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1	[redacted] 07/07/08	The Remedial Investigation Report (RIR) fails to determine whether the Interim Waste Containment Structure (IWCS) is leaking. Battelle reports contradict the United States Army Corps of Engineers (USACE) assertion that Building 409 has preexisting contamination that accounts for very high detections in and around a nearby pipeline. The possibility that contamination may be associated with leakage from the IWCS is not explored. There are at least three possible pathways for leakage from the south dike to the two wells with elevated detects, SE of this wall, which have not been assessed. (These wells are also due east of Building 409.) a) Building 409 located outside of the IWCS had drains associated with it that could provide preferential pathways for uranium to migrate away from the IWCS (if the cell is leaking into Building 409.) There has been no sampling of these drains. b) Building 409 had a pipeline that ran to the Central drainage ditch that could provide preferential pathways for uranium to migrate away from the IWCS (if the cell is leaking into Building 409.) There has been no documentation showing this pipe was removed but this is not reflected on RIR maps. Two wells in close proximity to where this pipeline may be located show elevated detects. c) The clay installed to cover the sand beneath the south dike could have breached with the sand providing a pathway toward the two contaminated wells. The absence of wells between the south dike wall and the two contaminated wells precludes evidence that the cell is not leaking. The bottom of the IWCS cannot be assessed or reliably monitored. Comment Details: The RIR fails to determine whether the IWCS is leaking. The possibility that contamination may be associated with leakage from the IWCS is not explored. The use of indirect measurements and theoretical calculations do not provide the data necessary for evaluation of IWCS integrity. Where indirect measurements do suggest a potential problem, such as the detection of elevated levels of uranium immediately outside of the IWCS, the RI failed to investigate. The RI assumes the contamination is pre-existing despite contradictory statements from Battelle which follows these RJR excerpts: RIR Page 5-75, Paragraph 2. "Plumes of dissolved uranium were found around the northern section of the IWCS and in the area south-southeast of the IWCS [Exposure Units (EUs) 7, 10 and 11]. These plumes are likely the result of site activities prior to the construction of the IWCS."

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1 (cont.)	[redacted] 07/07/08	RIR Page 5-75. Paragraph 4. "The Comprehensive Characterization and Hazard Assessment of the DOE-Niagara Falls Storage Site, Battelle 1981, reported contamination in the fire water reservoir, Building 409. Contamination inside the building was attributed to water seepage through the south wall from the earthen berm surrounding the reservoir. Low-level soil contamination south of Building 409 was listed as the probable source of building contamination. In addition, in 1985, as the K-65 residues were being transferred to Building 411 from the tower, Building 409 was used as a settling tank in the treatment of slurry water. According to unpublished construction reports, treated slurry water from various bays in Building 411 was pumped to Building 409 for additional settling prior to being pumped to Ponds 3 and 4. Building 409 underwent a gross decontamination operation using a high pressure wash in October 1985 after removal of the 'yellow cake' that had accumulated during its use as an intermediate settling basin. This information suggests that there is a strong potential for the residual groundwater contamination present south of the IWCS to be associated with these historical operations." Unpublished construction reports noted in the RIR (above) concerning the use of Building 409 as an intermediate settling basin were not provided in an appendix, and therefore, cannot be commented on. However, the RIR records Building 409 as having been decontaminated: RIR Page 1-12 Paragraph 2. "Remedial actions were also performed on Buildings 409 and 401. The superstructure, basement walls and floor slab of Building 409 were decontaminated after treated water that had been stored in the building was pumped to a surface impoundment." Battelle 1981, Page 4-13 described pre-existing contamination in Building 409 as minimal: "Several buildings have minimal contamination and could be reused with minor remedial actions or demolished. These include the fire water reservoir (Building 409), the surge tank (Building 415), and the most southerly accelerator (Building 412)." Battelle 1981, Page 4-11. Connecting Pipes and Drains. "Building 409 has connections both to the canal surrounding the surge tank, Building 415, and to the Central Drainage Ditch. However, no contamination was found in the drains of Building 409." Battelle 1981, Page 5-13 described contamination, south of Building 409 as "superficial": 'The area south of Building 409 was used for surface storage of crucibles, saw blades and other materials from metallurgical operations in the Niagara region. This area has residual, superficial contamination remaining (<0.75m), over a 334 sq. m (3600 sq. ft) area.
1 (cont.)	[redacted]	During discussions with USACE staff about its belief that Building 409 has pre-existing contamination (even though the

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	[redacted] 07/07/08	wells immediately outside this building were not elevated) they mentioned a theory that perhaps the Department of Energy (DOE) may have disposed of contaminated debris in Building 409 while constructing the IWCS - but since the purpose of the IWCS was to house contaminated debris and residues, this theory would seem unlikely. Also because the wells immediately outside Building 409 did reflect elevated detections, we have not yet seen evidence that the building itself is contaminated - this is why sampling the floor drains is recommended to identify one of three possible pathways of leakage from the south dike wall. USACE should furnish the construction reports used to explain the use of Building 409 as an intermediate settling basin for public review. Construction Problems: Published records relating to the construction of the IWCS show several problems were encountered in building the clay dike surrounding the IWCS. In particular, the brown sand and gravel unit was found to extend down to bedrock in one area of the southern dike. Bechtel Geotechnical Post-Construction Reports Volume 2. South Dike. September-November 1983: "One location along the southern section (E120 51672), a gray sand pocket was encountered near the top of the gray clay unit. As the sand was removed, the real extent of the sand pocket spread to include both walls of the excavation. The excavation was continued in that area until the underlying brown sand and gravel unit was reached. It was found that the brown sand and gravel unit extended down to bedrock. It was estimated that water was entering the excavation at a rate of 5 gallons per minute. After the bedrock was reached, the excavation was backfilled in an uncontrolled manner to the elevation of the surrounding trench area (elevation 299). The fill was placed in a rapid manner to avoid further undercutting of the side slopes due to the presence of running sand. Inspection indicated that the sand pocket was dipping downward in this area in all directions from the center of the trench. As a result of this dip toward the north (inside wall of the excavation) a thin layer of gray clay was exposed on the inside wall. It was also noted that large cracks had developed in both side slopes due to undercutting of the slopes. The base of the trench was not inspected due to the presence of standing water. It was again estimated that water was entering the excavation at a rate of 5 gallons per minute." Detection of high levels of dissolved uranium in and around underground pipes southeast of the southern dike warrant investigation, particularly since Building 409 located outside of the IWCS had drains associated with it that could provide preferential pathways for uranium to migrate away from the IWCS. Under these circumstances, existing groundwater wells situated in the area south of the IWCS would not necessarily detect migration of uranium away from the IWCS. As noted in the Summary section above, there are at least three possible pathways for leakage from the south wall to the two wells with

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		elevated detections SE of this wall. These two wells are also due east of Building 409 and in close proximity to the detached pipeline with high uranium detections.
1 (cont.)	[redacted] 07/07/08	To preclude leakage as an explanation for contamination of the SE wells USACE could consider: • Installation of wells along the south dike wall • Sampling of the drains of the former Building 409 and pipeline to the Central Drainage Ditch. The absence of any soil sampling in this area is also noted. In recent conversation USACE has mentioned it might disturb the IWCS to install wells on a slope outside the southern dike. However, several sets of wells have been installed on the IWCS perimeter slopes post-IWCS construction without any problems noted.
2	[redacted] 07/07/08	The RIR deliberately excluded certain waste operations from its review of historical documents, such as the storage and disposal of KAPL nuclear reprocessing waste. Comment Details: Review of historical documents for the RIR was incomplete. Also, the RIR excluded certain past site operations from its review of historic documents, such as the storage and disposal of KAPL nuclear reprocessing waste. The RI claims to have carried out a comprehensive review of historical documents. RIR Page xxxiv. E. S.3 RI Approach. "The RI began with a records review in order to gain an understanding of historic site operations and how these operations may have contributed to potential contamination." RIR Page 1-2. 1.3 RI Objectives and Scope. "Through a series of scopes of work (SOW) which governed the RI tasks and the Technical Project Planning (TPP) process which guided the program, the following items were identified as project objectives: Conduct an historical records search ..." RIR Page 2-2 Records Review. 2.2.2. Sources. "Four hundred forty-four documents and records were reviewed during the performance of this task. Most of the documents were prepared by the DOE (or DOE contractors) and its predecessor agencies. Documents authored by the U.S. Environmental Protection Agency (EPA), USACE and other governmental entities were also reviewed. The documents reviewed are listed and summarized in Appendix D." However, Appendix D contains no documents or records directly relating to KAPL waste. Only after numerous detections of Cesium-137, a fission product associated with KAPL waste, were found throughout the NFSS was a review of KAPL documentation considered, four years after the initial records review. No search for historical KAPL records was carried out. Field Sampling Plan Addendum for the Disposal of Abandoned Drums and Collection of Additional Surface and

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		Subsurface Soil Samples, RIR NFSS, July 2003. Page 1, paragraph 2: "The activities described in this document are based on the December 2002 SOWs. The objectives for this task are to: -Further characterize contamination in the surface and subsurface soils in the EUs at the NFSS and the Niagara Mohawk Property; -Sample and dispose of abandoned drums found at the NFSS and Vicinity Property G and characterize the surface and subsurface soil in the vicinity of the drums; -Manage and dispose of investigation derived waste generated during this task.
2 (cont.)	[redacted] 07/07/08	-Review available documentation on the KAPL wastes, gamma spectroscopy results and soil and groundwater Remedial Investigation (RI) results to determine if re-analyses of surface soils collected previously should be carried out or if additional samples should be collected. (The re-analysis of samples and the collection of additional samples as a result of this review have been postponed to a later task.) " The "available documentation" refers to a 2005 summary memo prepared by KAPL management regarding the 1950's KAPL waste shipments to and from the LOOW site. However, this 2005 summary contained a number of inconsistencies and failed to show that all KAPL waste actually left the LOOW site (for Oak Ridge.) It also did not address the issue of total radioactivity contained in the waste shipments. The failure of the RIR to review all relevant KAPL documents understates the potential KAPL volumes and impact at the site.
3	[redacted] 07/07/08	Background samples were located in areas impacted by Department of Defense (DOD) and DOE activities at the LOOW. Comment Details: Background groundwater samples on Modern landfill are not valid. The RIR erroneously assumed background samples were taken in areas not impacted by DOE and or DOD activity, RIR. Page 3-12 3.8.1.2. Background Samples. "Background soil samples collected by EA for chemical analysis during the LOOW RI were also used for this RI. Tetra Tech collected additional background samples for radiological analysis. Background sampling locations were located in the buffer area of the former LOOW. These areas were considered to be representative background sampling locations since they are close to Niagara Falls Storage Site (NFSS) and are presumably un-impacted by LOOW or NFSS site-related activities."

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		RIR Page 2-2. Paragraph 1. "Wells on the adjacent Modem Landfill site were selected for background groundwater sampling. All of the Modern Landfill wells that were designated as background wells are upgradient of the Modern Landfill disposal cell." Background from Modern is not valid because: -The Modern Landfill is adjacent to the NFSS, on the Developed part of the LOOW used for DOE and DOD activities -The Modern Landfill is down-gradient of the former Lewiston Landfill, where chemical contamination has previously been identified. Background samples used in the RIR for surface water and sediment were taken at the perimeter of the NFSS, despite the prior history of contamination of the NFSS vicinity properties for both DOD and DOE contamination.
4	[redacted] 07/07/08	The RIR Groundwater Fate and Transport Model fails to account for the impact of the abandoned underground utility lines on movement in the upper water bearing zone (UWBZ), although it concludes these pipelines provide potential pathways for migration across the site. Sand lenses are not addressed. Comment Details: The RI Model for Groundwater Fate and Transport fails to account for the impact of the abandoned underground utility lines on movement in the UWBZ, although it concludes these pipelines provide potential pathways for migration across the site. Sand lenses are not addressed. RIR Page xiv Paragraph 2. "it is possible that the pipelines/subsurface utilities and surrounding gravel provide a pathway for site-related constituents to travel between EUs and may explain the existence of constituents in many of the areas. Also, many manholes are damaged and allow surface water to enter the sewer system. Finally, given the age and generally poor repair of the system, infiltration and exfiltration are likely occurring." RIR Page xlvii Paragraph 2 "Uranium isotopes are predicted to migrate offsite within 1,000 years at concentrations that exceed the screening levels in EUs 1 and 11." The theoretical times calculated for contaminant migration off site are not accurate and should be recalculated using an adjusted Groundwater Fate and Transport Model.

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		The model should also be reviewed with respect to the assumption that sand lenses are laterally discontinuous and therefore do not effect migration times. Where sands lenses are not continuous they still impact timelines.
5	[redacted] 07/07/08	The radiological groundwater plumes identified, end at the western NFSS fence line because there was no sampling beyond the fence line and insufficient sampling at the boundary. Groundwater contamination would appear to already extend further west onto the Niagara Mohawk property. Comment Details: Radiological plumes end at the western NFSS fence line because there was no sampling beyond the fence line. Groundwater contamination would appear to already extend further west onto the Niagara Mohawk property. The RIR delineates groundwater plumes surrounding the IWCS as ending at the site boundaries, but a review of the total uranium results for surface water in the West Ditch on Niagara Mohawk property shows close correlation with the total uranium groundwater plumes to the west of the IWCS; i.e., the levels of total uranium in surface water in the West Ditch increase and decrease as the ditch is followed north, according to the increase and decrease in total uranium in groundwater on the adjacent NFSS. See color map below; surface water results for total dissolved uranium are inserted at left. No groundwater samples were taken on the Niagara Mohawk property (a right of entry was in place.) Groundwater samples should be taken between the NFSS fence line and the West Ditch on Niagara Mohawk property in order to further delineate groundwater plumes.
6	[redacted] 07/07/08	Data for total uranium in surface water in the West Ditch suggests this ditch is receiving groundwater from the UWBZ. Comment Details: There appears to be close correlation between the levels of total uranium in surface water at different sampling points along the ditch and the total uranium upper level groundwater plumes on the adjacent NFSS. USACE noted the phenomenon of discharge of the upper level groundwater to the Central Drainage Ditch but not to the West Ditch. The ability of the upper groundwater to become surface water, whenever the water table is above the level of the bottom of the ditches on the NFSS provides an important additional migration path and should be incorporated into the fate and transport model for the NFSS
7	[redacted] 07/07/08	The potential for other fission products and transuranic materials to be present on the NFSS has not been adequately investigated and is a significant data gap in the RIR. Five KAPL waste streams were excluded from investigation.

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		Comment Details: The RIR identifies Cs-137 as a ROC on the NFSS, but does not appear to acknowledge the known storage of fission-product contaminated materials on site. RIR Page 5-64- 5.9.1 Transuranic and Fission Product Data Review "A review of almost 950 surface soil, subsurface soil and sediment samples was conducted to identify fission product cesium-137 and the neutron activation product cobalt-60. Both of these radionuclides are produced in nuclear reactors and are commonly present in radioactive wastes. Cesium-137 is also a common radionuclide present in fallout from aboveground nuclear weapons tests. The existence of either of these radionuclides could be an indication that fission-product contaminated materials were stored at NFSS." The KAPL in Schenectady sent six different types of nuclear reprocessing waste to the site during the 1950s. - only one of these waste streams has been considered, and only as an afterthought in the RIR.
8	[redacted] 07/07/08	The RIR omitted previously reported radium-226 sample data registering 856,000 pCi/g. Comment Details: RIR Page 5-55, paragraph 1 "The radium-226 concentration in sample SS203-003, collected approximately 80 feet south of Building 401 in EU 13, was 1,140 pCi/g - the highest radium-226 concentration measured at the NFSS. The gamma radiation at this location measured 200,000 counts per minute. This sample consisted of a single nugget, which accounted for almost the entirety of the gamma radiation measured at this location." The maximum detection for radium-226 in surface soil on the NFSS was 856,000 pCi/g at the June 2003 TPP Meeting.
9	[redacted] 07/07/08	The RIR fails to establish background values for all relevant media and excludes data (ex. Plutonium239) on this basis. The exclusion of positive detections of contaminants in this way leads to false conclusions about contamination on site. Comment Details: A core sample from Building 401 was analyzed and found to contain 5.7 pCi/g of Pu-239. The RIR does not include this detection of Pu-239 in its site-wide evaluation of transuranic and fission product data. RIR Page 55-66 "The conclusion based on available data is that americium-241, which has not been identified as a radionuclide of

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		concern (ROC) in the Baseline Risk Assessment (BRA), is not a contaminant, thus, it is unlikely that other transuranics are present in significant concentrations or are widespread in NFSS soils/ sediment. This is further supported by a review of transuranic detections at the site. For example, there were only three very low detections of plutonium 239/240 in soil out of 34 samples analyzed. These detections occurred in EU 8, EU 11 and EU 13 at concentrations of 0.322, 0.129 and 0.536 pCi/g, respectively." The RIR excludes this Pu-239 detection because no RI background level was established: RIR Page 4-2. Section 4.3.1.2. "Because no suitable background data sets for the cores or railroad ballast media were available, it was not possible to determine if any parameter in these samples exceeded background. For this reason, site-related constituents were not determined for these media."
10	[redacted] 07/07/08	The RIR reports on the discovery of several abandoned drums on the NFSS and the neighboring Vicinity Property G. One of the two drums on the NFSS contained radioactive process material. Comment Details: The RIR reports on the discovery of several abandoned drums on the NFSS and the neighboring Vicinity Property G. One of the two drums on the NFSS contained Americium, likely to be associated with KAPL waste. (Vicinity Property G drums were too deteriorated to sample.) The discovery of drums, despite prior DOE ground penetrating radar surveys, shows that ground penetrating radar can not be relied upon to detect buried drums in the NFSS clay soils. The RIR analyzed the drum contents and found one drum contained Uranium residues along with Americium-241. Since Americium-241 would not be present in a natural Uranium product, is the source of this material KAPL?
11	[redacted] 07/07/08	The Phase 2 RIR reported that gamma surveys failed to detect elevated levels of uranium and radium. The contractor cited reverse correlations in comparing gamma survey work to soil sample results. Comment Details: The Phase 2 RI indicates gamma surveys could fail to detect elevated levels of uranium and radium. The report cites

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		reverse correlations in comparing gamma survey work to actual soil sample results. Does this change Data Quality Objectives for the sampling in the RI? i.e., could areas requiring remediation be materially understated? Field Sampling Plan Addendum Revision 1, Phase 11 R1 at the NFSS, page 5. 2.3 Gamma Walkover Surveys and Resulting Phase 11 Data Needs. "During Phase 1, gamma walkover surveys were used to screen the areas surrounding each planned surface soil and sediment sample collection location to identify local "hotspots" where samples were collected. The edges of ditches and nearby areas were similarly screened prior to collection of each sediment sample. Gamma readings ranged from 7,000 counts per minute (cpm) to 126,000 cpm. There does not appear to be a good correlation between the walkover survey results and the results of radiological analysis of corresponding samples_ The correlation fails in two ways. The first failure is that a single reading from the gamma walkover survey exhibits multiple concentrations from an individual constituent, some of which exceed the screening value. As an example, for the 11,000 cpm gamma survey reading, radium226 concentrations ranged from 0.734 pCi/g to 9.49 pCi/g. Some of these concentrations are above the 2.7 pCi/g screening value. The second failure is that some gamma walkover values exhibit a reverse correlation (i.e., at 9,000 cpm uranium-238 has a value of 120 pCi/g and at 126,000 cpm the uranium-238 value is 1.8 pCi/g). This is probably due to the alpha particle disintegration of some of the isotopes (i.e. uranium-238) instead of gamma ray emissions. In a walkover survey, detection of alpha particles would be reduced by shielding effects (e.g., distance, soil water and vegetation), whereas the gamma radiation penetrates the ground cover and would be more readily detected."
12	[redacted] 07/07/08	The RIR confirms the results of the IWCS environmental monitoring program, carried out over a twenty year period -that dissolved uranium in the UWBZ is highly mobile. The groundwater modeling used for the RI fails to address the chemistry of the upper and lower ground waters and the impact this has on contaminant solubility, notably radium, thorium and uranium. The use of dissolved uranium in the upper groundwater should be evaluated as an indicator of radium and thorium subsurface contamination. Comment Details:

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		Several groundwater plumes of dissolved uranium have been identified on the NFSS. However, the RI fails to consider the geochemical issues of solubility of radionuclides in the upper and lower groundwaters, in the context of the upper groundwater being a dilute sodium/calcium/magnesium sulphate solution, while the lower groundwater is much more concentrated in sodium chloride/sulphate. The effect of groundwater chemistry on solubility and migration should be reviewed for uranium, radium and thorium and the findings incorporated in the RIR groundwater fate and transport model. Since uranium is present along with radium and thorium in the NFSS residues, elevated uranium in the UWBZ should be evaluated as a useful indicator of subsurface radium and thorium contamination. RIR Page 5-75 "Plumes of dissolved uranium were found around the northern section of the IWCS and in the area south south-southeast of the IWCS (EU 7, 10 and 11). These plumes are likely the result of site activities prior to the construction of the IWCS. The issue of radium and uranium sorption in the clay soils of the NFSS has been investigated in the past and a number of conclusions drawn, but thorium does not appear to have been evaluated. Geochemical Information for Sites Contaminated with Low Level Radioactive Wastes: I - Niagara Falls Storage Site, F. G. Seeley and A. D. Kelmers. Oak Ridge, 1984.Abstract Page 9 Paragraph 4, Page 2 Paragraphs 9 & 2. "Poor uranium sorption was exhibited by all soil/groundwater systems; maximum sorption ratios ranged from 3.9 to 9.0 L/kg at the lowest uranium solution concentrations tested and decreased to 1 L/kg at higher concentrations. One sample of soil at the 13.7m (45 ft) depth (just above bedrock) showed high uranium sorption. Uranium was very soluble in soil/groundwater systems; the apparent concentration limit was greater than 6 g/L. The high solubility was shown to be due to the formation of the soluble uranyltricarbonate anionic complex. Very high radium sorption ratios (up to 11,200 L/kg) were obtained."
12 (cont.)	[redacted] 07/07/08	"The results suggest that any uranium which is in solution in the groundwater at the NFSS may be poorly retarded due to the low uranium sorption ratio values and high solubility measured. Further, appreciable concentrations of uranium in groundwater could be attained from soluble wastes. Release of uranium via migration could be a significant release pathway. Solubilized radium would be expected to be effectively retarded by soil at the NFSS as a result of the very high radium sorption ratios observed."

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13a	[redacted] 08/25/08	Historically, background concentrations of total uranium in the upper groundwater at the LOOW site were measured off site and found to be consistently less than 3 pCi/L. (NFSS Environmental Surveillance Reports 1982-1986.) The offsite groundwater sampling locations were two residential wells north of the LOOW site, as shown in Fig 3-3, Appendix A1, (NFSS Environmental Surveillance Report, 1986.) Table 3-8, Appendix A1, "Annual Average Concentrations of Uranium in NFSS Water Samples, 1982-1986", shows on site groundwater monitoring results also support the 3pCi/l background value as being correct – several on site wells show concentrations of total uranium below 3pCi/L.
13b	[redacted] 08/25/08	The "background" concentration of total uranium in the upper groundwater at the LOOW site was artificially increased when the NFSS Environmental Monitoring Program was altered and background samples were no longer measured at off site locations. In 1987, as a change to the NFSS Environmental Surveillance Program, sampling of domestic water supply wells was terminated after first quarter results were obtained, since concentrations of uranium and radium had not exceeded 3.0pCi/L and 0.3pCi/L respectively, since 1983. Table 3-3, Appendix A2, (NFSS Environmental Surveillance Report, 1987.) For 1987, 1988 and 1989 the background concentration of total uranium in the upper groundwater was not measured, since a background of less than 3.0pCi/L had been established for total uranium. In 1990 a new on site background monitoring well, 20S, was drilled on the NFSS in the location shown in Appendix A3 and the background for total uranium immediately increased to 8pCi/l from the formerly recognized value of < 3 pCi/L. Table 3.8 and Figure 3-4, Appendix A3, (NFSS Environmental Surveillance Report, 1992.). In 1993 total uranium measured 13 pCi/L in well 20S. In 1996 a historical average value for background total uranium in the upper groundwater was calculated as 7.59 pCi/L using the data from well 20S (now referred to as B02W20S) from 1992-1996. In 1997 the historical average background for total uranium was 7.60 pCi/L (measured in 1997 as 7.68 pCi/L.) In 1998 total uranium background as measured in well B02W20S was 9.95 pCi/L. In 1999 total uranium background as measured in well B02W20S was 8.2 pCi/L. In 2000 total uranium background as measured in well B02W20S was 8.669 pCi/L. In 2001 total uranium background as measured in well B02W20S was 9.37 pCi/L.

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		In 2002 total uranium background as measured in well B02W20S was 10.30 pCi/L. In 2003 total uranium background as measured in well B02W20S was 10.60 pCi/L. In 2004 total uranium background as measured in well B02W20S was 8.83 pCi/L. In 2005 total uranium background as measured in well B02W20S was 9.81 pCi/L. In 2006 total uranium background as measured in well B02W20S was 8.200 pCi/L. From 2002 onward background was determined by averaging the results from well B02W20S for the period 1992 – 1997. According to the 2006 NFSS Environmental Monitoring Report (page 18) "Background concentrations for the upper groundwater system were determined by averaging analytical results from 1992 through 1997 for the appropriate constituents at monitoring well B02W20S. This well was selected to represent background because it is distal from and not down gradient of the IWCS. Additional background groundwater was sampled in 2003 from wells hydraulically up gradient from operations at the adjacent property of Modern Landfill. Since this data, compiled for the RI, was comparable to historic groundwater concentrations from B02W20, this well was verified to be representative of background conditions."
13c	[redacted] 08/25/08	"Background" groundwater monitoring wells used for the NFSS RI are sited on Modern Landfill, a former NFSS Vicinity Property which is known to have been previously impacted by both DOD and DOE operations, including outside storage of thousands of drums of K65. The fact that groundwater data from Modern is comparable to that from NFSS well B02W2S, does not verify that well B02W2S is representative of background conditions, but instead serves to illustrate how widespread groundwater contamination is on both the NFSS and the surrounding areas of the former LOOW site.
13d	[redacted] 08/25/08	It is important to establish an accurate value for background uranium in groundwater at the NFSS (and LOOW site) since this may impact future remediation efforts. According to the Army Corps of Engineers, in a recent paper, "Utilizing Isotopic Uranium Ratios in Groundwater Evaluations at NFSS", 2006, "Evaluating the background concentration of uranium in groundwater at NFSS is central to both determining the nature and extent of site contamination and supporting assessments of human health and ecological risks." "Cleanup decisions for groundwater can have substantial cost implications, so the ability to distinguish between ambient and those reflecting site contamination is crucial." The designated background for uranium has tripled since 1989, as a direct result of siting "background" wells in contaminated locations.
14	[redacted]	Uranium has been shown to be very soluble in the groundwater of the UWBZ at the NFSS (LOOW) site. Uranium in

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	[redacted] 08/25/08	solution is also poorly retarded by the clay soils, which contrasts with radium on site, which has been shown to be retarded by the NFSS (LOOW) clay soils. The committee believes that the first indication of contamination leaching out of the IWCS is likely to be elevated levels of uranium in groundwater. The uranium groundwater plumes in the UWBZ, immediately outside the IWCS, are therefore of great concern, particularly the plumes south of the IWCS, where the uranium levels are very high and the integrity of the clay dike is questionable.
15	[redacted] 08/25/08	In regards to the "total uranium" groundwater plume immediately south of the IWCS, the committee requests clarification of the analytical data for temporary well point (TWP) TWP833. The 2007 NFSS RIR documents sample GW-TWP833-3511 as having a concentration of 9580 ug/L of total dissolved uranium. This value does not correlate with the analytical data given for the individual uranium isotopes in the same sample. Is this a typographic error? Will USACE release a Correction Sheet? Regardless of this discrepancy, uranium concentrations in sample GW-TWP833-3511 are very high.
16	[redacted] 08/25/08	Review of the groundwater samples taken south of the IWCS and the rationale given for these samples, indicates that five TWPs were sampled to evaluate the integrity of the subsurface clay dike near the southern perimeter of the IWCS and another six TWPs were sampled to investigate the presence or absence of radiological and non-radiological compounds in the groundwater associated with Building 409. (3) Sample GW-TWP833-3511, one of the samples taken to evaluate the integrity of the southern clay dike, was found to contain high levels of uranium, casting doubt on the integrity of the dike at this location and opening up the possibility of contamination beginning to move out of the IWCS. Building 409 has been identified as a potential source of the high levels of uranium in groundwater south of the IWCS, notably that found in sample GW-TWP833-3511. However, the six groundwater samples taken specifically to investigate radiological contamination associated with Building 409 do not support this theory: uranium concentrations were all relatively low. The committee would like documentation on all further investigations that are planned concerning the issue of potential leakage of the IWCS along the southern dike. Further, what other data gaps have USACE identified in the course of their RI for the NFSS and what plans are there to address these data gaps?
17	[redacted]	The committee found the 2007 and partial 2008 surveillance data on the new Buffalo District Website. These data are being reviewed and incorporated into existing time-line analyses.

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18	[redacted] 08/25/08	The timing of the FS recommendations was discussed again. The outcome was the action to question USACE about the opportunity to present the Committee recommendations on the scope of alternatives to evaluate. (One day later the Buffalo District announced plans and an outline of the FS. This announcement implies that a contractor has been hired and the process has begun.)
19	[redacted] 04/02/08	Escape From The Residues In Buildings 411, 413 And 414 1) Failure of plugs and or leakage due to poor surface preparation and 2) Infiltration of rainwater and irrigation water into residues will produce additional leachate and 3) Failure to repair piezometers to monitor hydraulic conditions in residues. "It's understood that the sealing of subsurface pipelines associated with the former LOOW water treatment plant is a concern to the community. However, the pipe seal competence is likely longer term issues since hydraulic heads are not expected to force movement for 200-300 years." (2008, USACE: Letters 4-11 to 5-4-2008, p.3) The premise is that the model estimates of the Hydraulic heads inside the 411 foundation can be trusted without reinstallation of piezometers to validate the model. Also question posed by the RAD Radiation Committee at the USCAE Public meeting "Will the piezometer well inside the Building 411be repaired or replaced? We need the data to determine the ground water level inside the residue storage buildings and whether there is evidence of rainwater accumulation and/or seasonal variations produced by flow into and out of the structure."
20	[redacted] 04/02/08	Escape From The Residues In Buildings 411, 413 And 414 Concrete failures at location of cracks, leaks and produced by excessive loading "Additionally, wick drains were installed in the bays to dewater the residues to the extent possible and the encapsulation of the buried buildings should not produce significant structural differentials and cracking since they are removed from aerial exposure and somewhat in dynamic equilibrium with ambient geology." (2008, USACE: Letters 4-11 to 5-4-2008, p.3)
21	[redacted] 04/02/08	Escape From The Residues In Buildings 411, 413 And 414 Flow into and along foundation bedding under buildings. "The Building 411 foundation fill described in the cut-off wall log is not a sand lens." (2008, USACE: Letters 4-11 to 5-4-2008, p.3)

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		There is no data on the fill under Building 411. And "The team looks forward to more closely focusing on items that the Radiation Committee has included in their assessment as it relates to the short and long-term effectiveness in the Feasibility Study." (2008, USACE: Letters 4-11 to 5-4-2008, p.3) When radioactivity liquids flow under the buildings the scope of demolition and excavation dramatically increases the cost of remediation. It will be necessary to sample the ground water near the residue building foundations for radioactive contamination before preparing any Feasibility Studies.
22	[redacted] 04/02/08	Escape From The Residues In Buildings 411, 413 and 414 Flow into the residues from below during the spring and flow out during the dry season consequently raising and lowering the saturated zone inside Building 411 "High groundwater levels in the LWBZ will slow downward transport by "seasonally perching" the IWCS material, as driven by upward pressures in the glacio-lacustrine clay (GLC) (from the alluvial sand and gravel and fractured Queenston shale bedrock units). A weak vertical (downward) gradient through the GLC was assigned in the numerical model to conservatively accounts for this seasonal hydrodynamic effect (i.e., the downward gradient assumed all year long); again we're forcing transport in the model due to the "buttoned up" or contained nature of the IWCS." (2008, USACE: Letters 4-11 to 5-4-2008, p.3) As well as "vertical gradients vary with season, with 2/3 of the year being upward or equilibrated" (2008, USACE: Letters 4-11 to 5-4-2008, p.3)
23	[redacted] 04/02/08	Downward Leakage Past The GLC Sand pockets that penetrate the GLC "Groundwater modeling (which assumed no cutoff wall/dike existed) indicates that the sand lenses on-site are both vertically and laterally discontinuous and leaching beneath Building 411 will occur (i.e. uranium will leach above background levels) within a 200 year timeframe." (2008, USACE: Letters 4-11 to 5-4-2008, p.3)

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24	[redacted] 04/02/08	Downward Leakage Past The GLC Test borings and/or pilings under buildings prior to original building construction "The layback and fill around 411 is indicative of slab concrete foundation and not vertical excavation with piles (steel would have been too precious at that time to spend on un-needed piles - the GLC would have molded around them with time and vertical gradients vary with season, with 2/3 of the year being upward or equilibrated)." (2008, USACE: Letters 4-11 to 5-4-2008, p.3)
25	[redacted] 04/02/08	Horizontal Leakage To and Past Clay Cutoff Walls Lack of evidence that all pipes intercepting the clay cutoff walls were sealed at the wall interface "It's understood that the sealing of subsurface pipelines associated with the former LOOW water treatment plant is a concern to the community. However, the pipe seal competence is likely longer term issues since hydraulic heads are not expected to force movement for 200-300 years. Additionally, the piping to the Central Drainage Ditch is truncated by the cut-off wall that is down to ~305 ft in elevation." (2008, USACE: Letters 4-11 to 5-4-2008, p.3)
26	[redacted] 04/02/08	Horizontal Leakage To and Past Clay Cutoff Walls Lack of geophysical investigation of the cutoff wall south, east and west of Building 411 "The Geophysical Survey of the IWCS indicates no short-term competency issues (e.g. cap settling, cutoff wall/dike failure, seismic vulnerabilities, etc.) within the IWCS. USACE acknowledges that there are limitations associated with this survey methodology. These limitations were leveraged to the extent possible by integrating other geophysical survey methods. This investigation was not a stand alone integrity assessment, but used as an additional weight of evidence in our integrity investigation." (2008, USACE: Letters 4-11 to 5-4-2008, p.3) Also question posed by the RAD Radiation Committee at the USCAE Public meeting What technology will USACE use to verify the integrity of the clay wall between Building 411 and the Central drainage Ditch?
27	[redacted] 04/02/08	Horizontal Leakage To and Past Clay Cutoff Walls Poorly located monitoring wells "Lastly, contamination from seepage of the IWCS has not been identified in the Central Drainage Ditch, or upper and lower groundwater-bearing zones, further indicating that legacy piping is truncated within the IWCS; and any remnant external piping should not affect the long-term competency of the cell." (2008,

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		USACE: Letters 4-11 to 5-4-2008, p.3)
28	[redacted] 04/02/08	Horizontal Leakage To and Past Clay Cutoff Walls Hydrological model treats only the bulk properties of the soils and clay layers. Also question posed by the RAD Radiation Committee at the USCAE Public meeting: Will USACE refine the computer groundwater model with fine scale details of the wall of the buried buildings, the pipeline locations and the clay wall? The result may be dramatically different and demonstrate the sensitivity of the output to initial conditions.
29	[redacted] 04/02/08	Horizontal Leakage To and Past Clay Cutoff Walls No explanation for the above average radon flux measurements in the southeast and southwest corners of the IWCS as reported in the 2006 NFSS Environmental Surveillance Technical Memorandum.
30	[redacted] DOH 07/22/08	P1-10 The fact that there were no criteria for U or Cs-137 until 1988, which is after most of the previous NFSS cleanup was done, is troubling and raises questions about the adequacy of previous cleanups. The apparent widespread presence of surficial contamination and some subsurface contamination found at NFSS supports this concern.
31	[redacted] DOH 07/22/08	P1-11 The underdrain from Building 411 (currently storing radioactive residues) must have drained somewhere and should have been sealed. This should be documented and an indication provided that exterior drains were sealed adequately in order to last for the duration of the facilities life and that monitoring of potential leaks can occur.
32	[redacted] DOH 07/22/08	P2-6 The fact that deposits of sand and gravel up to 20 feet in thickness occur in the Brown Clay Unit is important, as that nears the total thickness of the unit. This reduces potential low-permeability protection of this layer.
33	[redacted] DOH 07/22/08	P2-11 Climate data used for NFSS monitoring and analyses should be collected on site. Use of data from Niagara Falls Air Force Base located seven miles southeast and above the Niagara Escarpment is inappropriate and is a significant data gap. The incremental cost of installing a basic meteorological station at NFSS is negligible compared to the cost of ongoing maintenance and value of site data.
34	[redacted] DOH 07/22/08	P3-3 The annual dose limit of 100 mrem/yr above background for the public is the DOE primary standard (DOE Order 54005), and applies to all exposures pathways. For NFSS, which contains a fenced storage area, some public exposure could occur only through airborne emissions. In that case, the exposure should be limited to only 10 mrem/year. If NFSS is a disposal facility, then the appropriate dose would be 25 mrem/yr. The rationale as to why the dose limit is 100 mrem/yr should be explained.
35	[redacted] DOH 07/22/08	P3-6 The fact that Outfall 2 was a banded wooden pipe suggests that there were other wooden pipes installed at the time of LOOW plant construction. The inevitable loss of integrity of the wooden pipes is a concern due to the likelihood of enhancing subsurface migration.

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36	[redacted] DOH 07/22/08	P3-7 It is stated that enough unbiased samples were collected to ensure adequate data coverage for each constituent and media in each EU for risk assessment purposes. It is not clear how the number and locations of samples were determined.
37	[redacted] DOH 07/22/08	P3-8 There is a discrepancy between the down hole gamma logging (Appendix K) and the borehole logs in Appendix N . For example, Boring 211has a depth of 15 feet bgs, but the gamma log profile shows a depth to > 131 ft. Also, SB 214. The gamma log for SB811 indicates a depth of 231 feet bgs.
38	[redacted] DOH 07/22/08	P3-9 Selection of Lew-Port school and ANG WETS as background locations for gamma radiation raises concerns since both properties were once part of the LOOW.
39	[redacted] DOH 07/22/08	Fig 3-14 The choice of background location BKGD-8 appears inappropriate since although it was in buffer areas, it was actually very close to roads and infrastructure associated with the TNT explosives storage and AFP-38 incinerator, railway and a drum storage area. There would seem to be other locations that could have been selected that were isolated from known activity areas. Use of Modern landfill groundwater wells as background also raises doubts since the Modern property was formerly associated with transport and unloading of materials in the LOOW and there was a former waste disposal area (Town of Lewiston landfill) which was not constructed to modern containment standards.
40	[redacted] DOH 07/22/08	P 3-24 In 2000, the well development protocol was changed to maximize water clarity and reduce development time. It is hard to understand how reducing the number of well volumes removed would result in better development. However, the 2003 development criteria was appropriate in determining representative groundwater was sampled.
41	[redacted] DOH 07/22/08	P3-27 The groundwater sampling protocols used were generally appropriate, however, the choice of using a bailer for volatile organic compound (VOC) collection is puzzling as it is the device with most variability and negative sampling bias.
42	[redacted] DOH 07/22/08	P3-38 Ten drums of investigation derived waste contained sufficient fission products that they required separate disposal. The locations where the material in the ten drums that contained Pu-239/240 and Sr-90 originated is not noted here. The presence of these compounds at the LOOW is significant, and efforts to determine where the material came from should be pursued.
43	[redacted] DOH 07/22/08	P4-5 Including potential outliers of radium-226 and thorium-230 at SDBKGD-2 in the sediment background data set requires further explanation. This location is at the upgradient portion of the West Ditch on NFSS, yet had the maximum sediment concentration values for radium-226 and thorium-230 found at NFSS and is located only 300 feet west of elevated radium-226 in soil (67.9 pCi/g). It would seem reasonable to conclude that this area had been affected by activities at NFSS and would not be considered to be background conditions.
44	[redacted] DOH 07/22/08	P 4-7 The methodology for determination of site-related constituents appears to include any description of, or review of historical activities and likely contaminants that might have been associated with those activities. This should be a key element of any attempt to identify site-related contaminants.

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45	[redacted] DOH 07/22/08	P 4-11 Use of groundwater monitor wells on Modern Landfill property because they are upgradient and east of NFSS is not entirely appropriate. In particular five monitor wells (PZ-21D,M and S, PZ-25S, MW-17) were chosen that are located within an area known as the LOOW classification yard, and is identified as a DOD area of concern in the DERP-FUDS investigations. Radiologic contamination of surficial soil did occur on the property now occupied by Modern landfill and has been remediated ((Bechtel National Inc., 1983; Bechtel National Inc., 1986; Keller E. L., 1981; Stukenbroeker, 1981). It seems more judicious selection of background locations could have been made.
46	[redacted] DOH 07/22/08	Fig 4-20 Very few of the groundwater locations in either the UWBZ or LWBZ do not have an exceedance of an site-related constituents.
47	[redacted] DOH 07/22/08	Fig 4-25a No soil samples are shown below 5' depth.
48	[redacted] DOH 07/22/08	The presentation of the data is organized around the 18 EU which were defined for the BRA. However, it is unclear if the designation of the EUs occurred before or after the investigation. Further clarification should be made as to the role of historical information to guide the investigation and then to divide the site into EUs after review of the data.
49	[redacted] DOH 07/22/08	p5-3 The essential human nutrients listed (Fe, Mg, Ca, K, Na) are also significant elements in minerals, and are considered major cations which make up the geochemistry of groundwater and surface water. Therefore, their importance goes beyond nutrition as they are also important in understanding groundwater conditions and processes affecting subsurface contaminant fate and transport. The statements made are not incorrect, but to imply that these elements as only of concern as human nutrients is inappropriate.
50	[redacted] DOH 07/22/08	p5-4 The discussion regarding contaminated groundwater and plumes is reasonable. It is a difficult thing to draw delineated plume maps in the shallow groundwater as the site contains many complicating factors. For example, the presence of buried pipelines or infrastructure, vertical fractures in the UCT, unknown distribution of surface releases, groundwater-surface water interaction at ditches, non-uniform sand lens distribution may all affect the follow of groundwater and hence the migration of contaminants leading to a complicated distribution. The site hydrogeologic conceptual model should reflect this complex and difficult to monitor conditions. The plume maps that are shown only place lines around the locations where contamination was discovered, and it should be recognized that this may be incomplete and simplistic.
51	[redacted] DOH 07/22/08	p 5-5 The uncertainty around the location of the radium storage vault suggests that a grid based soil sampling plan would have been more appropriate to determine if contamination is present from this historical activity.
52	[redacted] DOH	p 5-6 The presence of VOCs, metals and radionuclides at depths in soil greater than 10 feet invites explanation. If radionuclides had the sorption coefficient assigned by the modeling [HGL 2007, Science Applications International

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	07/22/08	Corporation (SAIC) 2007a] and actually migrated downward from the surface over a period of only 60 years, this would exceed expected travel times. This comment also applies to the presence of Cs-137 found in groundwater in EU1.
53	[redacted] DOH 07/22/08	Fig 5-1 to 5-4 The inferred uranium plumes shown in these figures indicate that the presence of uranium in shallow groundwater is widespread across the NFSS (with exception of northeast portion. a. The plumes are not fully delineated and could be much larger than shown. b. Elevated uranium occurs in shallow groundwater near the boundaries of the NFSS indicating either potential offsite (northwest) or onsite (from south or east) migration. c. There is a clear presence of uranium in groundwater along the west and north boundaries of the IWCS d. The interpreted elevated Uranium along buried pipelines southeast of the IWCS is likely correct, indicating the importance of buried utilities as potential groundwater pathways.
54	[redacted] DOH 07/22/08	p5-13 The fact that a former sellite manufacturing area was present should have been included in the discussion of whether sodium was a site related contaminant (and not just a nutrient). Sellite is sodium sulfite.
55	[redacted] DOH 07/22/08	p 5-19 The presence of slag or gravel and the resulting groundwater infiltration that inhibited further excavation indicates the importance of either natural or manmade deposits of coarse grained materials as groundwater pathways which could affect he migration of groundwater and contamination in a non-uniform manner.
56	[redacted] DOH 07/22/08	p 5-20 The presence of enriched uranium at a depth of 5.5 feet should be further investigated. The implications that such material is a) present and b) could have migrated or been buried to that depth is significant as it represents a different class of nuclear waste than typically associated with this site.
57	[redacted] DOH 07/22/08	sec 5.3.1.4 The figures summarizing the occurrence of site-related constituents in groundwater are Figures 4-18 and 4-19, not as shown.
58	[redacted] DOH 07/22/08	p5-21 The presence of elevated manganese or iron in groundwater does not need to be justified by the presence of elevated Mn or Fe in soil. Reductive dissolution of iron and manganese from soil is a common process that can cause elevated Mn and Fe in groundwater. The Mn plume is poorly defined since it is defined by only two locations (Fig 5-5). A more likely explanation that should be investigated is the potential presence of organic matter in the subsurface soils, or released organic compounds.
59	[redacted] DOH 07/22/08	p 5-22 Figures 5-8 to 5-12 show groundwater plumes for chlorinated ethenes and vinyl chloride. The compounds are part of the degradation chain of tetrachloroethane which occurs under reducing conditions in groundwater. The presence of methane in groundwater at MW 415A confirms that reducing conditions exist. The plume isopleths as drawn are merely interpretations as there is insufficient delineation of the plume to be confident of its extent. However, of more important significance for these VOC plumes is that the dissolved concentrations are at a level indicating the potential presence of a tetrachloroethane (PCE) fluid in the subsurface. PCE, a chlorinated solvent, behaves as a dense non-aqueous phase liquid

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		(DNAPL) in groundwater and the observed concentration of 103.3 mg/L is approaching 50 % of the solubility of PCE in water. The likely presence of a DNAPL source and dissolved plume should be further investigated in both the UWBZ and, because it is a DNAPL, the LWBZ as well. Contrary to the fate and transport modeling discussed in section 7.3.4, the modeling only addresses dissolved phases and does not account for DNAPL transport.
60	[redacted] DOH 07/22/08	p 5-26 The compound 1,1,2-TCE is likely meant to be 1,1,2-TCA (i.e. trichloroethene).
61	[redacted] DOH 07/22/08	p 5-35 Since the lone subsurface soil sample exceeded background upper tolerance limits (UTLs) for radiologic parameters, this indicates the need for further delineation at depth.
62	[redacted] DOH 07/22/08	p 5-38 The detection of RDX should be further investigated.
63	[redacted] DOH 07/22/08	p 5-49 The significance of Cs-137 in groundwater appears to have been minimized since it was observed in wells below the derived maximum contaminant level (MCL). However, what is not addressed is that Cs-137, a radiogenic isotope often associated with atmospheric fallout or nuclear fission and the KAPL waste was found in groundwater. If the Cs-137 came from atmospheric fallout (perhaps Chernobyl in 1986?) and recharged to groundwater, then it usefulness as a tracer may be important. Otherwise the presence of fission products at NFSS must be assumed.
64	[redacted] DOH 07/22/08	p 5-50 Actually, higher dissolved oxygen in MH09 would be more conducive to greater solubility and mobility of uranium, contrary to what is stated in the text. The statement in the text should be clarified.
65	[redacted] DOH 07/22/08	p 5-52 It is noted that there is a lack of soil samples collected to evaluate the high gamma areas noted. This should be investigated further.
66	[redacted] DOH 07/22/08	p 5-53 EU 12 may be wooded now, but photographs from the 1940's suggest that most land in this area had been cleared. Can it be confirmed that this area remained wooded and had no activity for the duration of the past 65 years?
67	[redacted] DOH 07/22/08	p 5-61 the presence of Pu-239 in the floor of Building 401 is significant as it confirms the presence of KAPL waste and fission products at NFSS.
68	[redacted] DOH 07/22/08	p 5-63 The presence of americium-241 in West Ditch surface water is significant. It appears that americium-241 should have been part of the analytical program for surface water at NFSS.

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69	[redacted] DOH 07/22/08	p 5-64 It appears to be a reasonable conclusion that historical operations on NFSS property have caused the impact by metals and radionuclides on the Niagara Mohawk property.
70	[redacted] DOH 07/22/08	Section 5.9 The evaluation of transuranic and fission product data raises several points for discussion. USACE created strip charts for amercium-241, cesium-137 and enriched uranium and identified "outliers." It then intends go back to the sampled locations and determine the reason for the "outlier" status. This methodology is completely backwards. The preferred and more systematic approach by the EPA, Nuclear Regulatory Commission (NRC) and DOE under MARSSIM is to start from the historical record, to determine which parts of the NFSS site are likely to be contaminated, which parts may be contaminated and which parts had no contamination. Parts of the site that were likely contaminated would be thoroughly examined, the number of samples and the gamma survey determined to give a statistically significant result. Areas with no contamination would be explored in a more cursory fashion. In this way, USACE would home in immediately on problem areas. The absence of americium-241 does not imply the absence of transuranics, such as Pu-239. This again depends on a review of the historical records. Since the waste from Schenectady was due to separation of plutonium from the waste materials, one does not expect to have a correlation. Americium-241 would generally follow the high-level waste and, to a lesser extent, the uranium product stream. Americium-241 decays to neptunium-237, not Pu-239.
71	[redacted] DOH 07/22/08	p 5-74 The conclusion that the previous remediation of West Ditch was incomplete appears correct. Transport of contaminated sediment should be investigated further.
72	[redacted] DOH 07/22/08	p 5-76 The presence of radiological and other site-related constituents in the LWBZ is significant by itself, and whether or not it exceeds its UTL is important with respect to exposure. However, the fact that it is present in the lower aquifer suggests that explanations of how it got there as it is contrary to expectations based on information in the RI.
73	[redacted] DOH 07/22/08	p 5-77 Ballast by the rail road tracks has a correlation with radium-226. USACE appears to believe it is due to slag. Another possibility is that the contamination is due to loading and unloading of railroad cars. Again, the historical record and sample locations should shed light on this issue.
74	[redacted] DOH 07/22/08	The half-lives presented in Tables 6-1 to 6-3 are not site-specific rates of degradation. Many organic compounds degrade in the environment, however, most processes are microbially-mediated and appropriate environmental conditions must be present and maintained for the degradation to occur. For example, there are important differences between degradation rate of a compound in surface water (exposed to oxygen and sunlight) compared to groundwater where conditions would be much different. Therefore if these tabulated values are to be used to infer degradation half-lives at NFSS, then only those half-lives that were determined under field and environmental conditions to be similar to NFSS should be considered. Rates derived from laboratory microcosm studies have only limited applicability to predicting degradation in

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		the field. Similarly, distribution coefficients (Kd) are not necessarily transferable between sites, or laboratory and field. Therefore, results derived from use of these tabulated values should be considered very carefully as they are unlikely to represent true behavior at the NFSS.
75	[redacted] DOH 07/22/08	p 6-2 The dismissal of acetone and 2-butanone as contaminants of concern due to "tendency to quickly degrade in the atmosphere and to biodegrade easily", and that they are potential laboratory contaminants appears unreasonable. The data was reviewed and verified as being valid. The fact that these compounds were detected decades after operations ceased at the site suggests that the assumption of rapid degradation and low migration concern are doubtful.
76	[redacted] DOH 07/22/08	p6-4 I disagree that a "complete understanding of the specific metal mobility and chemistry is beyond the scope of this RI". Knowledge of a contaminants site-specific fate and transport characteristics is precisely what the RI is intended to demonstrate.
77	[redacted] DOH 07/22/08	Section 6.6 A RIR should contain a description of the site conceptual hydrogeologic model, and is missing from this report.
78	[redacted] 09/08/08	The RI does not focus on the IWCS in proportion to the dominating concern for wastes inside and the potentials for their release. This deficiency calls into some doubt the process by which the Army Corps is remediating the NFSS.
79	[redacted] 09/08/08	If the RI Step of the NFSS project is itself inadequate, and corrections are relegated to long-term planning, the requisite long-term planning should be built explicitly into the project.
80	[redacted] 09/08/08	There is likely about as much strontium-90 as cesium-137 at the NFSS. Strontium-90 was not detected because its laboratory detection limits were set too high, about ten times as high as for cesium-137.
81	[redacted] 09/08/08	The detection level for strontium-90 was about ten times too high to meet the requirements for an appropriate RI at the NFSS. The bottom-line {} remediation levels allow one excess cancer in a million, which is the risk accepted as default in the RAIS. For this default, the limiting pathway is ingestion of milk produced by cows feeding on vegetation contaminated with up to 0.064 pCi/g of strontium-90 in soil on the site. The preliminary remediation goal (PRG) would limit strontium-90 to no more than 0.064 pCi/g in soil. For a RI of a site like the NFSS to be adequate, the minimum detection level for strontium-90 in soil samples would then be chosen as some fraction of 0.064 pCi/g, enough less than 0.064 pCi/g to allow confidence in the remediation. A smaller fraction of this 0.064 pCi/g value would be selected if the actual remediation goal might be set more conservatively, such as a subsistence farming land use scenario. A larger fraction might be selected if the actual remediation goal were less conservative, such as some re residential or industrial land use scenarios. Stakeholders, regulators, and other

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		decision makers would ordinarily be involved in selecting the target land use scenario and risk level for site remediation. Then the RAIS would allow a site-specific remediation goal for on-site contaminants such as strontium-90 in media such as soil.
82	[redacted] 09/08/08	Some of the background sampling locations were probably contaminated with site-related materials, including fission product(s). This contamination of the study background raised the levels against which site contamination was measured. This possibility of site-re related contamination of samples-collected-as background can be evaluated for the purpose of this review by separating the background soil sample locations for the RI into two categories, based on pre-LOOW land use at the background sampling locations. The Army Corps picked 16 locations outside the NFSS as representative of background for the NFSS, un-impacted by site-re related contaminants. Sample locations and rationales are described for each background location in Table 3-5 of the RIR. The description includes distance and direction from the NFSS and land use prior to establishment of the LOOW. For the purpose of this re review, four of those 16 locations were selected on the basis of great distance from likely LOOW influence and land use that might discourage storage of LOOW-related materials, or other incidental LOOW uses. Table 3, on the next page, shows the four background locations designated for this re review as more re-assured background: B001 - 1,400 feet west of NFSS, unoccupied fore rest in LOOW buffer zone. B002 - 1,800 feet southwest of NFSS, an orchard rd in LOOW buffer zone. B013 - 16,000 feet west-northwest of NFSS, always a residential area. SBK1 - one mi mile west of NFSS, "not impacted by site-specific opera rations. Sample data from these four more re-assure red background locations were compared in Table 3 to the corresponding data from the other 12 locations, designated for this re review as less-assured background Table 3 is interpreted by radionuclide, as follows: Cesium-137 - The arithmetic means of the more re-assured and the less-assured background sample results, and their statistical uncertainties, in Table 3 are more re-assured background: 0.070 ±0.012 pCi/g, less-assured background: 0.155 ±0.010 pCi/g. The mean cesium-137 in the less-assured background samples is a little mo more than twice the mean in the more re-assured background samples. The mean of the less-assured background samples is 14 standard deviations of counting uncertainty above the mean of the more re-assured background samples.
83	[redacted] 09/08/08	The buffer zone of the old LOOW is evidently contaminated with site-related fission product(s). The activity of this background contamination is probably important for setting appropriate remediation goals for the NFSS.
84	[redacted] 09/08/08	The RI fails to include radon emissions and airborne pathways. This failure needs correction.

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85	[redacted] 09/08/08	With fission products widespread at the NFSS, technetium-99 should be included as an analyte in the RI.
86	[redacted] 09/08/08	Surficial groundwater (—the unconfined aquifer—) under the NFSS generally flows into the Central Ditch and leaves the site as surface water flowing northward in the ditch.
87	[redacted] 09/08/08	Flows of surficial water in the area of interest are probably dominated by extended, lineal preferred pathways.
88	[redacted] 09/08/08	Interactions between groundwater and artificial lineal features on the NFSS should be evaluated in order to assess contaminant transport on and off of the site.
89	[redacted] 09/08/08	Problems with validation of data restrict the inferences that can be drawn from the analytical results of the RI.
90	[redacted] 09/08/08	There is no explicit basis within the RI to judge its overall validity and realism.
91	[redacted] 09/08/08	The RI generally does not satisfy the EPA Reviewer Checklist.
92	[redacted] 09/08/08	The Army Corps should have obtained a wider range of interests, viewpoints, and inputs into the remediation process in order to develop an adequate Sampling and Analysis Plan for the RI at the NFSS.
93	US EPA 08/27/08	The IWCS has a design life of 25-50 years. In 1984, DOE proposed a ten-year timeframe in which to review the integrity of the IWCS and to implement modifications as required. To date, approximately 26 years have elapsed. What are USACE's plans for periodic review of the IWCS's integrity and for any modifications to the IWCS? Besides the geophysical surveys performed by USACE to evaluate the integrity of the IWCS, is USACE considering physical inspections of the IWCS barriers (e.g., via partial trenches) to evaluate the integrity and confirm the geophysical findings?
94	US EPA 08/27/08	The groundwater radiological conditions and modeling should consider the total and dissolved phase of the radionuclides. Figures showing groundwater plumes of the total phase need to be included in the RIR.
95	US EPA 08/27/08	The source of cesium-137 in groundwater is not well determined: possibly because of insufficient availability of historical information vis-à-vis site operations and waste handling. There may be a potential cesium-137 groundwater plume

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		centered along/near the Central Ditch and extending from EU 11 to EU 2. The location' l this potential plume needs further evaluation. Also, further evaluation of plutonium-239 is recommended at least in areas containing cesium-137.
96	US EPA 08/27/08	It seems that the objectives of the DOE previous remedial actions are less stringent than those of USACE. This seems evident because USACE remedial- investigations concluded the elevated levels of radioactivity still exist within the area previously remediated by DOE. As such, it is prudent that USACE re-investigate vicinity properties. If this is not possible because of pre-existing agreements between USACE and DOE at the time of FUSRAP responsibility transfer, then other means are needed to assure vicinity properties and any other off site areas potentially impacted from former operations of the LOOW site are properly remedied.
97	US EPA 08/27/08	Given the fact that radioactivity is still found in surface water and sediment samples, it is prudent that USACE investigates off-site sediment and surface water bodies that could have been impacted by historical discharges, including the outfalls at Niagara River.
98	US EPA 08/27/08	Groundwater modeling indicates that a groundwater plume is migrating off-site. As such, we recommend that off-site groundwater monitoring wells be installed and monitored along with on-site wells routinely in quarterly bases to account for seasonal variation, including the monitoring of private wells downgradient of NFSS.
99	US EPA 08/27/08	The presence of elevated levels of total radium-226 and radium-228 in groundwater is not fully addressed in the RIR. This needs to be addressed and plume maps provided showing data of total and dissolved phases.
100	US EPA 08/27/08	At times USACE attempts to link the source of contamination found with previous site operations and storage of waste, while at other times the source of contamination in certain areas remains undetermined (e.g., the source of the groundwater uranium plumes on the north and west sides of the IWCS, the source of radium-226 and radium-228 in groundwater near the IWCS, the source of Cs-137 in certain EUs, etc.). Can the source of the plumes near the IWCS be due to the materials stored inside the IWCS? Determining the source of the contaminants will provide a better understanding of the site conditions and consequently aid in the FS and remedial action phases.
101	US EPA 08/27/08	The metals analyses method used to assess total-uranium in seems to underestimate the total-uranium concentrations when the contaminant levels are elevated. As such, when metals analyses are performed to assess total-uranium (µg/L), USACE should give consideration. to also use also use the specific activities for each uranium isotope to obtain total uranium in µg/L and compare the results of both methods to identify any potential errors, overestimates, or underestimates.
102	US EPA 08/27/08	It is prudent that USACE investigates off site areas that could have been impacted from historical discharges via run-off, pipelines, underground utilities, previous usage, and groundwater plumes.
103	US EPA 08/27/08	Given that fact that USACE still needs to re-investigate vicinity properties (e.g., groundwater, private wells, surface water, sediment, outfalls, underground utilities etc.) and address potential on-site data gaps (e.g., contaminants in groundwater and possibly intrusive inspection of the IWCS), USACE should evaluate the new findings and determine the need for revising the Baseline and Ecological Risk Assessments and groundwater modeling.

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104	US EPA 08/27/08	EPA believes that the groundwater investigations performed by USACE to date, especially in the UWBZ are interim investigations to gain some understanding of the contaminant conditions in groundwater. EPA anticipates that USACE will fully address the final groundwater conditions, on-site and off-site, after the removal of contaminant sources in surface and subsurface soil, underground utilities, and other structures.
105	US EPA 08/27/08	Section ESA, Page xxxv, Site Description: The text indicates that "the surrounding area land use consists primarily of row-crops and orchards, abandoned agricultural fields, and second-growth forests". This appears to be inaccurate as there is considerable public interest in the NFSS, particularly because the NFSS is near a growing population. Although Figure 1-7 shows the surrounding land use, it doesn't show where individual residences are located. Consistent with this comment, it can be noted that the greenery that appears toward the east and north of the site in Figure 1-12, consists of the Modern Landfill and CWM properties. Perhaps a tax map could be provided which would show the density of residential properties within the private land shown on Figure 1-7.
106	US EPA 08/27/08	Section ES.S, Page xxxvii, EU 3 and EU 4. , Acid Area: Were the acids only used in support of the DNT operations or were they also used in radiological operations such as pickling of nuclear fuel?
107	US EPA 08/27/08	Section ES.7: Did the BRA include the toxicity risk from the uranium isotopes? If not, then the toxicity risk assessment should be included.
108	US EPA 08/27/08	Section ES.7, Page xlvi, lst paragraph. The risk to the subsistence farmer from pipeline and subsurface utilities assumes limited exposure time. This may change in the future scenario should contaminants within such utilities be relocated in the future due to construction or disturbance of such lines. Therefore, exposure of subsistence farmer to contaminants identified in such utilities may need to be considered.
109	US EPA 08/27/08	Section: ES.7, Page xlvi 1st paragraph: Even when contaminants in groundwater may meet the human health risk criteria, USACE should address the presence of contaminants in groundwater to meet the MCLs set forth in the Safe Drinking Water Act.
110	US EPA 08/27/08	Section ES.9, Paragraph xlvii, 2nd paragraph: It is unclear why groundwater samples were not collected from EU 9. Please explain given that there is a groundwater plume near the western boundary of EU 7 that abuts the eastern boundary of EU 9 and that radiological contamination was found on the banks of the West Ditch that is located in EU 9. Future groundwater sampling in EU 9 should be considered.
111	US EPA 08/27/08	Section 1.5, Page 1-4, 2nd paragraph: The paragraph states, in part, "Radioactively contaminated soil from a vicinity property was excavated and placed on the R-10 pile in 1981. "The DOE remedial objectives of 1981 may not meet the current USACE objectives that are set to meet CERCLA standards. As such, the RIR needs to specify which vicinity property is referred to in this paragraph and USACE should consider revisiting such property, re-assess the radiological conditions, and take the necessary actions to ensure the protection of the public health and the environment.
112	US EPA 08/27/08	Section 1.5, Page 1-4, 4th paragraph,: The paragraph states, in part, "The residues containing low levels of radioisotopes (K-65, L-30, and F-32) were placed into the IWCS... " It's unclear what is meant by the term "low levels" in this sentence

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		when historical data indicates radium-226 concentrations as high as 500,000 pCi/g, especially when in the remainder of the RIR refers to sampling results of much lower concentrations as elevated levels. Please explain or revise
113	US EPA 08/27/08	Section 1.5.3.1, Page 1-9: The radiological surveys performed by AEC in 1970 within the LOOW boundary were conducted by using a sodium iodide gamma detector held at a height of one meter above the ground surface. Such surveying method is inefficient to identify contamination in surface soil; and mostly ineffective to identify contamination in, subsurface soil. Therefore, USACE should consider re-investigating the former AEC; surveyed areas and; if necessary, conduct a historical site assessment for all suspect area, that are located outside the current NFSS site boundary. Given that USACE identified elevated levels of contamination in previously remediated areas within the NFSS, it is more likely to identify contamination in previously remediated areas outside the NFSS.
114	US EPA 08/27/08	Section 1.5.3.2, Page 1-9: It is unclear if the DOE considered a review of archive aerial photographs as part of their study of the NFSS to identify any potential fill areas. It seems that USACE based their historical site assessment (HSA) on previous work and records obtained from the DOE and it is unclear if a review of archive aerial photographs was part of the HSA. If the HSA did not include a review of archive aerial photograph; then such a review is recommended to identify any potential undocumented areas: - Otherwise, USACE should state that the HSA included a review of' archival aerial photographs and discuss the findings.
115	US EPA 08/27/08	Section 1.5.3.2, Page 1-11, 2nd paragraph: Previous remedial actions performed by DOE seem to be conducted under the objective of meeting only general dose rate action levels attributed to external radiation. This can be supported by USACE RIs, which concluded that elevated levels of radioactivity still exist in previously remediated areas within the NFSS. As such, USACE should consider re-investigating all vicinity properties previously remediated by DOE to meet USACE remedial action objectives.
116	US EPA 08/27/08	Section 3.1, Page 3-4, 1st paragraph: Given that the ditches are inundated 50% of the year, were the inaccessible areas investigated? If not, inaccessible areas should be investigated in future field activities.
117	US EPA 08/27/08	Section 3.4.3.3, Page 3-9: While sampling, pebbles were removed from the sample. At times, the radioactive material could be in the form of chunks of slag. After removing the pebbles, were they scanned prior to discarding them?
118	US EPA 08/27/08	Section 3.12.2.3, Page 3-31: Given the previous site operational history, the outfalls at Niagara River need to be investigated.
119	US EPA 08/27/08	Chapter 4, TABLES: A footnote needs to be included for all applicable tables associated with Chapter 4 to explain the meaning of the dashed lines "—". Do the dashed lines mean the ROC or COC wasn't detected or wasn't analyzed for? Please define the meaning of the dashed lines.
120	US EPA 08/27/08	Chapter 4, TABLES: The tables associated with the surface soil results include surface soils collected from a depth 0-0.5'. While the tables associated with subsurface soil include all surface and surface soil samples collected from a depth of 0-10'. This provides an overlap of data presentation. Although this type of presentation may be beneficial for the BRA, the data should be provided separately in the RIR (e.g., surface soil includes data for samples collected from 0-0.5', and

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		subsurface soil includes data for samples collected from 0.5-10') to aid in identifying the source of the groundwater plume. More importantly, the depth of contamination is essential for the purpose of groundwater modeling and the way the data is presented makes it difficult for others to reuse the data in groundwater modeling efforts. The soil data should be separated accordingly without an overlap of the results. It would be very beneficial if a table is provided indicating the depth of every individual sample.
121	US EPA 08/27/08	Sections 4.4.2, Page 4-7, Step 1: The paragraph states "the frequency of detection for each parameter in each data set was determined. Parameters that were not detected in at least 5 percent of the samples in each EU/medium were dropped from further evaluation and were not considered to be site-related constituents ". Screening site-related constituents based on the frequency of detection may be an acceptable method only when sufficient sampling locations are considered to define the extent of contamination. EPA believes that additional sampling locations need to be installed to define groundwater plumes in on-site and off-site areas. Therefore, it may be premature to eliminate contaminants from the list of site-related constituents when more data is needed, especially the deletion of radium-226 and radium-228, which are the primary on-site contaminants and are found at elevated concentrations on EU 4, EU 10 and EU 11. Further, USACE should give consideration to mitigating contaminants found in point-source areas.
122	US EPA 08/27/08	Chapter 5: The total-uranium sediment/soil sample results are reported in units of µg/g. While EPA understands the purpose of reporting the total-uranium groundwater sample results in µg/L, it is unclear of what is the benefit of reporting soil/sediment samples results in units of µg/g.
123	US EPA 08/27/08	Section 5.1.1, Page 5-3, 3rd paragraph: This paragraph talks about the use of total uranium in µg/L rather than the sum of the uranium isotopes in pCi/L. We understand that the total uranium results in µg/L reported in the RIR were obtained via the metals analytical method instead of obtaining it by using the specific activities for each uranium isotope to convert the total uranium from pCi/L to µg/L. We also understand that the conversion factor of 0.9 to convert the total uranium from pCi/L to µg/L as stated in the Drinking Water Act can't be used because this factor only applies to natural uranium, whereas the uranium at NFSS is not natural and thus the isotopic uranium ratios differ. EPA performed a comparison between total uranium results obtained via the metals analytical method and those calculated by using the specific activities for each uranium isotope to determine the appropriateness of the metals analytical method. The results are included in Table 1, which is attached at the end of the comments. Overall the metals analytical method seems to be an appropriate method to estimate total-uranium with some comments, which are listed below. - The total total-uranium results for EU6 seem to be underestimated by approximately 30%. We recommend using the individual uranium specific activities to calculate total uranium when there is a significant difference between the results. - The maximum detected dissolved total-uranium result for EU 10 appears to be entered incorrectly (Table 4-104). This number may need to be 958 µg/L instead of the reported value of 9580 µg/L. Please check the number and revise if necessary. If there is a significant underestimate between the revised number and the calculated number,

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		then the calculated number should be used. Note that the dissolved total-uranium result of 9580 µg/L is also reported in Table 4-118. - The total total-uranium results for EU 10 seem to be underestimated by approximately 60%. We recommend using the individual uranium specific activities to calculate total uranium when there is a significant underestimate between the results. - The dissolved total uranium results for EU 11 seem to be underestimated by approximately 63%. We recommend using the individual uranium specific activities to calculate total uranium when there is a significant underestimate between the results. - The dissolved total-uranium results for EU 13 seem to be underestimated by approximately 21%. We recommend using the individual uranium specific activities to calculate total uranium when there is a significant underestimate between the results.
124	US EPA 08/27/08	Section 5.1.1, Page 5-3, last paragraph: This paragraph talks about the use of total and dissolved radionuclide concentrations in groundwater plumes and modeling. It is unclear why the total radionuclide concentrations were only used to define the plume and were excluded from the groundwater modeling. USACE has collected data on the groundwater chemistry (i.e., carbonate, sulfate, phosphate, fluoride, chloride, silicate, pH, etc) that can influence the solubility and insolubility of radionuclides in groundwater. As such, both total and dissolved data along with the groundwater chemistry should be used in the groundwater modeling.
125	US EPA 08/27/08	Section 5.2 (EU 1 and 2), Page 5-4: Certain soil samples collected from EU 1 exhibited trace amounts of Cs-137 which may be attributed to the storage of KAPL waste in this EU. Therefore, because KAPL waste also included plutonium, then the soil in this EU should be investigated for the potential presence of plutonium.
126	US EPA 08/27/08	Section 5.2 (EU 1 and 2), Page 5-4: It is unclear whether groundwater samples collected from EU 1 were analyzed for Cs-137 and plutonium isotopes (Table 4-96). Given that there is a groundwater plume migrating from EU2 towards EU 1 and the fact that Cs-137 was identified in EU 2 groundwater at a maximum concentration of 61.5 pCi/L, groundwater samples collected from EU 1 should be analyzed for both Cs-137 and Pu-239 and those collected from EU 2 should also include the analyses for Pu-239.
127	US EPA 08/27/08	Section 5.2 (EU 1 and 2), Page 5-4: Given the fact that there is a plume along the northern boundary of EU 1, off-site monitoring wells north of EU 1 are necessary to identify and delineate a potential off-site plume.
128	US EPA 08/27/08	Section 5.3 (EU 3 and 4), Page 5-14: It is unclear why the dissolved analyses for all radionuclides are not reported in Table 4-9 for EU 3. Please included such results or explain why the dissolved analyses were not performed/included.
129	US EPA 08/27/08	Section 5.3 (EU 3 and 4), Page 5-14: Cs-137 was identified in surface soil and in groundwater while it was not identified in subsurface soil. Therefore, there is a chance that Cs-137 was either missed in subsurface soil or the Cs-137 in surface soil is isolated from that identified in groundwater, thus raising the possibility of a Cs-137 groundwater plume entering EU from another EU. Further evaluation for potential Cs-137 plume in groundwater may be necessary.

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130	US EPA 08/27/08	Section 5.3 (EU 3 and 4), Page 5-14: A maximum concentration of total radium-226 and total radium-228 of 10.7 pCi/L and 70.4 pCi/L, respectively, are identified in the groundwater of EU 4. It is unclear why a figure to show a radium plume for EU 4 is not provided in the RIR. Such figure should be provided.
131	US EPA 08/27/08	Section 5.3 (EU 3 and 4), Page 5-14: The elevated concentrations total radium-226 and radium-228 need to be addressed in this section.
132	US EPA 08/27/08	Section 5.5.1.4 (EU 8), Page 5-38: In addition to the uranium plume in groundwater, there is a potential to have a radium plume. That is, the sum of thorium-230 and thorium 232 may slightly exceed 5 pCi/L. Because both of the aforementioned thorium isotopes are parents to radium-226 and radium-228, respectively, there is a potential ingrowth of radium that may exceed the MCL in the future. Further groundwater sampling of thorium may be needed in this EU.
133	US EPA 08/27/08	Section 5.6.1.4, 2nd bullet (EU 7, 10 and 11), Page 5-49: The uranium plume found on the south side of the IWCS may be associated with the sanitary sewer and water lines, while the uranium plumes found on the north and west sides of the IWCS are not associated with any source. The source of such plume needs to be identified and reported in the RIR.
134	US EPA 08/27/08	Section 5.6.1.4, (EU 7, 10 and 11), Page 5-49: In Table 4-118, the total and dissolved radium-226 concentrations collected from monitoring well GWTWP851-3565 are 2.59 and 2.75 pCi/L, respective. The "equality" in such results suggests that radium-226 may be present in a soluble form. Yet, four other wells exhibiting total radium-226 concentrations ranging from 4.58 to 11.3 pCi/L, don't have reported results for dissolved radium-226. Similarly, a total of seven monitoring wells exhibiting elevated concentrations of total radium-228 ranging from 8.59 to 126 pCi/L did not have dissolved radium-228 data reported in the RIR. Please explain if whether groundwater samples exhibiting elevated concentrations of total radium-226 and radium-228 were also analyzed for dissolved radium-226 and radium-228. Analyses on dissolved radium-226 and radium-228 must be performed on those samples that exhibited elevated concentrations of total radium-226 and radium-228.
135	US EPA 08/27/08	Section 5.6.1.4, 4th bullet (EU 7, 10 and 11), Page 5-49: This paragraph discusses the detection of elevated concentrations of Cs-137 in EU 10 during the phase 2 sampling activities and then Cs-137 was not detected during the phase 3 sampling activities. The reasoning of such behavior and the source of Cs-137 in EU 10 should be discussed.
136	US EPA 08/27/08	Section 5.6.1.4 (EU 7, 10 and 11), Page 5-49: Elevated concentrations of radium-226 and radium-228 were identified in EU 10 groundwater samples, yet neither the results nor the source were discussed in this section. The results and the source of the elevated radium concentrations need to be addressed in this section.
137	US EPA 08/27/08	Section 5.6.1.4 (EU 7, 10 and 11), Page 5-49: A sufficient number of wells exhibiting total radium-226 and radium-228 in excess of the MCL in EU 10 and at least two wells in EU 11 we identified. Yet no figures were provided to show the plumes for radium-226 and radium-228. Such figures need to be included in the RIR.
138	US EPA 08/27/08	Section 5.9.4.1, Page 5-66: The paragraph states, in part, "For example, there were only three very low detections for plutonium 239/240 out of 34 samples analyzed. These detections occurred in EU 8, EU 11, and EU 13 at concentrations of '0.322, 0.129, and 0.536 pCi/g, respectively." This section needs to address the plutonium-239 concentration of 5.72

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		pCi/g that was found in Railroad Ballast and Core Samples, which is listed in Table 4-2 of the RIR.
139	US EPA 08/27/08	Section 5.9.5, Page 5-72: Further evaluation of fission products in the UWBZ is recommended, especially Cs-137 and to a lesser extent Pu-239 unless new data reveals significant changes in the levels of plutonium.
140	US EPA 08/27/08	Section 5.10.1.2, Page 5-73: Although the maximum concentration (i.e., 3.66 pCi/L) of radium-226 may not be too significant under the current discharge conditions, consideration should be given to historical off-site surface water discharges where radiological concentrations could be more significant, which can be supported by the presence of much higher levels of radioactivity in sediment samples collected from the on-site ditches. Therefore, USACE should consider investigation off-site sediment and surface water bodies.
141	US EPA 08/27/08	Section 5.10.1.3, Page 5-74: USACE should consider investigating off-site sediment and surface water bodies that could have been potentially impacted by historical off-site discharges.
142	US EPA 08/27/08	Section 5.10.1.4, Page 5-74: The presence of elevated concentrations of radium-226 and radium-228 found in many monitoring wells collected from the UWBZ should also be discussed in this section.
143	US EPA 08/27/08	Section 6.3, Page 6-6, 3rd paragraph, 1st sentence: This may be true under current conditions. Future scenarios where the sediment may be relocated and thus increasing the exposure duration should be considered to assess the risk and the need for remedial action or institutional controls. Also, off-site sediments that could have been impacted by former discharges should be investigated and the associated risks assessed.
144	US EPA 08/27/08	Section 6.4, Page 6-7, 2nd paragraph, 3rd sentence: Off-site surface water should be investigated and the associated risks assessed.
145	US EPA 08/27/08	Section 6.6, Page 6-8, 1st paragraph: USACE should also consider including off-site groundwater monitoring in their annual monitoring report. Figure 4-9 of Appendix E of the RIR shows locations of private wells within a 3 ½ mile radius of NFSS in 1994. As a safety measure, USACE should also consider monitoring private well #2, which is located north-northwest at a distance of 1 ½ miles downgradient of NFSS.
146	US EPA 08/27/08	Section 6.6.1, Page 6-9, 1st paragraph: It is unclear if the groundwater modeling considered the scenario where no maintenance is performed on the IWCS and the failure of engineering controls. Such scenario should be considered to determine the impact of the IWCS on the environment and the surrounding community when maintenance of the IWCS stops and engineering controls fail.
147	US EPA 08/27/08	Section 6.6.1, Page 6-10, top of page: It is unclear why only the dissolved concentrations were used to define the isoconcentrations (i.e., the shape and extent of the plume). This may be acceptable for the purpose of the BRA when assuming the water as a drinking water source (filtered water). However, addressing only the dissolved phase may not be sufficient (i.e., when irrigation is considered as an exposure route in the resident farmer scenario). Further, addressing only the dissolved phase may be insufficient to identify and delineate any potential groundwater plume. As such, the BRA should consider both the dissolved and the suspended phase (total) of radionuclides in groundwater. Also, the RIR should include figures to show any potential plumes associated with the suspended phase. It is prudent to understand the

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		groundwater chemistry and explain the behavior of radionuclides in groundwater (e.g., why higher levels of radionuclides are found in the suspended phase than a dissolved phase or vise versa, and how the radionuclide solubility level changes based on the groundwater chemistry). Off-site groundwater monitoring wells may be needed should the findings identify a groundwater plume, whether suspended or dissolved, exiting the site boundary.
148	US EPA 08/27/08	Section 6.6.2, Page 6-10, 1st sentence: It would be beneficial if a sentence is added to list the considered four failure scenarios.
149	US EPA 08/27/08	Section 7.1.5, Page 7-3, groundwater: The BRA should also address the toxicity risk from uranium.
150	US EPA 08/27/08	Section 7.3.4, Page 7-12, groundwater: Total radium-226 (monitoring well GW313-747 exhibited 10.7 pCi/L) and radium-228 (monitoring well GW313-747 exhibited 70.4 pCi/L) concentrations in excess of the MCL were identified in EU 4 (see Table 4-99 and Table 4-113). This should be discussed in this section of the RIR. Further assessment of radium in EU 4 is necessary.
151	US EPA 08/27/08	Section 7.3.7, Page 7-21, Groundwater Fate and transport Modeling, 2nd paragraph: The paragraph states, in part, "It is concluded that existing reported radium concentrations in EU 7/10 plume are less than the MCL now (considering both total and dissolved results)…". This statement may not be true as concentrations ranging from 5.35 to 126 pCi/L of total radium-226 and radium-228 were measured in EU 10. Also, the same consideration (e.g., total and dissolved) should be given to all radionuclides in all EUs.
152	US EPA 08/27/08	Section 7.3.10, Page 7-28, groundwater: Total radium-226 (monitoring well GW-TWP830-3502 exhibited 10 pCi/L, GW-TWP852-3568 exhibited 5.35 pCi/L, and GW-TWP856-3580 exhibited 11.3 pCi/L) and radium-228 (monitoring wells GW102-745, GW-TWP830-3502, GW-TWP831-3505, GWTWP853-3571, GW-TWP854-3574, GW-TWP856-3580, and GW-TWP858-3586 exhibited concentrations ranging from 8.59 to 126 pCi/L) concentrations in excess of the MCL were identified in EU 10 (see Table 4-104 and Table 4-118), This should be discussed in this section of the RIR and included in the plume figures. Further assessment of radium in EU 10 is necessary.
153	US EPA 08/27/08	Section 7.3.10, Page 7-28, Groundwater Fate and Transport Modeling: Be specific as to what will be the basis of using a different Kd during the FS (e.g., measurements to determine a site-specific Kd).
154	US EPA 08/27/08	Section 7.3.11, Page 7-32, Groundwater Fate and Transport Modeling: The modeling results should specify how far out south will the plume migrate off-site.
155	US EPA 08/27/08	Section 7.3.17 (EU 17): This is a site wide EU for all media. It is unclear why only the groundwater media is addressed in this section. The remaining media (surface soil, subsurface soil, surface water, sediment, and pipelines are underground utilities) should be included in this section.
156	US EPA 08/27/08	Chapter 7: Under the "Recommendations" sections of each EU, USACE indicates the medium/media that needs further evaluation in the FS. It is unclear what the "further evaluation" will comprise, that is, does it mean evaluating alternatives of Action, No Action, and so on, or does the evaluation also include further investigations prior to evaluating

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		the alternatives. Certain media (groundwater as an example), areas (on-site and off-site), and certain parameters (radium-226, radium-228, Cs-137, and Pu-239) need further assessment prior to evaluating alternatives in the FS. EPA recommends that USACE address such data gaps prior to evaluating the associated alternatives in the FS.
157	US EPA 08/27/08	Chapter 7: It would help if the "Nature of Occurrence" sections for each EU, differentiated between chlorinated and non-chlorinated VOCs.
158	US EPA 08/27/08	Section 7.3.17, Page 7-48, 1st paragraph: The paragraph talks about the plumes located northwest and southwest of the IWCS. The plumes on the north and west of the IWCS should be addressed as well.
159	US EPA 08/27/08	Section 7.3.17, Page 7-49, Groundwater Fate and transport Modeling, last paragraph: The paragraph states, in part, "It is concluded that existing reported radium concentrations in EU 7/10 plume are less than the MCL now (considering both total and dissolved results)... ". This statement may not be true as concentrations ranging from 5.35 to 126 pCi/L of total radium-226 and radium-228 were measured in EU 10. Also, the same consideration (e.g., total and dissolved) should be given to all radionuclides in all EUs.
160	US EPA 08/27/08	Editorial- Page xxxviii, EU 12, 2nd line: Replace "…central portion this EU…" with "..central portion of this EU…".
161	US EPA 08/27/08	Editorial- Section ES. 9, Page xlvii, last paragraph: Delete the extra period "." at the end of the paragraph.
162	US EPA 08/27/08	Editorial- Section 2.3, Page 1-2, 8th bullet: The more appropriate acronym for "Screening-Level Ecological Risk Assessment" is SLERA. Consider replacing SERA with SLERA.
163	US EPA 08/27/08	Editorial- Page 3-3, 4th paragraph: Replace "extend" with "extent".
164	US EPA 08/27/08	Editorial- Page 3-3, Section 3.2, 1st paragraph: Replace "horizontal and vertical datums" with "horizontal and vertical data". Also, replace "…surface and vertical datum…" with "..surface and a vertical datum…".
165	US EPA 08/27/08	Editorial- Page 5-28, 2nd line of 2nd paragraph: Replace "…gamma walkover or were random samples…" with "…gamma walkover or where random samples…"
166	US EPA 08/27/08	Editorial-Page 6-8, Section 6.6.1, subsection 1: Delete extra period "." at the end of the paragraph.
167	US EPA 08/27/08	Editorial- Section 7.1.5, Page 7-3, last paragraph: The more appropriate acronym for "Screening-Level Ecological Risk Assessment" is SLERA. Consider replacing SERA with SLERA.
168	US EPA 08/27/08	Editorial- Section 7.2.2, page 7-4, 2nd paragraph: Replace "strontium-190" with "strontium-90".
169	US EPA 08/27/08	Editorial- Section 7.3.16, Page 44, Relation to history: Replace "…that would were…" with "..that were..".

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170	US EPA 08/27/08	Editorial- Table 3-7 and 3-18: Under the “Analyses” column, replace “exposives” with “explosives”.
171	US EPA 09/16/08	It is inappropriate in the BRA to compare the detected contaminant concentrations to background concentrations when identifying site-related constituents. Recommended risk assessment policy does not provide for background comparison as a method to select contaminants of concern (COCs) in the human health or ecological risk assessment. The EPA recommended policy is to include all radionuclides and chemicals that exceed human health and ecological risk-based screening values in the risk assessment and discuss any comparisons to background in the Uncertainty Section of the report. This could result in the addition of radionuclides or chemicals to the list of site-related constituents and potentially increase the calculated values of the BRA.
172	US EPA 09/16/08	The drinking water exposure parameters for the subsistence adult and child and the resident adult and child of 2.3 and 0.5 L/day are not recommended by EPA Region 2. An adult drinking water ingestion rate of 2 L/day and a child's ingestion rate of 1 L/day are the recommended values. The use of these values in the risk assessment calculations will change the cancer risk and non- cancer hazard index (HI) values (which are already greater than target levels) for the receptors potentially exposed to groundwater.
173	US EPA 09/16/08	The equation for the calculation of the PRGs for the subsistence farmer could not be found in the appendices of the BRA. EPA would like to check this equation so that a spot check of the PRGs can be performed.
174	US EPA 09/16/08	For illustration purposes only, the upper water-bearing zone groundwater chemical concentrations should be compared to surface water screening criteria in the ecological risk assessment to determine if any potential exceedances may exist.
175	US EPA 09/16/08	The SLERA contains 'a Weight of Evidence Assessment (Section 4.6) that attempts to understand the contexts of the risks based on various pieces of evidence and aims to "extend the separate findings from risk assessment towards the holistic view of risk management." Risk management is something that needs to be presented in a separate; document (e.g. Technical Memo or the FS) where the risk assessment results and other considerations (economic, future land use, community acceptance, etc.) are discussed and weighed to determine if remedial actions are necessary. Since this Weight of Evidence Assessment presents information for use in risk management decisions, it should be removed from this risk assessment report.
176	US EPA 09/16/08	There should be an explanation in the ecological risk assessment as to why carnivorous fish are not included as receptors of concern. It seems that the aquatic habitats at the site may not be suitable for fish survival but it is not stated specifically
177	US EPA 09/16/08	The statements presented in Section 4.2.1.1 Terrestrial Habitats need to be verified. The section states that areas of the site exhibit wetlands characteristics but their federal jurisdictional status has not been determined. The conclusion of the section is that "... no federally designated wetlands exist on NFSS (NYSDEC 2004)." It seems that wetlands delineation is necessary for the site to determine if federally regulated wetlands are present or absent.
178	US EPA 09/16/08	The BRA addresses the on-site conditions and the potential migration of contaminant to off-site locations. There is a potential for the presence of contamination at vicinity properties, off-site underground utilities, and at outfall locations

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		that are not addressed in the RIR or the BRA. The off-site areas should be investigated and the BRA revised or amended if deemed necessary.
179	US EPA 09/16/08	At other sites, when radium-226 or radium-228 are present, elevated levels of radon-222 and radon-220 where measured in people's homes due to site related contamination. At times, the contaminated material was brought indoors and reused in the house structures. Other times, the radon entered the homes via, cracks, unfinished floors, or basement sumps. Please, provide a justification why the radon pathway was not considered in the BRA given that radium-226 is the primary site contaminant.
180	US EPA 09/16/08	Page 1-2, Section 1.1: The strategy and objectives are tailored to address the contaminants with the NFSS site boundary and the potential for off-site contaminant migration. Depending on the results of future off-site investigations, the strategy and objectives may need to be expanded to include vicinity properties, underground utilities, and outfalls. Also, off-site groundwater monitoring and sampling is necessary as the groundwater modeling may not be appropriate for this application.
181	US EPA 09/16/08	Page 3-3, Section 3.1.1, last paragraph: The paragraph discusses the finding of the hot rock about the size of a dime that contained over 800,000 pCi/g of radium-226 and similar elevated concentrations of other radionuclides. The paragraph then provides a justification that such results were not used in the risk/dose assessment because the rock was effectively removed. USACE needs to discuss the likelihood of similar rocks to be present in surface and subsurface soils at the site or consider including such results in the risk/dose assessment.
182	US EPA 09/16/08	Page 4-13, Section 4.2.4.1, Section 4.2.4.1, Soil Dwelling Invertebrates Terrestrial Exposure Class: The fact that earthworms and other soil dwelling invertebrates serve as food items for insectivorous birds and mammals can be added to this section.
183	US EPA 09/16/08	Page 4-16, Section 4.2.4.2, Aquatic Biota-Eating Predator Exposure Class: An upper trophic level fish species is missing as a selected receptor of concern for this exposure class. There should be a discussion of the reason(s) why no fish are evaluated through the food chain pathway. This comment relates to the General Comment mentioned above.
184	US EPA 09/16/08	Page 4-19, Section 4.3.2.1. Screening Steps for COPCs, Steps 2 and 3: Both of these screening steps state that HQs should be summed " ... separately for organic and inorganic COPCs to obtain HIs for soil, sediment, and surface water." EPA ecological risk assessment guidance recommends that all HQs be summed together to calculate a Hazard Index.
185	US EPA 09/16/08	Page 4-19, Section 4.3.2.1, Screening Steps for COPCs, Step 3: This step states that the lower of the RME or maximum concentration will be used to calculate average daily doses. EPA guidance recommends that the average concentration be used in the risk assessment calculations when the maximum concentration is not used (less conservative screening).
186	US EPA 09/16/08	Section 4.3.2.3. Exposure Evaluation for COPCs: The ADD equations need to be revised to include parentheses around the BAFs or BCFs and the corresponding media/biota intake value.
187	US EPA 09/16/08	Page 4-21, Section 4.3.2.3, Exposure Evaluation for COPCs: The ADD equation for terrestrial animals needs to be corrected; the term BCFa is present in the equation and BAFa in the definition of terms.

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188	US EPA 09/16/08	Table 2.2: There is no information on the source of the toxicity values used in this table. They should be included so that these values can be verified as the most up to-date EPA approved values.
189	US EPA 09/16/08	Table 2.6: The resident child HI from ingestion of food items of 0.08 does not agree with the value of 0.8 presented on page 2-41. Please correct this discrepancy.
190	US EPA 09/16/08	Table 2.7: The total RME ILCR for the construction worker presented here is 1.4E+02. The correct value should be 9.4E-04. Please correct this discrepancy.
191	US EPA 09/16/08	Table 2.8: The subsistence farmer adult and child HI values from ingestion of food items of 0.1 and 0.3 do not agree with the values presented on page 2-45 (0.01 and 0.03). Also, the recreational adolescent HI from exposure to surface soil of 0.0004 does not agree with the value on page 2-47 of 0.0003. Please correct these discrepancies.
192	US EPA 09/16/08	Table 2.10: The surface water HIs for the construction worker and maintenance worker of 0.00005 do not agree with the values (0.00004) presented on pages 2-52 and 2-53. Please correct this discrepancy.
193	US EPA 09/16/08	Table 3.7 through Table 3.17: The footnotes state "Values are provided if the exposure pathway is identified as complete in the conceptual site model, otherwise "--" is shown". For all the receptors, sometimes either %-" is shown for risk with the associated dose or vise-versa. It is unclear how can the exposure pathway can be identified for the dose assessment and not identified for the risk assessment or vise-versa. Please revise or explain with justification.
194	US EPA 09/16/08	Table 4.2: a) The management goals for both the terrestrial and aquatic populations and communities mention "... past MED activities"; this should be changed to NFSS instead. b) The decision rules for assessment endpoints 3, 4, 5, 6, 7, and 8 are missing text describing the outcome if the sum of fractions or sum of HQs is greater than 1. c) Assessment Endpoint 7 is missing the selected receptor of mallard duck.
195	US EPA 09/16/08	Table 4.3 through Table 4.11: Conservative wildlife exposure parameters need to be used in the calculation for average daily dose in a SLERA. In order to maximize the dose, the minimum body weight and the maximum ingestion rate for each selected receptor needs to be used. A review of these tables indicates that several average values (body weight, food ingestion rate, and water ingestion rate) were used instead of the most conservative values for the short-tailed shrew, red fox, red-tailed hawk, mallard duck, raccoon, great blue heron, and eastern cottontail. The American robin had its diet divided into a plant fraction and animal fraction of 50% each. In order to be conservative, the most contaminated dietary component, either plant or animal, should be used as 100% of the diet.
196	US EPA 09/16/08	Throughout the more appropriate acronym for Screening-Level Ecological Risk Assessment is SLERA. Consider replacing "SERA" with "SLERA".
197	NYSDEC 09/12/08	Page 1-4, last paragraph: With respect to ARARs, New York state requirements should also be taken into account.
198	NYSDEC	Page 2-4, Section 2.2.2.1. first paragraph: Why weren't recent soil borings by CWM (post 1993) or USACE's FUDS

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	09/12/08	contractor (EA Engineering) reviewed as part of the program?
199	NYSDEC 09/12/08	Page 2-6, Section 2.2.2.2,. Figures 2. 10, 2.11, 2.12: Although these Figures may be better presented as 3 dimensional animations on a computer, they do not translate well in two dimensions. Traditional Isopach or surface contour maps of the different unconsolidated deposits may better present the underlying geology.
200	NYSDEC 09/12/08	Page 2-7, Section 2.2.2.3.2, third paragraph: When considering the distribution of sand lenses within the UCT at the area of interest, the reader should understand the set of data used (as shown in Figure 2.8) and the focus of the study (NFSS).
201	NYSDEC 09/12/08	Page 2-11, Section 2.3.1. first paragraph: The term "statistically disconnected" with respect to sand lenses may be true in a statistical sense, but is better supported by field data.
202	NYSDEC 09/12/08	Page 2-11, Section 2.3.2: Please note that due to the limited amount of hydraulic conductivity data for the GLC unit, the power of the statistical evaluation is reduced.
203	NYSDEC 09/12/08	Page 2-12, Section 2.3.6: Please note that some of the monitoring wells depicted on Figure 2.25 as Queenston Formation wells, are not screened in the bedrock (FP01D, F802LD, F102D, W202D, W1206D, Wl101D, W1103D. W1104D & W1105D).
204	NYSDEC 09/12/08	Page 2-14, Section 2.4.1, second paragraph: Please explain what "semivariogram analysis" is and why it is useful in evaluating sand lens correlation.
205	NYSDEC 09/12/08	Page 2-17, Section 2_5.1, last paragraph. Figure 2.28: • Does USACE realize that several of the wells on the CWM property used to create Figure 2.28 are part of groundwater extraction systems? • It is not understood why a wider number of monitoring wells on the CWM property, measured on October 17, 2000, were used to create this Figure (and other potentiometric surface maps). • Why are water level measurements from only one year (two events) reviewed when water level measurements have been taken annually for several years? Multiple years of consistent flow directions creates a much more compelling argument.
206	NYSDEC 09/12/08	Page 2-21, Section 2.6, second paragraph: Water budgets are conducted by CWM (and possibly Modern) annually. In addition, CWM has an on-site weather station.
207	NYSDEC 09/12/08	Page 3-1, Section 3.2: Finite difference modeling was performed by CWM in the mid-1980's and in 2002.
208	NYSDEC 09/12/08	Page 3-7. Section 3.3.3.2, Figure 3.4: Please provide information on the selection of recharge areas. Especially the swampland ponded water depicted on the eastern side of the IWCS.
209	NYSDEC 09/12/08	Page 3-13. Section 3.4.3.1, first paragraph: Was the zonation of hydraulic conductivity based on field data, or to make the model "fit" water level measurements?
210	NYSDEC	Page 3-14. Section 3.4.3.2, third paragraph: The text states: "...the model tends to over predict the hydraulic heads near

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	09/12/08	the Central Drainage Ditch...". Could this be related to the selection of this area as a "recharge area" (as shown on Figure 3.4)?
211	NYSDEC 09/12/08	Page 4-15, Section 4.3.2.1, last bullet on excluding constituents: Does this statement mean that if a constituent is not widespread, it's transport is not modeled? What if a constituent is in one isolated area and in high concentrations?
212	NYSDEC 09/12/08	Page 4-29, Section 4.5: It is not clear from the simulations, whether the model considers groundwater discharge to surface water (Central Drainage Ditch, West Ditch).
213	NYSDEC 09/12/08	Page xxxv, Section ES.4 first paragraph: Change "...and on the northwest by the village of Lewiston" to "... and on the northwest by property owned by the town of Lewiston".
214	NYSDEC 09/12/08	Page xli, Section ES.4 Surface and Subsurface Soil, first paragraph: A description of the "sealing" of the pipeline utilities extending off-site should be provided if available. If documentation is not available, the sealing of the pipelines should be field confirmed (and sealed if not).
215	NYSDEC 09/12/08	Page xli, Section ES.6, Groundwater, first paragraph: The term "Plume" should not be used to describe the presence of radionuclides, metals or organic compounds in the groundwater. Insufficient data is presented in the report to substantiate the areas of elevated groundwater contaminants (as depicted on the Figures of Section 5) and appear to be a figment of computerized contouring of data and not representative of actual field conditions. This is not an acceptable and responsible method to present groundwater information.
216	NYSDEC 09/12/08	Page 1-4, Section 1.5, fifth paragraph: NYSDEC comments on the 1986 DOE Record of Decision include the Department's position that shallow land burial (such as the waste containment structure) is not appropriate for the K-65 waste. The Department considers the K-65 waste to be "Greater than Class C" material.
217	NYSDEC 09/12/08	Page 1-5. Section 1.5, first paragraph: It is the Department's understanding that Building 403 was used as a firehouse not a laboratory and office building. Please clarify.
218	NYSDEC 09/12/08	Page 1-5, Section 1.5.1, Baker-Smith Area: It is the Department's understanding that the Baker Smith area was used for warehousing, a pipe shop and other "hand-shops".
219	NYSDEC 09/12/08	Page 1-6, Section 1.5.1, Power Area: It should be mentioned that Building 401 was originally a coal fired, steam plant with coal storage located on the south side of the building.
220	NYSDEC 09/12/08	Page 1-6, Section 1.5.1, Freshwater Treatment Plant: Given the importance of the current status of the former water treatment plant for the storage of residues, much greater detail of the design, operation and use of treatment plant units/buildings should be provided.
221	NYSDEC 09/12/08	Page 1-6, Section 1.5.2: The materials originally "stored" in Building 411 and the Baker-Smith Area should be identified and listed in the report.
222	NYSDEC 09/12/08	Page 1-9, Section 1.5.2, Other Wastes: Other operations and materials stored at the site (Fuel Rods, Cesium "caps", Uranium billets, "new naval waste area") should be included in discussions of historical operations.

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223	NYSDEC 09/12/08	Page 1-9, Section 1.5.3.1: The results of the 1970 AEC radiological survey may not have been sufficiently sensitive, given that the detector was located one meter above the ground during the survey.
224	NYSDEC 09/12/08	Page 2-3, Section 2.2.3: Given that 444 documents and records associated with past construction, waste storage and remedial activities were reviewed to generate this section, three pages of findings is insufficient. Much greater discussion on historical information should be presented.
225	NYSDEC 09/12/08	Page 2-11, Section 2.3.6: Why does this report use meteorology data from Niagara Falls Air Force base when the groundwater modeling report uses data from Lewiston?
226	NYSDEC 09/12/08	Page 2-13, Section 2.4.1: Is General Engineering Laboratories ELAP certified?
227	NYSDEC 09/12/08	Page 3-3, Section 3. 1, Table 3-2: The sample naming convention is illogical. Linking the EU to the sample name would make data review much simpler.
228	NYSDEC 09/12/08	Page 3-4, Section 3.2.1: Were efforts made to tie the topographic survey to surveys of CWM and/or Modem Landfill? The top paragraph on the page discusses areas of settlement on the IWCS cap noted during the 1999 survey. Please provide a figure showing these locations.
229	NYSDEC 09/12/08	Page 3-6, Section 3.3.2.3, last paragraph: Given the importance of underground utilities as potential migration pathways, a greater discussion of the non-intrusive geophysical survey techniques and findings must be included in the report.
230	NYSDEC 09/12/08	Page 3-10, Section 3.5.2: Why was the site broken into six sectors for the gamma walkover survey when it was previously broken into 14 EUs? This inconsistency only adds to confusion when reviewing the results.
231	NYSDEC 09/12/08	Page 3-12, Section 3.6.2: NYSDOH considers surface soil to be the interval 0 - 2" for exposure (the RI used 0 - 6" as surface soil).
232	NYSDEC 09/12/08	Page 3-22, Section 3.10.2.3: Were the new permanent wells surveyed? Were wells installed in the LWBZ cased off to prevent "dragdown", prior to advancing from the UWBZ to the LWBZ?
233	NYSDEC 09/12/08	Page 3-25, Section 3.10.2.6: The report mentions that two site-wide water level measurement events were conducted (12/7/99 and 8/24/00). Is the data associated with these events presented somewhere?
234	NYSDEC 09/12/08	Page 3-25, Section 3.10.2.7: Were the TWPs surveyed?
235	NYSDEC 09/12/08	Page 3-25. Section 3.10.2.10: Since the TWPs were not developed prior to sampling, this may skew the metals and radiological analytical results due to turbidity.
236	NYSDEC 09/12/08	Page 3-38, Section 3.16.1.2: Is the source of the ten drums of solid Investigation Derived Waste, which were rejected by the disposal facility (WCS), known?
237	NYSDEC	Page 4-1, Section 4.2, first bullet: Within the first bullet it states: "Numerous small chips of radioactive waste residue

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	09/12/08	with elevated gamma readings were found near the ground surface in the vicinity of these trenches". It is my understanding in speaking with Corp representatives that these chips were collected upon discovery and surrounding soils were re-surveyed. This needs to be better documented in the report.
238	NYSDEC 09/12/08	Page 4-1, Section 4.2: Please note the information contained in Table 4-1 indicates several other "significant" findings in addition to those presented here.
239	NYSDEC 09/12/08	Page 4-1. Section 4.3: Why weren't the analytical results from the drum, road core and railroad ballast used to determine site related contaminants? Couldn't these matrices contribute to site contamination?
240	NYSDEC 09/12/08	Page 4-2, Section 4.3.1: It is not understood why a background data set could not be established for roadways and railroad ballast. Aren't there roads or railroads not impacted by the site? Or for railroad ballast, why not statistically evaluate the data set and look for outliers? For roadways, a simple review of the data would indicate results out of the expected range (such as 26 ppm of arochlor-1254 in sample RC-coreOl-3730 or 5.72 pCi/g of Pu-239 in RC-core3-3734).
241	NYSDEC 09/12/08	Page 4-2, Section 4.3.2: The uranium content seems elevated in the sample of Drum 1. Please provide additional details.
242	NYSDEC 09/12/08	Page 4-2, Section 4.4.1: Because the first reference to an actual number for specific Background Screening Value was found in Table 4-20, it is suggested that within the written text of the document that a listing of background screening values for chemicals be placed in the chemical section and background screening values for radionuclides be placed in the radionuclide section. It might even be helpful if these lists were on separate pages so that they could be removed from the document, making it accessible upon further reading.
243	NYSDEC 09/12/08	Page 4-5, Section 4.4.1. second bullet: Was the railroad bed near the monitoring wells in question sampled to support the hypothesis proposed for the elevated Uranium in samples from these wells?
244	NYSDEC 09/12/08	Page 4-5, Section 4.4.1, fifth and sixth bullets: The appropriateness of the background locations for surface water and sediment needs to be reviewed considering that they are not upgradient/ upstream/ upwind of the site (and the R-10 pile was uncovered for years).
245	NYSDEC 09/12/08	Page 4-6, Section 4.4.1, Statistical Evaluation: Due to the limited amount of background data, the power of the statistical evaluation is diminished. Therefore, the determination of Upper tolerance limits may be questionable and should be used with caution.
246	NYSDEC 09/12/08	Page 4-7, Section 4.4.2: It is understood that statistical evaluation of data can be powerful. However it can also be confusing. Simpler methods for selecting site related contaminants of concern should also be presented (such as process knowledge, site use, historical information).
247	NYSDEC 09/12/08	Page 4-9, Section 4.5: The use of the correct units for Uranium should be carefully observed. For uranium analysis on liquid media pCi/L or µg/L can be used depending on the purpose of the analysis and standard being compared. However, for soils or sediments the units have to be reported as pCi/g. This comment is applicable to all soil/sediment sample results.

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248	NYSDEC 09/12/08	Page 4-10, Section 4.6.1.: With respect to naturally-occurring inorganic compounds, it is not advisable to "pool" data from different strata; or to mix surface soil data with subsurface soil data.
249	NYSDEC 09/12/08	Page 4-11, Section 4.9.1: It is not advisable to mix data from different flow zones.
250	NYSDEC 09/12/08	Page 5-2, Section 5.1.1, second paragraph: If samples were collected from a ditch or drainage way, sediment is a proper term for the sample. Materials in-these locations are much more likely from migration and/or deposition during rainfall/runoff events.
251	NYSDEC 09/12/08	Page 5-4, Section 5.1.2, second paragraph: With the exception of the last sentence, this paragraph explains the distribution and migration characteristics of the site. However, the last sentence contradicts the reality of the hydrogeologic setting. As stated elsewhere in these comments, the use of the term "plume" is inaccurate and gives a exaggerated depiction of groundwater conditions and migration.
252	NYSDEC 09/12/08	Page 5-4, Section 5.1.2, last paragraph: Bis (2-ethylhexyl) phthalate is a common laboratory contaminant and should have been addressed as part of data validation. Presenting a "plume" of this constituent is inappropriate and should not be presented.
253	NYSDEC 09/12/08	Page 5-6, Section 5.2.1.1, third bullet: The discovery of positive Cs-137 analytical results at several locations around the site needs to be explained. Cs-137 has been shown, in some instances to result from global fallout settling in low laying areas, or as subtly mentioned on this page, in areas of former building foundations, inferring possible accumulated fallout off a roof drip edge or from KAPL waste being present. Plutonium-239 analysis should be performed to rule out the latter. In any event, a discussion should be presented highlighting potential sources.
254	NYSDEC 09/12/08	Page 5-6, Section 5.2.1.1, fourth bullet: Were shallow soil sampling results consistent with the results of the gamma walkover survey (did the walkover survey detect contamination not identified by the soil sampling or visa-versa)?
255	NYSDEC 09/12/08	Page 5-7, Section 5.2.1.1, second bullet: Please define what is meant by "...exceedances of the background UTL by a factor of at least 10 were relatively few."
256	NYSDEC 09/12/08	Page 5-7, Section 5.2.1.1, third bullet: With respect to the distribution of Cs-137 detections in soil samples, it is not unexpected to have compounds present in a random fashion, especially considering the manner in which materials were stored and handled at the facility.
257	NYSDEC 09/12/08	Page 5-7, Section 5.2.1. l , fourth bullet: The value of the information presented in this bullet would be greatly enhanced if the locations, concentrations and identity of the detected compounds were provided.
258	NYSDEC 09/12/08	Page 5-8, Section 5.2.1.1. first bullet: This bullet provides only the bear minimum of information on the sampling results. Where were above background levels of radionuclides detected in the subsurface? What about metals? Volatile organics? The information presented is more appropriate for an executive summary rather than a presentation of the results of the investigation.
259	NYSDEC	Page 5-8, Section 5.2.1.1, second bullet: Please provide the identification numbers corresponding to the abandoned drum

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	09/12/08	samples referenced in this bullet. Please provide specific information on the compounds which were detected in samples of the material within the drum and the soil beneath the drum. This information will allow the reviewer to better assess the statement in the report that the drum is not the source of compounds detected in the soil.
260	NYSDEC 09/12/08	Page 5-9, Section 5.2.1.4, first bullet: Given the characteristics of the unconsolidated strata the groundwater samples containing elevated dissolved total uranium were collected from, it is more likely that the contamination exists in discrete areas and not as a continuous "plume". In order to substantiate the "plume" depicted in Figure 5-4, several additional groundwater sampling points containing elevated dissolved total uranium are necessary between and in the vicinity of the two wells used.
261	NYSDEC 09/12/08	Page 5-10, Section 5.2.1.4, second bullet: Why does the report consider ten times the background UTL as the criteria for determining impact to the groundwater? The purpose of the investigation is to characterize the different media. Often, just the presence of a constituent is sufficient to warrant additional investigation. This bullet is also inconsistent with the information presented in the fourth bullet, as Cs-137 is a radionuclide and it was detected in excess of 10 x the UTL (non-detect).
262	NYSDEC 09/12/08	Page 5-10, Section 5.2.1.4, fourth bullet: Please correct the first sentence to read: "Cesium-l37 was detected in groundwater at location MW 404A and GW810A....". The detection of cesium-137 in groundwater is of concern to this Department, and the investigation and characterization of the presence of cesium-137 in groundwater at this area was not sufficient. Simply making calculations on two individual sampling results does not answer the questions of why the contaminant is present. Are wells 404A and GW810A isolated areas exhibiting the highest levels of contamination or do other areas exist? Why did the resample of well GW810A not detect cesium-137? What was different? Does USACE have a theory?
263	NYSDEC 09/12/08	Page 5-12, Section 5.2.2: Please see previous comments on_ the use_ of the term "plume".
264	NYSDEC 09/12/08	Page 5-16, Section 5.3.1.1, Trenches 411,412, 413: Why weren't parameters other than radiological parameters investigated? Doesn't the name "New Naval Waste Area" suggest the materials at the area were possibly associated with the Navy Interim Pilot Production Plant? Discolored materials and elevated PID readings were noted in all three trenches. Wouldn't this suggest other contaminants besides radionuclides could be present?
265	NYSDEC 09/12/08	Page 5-18, Section 5.3.1.1. second bullet: It is not clear why the presence of ballast in the area leads the author to suggest that the ballast is responsible for elevated concentrations of radium-226 in soil samples. Was ballast noted in the samples? How does the ballast explain the presence of other contaminants detected in these samples?
266	NYSDEC 09/12/08	Page 5-18, Section 5.3.1.1. fifth bullet: The report should also discuss the locations of the detections, not just state "frequently" or the "maximum concentration". Several locations had detections of PCBs above New York State cleanup standards.

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267	NYSDEC 09/12/08	Page 5-18, Section 5.3.1.1, sixth bullet: It should be noted that Tetrachloroethylene (PCE) was detected at a concentration of 63 parts per million in boring SB415.
268	NYSDEC 09/12/08	Page 5-19, Section 5.3.1.1, fifth bullet: Please clarify which sample number corresponds with which material sampled.
269	NYSDEC 09/12/08	Page 5-20, Section 5.3.1.2: Regardless of turbidity, elevated metals were present in the water sample. This implies that the contaminants are subject to suspension, transport and migration; and therefore a potential problem.
270	NYSDEC 09/12/08	Page 5-21, Section 5.3.1.4: Review of the Section 5 Figures depicting groundwater "plumes" leads one to believe groundwater migrates in several directions from the same location. This observation is an additional reason why the Department does not consider the Report's presentation of groundwater conditions is appropriate.
271	NYSDEC 09/12/08	Page 5-22, Section 5.3.1.4, first bullet: It is not so much the concentration of Cs-137 in groundwater samples, but more its presence that is of concern
272	NYSDEC 09/12/08	Page 5-22, Section 5.3.1.4. second bullet: The concentration of PCE in monitoring well 415A warrants additional investigation and possible interim remedial actions. Please note that due to the low solubility of PCE , the high concentration of PCE detected in well 415A may indicate the presence of separate phase product in the vicinity of this location. The Department will not consider natural attenuation as a viable remedial option to address contamination of this magnitude.
273	NYSDEC 09/12/08	Page 5-23, Section 5.3.1.5. first bullet: Just because a contaminant is not prevalent at numerous locations does not exclude the possibility of it being a problem at individual locations.
274	NYSDEC 09/12/08	Page 5-24, Section 5.3.1.5, fifth bullet: The results of samples collected from MH32 and MH35 are not discussed in the groundwater section of this EU. The results are discussed further in Section 5.3.2.
275	NYSDEC 09/12/08	Page 5-24, Section 5.3.1.5, Sanitary Sewers, first bullet: The concern, again, is the presence of Cs-137 in samples, not necessarily the concentration. Is there a theory on whether these Cs-137 detections are due to groundwater infiltration or the opposite?
276	NYSDEC 09/12/08	Page 5-25, Section 5.3.1.5. Storm Sewers, first bullet: It is interesting to note that adjacent manholes MH35 (acid sewer) and MH22 (storm sewer) both detected VOCs. However an investigation of groundwater in the vicinity was not conducted to determine if this media is affected. Investigation of this area should be conducted.
277	NYSDEC 09/12/08	Page 5-25, Section 5.3.2: How can the limit of contamination in the pipeline be determined when no samples are collected downstream of the impacted locations? Additional sampling is necessary.
278	NYSDEC 09/12/08	Page 5-26, Section 5.3.3, second bullet: Please note the following with respect to past usage of PCE: Multiple government uses of the property involved the use of solvents such as the Navy Interim Pilot Production Plant, Air Force Plant 68, and the Boron-10 Plant. Evidence of past disposal in the area includes abandoned drums, waste piles, pipes, sumps. It is not unreasonable to consider past government operations as a potential source.

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		Please remove the last sentence of this bullet, since the contamination noted on the NFSS is not associated with CWM operations, although CWM does operate groundwater extraction systems associated with past Federal Government contamination (P1202s and PCB Warehouse remedial systems).
279	NYSDEC 09/12/08	Page 5-26, Section 5.3.3, fifth bullet: The presence of bis(2-ethylhexyl)phthalate in sample results could also be associated with analytical laboratory contamination.
280	NYSDEC 09/12/08	Page 5-26, Section 5.3.3, sixth bullet: The presence of PCBs in this area could be related to oil jacketed lines, heat transfer fluids or gaskets caulks and seals. The presence of PCE could be associated with the disposal of spent solvent associated with the operations discussed in the comments in the second bullet.
281	NYSDEC 09/12/08	Page 5-26, Section 5.3.3 eighth bullet: It is expected that elevated gamma walkover survey readings would be associated with surface soil containing radionuclides.
282	NYSDEC 09/12/08	Page 5-27, Section 5.4.1: It would have been helpful if subsurface samples were taken northeast of road core RC 14 to assist in bounding the groundwater/soil contamination noted on the CWM side of the fence.
283	NYSDEC 09/12/08	Page 5-32, Section 5.4.1.4, second paragraph: Data from monitoring well BH57 (screened in the upper Queenston formation) should not be compared to background values for the LWBZ data.
284	NYSDEC 09/12/08	Page 5-33, Section 5.4.2: When discussing elevated surface soils in the southeast corner of EU6, is the author referring to sample locations 606 and/or 6B005?
285	NYSDEC 09/12/08	Page 5-35, Section 5.5.1.1: Please provide the locations, detected parameters and concentrations of contaminants discussed in this section. The current discussion is vague.
286	NYSDEC 09/12/08	Page 5-36, Section 5.5.1.1, first and second bullet: Please note that the source of debris piles investigated by trench 302 and 305 is believed to be the result of DOE remedial work preformed on Modern Landfill property in the 1980's (Vine Street/Vicinity Property N North).
287	NYSDEC 09/12/08	Page 5-38, Section 5.5.1.4, first bullet: Please note that the groundwater contamination noted in samples collected from wells 302/302A and 313 are not part of a "plume" and have different radiological signatures.
288	NYSDEC 09/12/08	Page 5-40, Section 5.5.2: The best explanation of the dissolved uranium plume is that the "plume" does not exist and is a figment of computer contouring.
289	NYSDEC 09/12/08	Page 5-43, Section 5.6.1.1, second bullet: Subsurface soil sample 8D006 (0.8) should also be noted when discussing samples with elevated contaminants.
290	NYSDEC 09/12/08	Page 5-45, Section 5.6.1.1, fourth bullet: Was a sample of the "chips" exhibiting the high gamma readings collected and analyzed?
291	NYSDEC 09/12/08	Page 5-46, Section 5.6.1.1, first bullet: The detection of "Niobium-95" in Trench 810 should be discussed.

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292	NYSDEC 09/12/08	Page 5-49, Section 5.6.1.4, second bullet: Additional investigation is required to support the statements in this bullet. The elevated uranium-234 samples were collected from different media (groundwater and sanitary sewer). Other groundwater samples in the vicinity do not indicate contamination of the same magnitude and characteristics.
293	NYSDEC 09/12/08	Page 5-49. Section 5.6.1.4, fourth bullet: The concern with Cs-137 is not the concentration but rather its presence since cesium is not associated with uranium milling residues.
294	NYSDEC 09/12/08	Page 5-49, Section 5.6.1.4, fifth bullet: Bis(2-ethylhexyl)phthalate is a common laboratory contaminant. The concentrations noted are not unusual in analytical reporting.
295	NYSDEC 09/12/08	Page 5-49, Section 5.6.1.5: Due to the detection of elevated contaminants in samples collected from the underground utilities and the potential of these pipelines to serve as a migration pathway, further field investigation is required.
296	NYSDEC 09/12/08	Page 5-51, Section 5.6.2: The localized areas of groundwater contamination identified north of the IWCS could be related to the open storage of R-10 residues in vicinity of this area.
297	NYSDEC 09/12/08	Page 5-51, Section 5.6.3, _first bullet: The disposal of building materials in the burial areas could be a potential source of detected contaminants.
298	NYSDEC 09/12/08	Page 5-51. Section 5.6.3, second bullet: It is highly unlikely Cs-137 would migrate up-gradient in groundwater from EU 1 & 2 to EU 7.
299	NYSDEC 09/12/08	Page 5-52, Section 5.6.3, third bullet: Soil samples should be collected from the areas on the northwest, east and southeast side of the IWCS where elevated gamma readings were noted, to address this identified data gap.
300	NYSDEC 09/12/08	Page 5-53, Section 5.7.1.1: In summary, the contaminated soil identified in the vicinity of Building 401 will need to be addressed as part of the removal and remediation of Building 401.
301	NYSDEC 09/12/08	Page 5-59. Section 5.7.1.4, third bullet: The text of this bullet points out why the areas of elevated concentrations in groundwater should not be referred to as plumes at this facility.
302	NYSDEC 09/12/08	Page 5-60, Section 5.7.1.5, Floor Drains: The analytical data associated with samples collected from the Building 401 floor drains identified high levels of various contaminants. These drains (and associated piping) must be addressed as part of the building remediation and removal.
303	NYSDEC 09/12/08	Page 5-62, Section 5.7.3, second bullet: It would be useful if, as part of the discussion on the correlation of soil sample results to gamma walkover data, there was an evaluation of the soil data to determine if other radioactive parameters were present besides gamma emitters. In other words, was the gamma survey effective in identifying areas of surface radiation contamination, given the range of radioactive materials possibly present?
304	NYSDEC 09/12/08	Page 5-74, Section 5.10.1.4, first bullet: Please rewrite to read: "Several areas of localized groundwater contamination were identified...". The term "plume" gives the impression of migration. Also, see previous discussion on areas of groundwater contamination.
305	NYSDEC	Page 5-75, Section 5.10.1.4, second bullet: Given its proximity to the IWCS and concerns over the identified

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	09/12/08	contamination in the former Building 409 area, additional characterization and remedial work are warranted.
306	NYSDEC 09/12/08	Page 5-75, Section 5.10.1.4, third bullet: Figure 5-16 does not accurately portray the groundwater potentiometric surface of the UWBZ at the NFSS.
307	NYSDEC 09/12/08	Page 5-76, Section 5.10.1.4, second bullet: This statement is not adequately supported by information gathered as part of the RI. Additional groundwater monitoring investigation is required to substantiate.
308	NYSDEC 09/12/08	Page 5-78, Section 5.10.2: Replace "plumes" with "groundwater impacts".
309	NYSDEC 09/12/08	Page 6-1, Section 6. 1, second paragraph: New York state regulations must also be considered ARARs.
310	NYSDEC 09/12/08	Page 6-3, Section 6.1, Semi-volatile organic compounds (SVOCs): Bis(2-ethylhexyl)phthalate is a common laboratory contaminant. Evaluation of analytical data detecting this compound should take that into consideration.
311	NYSDEC 09/12/08	Page 6-8, Section 6.6: Please see Department comments on the "Groundwater Flow and Contaminant Transport Modeling Report".
312	NYSDEC 09/12/08	Page 6-9, Section 6.6.1, Item "3": Please see previous comments on the depiction of groundwater contamination.
313	NYSDEC 09/12/08	Page 6-9, Section 6.6.1, last paragraph: As previously commented on in Section 5, the "definition" of a groundwater plume is not based on actual field/geologic conditions. Given the groundwater flow characteristics of the upper water bearing unit, and attenuation of contaminants in geologic material with a high ion exchange potential, the release would have to have occurred approximately 1000 years ago in order for contaminants to have migrated the distance depicted by the report in the northwest portion of the NFSS.
314	NYSDEC 09/12/08	Page 6-10, Section 6.6.2: Please understand that modeling is a tool used as part of the remedial decision making process. Results of modeling are only as good as the imputed data and assumptions used. The drawbacks of modeling for the time frames evaluated here are inherent with the inability to calibrate and validate for the long period (1000`s of years).
315	NYSDEC 09/12/08	Page 6-13, Section 6.6.4: While the distribution coefficient (K_d) used for uranium-238 (3.6 L/Kg), as part of the groundwater modeling, is much lower than what would be expected in a clay rich material; the purpose of the modeling was to present a worst case scenario.
316	NYSDEC 09/12/08	Page 7-4, Section 7.2.2, second paragraph: Please change strontium-190 to strontium-90.
317	NYSDEC 09/12/08	Page 7-9, Section 7.3.2. Recommendations: Please clarify the proposed recommendations for Subsurface Utilities (How did the contaminants detected in this media drop out?)
318	NYSDEC 09/12/08	Page 7-13, Section 7.3.4, Nature of Occurrence: Given the numerous contaminants and media affected at this EU, additional investigation is necessary to fully characterize the unit. Further investigation must define the nature, extent

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		and rate of migration of the identified contaminants.
319	NYSDEC 09/12/08	Page 7-15, Section 7.3.4. Recommendations: Remedial action will be required for this EU.
320	NYSDEC 09/12/08	Page 7-30, Section 7.3.10, Recommendations: Besides the IWCS, the FS should evaluate soil/groundwater adjacent to the unit and the ability to monitor the IWCS.
321	NYSDEC 09/12/08	Page 7-38, Section 7.3.13, Recommendations: Building 401 should be taken down, followed by remediation of its foundation and subsurface.
322	NYSDEC 09/12/08	Page 7-42, Section 7.3.15, Recommendations: Site drainage should continue to be monitored with respect to remedial actions taken at other EUs and to assess groundwater discharge to surface water.
323	NYSDEC 09/12/08	Page 7-46, Section 7.3.17, Recommendations: As stated previously, the characterization of groundwater contamination in this report is not accurate or scientifically based. Any conclusions based on the flawed assumptions are also potentially flawed.
324	[redacted] DOH 07/22/08	Subsurface Geologic Conditions. It is rare that modelers have such a wealth of subsurface data as is available for the NFSS,CWM and Modern sites. More than 700 boreholes were evaluated to assess the geologic conditions and related data needed for input parameters to the flow and transport models. However, as in all geologic sampling exercise, the information and knowledge gained is derived from discrete locations where the samples were taken. It is often necessary to make assumptions as to what conditions exist between boreholes, and it is important that subsurface data be available to provide a three-dimensional understanding of the geologic lithology, stratigraphy and characteristics. As shown in the report (see HGL Fig 2.8), many borehole locations are available on the NFSS, CWM and to a lesser degree on the Modern Landfill. However, there is a paucity of data to the west and northwest of the NFSS, which also happens to be the general direction of groundwater flow. Therefore, there is uncertainty as to actual conditions in this important region of the model and requires modelers to make assumptions as to continuity of geologic units and their properties. This can be considered to be a data gap in knowledge of subsurface conditions. The presence of fractures in the UCT to a depth of approximately 9 feet (2.7 m) is noted and characterized as minor. However, discontinuities in the clayey matrix due to fracturing is commonly observed in surficial clay tills and their role in contaminant fracture has been found to be significant
325	[redacted] DOH 07/22/08	Hydraulic Properties. The evaluation of hydraulic conductivity values provides a reasonable estimation of the characteristics for the various hydrostratigraphic layers. However, it is important to point out that there is variability associated with each layer's properties, and therefore any estimates of groundwater velocity or flux should reflect that variability. For example, it is clear from the distribution of KH values that the alluvial sand and gravel unit generally has a KH ten times higher than the UCT unit, but the range of values also overlaps. So, there may be areas where the two units have essentially the same KH. In the big picture, use of geometric mean values is reasonable; however, the variability that may occur at the smaller, local scale

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		should not be overlooked when interpreting groundwater flow and transport. As noted in HGL table 2.4, the KH for UCT and GLC have equivalent geometric means and same values were used in the model (HGL Table 2.5). But, the variability of KH in the UCT extends over six orders of magnitude. The GLC is believed to be more homogeneous than the UCT, but there are apparently only five hydraulic conductivity measurements. Since the GLC is part of the underlying natural "containment" of the IWCS, there should be better characterization of the properties of the GLC unit. The GLC has also been described as containing occasional laminations of silt, and sand and gravel (Golder Associates Inc., 1988; Wehran-Envirotech, 1990; Wehran Engineering Corporation, 1977). These small scale features can be important in transmitting groundwater or contaminants on a local scale. The distribution of K for the Alluvial Sand and gravel unit (HGL Figure 2.23) appears to rely on only three values in the direct vicinity of the IWCS. Since the IWCS is a repository of contaminants, the ASG is a significant aquifer unit and modeling of the transport form this location is very important, this lack of localized K data appears to be a deficiency. Lastly, the distribution of hydraulic conductivity shown on HGL Figures 2.21 to 2.25 are inferred from the available data, and should be regarded as reasonable estimates given the available data. Different values than shown may exist between the borehole locations, and there area no data locations outside of the NFSS, CWM and Modern property lines.
326	[redacted] DOH 07/22/08	The distribution of sand lenses in the UCT is an important feature. The presence of the more-permeable sandy zones within a low-permeability clayey unit holds the implication that there could be pathways or increased migration of groundwater flow and contaminant migration through the sand lenses. Of particular interest, is that for the three waste disposal facilities, the NFSS happens to sit directly over an area which appears to have a higher frequency of sand lens occurrence. The reason as to why more sand lenses were apparently observed in the vicinity of the IWCS may not be known or real, but could be due to the increased density of boreholes on the NFSS, differences in investigation techniques, or just plain bad luck. If a similar density of boreholes were installed in nearby properties, a similar pattern of sand lens occurrence might be observed. The significance of the sand lenses relate to understanding groundwater flow paths, selection of the hydraulic conductivity values used in the model and proper positioning of groundwater monitoring well locations. The authors have evaluated the sand lenses using geostatistics in order to determine the spatial extent of the sand lenses and ultimately whether they are connected flow paths (see Appendix B). The compilation of sand lens data is extensive and thorough. However the semi-variogram approach used is not convincing that the sand lenses are not interconnected.
327	[redacted] DOH 07/22/08	Water Budget. One potential scenario to be considered in the FS is to leave the IWCS residues in place. In that case an assessment of the long term potential climate change issues and effect on precipitation, temperature, evapotranspiration and recharge should be addressed.
328	[redacted]	Sec 3.3.3.3 The stream boundary for the Central Drainage Ditch is incorrect. The Central Drainage Ditch drains to Four Mile

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	DOH 07/22/08	Creek, and not Six-Mile Creek as shown on figures 3.1 and 3.4.
329	DOH 07/22/08	Sec 4.3.2.1 The use of Kd isotherm based sorption models to simulate the migration of metals and radionuclides is a common approach but has strong limitations. The interaction between dissolved ions in solution with solid mineral phases can be described through the use of isotherms. An isotherm is a plot of the mass sorbed on the solid surface versus the concentration of the constituent in solution, at a fixed temperature. As the concentration of the sorbate is increased, the mass sorbed also increases in a linear or non-linear manner. Isotherms are empirically derived from laboratory batch or column experiments. The slope of a linear isotherm is known as Kd or the distribution coefficient. The distribution coefficient approach uses one parameter to describe partitioning between solution and solid matrix that may be due to several geochemical processes, and it is usually assumed to be constant in an aquifer. Equilibrium and reversibility of reactions is assumed. Site mineralogy is an important factor, but is neglected (Zhu and Burden, 2001).This simple method of describing ion sorption can be easily incorporated into a mathematical solution of the advection-dispersion equation, that can be solved analytically or by numerical methods. As a result most groundwater solute transport model codes (including the one used for this project) use an isotherm approach to describe surface-solute interaction and retardation. However, the assumptions and difficulties associated with Kds make the applicability of these models to environmental problems concerning metals questionable. Deficiencies in the Kd approach have been known for some time (Bethke and Brady, 2000); (Brady and Bethke, 2000); (Cherry et al., 1984); (Reardon, 1981)), models using Kd are still applied to metals in groundwater problems ((Sandia National Laboratories, 1999); (U. S. EPA, 1996a); (U.S. EPA, 1999); (U.S. EPA, 2001)). Attempts have been made to make the Kd approach more appropriate through the use of generic Kd vs. pH relationships and selectivity coefficients derived from a geochemical model (U. S. EPA, 1996b) or including non-linearity and probabilistic approaches (U. S. EPA, 1996a). Some factors which most affect dissolved metal concentrations are the total concentrations of metal in the soil, soil solution pH , organic matter content, and the presence of iron and manganese oxides (Sauve et al., 2000b). Redox conditions are also important. Distribution coefficients of a metal can vary over several orders of magnitude for given pH, total metals in soil or organic matter content. Given the multivariate influences that affect metal concentration in solution, it is unlikely that empirical approaches alone will be successful in predicting metal transport at a particular contaminated site (Sauve et al., 2000a). There are however, some advantages of the Kd based model approach which include: • Simple and easy to include in transport models • Many models are available with this formulation
329 (cont.)	DOH 07/22/08	• Retardation concept is easily understood • Works best for weakly sorbing, low concentration, contaminants which participate in few reactions and where chemical conditions and pH do not vary. Some disadvantages of the Kd based model approach include:

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		• simplistic and compromises the role of geochemistry • can only simulate one solute at a time (Zhu and Anderson, 2002) • assumes an unlimited number of sorption sites and does not include competition • a site specific Kd does not ensure correct assessment of fate under transient system conditions • changes in aqueous speciation and temporal variations are not accommodated (Langmuir, 1997) • typically overestimate plume advance and underestimate "tailing" (Brady and Bethke, 2000)The characterization requirements for contaminated sites which contain metals and radionuclides, in either soil or groundwater should be enhanced to include geochemical measurements of groundwater and characterization of all solid phases and aquifer mineralogy. This has not been done at NFSS. Screening level and detailed risk assessments for the migration of metals in groundwater should be supported by geochemical calculations and reactive transport modeling. Kd-based transport models should not be relied on as the only modeling tool unless the very specific conditions for Kd use can be demonstrated at the site. The minimum approach for screening metals-contaminated sites should include use of equilibrium models (e.g. MINTEQA2) to identify potential reactions, characterization of mineral phases present and provide an opportunity to verify that reactions are actually occurring. In general, for an important site such as NFSS, simple coupled reactive transport models, or even more sophisticated models, could be applied to better understand issues of metal/radionuclide transport.
330	[redacted] DOH 07/22/08	It appears that the same Kd value was used in all of the model layers. This is inappropriate as each layer will have different lithology and other characteristics.
331	[redacted] DOH 07/22/08	Sec 4.4.3.4 The model calculations for organic contaminants which include a biodegradation rate should only be considered to be for information or bounding purposes rather than a simulation of likely behavior. Additional site-specific information would need to be collected and evaluated in order to provide confidence that the model decay rates are reasonable for site conditions, and that NFSS aquifer conditions would remain conducive for continued biodegradation in the future. Inclusion of a no-decay case would be useful to bound the likely behavior of the organic contaminants.
332	[redacted] DOH 07/22/08	Sec 4.4.3.5 Use of the MINTEQA2 geochemical model is appropriate to estimate the solubility of elements and complexes at NFSS. However, it appears that the methodology used involved the measured geochemistry of only one groundwater sample (Appendix D). The selected well was OW04B, completed in the UCT. Unfortunately there are no other geochemical analyses presented for the UWBZ, or the LWBZ, so there is no confidence that the one selected geo is in fact representative of groundwater at NFSS. In addition, Table 3 of Appendix D does not indicate the critical parameters pH, dissolved oxygen or redox conditions at which the

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		simulations were performed. The mineralogy of the NFSS aquifers is not documented.
333	[redacted] DOH 07/22/08	Sec 4.6 An explanation for the choice of parameters subject to sensitivity analysis should be provided. The variation in Kd only involved the increase in value. The site-specific work by (Seeley, 1984) also indicated that laboratory derived distribution coefficients were as low a 1.1. Testing a lower Kd would help assess poor sorption (faster migration) conditions.
334	[redacted] DOH 07/22/08	Conclusions. The development of the hydrogeologic modeling tools has been undertaken in a very thorough and thoughtful manner. With the exception of comments noted above, considerable insight into the behavior of ground water and solute transport from the IWCS is possible. Due to disagreement over the applicability and meaningfulness of the use of Kd values without further geochemical insight, the predicted times of migration and concentration values should not be accepted as accurate. Since there is disagreement over the solute transport issues, the understanding and interpretation of groundwater flow based on the model could have received more emphasis. In particular, since large drainage ditches are located so close to the IWCS, the potential for groundwater discharge to surface water would appear to be high. This seems to be a higher and faster source of risk exposure that has not been fully discussed I the report.

Seeley, F. G. and A.D. Kelmers, 1984. *Geochemical Information for Sites Contaminated with Low-Level Radioactive Wastes: I – Niagara Falls Storage Site*, Oak Ridge National Laboratory (ORNL) Oak Ridge Tennessee, November.