages 1-4 in Appendix 1 (Book 2 of 5) due to poor resolution of these maps. Please provide clearer or more detailed maps for each package with visible indication of the locations of the samples.

### *Response*

*Copies of the requested maps are provided in Enclosure 4.*

## Request for Additional Information Number 9

Topic: MDA for removable alpha

Reference: FSSR Page 22, Section 8.3

### Issue:

On Page 22, Section 8.3 states that the MDA for removable alpha is less than 20 dpm. Also, on page 66, Section 10.3 states that no removable alpha exceeded the MDA. However, on page 72. in Package No. 20, one alpha result was 22 dpm. Although very minor in safety significance, please reconcile this discrepancy.

### Response

*Section 10.3 should have stated that removable alpha activity in excess of twice the applicable MDA was not identified.*

*There are no criteria for release for unrestricted use in terms of alpha activity since no licensed alpha emitting radionuclides have been identified.*

*An occasional removable alpha activity result, slightly in excess of the minimum detectable activity, is most likely attributable to statistical fluctuations in the background count rate or the presence of naturally occurring radionuclides.*

## Request for Additional Information 10

Topic: Cs-137 Sample Results

Reference: FSSR, Top of page 86, Section 10.6

Issue:

Top of page 86, Section 10.6 states that the only radionuclide identified was Co-60. However, one sample result for Cs-137 (Survey Package-2) exceeded the MDA at 1.02 pCi/g. Please revise Section 10.6 to acknowledge the sample results for Cs-137, or otherwise reconcile this discrepancy.

*Response*

*Given that Cs-137 was not identified in the samples collected and analyzed to confirm the radionuclides of interest, the sample analysis results in question were associated with soil samples, and a Cs-137 activity concentration of 1.02 pCi/g is within the range of expected background activity concentrations. It was concluded that the Cs-137 activity concentration associated with the soil sample was due to background.*

**REQUEST FOR ADDITIONAL INFORMATION**  
PATHFINDER GENERATING STATION  
FINAL STATUS SURVEY REPORT DOCKET NO, 030-05004

**Enclosure 2**

*Xcel Energy TENORM Work Plan*

# Pathfinder Generating Plant TENORM Investigation Work Plan

## Introduction

As part of the Pathfinder 10 CFR 30 Byproduct License termination process, a field radiation survey was performed at the subject site in accordance with the NRC-approved Decommissioning Plan. Above-background radiation levels were recorded in the settling ponds #1 and #2. Subsequent soil testing confirmed the presence of non-licensed isotopes. These isotopes are believed to be technologically enhanced naturally occurring radioactive material (TENORM), and are not the result of the Pathfinder Nuclear plant operation, (Personal communication 11/17/06<sup>1</sup>).

Ground water from the Split Rock Creek Aquifer is believed to be the source for the isotopes. Decades of discharging ground water and water treatment (RO) wastewater into the ponds are believed to have resulted in the accumulation of detectable levels of TENORM.

Xcel Energy, in a 10/9/06 letter to the South Dakota Dept of Natural Resources (SD DENR), committed to developing this work plan, which will:

- Characterize the radioactive contamination:
  - Identify the spatial extent of radioactivity in the ponds.
  - Identify the specific radioisotopes involved, verify that they are not byproducts of nuclear operations, and confirm them as TENORM.
- Identify applicable regulations, state or federal regulatory authorities, and cleanup standards.
- Develop a Corrective Action Plan (CAP), separate from the NRC-approved Pathfinder Decommissioning Plan that will allow Xcel Energy to proceed with site decontamination and decommissioning activities and license termination.
- Identify a time line for project milestones.

## Background

A field scan, using a low level dose rate meter, identified above background radiation activity near waste water discharge pipes in ponds #1 & #2. Ponds #3 & #4 reported back ground levels. Subsequent soil sampling by the NRC in pond #1 adjacent to the discharge pipe revealed measurable concentrations of Radium 226. Radium 226 is considered a naturally occurring radioactive material. NRC analysis did not find any licensed isotopes, which would be affiliated with the nuclear plant operation. Table 1 below summarizes NRC results.

**Table 1: TENORM Results for Pond #1<sup>1</sup>**

Sample Depth	Radium 226 concentration
0 inches	131 pCi/g
6 inches	110 pCi/g
18 inches	66 pCi/g

The presence of TENORM in ponds 1 & 2 and absence in ponds 3 & 4 is logical considering their historic pond operation as overflow capacity. With the exception of an eighteen-month period, wastewater was routed only to ponds 1 & 2. Water quality for NORM is not available for the Big Sioux Aquifer at the Pathfinder site. Historically, ground water analysis has focused on inorganic parameters and/or NRC licensed isotopes.

<sup>1</sup> 11/17/06 Conference call between Xcel Energy & NRC regarding October 2-5 Inspection.

## Applicable Regulations

Preliminary data collected by the NRC and Xcel Energy have identified Radium 226 as the principle radioactive isotope in the settling ponds. Radium 226 is a component of the uranium break down series and the immediate precursor to Radon 222. These isotopes fall under the category of TENORM and currently are not regulated by the NRC. The SD DENR regulates Pathfinder's pond operation via its ground water discharge permit (GWD 3-92) and therefore has been identified as the governing agency.

South Dakota rule number 74:54:01:04 identifies a ground water standard of 5pCi/l for radium 226 & 228 combined. South Dakota rules do not specify a soil standard for radium. However, SD DENR enforces the federal soil clean up criteria specified in 40 CFR Part 192. The federal clean up criteria identifies a radium standard of 5pCi/g for surface soils and 15pCi/g for soils deeper than 15cm.

## Proposed Field Work

Proposed fieldwork has four objectives; they are:

- Confirm TENORM isotopes in the soil and verify that no 10 CFR 30 Byproduct material is present.
- Assess TENORM in ground water.
- Correlate field screening results to analytical results.
- Delineate TENORM concentrations in settling pond soils.

Due to analytical costs, field-screening techniques will be used to select samples for lab analysis and to provide a field delineation of soil contamination. A low-level dose rate meter, calibrated and capable of measuring 1  $\mu$ rem/hr will be used to screen discrete soil samples. This same meter will also be used to monitor above ground exposure rates. This type of meter was responsible for the initial identification of the elevated TENORM.

*A trained geologist, and a person trained in radiological monitoring will be present throughout the field investigation.*

### Soil Investigation

An all terrain HSA drill rig will be used to advance soil borings in Ponds #1 and #2. Borings will be located on a 20ft x 20ft grid (Figure 2). In the horizontal plane, borings will start nearest the discharge pipe and progress outward until back round conditions are obtained, as determined by the dose rate meter. In the vertical plane, continuous soil samples will be collected using a 3" diameter split spoon. The depth of each boring is anticipated to be approximately five feet, however it will vary depending upon when background conditions are measured in the field.

Each split spoon will be screened using the dose rate meter. If a portion of the soil core is above background and influences the metering of the rest of the core, it will be removed to allow a more accurate scan of the soil core. Field screening results for each split spoon will be documented in the soil boring log along with its ASTM texture classification. Selected soil samples will be collected for lab analysis.

Two soil samples, which field screening suggest as having the highest TENORM concentrations, will be analyzed using a Gamma Spectrometer to identify and measure any detectable gamma radiation and respective energy levels. In addition, a specific evaluation will be performed to detect the presence of the following radioisotopes: Tritium, Isotopic Uranium, Isotopic Thorium and Radium 226. This analysis is meant to confirm radium 226 as the predominant radioisotope found in the basins. Additional soil samples (4-5 from each basin) will be analyzed for radium only. These samples are meant to establish a correlation between field screening results and lab results. Lab samples will represent both horizontal and vertical distributions.

### Ground Water

Ground water samples will be collected from three down gradient wells: P-3, P-4, and P-9. These wells were selected due to their known hydrologic connection to Ponds #1 and #2. Ground water sampling

methods will be consistent with those approved in the GWD 3-92 monitoring plan. Ground water samples will be analyzed for: Gamma Spec, Tritium, Isotopic Uranium, Isotopic Thorium and Radium 226.

## Corrective Action Strategies

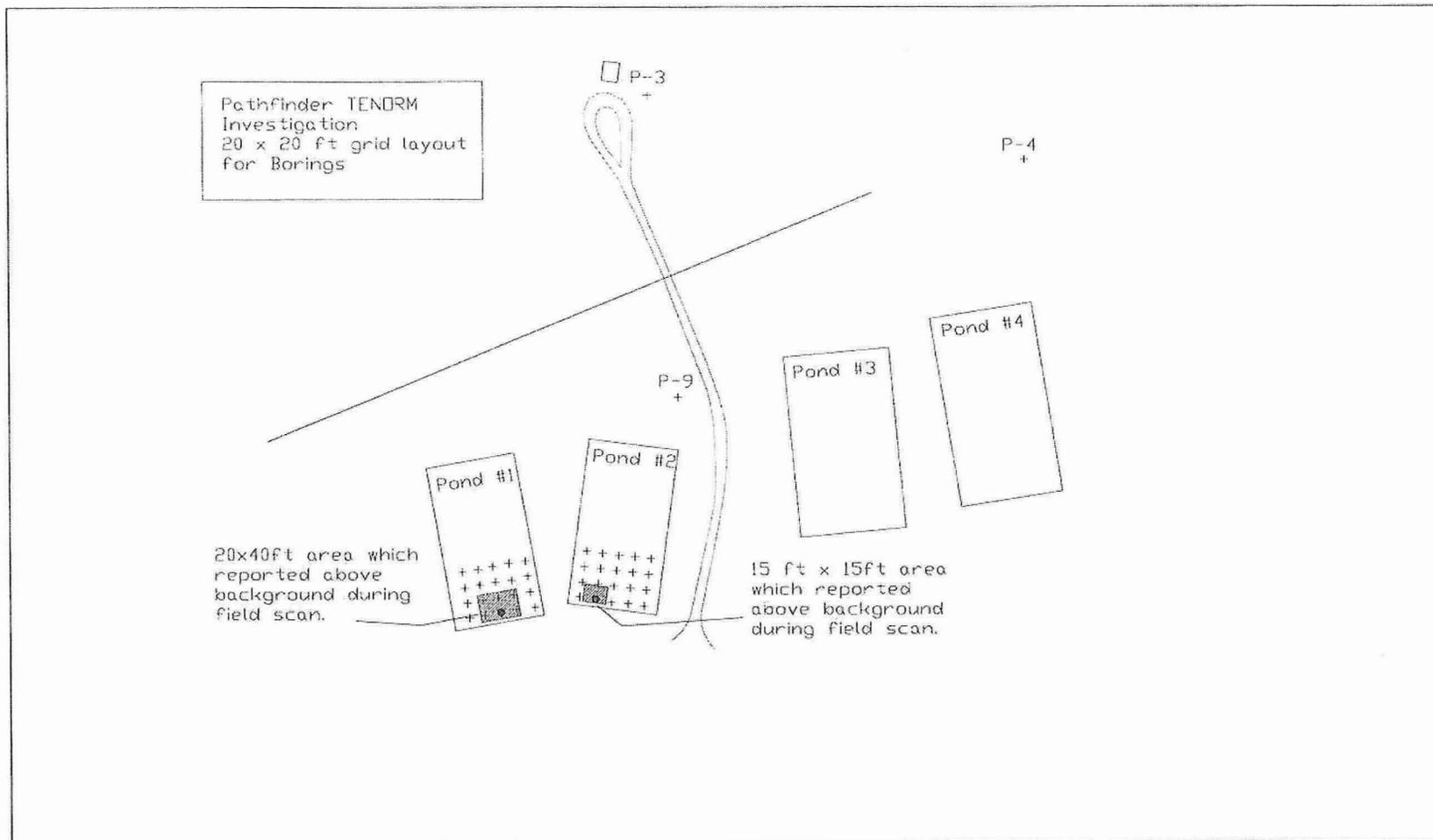
Xcel Energy will evaluate the feasibility of two corrective action strategies. Strategy 1 will entail excavation and disposal of the TENORM contaminated soils. Both on-site and off-site disposal options will be addressed. Strategy 2 will evaluate in-situ isolation of basin soils. Both high permeable and low permeable isolation techniques will be addressed.

## Schedule

A tentative schedule is proposed in the table below:

Task	Completion Date
Field Investigation	2/28/07
Investigation report & CAP feasibility report	7/30/07
Implementation of CAP	12/31/08

Figure 1 Pathfinder TENORM Investigation - Proposed Sampling Locations



**REQUEST FOR ADDITIONAL INFORMATION**  
PATHFINDER GENERATING STATION  
FINAL STATUS SURVEY REPORT DOCKET NO, 030-05004

**Enclosure 3**

*Settling Basin Wells*

*Water Sample Results*

Chuck Donkers  
Excelenergy

**Report of Analysis/Certificate of Conformance**

05/04/2007

LIMS #: L31509

Project ID#: NM001-3ESPPI-06

Received: 03/29/2007

Delivery Date: 04/28/2007

P.O. #: PER RECEIPT

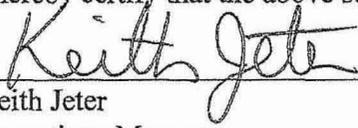
Release #:

SDG #:

This is to certify that Teledyne Brown Engineering - Environmental Services located at 2508 Quality Lane, Knoxville, Tennessee, 37931, has analyzed, tested and documented samples as specified in the applicable purchase order.

This also certifies that requirements of applicable codes, standards and specifications have been fully met and that any quality assurance documentation which verified conformance to the purchase order is on file and may be examined upon request.

I hereby certify that the above statements are true and correct.

  
\_\_\_\_\_  
Keith Jeter  
Operations Manager

*Cross Reference Table*

Client ID	Laboratory ID	Station ID(if applicable)
P-3	L31509-1	
P-4	L31509-2	
P-9	L31509-3	

# Report of Analysis

05/04/07 07:59



## L31509

Excelenergy

NM001-3ESPPI-06

Chuck Donkers

Sample ID: P-3	Collect Start: 03/26/2007 00:00	Matrix: Ground Water (WG)
Station:	Collect Stop:	Volume:
Description:	Receive Date: 03/29/2007	% Moisture:
LIMS Number: L31509-1		

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
H-3 (DIST)	2010	<		<b>1.93E+02</b>	pCi/L		10	ml		04/03/07	75	M	U
RA-226	2016	<b>8.45E-01</b>	5.49E-01		pCi/L					04/10/07			+
BE-7	2007	<		<b>3.97E+01</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
K-40	2007	<		<b>8.85E+01</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
CR-51	2007	<		<b>4.21E+01</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
MN-54	2007	<		<b>3.73E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
CO-58	2007	<		<b>3.91E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
FE-59	2007	<		<b>8.45E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
CO-60	2007	<		<b>4.15E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
ZN-65	2007	<		<b>7.96E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
NB-94	2007	<		<b>3.85E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
NB-95	2007	<		<b>4.55E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
ZR-95	2007	<		<b>7.76E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
MO-99	2007	<		<b>5.99E+02</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
RU-103	2007	<		<b>4.61E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
RU-106	2007	<		<b>3.81E+01</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
AG-110M	2007	<		<b>4.00E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
SB-124	2007	<		<b>4.46E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
SB-125	2007	<		<b>1.15E+01</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
I-131	2007	<		<b>1.08E+01</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
CS-134	2007	<		<b>3.94E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
CS-137	2007	<		<b>4.27E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
BA-140	2007	<		<b>2.41E+01</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
LA-140	2007	<		<b>7.24E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
CE-141	2007	<		<b>8.17E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
CE-144	2007	<		<b>2.93E+01</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
RA-226	2007	<		<b>1.05E+02</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U Spec No
TH-228	2007	<		<b>8.13E+00</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No
TH-232	2007	<		<b>1.74E+01</b>	pCi/L		969.85	ml	03/26/07 00:00	04/06/07	54000	Sec	U No

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**Flag Values**

- U = Compound/Analyte not detected or less than 3 sigma
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- High = Activity concentration exceeds customer reporting value
- Spec = MDC exceeds customer technical specification
- L = Low recovery
- H = High recovery

- No = Peak not identified in gamma spectrum
- Yes = Peak identified in gamma spectrum
- \*\*\*\* Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

**Bolded text indicates reportable value.**

# Report of Analysis

05/04/07 07:59



## L31509

Excelenergy

NM001-3ESPPI-06

Chuck Donkers

Sample ID: P-3	Collect Start: 03/26/2007 00:00	Matrix: Ground Water	(WG)
Station:	Collect Stop:	Volume:	
Description:	Receive Date: 03/29/2007	% Moisture:	
LIMS Number: L31509-1			

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
TH-228 (AS)	2001	<		<b>7.59E-02</b>	pCi/L		200	ml		04/30/07	60000	sec	U
TH-230 (AS)	2001	<		<b>2.85E-02</b>	pCi/L		200	ml		04/30/07	60000	sec	U
TH-232 (AS)	2001	<		<b>5.32E-02</b>	pCi/L		200	ml		04/30/07	60000	sec	U
U-233/234 (AS)	2001	<b>5.35E+00</b>	4.92E-01		pCi/L		200	ml		04/18/07	60001	sec	+
U-235 (AS)	2001	<b>2.10E-01</b>	9.03E-02		pCi/L		200	ml		04/18/07	60001	sec	+
U-238 (AS)	2001	<b>3.62E+00</b>	3.84E-01		pCi/L		200	ml		04/18/07	60001	sec	+

Comment: 1 shipping date used for collection date. Ra-226 analyzed at sub-laboratory TMA2

Page 4 of 10

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- High = Activity concentration exceeds customer reporting value
- Spec = MDC exceeds customer technical specification
- L = Low recovery
- H = High recovery

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- Yes = Peak identified in gamma spectrum
- \*\*\*\* Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

# Report of Analysis

05/04/07 07:59



## L31509

Excelenergy

NM001-3ESPPI-06

Chuck Donkers

Sample ID: P-4	Collect Start: 03/26/2007 00:00	Matrix: Ground Water	(WG)
Station:	Collect Stop:	Volume:	
Description:	Receive Date: 03/29/2007	% Moisture:	
LIMS Number: L31509-2			

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
H-3 (DIST)	2010	<		<b>1.99E+02</b>	pCi/L		10	ml		04/03/07	75	M	U
RA-226	2016	<		<b>7.57E-01</b>	pCi/L					04/10/07			U
BE-7	2007	<		<b>3.39E+01</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
K-40	2007	<		<b>7.11E+01</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
CR-51	2007	<		<b>3.70E+01</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
MN-54	2007	<		<b>3.56E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
CO-58	2007	<		<b>3.80E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
FE-59	2007	<		<b>7.83E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
CO-60	2007	<		<b>3.73E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
ZN-65	2007	<		<b>7.13E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
NB-94	2007	<		<b>3.58E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
NB-95	2007	<		<b>4.01E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
ZR-95	2007	<		<b>6.95E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
MO-99	2007	<		<b>4.30E+02</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
RU-103	2007	<		<b>4.23E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
RU-106	2007	<		<b>3.36E+01</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
AG-110M	2007	<		<b>3.35E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
SB-124	2007	<		<b>4.18E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
SB-125	2007	<		<b>1.02E+01</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
I-131	2007	<		<b>8.93E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
CS-134	2007	<		<b>3.71E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
CS-137	2007	<		<b>3.73E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
BA-140	2007	<		<b>2.15E+01</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
LA-140	2007	<		<b>7.19E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
CE-141	2007	<		<b>6.33E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
CE-144	2007	<		<b>2.26E+01</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
RA-226	2007	<		<b>8.82E+01</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U Spec No
TH-228	2007	<		<b>7.31E+00</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No
TH-232	2007	<		<b>1.58E+01</b>	pCi/L		910.01	ml	03/26/07 00:00	04/05/07	56017	Sec	U No

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**Flag Values**

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- High = Activity concentration exceeds customer reporting value
- Spec = MDC exceeds customer technical specification
- L = Low recovery
- H = High recovery

- No = Peak not identified in gamma spectrum
- Yes = Peak identified in gamma spectrum
- \*\*\*\* Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

**Bolded text indicates reportable value.**

# Report of Analysis

05/04/07 07:59



## L31509

Excelenergy

NM001-3ESPPI-06

Chuck Donkers

Sample ID: P-4		Collect Start: 03/26/2007 00:00				Matrix: Ground Water (WG)							
Station:		Collect Stop:				Volume:							
Description:		Receive Date: 03/29/2007				% Moisture:							
LIMS Number: L31509-2													
Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
TH-228 (AS)	2001	<		<b>1.81E-01</b>	pCi/L		200	ml		04/30/07	60000	sec	U
TH-230 (AS)	2001	<		<b>6.77E-02</b>	pCi/L		200	ml		04/30/07	60000	sec	U
TH-232 (AS)	2001	<		<b>9.57E-02</b>	pCi/L		200	ml		04/30/07	60000	sec	U
U-233/234 (AS)	2001	<b>2.79E+00</b>	3.29E-01		pCi/L		200	ml		04/18/07	60001	sec	+
U-235 (AS)	2001	<b>1.31E-01</b>	7.26E-02		pCi/L		200	ml		04/18/07	60001	sec	+
U-238 (AS)	2001	<b>1.88E+00</b>	2.62E-01		pCi/L		200	ml		04/18/07	60001	sec	+
Comment: 1 shipping date used for collection date. Ra-226 analyzed at sub-laboratory TMA2													

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### Flag Values

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- U\* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
- High = Activity concentration exceeds customer reporting value
- Spec = MDC exceeds customer technical specification
- L = Low recovery
- H = High recovery

**Bolded text indicates reportable value.**

- No = Peak not identified in gamma spectrum
- Yes = Peak identified in gamma spectrum
- \*\*\*\* Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

# Report of Analysis

05/04/07 07:59



## L31509

Excelenergy

NM001-3ESPPI-06

Chuck Donkers

Sample ID: P-9	Collect Start: 03/26/2007 00:00	Matrix: Ground Water	(WG)
Station:	Collect Stop:	Volume:	
Description:	Receive Date: 03/29/2007	% Moisture:	
LIMS Number: L31509-3			

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
H-3 (DIST)	2010	<		<b>1.89E+02</b>	pCi/L		10	ml		04/03/07	75	M	U
RA-226	2016	<		<b>7.97E-01</b>	pCi/L					04/10/07			U
BE-7	2007	<		<b>3.55E+01</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
K-40	2007	<		<b>9.01E+01</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
CR-51	2007	<		<b>3.92E+01</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
MN-54	2007	<		<b>3.97E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
CO-58	2007	<		<b>4.07E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
FE-59	2007	<		<b>7.96E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
CO-60	2007	<		<b>3.81E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
ZN-65	2007	<		<b>7.85E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
NB-94	2007	<		<b>3.95E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
NB-95	2007	<		<b>4.45E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
ZR-95	2007	<		<b>7.05E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
MO-99	2007	<		<b>4.43E+02</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
RU-103	2007	<		<b>4.53E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
RU-106	2007	<		<b>3.54E+01</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
AG-110M	2007	<		<b>3.78E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
SB-124	2007	<		<b>4.54E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
SB-125	2007	<		<b>1.04E+01</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
I-131	2007	<		<b>9.41E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
CS-134	2007	<		<b>3.88E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
CS-137	2007	<		<b>4.14E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
BA-140	2007	<		<b>2.36E+01</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
LA-140	2007	<		<b>7.21E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
CE-141	2007	<		<b>6.95E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
CE-144	2007	<		<b>2.53E+01</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No
RA-226	2007	<		<b>9.59E+01</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U Spec No
TH-228	2007	<		<b>6.47E+00</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U Yes
TH-232	2007	<		<b>1.54E+01</b>	pCi/L		899.88	ml	03/26/07 00:00	04/05/07	55982	Sec	U No

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- Flag Values
- U = Compound/Analyte not detected or less than 3 sigma
  - + = Activity concentration exceeds MDC and 3 sigma; peak identified(gamma only)
  - U\* = Compound/Analyte not detected. Peak not identified, but forced activity concentration exceeds MDC and 3 sigma
  - High = Activity concentration exceeds customer reporting value
  - Spec = MDC exceeds customer technical specification
  - L = Low recovery
  - H = High recovery

- No = Peak not identified in gamma spectrum
- Yes = Peak identified in gamma spectrum
- \*\*\*\* Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

**Bolded text indicates reportable value.**

# Report of Analysis

05/04/07 07:59



## L31509

Excelenergy

NM001-3ESPPI-06

Chuck Donkers

Sample ID: P-9	Collect Start: 03/26/2007 00:00	Matrix: Ground Water (WG)
Station:	Collect Stop:	Volume:
Description:	Receive Date: 03/29/2007	% Moisture:
LIMS Number: L31509-3		

Radionuclide	SOP#	Activity Conc	Uncertainty 2 Sigma	MDC	Units	Run #	Aliquot Volume	Aliquot Units	Reference Date	Count Date	Count Time	Count Units	Flag Values
TH-228 (AS)	2001	<		<b>1.38E-01</b>	pCi/L		200	ml		04/30/07	60000	sec	U
TH-230 (AS)	2001	<		<b>8.65E-02</b>	pCi/L		200	ml		04/30/07	60000	sec	U
TH-232 (AS)	2001	<		<b>3.29E-02</b>	pCi/L		200	ml		04/30/07	60000	sec	U
U-233/234 (AS)	2001	<b>7.08E+00</b>	6.22E-01		pCi/L		200	ml		04/18/07	60002	sec	+
U-235 (AS)	2001	<b>1.15E-01</b>	6.98E-02		pCi/L		200	ml		04/18/07	60002	sec	+
U-238 (AS)	2001	<b>2.68E+00</b>	3.35E-01		pCi/L		200	ml		04/18/07	60002	sec	+

Comment: 1	shipping date used for collection date. Ra-226 analyzed at sub-laboratory TMA2
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**Flag Values**

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- \*\*\*\* Results are reported on an as received basis unless otherwise noted

MDC - Minimum Detectable Concentration

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**REQUEST FOR ADDITIONAL INFORMATION**  
**PATHFINDER GENERATING STATION**  
**FINAL STATUS SURVEY REPORT DOCKET NO, 030-05004**

**Enclosure 4**

Replacement Sample Location Maps for Survey Packages 1-4 follow this page. The following maps provide detail regarding the sample locations.

Survey Package 001 – Effluent Discharge Pathway – 2 pages

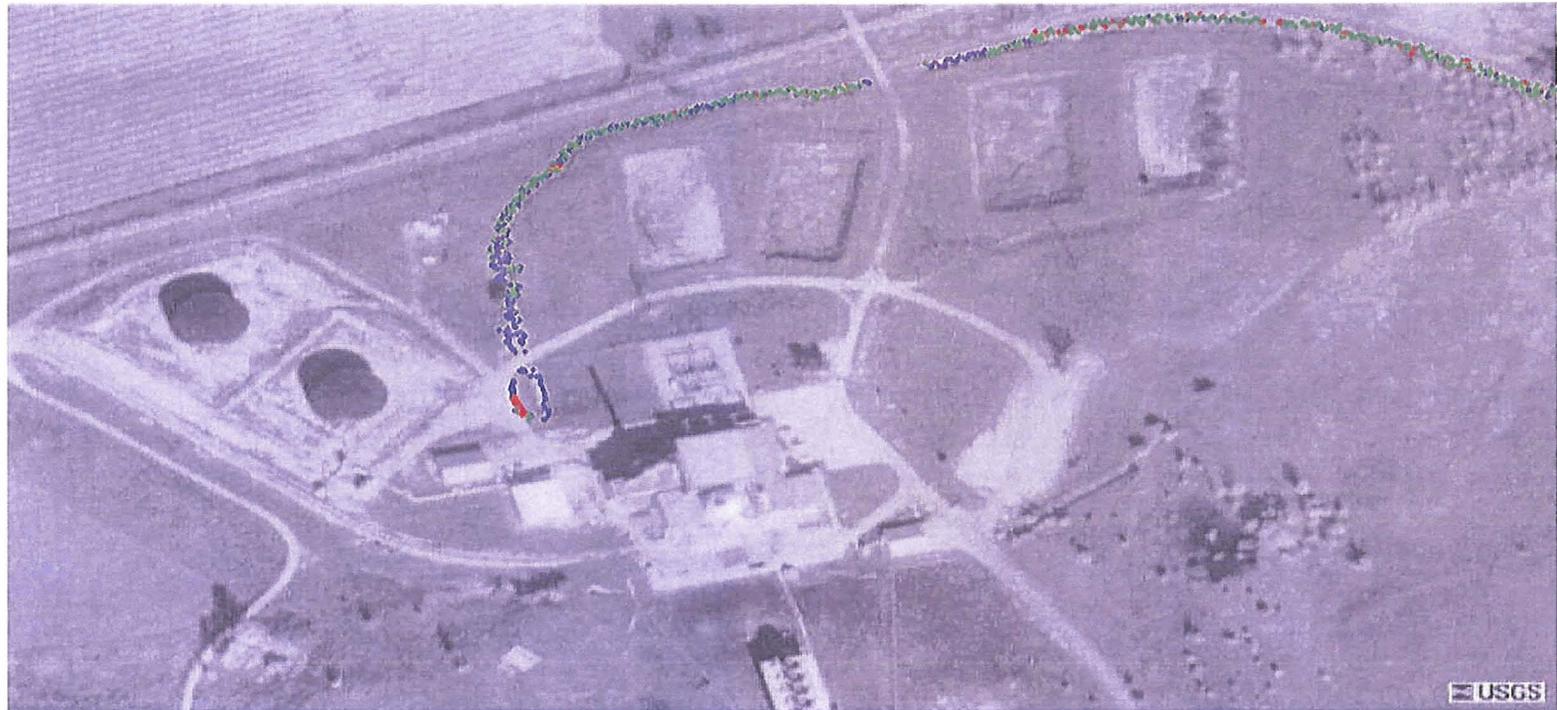
Survey Package 002 – Class 3 Open Areas – 2 pages

Survey Package 003 – Retention Basins – 2 pages

Survey Package 004 – Construction Laydown Area – 2 pages

Intake/Pump Building – 2 pages

**Survey Package 001 - Effluent Discharge Pathway  
Exposure Rate  
(R/hr)**

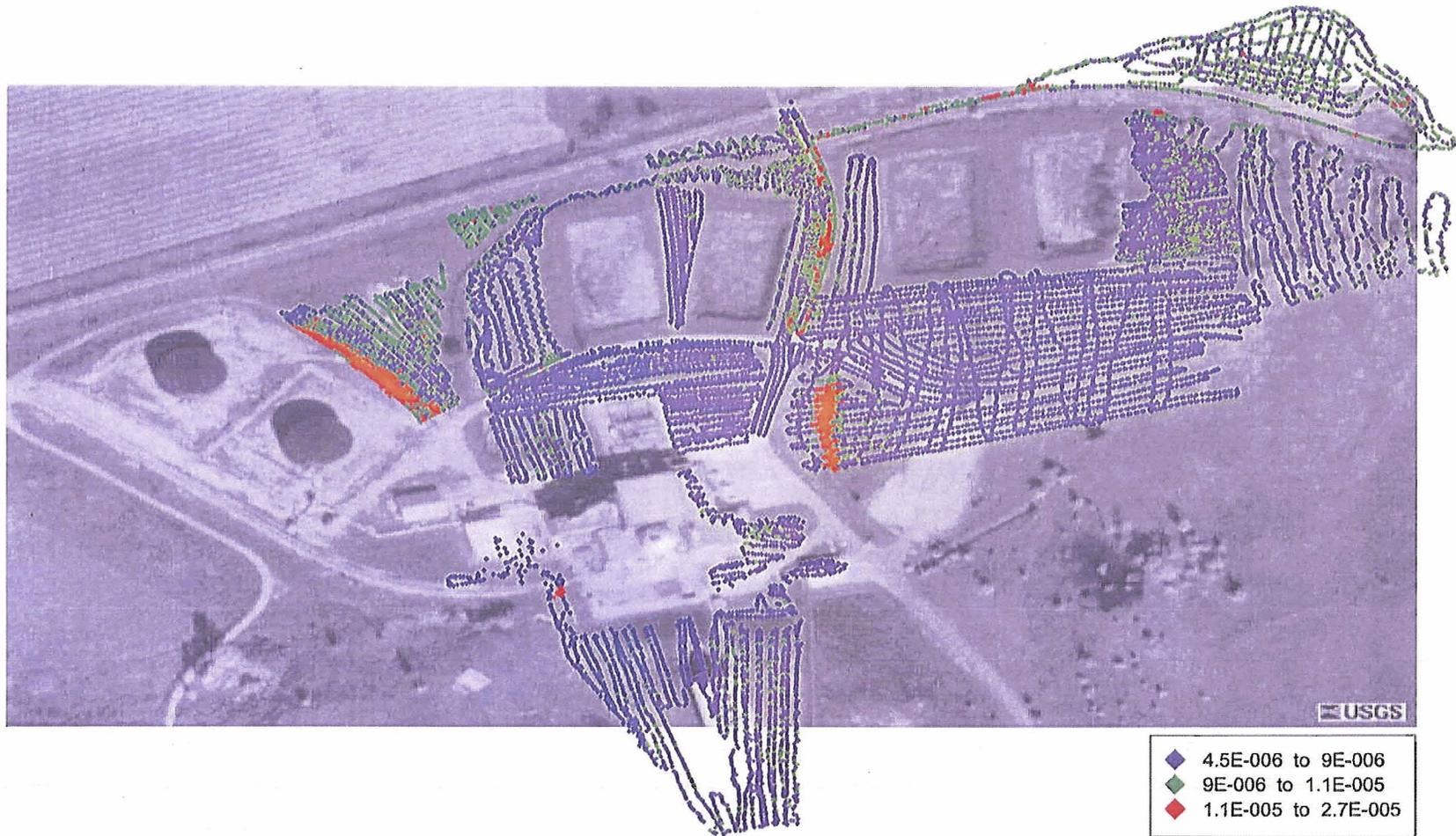


- ◆ 5E-006 to 9E-006
- ◆ 9E-006 to 1.1E-005
- ◆ 1.1E-005 to 2E-005

# Survey Package 001 – Effluent Discharge Pathway Sample Locations



**Survey Package 002 - Class 3 Open Areas**  
**Exposure Rate**  
**(R/hr)**

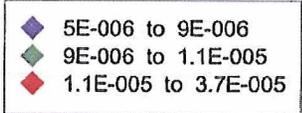
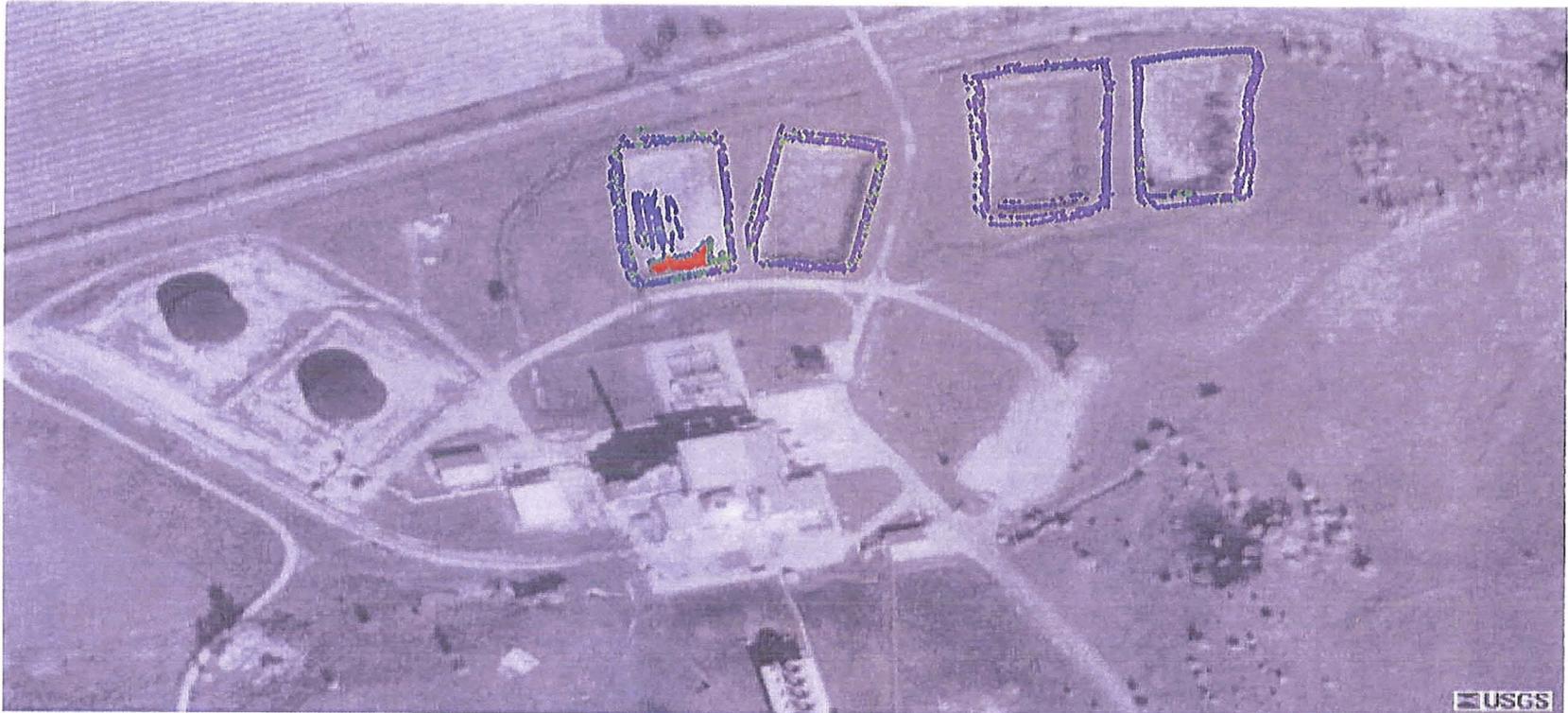


# Survey Package 002 – Class 3 Open Areas Sample Locations



2-2

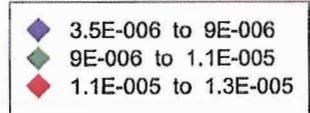
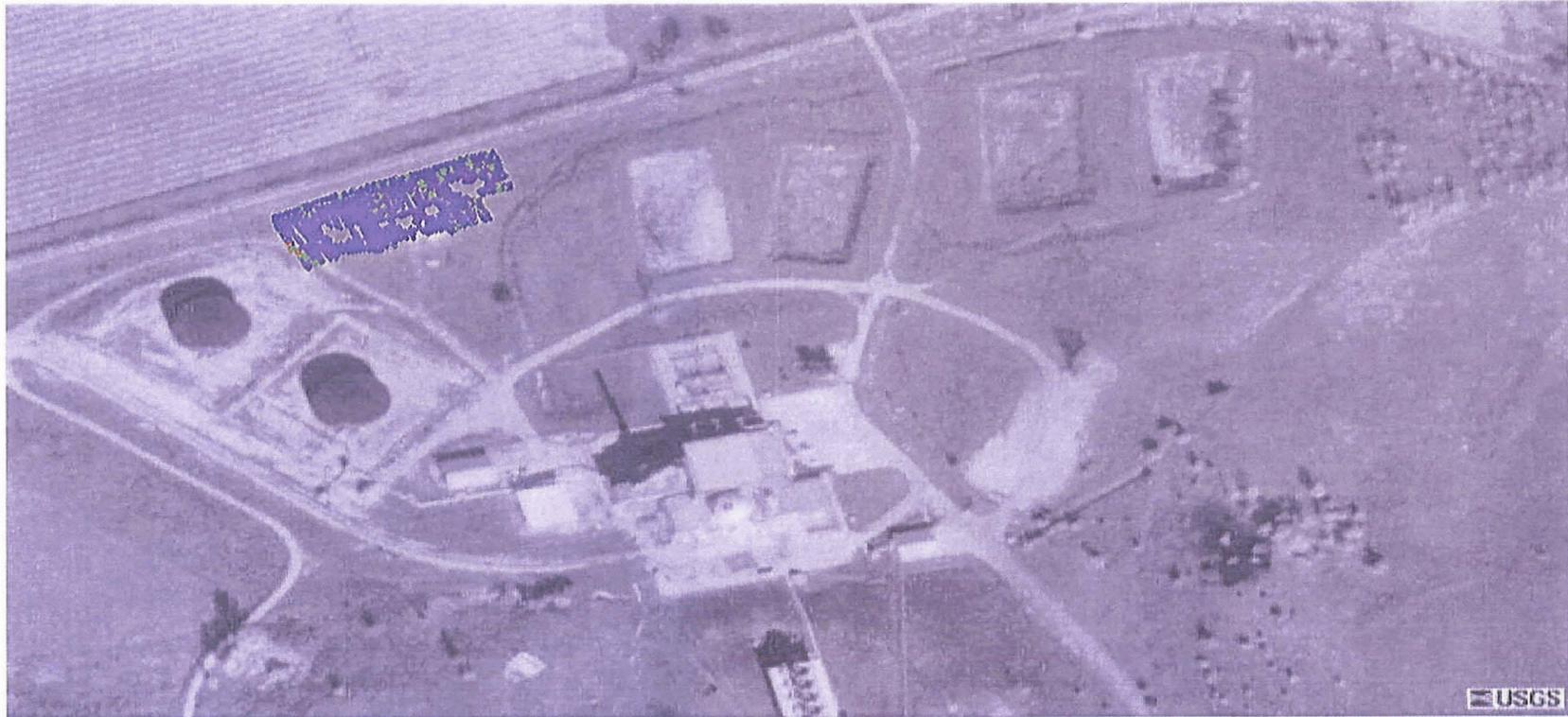
**Survey Package 003 - Retention Basins**  
**Exposure Rate**  
**(R/hr)**



# Survey Package 003 – Retention Basins Sample Locations



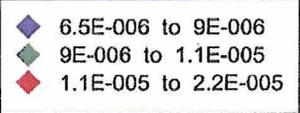
Survey Package 004 - Construction Laydown Area  
Exposure Rate  
(R/hr)



**Survey Package 004 – Construction Laydown Area  
Sample Locations**



**Intake/Pump Building  
Exposure Rate  
(R/hr)**



## Intake/Pump Building Sample Locations

