FINAL

Site Investigation Report

Smoky Canyon Mine, Caribou County, Idaho

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APPENDIX I

Responses to Comments on the
Site Investigation Report for the Smoky Canyon Mine
March 2005 Draft

General Comments

1. After reading through both Volumes of the Smoky Canyon Mine Site Investigation Report, I was impressed by the quality and detail of the SI. I thought that it was organized very well, easy to read and understand, even the hydrology, wildlife and terrestrial biota sections, which are not my expertise. The maps, tables, pictures and figures were very well done, and augmented the text and sampling descriptions for a clear spatial context of the existing conditions. The sections on mining history and regulatory criteria were informative and laid the basic groundwork for understanding the context of the SI results.
2. COPC concentrations were given in tabular form for all samples from water, seeps, overburden soil, sediments, vegetation, and animal tissues. In addition, concise summaries were included in each section. Regulator screens for selenium and the other COPCs were included so that data was easy to interpret. In addition, tables were provided to show locations in all samples where COPC concentrations exceed screening levels.

3. I have found this to be one of the most informative and educational documents I have read concerning the mines in general, at least in the time I have been here.

4. I have read the Smoky Canyon Mine Site investigation Report notebooks and have no edits or suggestions. I thought NewFields did a good job on it. The report was well organized and understandable. From what I can see, the consultant didn't try to pretty-up or whitewash the findings. They just presented them as they were. I particularly liked the way they attempted to explain sources of contaminated fish and describe ecological and human health risks.

5. The document is well written and well organized. The major portion of the document reports the Site Investigation findings without bias or conclusions. The authors are very clear in distinguishing between factual and conceptual. Conceptual models presented in the document are thorough and reasonable based upon available information. Conclusions presented in Chapter 11 are thoroughly explained and supported by the data presented. The appropriate screening levels and regulatory criteria have been applied to the data throughout the document. The figures are complete, easy to read and significantly contribute to the report.

6. Overall the quality of the reporting on the task accomplishment is very high and does an excellent job of disclosing findings from the assigned tasks. The report contains excellent discussions on the hydrologic conditions of the Smoky Canyon Mine site. The topics included have a very useful level of detail on approach used to achieve the results shown. The same is true for the

techniques used. It contains excellent and logical discussions of many issues. There are many insightful and informative summaries. Problems encountered with sampling that during the study and their relevance is explained well in the report.

Response: These six general comments are noted and appreciated.

7. There was no discussion on bioaccumulation to bald eagles from eating any of the fish that are above EPA levels. Any data taken from the Area B Site Investigation needs to be included in this as well since it is in close proximity to Area A.

Response: The Area B investigations included evaluation of potential risks to bald eagles. References for the investigation reports are now listed in a separate bibliography (new Appendix H). Additional references to findings of the Area B investigations have also been incorporated throughout the document.

8. Some tasks contained in the original investigation plan completed by another contractor in 2003 seem constrained. This may have affected the quality of results by overly limiting the scope of the study or data that was collected. For example, hydrologic gain-loss studies for Sage Creek were tasked only in a reach in the alluvial valley well below the mine, not in the mountainous area of the mine. No tasking for gain-loss studies was done for Smoky Creek at all. Answering the question of what may have been missed by constraining the gain-loss study to about half the stream mileage near the mine could be beneficial. Discussion in this accomplishment report could help plan changes in scope, tasks or study criteria in the tasking would be helpful both for identifying any items that require more data collection that would be collected to better support the EECA and other the upcoming site investigation plans for nearby mines. A similar hindsight discussion of potential constriction or misdirection of sampling tasks, objectives and standards found in the FSP and QAPP would be helpful to support this objective as well.

Response: The scope of work presented in the Site Investigation (SI) Work Plan was reviewed and approved by the USFS, the lead agency for work performed under the AOC. The FSP and QAPP were also reviewed and approved by the USFS. Any additional data needed to support the EECA will be identified in the EECA Work Plan. This approach is consistent with the AOC Statement of Work for the SI and EECA.

In regards to the scope of gain-loss studies, the SI included detailed flow measurements on several stream reaches but also included routine flow measurements on all of the stream drainages that cross the active mining operations at locations both upstream and downstream of those operations. The stream flow data collected during the SI met the data needs identified in the SI Work Plan.

A gain-loss survey was performed along Smoky Creek in 2003 as part of the B and C Panel operations, and results of that survey were reported to the land-

management agencies separately. Relevant findings from that survey were reviewed in preparation of the SI Report.

9. The issue of the current drought should be included in the summary sections when discussing flux, mass loading, flows, etc., and trends in data (ie., all of these factors would probably change if precipitation returned to levels prior to the last ~six years).

Response: Several sections of the document have been revised to better describe conditions during the field activities performed in support of the SI and to describe the SI data in the context of the drought conditions.

Specific Comments

Section 2

- 2. , pg. 2-3, 1st paragraph: I disagree that the Wells Fm. is the only geologic unit with potential as a culinary water source. Alluvial deposits in Sage Valley certainly were proven to provide sufficient quantity for development.

  Response: Agreed. The sentence now reads "The Wells Formation aquifer is the only regional groundwater flow system that receives local recharge in the immediate vicinity of the site."

- 2.7.3, pg. 2-9: Boreal Toads have found in Sage Meadows (Maxim Report, 2004). This needs to be included.

  Response: Boreal toads have been added to the amphibians known present in the vicinity of the site. Boreal toads are also identified as a USFWS species of concern.

- 2.7.4, pg. 2-9: "…linkage habitat" (for) the threatened Canada Lynx.

  Response: This correction has been made.

Section 3

- 3.5, pg. 3-15: I saw no reference to why selenium is a problem or at what levels it becomes a problem. There is no mention of the deaths of livestock or wildlife caused by past concentrations of selenium in forage or water sources. There is no discussion on what plants bring it to the surface better than others. I feel that there needs to be some discussion on these subjects.

  Response: Additional background information has been included in Section 1, which explains that livestock deaths in the mining district triggered industry and agency concerns. There have been no livestock or wildlife deaths from exposure to selenium at the Smoky Canyon Mine however.

Section 4

- 4.4.1, pg. 4-9 and 4-10, Overburden Area Sampling Transects:

- It is difficult to have a soil horizon developed in recent overburden. Include reference to the overburden being considered as if it were soil.

- This section wrote that the sampler would dig the sample pit and "…scrape the soil from the pit walls…" This implies that the course fraction of the soil matrix (or overburden matrix) probably was not included in the soil sample. Much of the selenium literature indicates that the highest bio-available Se is in the course fraction of the soil matrix. The entire matrix that is intended for use needs to be samples and analyzed.

Response: The term "soil" was used generically and includes native soil, cover/reclamation soil (if any) and near-surface overburden materials. This explanation has been added to the report to clarify how the term "soil" is used. The description of sampling methods has also been revised to explain that both soil, if present, and overburden may be collected from the pit wall at any of the sampling locations.

Both coarse- and fine-grained materials were included in the materials scraped from the pit walls, and efforts were made to collect materials representative of those exposed on the pit walls. This clarification has been included with the description of the sampling methods.

The primary objective of the soil/overburden sampling task was to describe the spatial variability in selenium, and other COPCs, in surface and root zone materials in both undisturbed areas and overburden disposal areas. The bioavailability of selenium in soil/overburden will not be characterized from these samples. Selenium bioavailability can be evaluated using the selenium concentrations in vegetation samples collected from the same locations, and this type of evaluation may be performed to support the EECA and future remedial design.

- 4.4.4, pg. 4-11, last two paragraphs: The surface of the overburden probably will not have the organic matter that the top two inches of a native soil does.

  Response: Comment noted.

Section 5

- 5.2.2, pg. 5-5: Two different analytical methods for Selenium in groundwater are given in table 5-1, each of which has a different MDL. Presumably this is because of the two different labs that were used. Identification the conditions for each MDL in the table could be included.

  Response: Only groundwater samples submitted for analysis of selenium redox species were analyzed using method 3114C, the method with the lower reported MDL. Both methods achieved the target MDL specified in the QAPP.

- 5.2.2, pg. 5-5: For some elements in table 5-1 (Arsenic, Nickel, Silver), EPA 200.8 is given as the sole analytical methods of determination for total concentration. EPA indicates that procedure 200.8 is based on an ICP-MS instrument. But on

page 5-5 the report states that ICP-MS is not used for Selenium because it is "not available from the contracted laboratory."

Response: Groundwater samples were analyzed using the methods specified on page 5-5 and listed on Table 5-1; Table 5-1 does not list Method 200.8. Some of the surface water samples collected prior to finalization of the SI Work Plan and FSP were analyzed by ACZ Laboratories using EPA Method 200.8, ICP-MS, for a longer list of analytes, including arsenic and silver. Methods used for analyses of surface water samples are listed on Table 5-2, and these include Method 200.8.

- 5.2.2, Although both the MDLs for aqueous selenium (section 5.2.2) meet the basic requirement of 0.001 mg/L, this basic requirement is relatively close to the chronic action level of standard of 0.005 mg/L. Background levels are likely well below the basic requirement level of 0.001 mg/L. Therefore, both background levels and some elevated selenium levels in ground and surface waters that are below the current MDL may not be detectable. This leaves a substantial "hole" in what is known about selenium levels. It also can make it more difficult to detect the edges of a contaminant plume and make mapping of the plume more difficult and less accurate. Though this does not represent an error in the analysis, it does present a potential weakness in what can be determined and what could be missed in sampling. Aqueous selenium moving off-site in ground and surface waters may not be detected at some locations. This is discussed indirectly in the report. More detailed and direct discussion on what may have been a weakness in the QAPP would be very useful.

Response: Comment noted. The target MDL included in the QAPP was reviewed and approved by the USFS and meets the project's objectives.

Section 6

- 6.1.1, pg. 6-2, top of page, 1st full paragraph: The text states that the water in GW-11 does not represent groundwater flow into the well. Discussion needs to clarify if this represents intermittent drainage from the base of the backfilled pit (leachate), or something else.

Response: This paragraph has been revised, and the last sentence reads: "Instead, the samples represent stagnant water present in the well sump at the time of sampling, which is most likely water that drained from the bottom of the pit into the well sump."

- 6.1.3, pg. 6-5: Include the well construction and development information for the industrial well (GW-IW) and the culinary well (GW-CW) since data from these wells is included in later chapters and discussions. Some of the necessary information is in section 6.1.4, but all of the information should be included here as well.

Response: The well construction information for the Culinary and Industrial Wells is included with Technical Memorandum No. 3 in Appendix G. A reference to Appendix G has been included in Section 6.1.3, as requested above.

Section 7

- 7.2, pg. 7-3, top of page: Text states that nickel and vanadium are not regulated in groundwater. However, the Idaho Groundwater Quality Rule does have an anti-degradation rule. Indicate if nickel and vanadium evaluated in this context.

Response: Nickel and vanadium were not evaluated in the anti-degradation context because neither the regional background concentrations nor local background concentrations for nickel and vanadium in groundwater have been characterized. Nickel and vanadium were evaluated relative to the "monitoring" and "removal" action levels for groundwater presented in the IDEQ's Area-Wide Risk Management Plan. The monitoring action levels for these two COPCs are risk based rather than background based.

- 7.2.1, pg. 7-3: The text states that pizometer construction does not allow for collection of representative groundwater samples, so it is unclear why data from GW-19A is included in this section, and what the water collected from GW-19A represents. The text also states that water collected from GW-19A has high turbidity. But dissolved date is still of value for characterizing the geochemistry of the shallow aquifer. The text states that GW-19A was not constructed as a monitoring well and could not be used for drinking water so results from this location are not considered usable for defining the nature and extent of groundwater contamination. However, the culinary well (although in the Wells Formation) was not constructed as a monitoring well and that data is being used. This paragraph is very confusing and might be best left out or re-written.

Response: The first two sentences in the paragraph have been deleted. The Culinary Well was originally installed as a monitoring well and was later converted for use as a water supply well.

- 7.2.2, pg. 7-6, top of page, last sentence: The text states that the extent of the Wells Formation groundwater contamination by selenium appears to be primarily limited to the vicinity of Pole Canyon. This statement is misleading since Hoopes Springs water data indicates contamination and is more than 2-miles south of Pole Canyon.

Response: The text has been revised to read: "Groundwater with selenium above the groundwater quality standard is limited in extent to the lower Pole Canyon area."

- 7.2.2, top of pg. 7-6, last paragraph, last sentence: FS disagrees with the assessment in the last paragraph that states "The extent of Wells Formation groundwater contamination by selenium appears to be primarily limited to the vicinity of Pole Canyon". The release of a contaminant is not measured by standard exceedance, it is measured against background. Releases are measured in the culinary, industrial and consent order wells. Hoopes springs as an expression of groundwater also indicates a release. Whether Hoopes is directly related to Pole Canyon has not been determined. Contamination in the Wells fm. extends well beyond the vicinity of Pole Canyon.

Response: The intent of the referenced sentence was to describe the extent of groundwater containing selenium at concentrations above the groundwater quality standard and not the extent of groundwater contamination. The text has been revised to read: "Groundwater with selenium above the groundwater quality standard is limited in extent to the lower Pole Canyon area."

- 7.2.3, pg. 7-6, 2nd paragraph: The text states that GW-11 contains COPCs and a number of other constituents at concentrations greater than groundwater quality standards, but GW-11 is located within the active mineral extraction area, and because the yield is not sufficient for the use as a water supply, these standards do not technically apply. These are not the appropriate arguments to make regarding the application of standards to this data. The more appropriate argument is the same as that presented on page 6-2, that the samples represent stagnant water present in the well sump rather than groundwater flow into the well.

Response: Agreed. The paragraph has been revised as follows:

"The water samples collected from monitoring well GW-11 contain COPCs, and a number of other constituents, at concentrations greater than groundwater quality standards. Technically, the groundwater quality standards are not applicable for comparison to COPC concentrations in the samples collected from GW-11 because the samples were from stagnant water present in the well sump rather than from groundwater inflow. However, the groundwater quality standards have been applied here as general screening criteria. Exceedances of the screening criteria are identified in Table 7-8 and briefly summarized below. Water chemistry at GW-11 is considered further with the evaluation of selenium geochemistry and mobility from the A Panel backfill in Section 8.1."

- 7.4.2, pg. 7-16, Smoky Creek: Sediment releases to Smoky Creek have occurred several times since the mine was constructed. Documents in the record demonstrate that shale sediment from the SUP access road from the mine to the west has had several storm related releases where shale used to surface this road was eroded into the drainage, was bladed into the drainage during maintenance operations, and on at lease two occasions escaped the mine site when the sediment pond at the north end of panel A released sediment to the stream. Contributions of sediment in abundance from outcrops of the Phosphoria fm. are less likely to have impacted Smoky Creek than mine operations.

Response: The following information was provided by Dennis Facer, Mine Manager, Simplot Smoky Canyon Mine, on June 16, 2005:

> We have no documentation or information that indicates there has been a release of material containing phosphate from the mine property into Smoky Creek. There have been a couple of incidents and releases from the tailings line, but according to our records none of them have reached Smoky Creek. We also have had a minor discharge from the access road to Smoky Creek.
>
> Following are known events related to Smoky Creek:
>
> 1) On January 22, 1985, the tailings line developed a leak due to lack of a vacuum break. The leak occurred about 200 feet within USFS property above the current tailings pond

#2. The leak occurred past the point where it could have flowed to Smoky Creek. The leak impacted mostly lands owned by the J. R. Simplot Company, however some sediments did reach Tygee Creek (in the area where TP2 is now located). The incident was investigated by the USFS and BLM on January 29, 1985. At that time the water was clear in Tygee, with no visible sediments. The incident was reported to the Idaho Health and Welfare and the Idaho Fish and Game. The State did not respond to the incident.

2) Around April 30, 1986 we started to have problems with the tailing line just below the mill building. The tailings line from the mine collapsed due to lack of a vacuum break in the line. The pipe broke and this allowed tailings to be discharged. This occurred in the valley that existed between the mill building and Smoky Creek (this valley was filled in when A4 pit was developed). All of the material was above the settling pond that was located just south of Smoky Creek. None of this material reached Smoky Creek. The bulk of the solids was stopped with straw bales and any discharge was contained in the settlement pond. A pump was installed in the settlement basin and all the discharge was pumped into the tailings line. The situation was monitored closely to assure no material overflowed the settlement basin. As a result of this incident the overflow from this settling pond was permanently directed into the tailings line. This would assure mine sediment and water did not reach Smoky Creek. Also as a result of this incident, we installed thicker wall pipe and vacuum breaks. This information was obtained from log books of the mill control room, personal communication with Verlen Andrews (mill supervisor at the time of the incident) and confirmed by Bob Black (Mine Manager at the time of the incident). Other than the mill log book, we do not have any documentation in our files on the incident. I additionally checked with Wendell Johnson of the BLM and they do not have an incident report in their files.
3) The only flow I know of that actually reached Smoky Creek occurred from the access road just south of Smoky Creek. Although adjacent to the A-pits, the access road is separated from the pit and haul road with a substantial berm. It was suggested during a compliance inspection that we install gravel filter dikes that would slow down the water and help filter out sediment in the road ditch between the tailings thickener and the last culvert that goes under our access road. During a major storm event, the gravel filter dikes were washed down the ditch into the culvert. This resulted in the culvert becoming plugged, and water bypassed the culvert and flowed into Smoky Creek. The only runoff was water that landed on the access road or ran onto the access road from natural ground between the lower and upper culvert in the area. This road is built out of chert and topped with crushed gravel. As a result of this event, we removed the “gravel filter dikes” in the access road ditch. We also added some large rip-rap to the slope where the possibility of water could discharge into Smoky Creek. We installed a small settlement basin on the south side of Smoky Creek, and then we redirected all water coming down the access road over Smoky Creek into these settlement basins.
4) A couple of years ago, the tailings line developed a leak above the thickener. This leak was very small and was corrected before any substantial amount of material was discharged. It was mid-winter and all the material that did leak froze and was removed from the area. It was above the diversion culverts, and had it been a large leak or continued to leak, the material would have flowed into a culvert and continued into a settling pond.
5) During the early development of the C-pit, we had a blast that sent fly-rock into Smoky Creek. This occurred on September 11, 2003. This was a result of the drill holes being placed too close to the edge of the material. This material was all chert or topsoil. This was cleaned up within a couple of days. This was reported to and inspected by the USFS and BLM. To assure this situation did not happen again, all drill holes are surveyed.

Based on this information, Section 7.4.2 has been revised to indicate that there was potential for runoff from the main access road to enter Smoky Creek in the past (as described above in item number 3).

- 7.5, pg. 7-17, last paragraph: Need to describe the reasons why the criteria for ponds vary. Simply use by livestock vs. wildlife were not the reasons for different criteria. The higher value was given to a pond if transient use whether by livestock or wildlife provided the exposure. If the water was used regularly by either livestock or wildlife the lower value of 50 ppb was designated.

Response: The descriptions of the two sets of action levels for non-regulated surface water were incorrect in the draft report. These have been corrected in the document for consistency with the Area-Wide Risk Management Plan, which is the source of those action levels. The lower level applies to non-regulated surface water that has extended use by livestock or wildlife. The higher level applies to non-regulated surface water that has transient or limited use by livestock or wildlife.

- 7.5.1, pg. 7-18: Add discussion of drought conditions that affect the presence of seeps. DS-10 developed during normal conditions that led to the construction of DP-10. Disappearance of seeps is anomalous and related to the drought.

Response: The text has been revised to indicate that all of the seep flows and seep samples were collected during drought conditions.

- 7.5.1, pg. 7-18, last paragraph, 4th sentence: The text states that "At ES-4, total selenium ranged from 3.4 to 13.6 mg/L." The next sentence states that "Selenium concentrations at ES-4 were less variable, ranging from 12.4 to 13.6 mg/L between May 2003 and July 2004." These statements seemed to contradict one another with the range of values obtained from ES-4. This needs some clarification.

Response: This paragraph has been re-written and now reads:

"Total selenium concentrations measured for ES-4 range from 3.4 to 13.6 mg/L, but for the latest monitoring events, from May 2003 to July 2004, selenium concentrations were higher and less variable with a range from 12.4 to 13.6 mg/L."

- 7.6.3, pg. 7-24, paragraph 2, last sentence, and paragraph 4 last sentence: It is possible that airborne dust from the road and water transport sources may have contributed to the COPC concentrations of the adjacent native soils.

Response: Agreed.

- 7.6.4, pg. 7-25, paragraph 2 and table 7-26:
  - Since the mean (average) is twice the median (most often occurrence) this indicates that the high concentrations (for Se) may have been isolated from the rest of the overburden matrix (there may be hot spots that can be isolated for treatment).

  - Since the subsurface (root zone) is twice the concentration of the surface, this would indicate that either there is a difference in the type of material in the surface/subsurface or that the Se in the surface is moving either down to the root zone or being removed through the surface (i.e. vegetation, airborne, etc.).

Response: To address this comment, a discussion of the factors that control selenium concentrations in the surface and root zone materials was added. The Smoky Canyon Mine's reclamation practices have varied over time, especially methods for placement of soil on overburden. As a result, the thickness of soil cover on overburden varies across the historic disposal areas. Samples of either the surface or root-zone materials that contain cover soil are expected to have lower selenium concentrations than the samples that contain only overburden shale.

- 7.6.4, pg. 7-25, paragraph 3 and tables 7-26 and 7-34: The USFS 13 mg/kg guideline reference comes from a study from the Rocky Mountain Research Station. The soil samples used in making this reference had all been sieved to less then ¼ inch particles. In order to use the 13 mg/kg as a guideline for an overburden matrix, all of the overburden matrix would need to also be sieved to less than the ¼ inch course fragment size. Unweathered, course particles tend to show higher bio-available Selenium than smaller fine grain weathered soil particles.

Response: Comment noted.

- 7.6.4, pg. 7-25: Soil samples collected from the A-panel and compared to the USFS salvage recommendation of 13 mg/kg total Se dry wt. are inappropriate. This value should be measured prior to disturbance when soils are in place. To use this as a comparison values once these soils are mixed with overburden waste materials is an inappropriate application of the recommendation. A separate and much lower value should have been used in the comparison with soils placed and mixed with overburden.

  Application of soil over waste at the A panel was done in the mid-1990s and was done voluntarily by Simplot because the black shales on the surface of this dump were not successfully producing vegetation sufficient to meet reclamation release standards of the time.

Response: The USFS soil salvage recommendation for selenium was used as a screening tool for evaluating the distribution of selenium in soil and not to identify soils suitable for use in reclamation as per the intent of the USFS recommendation. Selenium concentrations were also compared to a site-specific background concentration of less than 3 mg/Kg. In order to avoid any confusion about comparison to the USFS salvage recommendation, references to that value have now been removed from this section.

- 7.7, pg. 7-27, last paragraph: Elk are not browsing animals they are grazers.

Response: This correction has been made.

- 7.7.5, pg 7-31, 3rd bullet: Clarify if the bullet should be "…equal to the action level…" or "… equal to the removal action level…"

Response: The statement should read "…equal to the removal action level…" and it has been corrected.

- 7.8, pg. 7-31 and 7-32: The following terms are not easily understood by all readers:
  - Area-wide background levels
  - Site-specific background levels
  - Relevant screening criteria
  - Reference concentrations
  - The phrase "IDEQ area-wide removal action levels" is fairly understandable. However, it is unknown if this term is used interchangeably with "removal action levels" which is used throughout the document. This needs to be clarified.
  - Clarify if "Idaho regulatory criteria" and "IDEQ area-wide removal action levels" are the same.
  - Many terms are used interchangeably throughout the document with the assumption that we all know which term is really intended.

Response: A glossary of terms has been added to the document, and revisions have been made to achieve consistent use of these terms throughout the document.

- Figure 7-19: Define non-regulated surface water action level (Wildlife or Livestock) and Non-detect (open bar), or referenced where in the text these might be found.

Response: The definitions for the two sets of action levels for non-regulated surface water have been corrected on figures and tables.

- Figure 7-48: Discuss what the "Area-Wide Background Level" represents.

Response: The area-wide background levels and removal action levels were defined in the IDEQ Area-Wide Risk Management Plan, which is referenced in the report.

- Figure 7-49: The color that we should be concerned about as discussed in the text, should be indicated on this figure.

Response: This figure is intended to present selenium concentration data for aquatic biota and allow comparison of the upstream and downstream concentrations on each of the stream drainages that crosses the mining area. There is no specific level of concern for selenium in aquatic biota that can be identified.

- Figure 7-50: The "Removal Action Levels" needs to be listed on to this and other figures showing sampling results.

Response: The values corresponding to the removal action level and background level have been added to this figure and any other figures where those values were not already given.

Section 8

- 8.1, pg. 8-2:
  The percentage of precipitation calculated to infiltrate below the evaporation/transpiration zone is unusually low at about 11-15%. Compare this to 50% for a study in the Snake River Plain (G. Clark), or 40-50% typical for the Eastern US (Ziemkiewicz). It appears that this figure is derived solely from the HELP model. It is very disappointing that at this phase (site investigation) of an existing site condition, there should complete reliance on a model, with no measured data to validate infiltration and percolation values, such as by Guelph permeameter, infiltration rings, TDR, neutron probe, etc. The estimation of recharge given could be more than 300% greater if percolation is 40% of precipitation instead of 11-15% predicted. It may account in part for disagreements on the location of the groundwater divide and flow directions in the groundwater model for the northern end of the mine, which also do not correlate well with ages of water derived from well sampling. It would also result in greatly underestimating the total selenium load and current size, extent, and potential for growth of the contaminant plume into the regional Wells Aquifer.

  The HELP model was developed for modeling soil cover performance (i.e. adequacy of soil moisture for vegetation) of a landfill. This is substantially different than modeling infiltration rate into a mine dump not covered with soil, only run-of-mine material as is the case for some dumps of the Smoky Mine. The model is clearly being used under conditions for which it was not designed, yet there is no discussion of analysis made that model assumptions are valid for this application. Though the results from this model run may agree well with results from some previous EIS studies, it could be explained by the fact that the other studies also did not validate the appropriateness of assumptions used in the model. Though the SI is not a NEPA document, the Agency was recently found to be in violation of the administration act (making a decision in an arbitrary and capricious manner) for not disclosing hydrologic model assumptions in an EIS for a project in northern Idaho.

  Other possible causes for the low value of percolation estimated by the model can be inferred from the report. It appears from the discussion in this section and in section 3.1.2 of Technical Memorandum 2 that model runs may have used annual averages of precipitation and evaporation. For the mine area, most precipitation and snowmelt occurs during early to mid spring and late fall, when evapotranspiration is very low. In contrast, most evapotranspiration and potential evaporation occurs in summer when precipitation is generally low. Using annual averages in this setting is entirely inappropriate. Table 8-1 indicates that a value of 3 was used for LAI. LAI from figure 3 in the HELP model is near the boundary between 2.5 and 1.6. but there is no source or validation for the suggested value in the model documentation. A peer reviewed source reports that Mountain Big Sagebrush has leaf area index of 0.43 – 1.10 (P. Clark).

  At least one important assumption for the groundwater model is not clearly discussed, namely the boundary conditions (constant head, mixed, flow) used for the model. If only simplistic constant head boundary conditions were used in the model, it also could explain some irregularities in flow patterns in the results.

Here are some useful references:

2001. Clark, P.E. and M.S. Seyfried. Point sampling for leaf area index in sagebrush steppe communities. Journal of Range Management. 54:589-594.

Clark, G.M., 1996, Occurrence of pesticides in surface water in the Rock Creek watershed, south-central Idaho, Moscow, Idaho: Journal of the Idaho Academy of Science, v. 30, no. 2, December 1994, p. 61-74.

Response: Comment noted. Refer to "Response to Comments Regarding Pole Canyon Hydrogeologic Setting" at the end of the responses to comments for additional discussion related to this comment.

- 8.1.1, pg. 8-3, A-Panel Pit Backfill: Identify what stratigraphic units underlie the pit backfill.

Response: The lowermost section of the Meade Peak member of the Phosphoria Fm underlies the pit. This information has been added as requested.

- 8.1.1.2, pg. 8-4: A panel transport to groundwater. 1st sentence "Net infiltration from surface water only contribution to the A panel pit".

  Yet later in the section, you state that "…possibly water from the lowest portion of the Meade Peak Member of the Phosphoria Formation." may contribute to this water collected in the sump.

  Its improbable that any water would emerge into the A pit from the Mead Peak member; it was mined from this portion of the pit. Any exposure of the Mead Peak member would be at an elevation lower than the top of the sump. No contribution would be expected from the Meade Peak member.

Response: The last part of the sentence on p.8-4, referring to inflow from the Meade Peak member, has been deleted.

- 8.1.1.2, pg. 8-4 thru 5, 5th paragraph: Selenite may have been the resident chemical species that oxidized to Selenate during the bailing process. Where Selenite has a greater potential for reduction or attenuation than Selenate, speciation of all backfill samples will provide valuable information about pore water in mine waste.

Response: Comment noted. Although additional data describing selenium redox speciation in water from the backfilled pits are not needed for the SI, such data may be useful for other Simplot programs.

- 8.1.1.2, pg. 8-4 thru 5, 6th paragraph: Is 0.31 mg/L total Se a typographical error. This concentration is 6 X the Safe Drinking Water Act criteria. Simplot has held that Se concentrations in their wells have never exceeded groundwater critieria.

Response: The error in the reported concentration range has been corrected. The upper end of the range is actually 0.031 mg/L, which is lower than the groundwater quality standard.

- 8.1.1.2, pg. 8-5, last paragraph: The Forest Service disagrees with this assessment of the groundwater impacts to the Culinary and Industrial wells. Based on the information provided in this report and reports from Ralston (1983) and the Panels B and C SEIS the Forest Service disagrees with the model of groundwater flow described here. A significant draw down and cone of depression likely occurs when the pumps are periodically operated, but that explanation alone cannot account for the Se values found in these wells.

Response: Significant drawdown (e.g., 47 feet at Culinary Well) does take place when the wells are pumped, and this drawdown does increase groundwater flow from the A Panel to the water supply wells. However, we are revising the paragraph in question for consistency with revisions made to Figure 8-10, the potentiometric surface map for the upper Wells Formation aquifer. See response to comment on Figure 8-10 below.

- 8.1.2.2, pg. 8-7 thru 8, 8th paragraph: Sorption of Se to soils is speculative, explain what monitoring will be developed to validate this assumption.

Response: The lines of evidence supporting attenuation of selenium transport between the seep discharge area and the storm water detention basin are now detailed in this section.

- 8.1.3, pg. 8-10, 3rd paragraph: Explain the disappearance of topsoil from the Pole canyon dump. I believe the record indicates that the initial design for the Pole canyon fill did not require the application of soil. Soil placement was undertaken by Simplot of their own volition to improve growing conditions on the dump.

Response: The paragraph has been revised as follows:

> "…The surface of the overburden was not originally covered, but Simplot later placed soil over some areas to improve re-vegetation. In most areas, 3 to 12 inches of soil are present on the overburden, but on the steeper east-facing slope, there are areas where shale is currently exposed…"

- 8.1.3.2, pg. 8-11, 1st paragraph:
  - The document record and information stated earlier in this report indicate that construction of a chert core was part of the design, but was not completed as designed. Early during the construction of the Pole canyon dump, Simplot personnel requested relief of the chert requirement from the BLM and FS because chert was not present in sufficient volume in the A panel to construct the core. Simplot was allowed to use a "calcareous" rib of rock that ran through the middle waste "low grades" to construct the drain.

  - Second, the unplanned failure of the dump on at least two documented occasions, mentioned above, has certainly changed the internal flow dynamics intended in the original design. Fine materials placed in the lower portion of the dump are not only exposed to water for longer times saturation of this

material will create a mound for water passing through the dump saturating a much larger volume of smaller waste particles and when saturated forcing water to flow through unsaturated portions of the dump.

- There is no discussion of the missing dye introduced by the Uof I . Correct this omission.

- There is no discussion of the instability caused by saturated conditions at the toe of the Pole Canyon dump. Discuss the liquification failures (3) and their probable causes.

- Explain the absence of data to define the internal pore water of the Pole Canyon dump and its chemistry. Installation of wells(piezometers) to ascertain the internal composition of the dump material, water levels, and lysimeters to acquire and analyze pore water chemistry should be discussed.

Response: Comments noted. Refer to "Response to Comments Regarding Pole Canyon Hydrogeologic Setting" at the end of the responses to comments for additional discussion related to these comments.

- 8.1.7.2, pg. 8-26 and 8-27, last paragraph on pg. 8-26 and 1st sentence on pg. 8-27: This paragraph discusses the two pathways for transport of selenium to the Wells Formation aquifer, the first being vertical infiltration into the Wells from the overburden dump and the second being vertical infiltration from the detention basin. The first sentence on page 8-27 states "Selenium is also attenuated along these flow paths." Data presented in this report supports selenium attenuation via plant uptake and sediment adsorption for the seep water, but there has not been any data presented to support selenium attenuation for water discharging from the base of a dump into the Wells Formation. This section needs some clarification.

Response: The paragraph refers specifically to selenium attenuation along transport pathways from the seep areas and has now been revised to clarify that point.

- 8.2.1.2, pg. 8-32: It would be helpful to include a map with all the surface water sample locations (including LP-A, -B and -C) in this section and to include as a reference for the discussion in the 2nd paragraph.

Response: A cross reference to the sample location map included in Section 4 has been added to this section.

- 8.2.2.1, pg. 8-40, last bullet: This paragraph discusses the mass load of selenium entering the Wells Formation from the Pole Canyon overburden. Information from GW-16 is not included here. Explain this in more detail. The statement "Only selenium concentrations could be measured at GW-18" is confusing since the major ion chemistry of GW-18 is discussed on the previous page indicating other elements were analyzed. Clarify this paragraph.

Response: The reference to GW-18 was an error. The bulleted statement has been revised to:

"The mass load of selenium entering the Wells Formation from the Pole Canyon overburden disposal area may be overestimated. The flux of Wells Formation groundwater at GW-16 is uncertain; therefore, the load estimate is also uncertain."

- 8.2.2.2, pg. 8-43: While I don't disagree with the assessment of contaminants to Hoopes Springs, I don't believe there is a sufficient monitoring network to answer the contribution questions from either D or E panels. Describe why there is a groundwater connection between D, E and Hoopes Springs.

Response: The potentiometric surface interpretation on Figure 8-10 indicates that groundwater from the D and E Panel areas flows towards Hoopes Spring. Based on this interpretation, it is reasonably certain that groundwater from the D and E Panel areas will discharge at Hoopes Spring. The extent to which selenium transport from the D and E Panel areas to groundwater discharging at Hoopes Spring has already taken place is not known however. This clarification has been made in Section 8.2.2.2.

- Figure 8-4: This graph indicates that water is stored in the dump and slowly released over the course of the next few months. Explain what this increased contact time does to water chemistry.

Response: Refer to "Response to Comments Regarding Pole Canyon Hydrogeologic Setting" at the end of the responses to comments for additional discussion related to this comment.

- Figure 8-10: Re-evaluate the groundwater flow system north of Pole canyon and west of the CO, IW, and culinary wells. Your map makes it appear as if water flows uphill to the mine from the west. Check for consistency with B and C EIS. IW and culinary well receive new water from the east with recharge from the Wells fm. exposed along the ridge of the Boulder anticline that plunges to the north.

Response: The potentiometric surface map shown on Figure 8-10 has been revised based on agency input (April 29, 2005) regarding the effects of local geologic structure on groundwater flow directions.

Section 9

- 9.3, pg. 9-5, 4th paragraph: This paragraph contains the statement that it is unlikely that animals would feed exclusively at the seep areas. While this may be true for livestock, it does not hold true for mammals with a small range, such as rodents. The data contained within this report indicates that these animals are impacted by compounds, particularly selenium, found in the food and water that is consumed by small mammals. There should be a discussion about these impacts and it's importance (or lack of importance) in the evaluation of ecological risk.

Response: Agreed. Individual small mammals that live in close proximity to the seep areas may experience elevated selenium exposure. This clarification has been made in the referenced paragraph.

- 9.4, pg. 9-6: List the threshold for fish, if one is available. There were several levels mentioned. Indicate which one we need to use to determine exceeding levels. Risk to fish due to (?) appears to be only of concern at Hoopes Springs… Due to… what? Also:…the mean concentration is lower sage creek is near the range that is protective of salmoinds. Define the "near" mean, and indicate whether it is below or above the range that is protective. The word "protective" is a little ambiguous. Help the readers decide if it is a good or bad thing.

Response: A footnote has been added to explain that the EPA is currently considering a risk-based standard of 7.9 mg/Kg selenium (dry weight) in fish tissue. This is the threshold level for selenium referred to in Section 9.4.

- 9.6, pg. 9-8, last sentence: This section mentions that ecological risk is low. Identify if this is a short term conclusion, and what the risk over the long term is. I would like to see something saying if selenium will continue to move down-gradient over time, and if the risk could be alleviated by improving water quality for the source areas. The selenium is still in the ground or vegetation. Describe where it is going. This is the KEY conclusion – that it can be fixed and the problem will go away! There is no conclusion of how it will go away. IF there is, I have not found one.

Response: Comment noted. The additional analysis and conclusions requested in this comment will be completed through the EECA.

Section 10

- 10.2.2, pg. 10-2, 1st paragraph, last sentence: The text states the culinary well groundwater is well below the MCL for COPCs. Historical data from 1996 – 2001 previously presented indicate that selenium concentrations in the culinary well have ranged from 0.007 mg/l to 0.31 mg/L (MCL for selenium is 0.050 mg/L). Clarify this statement.

Response: The range of selenium concentrations measured at the Culinary Well in the past is 0.007 to 0.031 mg/L. This range has been added to the last sentence in the paragraph.

- Figure 10-1: This figure states that there is "little significance" of the "grey-scale model elements" – the ingestion of contaminated plants and animals. How was this conclusion reached?

Response: Note number 2 on Figure 10-1 has been revised as follows:
"Grey-scale model elements currently have little significance at the Smoky Canyon Mine Site, as detailed in Section 10."

Section 11

- This section reads well and does not make a lot of assertions with which I would take issue or go beyond the scope of the SI with its conclusions. (There were a few "only" 3 samples exceeded a particular criteria, but these seem to be balanced by use of phrases like "high COPC concentrations." I normally suggest a more quantitative less judgmental approach, but since this report seems more balanced than most, I don't think it is worth a comment.)

Response: Comment noted.

- 11.1.1, pg. 11-2: E-panel pits were located along En echelon normal faults that appear to me were created as the thrust plate began to nose over. During mining of both D and E panels, travertine was found in the pits indicating water movement along preferential flow paths along the faults. Small solution caverns were formed along these faulted areas. Monitoring between D and E panels and the springs to the east may confirm water movement from west to east from these pits into the thrust fault where north – south flow seems to prevail.

Response: Comment noted. The need for additional groundwater monitoring data will be assessed as part of the EECA.

- 11.1.1, pg. 11-4, Seeps and Detention Basins: I did wonder about the reference to the "0.201 mg/L removal action level for selenium." Later I determined that this is based on the area wide study and is an action level for wildlife. However, the action level for livestock is lower. Is it appropriate to even be using the term "action level" in the SI? Even if it is, the text should explain the target for which the action level is relevant.

Response: The term "action level" originates from the IDEQ Area-Wide Risk Management Plan, and the removal action levels from that plan have been used as screening criteria to evaluate COPC concentrations in the non-regulated surface waters. A clarification has been added to explain that the 0.201 mg/L concentration is the removal action level for non-regulated surface water that is not routinely used by livestock or wildlife (i.e., transient use).

- 11.1.2.1, pg. 11-10, Pole Canyon Overburden Disposal Area, 1st paragraph, 2nd to last sentence: The text states that "Pole Canyon Creek continues to lose water to the alluvial system as it flows from the A Panel overburden disposal area into Sage Valley…" Describe this in more detail, as I didn't think that the A Panel overburden dump contributed water to Pole Canyon Creek, except at the Pole Canyon Dump.

Response: This error has been corrected, and the sentence now reads: "Pole Canyon Creek continues to lose water to the alluvial system as it flows from the <u>Pole Canyon</u> overburden disposal area into Sage Valley…"

- 11.1.2.2, pg. 11-13, Shallow Groundwater System, 3rd paragraph: I only agree that attenuation is occurring if dilution is a considered to be part of attenuation.

Infiltration water beyond the dump is primarily Selenate and is unlikely to attenuate in the alluvial valley deposits.

Response: Comment noted.

- 11.1.2.2, pg. 11-14, Wells Formation: Please provide proof of attenuation along flow paths from the seeps to groundwater where we know that Se exposed to the atmosphere is entirely selenate. We know Selenate only attenuates under extreme reducing conditions. Explain your proof that attenuation from springs plays a significant role.

Response: Evidence for attenuation of selenium transport at seep discharge areas was presented in detail in Sections 8.1.5 and 8.1.7. The attenuation described in those sections results from interaction of seep water with organic-rich soil and detention basin sediments and uptake by vegetation. References to the relevant previous sections have been added to the discussion of transport from seeps to the Wells Formation aquifer in Section 11.1.2.2.

- 11.2.2, pg. 11-19: Have the acceptable levels been determined?

Response: The site-specific remediation goals, or "acceptable levels," have not been determined. Preliminary remediation goals will be developed as part of the EECA.

- 11.2.2, pg. 11-19: This is the only portion of the report that was not quite clear. Perhaps this is beyond the scope of the SI and will be done later in a different document.

Response: Remedial action objectives will be fully developed as part of the EECA.

Comprehensive Response to Comments Regarding Pole Canyon Hydrogeologic Setting

I. The water-balance and mass-balance analytical models presented in the draft SI Report were developed to evaluate the relative importance of the different pathways that can potentially transport selenium from the Pole Canyon overburden area.

The water balance relies primarily on empirical data, including surface water flow data collected on numerous occasions prior to and during the SI and groundwater elevation measurements collected on five different occasions during the SI. The water balance is also based in part on an estimate of the water input to overburden from surface infiltration (incident precipitation and run-on from adjacent slopes), and estimates of the groundwater flux in the alluvial flow system and the Wells Formation aquifer under the overburden disposal area. The water balance does not rely on a numerical groundwater flow model.

The mass balance also relies primarily on empirical data and is based on the water balance calculations as well as measured selenium concentrations in surface water and groundwater.

The water- and mass-balance models may not precisely quantify water flux and/or mass flux associated with any of the individual pathways at any give time. However, these models do provide the necessary level of understanding of the relative importance of these different pathways to move forward with the EECA and remedy development.

II. The EPA's HELP Model was used to estimate the amount of water entering overburden annually from the surface due to incident precipitation. HELP Model infiltration estimates were generated for all of the overburden disposal areas, including the Pole Canyon overburden disposal area.

The HELP model is routinely used to generate estimates of infiltration into waste disposal areas as part of CERCLA-type site characterization projects. The limitations of the model, which are noted in the comments above, are explained in Technical Memorandum No 2, which is referenced in Section 8.1 and included as Appendix F to the SI Report. The HELP model has been and is currently being used by BLM and USFS to provide predictive estimates of infiltration into proposed overburden disposal areas (e.g., Smoky Canyon Mine Panels B&C SEIS, Smoky Canyon Mine Panels F&G EIS), including areas with simple vegetated-soil covers.

The HELP model input parameters used are based on those adopted for the Panels F and G EIS following work completed for the BLM/USFS by JBR and reviewed by a leading expert, Dr. Jim Kunkel of Knight Piesold Consulting. A reference to this previous work was provided in Section 8.1.3.2 and has been added to Section 8.1.

The resultant surface-infiltration estimates for the overburden disposal areas at the Smoky Canyon Mine (range from 2.2 to 3.6 inches per year) are comparable to those generated by BLM and USFS for planned overburden disposal areas in the Panels B and C area (4 inches per year) and Panels F and G area (1.9 to 5.3 inches per year), depending on soil/chert cover configuration), and the differences between the Panel F and G estimates and those

generated for the existing overburden areas are consistent with expected differences due to the types of surface materials present at the Smoky Canyon Mine.

Because a long-term average value was used for annual precipitation (32 inches/year), the infiltration estimates reported on Table 8-1, including the infiltration estimate used for the Pole Canyon water balance, are likely to overestimate actual infiltration during the SI when the site received 28 inches of precipitation over a 12-month period.

With respect to the Pole Canyon water balance, the amount of water entering overburden as infiltration from incident precipitation represents a minor component (approximately 7 percent) of the total amount of water that the overburden receives annually. The vast majority of the water supplied to the Pole Canyon overburden disposal area is inflow from Pole Canyon Creek. As a result, the uncertainty associated with the estimate of infiltration from incident precipitation has little effect on the overall water balance. For example, doubling the surface infiltration estimate from 2.2 to 4.4 inches per year increases the fraction of water entering the overburden from incident precipitation, but the higher infiltration estimate would still only be 13 percent of the annual water budget.

Most importantly, the estimate of the selenium mass load released/transported from overburden is not dependent on the estimated infiltration rate. The mass of selenium released is based on measured selenium concentrations in the creek and groundwater flow systems downgradient of the overburden area, and it is not tied to the infiltration rate used in the water balance.

III. The Pole Canyon overburden disposal area is free-draining, and there is no significant storage of water within the overburden either seasonally or on a longer-term basis.

The following data were used to evaluate seasonal hydrologic conditions associated with the Pole Canyon overburden disposal area:

- Pole Canyon Creek surface flow data (1979-2004)
- Pole Canyon Creek water chemistry data (1995-2004)
- Shallow groundwater (alluvial flow system) water levels at GW-15 (2003-2004)
- Deep groundwater (Wells Formation aquifer) water levels at GW-16 (2003-2004)
- Groundwater chemistry within alluvial deposits and Wells Formation aquifer downgradient of Pole Canyon (2003-2004)

Multiple lines of evidence indicate that there is no measurable “storage” of water within the overburden from year to year or even seasonally during times of the year that the overburden receives higher flow from Pole Canyon Creek.

The surface flow data shown on Figure 8-4 indicates that there is more water entering the overburden from Pole Canyon Creek than there is water exiting the overburden at lower Pole Canyon. If a significant volume of Pole Canyon Creek water or infiltration was “stored” within the dump, there would be times of the year when these waters would drain from the overburden and cause the outflow to be significantly greater than the inflow. The same data shown on Figure 8-4 are also presented in the table below.

Measured Surface Flows in Pole Canyon Creek

Year	Month	Upper Pole Canyon Creek Flow (cfs)	Lower Pole Canyon Creek Flow (cfs)
1979	June	5	2
1997	May	10.62	4.81
	June	2.85	2.32
	July	0.64	0.42
	August	0.37	0.08
	September	0.35	0
	October	0.22	0
1998	June	10.62	2.9
	July	2.22	1.93
	August	1.19	0.42
	September	0.46	0
	October	0.43	0
	November	0.22	0
2000	June	1.33	0.55
	September	0.07	0
2002	May	1.94	2.02
	October	0.08	0
2003	May	2.57	1.76
	October	0.05	0.01
2004	February	0.02	0.001
	May	1.75	1.08
	July	0.43	0.19

Pole Canyon Creek is the dominant source of water to the overburden. Saturated conditions within the overburden disposal area are limited to the base of the overburden along the footprint area for the Pole Canyon Creek channel. That footprint area and the elevation of creek water within the dump (i.e., the saturated thickness of overburden along the creek channel) would increase proportionately in response to higher creek flow, but there is no evidence for resultant storage of water.

The change in Pole Canyon Creek flow from upstream to downstream of the overburden area has been confirmed as loss to the groundwater flow systems. Loss from the channel footprint area recharges both the alluvial and Wells Formation groundwater flow systems. Although creek flows vary from year to year and also seasonally, the same pattern of loss from the creek channel is observed regardless of the flow conditions. Loss of flow from the creek was also observed along this reach of Pole Canyon Creek before the overburden was placed in the canyon (Ralston, 1979).

The water lost from the Pole Canyon Creek channel enters directly into adjacent alluvial deposits and the underlying Wells Formation bedrock. Alluvial deposits rapidly “fill up” during times of higher creek flow, and the water level rises (see Figure 8-6 for graph of creek flows and shallow groundwater levels at GW-15 over time). The rapid changes observed in alluvial groundwater elevations are accompanied by rapid changes in water chemistry. When the alluvial water level is very high, water chemistry is most similar to creek water during the spring runoff event. These results demonstrate that the rate of loss from the creek channel to the alluvial deposits varies as a function of creek flow, and therefore varies seasonally.

The rate that water is lost from the creek channel to the Wells Formation is limited by the footprint area of the Wells Formation subcrop, the width of saturated flow in the creek channel and alluvial deposits, and the permeability of the bedrock. These factors are relatively constant, and correspondingly, there is little variability in groundwater elevations and groundwater chemistry observed in the Wells Formation aquifer below the Pole Canyon area. Therefore, the recharge rate, and selenium transport rate, to the Wells Formation aquifer remains relatively constant over time. Further, the seasonal variations in water chemistry observed in the creek and shallow alluvial deposits are not preserved during transport from the base of the overburden through more than 200 feet of unsaturated bedrock to the Wells Formation aquifer. This thick unsaturated zone has the ability to store water and deliver it more slowly, thereby moderating variability in selenium mass transport to the Wells Formation aquifer.

Figure 8-5 presents the results from a monthly water-balance model for the Pole Canyon area. These data show an apparent lag for release of spring runoff water from the overburden area to one of the transport pathways (i.e., lower Pole Canyon Creek, alluvial groundwater flow system and Wells Formation aquifer). This lag is not directly observed, but it is indicative of the time delay between the loss from the creek channel into the alluvium and Wells Formation aquifer and the rise in water level that can be observed in downgradient alluvial deposits at GW-15 (see Figure 8-5). Therefore, although it appears that the model indicates storage during the late spring and summer, there is actually drainage into the alluvial deposits, which can later be measured at GW-15.

Descriptions of a dye tracer test performed by the University of Idaho (G. Moller, personal communication, 2004) indicate that the dye released to upper Pole Canyon Creek was never detected in creek water below the overburden disposal area. This test result is consistent with loss of water from the creek channel to either of the groundwater flow systems that underlie the dump. Dye transported to a groundwater flow system would not be detected in lower Pole Canyon Creek. The dye-tracer test results were not referenced in the SI Report because they have not been reported in writing.

Given the lines of evidence and conceptual understanding of the dump hydrologic setting, it appears that saturated conditions do not exist within the overburden, except along the limited creek-channel footprint area. The extent of saturated conditions along the base of the dump varies seasonally with the volume of flow in Pole Canyon Creek.

Conditions at the toe of the overburden area are different now than when slope failures occurred in the past. There have not been any slope failures since fine-grained materials originally placed on the toe slope of the overburden area, at the creek outfall, were removed and replaced with coarser overburden. Therefore, the past slope failures at the toe of the dump, referred to in the comment as “liquification failures,” probably occurred due to seasonally higher creek flow and expansion of the saturated zone at the base of the overburden to accommodate that higher flow combined with the presence of fine-grained materials that slowed drainage from the base of the dump slope.