Chapter 6

Chapter 6

6.1 INTRODUCTION

Chapter 6 contains the public comments received on the Draft Supplemental EIS (DSEIS) and the agencies' responses to those comments. BLM and DEQ considered and responded to all comments in preparing the Final GSM FSEIS.

Public meetings were held in Whitehall on January 31, 2005, Helena on March 14, 2005, and Butte on March 24, 2005. The meetings were conducted by DEQ and BLM to solicit input on the GSM DSEIS. Each of the public meetings had public speakers talk on issues and opinions concerning the GSM DSEIS. The speakers listed in Table 6-1 are listed in the order in which they spoke at the particular meeting.

The public comment period went from December 16, 2004, until April 12, 2005. The comments contained herein request clarification, more discussion, give new information, question analytical techniques, suggest new alternatives, or are a positive/negative response to the recommended alternative.

This section describes the paraphrased comments received in written format, and then lists the commenters' letter number in parentheses following the comment. These comments may have been paraphrased, or otherwise updated for ease in preparing this document.

Similar comments have been grouped together, where possible, to create comment statements that capture the idea of two or more commenters. Comment statements may not be exact quotes of anyone or any one organization. Comments are grouped in the order in which they are numbered for this document.

What has changed in Chapter 6 since the DSEIS?

Chapter 6 was not included in the DSEIS. The chapter is a result of the documentation received from the public during the comment period:

- Table 6-1 lists the public meeting speakers.
- Table 6-2 is a log of the individuals making public comments.
- Comments 1-392 are comments received by the public and the agencies' responses to those comments.

Table 6-1 - Public Meeting Speakers

Whitehall Public Meeting 17 Speakers January 31, 2005	Helena Public Meeting 13 Speakers March 14, 2005	Butte Public Meeting 7 Speakers March 24, 2005
Tom Lythgoe	Bob Sims	Ken Weber
Ken Weber	Tom Salvagni	Ed Handl
Chuck Notbohm	Tim Mulligan	Tom Salvagni
Ed Handl	Scott Mendenhall	Peter Bogy
Elaine Mann	Roger Stover	Tom Harrington
Roger Stovers	Tom Lythgoe	Rick Jordan
Bob Sims	Tom Harrington	
Kelly Weber	Ken Weber	
Mark Briggs	Ed Handl	
Phil Mulholland	Peter Bogy	
Mark Isto	Webb Brown	
Joe Davis	Angela Janacaro	
Tom Harrington		
Tammy Johnson		
Joe Bardswich		
Tom Salvagni		

Table 6-2 is a list of commenters and their corresponding letter or form designation number. These letter numbers are shown at the end of the particular paraphrased comment statement to identify the person or organization that made the comments. Numbers in parentheses (following the Letter Number) are the numbers of pages in the original comments, whether hand written or typed.

Table 6-2 - Log of Public Comments

Letter Number	Name of Commenter
1(2)	Sarah M. Reum
2(2)	Kipp Keim
3(2)	Thomas A. Dale
4(2)	Wayne Severance

Letter Number	Name of Commenter
5(2)	June Severance
6(2)	Gwen M. Quesnell
7(2)	Delbert O. Hunt
8(2)	John F. Childs
9(2)	Robert Nimmick
10(2)	Darrell Scharf
11(2)	Miles Page
12(2)	Tanika Page
13(2)	Nina K. Olson
14(2)	John A. Olson
15(2)	Lynn R. Jensen
16(2)	Alan R. Jensen
17(2)	Ramona Fiack
18(2)	Delbert Fiack
19(2)	Susan Fulford
20(2)	Larry L. Fulford
21(2)	Donald R. Gillespie
22(2)	Bonna G. Gillespie
23(2)	Rachel E. Monforton
24(2)	Tom Monforton
25(2)	Pat H. Irwin
26(2)	Dave Chapman
27(2)	Mabel Ferch
28(2)	Bernard J. Ferch
29(2)	Kenneth R. Dodd
30(2)	Clifford J. Hoopes
31(2)	Patricia L. Hoopes
32(2)	Rory Lamp / Bill Upton (Nevada Dept. of Wildlife)
33	Jerry Hanley
34	Patsy Ballard
35	Larry Feight & Family
36	Rick Bishop (Bishop Insurance Agency)

Letter Number	Name of Commenter
37	Bonnie Brown (Jefco Real Estate)
38	Wanda Freman
39	James L. Loomis
40	Dr. Kathy Meyer (Whitehall Chiropractic)
41	Dana Bauer
42	Paul Richards
43	Andy Johnson
44	Kurt Ehlert (Tractor & Equipment Co.)
45	Lee Ebeling, P. E. (Lacy & Ebeling Engineering Inc.)
46	Jim Smitham (Butte Local Development Corporation)
47	Angela Janacaro (Montana Mining Association)
48	Delbert Hunt
49	Mary Whittinghill (Montana Taxpayers Association)
50(2)	Scott Mendenhall (House Representative for District 77)
51	Ken S. Eurick
52(2)	Tim Mulligan
53(2)	Roger W. Rohr (Tractor & Equipment Co.)
54	Mark Nelson
55	Ken Holkan
56	Clint Clements
57	Mike Ferguson
58	Jason Johnson
59	Cindy Larsen (Whitehall Chamber of Commerce)
60	Terry Basnett
61	Joe Nicholls
62	Steve Streadwick
63	David Bonko
64	William Turner
65	Scott Conner
66	Richard Flowers
67	Bob Sunderland
68	George Smith

Letter Number	Name of Commenter
69	Lance Hugulet
70	Donna L. Heikkinen
71	Robert V. Shaw
72	David Soennichsen
73	Dick Coughlin
74	Scott Parker
75(2)	Kevin R. Johnson (Montana Bentonite, LLC)
76	Justin Wentland
77	Sam Freese
78	Mark Janacaro
79	Paul Smith
80	Mike Wall
81	Tom Nicholson
82	Jack & Olive Smith
83	William D. Todd
84	Tim O'Donnell
85	Frank Sholey
86	Rodney Mills
87	Jay McCarthy
88	Jim Loomis, Jr.
89	Thomas Kinghorn
90	Robert Carpenter
91	Martin L. Johnson
92(4)	Tom Salvagni
93	Ray Panisko
94	Harry Parker
95	Greg Powers
96	Jeremy Bennett
97	Ken Hugulet
98	Tom Powers
99	Gary White

Letter Number	Name of Commenter
100	Brock Hassler
101	Ray Fitzpatrick
102	Wyatt Hartmann
103	Bret Martinell
104	David Lambrecht
105	Nina K. Olson
106	Don Drake
107	Brian Alley
108	Patrick J. Flowers (Mont. Fish, Wildlife & Parks Supervisor for Region #3)
109	Eric Johnson
110(4)	Edward L. Handl, P. E. (Atlatl Inc.)
111	Leita Beardsley
112(2)	Laura Skaer (Executive Director for the Northwest Mining Association)
113	Joe Dillon
114	Harold Sant
115	John Patritti
116	Sam Graham
117	Tom Peters
118	Kelly Stolp
119	Rick Henderson
120	Bill Chase
121	Ken Bahr
122	Tim Hockenberry
123	Bob Cronholm
124	Chris M. Nelson
125	John Perigo
126	Jim Chiotti
127	Tom & Twila Harrington
128	Tom Harrington (Whitehall Community Transition Advisory Committee Chairman)

Letter Number	Name of Commenter
129	Pat Connors
130	Gordon Lyons
131	Shawn McGurk
132	Don Powers
133	Richard A. Smith
134	Kerry Weightman
135	John Von Bergen
136	Dan Masica
137	Ryan Brackett
138	Brian Friesz
139	Dean Schroeder
140	Tim Near
141(2)	Tomas E. Lythgoe, Chuck Notbohm, Ken Weber (Jefferson County Commission)
142	Don Drake
143	Tomas E. Lythgoe
144(2)	Philip S. Mulholland (Mine Geologist)
145	Patricia Lewis (Jefferson Local Development Corporation)
146	Cory Vollmer (AFFCO)
147	Mark Briggs
148	Rick Johnston
149	Dan Donner
150	Greg Mills
151	Dave Vossler
152	Gary O'Farrell
153	Rich Johnson
154	Jeff Coleman
155	Douglas M. Hardison
156	Shane Albracht
157	Larry Downing
158	Justin Hanninen

Letter Number	Name of Commenter
159	Rich Prodgers
160	Tim & Andrea Mulligan
161	Bob Sims
162	B. Sachau/Jean Public
163	Bill Tash (Montana State Senator for District 36)
164(3)	Betty Salvagni
165	Merle Olson
166	Lonna Johnson
167(7)	Larry Svoboda (U. S. Environmental Protection Agency)
168(29)	Plaintiffs Representatives (David K. W. Wilson, Jr., Thomas M. France, and James R. Kuipers, PE)
169(48)	Golden Sunlight Mine

6.2 INDIVIDUAL COMMENTS AND RESPONSES

6.2.1 Public Interest Group Form Comments

The first six comments are from forms provided by a public interest group to the public for responding to the DSEIS and the public meetings held in early 2005. The 31 respondents indicated whether they agreed, disagreed, or had no opinion on six comments printed on the form. Each comment is repeated here and the responses are summarized by response number from Table 6.2.

Comments 7 through 19 are from these 31 respondents in written form.

1. **COMMENT:**
   The preferred alternative – recommended by the Montana Department of Environmental Quality and the Bureau of Land Management – should be authorized and implemented. This alternative, the Underground Sump Alternative, is the best reclamation plan for ensuring environmental protection and water quality.

The 31 commenters listed below made the following response to the above statement:

Agree	Disagree	No Opinion	Not Marked
1-21, 23-28, 30-31	-	-	22, 29

RESPONSE:
Thank you for your comment.

2. COMMENT:
Worker safety is a critical part of any EIS and Record of Decision. The agencie's preferred alternative, the Underground Sump Alternative, provides the highest level of safety to workers in the future. It does this by utilizing the underground workings and by further reducing worker exposure to falling rock.

The 31 commenters listed below made the following response to the above statement:

Agree	Disagree	No Opinion	Not Marked
1-21, 23-28, 30-31	-	-	22, 29

RESPONSE:
Thank you for your comment.

3. COMMENT:
While "backfilling" the pit may be supported by some as the proper thing to do, it is not. Backfilling actually increases the chance of worker injury, brings undue costs, increases unnecessary fuel consumption, reduces air quality, and most importantly, increases the risk to water quality, including in the Jefferson River. Backfilling is simply the poorest choice for reclaiming this pit.

The 31 commenters listed below made the following response to the above statement

Agree	Disagree	No Opinion	Not Marked
1-16, 18-21, 23-28, 30-31	-	17	22, 29

RESPONSE:
Thank you for your comment. The agencies disagree that the chance of worker injury would increase. See Section 4.4.3.1.1.

4. **COMMENT:**
It appears that there are additional mineral resources in the vicinity of the pit. Backfilling will likely preclude future development of those mineral resources, or at the very least make it difficult, cumbersome and environmentally more difficult to access. The Underground Sump alternative, however, helps keep future options open – for both mining and proper water management.

The 31 commenters listed below made the following response to the above statement:

Agree	Disagree	No Opinion	Not Marked
1-3, 5-21, 23-28, 30-31	-	-	4, 22, 29

RESPONSE:
Thank you for your comment.

5. **COMMENT:**
As noted in the DSEIS, the Underground Sump Alternative provides "Flexibility for future improvements," which is currently being researched in several locations. This is particularly relevant regarding technologies being developed for water treatment such as microbes, carbon sources, etc. The ability to use such technologies in the future will be much greater in an open body of water (including underground) than in soggy backfill material. This alternative provides similar flexibility in other aspects of reclamation also.

The 31 commenters listed below made the following response to the above statement:

Agree	Disagree	No Opinion	Not Marked
1-28, 30-31	-	-	29

RESPONSE:
Thank you for your comment.

6. **COMMENT:**
As the BLM has indicated, backfilling the pit may result in "unnecessary or undue degradation of public lands" and should be avoided. The Underground Sump

Alternative provides the best solution for public lands, private lands, the environment, water quality, nearby communities and the State of Montana.

The 31 commenters listed below made the following response to the above statement:

Agree	Disagree	No Opinion	Not Marked
1-28, 30-31	-	-	29

RESPONSE:
Thank you for your comment.

In addition to submitting circled responses (comments 1-6), the following is the paraphrased comment made by 5 of the 31 commenters.

7. **COMMENT:**
The Underground Sump Alternative is common sense, addresses all the long term issues, and was developed by experts, so let's put this issue to rest and not let the Environmental Extremists (backfill options) shut down the mining industry in Montana. (2, 3, 5, 10, 25)

RESPONSE:
Thank you for the comment.

6.2.2 Other Individual Written Comments

This section describes the paraphrased comments received in written format, and then lists the commenters' letter number in parentheses following the comment.

8. **COMMENT:**
GSM is sitting in limbo waiting on a decision that should have been cleared up years ago. I support your recommended alternative, the Underground Sump. Those who seem to challenge the mine at every turn, say that by not backfilling the pit, GSM is defying the Montana Constitution. That is ridiculous. The law clearly states that backfill decisions should be made on a case by case basis. I think the DSEIS is clear and concise as to what each alternative would accomplish. Either of the no backfill alternatives is far and away better for our environment than the backfill alternatives.

I very much desire clean water and a nice town to live in. This is our community, and frankly, I don't know why the environmentalists can't leave us alone. They prefer alternatives that would poison the water, take away jobs, reduce worker safety, and reduce tax revenue for the schools, city, county, and the state of Montana. (32-34, 36-39, 45-51 54, 56, 57, 59, 62, 70, 71, 84, 92, 96-100, 104, 107, 118, 121, 123, 124, 128, 133, 138, 139, 141, 142, 144, 145, 147, 148, 152, 153, 155-158, 164-166)

RESPONSE:
Thank you for the comment.

9. **COMMENT:**
My family and I live just southeast of the mine by about 2.5 miles. I am completely opposed to any option that backfills the pit, with the potential to contaminate my well. My family and I will live with the results of this decision long after the mine is gone. I already know that mine operations affect my well, and here is why. My well is 200 feet deep, and over the years I have installed and changed an iron filter on a monthly basis. When the mine stopped mining ore this past time and went to the next phase of stripping, the iron filter contaminants were greatly reduced. I am not employed by GSM. I have records for my well. (35)

RESPONSE:
Thank you for the information.

10. **COMMENT:**
Numerous debates on the GSM and its reclamation have occurred over many years. As some groups argue for backfilling the pit, it seems other mines have tried this with great expense and less than successful environmental results. I am writing in support of the recommended option, the Underground Sump Alternative. This is the best of all the alternatives.

The decision as to how to handle this reclamation problem needs to be made in the best interest of all and not just a limited few who come here to push their agenda and then go home and don't really care about the true impacts of this decision. (40, 41, 53, 58, 60, 61, 63-68, 72, 75-77, 81-83, 86, 87, 89, 93-95, 101-103, 105, 111, 112, 116, 117, 119, 120, 122, 125-127, 129-132, 134, 135, 137, 140, 146, 154, 161, 163)

RESPONSE:
Thank you for the comment.

11. **COMMENT:**
The Montana Constitution mandates complete reclamation of all pits and highwalls to original contour. The Constitution also requires all poisoned waters be thoroughly purified and all final contours be revegetated with natural species requiring no water or fertilizer additions. (42)

RESPONSE:
The Montana Constitution does not require the reclamation of all pits and highwalls to original contour. Article IX, Section 2, of the Montana Constitution requires all lands disturbed by the taking of natural resources to be reclaimed and delegates to the Montana Legislature the authority to provide effective requirements and standards for the reclamation of lands disturbed.

The Montana Legislature has enacted the Metal Mine Reclamation Act to fulfill its obligations under Article IX of the Montana Constitution. The Metal Mine Reclamation Act requires open pits and rock faces to be reclaimed to a condition 1) of structural stability competent to withstand geologic and climatic conditions without significant failure that would be a threat to public safety and the environment; 2) that affords some utility to humans or the environment; 3) that mitigates post-reclamation visual contrasts between reclamation lands and adjacent lands; and 4) that mitigates or prevents undesirable offsite impacts. The Metal Mine Reclamation Act neither requires nor prohibits use of backfilling as a reclamation measure. Rather, DEQ is required to base its decision to require any backfill measure on whether and to what extent backfilling is appropriate under site-specific circumstances and conditions to achieve the standards previously discussed. DEQ is applying these standards in selecting the reclamation alternative.

MMRA requires compliance with the Montana Water Quality Act to protect water quality. MMRA does not require the use of native species in revegetation, but GSM is planting mostly native species.

12. COMMENT:
I support the recommended alternative for the GSM FSEIS. Sustainable development would require leaving the pit open, so that future generations could take advantage of lower quality ores that have already been exposed. The people who have sued regarding the backfilling of the pit, and then didn't bother to show up at the public meetings, are just showing that their suit is frivolous. GSM should be allowed to sue them for recovery of funds used to address these frivolous issues, and also for damages caused by their continuous delaying tactics. (43, 44, 49, 85, 88)

RESPONSE:
Thank you for the comment.

13. COMMENT:
If the GSM is forced to implement one of the backfill alternatives and not the one supported by science and the experts, and as a result, my property and water are contaminated by ARD, etc.; who do I come after? Surely, not those who are pushing for these backfill alternatives that will most likely cause this to happen. (52, 160)

RESPONSE:
Thank you for the comment. The agencies will make their decision based on science and the legal standards set forth in the Montana Metal Mine Reclamation Act. Your legal question regarding liability is outside the scope of the SEIS.

14. COMMENT:
I am writing to show my support for the Underground Sump Alternative. It is very difficult to get a good paying job with benefits that can help support a family. I believe that either of the backfill alternatives would cause GSM to close and cause many unemployed workers as well as cutting tax revenues for our schools, city, county, and state. (55, 73, 74, 78, 90, 109, 113, 115, 136, 149-151)

RESPONSE:
Thank you for the comment.

15. COMMENT:
I support the Underground Sump Alternative because it takes care of the environment as well as the local, county, and state economies. Workers spend their checks, pay their taxes, employers buy goods, services, and pay their taxes. If one could track all the dollars, the economic impact of GSM would be staggering! The mine has paid over 200 million dollars in wages and benefits to its employees and have paid over 30 million dollars in taxes. (69, 79, 114)

RESPONSE:
Thank you for the comment.

16. COMMENT:
I am a lifelong Montana resident and an avid outdoorsman. What I have learned over the years is that without a good paying job, I can't participate in these activities. My point is, I'm tired of hearing that tourism is Montana's future. It is not the future! Can all Montanans make a living and support a family in a small town waiting tables, cleaning motel rooms, being a teller at a quick stop, or selling Montana trinkets on the street corner? I don't think so! Without the higher paying jobs like mining, our economy can't survive over the long run. The well-to-do folks from the east or west coasts can still be a part of the state economy, but not the whole economy! Support the recommended alternative. (91)

RESPONSE:
Thank you for the comment.

17. COMMENT:

As an avid outdoorsman, I would like to add a few other items to the decision. Let me list a few other things GSM has done over the past few years to aid in environmental improvements and help for the community.

A: Donated 20 acres of land to the Montana Dept. of Fish, Wildlife, and Parks for the construction of a family fishing pond. This will hopefully come to fruition in the near future.

B: Has consolidated more than 500 acres of wetlands in the Piedmont Swamp area near the Jefferson River.

C: Has purchased more than 600 acres of elk calving grounds in the Bull Mountains.

D: Carefully manages the Candlestick Ranch, enhancing the public's access and recreational opportunities.

E: Purchased computers and musical instruments for local schools.

F: Given college scholarships.

G: Purchased medical equipment.

H: Helped start the community endowment foundation.

I: Put a roof on the school.

J: Purchased weight equipment.

K: Helped with the library expansion.

L: Is working on economic development projects to help mitigate eventual mine closure.

M: Helped with a turkey stocking program.

How much have the plaintiffs spent, in "on the ground" improvements in our area? Please implement the Underground Sump Alternative. (106, 143)

RESPONSE:

Thank you for the comment. Your question is outside the scope of the SEIS.

18. COMMENT:

My staff (MT FW&P) has reviewed the SEIS for reclamation of the GSM. Given our responsibilities, we support the selection of an alternative that provides the most effective reclamation of the mine site over the long term, while taking care of the long term water protection and monitoring program. We hope the bond will cover these water protection and water monitoring expenses over the life of this site.
My staff doesn't feel qualified to fully evaluate these alternatives. However, we trust that your chosen alternative will accomplish these two long term goals. (108)

RESPONSE:
Thank you for the comment. The bond will cover the cost of water protection and monitoring.

19. **COMMENT:**
As professionals, working with the Jefferson County Commissioners and others, I support the Underground Sump Alternative (USA). Here are 9 solid technical reasons why the MDEQ and BLM should continue on the FSEIS using this recommended alternative.

1. The Underground Sump Alternative (USA) is the optimum choice when considering all factors from the numerous, comprehensive, multi-disciplinary scientific studies summarized in DSEIS.
2. This is the only alternative which will not expose additional rock to additional saturated pit conditions. This should render all other options unacceptable.
3. This Alternative will best preserve remaining mineral resources so that economics or technology might make them reserves in the future.
4. The USA would allow for future developments in science, technology, research, and the creative human spirit. In addition to the technology in the mining or economic world mentioned in number 3 above, who knows what use we may find for an open pit?
5. The USA does not require the re-handling of millions of tons of rock and the problems associated with those alternatives. These problems include dust emissions, extra fossil fuel usage with associated green-house gases, and much greater worker safety issues.
6. The preferred alternative will allow GSM the greatest chance of a longer productive life.
7. The USA provides the most simple and straightforward long term water quality plan. Considering the myriad of technical problems associated with the other alternatives, the USA should have the highest probability of resulting in a trouble free, sustainable, environmentally protective operation on a continuous basis.
8. The recommended alternative will have the lowest static groundwater level in the future. This should allow plenty of time for repairs or replacements of pumping system parts should the need arise. This is, by far, the best alternative for long term groundwater protection.
9. The final solid reason for choosing the USA is allowing technology advancements in pumping or water treatment options. These changes can be implemented much easier in an open pit than in any of the backfill options. (110, 159)

RESPONSE:
Thank you for the comment.

6.3 ENVIRONMENTAL PROTECTION AGENCY COMMENTS AND RESPONSES

Letter Number 167, as listed in Table 6.2 above, is from the Denver office of the EPA. EPA's three page cover letter and four pages of comments were broken down in Comments 20 through 32.

20. COMMENT:

EPA's review of the DSEIS found improvements to the information available and in the understanding of hydrology and hydrogeology in the project area compared to the previous EIS. EPA has remained neutral throughout this process regarding whether the GSM pit should be backfilled. EPA will only support alternatives that protect Montana's natural resources. Based on our review of the DSEIS, we believe that adverse impacts to receiving water quality could be avoided with or without pit backfill. Importantly, the DSEIS indicates that pit backfill alternatives could adversely affect the Jefferson River alluvial aquifer. EPA believes that with improved mitigation, water management and model assumptions that more accurately reflect what is known of the project area, adverse impacts from pit backfill to water quality might be avoided. In our attached Detailed Comments, we will provide specific recommendations for improvement of the analysis for the FSEIS that we expect will lead to a more conclusive assessment of the potential impacts of the alternatives. (167)

RESPONSE:

Additional mitigation, water management, and water modeling assumptions are analyzed in the FSEIS in Table 4-8. The agencies' responses to specific concerns raised by EPA regarding mitigation, water management and water modeling assumptions are addressed in responses to Comments 26 through 29.

21. COMMENT:

EPA actively participated in the Multiple Accounts Analysis (MAA) process that brought multi-agency expertise together to identify and analyze the basic alternatives. In hindsight, MAA may not be the best tool for analyzing a project with essentially only two alternatives (backfill vs. no backfill). However, bringing the interested parties together was important and effective in many ways. The process raised the participants' understanding of the project site, the mine, and the technical, socio-economic and environmental factors to be considered in this decision. Bringing together this group of experts resulted in thorough identification of the challenges faced by each alternative, improved modeling, and developed a shared understanding of the array of issues covered in this EIS. The MAA successfully identified the basic alternatives for analysis, and successfully eliminated a number of infeasible alternatives from detailed study. (167)

RESPONSE:

Thank you for the comment.

22. COMMENT:
This MAA was conducted in a tight timeframe relative to most MAA's. The MAA is typically run as an iterative process that allows for alternatives to be improved over time to attempt to avoid identified weaknesses. In this case, the MAA was largely forced to stay with the basic alternatives (a single iteration), and there was not sufficient time to revise alternatives or to reanalyze the impacts of alternatives under different mitigation packages. For example, at several times during the MAA process, EPA commented that a pit backfill alternative could include both in-pit collection and down-gradient collection. EPA and others also suggested possible mitigation measures to reduce the potential for impacts to water quality. The process, unfortunately, was prematurely ended by the lead agencies before many of these measures could be evaluated by the group. We encourage the lead agencies to re-engage the participants to assess the potential for mitigation to avoid adverse impacts, to look for solutions to technical challenges, and to assess the model input variables for representativeness. This analysis could then be included in the FSEIS and would be available to the decision makers. By honing the analysis in this way, the decision makers can have improved confidence in the impact predictions in the FSEIS. (167)

RESPONSE:
Additional mitigation, water management, and water modeling assumptions are analyzed in the FSEIS, and impacts from pit backfill to water quality have been addressed in the FSEIS in Table 4-8. The agencies' responses to specific concerns raised by EPA regarding mitigation, water management and water modeling assumptions are addressed in responses to Comments 26 through 29. The agencies have decided not to re-engage the MAA process.

23. COMMENT:
Based primarily on the need for perpetual treatment to meet water quality standards under all alternatives, and on the lack of consideration of potential mitigation to reduce risks to water quality primarily in the pit backfill alternatives, EPA has issued a rating on this DSEIS of EC-2 (Environmental Concerns - Needs Information). The "EC" rating indicates that the EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the proposed alternative, or application of mitigation measures or actions that can reduce these impacts. The "2" indicates that EPA has identified additional information, data, analyses or discussion should be included in the Final EIS. A full description of EPA's EIS rating system is enclosed. (167)

RESPONSE
There are additional mitigation measures added to the analysis in Chapter 4 under each alternative. All supplemental new information since publication of the DSEIS is reviewed and addressed in the FSEIS.

24. COMMENT:

EPA recognizes the substantial difference in cost among the alternatives. We recognize the lead agencies have many complex factors to consider in making the decision on whether to backfill the pit. EPA will support any alternative that proves sustainable in protecting Montana's natural resources and that complies with applicable laws and regulations for protecting environmental resources.

RESPONSE

Thank you for the comment.

25. COMMENT:

A great deal of energy was expended in understanding the basic alternatives analyzed in this EIS. The Multiple Accounts Analysis (MAA) participants were engaged to find the strengths and weaknesses of each alternative. The MAA process was unfortunately halted before the group could employ their collective expertise and creativity to seek solutions for the weaknesses identified. This is particularly true of the pit-backfill alternatives where little time was invested by the MAA group to solve the identified issues that potentially detract from backfill alternatives. We are not suggesting that every challenge has a feasible option for reducing or eliminating that problem, or that every problem deserves an in-depth attempt to resolve. However, for problems that ultimately lead to a projection that environmental standards could be violated, we believe a serious effort to avoid those problems is worth the investment. EPA is concerned that a full and thorough analysis of mitigation measures appropriate for the pit-backfill alternatives was not completed. (167)

RESPONSE:

Thank you for the comment. Analysis of additional mitigation measures for the pit backfill alternatives has been included in the FSEIS in Chapter 4.

26. COMMENT:

The environmental challenges with pit backfill are primarily tied to the ability to protect ground water in the Jefferson River alluvial aquifer from adverse impacts. There are three basic ways to successfully protect water resources with this project:

A. Control (reduce) the amount of water entering the pit;

B. Collect the water after it has entered the pit; or

C. Collect the water down gradient, after it has been discharged from the pit.

The DSEIS includes alternatives that begin to assess in-pit and down-gradient water collection. There is no alternative that includes measures to prevent ground water from entering the pit. There is also no alternative that combines the three approaches. To understand whether water resources can feasibly and reliably be protected while backfilling the GSM pit, it seems critical that all three water control methods are fully assessed, perhaps most efficiently in a single alternative.

Perhaps the next step in the feasibility assessment of pit backfill should be to determine how much up-gradient ground water and/or pit water (including water collected as it leaves the pit) would have to be collected in order protect water quality given the predicted capture efficiency of the Rattlesnake Gulch collection wells. At that point, a group of experts could be assembled to determine whether there is a combination of up-gradient collection and in-pit collection that could capture that amount of water.

The following factors appear to make an integrated approach to water management more feasible:

A. The majority of the 15 gpm of ground water that enters the pit comes in via a single fault, the Corridor Fault.
B. Most (up to 90 percent) of the water that enters the backfill is predicted to exit to the east from the Sunlight/Range Front Fault and along the Corridor Fault.

This opens the possibility that water management in these select areas could sufficiently reduce the volume of water leaving the pit to protect water quality in the Jefferson Aquifer.

For water leaving the pit, it is unclear why the down-gradient collection alternative proposes collecting that water down in Rattlesnake Gulch rather than as soon as it leaves the pit. The DSEIS states (p. 1-24), "Relying on capture of pit outflows at distances down gradient of the pit may introduce a larger degree of uncertainty and risk concerning the effectiveness of capturing all contaminated groundwaters and could require collection of a greater volume of groundwater." We, therefore, recommend that near-pit collection be addressed in the FSEIS. If near-pit collection proves feasible, even in part, it would be a benefit to water quality because the pit effluent would be captured without the need to capture and treat dilution water as well. EPA recommends the FSEIS include an analysis of cost and engineering feasibility related to capturing this discharge immediately east of the point of discharge from the pit.

RESPONSE:
The agencies appreciate EPA's specific recommendations. As described in the agencies' response to Comment 28, the pit water balance has been updated based on additional data obtained since the DSEIS. The expected pit seepage rate has been revised from an estimated 16 gpm for the DSEIS, to a range of 27 to 42 gpm for the FSEIS (Telesto, 2006). The reasons for this revision are described in the response to Comment 28.

The agencies have performed additional evaluation of EPA's three suggested water control methods in the partial pit backfill alternatives. Mitigation Measure 15 has been expanded to include 3 sub-components (Section 4.8.2.1). Measure 15a is the same as Measure 15 as presented in the DSEIS, which comprises downgradient capture at two locations. Measures 15b and 15c incorporate upgradient collection wells (Measure 15b) and new wells near the eastern edge of the pit in the Upper Rattlesnake collection system (Measure 15c). The agencies have concluded that these measures could be applied to any alternative as mitigation measures.

Upgradient Capture (Measure 15b)

Capture of groundwater prior to entering the pit would reduce the total volume of water that enters the pit, and would reduce the seepage volume that would have to be pumped from the pit under the Partial Pit Backfill With In-Pit Collection Alternative, or collected down gradient under the Partial Pit Backfill With Downgradient Collection Alternative. The DSEIS identified the Corridor Fault as the primary source of groundwater inflow to the pit. This would be the main target of an upgradient capture system. GSM currently operates two dewatering wells, PW-48 and PW-49, in the north highwall of the pit. The combined pumping rate from PW-48 and PW-49 has averaged approximately 18.2 gpm (Telesto, 2006). The existing wells would be covered during construction of either of the partial pit backfill alternatives. Similar wells could be constructed after completion of the partial pit backfill alternatives, and that 15 gpm could be captured upgradient of the pit, based on the recent experience of GSM and the hydrogeology of the pit area.

Implementing upgradient capture mitigation Measure 15b for the Partial Pit Backfill With Downgradient Collection Alternative would reduce the rate of groundwater seepage that enters the Tdf/colluvial aquifer by 15 gpm, thus reducing the expected seepage range from 27 to 42 gpm to 14 to 29 gpm. The effects of the reduced seepage rates on predicted groundwater quality in the Jefferson River alluvial aquifer are discussed in Comment 28 and in Section 4.8.2.1.

In-Pit Collection

The agencies considered additional mitigation measures to improve collection of water in the backfilled pit, but did not find any capable of overcoming the technical limitations and uncertainties associated with this approach. Collecting water after it has entered the pit was evaluated in the DSEIS under the Partial Pit Backfill With In-Pit Collection Alternative. The analysis indicated that complete control of pit seepage cannot be guaranteed because of problems associated with drilling and operating wells in 875 feet of backfill that is corrosive and subject to settling.

For the DSEIS, hydraulic conductivity estimates for the backfill material ranged from 10^{-3} to 10^{-5} cm/s (Telesto, 2003e). Pit flow analysis conducted for the DSEIS predicted that hydraulic conductivity values of 10^{-6} cm/s or less would result in perching of groundwater within the backfill that would lead to horizontal, rather than vertical groundwater flow, thus permitting seepage to leave the pit without being captured by the wells (Telesto, 2003e). The agencies discounted the horizontal flow potential because perching would not be continuous across the backfilled pit (Figure 4-1).

Additional permeability testing of potential backfill material under simulated load conditions, such as that in a backfilled pit, was conducted subsequent to the DSEIS (Telesto, 2005). The results indicate that under 450 feet of backfill, the hydraulic conductivity can decrease to 10^{-6} cm/s, and that under 900 feet of backfill, the hydraulic conductivity can decrease to 10^{-7} cm/s (Telesto, 2005). This additional evaluation indicates that collection of pit seepage using vertical wells cannot be reliably assured. The number of wells was increased from four to up to 11 to offset this potential problem (Section 4.2.2.5.2).

The Partial Pit Backfill With In-Pit Collection Alternative would have 100 feet of crusher reject in the bottom of the pit. The backfill from the waste rock dumps would be trucked into the pit in several areas. The mechanics of end dumping and cast blasting would create segregated fine and coarse zones, based on observations at GSM from offloading a portion of the East Waste Rock Dump Complex in 1994 (Figure 4-1). Each truck load would create a single segregated cell with larger material on the bottom and fines on top. There would be some zonation within the dumping zone with fines higher in the section. The several dump areas would create different broad zones. The process of weight compaction and weathering would produce fines that could move into the lower portions of the backfill with water, including the crusher reject, which is the pumping zone. Over time, the crusher reject would develop reduced permeability and may lose its ability to function as a sink to maintain collection of pit seepage (Section 4.2.2.1.2). These effects would occur in any alternative that includes pit backfill, including the No Pit Pond Alternative. The effect would be more pronounced in the partial pit backfill alternatives because there would be a much greater volume of backfill, and backfill would consist of less uniformly graded material.

Directionally drilled dewatering wells could be more effective than vertical dewatering wells. Directional wells would be drilled through bedrock into the crusher reject in the bottom of the pit. Directional wells in bedrock would avoid damage due to settling in the backfill and would be subject to settling and corrosion only near the bottom of the casing in the crusher reject. The low hydraulic conductivity of the backfill would still limit movement of water into the crusher reject and the wells (see also the response to Comment 27).

A mitigation option was considered to build the wells from the bottom up as the backfill was placed instead of waiting to drill through all the backfill. This is commonly done on valley fill heap leach pads. The collection wells are built from the bottom up as each lift of waste rock is placed. End dumping from 775 to 875 feet would damage the wells. The agencies dismissed this measure because the wells would still fail from corrosion and would have to be drilled through the backfill.

The agencies have concluded that pumping water out of the backfilled pit using vertical or directionally drilled wells would be difficult. If the Partial Pit Backfill With In-Pit Collection Alternative is selected, the agencies would bond for Measure 3 to identify flow paths, Measure 15a to maintain the two pump back well systems, Measure 15b to install upgradient capture wells, and Measure 15c to add new wells in the Upper Rattlesnake Gulch collection system and/or on secondary bedrock pathways because complete capture of seepage within the pit cannot be reliably assured (Section 4.8.2.1). This would be equivalent to permitting the Partial Pit Backfill With Downgradient Collection Alternative.

Downgradient Collection (Measure 15c)
The agencies have evaluated Measure 15c to collect water immediately down gradient in Upper Rattlesnake Gulch after it has discharged from the pit (see Section 4.2.3.1.2). This measure could be applied to the partial pit backfill alternatives. Up to five new wells would be installed near the eastern edge of the pit in an attempt to capture some of the pit seepage (Figure 4-5). The target of the capture wells would be the Tdf/colluvial aquifer just east of the pit, and if possible, the Corridor Fault. The agencies would require a detailed hydrogeologic characterization of the area directly east of the pit to identify the most effective zones for capture. However, the capture of water in this area is expected to be less effective than Measure 15a (capture in Rattlesnake Gulch and the South Pumpback System) and Measure 15b (upgradient capture) for the following reasons:

- Groundwater flow into this structurally complex aquifer could be in fractured rock, which might locally by-pass the Tdf/Colluvial aquifer adjacent to the pit and is less predictable than in the sedimentary deposits in Rattlesnake Gulch;
- The Tdf/colluvial aquifer at this location is deeper and more heterogeneous and has multiple channels (flow paths), making capture much more difficult than at the current location of the Rattlesnake Gulch capture system;
- Groundwater gradients have been documented to be high (*e.g.*, 130 foot drop across the fault separating bedrock from the colluvial/alluvial materials) due to permeability contrasts between the rock units (URS, 2001). The large groundwater gradient results in less saturated thickness and faster groundwater velocities, making capture in wells more difficult; and,
- Thorough evaluation of the effectiveness of Measure 15c could not be done until the alternative was constructed, and pit seepage began to leave the pit.

Implementing Measure 15c would result in a reduction of pit seepage into the primary pit flowpath. Due to the reasons listed above, the agencies have determined that the probability of achieving effective capture of pit seepage with Measure 15c is less than with Measures 15a and 15b, and that Measure 15c would not be relied upon as a primary mitigation measure for the Partial Pit Backfill With Downgradient Collection Alternative.

27. COMMENT:
EPA questions whether there may be methods available to increase the reliability of in-pit collection. It is possible that engineering solutions could overcome or limit the predicted difficulties with drilling and maintaining wells in backfill. For example, directional drilling might allow wells to be drilled primarily in bedrock rather than in backfill. There may also exist engineering solutions to problems like lensing, settling, etc. These issues were not a significant focus of the MAA, and it is not clear in the DSEIS that effort was expended to try to overcome these challenges after the MAA process was halted. (167)

RESPONSE:
See the response to Comment 26 about the ability to collect water in the pit backfill under the Partial Pit Backfill With In-Pit Collection Alternative. Engineered solutions to compensate for in-pit collection difficulties were discussed during the MAA process, and no engineered solutions were identified.

The Partial Pit Backfill With Amendment Alternative was dismissed, as described in the DSEIS. The analysis in the DSEIS indicated a risk that water contaminated with arsenic and zinc would have to be collected down gradient of the pit to ensure compliance with water quality standards.

The agencies considered directional drilling in bedrock for installing dewatering wells into the crusher reject under the backfill or an underground sump. Directional drilling methods commonly used in the oil and gas industry could be used at GSM. Directionally drilled wells would be subject to deformation of the portion of the backfill due to settlement of the backfill and corrosion for the portion of the well in the backfill. The pump and pump riser piping would also be subject to corrosion. For these reasons, directionally drilled dewatering wells would fail less frequently than vertical dewatering wells, but the magnitude and consequence of the failure would likely be the same. These wells may be more easily repaired than wells installed through the backfill.

The agencies also considered directional drilling through bedrock and collecting water in an underground sump below the backfilled pit. There would be no problems with settlement. Corrosion would be less of a problem. The low hydraulic conductivity of the backfill would limit movement of water into the underground sump. If the Partial Pit Backfill With In-Pit Collection Alternative, with an underground sump instead of crusher reject, is selected, the agencies would bond for Measure 3 to identify flow paths, Measure 15a to maintain the two pump back well systems, Measure 15b to install upgradient capture wells, and Measure 15c to add new wells in the Upper Rattlesnake Gulch collection system and/or on secondary bedrock pathways because complete capture of seepage within the pit cannot be guaranteed. This would be equivalent to permitting the Partial Pit Backfill With Downgradient Collection Alternative.

In summary, directionally drilled wells offer some advantages over vertical wells, but also have some disadvantages. The agencies have concluded that collecting water up gradient and down gradient of the pit would be more effective in controlling seepage from a backfilled pit.

28. COMMENT:
EPA has a number of questions and concerns related to the estimate of necessary pit-effluent capture efficiency. The FSEIS should identify the key assumptions that led to the estimate of necessary capture efficiency (*e.g.*, attenuation rate, dilution,

percent of effluent in the preferential pathway, etc.). The FSEIS should also discuss the sensitivity of the model to each of these variables or assumptions. By understanding these assumptions, reviewers have an opportunity to suggest opportunities for mitigation that could reduce risk, or to suggest why the assumptions may not be accurate. Depending on sensitivity of these variables, the analysis in the DSEIS may significantly overstate the risk to groundwater quality from pit effluent. The hydrogeologic evaluation of the preferential flow path for pit effluent is critical to the prediction of whether pit effluent will adversely affect the Jefferson River alluvial aquifer, yet that evaluation was fairly minimal and was based on large assumptions and sparse data. The analysis included in the DSEIS does not include any modeling to simulate ground-water flow and contaminant transport along this flow path. The sediments which comprise this pathway have characteristics that are not indicative of a high permeability pathway (*i.e.*, large radius cone of depression = low permeability). The water quality data from Tailings Impoundment No. 1 leakage do not indicate that any contamination from the impoundment has ever reached the Jefferson River – even though the impoundment leaked for some time – indicating some attenuation capacity. EPA recommends the FSEIS take a hard look at the assumptions that went into the hydrogeologic evaluation of the preferential flow path and make corrections where necessary to reflect what is known of this pathway. That analysis should include any mitigation identified that could reduce the necessary capture efficiency (*i.e.*, up-gradient ground water collection, in-pit collection, near-pit effluent collection, etc.) or that could increase the likelihood that effluent will be captured. (167)

RESPONSE:
EPA expresses concern with the estimate of necessary pit-effluent capture efficiency. The DSEIS cites references for the assumptions. The ranges of potential values used for evaluating impacts are shown in Table 6-3. The agencies have reviewed the assumptions upon which analyses that were presented in the DSEIS were based. Assumptions for the FSEIS are compared to the assumptions for the DSEIS in Table 6-3.

As indicated in Table 6-3, the groundwater flow in the Tdf/colluvial aquifer, inflow from the East Waste Rock Dump Complex, and groundwater flow in the Jefferson River alluvial aquifer were varied in the DSEIS to evaluate sensitivity of the impact evaluations to attenuation and capture efficiency.

For the FSEIS, pit outflow was varied based on a revised pit water balance model (Telesto, 2006). The revised pit water balance model utilized new data collected by GSM subsequent to preparation of the DSEIS, and predicts a range of pit seepage values rather than predicting a single estimate, as was reported for the DSEIS. The range of pit seepage values better represents the predictability of a natural system with numerous variables.

The water quality data for the inputs to the pit flow path model were updated through 2004 and revised to use the appropriate sources (HSI, 2006). New hydrogeologic and water quality data on the Jefferson River alluvial aquifer and buried channel aquifer became available from GSM studies conducted since the DSEIS (Spectrum Engineering and Kathy Gallagher, 2004; HSI, 2006)).

Geologic data available for the DSEIS indicated little to no calcite was present in the primary pit flow path to attenuate ARD. For the FSEIS, samples of the Tdf/colluvial and Jefferson River alluvial aquifers were obtained from drilling performed in 2003-2005 and submitted for laboratory analysis of calcite (Mogk, 2005). X-ray diffraction (XRD) and energy dispersive spectrometry (EDS) analysis, and scanning electron microscope (SEM) imaging was performed on nine samples from the saturated zone of the Tdf/colluvial and Jefferson River alluvial aquifers (Mogk, 2005). There was no evidence of the presence of calcite. The XRD results have a sensitivity level of about plus or minus 0.1 percent.

A related analysis of geologic logs from seven new drill holes in the Jefferson River alluvial aquifer and five borings in the Upper Rattlesnake Gulch drainage revealed the presence of iron oxides and associated red staining of sediments throughout the primary pit flow path. These data further supported the pre-historic migration of iron-rich fluids along this pathway (Spectrum Engineering and Kathy Gallagher, 2004; HSI, 2006)).

The analysis for the FSEIS incorporates the following:

- Modification of the projected pit inflow and outflow rates;
- Added sensitivity analysis for water quality inputs to the dynamic systems model (DSM);
- Narrowed uncertainty of some key parameters, including the calcite content of the Rattlesnake Gulch drainage flow path (Tables 4-4 and 6-3); and
- Confirmation of the primary pit effluent flow path as a prehistoric feature conveying iron-rich groundwater into the Jefferson River alluvial aquifer.

The amount of hydrogeologic data supporting the evaluation of the Rattlesnake Gulch drainage flow path for pit effluent is adequate. The area down gradient of the pit has been studied extensively as described in HSI (2003 and 2006). The sources used by HSI include: Golder, 1995a, Fig. 13; Keats, 2001 and 2002; SHB, 1982 to 1989; and GSM well logs. A total of 114 monitoring wells and borings from within or near the Rattlesnake Gulch drainage flow path and were used to delineate the flow path. Data from the wells and borings were used to develop a groundwater flow analysis. Water balances and other calculations were used to verify the flow analysis.

Flow path modeling was performed using a Dynamic Systems Model to evaluate groundwater flow and mixing from all water sources affecting the system. Contaminant sources and transport, including travel time, attenuation mechanisms, mixing, and dilution processes, along the flow path were documented in HSI (2003,

2006) and Telesto (2003e). Attenuation mechanisms were addressed, and the potential amount and duration of ARD attenuation predicted. The modeling effort for the DSEIS was appropriate for the aquifer setting and attenuation mechanisms involved. The agencies have updated the modeling for the FSEIS based on new data that became available between preparation of the DSEIS and the FSEIS (Section 4.3.4.1.2.2.1 and HSI 2006, Telesto 2006).

A high permeability pathway is defined relative to the surrounding material. The hydraulic conductivity in the pathway should be one-half to one order of magnitude higher than in the surrounding material to be considered a high permeability pathway. The analysis for the DSEIS (HSI, 2003) found that the hydraulic conductivity, using geometric mean data, of the identified primary flow path aquifers and the surrounding Tertiary-age materials was 3.5 ft/day to 0.07 ft/day, respectively, giving a difference of about one and one-half orders of magnitude (HSI, 2003). Previous studies have reported that the Tdf/colluvial aquifer has a hydraulic conductivity two to three orders of magnitude greater than that of the Bozeman Group aquifer (SHB, 1987, Hydrometrics, 1995). These hydraulic conductivities are obtained from field tests performed at GSM. The agencies disagree with the assertion that a large radius cone of depression equals low permeability. The size of a cone of depression is primarily a function of the hydraulic conductivity of the aquifer, boundary conditions, and recharge/discharge to the aquifer (for illustrations, see Driscoll, 1988). In an aquifer without recharge and boundary restrictions, the higher the hydraulic conductivity, the wider the radius and shallower the depth of the cone of depression will be. Recharge of the aquifer decreases the radius of the cone of depression. Restrictions in aquifer geometry lead to non-circular and deeper areas of drawdown. The Tdf/colluvial aquifer has definite boundaries, which limit the size and shape of the cone of depression and create a preferential flow pathway.

Tailings Impoundment No. 1 has leaked cyanide. Leakage from Tailings Impoundment No. 1 was never detected in the Jefferson River and Slough. This is not due to the attenuation capacity of the Bozeman Formation, but rather to other factors such as GSM's installation of capture wells soon after leak detection and the continual monitoring and upgrading of the complex capture system.

The primary flowpath from the pit is the Tdf/colluvial aquifer, which does not contain calcite (HSI, 2006). Metals would not be attenuated by long term, irreversible mechanisms. The point of compliance is not the Jefferson River, but rather the Jefferson River alluvial aquifer at the edge of the approved groundwater mixing zone. The agencies have concluded that monitoring and upgrading of the capture system would have to continue to prevent impacts from metals to the Jefferson River alluvial aquifer at the mixing zone boundary. For a discussion of mitigations reviewed to increase capture efficiency, see response to Comment 26.

Table 6-3. Summary of Key Parameters, Sources and Assumptions Used to Estimate Groundwater Capture Efficiency in the Tdf/Colluvial Aquifer

Parameter	Estimated Value	Sources & Assumptions
Groundwater Baseflow to Pit	DSEIS: 2 gpm	Calibrated Pit Water Balance (Telesto, 2003e).
	FSEIS: 17 to 32 gpm	Revised Calibrated Pit Water Balance (Telesto, 2006).
Pit Outflow	DSEIS: 16 gpm	Calibrated Pit Water Balance (Telesto, 2003e).
	FSEIS: 27 to 42 gpm	Revised Calibrated Pit Water Balance (Telesto, 2006).
East Waste Rock Dump Complex Inflow	1 to 3 gpm	Water Balance of East Waste Rock Dump Complex (FSEIS Section 4.3.2.1.1.1.2).
Baseflow-Recharge in Upper Rattlesnake Gulch	52 to 103 gpm	Impacts of Pit Seepage Analysis (FSEIS Section 4.3.4.1.1.2).
Quality of Baseflow Recharge to Tdf/colluvial Aquifer	See HSI, 2003, Table 5-9	Monitoring well MW-202 quality best represents shallow groundwater in the Tdf/colluvial aquifer.
Quality of East Waste Rock Dump Complex and Pit Effluent	See Telesto, 2003e, Tables 4 and 5, App. G.	Based on evaluations for 1998 FEIS, Appendix B, and pore water chemistry from West Waste Rock Dump Complex.
Cation Exchange Capacity	3.15 meq/100 g	Geologic descriptions of Tdf/colluvial aquifer: 1% smectite clay, 3% kaolinite clay and 2% iron oxides.
Calcite Content	DSEIS: 1.8 to 59%	DSEIS: back-calculation required for attenuation 1.8 to 59% based on acid potential of East Waste Rock Dump Complex and pit effluent.

	FSEIS: No detectable calcite	FSEIS: X-ray diffraction analysis: no detectable calcite in Tdf/colluvial & Jefferson River alluvial aquifers samples (Mogk, 2005; HSI, 2006).
Jefferson River Alluvial Aquifer Groundwater Baseflow	99 to 2500 gpm	Darcy Law flux based on monitoring well logs and water level measurements.
Jefferson River Alluvial Aquifer Water Quality	DSEIS: HSI, 2003, Table 5-9,	Water quality data from Jefferson River alluvial aquifer wells.
	FSEIS: Revised Jefferson River Alluvial Aquifer Water Quality	Water quality based on results of GSM well installations and hydrogeologic characterization completed in 2003-2004 (Spectrum Engineering and Kathy Gallagher, 2004; HSI, 2006).
Capture Efficiencies	80 to 99.99%	Based on analysis in HSI (2003 and 2006) and GSM's operational experience.

The agencies' review of new and existing data resulted in a number of changes in the pit water balance model (Telesto, 2006) and the primary pit flowpath model (HSI, 2006). The revised modeling efforts are described below and in Sections 4.3.4.1.1.2 and 4.3.4.1.2.2.1.

Pit Water Balance Model Revisions

In response to comments to the DSEIS, the agencies reviewed the pit water balance model and concluded that applying a range of possible groundwater baseflow to the predictive modeling for closure alternatives would better represent the level of certainty to which groundwater inflows to the pit, and thus pit outflows, can be known. The conceptual model of pit inflow was reviewed and modified to include two baseflow components: baseflow that occurs beneath the Corridor Fault, and baseflow that occurs above and within the Corridor Fault (Telesto, 2006).

Production records indicate that the highwall dewatering wells, PW-48 and PW-49, which produce from the Corridor Fault, have been pumped at a fairly constant rate 18.2 gpm (Telesto, 2006). Because the flow rates from PW-48 and PW-49 do not decrease during prolonged dry periods, and do not increase during prolonged wet periods, the combined minimum water rate produced from those wells of 15 gpm represents the minimum rate of baseflow that occurs above, and within the Corridor Fault. The maximum baseflow above and within the Corridor Fault is estimated to be 30 gpm, based on the maximum potential recharge area for the pit (Telesto, 2006). The baseflow from beneath the Corridor Fault was held constant at 2 gpm. For the FSEIS, the total baseflow rate (*i.e.*, baseflow below, within, and above the Corridor Fault) was varied from 17 to 32 gpm (Telesto, 2006). With this input range, the estimated rates of pumping for the Partial Pit Backfill With In-Pit Collection Alternative for the FSEIS range from 27 to 42 gpm, compared to 15 gpm for the DSEIS. The estimated rates of seepage from the pit for the Partial Pit Backfill With Downgradient Collection Alternative for the FSEIS range from 27 to 42 gpm, compared to 16 gpm for the DSEIS.

Primary Pit Flowpath Model Revisions
The agencies reviewed the flow path model that was applied for the DSEIS. As a result of the review, a number of modifications were made for the FSEIS, as described in HSI (2006). In the DSEIS, seepage from the pit into the primary pit flow path was modeled at a constant rate of 16 gpm for the Partial Pit Backfill With Downgradient Collection Alternative. For the FSEIS, seepage from the pit into the primary flow path was modeled as a variable, ranging from 0 to 45 gpm, enveloping the pit seepage range predicted by the updated water balance of 27 to 42 gpm. By modeling over that range, the agencies can evaluate the effects of uncertainty related to pit seepage, and can better evaluate the need for, and effects of, various mitigation measures.

The analysis presented in the DSEIS provided results for a range of capture efficiencies. Based on experience at GSM, the agencies have concluded that capture efficiencies of 80 percent could be realistically achieved for the individual groundwater collection systems included in Measure 15 of the DSEIS (Measure 15a of the FSEIS). The primary pit flowpath model for the DSEIS predicted that two groundwater collection systems operating at 80 percent would achieve groundwater standards at the mixing-zone boundary (Section 4.3.4.1.2.2.1). The DSEIS predicted that two groundwater collection systems operating at 80 percent capture efficiency would result in an overall capture efficiency of 95 percent. This was based on a calculation that did not account for recharge that would occur between the two capture systems. As a result of agency review, the primary pit flowpath Dynamic Systems Model was modified for the FSEIS to better represent groundwater capture and recharge along the flowpath (HSI, 2006). The result of the modification of the DSM is that two capture systems operating at 80 percent capture efficiency would result in an overall capture efficiency of approximately 92 percent.

The revised primary pit flowpath modeling conducted for the FSEIS indicates that nickel, cadmium, copper, zinc and iron are the most critical parameters with respect to meeting groundwater standards in the Jefferson River alluvial aquifer at the mixing-zone boundary (HSI, 2006, 2007). Of the DEQ-7 toxic and carcinogenic parameters, nickel is the most critical parameter for meeting DEQ-7 groundwater standards (see Figure 4-2). Meeting the DEQ-7 standard for iron, which is a harmful (non-toxic) parameter, is also problematic. The results of the updated pit water balance model (Telesto, 2006) and of the primary flow path modeling (HSI, 2006) are incorporated into the updated analysis summarized in Section 4.3.4, the Partial Pit Backfill With Downgradient Alternative.

Based on the updated analysis for the FSEIS (HSI, 2006, 2007; Telesto, 2006), the agencies concluded that even with all identified mitigation measures (Section 4.8.2.1), compliance with DEQ-7 groundwater standards for metals in the JRA Aquifer could not be expected over the entire predicted range of pit seepage.

29. COMMENT:

The DSEIS includes a projection of potential mineral reserves remaining after completion of Stage 5B as "over 1,500,000 ounces remaining in the known resource (p. 4-127)." In the same section, the DSEIS states that "one of the purposes of the Montana Metal Mine Reclamation Act is to prevent foreclosure of future access to mineral resources not fully developed by current mining operations." The DSEIS goes on to describe the substantial additional time and cost of removing any pit-backfill should pit expansion be necessary for future mine expansion. The DSEIS appears to assume that access to future mineral reserves or resources would have to happen by expanding the pit (p. 4-135), although some of the existing mining has been accomplished via underground workings. The DSEIS does not make a case for why mining beyond 5B would necessitate pit expansion, and why underground mining via a portal outside the pit could not happen. In summary, the DSEIS does not provide a rationale for why future access to mineral resources could not be accomplished with underground workings. Given the amount of overburden that would have to be removed to further expand the pit, it may be possible that underground mining would prove an economic advantage over pit expansion. The FSEIS should address this issue and assess the feasibility of access reserves beyond 5B while the pit remains backfilled.

Some additional information in the FSEIS could help the situation. The known configuration and depth of the breccia pipe and ore body below 5B should be discussed, as well as the amount of additional overburden that would have to be removed to expand the pit beyond Stage 5B. The time and cost of removing that overburden should be included and compared to those same costs in Stage 5B. The FSEIS could assume that the next pit expansion would be of the same scale as the 5B operation. Those costs could then be compared to costs and mineral recovery rates associated with constructing an underground access to the reserves from outside the pit.

The pit-backfill alternatives include the statement that "premature closure" would reduce tax revenue from mining Stage 5B (p. 2-53). This conclusion appears to be based on a statement from GSM that they "may" cease mining 5B if pit backfill is required (p. 4-153). Given that GSM will have expended the resources to remove the overburden to access the mineral resources in 5B by the time this decision is made, the assumption that mining 5B would halt should be re-evaluated in the FSEIS. The FSEIS should include sufficient information to support this assumption, or should revise the estimated tax revenue to reflect that 5B is likely to be completed under all alternatives.

All alternatives will require perpetual water treatment from both the waste rock dump effluent and pit water collection or effluent in order to meet water quality standards. There is no foreseeable technology that would eventually preclude the need for treatment of this water. It is, therefore, critical that the lead agencies pay close attention to the long-term operation and maintenance requirements and costs for the capture and treatment systems as the final closure plan is developed. (167)

RESPONSE

Foreclosure of future mining is not a decision criterion under MMRA. The agencies did not consider foreclosure of future mining in selecting the preferred alternative. Evaluating the potential for underground mining is outside the scope of the SEIS. The cost of removing backfill and the loss of tax revenue from not mining Stage 5B will not be factors in the decision under MMRA. Conditions at GSM have changed since the DSEIS was published. Whether to continue mining is a decision for GSM and Barrick. GSM makes decisions based on information that is not available to the agencies. The agencies accept GSM's statement that partial pit backfill may cause mining to cease at any time during mine operations. The decision in the FSEIS may still impact future mining at GSM. The agencies have weighed the long-term operation and maintenance requirements of water treatment carefully in their evaluation of alternatives.

In the DSEIS, the agencies tried to design alternatives that would meet water quality standards if implemented properly. The agencies considered long-term operation and maintenance requirements and costs for the capture and treatment systems. The analysis indicated that as system complexity increases, the potential for long-term failure and the subsequent risk to water quality increases, as discussed in Section 4.2 for each alternative under Consequence of Failure. The Underground Sump Alternative in the DSEIS was selected because it would provide almost complete control of pit seepage even without a collection system. The Underground Sump and No Pit Pond alternatives were the only alternatives that would provide adequate assurance that pollution of the Jefferson River alluvial aquifer in violation of water quality laws would not occur. The Underground Sump Alternative would be safer for workers (Section 4.4.5.1.2) and require less maintenance than the No Pit Pond Alternative (Section 4.4.2.1.2).

30. COMMENT:

In the Underground Sump Alternative, we found a lack of information or clarity regarding the portal to access the sump. The DSEIS lacked information on the expected longevity of the access portal. The DSEIS states that "agencies would require GSM to submit a plan for development, maintenance and monitoring" of an alternate portal (p. 4-56). More certainty regarding who would actually be responsible for the cost and development of the alternate portal, as well as the means of financial assurance, should be added to the FSEIS and Record of Decision. (167)

RESPONSE:
A conceptual plan for the 4,550-foot-elevation access portal was developed and analyzed in the FSEIS in Sections 2.4.5.1 and 4.2.4.1.2 and 4.2.4.2.2. In case of highwall raveling and slumping, a new access portal would be developed at the 4,750-foot elevation to access the underground workings. The new portal would be located in the northeast portion of the pit highwall 200 feet higher than the 4,550-foot-elevation portal assumed in the Underground Sump Alternative. The agencies assume the new access portal would be similar in design to the old underground portal developed by GSM beginning in July 2002, which was approved by the agencies under Minor Revision 02-001 on May 23, 2002. Underground access would be developed from the portal to the underground pump station, as described in Section 2.4.5.3. The only differences would be the need for additional pump stations and a longer adit to tie into the old underground workings.

Regular maintenance of the portal would be required annually to ensure safe access and to maintain pumping operations. Periodic underground maintenance would include scaling, clearing roadways, and occasional bolting as needed. This maintenance is designed to prevent failure. The portal is assumed to last 30 years for bonding purposes. The agencies have assumed portal failure on a regular basis, and bond would be posted to cover the costs of reopening or redeveloping the access portal. GSM would be responsible for the cost and development of the alternate portal, as well as the means of financial assurance. This information has been added to Section 4.2.4.2.2.

The portal would provide underground access. Secondary access after closure from the underground pump station would not be required by MSHA. GSM and the agencies would install secondary access to ensure worker safety. The secondary escapeway would also have to be maintained. GSM would be bonded for this maintenance.

31. **COMMENT:**
EPA found no mention of techniques to stabilize the highwall as a component of the no-backfill alternatives. For example, it may be possible that reducing the volume of ground water seepage into the pit (*i.e.*, through up-gradient collection) may increase highwall stability and improve worker safety. (167)

RESPONSE:
MMRA Section 82-4-336(9)(b)(i) requires open pit stability structurally competent to withstand geologic and climatic conditions without significant failure that would be a threat to public safety and the environment. Sections 4.2.1.2.1 and 4.2.1.2.2 of the DSEIS discuss highwall stability. The agencies concluded the highwall would be stable with a low probability of a large-scale failure. The agencies assumed raveling and sloughing over time. The conclusion was that, even with assumed failures,

there would be minimal impacts outside of the pit from periodic pit failures over the long term, which would prevent undesirable offsite environmental impacts. Section 4.2.1.2.3 describes pit highwall maintenance requirements. GSM removes overburden from weak areas, diverts storm water flow, has MSHA-required safety benches, horizontal drains, and buttresses. The agencies have developed a Mitigation Measure 15b that would require upgradient wells to reduce the volume of groundwater seepage into the pit (see response to Comment 26).

32. COMMENT:

The FSEIS should provide some information on how drains would be re-established into the sump should they fail (*e.g.*, due to highwall slumping into the pit). (167)

RESPONSE:

In the event that highwall sloughing closes the drains between the pit bottom and the underground sump, the drain holes would be reestablished. Bond would be posted to cover this work. Section 4.2.4.2.2 describes maintenance required to keep the pit safely accessible, and Mitigation Measures 4 and 9 address this work.

6.4 PLAINTIFFS' COMMENTS AND RESPONSES

Letter Number 168, as listed in Table 6.2 above, contains the plaintiffs' comments. These comprise Comments 34 through 61.

33. COMMENT:

Since the 1998 EIS the mine has continued with the planned pit 5B expansion as well as developed underground workings towards the pit bottom in order to access deeper higher grade ores. Significant reclamation of the West Waste Rock Dumps and a portion of the East Waste Rock Dumps have occurred although the mine was aware that resolution of the pit backfill issue might affect such reclamation by requiring removal of materials located in those dumps back into the pit as backfill.

Under the Court's 2002 Judgment, DEQ ordered GSM to provide the details of a modified Partial Pit Backfill with In-Pit Collection Plan, which is the Proposed Action in the DSEIS. In total, six other alternatives in addition to the above alternative are identified in the DSEIS.

1. No Pit Pond (No Action) (includes in-pit water collection);
2. Partial Pit Backfill With In-Pit Collection (Proposed Action);
3. Partial Pit Backfill Without Collection;
4. Partial Pit Backfill With Downgradient Collection;
5. Partial Pit Backfill With Amendment;
6. Underground Sump (with underground water collection sump); and,
7. Pit Pond (with pump and treatment).

The Partial Pit Backfill With Downgradient Collection alternative should have been identified as the preferred alternative (had additional mitigation been considered and included), because it is the alternative that is best designed to meet the Court's order. This conclusion is based upon the following:

- It is a proven design and the alternative can be constructed at GSM.
- Backfilling the pit would address highwall stability concerns and no highwall maintenance would be required.
- Backfill maintenance requirements could be approximately equal to pit highwall maintenance requirements.
- Groundwater capture and treatment is assumed – agencies cite 95 percent capture risk (where 5 percent of the water may not be captured and potentially reaches surface water). However, the overall risk is the same, if not less, than for other permitted facilities at GSM (*e.g.*, West Waste Rock Dump estimated at less than 95 percent in 1997 EIS).
- All alternatives would require maintenance and operation, including water treatment, in perpetuity and there is not a significant difference between alternatives in terms of total water treatment capacity and design when the combined loads from the entire mine site are considered.

- Groundwater quality within the mixing zone would be degraded but if treated with the same assumptions as for the other facilities at the mine site should not impact beneficial uses of the Jefferson River alluvial aquifer.
- Impacts to springs/seeps in the area should be minimal as most are naturally acidic and mineralized and potential for impacts to surface water is directly related to groundwater capture efficiency.

Risk to public safety would be minimized by the partial backfill and public access and post-mining land use would be possible.

DEQ's preferred alternative identified in the DSEIS would leave the pit highwalls in their present unstable and hazardous condition. This represents a far greater risk to human health and safety than the pit backfill alternative. Similarly, the preferred alternative in the DSEIS would essentially condemn any realistic future post-mining land use other than future mining and result in a *de facto* removal of those lands from public use. The pit backfill alternative, if properly designed and performed, will eliminate, to the extent practically feasible, the hazard to human health and welfare as well as restore the land to a productive post-mining land use.

Why were additional mitigation measures not considered in the DSEIS, in order to meet the Court ordered plan, including:

- additional means to capture contaminated groundwater in the pit area including drilling of collection wells outside the pit backfill material using directional drilling or other means;
- driving an adit under the backfilled pit into the existing underground workings from outside the pit in stable ground; and,
- additional means to prevent down gradient migration of contamination if preferential flow paths are discovered such as slurry walls or other devices to enhance capture efficiency? (168)

RESPONSE:
Historically, GSM has reclaimed waste rock dumps as they were completed; including the West Waste Rock Dump Complex, the south portion of the West Waste Rock Dump Complex, the Buttress Waste Rock Dump, and the off-loaded portion of the East Waste Rock Dump Complex. GSM reclaimed the waste rock dumps in accordance with approved reclamation plans.

The DSEIS addresses each of the bullet items:

- The agencies agree that the Partial Pit Backfill With Downgradient Collection Alternative is a proven design and could be constructed at GSM. See Sections 4.2.3.1.1 and 4.2.3.1.2.
- The agencies agree that backfilling the pit would eliminate pit highwall raveling and sloughing and no highwall maintenance would be required for the partial pit backfill alternatives. See Sections 4.2.2.2.1 and 4.2.2.2.2.

- The agencies agree that backfill maintenance requirements could be approximately equal to pit highwall maintenance requirements, except the backfilled pit area would be subject to additional settling due to saturation of the backfill material. See Section 4.2.3.3.1.
- The agencies disagree that the overall risk of violation of surface water quality standards and beneficial uses to the Jefferson River and Slough is the same, if not less than, for the West Waste Rock Dump Complex. In the Statement of Basis for the Proposed Mixing Zone in Appendix 1 of the 1998 Final EIS, for the West Waste Rock Dump Complex, the agencies assumed 50 percent capture efficiency for the toe drains and 82 percent capture efficiency for pumpback wells on the west flank of the dump complex. If these capture efficiencies are achieved, water quality standards would be met at the mixing zone boundary. Implementation of required mitigation Measure W-10, which specifies a hydrogeologic investigation on the west side, would be necessary to ensure that the required capture efficiencies are achieved. Ninety-five percent capture efficiency is not needed to prevent violation of surface water quality standards and beneficial uses on the west side.
- The agencies agree that all alternatives would require maintenance and operation, including water treatment in perpetuity, and there is little difference between alternatives in terms of total water treatment capacity and design when the combined loads from the entire mine site are considered. As discussed in Section 4.2.3.8.2, the 300 to 366 gpm volume from all sources needing treatment under the Partial Pit Backfill With Downgradient Collection Alternative would be less than the 392 gpm water treatment plant capacity approved in the 1998 Record of Decision.
- Groundwater quality within the mixing zone would be of lower quality but would comply with water quality standards at the mixing zone boundary and not impact beneficial uses of the Jefferson River alluvial aquifer, if over 95 percent of pit seepage is captured. The pit seepage flow path does not have the attenuation capacity of the East Waste Rock Dump Complex flow path and requires higher capture efficiency than needed for the West Waste Rock Dump Complex, as indicated in the fourth bullet above. The same assumptions do not apply to the pit seepage flow path.
- Under all alternatives, impacts to springs/seeps in the area should be minimal. For the partial pit backfill alternatives, the agencies have assumed in the analysis (Section 4.3.4.2.1.2) that one spring would increase in flow by 15 percent and one new spring would develop. Under the other alternatives, the agencies have predicted one spring would have decreased flows (Section 4.3.2.2.1.2).
- The agencies agree that risk to public safety would be minimized and public access would be similarly limited under all alternatives. See Section 4.4.4.1.3. The suitability for post-mining land use is addressed in Sections 4.4.4.5 and 4.4.4.6 for the backfill alternatives and in Sections 4.4.2.6 and 4.4.5.6 for the other alternatives.

All of the mitigation measures listed rely on capturing the ground water after it has been impacted by pit backfill. The little or no backfill alternatives collect pit water before it exits the pit and enters the groundwater system. There are fewer limitations and uncertainties associated with water collection in the pit with little or no backfill than with water capture outside of the pit.

With regard to additional mitigation measures:

- The agencies have addressed additional means to capture contaminated groundwater in the pit area including drilling of dewatering wells outside the pit backfill material using directional drilling in the response to Comment 26.
- The agencies have considered driving an adit under the backfilled pit into the existing underground workings from outside the pit in stable ground. Driving an adit is technically feasible. Topography, historic landslides, and reclaimed waste rock dumps limit potential external portal sites to the area south of the existing GSM administration building. A portal site near the existing GSM core shed would be the most efficient balance of elevation and ramp length. A ramp driven at -15 percent grade would extend 4,500 feet from the portal to the underground sump (H. Bogart, GSM, personal communication, 2006). Access beginning from any site further down the slope would be longer. Access beginning from any site further up the slope would be steeper or longer. The portal would be excavated from an excavation in weathered bedrock, and the ramp would cross the Range Front Fault, the Telluride Fault, and the Sunlight Fault before reaching the pump station. Ground conditions are unknown in this area. Power cables, ventilation ductwork, and discharge waterlines would hang from the roof. Periodic underground maintenance would include scaling, clearing roadways, and occasional bolting as needed. It would require more maintenance and have a higher safety risk than maintaining the limited amount of tunneling in the Underground Sump Alternative in the existing pit. The portal would provide underground access. Secondary access from the underground pump station after closure would not be required by MSHA. GSM and the agencies would install secondary access to ensure worker safety. The secondary escapeway would also have to be maintained. GSM would be bonded for this maintenance.
- The agencies have considered additional means, such as slurry walls or other devices to enhance capture efficiency and to prevent downgradient migration of contamination if preferential flow paths are discovered. Slurry walls have been used successfully as a containment measure, sometimes alone and sometimes in combination with pumps and drains. A slurry wall was used in the original design of GSM's Tailing Impoundment No. 1. This system consisted of a bentonite slurry cutoff wall, a collection pond, an underdrain system, and a row of pumpback wells upstream of the cutoff wall. The slurry wall was intended to limit downgradient groundwater flow immediately below the tailings embankment (SHB, 1985). The consulting engineering report stated, "Errors during construction of the bentonite slurry wall resulted in portions of the wall not being fully keyed into the relatively impermeable Bozeman Formation." This design flaw resulted in the documented 1983 cyanide release from the impoundment. Based on this experience and

considerably more site-specific information, there is evidence that slurry walls are not the appropriate mitigation strategy. The Bozeman Group is now known to consist of permeable deposits (Spectrum Engineering and Kathy Gallagher, 2004).

The analysis of Partial Pit Backfill With Downgradient Collection Alternative in the DSEIS included mitigation measures so that water quality standards were met at the mixing zone boundary within the Jefferson River alluvial aquifer. For the FSEIS, Mitigation Measures 15b and 15c are discussed in Section 4.8.2.1. The results of the analysis have not changed the agencies' rationale for the preferred alternative.

34. COMMENT:

Existing and Future Contamination from Other Sources - Section 1.4.2 in the DSEIS contains a discussion on acid drainage potential from the GSM pit and reclamation of waste rock to reduce ARD and mentions water treatment and bonding. The section should provide additional information addressing the amount of groundwater which is already planned for capture from the existing mine facilities (including duration, flow, contaminant load) and bonding related to those requirements in order to provide for later comparison to additional potential requirements, if any, resulting from pit backfilling. For example, the text could be revised to include the language "In addition to reclamation of waste rock and tailings impoundments, it is presently predicted that up to 350 gpm of metals contaminated water will be captured and treated in perpetuity from the waste rock piles, tailings impoundments and open pit, at a cost of $25M" (figures not exact).

RESPONSE:

The amount of groundwater planned for collection from the existing mine facilities is discussed under water treatment in Section 4.2.1.8 for the No Pit Pond Alternative and for each of the other alternatives in Sections 4.2.2.8, 4.2.3.8, and 4.2.4.8. These sections also discuss duration (*i.e.*, in perpetuity), flow, and relative chemical mass. Bond is not set until an alternative is selected for permitting and will be shown in the Record of Decision. Estimates of reclamation costs for GSM for each alternative are listed in Table 4-11.

35. COMMENT:

In addressing changed site conditions (p. 1-8 – 1-9), the DSEIS mentions "Additional technical information and evaluation was required to assess the waste rock backfill effects on compliance with the Montana Water Quality Act." If additional information was required to assess the waste rock backfill effects, then why is the same or similar additional information not required to assess the waste rock (and tailings) at the GSM site in their existing locations and their effects on compliance with the Montana Water Quality Act? If important new information has been developed concerning geochemistry and geohydrology for the mine site, why is it not equally important to also evaluate their effect on compliance with applicable regulations, and allow for a comparison of the mine site as a whole, including the existing waste rock piles and tailings impoundments in their present locations, with that of the pit backfill proposal?

Please provide additional information in the FSEIS on the existing requirements for contaminated water capture and treatment and the bonding requirements for the same. Please explain why additional information similar to that performed for the pit backfill proposal has not been required and applied to the existing rock piles and tailings which appear to have far greater potential for impacts? (168)

RESPONSE:
This SEIS evaluates impacts of pit reclamation alternatives. The agencies utilized new and available information for other mine facilities, for example three studies of Tailing Impoundment No. 1 by Keats (2001, 2002a, 2002b), the waste rock cover monitoring report by Nichol and Wilson (2003), and the West Waste Rock Pile Hydrologic Monitoring and Reclamation Report by Schafer Limited (2001). Therefore, the agencies do not agree that additional information was not applied to existing rock dumps and tailings impoundments, or that additional information is needed to assess waste rock and tailings in their existing locations and their effects on compliance with applicable regulations in the SEIS. The purpose of the SEIS is to supplement the technical analyses in the 1998 EIS, especially those components that needed to be evaluated to address pit reclamation. In completing the SEIS, the technical team reviewed and performed additional analyses on other components of the mine site as needed. The waste rock dumps were analyzed in this SEIS as part of the additional analysis completed based on the removal of waste rock and placement in the pit. The impacts on water quality from all waste rock dumps and tailings impoundments were addressed in the 1998 Final EIS, Appendix 1 for the mixing zone. As indicated above, the SEIS did evaluate new information for the East Waste Rock Dump Complex and Tailings Impoundment No. 1. The water balance for the East Waste Rock Dump Complex was completed for the SEIS in Section 4.3.2.1.1.1.2. No new impacts were identified, but the attenuation capacity would be depleted sooner and the amount of seepage would increase though not above the 1998 prediction including contingencies (Table 4-2). The amount of water predicted to need treatment from capture systems around Tailings Impoundment No. 1 was updated with actual water pumping records from GSM. See Section 3.3.7.2.

The agencies review annual monitoring reports from GSM and continually apply adaptive management to respond to changes in water quality and quantity. For example, the agencies worked with GSM in 2004 to drill additional wells to try to identify sources of nitrate in groundwater below the tailings impoundment. Under the Metal Mine Reclamation Act, DEQ can revise the reclamation plan at any time during mine life if significant environmental problems arise. The bond is reviewed annually and every 5 years under the Act.

36. **COMMENT:**

Reduction of Pit Highwall - According to the SEIS (p. 1-10) in describing the pit backfill alternatives "Cast blasting and dozing would be used to reduce the upper pit highwall rather than hauling all backfill material from the West Waste Rock Dump Complex." The previous paragraph states that "No waste rock material would be removed from the West Waste Rock Dump." The second paragraph should be revised to reflect a reduction in the material that cast blasting would result in hauling from the East Waste Rock Dump Complex. This is an example where the "proponent's" proposal should have been reconsidered since, later in the DSEIS, it is used to prejudice the discussion of the pit backfill alternative by connecting safety issues to the proposal. If public safety issues actually continue to exist following backfilling, then the design (*e.g.*, cast blasting at the top of the pit) should be reconsidered so as to ensure the result of backfilling meets the intended requirements of ensuring the health and safety of the public. We have no doubt that such a design can be determined (by grading of the top portions following cast blasting for example) to be safe if the agencies desire such an outcome.
Please explain why further consideration of designs to avoid public safety concerns was not considered for the pit backfill alternative? (168)

RESPONSE:

The suggested revision for page 1-10 is not needed because the cast blasted material is intended to replace any backfill that might be hauled from the West Waste Rock Dump Complex. The agencies concur that the backfill alternatives are safer than alternatives with little or no backfill. See response to Comment 33 for a discussion of public safety in the SEIS.

37. **COMMENT:**

Multiple Accounts Analysis Process and Issues Studied in Detail - Section 1.7.2 of the DSEIS is entitled "Multiple Accounts Analysis Process and Issues Studied in Detail." This implies that the MAA process was conducted to completion, when, in fact, it was stopped at a critical juncture in the technical/scientific process and was largely a failed effort in terms of discussion, timing, participation and utilization.

I served in the role of a technical expert and official MAA participant representing the Plaintiffs in the MAA process conducted by Spectrum Engineering on behalf of Montana DEQ and BLM with the cooperation of the Golden Sunlight Mine and Environmental Protection Agency.

Throughout the MAA process, I observed a strong bias by DEQ, BLM, and GSM representatives towards the development of technical facts and information intended solely to support those alternatives which would not involve pit backfilling. That bias is present throughout the DSEIS in that it fails to address obvious shortcomings with mitigations or changes to the alternatives or to compare them to existing conditions at the GSM mine site.

The conduct of the MAA was underscored by the attempt to achieve a result in an unrealistically short time frame. The process was initiated in May 2003 and prematurely concluded in August 2003, purportedly so that the DSEIS could be completed in September 2003 (it in fact was completed in November 2004). As such, the process was rushed to a premature conclusion that apparently has been embraced by BLM and DEQ and used in the SEIS as a final product. It did not represent a collaborative effort and any result should be noted in the SEIS as representing the viewpoint of only certain parties (and not representing Plaintiffs' view).

As noted (p. 1-10), a local rancher attended the fourth MAA meeting and provided input from a "public stakeholder" viewpoint to the process. The same rancher, who was not an official participant, with the apparent consent of DEQ, BLM and GSM, conducted public meetings using the preliminary MAA and representing it as a final and conclusive result. The rules of conduct of the MAA process require that only technically competent persons be allowed to participate, yet DEQ and BLM allowed an unqualified person to disrupt the process and present highly biased and unfounded views at a critical juncture in the process, essentially eliminating any chance of progress and development of meaningful results. This action tainted the entire MAA process and brings into question its relevance and usefulness in this circumstance.

Please accurately describe the MAA process, or eliminate from the SEIS any discussion and implication that the process resulted in any particular recommendation? (168)

RESPONSE:
The title does not imply that the MAA was conducted to completion. A draft report was prepared (Robertson GeoConsultants, 2003) and is described in detail in Section 1.7.2. Although the MAA was not formally completed, it was useful in defining issues, developing alternatives, and providing additional technical information to use in the analyses.

38. COMMENT:
Proven Design - According to the SEIS (p. 1-21), "Whether the components of the alternatives are considered proven within the mining industry must be considered." The use of the mining industry as a measure of "proof" is questionable. The mining industry is often times the last industry to adopt progressive practices and in many cases disclaims proof offered by other industries in order to avoid adoption of best management practices and other alternatives. For example, in 1996 the mining industry claimed that water treatment to treat acid drainage and metals was not a "proven" technology and therefore Montana's non-degradation water quality discharge standards could not be met. Today, just nine years later, ten of 13 major mines presently being regulated by DEQ are treating or have proposed to treat their water to meet regulatory standards. For this reason, the SEIS should not restrict

itself to those alternatives that the mining industry (in this case represented solely by GSM) does not consider proven, but rather should consider any alternatives that have been successfully used in other similar or equivalent applications.

Please explain why only technologies espoused by the mining industry are considered appropriate in the DSEIS? (168)

RESPONSE:
The agencies disagree that only technologies espoused by industry were considered. Proven design is discussed throughout the DSEIS, including Sections 4.2.1.1.1, 4.2.2.1.1, 4.2.3.1.1, and 4.2.4.1.1. The agencies have considered alternatives that have been successfully used in other similar or equivalent applications.

39. **COMMENT:**
Pit Highwall Stability - According to the SEIS (p. 1-22), an unreclaimed pit highwall "typically is not designed to remain completely stable for an indefinite period of time after closure..." and "gradually evolves to a more stable configuration over time." We agree with this statement, and it clearly suggests that future failures of the pit highwalls are likely if not certain. However, according to the DSEIS (p. 2-14), "GSM has not proposed any other specific measures to maintain or improve pit highwall stability after closure. No major pit highwall failures were predicted in the 1998 Final EIS."

It should be noted that it is difficult if not impossible to accurately predict the stability of pit highwalls. For example, pit highwall failures that have occurred at the Berkeley Pit in Butte, and at Montana Tunnels near Wickes, and elsewhere throughout the U.S. have never been "predicted." The nature of geotechnical stability makes accurate prediction difficult if not impossible as is evidence that no failure has ever been predicted beforehand, and only failures that have actually occurred can be accurately assessed (and then with some difficulty).

The last paragraph of this discussion in the SEIS is confusing and appears to attempt to suggest that pit backfilling will not result in highwall stability. This appears to be an attempt to bias the SEIS by balancing pit wall instability in an unbackfilled condition (100 percent certain to be unstable), with instability in the pit wall in a backfilled condition (1 percent or less probability on a comparative basis). DEQ must explain what is meant in this paragraph and consider whether it is appropriate or necessary to include in the DSEIS given the context of the intended discussion in this section (purpose and need). The need to address pit highwall stability is obvious, but the potential consequence should be provided in context in the appropriate discussion (Chapter 4).

Please explain what allows for more accurate prediction in this case and why the inevitability of pit highwall failures is not more fully recognized in the DSEIS as a likely consequence of not backfilling the open pit? Please explain in the DSEIS what the Montana DEQ's and the public taxpayer's liability will be in the event of a pit highwall failure that results in a human death, injury, or property damage. (168)

RESPONSE:
A discussion of pit highwall stability is presented in Sections 4.2.1.2.2, 4.2.2.2.1, 4.2.3.2.1, and 4.2.4.2.1 for each alternative in the DSEIS. Pit highwall stability failure modes and effects analyses were conducted for the 1997 Draft EIS. Additional pit highwall stability analyses were conducted (Brawner, 2005; Golder, 2005). Copies of these reports are in the Administrative Record.

Three potential failure modes were identified with respect to long term pit highwall stability: 1) raveling; 2) slope failure; and 3) wedge failure in the upper west highwall Grayson Formation sedimentary rocks. Results indicate that an adequate Factor of Safety (FOS) exists for both non-backfilled and backfilled pit scenarios. A combination of engineering design and operational procedures were outlined to manage the pit highwall after closure. The agencies reviewed these design and operational procedures and have developed additional mitigations to enhance highwall stability as referenced in the Comment 130 Response.

GSM is currently maintaining pit highwall stability under operational conditions caused by continuous stress to the highwall from vibration of moving equipment and blasting. Stability would increase at closure because these stresses would be removed.

The agencies addressed the risk to public safety in Sections 4.4.2.1.3, 4.4.3.1.3, 4.4.4.1.3, and 4.4.5.1.3. Liability in the event of a pit highwall failure that results in a human death, injury, or property damage is outside the scope of the SEIS. Post-closure operations would be bonded for long-term operation and maintenance, which would include highwall monitoring and reestablishing catch benches. Secondary access to underground workings would not be required by MSHA in the Underground Sump Alternative to protect worker safety as discussed in responses to Comments 30 and 33, but the agencies would require GSM to provide secondary access.

40. COMMENT:
Operation Requirement - According to the DSEIS (p. 1-23), "The potential risk of contamination to groundwater is more important than that to surface water at GSM."

What is the intent of this statement given that the Montana WQA primarily regulates surface water and that elsewhere in the DSEIS an emphasis on potential harm to surface water is emphasized in comparison of the alternatives? (168)

RESPONSE:
The citation is a general statement of the relative potential for impacts to groundwater and surface water. Since groundwater occurs beneath or around all of the GSM facilities, the risk of contamination to groundwater is more important than the risk to surface water in the form of springs, which occur infrequently within the GSM permit boundary. Impacts to groundwater are discussed in Sections 4.3.2.1, 4.3.3.1, 4.3.4.1, and 4.3.5.1. Impacts to surface water are discussed in Sections 4.3.2.2, 4.3.3.2, 4.3.4.2, and 4.3.5.2. Groundwater in the mixing zone has been impacted during operations. Contamination of springs during mine operations has not been conclusively shown. The agencies have assumed minimal impacts to surface water quality and quantity in the various alternatives. No contamination of the Jefferson River alluvial aquifer outside the mixing zone is predicted except for the Partial Pit Backfill With Downgradient Collection Alternative.

41. COMMENT:
Maintenance of Capture Points - According to the DSEIS (p. 1-24), "Relying on capture of pit outflows at distances down gradient of the pit may introduce a larger degree of uncertainty and risk concerning the effectiveness of capturing all contaminated groundwater and could require collection of a greater volume of groundwater." The present in-perpetuity mitigation program for capture of leachate outflows from waste rock dumps and tailing impoundments down gradient of those facilities similarly introduces a degree of uncertainty and risk concerning the effectiveness of capturing all contaminated groundwater and requires collection of significant volumes of groundwater.

How would the maintenance, safety, settling and compaction issues be different for the pit backfill alternative versus the same issues for the existing facilities where downgradient capture has been determined adequate? (168)

RESPONSE:
The agencies acknowledge that there is always a degree of uncertainty and risk associated with the performance of groundwater capture systems. However, the analysis in the DSEIS demonstrates that capturing pit effluent down gradient of the pit poses a larger degree of uncertainty and risk than capturing groundwater beneath the pit as planned in the Underground Sump Alternative. Maintenance of capture wells below the tailings impoundments and waste rock dumps would not be subject to settling and compaction as would wells in pit backfill. Safety for workers maintaining wells in the backfilled pit would be the same as for workers maintaining capture systems down gradient of tailings impoundments and waste rock dumps.

42. COMMENT:
Soil Cover Maintenance Requirements - According to the DSEIS (p. 1-24), previous reclamation has led to a shortfall of stockpiled soil for future reclamation

activities such as pit backfilling. This implies that previous approaches taken in reclamation have used an excess of topsoil, or otherwise not generated or identified additional suitable growth medium, for reclamation of the open pit. The lack of readily available cover soil, while an issue, should not be viewed as a negative aspect against pit backfilling because it represents a lack of foresight by the agencies and the operators which they have purposefully exercised since the 1998 Final EIS was issued.

Suitable growth medium has been located for past reclamation requirements and the ability to locate and use similar growth medium and therefore minimize this consideration in pit backfilling should be discussed in the SEIS. (168)

RESPONSE:
All reclamation activities at GSM have been conducted following approved reclamation plans. Section 1.7.2.1.7.1 of the DSEIS states that an adequate soil volume exists for reclamation activities under the No Pit Pond Alternative in the 1997 Draft EIS, but backfilling would result in additional soil requirements. This additional soil borrow source has been identified in the FSEIS in Section 4.3.2.3.

43. COMMENT:
Risk of Impacts to Groundwater Quality and Quantity in Permit Area - According to the DSEIS (p. 1-25), "Over time, the waste rock that is placed in the pit could be chemically and physically altered, causing pore waters with elevated concentrations of naturally occurring contaminants. The changing physical properties of the materials may affect flow patterns, and the changing chemistry of the effluent has the potential to impact down gradient groundwater. The ability to capture groundwater in various pit reclamation alternatives will affect the potential for additional impacts to groundwater in the permit area." The same waste rock material that presently or in the future will be located in the East Waste Rock Dump similarly could be chemically and physically altered increasing contaminant concentrations, changing flow patterns, and impacting down gradient groundwater.

RESPONSE:
Rehandling waste rock to backfill the pit would cause some additional physical alteration that would not occur if the waste rock is left in the dumps. The agencies have predicted water quality in the unsaturated zone of the backfilled pit would be the same as pore water quality in the waste rock dumps. Part of the backfill in the pit would be saturated (see Section 4.3.3.1.1.2.1). This would not be true of waste rock in the dumps. The agencies have predicted that water quality in the saturated zone would decrease due to jarosite dissolution. The agencies disagree that, for waste rock dumps, contaminant concentrations would increase, flow paths would change, and downgradient groundwater would be impacted more than predicted in the DSEIS and 1997 Draft EIS.

44. COMMENT:

Telesto (2003) concludes that current waste rock pore water is a good approximation of pit backfill pore water chemistry. Although pore water in the upper, unsaturated portion of the backfilled pit could have low pH and elevated metals concentrations, like the waste rock pore water, it is unlikely that pore water in the lower, saturated portion of the pit would have as low of a pH or as high concentrations of metals as current waste rock pore water. The cover and the saturation with water will decrease the amount of oxygen in the backfill and consequently reduce the rate of sulfide oxidation and acid drainage production. (168)

RESPONSE:

The agencies disagree that it is unlikely that pore water in the lower, saturated portion of the pit would have as low pH or as high concentrations of metals as waste rock pore water (see Section 4.3.3.1.1.2.1).

The saturated portion of the backfill would transition from oxidizing conditions immediately after placement and during groundwater filling in the pit backfill to reducing conditions when hydrologic steady-state conditions develop either under active water level management or for flow through conditions.

The saturated portion of pit backfill will be affected by ferric iron oxidation of pyrite and from dissolution of jarosite. The oxidation rate should diminish with time because of the low oxygen content of the groundwater and low oxygen diffusion in water. Lower oxidation rates do not automatically translate into higher pH. The pit backfill must contain sufficiently reactive materials to buffer the acidity produced with a decreased oxidation rate or the inflowing groundwater must carry sufficient alkalinity to buffer acidity it comes in contact with. As the backfilled pit fills with water, the solid phase oxidation products that formed from geochemical reactions in the unsaturated zone would probably dissolve due to the lower oxidation-reduction state of the saturated zone. The flushing of reaction products from both the unsaturated zone and saturated zone would continue for hundreds to thousands of years, because of the low groundwater recharge and flow rate (Telesto, 2003c).

Further, other metals that exist in the waste rock material that are more mobile in different pH conditions may be liberated or remain mobile with a changed pH condition in the saturated zone unless drastic pH rises could be achieved. For example, soluble nickel will remain in solution until the pH of the solution is increased to values on the order of 9 or 10. It is unlikely that simple saturation of a previously oxidized and metal laden waste would remove metals or change concentrations to a point that water quality could be considered non-degraded.

45. COMMENT:
Current waste rock pore water chemistry was used to model transport of seepage from a backfilled pit to the Jefferson River alluvium (HSI, Inc., 2003). The model should be rerun (for downgradient transport in aquifer) using backfill pore water with a higher pH and lower metals concentrations, at least as a sensitivity analysis. (168)

RESPONSE:
The agencies disagree that the model should be rerun using backfill pore water with a higher pH and lower metals concentrations, at least as a sensitivity analysis. See response to Comment 35.

46. COMMENT:
Telesto (2003) also concludes that a reduction in oxygen in waste rock in the pit would dissolve jarosite, release acidity and ferric iron, and keep the pH of pore water in a backfilled pit depressed. However, the pore water pH will increase because the rate of pyrite oxidation would decrease. Using Figure 1 in Telesto (2003), if only oxidation potential drops, the solution would enter the aqueous ferrous sulfate field, which is the reduced ferrous, not the oxidized ferric, iron. If the oxidation potential drops and pH goes up even slightly, the solution would enter the goethite field, and ferric iron would precipitate as a solid. It seems more likely, then, that under reducing conditions, if jarosite did dissolve, that aqueous ferrous sulfate and ferric hydroxide would form. (168)

RESPONSE:
The agencies disagree. Figure 1 in Telesto (2003) depicts solid or aqueous phases at equilibrium with the solution chemistry and does not consider reaction kinetics. As oxidation potential drops, the solution would tend to remain at the equilibrium boundary between jarosite and aqueous ferrous sulfate, which is a surrogate for the ferrous/ferric iron boundary, until all of the jarosite has reacted. During the time that the oxidation potential is buffered by the jarosite dissolution reaction, the activities of ferric and ferrous iron would be equal, which means that ferric iron would be available for activating further sulfide oxidation.

Jarosite stability and expected changes in backfill water chemistry are discussed in responses to Comments 47 and 48.

47. COMMENT:
The percentages of jarosite in the waste rock material were never quantified (Telesto, 2003; Personal Communication, Jim Finley, October 2003). Too much is being made of the presence of jarosite. Jarosite is only listed as being present in minor quantities in one whole rock waste rock sample and in trace quantities in another whole rock waste rock sample. Looking only at the clay fraction, jarosite was present in major quantities in 8 of 11 samples, but the clay fraction is only a

small portion of the whole rock material (data table provided by Jim Finley, Telesto Solutions, Inc., October 2003). (168)

RESPONSE:
The agencies disagree. The formation and dissolution of jarosite and its control over solution chemistry can be profound. X-ray diffraction (XRD) is a semi-quantitative mineral identification technique with a detection limit of approximately 1 percent for crystallized material. Assuming 1 percent would be present in the backfill, the estimated total quantity of jarosite is 44,750,000 tons. The amount of jarosite corresponds to approximately 8.1×10^{10} moles of jarosite. In addition, jarosite would continue to be produced by sulfide oxidation reactions within the unsaturated zone of the backfill. On a quantitative basis, the amount of jarosite in the backfill is a key component controlling the overall backfilled pit geochemistry. XRD does not identify amorphous secondary minerals that are undoubtedly present. Typically in acid generating waste materials, these include iron sulfates as well as other phases.

48. **COMMENT:**
It is possible that there would be a flush of low-pH, metal-rich leachate from the backfilled pit for some time (possibly tens of years after the lower pit is saturated and discharge from the backfilled pit occurs). However, if a capture system is in place, which it should be, this "first flush" could be captured and treated. Golden Sunlight Mine is prepared to commit to in-perpetuity pumping/capture and treating for a water-filled pit. However, in the long-term (tens to hundreds of years), it is more prudent to backfill the pit, with a contingency for capturing and treating discharge because the chances for improved water quality are higher in a backfilled pit. In addition, from hydrologic calculations, flow from a backfilled pit would be quite low (~25 gpm) and could potentially be diluted or neutralized to the point where discharge to the Jefferson River would not impair aquatic life. This possibility was not adequately tested by transport modeling performed on pit backfill leachate transport (HSI, 2003). (168)

RESPONSE:
The flushing of contaminants in sufficient concentrations to pose risks to groundwater and surface water quality will occur for a period much longer than tens of years, based on the geochemical evaluation performed for the DSEIS and cited therein (Telesto, 2003c). The geochemical evaluation found that the combination of rinsing and continued oxidation in both the saturated zone (from ferric iron) and unsaturated zone (from oxygen and ferric iron) will result in production of low pH, metal-bearing ground water for 100s to 1000s of years because of the large total mass of pyrite that would be placed in the pit. The combination of the long-term geochemical reaction rates in the pit and the low ground water flow rate from a backfilled pit (Telesto, 2003c) means that the process of flushing reaction products will continue for 100s to 1000s of years. The ambient baseline quality of groundwater in the debris flow aquifer of Rattlesnake Gulch provides further evidence that the mineralization naturally found at the GSM has produced low pH,

and metal-enriched groundwater since ancient times. Therefore, the agencies conclude that the analysis in the DSEIS sufficiently modeled the flushing of contaminants from a backfilled pit and their transport in primary and secondary flow paths (see Section 4.3.4.1.1.2).

49. COMMENT:

The backfill analogue study (Gallagher, 2003) was reportedly focusing on 1) initial predictions of water quality at the analogue sites; 2) comparison of predicted to actual conditions; and 3) water quality trends over time. While the first two are points were addressed and are instructive, the third point is more important and relevant to our charge for the Golden Sunlight Mine and was addressed at only one site (Butte underground workings and pit lake chemistry, Maest, 2003).

The conclusion of the backfill analogue study was that "none of the sites have an adequate period of record to make substantial conclusions on the ultimate water quality response to pit backfilling and pit/mine flooding." Because long-term water quality data was only provided for one site, this conclusion is not warranted. Water quality for the Butte underground workings shows improvement in water quality over time. While conditions in the underground are not directly comparable to a completely backfilled open pit, the decrease in oxygen and the filling with water are similar, and these conditions will drive redox reactions in a backfilled pit.

Water quality data over time for the San Luis Mine were provided to DEQ, yet these were not presented in the memorandum (the data disks could not be located, but copies could have been secured again from the agency). I have had conversations with Harry Posey and others at the Colorado Division of Mines and Geology, and they have informed me that water quality in seeps discharging from the backfilled pit were initially high in manganese and sulfate but that concentrations have decreased over time, and water quality in the adjacent Rito Seco Creek has improved. While it was difficult to adequately summarize and present water quality data over time for all backfilled pits in the time allotted for the study, more time should have been provided to evaluate and summarize the available long-term water quality data.

Rather than the conclusion reached in the backfill analogue study, based on the two examples with water quality data over time (Butte and the San Luis mine), it would be reasonable to conclude that water quality in backfilled open pits, while poor initially, should if anything improve somewhat over time as the backfill becomes saturated. The decrease in available oxygen over time should decrease the rate of pyrite oxidation, which should raise the pH and begin to immobilize metals roughly in the order of their hydrolysis constants.

Why will the pore water chemistry of the pit backfill not be as deleterious as suggested by the DSEIS? Please explain why the DSEIS and Telesto's hydrology models do not evaluate similar phenomena and potential impacts in the East Waste

Rock Dump as well as other mine features such as the West Waste Rock Dump and tailing impoundments on a comparative basis? (168)

RESPONSE:
The agencies disagree that the underground workings at Butte are a representative analog for a backfilled pit situation (Gallagher, 2003). The wallrock in the flooded Butte underground workings has been oxidized a few millimeters. Submerging unoxidized rocks would limit the oxidation of pyrite by oxygen, but not by ferric iron. The water quality data suggest that initial flooding of the underground workings removed a flush of products. Water quality has improved as those products were removed and as water has continued to circulate through the workings. A similar set of hydrogeochemical processes cannot be assumed for the backfilled pit scenario at GSM.

Another backfilled pit is the Whistle Mine in Ontario (Knight Piesold, 1998). Lime amended waste rock was backfilled into a pit and water quality samples collected. The intent was that the water quality would meet discharge quality over time. Even though the pH increased to near neutral due to lime amendment, it was unsuccessful in achieving discharge water quality standards, in particular for nickel due to the need for a pH near 9 or 10 to precipitate nickel. Collection and treatment continues.

The agencies disagree with the assessment of the San Luis Mine. Telesto has been working at the San Luis Mine from 1999 to 2006. There is no seepage from the backfilled pit at the San Luis Mine because the groundwater level in the backfilled pit has been actively controlled at an elevation such that groundwater cannot flow from the pit. The backfilled pit water chemistry was better because the backfill had been rinsed of oxidation products during storage. The San Luis Mine waste rock has less sulfide than the GSM waste rock. Waste rock with neutralizing capacity was used as backfill at the San Luis Mine. The zone of groundwater fluctuation occurs within the high neutralizing capacity material and not in sulfide-bearing waste rock. Because of the lower sulfide content and material with neutralizing capacity, the groundwater in the backfilled pit at the San Luis Mine has always had neutral pH with low metal concentrations.

The agencies do not dispute that pit effluent may improve over time; however, the improvement would be limited. See the response to Comment 48 for a discussion of the change in pit water quality over time.

Two measures influence the interpretation and projection of water chemistry associated with sulfide oxidation: 1) the total mass of sulfide present and 2) the rate of reaction. The total mass of sulfide can be used to evaluate the balance between potential acidity generated and potential neutralization capacity. The rate of reaction constrains the period over which the solution chemistry is influenced by sulfide oxidation. In the case of in-pit neutralization, the evaluation must consider both measures.

The rate of reaction does not normally affect the chemistry of water unless the neutralization reactions involve rapidly reacting carbonate minerals that are in contact with the pyrite. In the presence of rapidly reacting carbonate minerals, the sulfide oxidation rate can be balanced. The acidity and metals released during the oxidation process are neutralized and immobilized assuming an equivalent amount of neutralizing material is present. If the principal neutralization reaction is aluminosilicate weathering, as is the case at GSM, then the issue of relative rates of reaction would dictate the solution chemistry.

As the purpose of the SEIS was to evaluate pit reclamation alternatives, other facilities were not modeled, unless the information was necessary for the analyses. See response to Comment 35.

50. COMMENT:

Risk to Public Safety - According to the DSEIS (p. 1-29), "Under all open pit options, access restrictions on general public use would need to be maintained." An alternative should be developed and considered that would address and remove access restrictions over the long-term. In order for the pit backfill alternative or, any other reclamation alternative for that matter, to be effective and result in a clean and healthy environment it must result in the achievement of public safety. If 2H:1V slopes can achieve safe conditions on the waste rock piles where access restrictions are not envisioned long-term, then similarly it should be possible to achieve similarly safe conditions with pit backfilling at the same 2H:1V slopes.

Please explain if the same standard of performance is applied to the pit backfilling slopes as to the waste rock slopes why access restrictions to public use would need to be maintained? (168)

RESPONSE:

The risks to worker safety would be similar for 2H:1V slopes on pit backfill and waste rock dumps (see Section 4.4.3.1.2.). Please see Figure 1-3 to clarify land ownership and public access issues. Since much of the pit area land is privately owned, the mine would not allow public access with any of the alternatives to provide an additional measure for public safety (Shannon Dunlap, GSM, personal communication, 2006).

51. COMMENT:

Reclamation Costs - According to the DSEIS (p. 1-30), "Some level of backfilling could eliminate any reasonable likelihood of realizing a positive return on investment for GSM. Reclamation costs must be evaluated as an impact to GSM." This ignores previous rulings by the Montana District Court in a February, 2000 decision that "there is nothing in the constitution or the MMRA which allows a reclamation decision to be based on a threshold determination of whether a mine operator will make a profit."

Why does the DSEIS evaluate reclamation costs as an impact given the Court's ruling?

RESPONSE:

MEPA requires the agencies to disclose the economic impact of the alternatives on GSM (see Section 4.5.1 and Table 4-11). Economics are not considered in making a decision under MMRA.

52. COMMENT:

Alternatives Evaluated in Detail - According to the DSEIS (p. 2-1), "The Partial Backfill Alternative described in the 1998 Final EIS and subsequently updated to reflect current conditions and modifications (GSM, 2002) is the Proposed Action Alternative. The No Pit Pond Alternative described in the 1998 Final EIS and the 1998 ROD serves as the No Action Alternative. Five additional alternatives or variations of these alternatives were studied in the SEIS. Two of the five alternatives were evaluated in detail." Section 2.4.1 (p. 2-10) suggests four alternatives were studied in detail.

Why were all seven of the alternatives not evaluated in detail? How can an accurate analysis be performed if all alternatives are not developed in equal detail? Why were the alternatives not modified to identify appropriate mitigations as issues were identified where practical? (168)

RESPONSE:

The MAA process developed reasonable alternatives for analyses. Although three preliminary potential alternatives were dismissed, many technical analyses were completed for these alternatives in supporting documents for the preparation of the SEIS. Section 2.5 of the DSEIS provides the rationale for dismissing alternatives.

53. COMMENT:

Stage 5B Pit Backfill - According to the DSEIS (p. 2-19), "The Partial Pit Backfill With In-Pit Collection Alternative would remove 33 percent of the total volume in the East Waste Rock Dump Complex into the pit. None of the backfilling operations would reduce the current footprint of the dump of 438 acres. This varies from the 1997 Draft EIS, Chapter II, Section II.B.7.b, which would have used 30 to 32 percent of the total permitted volume and would have completely removed 82 acres of the dump complex."

Why was the Proposed Action changed to result in no reduction of the dump complex footprint? (168)

RESPONSE:
The agencies have changed the partial pit backfill alternatives based on the comment. As part of mitigation Measure 2A (see Section 4.8.1.2), waste rock would be removed to restore Sheep Rock Draw. Under this conceptual design, 67 acres of the dump footprint would be uncovered and Sheep Rock Draw would be placed back in its original channel (see revised Figure 2-5). The return diversion approved in the 1998 ROD would be reclaimed.

54. COMMENT:
Stability and Safety Concern - According to the DSEIS (p. 2-22) in discussing the Partial Backfill option, "Public access to the permit area would continue to be prohibited in selected areas due to concerns about the safety and security of maintenance personnel and equipment that would remain in the area."

Please explain how public access represents a hazard to maintenance personnel and equipment? Please explain why mitigations (*i.e.*, design modifications) were not identified to address those hazards rather than restrict public access? Please explain why the same hazards do not exist elsewhere on reclaimed (*e.g.*, reclaimed slopes on waste rock dumps) areas of the mine? (168)

RESPONSE:
See response to Comment 50.

55. COMMENT:
Hydrologic Conceptual Model and Feasibility Assessment - The DSEIS relies upon several studies by Telesto including a Hydrologic Conceptual Model and a Feasibility Assessment which address potential flows from the pit to groundwater and surface water as well as the transport and fate of potential contaminants of concern which might be present in those flows.

A number of the assumptions or initial conditions for the modeling of ARD transport from the pit will overestimate concentrations reaching the Jefferson River (HSI, Inc., 2003). For example, no basis is provided for the use of 5 percent infiltration (pg. 4); the EIS (1998) used 11.5 percent of annual precipitation. The lower infiltration will bias concentrations high because of lower dilution. (168)

RESPONSE:
The use of 5 percent of annual precipitation for recharge in the DSEIS is explained in Section 6.2.2 – Groundwater Travel Times in the Bozeman and Debris Flow Aquifers" on page 58 of the HSI (2003) report. This section discusses methods of calculating groundwater flux. This section states: "In the (sic) Appendix J study (1998 Final EIS), a recharge rate of 1.5 inches per year (about 11.5 percent of the annual precipitation) was used over Bull Mountain. Golder (1995a) arrived at a groundwater recharge estimate of 0.25 inches/yr (about 2 percent of annual precipitation) in their assessment of the water balance of the Sunlight Slip Block at GSM. Accordingly, a mid-range value of 5 percent of annual precipitation (0.69 inches/yr) was assigned for this evaluation."

Throughout the arid western U.S., it is recognized that a typical recharge rate for natural areas as well as revegetated areas is on the order of 5 percent (Maxey-Eakin, 1949). During the MAA process, the general consensus was that recharge would be around 5 percent and definitely not larger than 10 percent.
Increasing the recharge rate would not result in dilution of the water chemistry from the backfilled pit. It is nearly impossible to dilute pH, and the geochemistry of the backfill solid phases would dictate the chemistry of water for long periods of time – see responses to Comments 44 and 48. It would result in more poor quality water requiring higher ground water capture efficiency.

56. **COMMENT:**
Similarly, the assumption that 100 percent of flow from pit would be through Rattlesnake Gulch does not comport with flow path study results. Some flow from the pit should be routed through other faults and features in a rerun of the model. Assuming that 100 percent of the flow is through Rattlesnake Gulch will overestimate concentrations reaching the Jefferson River because this path does not go through the neutralizing Bozeman formation. Using a discharge from the pit of 103 gpm will overestimate concentrations in groundwater and in the Jefferson River. In the MAA meetings, flows of 10 or 25 to 50 gpm were mentioned as being more reasonable. (168)

RESPONSE:
In the DSEIS, the discharge from the pit was predicted to be 16 gpm (Telesto, 2003a), not 103 gpm as mentioned in the comment above. As described in the Response to Comment 28, the revised pit water balance model (Telesto, 2006) predicts the average outflow from the pit to be 27 to 42 gpm. The analysis in the DSEIS indicated that a portion of pit outflows through other bedrock flow paths could rejoin the groundwater system of Rattlesnake Gulch given the existing hydraulic heads and groundwater flow directions on the south side of the pit (see DSEIS Figure 3-6). For the FSEIS, the pit effluent flow rate down Rattlesnake Gulch was evaluated for a range of flows from 0 to 45 gpm (Figure 4-2). The 103 gpm referred to in the comment is the estimated upper end of the diluting flow in Rattlesnake Gulch from the naturally occurring groundwater in that aquifer. The diluting flows used in the DSEIS assessment were 52 to 103 gpm. To estimate impacts to the

Jefferson River alluvial aquifer, this range was used in the SEIS (see Section 4.3.4.1.1.2).

57. COMMENT:
The model should be rerun using more realistic ranges of outflows from the pit, infiltration rates, and percentages of flow through Rattlesnake Gulch. These sensitivity analyses should be included in the EIS. (168)

RESPONSE:
The pit hydrologic flow and water balance model (see Telesto, 2003a) rates of flow through Rattlesnake Gulch were based on 1) five years of weekly to bi-weekly readings from the Rattlesnake Gulch groundwater capture system (52 gpm), and 2) the groundwater flux through upper Rattlesnake Gulch calculated with Darcy's Law and the aquifer geometry, gradient and hydraulic conductivity obtained from GSM studies (103 gpm) (Golder, 1995; SHB, 1989). Sensitivity analysis was performed and presented in the DSEIS in Section 4.3.4.1.1.2 and in Table 4-7. See Tables 6-13 and 6-14 in the Hydrology Supplement Report (HSI, 2003), which contain analyses that included sensitivity to variations in the rate of flow through Rattlesnake Gulch (52-103 gpm), the contribution from the East Waste Rock Dump Complex (1-3 gpm), and rates of groundwater capture efficiency (80 - 99.99 percent). Technical experts involved in the MAA process commented on the values used in the analysis.

58. COMMENT:
It is most likely that zinc would be the contaminant of concern for the Jefferson River because concentrations are high in waste rock pore water, zinc is not easily immobilized by adsorption or precipitation, and zinc is an aquatic toxin. However, the analysis did not take the pit discharge through to the Jefferson River. The model takes the pit backfill discharge to the Jefferson River alluvium but not through it. What would dilution be in the alluvium? Also, what would predicted concentrations be in the Jefferson River, and, given the measured hardness, would this exceed or come close to exceeding ambient water quality criteria for protection of aquatic biota? (168)

RESPONSE:
The DSEIS analysis of Partial Pit Backfill With Downgradient Collection was based on evaluating compliance with water quality standards within the mixing zone. Most of the southern permit boundary falls in the Jefferson River alluvial aquifer or other alluvial deposits on the north side of the Jefferson River Slough. The Jefferson River alluvial aquifer receives water from the primary pit effluent groundwater pathway, in the southeast corner of Section 32 where the permit boundary crosses I-90. In response to the above comment, the agencies performed additional water quality analysis that carried the results of the DSEIS groundwater mixing model to the Jefferson River Slough and compared the results to DEQ7 surface water

standards (HSI, 2006, 2007) and to Non-Degradation of Water Quality rules (ARM 17.30.715) (HSI, 2007).

With two systems operating at 87.5 percent efficiency (combined efficiency of 96%), the analysis indicates that aluminum would be slightly below the chronic aquatic limit, and that chronic limits for cadmium and copper could be exceeded at low hardness conditions (25 mg/l per DEQ-7). The DEQ-7 standard for iron would be exceeded (HSI, 2006). As above, application of criteria for determining non-significant changes in water quality under ARM 17.30.715 failed for aluminum, copper, and iron (HSI, 2007).

Based on their experience, the agencies believe a maximum capture efficiency of 80 percent per system is potentially achievable. With two groundwater capture systems operating at 80 percent efficiency (combined efficiency of 92%), the analysis indicates that chronic aquatic standard for aluminum and iron would be exceeded at 188 mg/l hardness (based on a 3/8/2006 measurement from the Jefferson River Slough near the GSM property boundary), and that for low hardness conditions (25 mg/l per DEQ-7), chronic limits for aluminum, cadmium and copper would be exceeded (HSI, 2006). Application of criteria for determining non-significant changes in water quality under ARM 17.30.715 failed for aluminum, copper, and iron (HSI, 2007). Aluminum and copper are classified as "toxic" parameters, and iron as "harmful" according to Circular DEQ7.

59. COMMENT:

HSI (2003) assumes that no ARD attenuation or dilution would occur in the Rattlesnake Gulch aquifer and no attenuation or dilution (because recharge and dilution to individual fault zones cannot be reliably made with the available information) would occur in the Precambrian bedrock surrounding the pit. These assumptions will overestimate predicted concentrations traveling from a backfilled pit to the Jefferson River alluvium and do not appear to be supported by any available data (especially the assumption of no dilution). With a small amount of discharge coming from a backfilled pit, even small amounts of dilution, adsorption, and neutralization will help improve water quality.

Please address the comments provided above and explain the worst-case basis for Telesto's assumptions? Please explain why similar worst case assumptions should not be applied to all other mine features (waste rock piles and tailings) in a comparative analysis? Please explain why the potential for similar flow paths and potential for contamination of surface water was not similarly evaluated for the West Waste Rock Dump Complex in previous EISs or this DSEIS? Please explain why attenuation and other phenomena which were applied in previous analysis to suggest reduced impacts to surface water are not used in Telesto's analysis? (168)

RESPONSE:
The analysis did not overestimate the potential impacts of the Partial Pit Backfill With Downgradient Collection Alternative. The agencies agree that small amounts of attenuation may improve the quality of migrating pit effluent, which is why the DSEIS analysis evaluated several types of attenuation (Telesto, 2003e; HSI, 2003).

Attenuating mechanisms included: 1) dilution, 2) neutralization, 3) ion exchange, and 4) sorption (HSI, 2003; Appendix G). As described in the responses to Comments 28 and 57, the projected outflow from the pit was diluted with a range of potential flows in Rattlesnake Gulch from 52 to 103 gpm (HSI, 2003). The potential attenuation along the flow path was incorporated into the analysis.

The DSEIS analysis indicated that attenuation by ion exchange would last 10 to 20 years (see Section 4.3.4.1.2.2.1, and HSI, 2003). The exchange process is reversible, meaning that this attenuation mechanism may not be protective of water quality in the long term.

The DSEIS analysis of dilution and attenuation in geologic materials surrounding the pit was based on site-specific data. A column leaching study of ARD attenuation indicated that the dominant geologic materials in the pit effluent flow path offered essentially no attenuation or neutralization capacity (Schafer & Associates, 1994).

Analysis of attenuation mechanisms performed for the FSEIS demonstrated the absence of calcite in the primary pit effluent flow path, confirming the lack of neutralization potential (Mogk, 2005).

Some dilution by recharge would occur within the bedrock (HSI, 2003). Reasonable estimates of recharge and dilution in individual fault zones cannot be made with available information. Recharge waters migrate through the same rock that imparts the water quality characteristics to the existing groundwater. The bedrock groundwater around the pit is generally acidic (for example, that from highwall wells PW-48 and PW-49), and therefore would not serve to substantially improve the quality of migrating pit effluent. The agencies' conclusions about dilution and attenuation are consistent with site-specific data.

The agencies evaluated all GSM facilities potentially affected by the Proposed Action and alternatives, including the East Waste Rock Dump Complex. The DSEIS reviewed previous attenuation studies, and applied reasonably consistent contaminant fate, transport and attenuation assessments to potential discharge from both the pit and the East Waste Rock Dump Complex (see Section 4.3.2.1.1.1, and HSI, 2003, Section 6.0). The analysis of the East Waste Rock Dump Complex used middle to worst case estimates of recharge of 0.25 to 0.5 inches per year (see Section 4.3.2.1.1.1.2). The ARD modeling parameters compared to the 1997 Draft EIS were provided in Table 4-4, and included information sources. See response to Comment 35 for discussion of analysis of other mine facilities.

Flow paths and potential for contamination of surface water were evaluated for the West Waste Rock Dump Complex in the 1997 Draft EIS in Appendix J and in the 1998 Final EIS in Appendix 1.

60. COMMENT:

Rationale for Selection - We disagree with the rationale for selection stated in the SEIS (p. 2-56) as has been discussed in other comments herein and as follows: There is a significantly higher risk of a highwall failure that threatens public and worker safety with the no backfill alternatives. The agencies' reliance on analysis that is intended to address catastrophic pit-highwall failures versus failures of a variety of mechanisms that are sure to occur over time is short-sighted and relies on a concept that suggests the GSM pit walls are inherently more stable than other similar pit walls.

If only the Underground Sump and No Pit Pond Alternatives provide adequate assurance that pollution of the Jefferson River alluvial aquifer will not occur (assumedly by increasing risk of capture to greater than 95 percent), then why have past decisions not been made on a similar basis (in which event the No Action Alternative should have been chosen in 1992 as not mining was the only alternative that could assure greater than 95 percent capture of contamination from the tailings impoundments and waste rock dumps)? What uniquely makes effective capture of seepage in or down gradient of the pit more difficult than capture of seepage from the waste rock dumps and tailings impoundments?

The pit backfill alternatives would minimize the risk to workers monitoring the site post-reclamation and would similarly minimize public safety and access issues. Please address the agencies' rationale for the preferred alternative given that the pit backfill alternative would result in the above advantages and most likely not result in any impacts to surface water quality if the appropriate mitigations are applied? (168)

RESPONSE

Pit highwall stability for the various alternatives is addressed in the response to Comment 39.

Capture of seepage in the pit or down gradient of the pit, waste rock dump complexes, and tailings impoundments is addressed in the response to Comment 33. The mixing zone was analyzed in the 1997 Draft EIS, Appendix J, and the 1998 Final EIS, Appendix 1. Ninety-five percent capture efficiency from the waste rock dumps and tailings impoundments is not needed to comply with water quality standards at the mixing zone boundary.

The comment assumes that the alternatives not selected in the DSEIS achieved less than 95 percent capture of pit-contaminated groundwater. All alternatives were designed to achieve the degree of groundwater capture sufficient to protect water quality of the Jefferson River alluvial aquifer, if implemented properly. The partial pit backfill alternatives carry some risk and uncertainty, as discussed in Sections 4.2.2.9.2 and 4.2.3.9.2. The greater the reliance on capture systems under the partial pit backfill alternatives, the more likely there would be impacts to water quality in the Jefferson River alluvial aquifer. The agencies believe that the decision in the 1998 ROD also achieved the applicable water quality standards based on the information available at the time.

The DSEIS described the main pit groundwater flow path, the Tdf/colluvial aquifer, which would funnel most of the pit effluent down a relatively high permeability pathway with little or no attenuation capacity directly to the Jefferson River alluvial aquifer. The cyanide leak in 1983 from Tailings Impoundment No. 1, which followed a portion of this pathway, demonstrated to GSM and the agencies that this pathway posed risks to groundwater quality and the ability to meet water quality standards. The waste rock dump complexes have a different hydrologic setting and are not directly recharged by groundwater, as is the pit. Effluent from waste rock dump complexes has not yet developed. An evaluation of cover systems on the waste rock dump complexes and tailings impoundments found that no infiltration to waste rock dumps is expected if good vegetation cover is established, and that the presence of poor vegetation cover would be sufficient to prevent infiltration to the tailing impoundments (Junqueira and Wilson, 2005). To be conservative, the agencies assumed in the DSEIS that some precipitation would infiltrate the reclamation covers. Taken together, this information supports the analysis and selection of the preferred alternative made in the DSEIS.

The agencies have considered additional mitigations as a result of public comments on the DSEIS. See response to Comment 26. Public safety and access issues are addressed in the responses to Comment 33 and 50.

61. COMMENT:

Comparison to Similar Proposals - It is notable that the agencies approved complete and partial backfill at the Zortman and Landusky Mines in the 2001 Reclamation and Closure EIS. In all cases, they were able to identify proposed mitigations, including amendment of potentially acid generating materials together with capping of those materials and downstream capture and treatment of any deleterious constituents to the point where, in their opinion, no environmental harm would occur. In those cases where the proposed mitigations have failed (*e.g.* Swift Gulch where ongoing contamination is occurring), the agencies have yet to employ the identified mitigations (capture of groundwater flowing from the August Little Ben Pit to Swift Gulch or capture and treatment of the water in Swift Gulch itself), but, if they do so, should be successful at addressing the existing water quality impacts. The agencies apparently had no problem in that case approving those actions without having any greater certainty, and perhaps even less, of the outcome at Zortman and Landusky than they do for the GSM pit backfill proposal.

Please explain how this decision differs from that of the Montana DEQ and BLM in the Zortman and Landusky EIS? (168)

RESPONSE:
The geometry of the pit at GSM is fundamentally different than that of the Zortman and Landusky mines. The proposed reclamation measures at GSM differ accordingly. The Zortman and Landusky mine pit floors were located above the water table and collected storm water, which then infiltrated and percolated down to the water table. This contaminated groundwater has the potential to flow toward adjacent streams. This water is then captured and pumped to a treatment facility.

In contrast, the GSM pit extends deep beneath the water table and can be maintained as a sink with a hydraulic gradient toward the pit rather than away from it. There is not sufficient non-acid generating waste rock available at GSM for use as backfill. Placement of waste rock into the pit would increase contaminant loading to groundwater when the water table rebounds into the backfill. The Zortman and Landusky and GSM pit reclamation plans are consistent in that both would minimize placement of acid generating waste rock within or near groundwater.

For the Zortman and Landusky mines, alternatives were selected with the minimal amount of backfill needed to achieve free-draining conditions so runoff had less opportunity to infiltrate the underlying sulfide zone and become contaminated. This material was generally oxide in nature, with little potential to contribute to degradation. Most of this material was used to cover the sulfide-rich highwall segment and was judged to be a net benefit to source control (Wayne Jepson personal communication, 2001).

Other alternatives for the Zortman and Landusky mines with considerably greater amounts of backfill (up to 20 times the amount used) were analyzed and dismissed because they involved placement of millions of tons of sulfide waste rock at inherently riskier locations. The environmental controls and mitigation that would have been necessary for the Zortman and Landusky SEIS Alternatives Z4, Z5, L5, or L6 simply could not be developed with enough certainty to be protective of the environment.

Avoiding placement of sulfide material near groundwater was a goal of the reclamation plan. Limestone waste was used as the lowest layer of backfill in the Landusky August Pit because this pit floor was located near the water table. To the extent possible, backfilling of the Landusky pits was performed using waste rock that is not likely to generate acid drainage. This was done to avoid placing an additional source of contaminants within the pit. The quantities of backfill included in the selected alternative balanced the goals of routing storm water out of the pits and avoiding the placement of acid generating rock into the pits. The Zortman and Landusky SEIS was very clear in stating that "the nature of the backfilled material and its placement can increase environmental risks to surface and groundwater" and the Landusky preferred "Alternative L4 would avoid the potential negative impacts on the drainages to the north of the mine that would occur with the use of spent ore from the L87/91 leach pad as backfill." Landusky alternatives were rejected because additional backfill would have negative consequences on groundwater. By limiting backfill in the August-Little Ben Pit to non-acid generating material sources, the flow of water was able to be controlled and rerouted from originally flowing north back to the south where it can be captured and treated.

The reference to the situation in Swift Gulch proves the point that backfilling with acid-generating material even above the water table greatly increases the risk of contamination. The Zortman and Landusky SEIS itself predicted that, in Swift Gulch, the agency-selected alternative would decrease the contaminant load by 36 percent. The Zortman and Landusky SEIS also predicted that Alternative L5, with five times the backfill of the selected alternative, would increase the contaminant load by an estimated 66 percent. Alternative L6, with 15 times the backfill of the selected alternative would increase the contaminant load by an estimated 227 percent. Selecting alternatives that increase the risk of contamination in a location where the technical performance of capture and collection systems is in doubt, was determined to be undesirable at the Landusky Mine. That same logic is applicable to pit reclamation at GSM.

In summary, the pit backfill plans at Zortman and Landusky reduce impacts to the environment because non-acid generating material was used as backfill in order to reduce the quantity of contaminated infiltration reaching the water table. Pit backfill at GSM would increase negative impacts to the environment because acid generating material would be used as backfill and increase the quantity of contaminated infiltration reaching the water table.

6.5 GOLDEN SUNLIGHT MINE COMMENTS AND RESPONSES

Letter Number 169 as listed in Table 6.2 above is from the Golden Sunlight Mine. Their comments were broken down in Comments 62-391.

62. COMMENT:

Throughout the sections, GSM believes the term "acidic" should be added to references to both backfill and waste rock (including "material"), *e.g.*, "acidic backfill." (169)

RESPONSE:

The agencies disagree. The word "acidic" is used as necessary in the FSEIS.

63. COMMENT:

GSM believes the document should clearly state that there was minimal analysis of the potential environmental impacts from the Partial Pit Backfill Alternative in the 1997 DEIS. (169)

RESPONSE:

The agencies agree. The FSEIS states in the fourth to last paragraph of Section 1.4.3 that "DEQ agrees with BLM that a limited analysis of the potential environmental effects from groundwater exiting the backfilled pit from the Partial Backfill Alternative was completed in the 1997 DEIS."

64. COMMENT:

Page 3, Alternatives Considered But Dismissed, Partial Pit Backfill Without Collection, 2nd to last line and Partial Pit Backfill with Amendment Alternative, last line and Page 4, Preferred Alternative, Rationale for Selection, 1st Paragraph, 8th line - GSM believes it would be more appropriate to replace "guaranteed" with "reliably assured."

RESPONSE:

The agencies agree. These changes have been made.

65. COMMENT:

Page 3, Alternatives Considered But Dismissed, Pit Pond Alternative, 1st line -: Replace "mitigation" with "treatment." (169)

RESPONSE:

The agencies agree. This wording has been changed.

66. **COMMENT:**
Page 6, Table 1, Design & Constructability of the Alternative: Proven Design for No Pit Pond – the pit would be backfilled with 100 ft of crusher reject. (169)

RESPONSE:
The agencies agree and this wording has been changed.

67. **COMMENT:**
Partial Pit Backfill with Downgradient Collection – GSM suggests modifying the 2nd paragraph to "Pumping out of...., but the objective of overall 95 percent capture..." Also, secondary known and unknown flowpaths (*e.g.*, faults, fractures) would further reduce the reliability of the capture system (HSI, 2003). (169)

RESPONSE:
The agencies agree and this has been changed.

68. **COMMENT:**
This alternative should also include a statement that construction of a soil cover and its associated subsurface drainage layer on a long 2H:1V slope is difficult. (169)

RESPONSE:
This has already been addressed. GSM's consultant concluded that, in the partial backfill alternatives, a drainage layer would be necessary to keep the soil from slumping in saturated areas on steep 2H:1V slopes (Telesto 2003d). GSM has already been successful in reclaiming long steep slopes at the mine site. The agencies have concluded in Sections 4.2.2.7.1 and 4.2.3.7.1 that the subsurface drainage layer referred to in the comment to keep soil from slumping in saturated backfill is not needed in either of the partial pit backfill alternatives. Small localized failures could develop if the cover is saturated. GSM would be required to locate the seep and dewater it. Contaminated soil would be replaced with clean soil and the area revegetated. See mitigation Measure 2 in Section 4.8.1.2.

69. **COMMENT:**
Page 7, Table 1, Backfill, Backfill maintenance requirements - GSM suggests the agencies review the settlement numbers presented in the document. Consolidation testing presented in Appendix C of the Feasibility Assessment by Telesto (2003e) showed a 13 to 15 percent settlement of placed material will likely occur. Most of this settlement will occur during placement of the materials and soon (a few years) after final surface reclamation. Testing also showed that under saturating conditions, an additional 6 to 8 percent settlement could occur. No mention of the potential for settlement ranging up to 150 to 200 feet could be found in these documents for the No Pit Pond, Partial Pit Backfill with In-Pit Collection, and Partial Pit Backfill with Downgradient Collection Alternatives, respectively. Yet, these numbers are cited throughout the document. GSM suggests the agencies review their calculations and present the rationale for these values. (169)

RESPONSE:
The agencies acknowledge that the Telesto report (2003e) never mentions actual footages and uses percentages. The DEQ converted the percentages to feet of settlement so that the average reader could relate to the amount of settlement possible.

70. COMMENT:
Page 8, Table 1, continuation of Backfill Maintenance Requirements, Partial Pit Backfill with In-Pit Collection (Proposed Action), 2nd paragraph - GSM believes the agencies should discuss hydrostatic pressure in the highwall cover. While this information is briefly, and possibly inaccurately, presented on page 4-42, it is an important component of the stability analyses for the alternatives. (169)

RESPONSE:
See response to Comment 68.

71. COMMENT:
Page 8, Table 1, Underground Workings, Impacts to pit facilities due to subsidence - Based on the previous underground mining operations conducted at GSM, localized rock falls occurred in stopes but no subsidence was evident. GSM believes there is no evidence to suggest that there would be subsidence in the underground workings that would impact the open pit. However, any potential impacts could affect all backfill alternatives. (169)

RESPONSE:
Thank you for your comment. The change is not necessary. The SEIS assumed a long-term conservative analysis.

72. COMMENT:
Page 8, Table 1, Groundwater Effluent Management System, Operation requirements: Partial Pit Backfill With In-Pit Collection - Change "regularly" to "frequently due to corrosion." (169)

RESPONSE:
The agencies agree and this has been changed.

73. COMMENT:
Page 9, Table 1, Groundwater Effluent Management. System, Maintenance of capture points, 2nd paragraph regarding corrosion - Partial Pit Backfill With In-Pit Collection - We do not agree that the corrosion impacts for this alternative will be the same as for the No Pit Pond Alternative. Evaluations indicate corrosion will be a significant issue for the Partial Pit Backfill With In-Pit Collection wells, much more so than wells in 100 feet of backfill (Telesto, 2003e). These wells will likely need to be replaced frequently, and this should be noted in the summary. (169)

RESPONSE:
All wells would be in acidic conditions, subject to corrosion and subject to replacement. The only question is the timing of the replacement. The agencies do not believe this needs to be noted.

74. **COMMENT:**
Page 9, Table 1, Groundwater Effluent Management System, Maintenance of capture points, 2nd paragraph regarding corrosion - Underground Sump - Since the pumping system for the Underground Sump Alternative would not require wells to be completed in backfill, corrosion to wells is not applicable in this case. (169)

RESPONSE:
The agencies disagree. All pumping system components would be in acidic conditions, subject to corrosion and subject to replacement. The only difference is the lack of wells.

75. **COMMENT:**
Page 10 - 11, Table 1, Groundwater Effluent Management System, Maintenance of capture points, Access - Underground Sump - The first sentence "Access to the underground would be needed" is adequate for this description. We suggest deleting the remainder of this discussion since it describes mitigation. (169)

RESPONSE:
The agencies disagree. The remainder of the text was left in the document.

76. **COMMENT:**
Page 11, Table 1, Stormwater Runon/Runoff Management Maintenance requirements: Partial Pit Backfill With In-Pit Collection - Since the diversions for this alternative are engineered and require special construction unlike the stormwater diversions outside the pit, the maintenance requirements would not be the same as those for the No Pit Pond Alternative. Maintenance would be more involved and costly. (169)

RESPONSE:
The storm water diversions for the partial pit backfill alternatives would be constructed the same as diversions on the 2H:1V waste rock dump slopes. It may be more costly due to the total length of diversions maintained but the requirement should not change. The agencies do not believe additional wording is required.

77. **COMMENT:**
Page 11, Table 1, Soil cover maintenance requirements - For alternatives with cast blasted and reclaimed highwalls, hydrostatic pressure from the highwall seeps will result in damage to soil covers as described in Telesto, 2003d. This document makes specific references to the maintenance and monitoring of the phreatic surface

and drainage properties of the cover constructed on the 2H:1V slope. These maintenance issues are of high concern due to the low factor of safety (1.01) calculated for the stability of the cover placed on the 2H:1V slope under static conditions. GSM believes this information should be included. (169)

RESPONSE:
The agencies believe this has been addressed. See response to Comment 68.

78. COMMENT:
Page 11, Table 1, Soil cover maintenance requirements - GSM suggests adding information regarding the soil borrow requirements and associated disturbance for each alternative. (169)

RESPONSE:
The agencies agree and Table S-1 and Table 2-2 have been modified to include soil borrow requirements and acres of disturbance for each alternative under the soil cover maintenance requirements (erosion, revegetation) row:

No Pit Pond (No Action) column - A total of 290,400 cubic yards of soil cover material, from existing sources, would be necessary.

Partial Pit Backfill With In-Pit Collection (Proposed Action) - A total of 1,541,800 cubic yards of soil cover material, resulting in an additional disturbance of 31 acres, would be necessary.

Partial Pit Backfill With Downgradient Collection - No change, same as Partial Pit Backfill With In-Pit Collection.

Underground Sump - A total of 285,600 cubic yards of soil cover material, from existing sources, would be necessary.

79. COMMENT:
Page 12, Table 1, Soil cover maintenance requirements - Since the surface of the partial pit backfill alternatives will consist of 292 acres of revegetated surface versus 1 acre for the No Pit Pond Alternative, we do not agree that the impacts from highwall seeps to vegetation will be the same for all alternatives. If this impact were to occur, it would have a much larger impact in the partial pit backfill alternatives. (169)

RESPONSE:
The agencies believe this has been addressed. Any highwall seeps should be localized and create minimal disturbance. See response to Comment 68.

80. COMMENT:

Page 12, Table 1, Water Treatment, Additional sludge management requirements, 2nd paragraph under discussion of the Partial Pit Backfill With Downgradient Collection - Regarding the statement "Jarosite in the saturated portion of the backfill would prevent reducing conditions from developing and allow further production of acid. Metals would be released during the dissolution of jarosite" – Jarosite is stable under oxidizing conditions and unstable under reducing conditions. However, the presence of jarosite in the pit backfill will only influence the redox conditions until it all dissolves. Jarosite will likely dissolve and release metals in the saturated portion of the backfill. Once jarosite completely dissolves, reducing conditions will likely develop in the saturated portion of the backfill. This is described in Section 4.3.3.1.1.2.1 and should be clarified in Table 1. (169)

RESPONSE:

The agencies agree with this comment. The text in Table S-1 and Table 2-2, under Partial Pit Backfill With Downgradient Collection, is altered to read, "Weathering would continue to produce oxidation byproducts in the saturated backfill. Jarosite in the saturated portion of the backfill would, for a time, prevent reducing conditions from developing and allow further production of acid. Jarosite is stable under oxidizing conditions and unstable under reducing conditions. The presence of jarosite in the pit backfill would only influence the redox conditions until it all dissolves. Jarosite would likely dissolve and release metals in the saturated portion of the backfill. Once jarosite completely dissolves, reducing conditions would likely develop in the saturated portion of the backfill. The flow from the unsaturated portion of the backfill above the water table would contribute low pH water with high metal concentrations to the pit discharge for hundreds of years. There is limited natural attenuation capacity along the primary and secondary flow paths from the pit. The sludge management requirements would be about the same as the Partial Pit Backfill With In-Pit Collection Alternative because the chemical mass would be about the same."

81. COMMENT:

Page 14, Table 1, Impacts to groundwater quality and quantity, Risk of impacts to groundwater quality - No Pit Pond - This alternative would not result in pit outflows. (169)

RESPONSE:

The agencies agree that pit outflows would be minor to non-existent and have concluded impacts from pit outflow would be minimal. No change is necessary.

82. COMMENT:

Page 15, Table 1, Impacts to groundwater quality and quantity, Risk of violation of groundwater to the Jefferson River Alluvium, Partial Pit Backfill With Downgradient Collection - The following wording is suggested for the first sentence - "Groundwater quality standards would be met at the permit boundary if the 95 percent or greater capture efficiency is achieved, and then beneficial uses of the Jefferson River alluvial aquifer would not be affected." (169)

RESPONSE:

The referenced sentence has been changed to read as follows: "Two groundwater capture systems in Rattlesnake Gulch, each operating at an efficiency of 87.5 percent or greater would be required to meet water quality standards at the mixing zone boundary. Beneficial uses of the Jefferson River alluvial aquifer would not be affected."

83. COMMENT:

Page 18, Table 1, Mineral reserves and resources, Access to future mineral reserves, Partial Pit Backfill With Downgradient Collection - This alternative would not be the same as the Proposed Action since the backfill material would be saturated. The backfill material would have to be dewatered and would have to drain prior to excavation. Due to the time that would be required for the pore spaces to drain adequately, in GSM's opinion it is questionable whether the pit would be mineable under this scenario. (169)

RESPONSE:

The agencies disagree. The pit could still be mined, though perhaps at a higher overburden stripping price.

84. COMMENT:

Page 19, Table 1, Mineral reserves and resources, Access to future mineral reserves..., 1st paragraph, Partial Pit Backfill With In-Pit Collection - It is unclear why the statement "...though is would likely take less than that" is included. The value of 116 months was based on operational information and experience that 405,000 cubic yards of backfill could be removed per month. This was the standard used to evaluate all alternatives and should be no different for this alternative. (169)

RESPONSE:

The agencies agree. This phrase has been deleted.

85. COMMENT:

Page 19, Table 1, Land Use After Mining, Suitability of land use after mining - NPP - GSM suggests deleting "limited" from the third sentence since the entire highwall would be available as habitat, and it is the entire highwall which provides the topographic relief features desired by raptors. (169)

RESPONSE:

The agencies disagree with the comment. Limited development of bat and raptor habitat in the upper highwall, as described in Sections 2.4.2.6 and 4.4.2.6.1 and the

1997 Draft EIS Chapter IV, Section IV.E, is part of the existing permit and the No Action Alternative.

86. **COMMENT:**
Page 1-1, Section 1.1, 1st paragraph, 2nd sentence - We believe the primary purpose of the SEIS is to evaluate reclamation alternatives for the GSM open pit after mining is completed. Therefore, the following change in wording is suggested: "This Supplemental Environmental Impact Statement (SEIS) has been prepared to evaluate reclamation alternatives for the GSM pit after mining is completed. As part of this process, site-specific data have also been updated where relevant." (169)

RESPONSE:
The agencies do not believe this wording is necessary.

87. **COMMENT:**
Page 1-2, Section 1.2, 1st full paragraph, 7th line - The Proposed Action involves "partially" backfilling the pit and this should be noted. (169)

RESPONSE:
The agencies agree and this has been changed.

88. **COMMENT:**
Page 1-2, Section 1.3, 4th and 5th bulleted items - Please add text stating these items are required under NEPA and MEPA. (169)

RESPONSE:
The agencies agree and this has been changed.

89. **COMMENT:**
Page 1-2, Section 1.3, 5th bulleted item - Please note that the best "available" scientific data were used. (169)

RESPONSE:
The agencies agree and this has been noted.

90. **COMMENT:**
Page 1-3, Section 1.4.2, 2nd paragraph - Please note that the address for Placer Dome U.S. is 1125 Seventeenth Street, Suite 2310 (not Suite 310). (169)

RESPONSE:
This address correction has been made to reflect Barrick ownership and address.

91. COMMENT:
Page 1-3, Section 1.4.2, 3rd paragraph - We request that a land status map be added to the document for clarification of private, state, and federal land ownership in the mine area. (169)

RESPONSE:
The agencies agree and Figure 1-3 has been added to include ownership in relation to major mine facilities.

92. COMMENT:
Page 1-3, Section 1.4.3, 1st paragraph - Add to the second sentence: "As is typical for precious metal mines, approximately 1/6..." (169)

RESPONSE:
The agencies do not think this change needs to be added to the text.

93. COMMENT:
Page 1-3, Section 1.4.3, 2nd paragraph, 4th line - Please note that the collected water is naturally "slightly" acidic. (169)

RESPONSE:
The agencies agree and this has been changed.

94. COMMENT:
Page 1-6, 1st paragraph, 1st line - GSM suggests modifying the first sentence to indicate the "vast majority" of waste rock at GSM has potential to create acid rock drainage. (169)

RESPONSE:
The agencies agree and this has been changed.

95. COMMENT:
Page 1-6, 1st paragraph, 5th line - Please add the following text following the term heavy metals: (*e.g.*, copper, cadmium, and nickel). (169)

RESPONSE:
The agencies agree and this has been changed.

96. COMMENT:
Page 1-6, 1st paragraph, last line - The discussion in this paragraph incorrectly leads the reader to assume that GSM is under bonded. Please note in the last line that the $54+ million is the bond required for the existing disturbance and water treatment activities and a significant portion of the work covered by this bond has been completed. (169)

RESPONSE:
This last sentence has been clarified as follows: "GSM has posted a total bond of $54,380,000 to cover reclamation, water treatment, and closure costs. GSM is currently bonded for 2,619.55 acres of disturbance. Through December 31, 2006, GSM has disturbed 2,236 acres and reclaimed 1,072 acres (2006 GSM Annual Report)."

97. **COMMENT:**
Page 1-8, 3rd paragraph (below 2nd numbered list), 4th line - Please include a land status map and reference this figure following the information about the location of waste dumps on BLM managed federal land. (169)

RESPONSE:
See response to Comment 91.

98. **COMMENT:**
Page 1-9, 1st paragraph under bulleted list, 1st line - GSM "submitted" a partial pit backfill plan as ordered by DEQ, but did not propose this alternative in their submittal. Please change "propose" to "submitted" in the first line. (169)

RESPONSE:
The agencies agree and this has been changed.

99. **COMMENT:**
Page 1-11, Table 1-1 - Please replace the existing text with the following text in the Permit/Approval description for BLM: "Approval of Plan of Operations to prevent unnecessary or undue degradation under the Federal Land Policy and Management Act and the 43 CFR Subpart 3809 Regulations." (169)

RESPONSE:
The agencies partially agree and this has been changed as follows: "Administering FLPMA and NEPA to prevent unnecessary or undue degradation."

100. **COMMENT:**
Page 1-11, Table 1-1 - Should the DNRC be listed in this table? (169)

RESPONSE:
The DNRC does not need to be listed because it has no regulatory jurisdiction over the pit reclamation plan.

101. **COMMENT:**
Page 1-11, Section 1.6.1.3, 3rd line - Please add "to prevent unnecessary or undue degradation" after "(43 CFR, Subpart 3809)." (169)

RESPONSE:
The agencies agree and this has been added.

102. COMMENT:
Page 1-12, last set of bulleted items - Please refer to the section numbers for each bulleted item. (169)

RESPONSE:
The agencies agree and this has been added as follows:
- Areas of critical environmental concern (Section 1.7.3.10);
- Prime or unique farm lands (Section 1.7.3.11);
- Floodplains (Section 1.7.3.12);
- Native American religious concerns (Section 1.7.3.9);
- Threatened or endangered species (Section 1.7.3.3);
- Solid or hazardous wastes (Section 1.7.3.6);
- Drinking water/groundwater quality (Section 1.7.2.2.1.1);
- Wetlands/riparian zones (Section 1.7.3.1);
- Wild and scenic rivers (Section 1.7.3.13);
- Wilderness (Section 1.7.3.14);
- Environmental Justice (Section 1.7.3.15);
- Invasive, non-native species (Section 1.7.3.16).

103. COMMENT:
Page 1-13, Table 1-2 - GSM suggests adding the 1981 EIS and other pertinent documents completed between 1975 and 1980 to this table. (169)

RESPONSE:
The agencies agree and the following documents have been added:

Document Title	Author	Date
Operating Permit No. 00065	DSL	April 24, 1975
Environmental Impact Statement for Amendment 001	DSL	April 1981
Assessment of Potential Acid Producing Characteristics of Geologic Material From the Golden Sunlight Mine	Dollhopf, D.	1989
Assessment of Water Quality Impacts – report to MDHES	Hydrometrics	1990

Also note that the reference date for Parades, M.M. has been changed to 1994.

104. COMMENT:

Page 1-19, Section 1.7.2, second paragraph - GSM believes the agencies should note the MAA process was not successfully concluded to the satisfaction of all parties involved. Although the MAA provided valuable input to the NEPA document regarding alternatives and consequences, Section 1.7.2 may leave the reader with the impression the MAA process was concluded with the approval of all involved. This impression is repeated in several sections of the SEIS (*e.g.*, 2.3.3, 4.1, 4.4.1, and 5.1). However, it was the professional opinion of the consultant conducting the MAA that the Draft Consensus MAA is representative of the majority of the participants in the Technical Working Group. While a true consensus was not reached for the pit reclamation alternatives at GSM, the MAA process clearly defined alternatives and issues. (169)

RESPONSE:

A draft report was prepared (Robertson GeoConsultants, 2003) and is described in detail in Section 1.7.2. Although the MAA was not formally completed, it was useful in defining issues, developing alternatives, and providing additional technical information to use in the analyses. The following changes have been made in the text:

Section 1.7.2, end of the second paragraph, add: "Although the MAA was not formally completed, it did provide valuable input on alternatives and environmental impacts."

Section 2.3.3, fifth paragraph, at the beginning of the second sentence, add: "While the MAA was not formally completed, the agencies determined ..."

Section 4.1, second paragraph, second sentence, delete: "including the MAA process ..."

Section 4.4.1, third paragraph, first sentence is changed: "This SEIS took a more detailed look ...". The last sentence of the paragraph is deleted.

105. COMMENT:

Page 1-20, 1st full paragraph, last line - Please clarify the term "co-extensive." (169)

RESPONSE:

Co-extensive means having the same limits, boundaries, or scope. MEPA and NEPA require the agencies to disclose and analyze issues that are identified during scoping. Decisions made under the applicable federal and state laws are not necessarily governed by these issues. Instead, the decisions are made within the authority of the applicable law.

106. COMMENT:
Page 1-21, Section 1.7.2.1.1.1, last line - Please modify this sentence to read "...within the mining and reclamation industries..." (169)

RESPONSE:
The agencies agree and this has been added.

107. COMMENT:
Page 1-23, section 1.7.2.1.5.1, 5th paragraph - Please add the following text to the end of the first sentence in this paragraph: "but this applies only if the capture can be reliably achieved." (169)

RESPONSE:

The agencies disagree and do not believe this wording is necessary.

108. COMMENT:
Page 1-24, Section 1.7.2.1.7.1 - Also note that adequate soil cover exists for the Underground Sump Alternative. (169)

RESPONSE:
The agencies do not believe this change is necessary.

109. COMMENT:
Page 1-27, Section 1.7.2.3.1.1, 2nd sentence - This statement should be modified to reflect that GSM currently does not have a written policy regarding fully loaded haul truck traffic down pit haul roads. However, policies would be developed to ensure the safety of workers involved in haulage activities and other pit personnel. (169)

RESPONSE:
The agencies agree and this has been changed.

110. COMMENT:
Page 1-29, Section 1.7.2.3.5.1 - Please modify the term "contends" as follows: "GSM has indicated that precious metal mineralization..." "GSM believes that if these resources are buried..." Please also see the comment concerning Page 4-127, Section 4.4.2.5.1 and Page 4-128 for information regarding GSM mineral resources. (169)

RESPONSE:
The agencies agree and this has been modified as suggested.

111. COMMENT:
Page 1-29, Section 1.7.2.3.7.1 - Since no quantification will be completed, please remove the term "amount of" from the 2nd line. (169)

RESPONSE:
The agencies have reworded this sentence from "The amount of visual contrast..." to "The mitigation of visual contrast..."

112. COMMENT:
Page 1-29, Section 1.7.2.3.8.2, 2nd paragraph - It is unclear how relying on mixing and partial attenuation could limit "long-term management requirements." Please clarify this as GSM does not believe this is true. (169)

RESPONSE:
The agencies disagree. Mixing and attenuation of pit effluent would occur under the Partial Pit Backfill With Downgradient Collection Alternative. Since the groundwater is naturally acidic and contains contaminants and attenuation has been shown in the DSEIS analysis to be limited, there would be little or no reduction in long-term management of pit effluent, capture systems, or water treatment.

113. COMMENT:
Page 1-30, 1st paragraph, last line - Please note that "Alternatives that do not achieve complete control of pit water increase the liability for GSM, the State of Montana, the community, and some other future party." (169)

RESPONSE:
The agencies disagree. The issue is future liability for GSM.

114. COMMENT:
Page 2-1, Section 2.1, 2nd paragraph, last sentence - GSM believes that the primary purpose of the SEIS is to evaluate reclamation alternatives for the GSM open pit after mining is completed. We suggest the following wording change: "Completion of a SEIS was determined to be necessary by the DEQ and BLM to evaluate potential environmental impacts by implementing a partial pit backfill alternative. This evaluation also takes into consideration new technical information gathered for assessing impacts of the partial pit backfill alternative and changes to pit designs from minor revisions granted since the 1998 EIS." (169)

RESPONSE:
The agencies do not believe this wording needs to be added.

115. COMMENT:
Page 2-3, Section 2.2.2, last full sentence - There is potential for additional underground mining. Therefore, GSM suggests modifying the last sentence to read "This phase of underground mining was completed by the end of January 2004." (169)

RESPONSE:
The agencies agree and this wording has been changed.

116. COMMENT:
Page 2-6, last paragraph, last sentence - This sentence implies that treatment plant discharge is mixed with water from the dewatering wells and run through the treatment plant again, which is incorrect. We believe it should read: "The water from the highwall dewatering wells is either: 1) mixed with treatment plant discharge and directed to the land application disposal (LAD) infiltration basin, 2) sent to the lined pond below the mill for treatment at the water treatment plant, or 3) pumped to Tailing Impoundment No. 2 for reuse as process water." (169)

RESPONSE:
The agencies agree and this wording has been changed.

117. COMMENT:
Page 2-7, Section 2.2.4, last paragraph in the section, 1st line - GSM believes that DEQ "required," rather than "requested" a modified partial pit backfill plan. (169)

RESPONSE:
The agencies agree and this wording has been changed.

118. COMMENT:
Page 2-7, Section 2.2.4, last paragraph in the section, 2nd line - GSM suggests modifying the last part of this line to read: "The 5B pit expansion would add 4 to 5 years to the current mine life." (169)

RESPONSE:
The agencies agree and this wording has been changed.

119. COMMENT:
Page 2-7, Section 2.2.4, last paragraph in the section and Page 2-7, Section 2.2.4, last paragraph in the section, last full sentence - Page 2-3, 2nd paragraph says that "GSM has decided to begin mining the Stage 5B and is now proposing an ultimate pit bottom of 4,525 ft. The agencies will evaluate this change of pit depth in the SEIS." How will the ultimate decision about approval of mining to this depth be addressed (*e.g.*, ROD, Preferred Alternative description, etc.)? (169)

RESPONSE:
The ultimate decision will be addressed in the ROD.

120. COMMENT:
Page 2-8, Section 2.3.2, 1st paragraph - GSM believes the agencies should describe the level of evaluation of the partial pit backfill alternative in the 1997 Draft EIS. GSM does not believe the environmental impacts of the alternative were fully evaluated in the 1997 DEIS. (169)

RESPONSE:
The agencies agree. See response to Comment 63.

121. COMMENT:
Page 2-9, 4th bulleted item - GSM suggests noting that, before this could be implemented, a determination of land status would be necessary. (169)

RESPONSE:

The agencies disagree. The change is not necessary.

122. COMMENT:
Page 2-9, Section 2.3.3, 1st paragraph - This discussion implies the alternatives were developed by comments at the scoping meeting and from information in previous environmental documents, and the MAA process only refined these previously identified alternatives. Since many of the alternatives were defined by the Technical Working Group during the MAA process, this should be noted. (169)

RESPONSE:
The agencies do not believe this wording is required.

123. COMMENT:
Page 2-9, Section 2.3.3, 2nd paragraph - The Technical Working Group (TWG) didn't really identify "deficiencies," the alternatives were discussed and modified based on the discussion of technical issues. Perhaps more accurate wording would be "As the process evolved, the TWG modified alternatives based on technical discussions and evaluation of accepted practices." (169)

RESPONSE:
The agencies agree. This wording has been changed.

124. COMMENT:
Page 2-10, Section 2.4.1, last bulleted item - GSM suggests this item be modified to read: "...and the potential loss of mineral resources and reserves associated with burial activities of the backfill alternatives." (169)

RESPONSE:
The agencies do not believe this wording is required.

125. COMMENT:
Page 2-11, Section 2.4.2.1, 1st paragraph, 1st sentence - Since use of the underground sump is ongoing, GSM suggests modifying this sentence to read "....the underground sump in the underground mine will not be closed until the end of mining because it will be used as part of the dewatering system for Stage 5B." (169)

RESPONSE:
The agencies do not believe this wording is required.

126. COMMENT:
Page 2-11, Section 2.4.2.1, 1st paragraph: 2nd sentence - GSM suggests the following wording change for clarity: "Portions of the pit that break through into the underground mine posing a hazard to workers would be backfilled." (169)

RESPONSE:
The agencies agree and this wording has been changed.

127. COMMENT:
Page 2-12, Section 2.4.2.2, 2nd paragraph, 5th line - Add a sentence indicating crusher reject is also acid-generating as defined by testing for the SEIS. (169)

RESPONSE:
The agencies do not believe this wording is required.

128. COMMENT:
Page 2-12, Section 2.4.2.2, 3rd paragraph - GSM suggests noting that no additional disturbance would be necessary for the No Pit Pond Alternative cover requirements. (169)

RESPONSE:
The agencies agree and this wording has been added.

129. COMMENT:
Page 2-14, Section 2.4.2.3, 1st paragraph, 1st line - This discussion cites Section 2.2.3, which describes actual dewatering activities at the mine. It is unclear what is meant by "additional information on the conceptual design of the dewatering system..." There is nothing conceptual about the information in Section 2.2.3. (169)

RESPONSE:
The agencies do not believe changes are required.

130. COMMENT:

Page 2-14, Section 2.4.2.4, 2nd to last line and page 2-22, Section 2.4.3.4, 1st paragraph, 5th line - GSM contracted C.O. Brawner Engineering Ltd. (Brawner) to conduct a post-closure geotechnical assessment of the open pit to support previous work conducted for the SEIS. The objectives of this assessment were to assist GSM in reviewing the geotechnical assumptions used by the agencies in preparation of the DSEIS and provide technical comment/opinion using existing geotechnical information. A copy of the report generated is attached to these comments. GSM believes that some of the technical analyses and conclusions can be utilized by the agencies to corroborate the analyses included in the DSEIS.

In addition, GSM contracted with Golder Associates to conduct a review of the DSEIS information and conduct additional stability analyses. Golder's analyses included an evaluation of raveling, overall slope failure, and wedge failure in the upper west wall. The Golder Associates (April, 2005) report is submitted with these comments and also corroborates the conclusions presented in the DSEIS. (169)

RESPONSE:

The agencies agree and have made the following text modifications.

In Section 2.4.2.4, the text in the first paragraph has been modified:

"...as a result of controlled blasting and scaling. ~~GSM has not proposed any other specific measures to maintain or improve pit highwall stability after closures.~~ No major ... in Section 4.2.1.2."

In response to comments on the DSEIS, GSM proposed operational measures to stabilize the pit highwall and a long-term monitoring and maintenance program based on technical reviews and additional analyses (Brawner, 2005; Golder, 2005). The following text modifications have been made at the end of Section 4.2.1.2.3. and apply to Section 4.2.4.2.2.

"Technical reviews, additional analyses (Brawner, 2005; Golder, 2005), and the conclusions in the DSEIS confirm that the pit highwall stability conclusions reached in the 1997 Draft EIS remain valid with respect to overall slope stability. Additional analyses of pit highwall raveling and of wedge failure indicated that there is little potential for structurally controlled failures with the exception of the existing failures in the upper west and northwest walls (Brawner, 2005; Golder, 2005).

"Other operational measures that GSM would implement to stabilize the pit in preparation for this reclamation alternative would include the following (Brawner, 2005; Golder, 2005):

- A 100-foot-wide safety bench would be left at the 5,700-foot elevation. Narrower catch benches spaced every 100 vertical feet would also be left to catch rock fall that would occur after mining is completed.
- Wire mesh would be installed over some sections of the west wall failure to mitigate rock fall hazards. Two dowels have been placed to secure a sandstone block. Additional bolts or dowels would be installed. Reinforcement considered critical in the long term would include appropriate corrosion protection.
- Bench face angles would be reduced in the Lone Eagle Fault Zone, and bench crests would be reduced in local areas of the west highwall in the footwall of the Corridor Fault Zone and along the south wall where there are north-dipping geologic bedding structures.
- Potentially unstable slabs or wedges would be mined out.
- Horizontal drains would be installed around the pit perimeter to reduce water pressure in the pit highwall if seepage is encountered in the lower 300 feet of the Stage 5B pit.
- Drainage interception ditches would be constructed around the open pit to minimize surface water flowing over pit slopes.

"Although rock mass stability analyses indicate adequate factors of safety for overall highwall slopes, a long-term stability monitoring and maintenance program would be required for the No Pit Pond and Underground Sump alternatives. Monitoring would concentrate on failure areas on the west and upper northwest highwall areas. The proposed program would include the following (Brawner, 2005; Golder, 2005):

- Regular inspection of the pit by a rock mechanics professional;
- Installation of piezometers to periodically monitor pore water pressures;
- Monitoring of areas where failures have occurred;
- Installation of 8-10 global positioning system monuments on selected locations to monitor movement;
- Monitoring of water levels in wells;
- Restricting access to the pit during and shortly after rainfall events, rapid thaws, and seismic events; and,
- Cleaning catch benches as needed."

In Section 2.4.3.4, the text in the first paragraph has been modified:

"...for the Partial Backfill Alternative." ~~GSM has not proposed any specific measures to maintain or improve pit highwall stability after closure.~~

In response to comments on the DSEIS, GSM proposed operational measures to stabilize the pit highwall and a long-term monitoring and maintenance program based on technical reviews and additional analyses (Brawner, 2005; Golder, 2005). The following text modifications have been made at the end of Section 4.2.2.2.1 and apply to Section 4.2.3.2.1.

"The SEIS's stability conclusions are supported by subsequent technical reviews and additional analyses (Brawner, 2005; Golder, 2005). These studies concluded that with the pit slopes covered, highwall raveling and other failure modes are not important stability issues under the partial pit backfill alternatives."

131. COMMENT:
Page 2-15, Section 2.4.2.6, first bulleted item - GSM suggests changing the term "would" to "may" for accuracy. (169)

RESPONSE:
The agencies do not believe this wording is required.

132. COMMENT:
Page 2-16, first bulleted item - GSM suggests changing the word "trees" to "seedlings" for accuracy. (169)

RESPONSE:
The agencies do not believe this wording is required.

133. COMMENT:
Page 2-17, 2nd bulleted item - Text previously identifies that crusher reject would be used for the lower 100 feet of backfill. (169)

RESPONSE:
The agencies agree and this wording has been modified.

134. COMMENT:
Page 2-17, last bulleted item - GSM suggests adding "as currently approved for all waste rock facilities at the mine" to the end of this sentence. (169)

RESPONSE:
The agencies agree and have added the words "as currently approved for all 2H:1V waste rock facilities at the mine." to the end of the sentence.

135. COMMENT:
Page 2-22, 1st paragraph - At the time the backfill plan was submitted, the most likely source was the area northeast of the East Waste Rock Dump. However, since that time, another potential soil source has been identified north of Tailing Impoundment No. 1 and a portion of the area was permitted for disturbance. The remainder of this area would be required to be permitted for a borrow source. (169)

RESPONSE:
The agencies agree and Section 2.4.3.2 has been modified to address all borrow sources as follows: "The proposed source includes a 47-acre soil borrow source

identified north of Tailings Impoundment No. 1. A portion of the area (about 16 acres) has been permitted for disturbance. The remaining 31 acres of this area would be permitted for a soil borrow source (Figure 1-2) (Shannon Dunlap, GSM, personal communication, 2006)."

136. COMMENT:
Page 2-22, Section 2.4.3.3, 1st paragraph - Telesto's 2003a document does not state that the average predicted pumping rate is 20 gpm. The first sentence of the paragraph should be struck along with the "However," at the beginning of the second sentence, to make this statement correct. The differences in predicted pumping rates for the various alternatives range from approximately 15 to 30 gpm. (169)

RESPONSE:
The agencies agree. The text has been modified to read as follows: "For the Partial Pit Backfill With In-Pit Collection Alternative, the 10-year time-weighted average water balance indicated that the pumping rate would be on the order of 27 to 42 gpm (Telesto, 2006). The dewatering system..."

137. COMMENT:
Page 2-23, Section 2.4.3.5, 2nd line - GSM suggests changing the term "remove" to "prevent" for accuracy. (169)

RESPONSE:
The agencies agree and this wording has been modified.

138. COMMENT:
Page 2-23, Section 2.4.3.6, 1st paragraph - GSM suggests the agencies include a statement indicating the amount of additional disturbance for the soil borrow areas. (169)

RESPONSE:
The agencies agree and Section 2.4.3.2 has been modified as addressed in response to Comment 135.

139. COMMENT:
Page 2-24, Section 2.4.4.3, 1st paragraph, 7th line - In order to more accurately describe the system, GSM suggests the following wording: "Contaminated groundwater from the pit, estimated at 16 gpm, would mix with ambient groundwater and the entire 121 gpm would be collected in a series of 26 or more new capture wells..." (169)

RESPONSE:
The agencies agree and this wording has been modified and updated as follows: "Contaminated groundwater from the pit, estimated at 27 to 42 gpm, would mix with ambient groundwater, estimated to range from 52 to 103 gpm, and the resulting

combined flow would be collected in a series of 26 or more new capture wells plus the existing wells in the Tailings Impoundment No. 1 south pump back system (Telesto, 2006)."

140. COMMENT:
Page 2-26, Section 2.4.4.4, 1st paragraph - GSM suggests describing the effects of hydrostatic pressure in the soil cover on slopes for the partial pit backfill alternatives. As described in the Geotechnical Report (Telesto, 2003d), "...pressure head build up could occur in the lower stages of the resloped highwall under the partial pit backfill alternative, especially if the permeability of the blasted highwall material and waste rock backfill drops below the 10^{-4} cm/sec range. Thus for soil cover stability to be maintained in the long-term, the flow through the soil cover and a pressure head build up would not be allowed." (169)

RESPONSE:
The agencies believe this has been addressed. See response to Comment 68.

141. COMMENT:
Page 2-27, Section 2.4.5.1, 2nd paragraph, 4th line - GSM suggests the following wording: "The current mine plan for the 5B Pit includes mining a safe distance from the underground stopes, backfilling the stopes where practicable, and then mining through the stopes." (169)

RESPONSE:
The agencies agree and the wording has been changed.

142. COMMENT:
Page 2-28, 1st line and 3rd bulleted item - GSM suggests changing the term "road" to "ramp." (169)

RESPONSE:
The agencies do not believe this wording change is necessary.

143. COMMENT:
Page 2-28, last paragraph - Based on actual collected data for a short time period, the flow rate of water pumped from the pit/underground workings has averaged about 30 gpm, not between 30-47 gpm. GSM requests this value be changed for accuracy. (169)

RESPONSE:
The agencies agree and the wording has been changed.

144. COMMENT:
Page 2-29, Figure 2-8 - Since the Underground Sump is the preferred alternative, we recommend a figure showing how the components of the dewatering system function be included in this section. (169)

RESPONSE:
The agencies disagree. Figure 2-8 is adequate to show the dewatering system in conceptual detail.

145. COMMENT:
Page 2-30, 1st paragraph - GSM suggests a reference to the pit seep water quality discussion be included in this paragraph. (169)

RESPONSE:
The agencies agree. Reference to Gallagher (2003b) has been added to the text.

146. COMMENT:
Page 2-31, Section 2.5.2, 2nd paragraph - GSM suggests deleting the term "site-wide" as the facilities covered under the mixing zone are delineated within the sentence and do not represent every facility at the site. (169)

RESPONSE:
The term site-wide mixing zone is appropriate because the areal extent of the mixing zone encompasses the majority of the mine permit area.

147. COMMENT:
Page 2-32, 1st paragraph, 8th line – HSI (2003) does not include any statements about the debris flow blending with alluvial gravel deposits beneath Tailings Impoundment No. 1, but describes the lithology as follows: "In the area between Tailing Impoundment No. 1 and the Jefferson River Alluvium, saturated sand and gravel overlies the Bozeman Formation Aquifer. This material has been classified as Quaternary in age (Keats...)." (169)

RESPONSE:
The agencies believe this has been addressed. On page 40 of HSI (2003), the authors state, "A likely explanation is that the gravel channel is time-transgressive, being Tertiary where it has remained buried in the northern Rattlesnake drainage, and reworked during the Quaternary lower in the drainage where it surfaces and blends with the natural drainage channel of lower Rattlesnake Gulch."

148. COMMENT:
Page 2-32, 1st paragraph below bulleted list - GSM believes the agencies should include the rationale for using the assumption that less than 10 percent of the pit water would flow south along the Range Front Fault. (169)

RESPONSE:
The agencies agree. The agencies stated in the DSEIS that "less than 10 percent of the pit water would likely flow south along the Range Front Fault and other secondary flow paths." The 10 percent estimate is an assumption based on the consensus of several scientists working on this SEIS. The rationale for the 10 percent estimate is as follows:

The Sunlight Vein, Sunlight and Range Front faults, and the Corridor Fault create complex fault zones located on the eastern side of the pit. As water exits the pit, it would flow both along and out of these structures. Water that reaches Tertiary debris flow sediments will migrate into the primary flow path. The tendency for groundwater to flow preferentially either through any structures or into the Tertiary sediments is controlled by the relative ability of the materials to transmit water.

Studies have produced potentiometric maps that have included the Range Front Fault (Golder, 1995a; HSI, 2003; URS 2001). All maps indicate that groundwater flows in a southeasterly direction. Water that crosses the fault zones would migrate into the Tertiary sediments. Water that stays in the fault zones would likely migrate southward. The hydraulic gradient between monitoring well PW-12, which is located on the east side of the fault near the east entrance to the pit, and PW-4, which likely intersects the Range Front Fault to the south, is approximately 0.013 foot/foot (*i.e.*, a vertical drop of 13 feet for every 1,000 feet of movement along the flow path) (Figure 3-8). The hydraulic gradient between PW-12 and PW-8 is approximately 0.037 ft/ft.

Considering these gradients, the transmissivity of the Sunlight and Range Front faults would have to be substantially greater than that of the surrounding rocks, or the faults would have to have relatively continuous impermeable zones acting as hydraulic barriers, in order for preferential flow to occur along the fault. Evidence of both is present in the pit area. There is a permeability contrast across the Sunlight and Range Front faults, evidenced by an abrupt change in groundwater level of 130 feet from the bedrock aquifer to the Tdf/colluvial aquifer (URS, 2001). This permeability contrast suggests either that the fault is acting as a hydraulic barrier or that there is a permeability contrast between rock types (URS, 2001). Geologic evidence in PW-64 indicates the permeability contrast in the Range Front Fault in this vicinity results from differences in rock types rather than structures. This conclusion supports contrasting permeability measurements in the bedrock and Tdf/colluvial aquifers (GSM, 1995; Hydrometrics, 1995). Hydraulic barriers are also present in the pit area as indicated by the change in oxidation state across the Wegner Fault, an early stage of range front faulting. The complex nature of the faulting along the range front strongly suggests that the presence of both permeability contrasts and impermeable zones have and will continue to influence the direction of groundwater flow.

Pit seep monitoring indicates that, between 1995 and 2001, GSM identified two seeps on the south pit highwall (Gallagher, 2003). The maximum measurable flow observed from these seeps was 0.75 gpm, with the majority of measurements recorded as "wet." The flow from seeps on the south highwall is assumed to be 1 to 3 gpm. The observed flows occurred under the influence of a large hydraulic gradient created by the dewatered pit. If the hydraulic gradient is reversed in a backfilled pit such that groundwater moves out of the pit along structural pathways, the magnitude of the gradient away from the pit would likely be less than the gradient toward the pit. Potential outflows from the pit along the south highwall would likely be substantially less than 4.2 gpm.

Flow in fractured bedrock is complex and predicting where groundwater will flow is difficult. The majority of water would flow out of the pit via the Tdf/colluvial aquifer. It is assumed that a maximum of 4.2 gpm would flow out of a saturated pit via secondary flow paths in a variety of structures and locations. This is 10 percent of the total pit outflow under the Partial Pit Backfill With Downgradient Collection Alternative.

149. COMMENT:

Page 2-33, 1st paragraph, 6th line and page 2-34, 1st paragraph below bulleted list, last line - GSM believes that "guaranteed" should be replaced with "reliably assured." (169)

RESPONSE:

The agencies agree and the wording has been changed.

150. COMMENT:

Page 2-33, Section 2.5.3, 1st paragraph, 3rd to last line - The reference to DEQ, 1990 should be replaced with "DSL, 1990" as noted in the references. (169)

RESPONSE:

The agencies agree and the change has been made.

151. COMMENT:

Page 2-34, 1st full paragraph - Note that Laura Kuzel's mine backfill information and summary table contained in Appendix 1 of the analog study only noted that the Flambeau Mine was ultimately amended with lime. However, the wording in the SEIS suggests there was an analysis of lime amended waste material. This is not the case. Please remove the reference to the analog study. (169)

RESPONSE:

The agencies do not believe the wording implies that there was an analysis of lime amended waste material.

152. COMMENT:

Page 2-34, 5th bulleted item - GSM suggests replacing the term "under these conditions" in the 3rd line with "under higher pH conditions." (169)

RESPONSE:
The agencies do not believe this wording change is necessary.

153. COMMENT:
Page 2-35, 1st partial paragraph, 1st line - Regarding the statement that "...the addition of lime would neutralize the acidic quality of the mine water for some period of time..." - Zinc and arsenic mobility decreases as acidic solutions approach circum-neutral pH values. Arsenic mobility may increase if pH values increase significantly above circum-neutral pH values (*e.g.*, pH>10); however, zinc will precipitate from solution at these extremely elevated pH values. A reference should be included supporting this statement or it should be deleted. (169)

RESPONSE:
The following reference has been added to the text: (Gräfe, Markus, Maarten Nachtegaal, and Donald R. Sparks, 2004).

154. COMMENT:
Page 2-35, Section 2.5.4, 1st paragraph, 1st line - GSM believes the term "biological treatment" is more accurate than "biologic mitigation." (169)

RESPONSE:
The agencies agree and the wording has been changed.

155. COMMENT:
Page 2-36, 1st paragraph, 3rd line - GSM suggests adding "Thus, this is not a reclamation alternative with proven design and reliability" after the first sentence. (169)

RESPONSE:
The agencies disagree and this change has not been made.

156. COMMENT:
Page 2-37, 1st paragraph, last sentence - GSM suggests the agencies note that the 4,635-foot pond elevation was determined by Telesto (2003a and 2003e). (169)

RESPONSE:
The agencies agree and this change has been made.

157. COMMENT:
Page 2-38, Section 2.7.1, 2nd paragraph, last sentence - GSM believes the range presented for the Partial Pit Backfill with Downgradient Collection Alternative is incorrect. The analysis shows that 16 gpm of pit water would mix with ambient water for a total of approximately 121 gpm. Since no collection system is proposed at the pit discharge, then there would always be more than 16 gpm for collection. GSM

suggests this statement be modified to read: "The collection rate...would be approximately 121 gpm." There is no reference in HSI (2003) indicating any range of this type, therefore the reference should be removed. (169)

RESPONSE:
The agencies agree that no specific mention of the 16 to 121 gpm range was made in HSI (2003) and the reference has been removed. The text has been changed to read: "The collection rate for the Partial Pit Backfill With Downgradient Collection Alternative would be in the range of 79 to 145 gpm (Telesto, 2006)."

158. COMMENT:
Pages 2-40 through 2-55, Table 2-2 - See comments for the Summary Table presented above. (169)

RESPONSE:
All edits have been checked and all acreages have been revised based on the 2004 GSM Annual Report as follows:

- Section 1.7.2.1.7.1, line 1
- Section 2.1, page 2-2, 3rd paragraph, line 1
- Table 2-1, page 2-2
- Section 2.2.1, 3rd paragraph, line 3
- Section 3.3.5, 1st paragraph, line 7
- Section 4.3.2.3, page 4-84, last paragraph, line 2
- Section 4.3.2.3.1, page 4-87, line 1
- Section 4.9.2, 6th paragraph, line 1
- Section 4.9.3, 3rd paragraph, line 1
- Section 4.10, 2nd paragraph, line 4

159. COMMENT:
Page 3-1, Section 3.1, 1st paragraph - Since this section describes the existing environment for all alternatives, GSM suggests the following re-wording of the 3rd sentence - "Resources that would not be affected by the alternatives evaluated are not discussed in detail." (169)

RESPONSE:
The agencies agree and this wording has been changed.

160. COMMENT:
Page 3-1, Section 3.2.1.1, 1st paragraph - While it is true "the Precambrian rock types in the vicinity of the mine include sandstone, siltstone, and shale," these are meta-sediments. Please modify the description to include this information. (169)

RESPONSE:
The agencies do not believe this level of detail is necessary. The agencies recognize the distinction between sedimentary and metasedimentary rocks in that

sedimentary rocks are weak and porous while the induration / metamorphism of metasedimentary rocks makes them much stronger and not as porous or not porous at all. Disseminated flow would dominate in sediments and fracture flow in metasediments. Sediments have much less ability to maintain highwall stability than metasediments.

161. COMMENT:
Page 3-8, Section 3.2.1.3, 2nd paragraph on page - This paragraph describes the Jefferson River Quaternary alluvial deposits as shown on Figure 3-1. The map only shows the recent Jefferson River Alluvium (JRA) as "Qal" on the map. The part of the JRA we have been most concerned about is the buried channel north of I-90 (HSI, 2003). It may be useful to add an additional sentence indicating that buried JRA sediments also extend north of I-90 and are an important component of the analysis. (169)

RESPONSE:
The agencies revised Figure 3-1 to reflect information concerning the extent of the Jefferson River alluvium deposits north of Interstate 90 obtained by GSM during installation of monitoring wells in 2003 and 2004 (Gallagher, 2005). The following has been added to the above-referenced section of the FSEIS to describe the alluvium:

"The Jefferson River alluvium is a stream deposit consisting of unconsolidated, permeable alluvium of the river floodplain and the adjacent gravelly terrace deposits (Spectrum Engineering and Kathy Gallagher, 2004). This unit follows the flow direction of the Jefferson River (Figure 3-1). At least one of the alluvial terraces is buried by 40 to 80 feet of more recent colluvium and alluvial deposits. It is likely the upper terraces grade into the recent alluvium of the Jefferson River system and are hydrologically connected to some degree. The alluvial deposits consist of unconsolidated gravel, sand, and finer-grained overbank deposits. The well-rounded gravel fraction includes quartzites and volcanics from up-river regions. Angular silicified siltstones and latite appear to be derived from the mine area. Much of the gravel is iron stained. Fragments of ferricrete are present from the Tertiary debris flow deposits. The six borings in the Jefferson River alluvium were distributed both up gradient and down gradient of the Tertiary debris flow deposits. Rock types associated with the mine area were seen in greater abundance in samples from downgradient borings. Samples from the unsaturated portion of the Jefferson River alluvium were calcareous and effervesced in hydrochloric acid, while samples from the saturated portion were non-calcareous and did not effervesce (Gallagher, personal communication, 2006)."

162. COMMENT:
Page 3-8, Section 3.2.1.4, 1st paragraph - Since the term "perched" is often associated with groundwater, a better term might be "located." (169)

RESPONSE:
The agencies agree and the wording has been modified.

163. COMMENT:
Page 3-8, Section 3.2.1.4, 2nd paragraph - Again, GSM suggests indicating the rocks are meta-sediments. (169)

RESPONSE:
The agencies do not believe this level of detail is necessary.

164. COMMENT:
Page 3-9, Section 3.2.1.5, 2nd paragraph, 2nd line - GSM suggests the following changes: - "Ferricrete deposits can be modern... indicating prehistoric natural production of acidic discharge." (169)

RESPONSE:
The agencies do not believe this level of detail is necessary.

165. COMMENT:
Page 3-10, 1st paragraph, 6th line - "These deposits may be indicative of ancient deposits that were formed due to ARD naturally emanating from ..." (169)

RESPONSE:
The agencies do not believe this level of detail is necessary.

166. COMMENT:
Page 3-10, Section 3.2.2.2, 1st paragraph - GSM conducted additional studies on faulting and seismic activity at the site within the past year. In 2004, work was initiated due to a moderate magnitude earthquake that occurred close to the GSM on June 28, 2004. A copy of the report from AMEC is included with these comments. Additionally, in 2005, C.O. Brawner Engineering and Golder Associates evaluated previous values used in seismic analyses and confirmed these were reasonable and appropriate. These reports may also contain information that would be of use for Chapter 3. (169)

RESPONSE:
Thank you for the comments and reports. The following text has been added at the end of Section 3.2.2.2.

"GSM conducted additional studies at the site after a 4.0 magnitude earthquake occurred close to GSM on June 28, 2004 (AMEC, 2004). It was felt at the mine, but no damage was done and no highwall instability occurred.

GSM evaluated previous values used in seismic analyses and confirmed these were reasonable and appropriate (Brawner, 2005; Golder, 2005a, 2005b)."

167. COMMENT:
Page 3-13, Section 3.2.2.3, 2nd paragraph - GSM suggests indicating the rocks are meta-sediments. (169)

RESPONSE:
The agencies do not believe this level of detail is necessary. See the response to Comment 160.

168. COMMENT:
Page 3-13, Section 3.3, Title - This section title indicates geochemistry data will be described. A lot of new geochemical data were collected for the SEIS. GSM suggests including this new information in this section. (169)

RESPONSE:
The agencies agree. The following has been added to the bulleted list under Section 3.3:

- The pit backfill geochemistry was evaluated in detail (Telesto, 2003c).
- The East Waste Rock Dump Complex mineralogy was characterized (Telesto, 2005a).

169. COMMENT:
Page 3-13, Section 3.3, 1st bullet in this section - GSM suggests rewording this sentence as follows: "A re-analysis of the pit hydrology... was conducted based on data that were not available at the time the 1997 Draft EIS was written." (169)

RESPONSE:
The agencies do not believe this wording is necessary.

170. COMMENT:
Page 3-15, Section 3.3.1.4, 1st paragraph - The Golder (1995a) cross-sections show the landslide/debris flow deposits north of the tailing impoundment, but the surficial geology map shows the deposits extend further south. The general geology map in the SEIS doesn't even show the landslide/debris flow sediments. GSM suggests more carefully delineating these sediments since they are an important flowpath. (169)

RESPONSE:
As indicated in surface geology maps of the GSM area (Golder, 1995a; GSM 1996c), the portion of the Tertiary landslide/debris flow deposit which is expressed at the surface is relatively minor, and specifically delineating this on Figure 3-1 would not enhance the understanding of the geology as presented. The vast majority of this deposit is buried by other surficial deposits. As discussed in Section 3.3.7.2, the primary pit flowpath is comprised primarily of the Tertiary landslide/debris flow deposit, which is mapped on Figure 3-8.

171. COMMENT:
Page 3-15, Section 3.3.1.5, 1st paragraph - Again, Figure 3-1 does not really show the Jefferson River Alluvium we are describing in this section. Since it is another important flowpath, suggests producing a better map for the final document. (169)

RESPONSE:
See response to Comment 170.

172. COMMENT:
Page 3-18, Section 3.3.4, 2nd paragraph, 2nd line - GSM suggests also noting that the springs also cease to flow during freezing conditions during winter. (169)

RESPONSE:
The agencies agree and this wording has been added.

173. COMMENT:
Page 3-18, Section 3.3.4, 2nd paragraph - 4th line - North Borrow, Sunlight, and Arkose Valley springs should be added to the list of springs at the bottom of page. (169)

RESPONSE:
North Borrow, Sunlight and Arkose Valley springs were not included in the DSEIS because they have been buried by mining activities. The agencies agree that they should be mentioned and the paragraph now reads:

"The major springs and seeps that have been mapped within and adjacent to the pit area and are currently accessible include Rattlesnake Spring, Bunkhouse Springs, Stepan Spring, and Stepan Original Spring. Surface seeps existed in the Midas Spring, North Borrow Springs, Sunlight Spring, and Arkose Valley Spring areas (Figure 3-5), but have since been intercepted by drain systems to allow placement of waste rock piles. The drains were constructed to prevent contact between water and waste rock materials."

174. COMMENT:
Page 3-21, Section 3.3.5, 1st paragraph, 7th line - GSM suggests changing the text to indicate 106 acres (not 76.8 acres) of the EWRD have been reclaimed, as this is the latest reported value. (169)

RESPONSE:
The agencies agree and the GSM 2006 Annual Report has been used to update all acreages. See Comment 158 for a list of changes made.

175. COMMENT:
Page 3-26, 1st paragraph, last sentence - Since the capture system is very effective (Keats, 2001), GSM suggests modifying this sentence as follows: "Evaluations

indicate the capture systems are capturing the majority of water. The minor quantity of uncaptured groundwater…" (169)

RESPONSE:
The agencies agree and this wording has been modified as follows: "Evaluations indicate the capture systems are completely or nearly completely capturing all groundwater in the Quaternary alluvial aquifer and the majority of water in the Bozeman Group aquifer. The minor quantity of uncaptured groundwater may reach the Jefferson River alluvial aquifer via coarser units within the Bozeman Group aquifer (Hydrometrics, 1994, 1997; Keats, 2001, 2002; Spectrum Engineering and Kathy Gallagher, 2004)."

176. COMMENT:
Page 3-27, 1st paragraph, 7th line - There is a reference to 50 gpm. However, on page 3-26, the number is 52 gpm. (169)

RESPONSE:
The agencies used both numbers in the 1997 Draft EIS. They are essentially the same and do not need to be changed.

177. COMMENT:
Page 3-27, 3rd paragraph, 2nd to last line - This paragraph contains the first reference to the "Tertiary fluvial sandstone aquifer." This aquifer is not discussed in the stratigraphy section. (169)

RESPONSE:
The agencies agree. The aquifer that the text is referring to is the Bozeman Group aquifer. The phrase "Tertiary fluvial sandstone aquifer" has been replaced with "Bozeman Group aquifer."

178. COMMENT:
Page 3-28, Section 3.4, 1st paragraph, 4th line - GSM suggests noting in this discussion that, because of the shortfall of stockpiled topsoil for the partial pit backfill alternatives, additional disturbance will be necessary. (169)

RESPONSE:
The agencies agree. The following sentence has been added after the seventh sentence. "In addition, a new soil borrow source has been identified north of Tailings Impoundment No. 1, which would require an additional 31 acres of disturbance to salvage enough soil for the pit backfill alternatives." See responses to Comments 42 and 135.

179. COMMENT:
Page 3-30, continuation of Section 3.5 - GSM suggests incorporating the information from the 1997 Draft EIS concerning all bat and raptor species into this section.

Additional and supporting information compiled and analyzed by Gary Back, Ph.D. (SRK Consulting, 3/14/05), is attached for use as a reference for the FSEIS. (169)

RESPONSE:
The agencies have tiered to the 1997 Draft EIS information on bats and raptors in Section 3.5. Changes have been made to Section 3.5 as follows:

"In addition to the named species, long-legged myotis, Yuma myotis, long-eared myotis, and western small-footed myotis are found or may be found in the area (SRK Consulting, 2005)."

"Twelve raptor species were previously observed in the vicinity of the mine. These species include the bald eagle, golden eagle, turkey vulture, rough-legged hawk, red-tailed hawk, northern harrier, northern goshawk, sharp-shinned hawk, merlin, American kestrel, great-horned owl, and saw-whet owl. An active golden eagle nest was documented in 2003 north of the pit highwall (SRK Consulting, 2005 and Shannon Dunlap, personal communication, 2006)".

180. COMMENT:
Page 3-34, Section 3.10, 1st paragraph, 2nd line - All work practices are conducted following GSM's Safety Manual and various safety policies and procedures. (169)

RESPONSE:
The agencies agree. This wording has been changed.

181. COMMENT:
Page 3-34, Section 3.10, bulleted list - GSM suggests changing the wording to indicate the Critical Incident Initiative is a Placer Dome policy, not just GSM. (169)

RESPONSE:
The agencies do not believe this change is required in light of the mine now operating under the Barrick Safey Manual.

182. COMMENT:
Page 4-1, Section 4.1 - There should be a discussion of the organization of the section, *i.e.,* discuss the division of technical and environmental impacts. Also in a previous discussion it is noted the technical and environmental impacts assessed in the MAA generally could not be separated for analysis. Clarification would be helpful since the agencies separated the technical and environmental impacts for the Chapter 4 environmental consequences section. (169)

RESPONSE:
The agencies disagree. Table 1-3 lists the issues studied in detail by category and Section 1.7.2 explains each issue.

183. COMMENT:
Page 4-1, Section 4.1, 2nd paragraph, 2nd sentence - GSM suggests adding the following text to this sentence: "This means that part of the seepage (estimated to be a minor 1 to 3 gpm) from the dump complex...(HSI, 2003)." (169)

RESPONSE:
The agencies disagree and do not believe this wording is required.

184. COMMENT:
Page 4-1, Section 4.1, last paragraph - GSM agrees the analysis should focus on risks and uncertainties. (169)

RESPONSE:
Thank you for the comment.

185. COMMENT:
Page 4-2, 2nd bulleted item, 4th line - GSM suggests modifying the term "ease" with either "certainty" or "technical feasibility." (169)

RESPONSE:
The agencies agree that "certainty" would be a more appropriate word for this sentence and this change has been made to the third bullet in Section 4.1.1.

186. COMMENT:
Page 4-3, Section 4.2.1.1 - While the 1997 DEIS did not specifically have a section called "Design and Constructability of the Alternative," GSM believes the alternative was adequately evaluated at that time. Note the agencies indicate the No Pit Pond is a proven technology in a subsequent paragraph. (169)

RESPONSE:
Comment noted.

187. COMMENT:
Page 4-3, Section 4.2.1.1.1, 2nd paragraph & Page 4-33, Section 4.2.2.1.1, 2nd paragraph - The analog study did not specifically determine how backfill was placed in the pits. Therefore, the reference to "end dumping" is not necessarily true. (169)

RESPONSE:
The agencies agree. References to end dumping have been removed from the text.

188. COMMENT:
Page 4-4, Section 4.2.1.2.1 - GSM suggests moving the majority of this discussion to Chapter 3 since it describes the history of pit failures and the existing

environment. Only the information concerning the No Pit Pond and pit highwall stability analysis should be included in this section. (169)

RESPONSE:
The agencies believe this discussion is best left together in Section 4.2.1.2.1.

189. COMMENT:
Page 4-4, Section 4.2.1.2.1, 1st paragraph, 2nd sentence - GSM suggests rewording this discussion for clarity as follows: "There have been several pit slope failures in connection with on-going mining activities. Little information is available for pre-1992 slope failures. The following list provides volume and timeframe estimates for selected post-1992 slides (Telesto, 2003f):" (169)

RESPONSE:
The agencies agree and this wording has been changed and updated with "(Brawner, 2005; Golder, 2005)" and added to Section 4.2.1.2.1.

190. COMMENT:
Page 4-5, 3rd paragraph below bulleted list - GSM suggests the following changes to this paragraph for accuracy: "...With pre-splitting, a row of holes is drilled along the final excavation line and loaded with a special grade of explosive. These holes are fired prior to the production blast to create a fracture line at the excavation limits. The idea of pre-splitting is to isolate production shots from the remaining rock formation by forming a crack along the designed highwall. Although..." (169)

RESPONSE:
The agencies agree and this change has been made to Section 4.2.1.2.1.

191. COMMENT:
Page 4-5, last paragraph, 1st sentence - GSM suggests rewording this sentence for clarity to read: "The expected range of potential impacts of pit highwall instability during operations will range from remote and minimal to the loss of a substantial portion of the ore reserve." However, it should also be noted that GSM would not be mining the 5B pit if there was a high probability of "loss of a substantial portion of the ore reserve." (169)

RESPONSE:
The agencies disagree and do not believe this wording is required.

192. COMMENT:
Page 4-6, 4th paragraph, 2nd sentence beginning on 3rd line - GSM suggests modifying the second sentence of this paragraph to include: "Portions of the outside edges of mine benches have broken off..." (169)

RESPONSE:
The agencies agree and this wording has been modified in Section 4.2.1.2.1.

193. COMMENT:
Page 4-6, 5th paragraph, 5th line - GSM believes this statement should be modified to indicate both failures were initiated by on-going mining activities in that area. (169)

RESPONSE:
The agencies agree and this wording change has been made in Section 4.2.1.2.1.

194. COMMENT:
Page 4-7, 1st paragraph, last sentence - GSM believes the agencies should provide the rationale for the assumption that "occasional failures" will occur and suggest the agencies change the wording to: "occasional localized failures similar to those that can be observed in the highwall today." (169)

RESPONSE:
The agencies agree and this wording has been modified in Section 4.2.1.2.1.

195. COMMENT:
Page 4-7, Section 4.2.1.2.2 - GSM agrees that the pit wall will be stable and modes of significant failure have a very low probability of occurring. GSM has conducted additional studies to corroborate this fact. Studies conducted by C.O. Brawner Engineering and Golder Associates are attached, as part of GSM's comments.

Overall – The first paragraph states that the 1997 Draft EIS found that block slip movements into the pit are moderately likely. In addition, Section 4.2.1.2.1 states that a large scale wedge failure occurred within the Stage 2 pit. However, the fourth paragraph of referenced section states that block failure analyses were not conducted for the current SEIS. This appears to be inconsistent and needs to be further clarified in the text.

Although the text does present reasons why block failure analyses were not conducted, specific reference to the purpose of the current analysis should be presented. The second paragraph of Section 4.2.1.2.2 should specifically state that the current failure analysis was conducted to assess the potential for massive failures of the pit that would damage or destroy the reclamation alternatives and that, for the reasons presented in the following paragraphs of the section, massive block failures having such an effect are highly unlikely and thus were not considered.

In addition, the third sentence of paragraph 5 states "although the major formation dip is away from the pit, there are low lying bedding planes and joint faces that do dip into the pit especially on the northwest side." This sentence should be qualified with an explanation that these bedding planes and joint faces are located such that they are not expected to result in a massive block failure that would damage or destroy the reclamation alternatives. (169)

RESPONSE:
Thank you for your comments. These studies are now part of the Administrative Record. The clarifications mentioned have been made to the text as follows:

Section 4.2.1.2 Pit Highwall. The following sentence has been added in front of the last sentence of this section: "In 2005, GSM conducted reviews of the pit highwall information. The conclusions support the overall stability conclusions found within the DSEIS (Brawner, 2005; Golder, 2005)."

Section 4.2.1.2.1 Stability Observations at GSM (1981-2005). The following has been added as part of the last sentence of the first paragraph before the bulleted list: "... (Brawner, 2005; Golder, 2005)."

A new bullet has been added to the list as follows:

- " Northwest pit highwall – Around 50,000 to 70,000 tons on June 8, 2005. The slope between the 5,200-foot and 5,450-foot-elevation benches failed and remobilized the failure between the 5,450-foot-elevation bench and the 6,030-foot-elevation highwall crest. The toe of this failure on the 5,200-foot-elevation bench evidently involved the intersection of the Corridor Fault and the Lone Eagle Fault (Golder, 2005)."

Section 4.2.1.2.2 Pit Highwall Stability. This section has been modified in several places.

The following sentences replace the first two sentences of the fifth paragraph:

"Circular failure analysis was chosen to model the potential for massive failure of the pit that would damage or destroy the reclamation alternatives because of the site-specific geology of the pit. Pit highwall stability was modeled to estimate the potential for massive failure in the circular failure mode for each reclamation alternative..."

The following sentences have been added at the end of the fourth paragraph:

"Most high angle faults running through the pit dip into the center of the pit, the Range Front Fault dips steeply away from the pit on the east and the Corridor Fault dips gently towards the east across the upper portion of the pit. These configurations make the possibility of block failure less likely than a circular failure. Damage to a reclamation alternative as a result of massive block failure is unlikely."

The following has been added as a new eighth paragraph:

"GSM prepared additional stability analyses since the DSEIS focusing on the stability of the pit highwall (Golder, 2005). Rock mass stability analyses indicate adequate factors of safety with respect to rock mass failures for the highwall. Failure analyses indicate little potential exists for structurally controlled failures of the highwall, with the exception of the existing failures in the upper west and northwest highwalls (Golder, 2005). In these areas, raveling and small wedge failures could occur. Such failures would be limited in scope and would not damage or destroy the reclamation alternative."

196. COMMENT:
Page 4-7, Section 4.2.1.2.2 2nd paragraph, 2nd line - GSM requests the agencies delete the term "proposed" from "proposed pit reclamation alternatives." (169)

RESPONSE:
The agencies agree and the word "proposed" has been removed.

197. COMMENT:
Page 4-7, Section 4.2.1.2.2 2nd paragraph, last sentence - GSM suggests defining the meaning of, and purpose for, a "margin of safety." It should be explained how this applies to block and circular failures. (169)

RESPONSE:
The text has been modified and the phrase "and include a margin of safety" has been removed.

198. COMMENT:
Page 4-7, Section 4.2.1.2.2 4th paragraph - GSM contracted with Golder Associates to conduct a review of the SEIS information and conduct additional stability analyses. This report, "Post-Closure Slope Stability, Mineral Hill Pit, Golden Sunlight Mine," (April, 2005), is attached. Additionally, C.O. Brawner Engineering conducted an evaluation of geotechnical assumptions utilized in the SEIS. This report is also included with this submittal. (169)

RESPONSE:
Thank you for your comment. See responses to Comments 39, 130, 166, and 195.

199. COMMENT:
Page 4-7, Section 4.2.1.2.2 5th paragraph, last sentence - GSM suggests adding information on why circular failure analysis overestimates the chance of highwall failures. (169)

RESPONSE:
The agencies agree. The text after the fourth sentence in the fifth paragraph has been modified as follows:

"Circular failure would have to occur across the bedding planes and geologic structures. In circular failure analysis, structures are ignored and the material is treated as unconsolidated. The analysis overestimates the chance of highwall failure because it ignores a fundamental strength component in the analysis (Telesto, personal communication, 2005)."

"Failure planes typically follow structures. Bedding in much of the pit and a 200-foot-thick latite sill in the northern part of the pit dips away from the pit. However, along the south and southwest pit highwall, beds dip gently into the pit. Adverse bedding orientation, usually in conjunction with structural or jointing intersections, has only contributed to small slope failures in an area confined to the west and northwest corner of the pit, in a zone in the general vicinity of the Corridor Fault. Historically, failures in the pit have generally been small and have occurred along steep northeast trending faults due to mining activities."

200. COMMENT:
Page 4-8, 3rd paragraph - This paragraph should be clarified. The lower factor of safety was determined by using all of the minimum strength values. This lower value changed slightly, while the value for the expected case did not change. Telesto's technical memorandum stated that a factor of safety change of 0.021 will most likely occur with the addition of a pit lake. However, a change of less than 0.1 in the overall factor of safety is typically beyond the accuracy of this analysis, and therefore the addition of a pit lake is not significant. (169)

RESPONSE:
The agencies disagree that additional clarification is needed. The text has not been changed.

201. COMMENT:
Page 4-9, 3rd paragraph - GSM suggests adding a sentence indicating there has been no known change in earthquake effects since the EIS was completed. However, a seismic evaluation including pseudo-static analyses information are included in the appendices of Telesto's Geotechnical Evaluation (2003d). Telesto's discussion is corroborated by the enclosed C.O. Brawner Engineering and Golder Associates (2005) reports. Both of these reports address seismicity and pit slope factors of safety associated with seismic events. (169)

RESPONSE:
Thank you for the additional studies. The agencies have replaced the last sentence with the following text and added a new paragraph to Section 4.2.1.2.1: "A seismic evaluation, including pseudo-static analyses information, was conducted for the DSEIS, which corroborated the 1997 Draft EIS analysis (Telesto, 2003d).

GSM conducted additional studies at the site after a 4.0 magnitude earthquake occurred close to GSM on June 28, 2004 (AMEC, 2004). It was felt at the mine, but no damage was done and no highwall instability occurred."

202. COMMENT:
Page 4-10, last paragraph, sentence beginning at the end of the 9th line - For clarification, the backfill will be used as a sump from which to install and pump wells. The placement of the backfill, in and of itself, does not keep the pit pond from forming. (169)

RESPONSE:
The agencies agree. The paragraph has been modified as follows: "The properties of the crusher reject material are described in detail in the groundwater effluent management system, Section 4.2.1.5.1. Wells would be installed and water would be pumped to prevent a pond from forming."

203. COMMENT:
Page 4-11, 3rd paragraph, 2nd sentence beginning on the 3rd line - Inclinometers are not used in the pit, therefore, GSM suggests removing "Inclinometers and" and beginning the sentence with "Survey prisms, which are..." (169)

RESPONSE:
The change has been made.

204. COMMENT:
Page 4-11: 5th paragraph, last sentence - The words "attempts to" should be removed. (169)

RESPONSE:
The agencies agree. These words have been removed.

205. COMMENT:
Page 4-12, 3rd full paragraph and Page 4-13, 2nd full paragraph - GSM suggests the agencies provide rationale for their assumption that 100,000 cubic yards of material will ravel from the highwall and another 100,000 cubic yards of material will slough and be deposited in the bottom of the pit. (169)

RESPONSE:
The agencies made a conservative estimate. As stated in the draft, this estimate was made "to address risk and uncertainty."

206. COMMENT:
Page 4-12, last paragraph above Section 4.2.1.2.3 - GSM believes this paragraph should be moved to the discussion on the underground workings alternative. (169)

RESPONSE:
The agencies disagree. This paragraph falls under contingencies for pit highwall stability and potential failure.

207. COMMENT:

Page 4-13 – 4-14, Pit Highwall Maintenance Requirements section - One element not discussed is the need to regularly monitor the crests of the pit for tension cracks. The need is two fold: 1) to know when movement is occurring and, 2) to insure storm water run-on does not have a clear path into the highwalls. (169)

RESPONSE:

The agencies agree and a new paragraph has been added in Section 4.2.1.2.3 between the second and third paragraphs:

"The crest of the pit would need to be monitored regularly for tension cracks to know when movement is occurring and to ensure storm water run-on does not enter the pit."

208. COMMENT:

Page 4-13 to 4-14, Section 4.2.1.3 - GSM believes this section incorrectly implies that complete or nearly complete backfilling is extremely common in Montana, and elsewhere in the U.S. Although some backfilling has occurred at several mines, these activities were often due to sequential mining and were generally not at the scale proposed in the Partial Pit Backfill alternatives described for GSM. These alternatives include massive backfilling, including placing 33,311,000 cubic yards of material back in the pit and cast blasting and dozer rehandling of an additional nearly 12,000,000 cubic yards of material. This quantity of material is far in excess of any backfill project in Montana or elsewhere. GSM suggests the agencies expand the discussion to include the limited thickness and type of backfilling that has occurred at the referenced sites. Examples include:

Beal Mountain: The Main Beal Pit was developed on a hillside, with the tallest highwall reaching approximately 550 feet. The pit was sequentially backfilled to the elevation of German Gulch and drains to this creek and contains between 130 to 240 feet, depending on location within the pit, of backfill from the Main Beal and South Beal pits. Backfilling the pit with non-acid generating material was a requirement of the permit to extend the pit below the water table.

Basin Creek: The Columbia Pit was a small side hill cut that was approximately 100 feet deep at the deepest point. This side hill cut was sequentially backfilled to original contour during mining from the nearby Paupers Pit complex. The Paupers Pit complex was located on a ridge line, with depths ranging from 100 to 250 feet dependent upon topography. This pit was filled to original contour with waste rock from the dump. The lower approximately 20 feet of the Paupers Pit was mined below the water table.

Zortman and Landusky: In the first section describing the pits backfilled during operations, it should be noted that the Suprise and Queen Rose Pits were also partially backfilled during mining of the August Pit. For the second section, backfilling during reclamation, for Zortman pits: The South Alabama pit, which is not a true pit since one end is open, was already free-draining. Twenty (20) feet of leach pad material (225,725 cubic yards) was placed in this 0 to 250 foot deep pit. The OK-Ruby Pit Complex has between 10 and 240 feet (2,029,000 cubic yards) of fill followed by 6-inches of tailing, a liner, 6-inches of tailing and 18-inches of topsoil. Maximum pit depth for the pit complex was 240 feet. Backfill in the Mint Pit ranges from 10 to 50 feet thick (334,000 cubic yards). For Landusky Pits: The August-Little Ben Pit was backfilled with 5-feet of limestone from the South Goldbug Pit limestone stockpile followed by an average of 54 feet (1,666,700 cubic yards) of backfill from the L85/86 leach pad, for a total of 59 feet of backfill. The backfill was capped with a foot of compacted clay and two-feet of topsoil. The pit averaged 274 feet deep. The Suprise and Queen Rose were regraded and sideslopes covered, but no new fill was installed in the bottom of the pits. The pits are capped with two-feet of topsoil over a GCL liner.

CR Kendall: The Muleshoe and North Muleshoe Pits were mined first with most of the waste utilized for roads and infrastructure or stockpiled in waste rock dumps. Later the Muleshoe and North Muleshoe Pits were partially and sequentially backfilled to a depth of 160 feet (1,600,000 cubic yards), as part of the expansion of the pits. The South Horseshoe and Horseshoe Pits were mined next, with the South Horseshoe completed first. The South Horseshoe Pit was completely backfilled to a depth of 200 feet (234,000 cubic yards) with Horseshoe Pit waste, allowing the re-establishment of Little Dog Creek drainage. The Horseshoe Pit was partially backfilled to a maximum depth of 100 feet (173,000 cubic yards), using waste from the pit itself during expansion activities. The Barnes-King and Haul Road Pits were mined last. The small Haul Road pit was sequentially and completely backfilled to a depth of 180 feet (160,000 cubic yards) with rocky waste from the Barnes-King Pit, which was not backfilled. Finer textured waste from the Barnes-King Pit was stored for later re-use as reclamation material in the Kendall Pit.

Yellowstone Mine: This Luzenac-operated mine produces talc ore. The pits are all above the water table. The South Main Pit was partially backfilled with 200 feet (2,053,000 cubic yards) of dolomite (with minor amounts of volcanic ash) waste rock. The North Forty Pit is open at the east end. The western end of this "pit" was completely backfilled and backfill thickness decreased towards the east. The Pit was filled with the dolomite waste rock to an average thickness of 220 feet (4,335,000 cubic yards). The North Forty Pit will be covered by the North Dump.

The initial bulleted list of mines (page 4-13) includes Montana Tunnels. Representatives from this mine indicate material was used to buttress the east side of the pit and also to build ramps, but the pit was not backfilled as suggested by this section.

As described above, none of the backfill scenarios in Montana (or elsewhere as described in the Analog study) are similar to the partial pit backfill alternative for the Golden Sunlight Mine, which involves backfilling the pit, which is well below the water table, up to 875 feet deep.

The FSEIS should also recognize that the National Research Council/National Academy of Sciences has addressed the subject of backfilling in its report on "Hardrock Mining on Federal Lands" (1999), prepared at the request of the U.S. Congress. That report "was unable to find a basis to establish a general presumption either for or against backfilling in all cases." Id. at 82. It recognized that the NRC/NAS had addressed this subject in 1979 and found that restoration to approximate original contour was "generally not technically feasible for non-coal minerals, or has limited value because it is impractical, inappropriate, or economically unsound . . . ." Id. The 1999 NRC/NAS report stated that it had "no strong basis to contradict . . ." the 1979 conclusion on backfilling. Id. The 1999 NRC/NAS Report noted that in some cases backfilling can cause "the degradation of groundwater quality if the backfill material is leached or chemically transformed as a result of geochemical conditions in the backfilled pit or underground workings." Id. The 1999 NRC/NAS Report found further that the circumstances in which backfilling was "most likely to be viable" included sequential mining plans, *i.e.*, "mining areas where multiple ore bodies allow mining and backfilling to proceed without double handling of material." Id. at 83. In BLM's final rulemaking to modify the 43 C.F.R. Subpart 3809 regulations, dated November 21, 2000, BLM removed a proposed "presumption" in favor of pit backfilling in response to the discussion in the 1999 NRC/NAS report. 65 Fed. Reg. at 70,051 (Nov. 21, 2000). BLM stated that a site specific review would be required to determine the appropriate amount of backfilling, taking into consideration economic, environmental and safety concerns. Id. See 43 C.F.R. § 3809.420(c)(7)(i). (169)

RESPONSE:
Backfilling is common in Montana. The agencies appreciate the review of each of these mines but feel this is too much detail for inclusion. Montana Tunnels has been removed from the bulleted list of mines on page 4-13 as suggested in the comment. BLM will address the appropriate amount of backfilling in the Record of Decision.

209. COMMENT:
Pages 4-16 and 4-17, Section 4.2.1.3.1, Table 4-1 - This table contains a number of errors. Please make sure the footnotes are superscript for the pit size (675 acres) and depth (1,780 foot) numbers for the Berkeley Pit. The Butte Underground number should also be 10,000 (based on 2004 Bureau studies) and the 3 should be a footnote. (169)

RESPONSE:
All errors noted in this table have been fixed.

210. COMMENT:
Pages 4-16 and 4-17, Section 4.2.1.3.1, Table 4-1 - Delete the word "average" in the Partial Pit Backfill Alternative, %/Type sulfide column – a range is presented. (169)

RESPONSE:
The word "average" has been removed from the table.

211. COMMENT:
Pages 4-16 and 4-17, Section 4.2.1.3.1, Table 4-1 - In addition to the items listed in the first bullet, check all footnotes to make sure they are superscript. (169)

RESPONSE:
All footnotes for this table have been corrected.

212. COMMENT:
Pages 4-16 and 4-17, Section 4.2.1.3.1, Table 4-1 - The description in the Predictions row for the Berkeley pit is partially incorrect. Maest (2003) also noted no improvement in pit water quality, so that verbiage should be removed. Fix the footnote (5) in this cell and in the Butte Underground cell. Ann Maest noted that some constituents were improving in the Butte Underground, but saying "water quality improving with age" is incorrect. In her memo, she noted that some constituents were improving. (169)

RESPONSE:
The agencies agree. The phrase has been modified: "water quality for some constituents have improved over time (Maest, 2003)." The superscript in footnote "[5]" has been corrected in the table.

213. COMMENT:
Please indicate under San Luis and Geology that the backfill material was acidic. (169)

RESPONSE:
The agencies do not believe this change is necessary as acidity was not mentioned for any of the mines in the table.

214. COMMENT:
Page 4-18, Section 4.2.1.3.2, 1st paragraph, last sentence - GSM believes this discussion is contrary to the information presented in Telesto (2003e), and the discussion on page 4-20 which indicates the crusher reject "is expected to have the durability and uniformity to provide an adequate permeability over time." Also, the last two paragraphs in this section may be best suited for Section 4.2.1.2.3. (169)

RESPONSE:
The agencies have made a conservative assumption that the material would weather over time, reducing permeability in the crusher reject. The last two paragraphs do not need to be moved.

215. COMMENT:
Page 4-18, Section 4.2.1.3.2, 3rd paragraph, second sentence - In referenced Section 4.2.1.2.2, it states the agencies expect 200,000 cubic yards of ravel and slough. Also see GSM comment (re: Page 4-12, 3rd paragraph) regarding including rationale for the agency assumption. (169)

RESPONSE:
The agencies made a conservative estimate. As stated in Section 4.2.1.2.2, this estimate was made to address risk and uncertainty.

216. COMMENT:
Page 4-18, Section 4.2.1.4.1, 9th line - GSM suggests including the location of the "C" stope on Figure 2-2, as referenced. (169)

RESPONSE:
The agencies agree. This stope location has been included on Figure 2-2.

217. COMMENT:
Page 4-19, Section 4.2.1.5.1, 1st paragraph, 2nd sentence - GSM suggests indicating the crusher reject is expected to have the durability and uniformity to provide adequate permeability over time. (169)

RESPONSE:
The agencies disagree and this change has not been made. See response to Comment 215.

218. COMMENT:
Page 4-20, 2nd full paragraph, first line - GSM believes adequate data exist to more firmly state that "the acidic pit backfill groundwater would cause corrosion..." (169)

RESPONSE:
The agencies agree and this wording modification has been made in the last paragraph of Section 4.2.1.5.1.

219. COMMENT:
Page 4-20, Section 4.2.1.5.2, 1st paragraph, last sentence - The analyses show that no water would discharge from the pit under the No Pit Pond Alternative even if the dewatering system failed. Therefore, the agencies should not state this concern for this alternative. (169)

RESPONSE:
The agencies have assumed that a negligible amount of water, less than 10 percent of 25 to 27 gpm, could discharge from the pit through secondary pathways.

220. COMMENT:
Page 4-21, 1st full paragraph and Page 4-27, Section 4.2.1.5.2.1.6 - GSM believes that the discussion of the Midas Spring presented in Section 4.2.1.5.2.1.6 should be included in Chapter 3. The first major discussion of the spring is on Page 4-21. (169)

RESPONSE:
The agencies disagree. As mentioned in Section 3.3.4 of the SEIS, a detailed analysis of springs was presented in Section III.B.2.d of the 1997 Draft EIS.

221. COMMENT:
Page 4-21, 2nd full paragraph, 5th line - GSM believes it is unlikely the water in the pit sump under the No Pit Pond Alternative would be "pretreated." (169)

RESPONSE:
Comment noted.

222. COMMENT:
Page 4-21, 2nd full paragraph, last sentence - Telesto (2003e) noted that steel casing, not stainless steel casing, would have a lifespan of only a few months. However, stainless steel casing would corrode as well over time, although it would probably last more than a few months. (169)

RESPONSE:
The agencies agree and the text in Section 4.2.1.5.2 at the end of the fifth paragraph has been modified as follows: "Steel well casings were predicted to have a life span of only a few months (Telesto, 2003e). Stainless steel casings would corrode over time as well, although they would last longer."

223. COMMENT:
Page 4-21, 3rd full paragraph, last sentence - While GSM has had limited problems with scaling of pumps, pipes, and slotted casing over the mine life, scale has presented problems for flowmeters as noted on 4-23. (169)

RESPONSE:
Thank you for your comment.

224. COMMENT:
Page 4-23, 1st full paragraph, 4th line - GSM has only installed a few monitoring wells in portions of the waste rock dumps with shallow waste rock. These wells have all failed (PW-2, PW-16, PW-47 and PW-63). No dewatering wells have ever been installed in the dumps. (169)

RESPONSE:
Thank you for your comment.

225. COMMENT:
Page 4-23, Section 4.2.1.5.2.1.2, 1st paragraph, 3rd sentence beginning on 3rd line - GSM believes the agencies are describing PW-49 rather than PW-48 in this sentence. (169)

RESPONSE:
The first paragraph in the section is correct. The second paragraph first sentence has been modified to read that "Water quality in PW-49 is typically better than pit water..."

226. COMMENT:
Page 4-23, Section 4.2.1.5.2.1.2, 2nd paragraph, 2nd line - Note that in several documents we have modified the term "regional" to "intermediate," as described on page 3-23. (169)

RESPONSE:
The agencies agree. The text has been changed.

227. COMMENT:
Page 4-24, Section 4.2.1.5.2.1.3, 1st paragraph - The well was drilled approximately 185 feet, at an angle. There was approximately 150 feet of rock material that had accumulated in the bottom of the pit from mining activities on upper benches. The text states a well depth of 118 feet in several locations. Please clarify. (169)

RESPONSE:
The text has been changed in Section 4.2.1.5.2.1.3 as follows: "The pit dewatering system used in 2002 to 2003 consisted of a 118-foot-deep dewatering well in about 150 feet of backfill..."

228. COMMENT:
Page 4-24, Section 4.2.1.5.2.1.3: 4th paragraph - This paragraph discusses silting in of wells. GSM believes this information should also be included in the Partial Pit Backfill with In-Pit Collection Alternative discussion. (169)

RESPONSE:
The second to the last paragraph of Section 4.2.2.5.2 regarding well maintenance requirements has been modified as follows: "To prevent wells from silting in, wells must be installed with a gravel pack and the pump periodically raised in the well casing."

229. COMMENT:
Page 4-25, 1st paragraph, last sentence - GSM believes the last sentence should be reworded as follows: "Therefore, biofouling is not expected to be a problem in water management after mining." (169)

RESPONSE:
The agencies agree. This wording has been changed in the last paragraph of Section 4.2.1.5.2.1.3.

230. COMMENT:
Page 4-26, Section 4.2.1.5.2.1.5: 2nd paragraph - GSM believes the agencies should indicate that Rattlesnake Gulch groundwater is "naturally" acidic. (169)

RESPONSE:
The agencies disagree. Some of the groundwater in Rattlesnake Gulch may be from old mine workings.

231. COMMENT:
Page 4-26, Section 4.2.1.5.2.1.5: 5th paragraph, 1st sentence - Maintenance of the pumpback system is time consuming, but is routine rather than "complex." (169)

RESPONSE:
The wording of this sentence has been changed in the fifth paragraph of the section.

232. COMMENT:
Page 4-27, Section 4.2.1.5.2.1.6, last paragraph of section - GSM believes this statement belongs in the Partial Pit Backfill with In-Pit Collection discussion. (169)

RESPONSE:
The agencies disagree. Section 4.2.1.5.2.1 describes GSM's experience with dewatering. The agencies have summarized in each subsection which problems would affect different alternatives.

233. COMMENT:
Page 4-28, 3rd full paragraph - GSM suggests moving this paragraph to the Partial Pit Backfill with In-Pit Collection Alternative discussion. (169)

RESPONSE:
The agencies disagree. See response to Comment 232.

234. COMMENT:
Page 4-28, Section 4.2.1.5.2.2 - This section appears to be incomplete. Mines are dewatered all over the world, including the United States. It is not clear why the Berkeley Pit and Butte Underground dewatering experience are included in this

section, other than to say that pumping from non-backfilled underground sumps is successful. The No Pit Pond Alternative section is likely not the place for this discussion. GSM suggests keeping discussion of the environmental consequence for a particular alternative only in the section for that particular alternative. The No Pit Pond alternative section includes various discussions regarding the other alternatives. (169)

RESPONSE:
The agencies presented a short summary of dewatering at other mines in Section 4.2.1.5.2.2. The summary highlights the problems adequately. The discussion of the Berkeley Pit and Butte Underground in this section is appropriate. Section 4.2.1.5.2.1 describes GSM's experience with dewatering. The agencies have summarized in each subsection which problems would affect different alternatives.

235. COMMENT:
Page 4-29, Section 4.2.1.6, 1st paragraph, 4th line - GSM suggests noting that the design is for a 100-year, 1-hour storm event. (169)

RESPONSE:
The agencies agree and have made this change.

236. COMMENT:
Page 4-29, Section 4.2.1.6.1, 2nd paragraph, 1st line - GSM believes that under the No Pit Pond Alternative, no diversions will be constructed on unconsolidated material. Therefore, this sentence is incorrect. This sentence may be more appropriate for the Partial Pit Backfill with In-Pit Collection Alternative. (169)

RESPONSE:
The agencies believe some fill and diversions may be required in this alternative.

237. COMMENT:
Page 4-29, Section 4.2.1.7.1, 2nd sentence - For clarity, GSM suggests the following wording: "Seven acres have already been revegetated within the pit boundary area." (169)

RESPONSE:
The agencies agree with this change. The text has been modified.

238. COMMENT:
Page 4-30, Section 4.2.1.8, 1st paragraph - It is unclear why the Berkeley Pit water treatment plant is referenced here. GSM has operated a water treatment plant, using the same method, for years.

The text states that based on the 1997 EIS, 102 gpm would be pumped to the WTP from pit seepage, while the table on the next page only shows 65 gpm. The 1997

Draft EIS, Volume 2, Appendix A, Table 2-1 shows 54 gpm from the pit would require treatment and the 65 gpm is the "with contingencies" value. The agencies should clarify the differences in the table and text. (169)

RESPONSE:
The third sentence has been modified as follows: "This system would be similar to the operational water treatment plants at GSM and the Berkeley Pit in Butte. The 1998 ROD approved the water treatment plant with a design capacity, including contingencies, of 392 gpm, which included the 65 gpm of pit inflows (54 gpm plus 20 percent contingency) then projected for the No Pit Pond Alternative (Table 4-2)."

239. COMMENT:
Page 4-30, Section 4.2.1.8, 3rd paragraph - GSM suggests modifying the second sentence as follows: "In the No Pit Pond Alternative in this SEIS, total water, from all sources needing treatment would be 260 gpm..."

GSM believes it should also be noted that the mine is already bonded for water treatment of 392 gpm. (169)

RESPONSE:
The agencies agree. The text has been modified as follows: "In the No Pit Pond Alternative in this SEIS, total water, from all sources needing treatment, would be 250 gpm. The change is the result of new water balance modeling since the DSEIS..."

The last sentence of the paragraph has been modified as follows: "GSM is currently bonded for 392 gpm ..."

240. COMMENT:
Page 4-31, Table 4-2 - The agencies may want to consider additional text to explain the differences in the numbers in this table. Also, there appears to be considerable inconsistencies between this table and text throughout subsequent Chapter 4. GSM suggests the agencies reconcile the discussions with information presented in this table. (169)

RESPONSE:
See response to Comment 238.

241. COMMENT:
Page 4-31, Section 4.2.1.8.1, 1st paragraph - Note that the volume of water destined for treatment described in the 1997 Draft EIS was all water from the mine site, not just pit water. While the SEIS predicted water quality from the pit backfill is expected to be worse, the quality of the total volume will not be much different. (169)

RESPONSE:
The agencies do not believe the text needs to be changed.

242. COMMENT:
Page 4-31, Section 4.2.1.8.1, 2nd paragraph - GSM believes this sentence should be revised to indicate that under this alternative, pit water requiring treatment is only about 1/3 of the volume previously predicted in the 1997 DEIS. The sentence now sounds like only 1/3 of the pit water would be treated. (169)

RESPONSE:
The agencies agree. The text in the above-referenced paragraph has been deleted and the following sentence has been added to the first paragraph of Section 4.2.1.8.1: "Because the volume of water requiring treatment in the SEIS is approximately one-third of the volume assumed in the 1997 Draft EIS, the overall sludge management requirements would be similar to, or less than, those evaluated in the 1997 Draft EIS, Chapter IV, Section IV.B.1.e."

243. COMMENT:
Page 4-31, Section 4.2.1.9 - GSM believes this discussion should contain a reference to the discussions on flexibility for future improvements and potential utilization of new technologies in this document. (169)

RESPONSE:
The agencies disagree and do not believe this discussion is necessary.

244. COMMENT:
Page 4-32, Section 4.2.1.9.2, last paragraph - GSM suggests adding that water could also be easily pumped out of the pit for treatment. (169)

RESPONSE:
The agencies agree and the text has been modified as follows: "Water could be pumped out of the 100 to 200 feet of pit backfill for treatment, if needed."

245. COMMENT:
Page 4-33, Section 4.2.2.1.1, 2nd paragraph - GSM suggests the following addition after the first sentence: "However, there are no known instances of pits of this depth receiving 875 feet of backfill in Montana or elsewhere." (169)

RESPONSE:
The agencies agree and the text has been modified as follows: "There are no known instances of pits receiving 875 feet of backfill in Montana or elsewhere."

246. COMMENT:
Page 4-33, Section 4.2.2.1.1, 3rd paragraph, 6th line - GSM suggests adding the following text: "...it is not a proven design in deep backfilled pits, such as is discussed in the DEQ proposed action, especially..." (169)

RESPONSE:
The agencies disagree and have not made this change.

247. COMMENT:
Page 4-33, Section 4.2.2.1.1, 3rd paragraph, last sentence - This sentence does not seem especially relevant in its current form. It may be useful to reword the sentence as follows: "It is possible to install casing in unsaturated, unconsolidated waste rock, as shown by the two-inch steel casing installations in the West Waste Rock Dump at GSM for data collection purposes (Schafer, 1995a). Monitoring wells have been constructed in the shallow portions of some of the waste rock dumps, but all these wells failed over time." (169)

RESPONSE:
The agencies agree. The text has been modified as follows: "It is possible to install wells in unsaturated, unconsolidated waste rock, as shown by the two-inch steel casings installed in the West Waste Rock Dump Complex at GSM for data collection purposes (Schafer, 1995a). Monitoring wells have been constructed in the shallow portions of some of the waste rock dumps, but all these wells have failed over time."

248. COMMENT:
Page 4-33, Section 4.2.2.1.1, 4th paragraph - GSM suggests striking the first sentence. (169)

RESPONSE:
The agencies disagree.

249. COMMENT:
Page 4-34, Section 4.2.2.1.2, 1st full paragraph, 5th sentence beginning on the 6th line - GSM suggests revising the wording of the sentence starting with "GSM is larger than the pits reviewed..." to "As noted in the analog study, attempts were made to identify and describe a backfilled mine pit with a similar depth to GSM's pit, however, none could be found." (169)

RESPONSE:
The agencies agree. The text in the second paragraph of the section has been modified by replacing the sentence with the following: "As noted in the pit backfill analog study, attempts were made to identify and describe a backfilled mine pit with a similar depth to GSM's pit. None could be found."

250. COMMENT:

Page 4-34, 4th full paragraph, end of the 4th line - GSM suggests changing the word "regular" to "frequent." (169)

RESPONSE:

The agencies agree. In the fifth paragraph of the section, the word "regular" has been changed to "repeated" based on the Telesto (2003e) report that states that wells would require frequent replacement due to consolidation. In addition, steel well casings would last only a few months so PVC casing and stainless steel pumps would be required. Telesto also states for this alternative, pumps would have to be replaced more frequently that current pit sump pumps.

251. COMMENT:

Page 4-34, last partial paragraph, 5th line - GSM suggests adding the following text after the sentence ending "...which is the agencies' goal" – "Therefore implementation of this alternative cannot reasonably assure this goal can be achieved." (169)

RESPONSE:

The agencies disagree and this wording change has not been made.

252. COMMENT:

Page 4-35, Section 4.2.2.2.1, 2nd paragraph, 2nd and 3rd sentences - The statement regarding long-term stability of the pit wall under the Partial Pit Backfill alternative should be qualified to indicate that if there is a rise in phreatic surface, the stability becomes comparable to the No Pit Pond alternative and thus would be similarly stable, not more stable. Telesto (2003d) evaluated the pit wall stability and found the expected factor of safety (FOS) for the pit highwall after completion of the 5B expansion to be 1.603. The expected FOS for the partial pit backfill alternatives would be 1.841 with the rise in phreatic surface. (169)

RESPONSE:

The agencies do not believe this change is necessary.

253. COMMENT:

Page 4-36, Section 4.2.2.3.1, 3rd paragraph, 1st sentence - GSM does not believe that delaying reclamation for a number of years to allow for backfill settlement would fulfill the mine's requirements under the MMRA. (169)

RESPONSE:

The agencies disagree. Settlement is part of mine closure.

254. COMMENT:

Page 4-37, Section 4.2.2.4.1, 1st paragraph - GSM does not believe the underground workings and portal maintenance plan are relevant to this alternative. (169)

RESPONSE:
The agencies disagree and no change has been made.

255. COMMENT:
Page 4-37, Section 4.2.2.4.1, 2nd paragraph, end of 3rd sentence, last line - GSM believes the agencies should recognize that the existing mine plan for the underground workings provides for some backfilling, but not complete backfill. There is no basis for imposing the requirement for complete backfilling of the underground. (169)

RESPONSE:
The agencies disagree and no change has been made.

256. COMMENT:
Page 4-37, Section 4.2.2.4.1, 2nd paragraph, last sentence - GSM believes this would occur continuously and indefinitely into the future, and therefore suggests adding "this would occur continuously and indefinitely into the future" to the end of the last sentence. (169)

RESPONSE:
The agencies disagree and no additional wording has been added.

257. COMMENT:
Page 4-37, Section 4.2.2.5.1, 3rd paragraph, 1st sentence - GSM suggests rewriting this sentence as follows: "The dewatering wells would be subject to short-term and long-term shearing and crushing caused by settlement, as well as short-term and long-term corrosion due to the acidic backfill." (169)

RESPONSE:
The agencies disagree and see no need to rewrite this sentence.

258. COMMENT:
Page 4-37, Section 4.2.2.5.1, 3rd paragraph, last sentence - To be consistent with previous information, GSM suggests rewording this sentence as follows: "The agencies believe the permeability of the backfill would decline as described in Section..." (169)

RESPONSE:
This sentence in the last paragraph of the section has been reworded to say: "The permeability of the backfill would decrease as described in Section..."

259. COMMENT:
Page 4-38, Section 4.2.2.5.2, 4th bulleted item - GSM suggests modifying "corrosion" with "short-term and long-term." (169)

RESPONSE:
The agencies disagree and the text has not been modified.

260. COMMENT:
Page 4-38, Section 4.2.2.5.2, 5th bulleted item - GSM suggests adding "short-term and" before "long-term" in this sentence. (169)

RESPONSE:
The agencies disagree and the text has not been modified.

261. COMMENT:
Page 4-39, 2nd full paragraph, first sentence - Dr. Robert Sterrett of Engineering Management Support, Inc. (EMSI) provided an opinion regarding declines in permeability in his report to GSM (4/8/05). His report is enclosed with this submittal to be included as GSM's comment. He states that "Under the partial backfill scenario, the mineral jarosite will form and such formation will reduce the permeability of the waste rock. Also, the weathering of the silicate minerals will likely produce clays that would further reduce the permeability. Although existing geotechnical testing has not shown decreases in permeability, the waste rock materials are relatively young (no more than 20 years) and full development of jarosite cementation and clay formations have not occurred...jarosite and clay formation are time dependent. Furthermore, it is a known and accepted fact that consolidation of millions of tons of waste rock stacked to a depth of 875 feet will result in a reduction in permeability." (169)

RESPONSE:
The agencies do not disagree with Dr. Sterrett's comment. Addition of his comments to the text does not change the meaning of the paragraph or add to its content. The paragraph already notes the effects of weathering and compaction under 875 feet of backfill on permeability.

262. COMMENT:
Page 4-39, last partial paragraph, last line and Page 4-40, 3rd paragraph below bullets, 2nd and 3rd lines - GSM suggests changing the term "could" to "can be expected to," which is warranted by the Telesto (2003e) corrosion analysis. (169)

RESPONSE:
The agencies do not believe this change is necessary.

263. COMMENT:
Page 4-40, 1st bulleted item - GSM suggests clarifying this description with the amount of time required for settlement (Telesto noted 35 years for water to reach the 5,050-foot level and over 100 years for equilibrium at 5,250 feet) as well as the requirements under the MMRA for reclamation. (169)

RESPONSE:
The agencies considered several measures to lessen the impacts due to settling and corrosion in Section 4.2.2.5.2. The agencies concluded these measures would be of limited use in reducing settlement in the long term. The time required for water to reach the two elevations is discussed in Section 4.3.4.1.1.2. No change is necessary.

264. COMMENT:
Page 4-40, 3rd paragraph under bullets, lines 5 and 9 - GSM suggests changing the terms "could" to "would," as warranted by the analysis. (169)

RESPONSE:
The agencies have changed the first reference of "could" to "would" in the second paragraph after the second set of bullets in the section.

265. COMMENT:
Page 4-40, last paragraph, last sentence - GSM suggests rewording this sentence for clarity and accuracy to: "Because wells will fail over the short- and long-term, GSM would be required to frequently and continually replace wells. This would lead to additional risk and uncertainty." (169)

RESPONSE:
The agencies do not believe this wording needs to be changed.

266. COMMENT:
Page 4-41, 1st paragraph, 3rd line - GSM suggests adding "and frequent" after "periodic." (169)

RESPONSE:
The agencies do not believe this wording needs to be changed.

267. COMMENT:
Page 4-41, Section 4.2.2.6.1, 1st paragraph and section in general - Because of the large area of cover, GSM does not agree that the maintenance requirements for storm water diversions are the same as for the No Pit Pond. There is significantly more maintenance involved with the Partial Pit Backfill alternatives to control stormwater and runoff than with the No Pit Pond alternative as described in the last paragraph on this page. (169)

RESPONSE:
The agencies disagree. The maintenance requirements per linear foot of storm water diversion are the same. There would be more linear feet of storm water diversions to maintain in the partial pit backfill alternatives. The total manpower and equipment time required for maintenance would be different but the requirements per linear foot would be the same.

268. COMMENT:
Page 4-41, Section 4.2.2.6.1, last paragraph - GSM suggests classifying outside the pit and inside the pit impacts separately. (169)

RESPONSE:
The agencies do not believe this is required.

269. COMMENT:
Page 4-42, Section 4.2.2.7.1 - GSM believes the agencies should expand on Telesto's information regarding cover soil stability in this discussion, as the discussion on this page does not accurately reflect the results of the evaluation presented in Telesto (2003d). Page 4-42 states that "small, localized stability problems would exist for the soil cover if the soil became saturated, especially if the backfill was relatively impermeable in localized areas." Telesto (2003d) notes that "the factor of safety for infinite slope failure of the soil cover material is essentially 1.0 (failed) if flow through the cover occurs." Telesto's report does not specifically address "small, localized" stability problems.

GSM suggests noting that additional soil borrow disturbance is required under this alternative. (169)

RESPONSE:
In the fourth paragraph of this section, the agencies have deleted "The soil cover was analyzed for stability (Telesto, 2003d)." The agencies have deleted "Analyses showed" and inserted: "GSM's consultant concluded that, in the partial backfill alternatives, a drainage layer would be necessary to keep the soil from slumping in saturated areas on steep 2H:1V slopes (Telesto, 2003d). GSM has been successful in reclaiming long steep slopes at the mine site. The agencies have concluded that the subsurface drainage layer to keep soil from slumping in saturated backfill is not needed in either of the partial pit backfill alternatives. The agencies concluded…". See response to Comment 68 about cover soil stability.

See responses to Comments 42 and 135 for a discussion of the soil borrow area disturbance.

270. COMMENT:
Page 4-44, Section 4.2.2.9.1, 2nd paragraph, 2nd sentence beginning on 1st line - GSM suggests replacing "This can be done although" with "This may be achievable on a short-term basis, although..." (169)

RESPONSE:
The agencies do not believe this wording needs to be changed.

271. COMMENT:
Page 4-46, Section 4.2.3.1.1, 2nd paragraph - GSM suggests moving the 3rd and 4th sentences to the Environmental Issues section. (169)

RESPONSE:
The agencies do not believe these sentences need to be moved.

272. COMMENT:
Page 4-46, Section 4.2.3.1.2, 3rd paragraph - The last sentence of this paragraph, as well as many other locations throughout the document, states that 95 percent capture efficiency may not be achievable based on GSM's experience capturing Tailings Impoundment No. 1 seepage. It may be more correct to indicate that there is substantial risk and uncertainty associated with meeting the required 95 percent capture efficiency. (169)

RESPONSE:
The agencies believe the wording is okay as stated.

273. COMMENT:
Page 4-47, 1st full paragraph, last sentence - Portage lists 52 monitoring wells for Tailings Impoundment No. 1 plus three surface water stations, therefore the sentence should be modified to state "...and a total of 55 monitoring wells and surface water stations are being sampled..." (169)

RESPONSE:
The agencies agree. The text has been modified in the fourth paragraph of the section as follows: "...and a total of 52 monitoring wells and three surface water stations were being sampled..."

274. COMMENT:
Page 4-47, 2nd full paragraph, 2nd sentence starting in 5th line - GSM suggests striking the sentence beginning "Despite continual upgrading..." The most current evaluation is by Donna Keats, with her results presented in paragraph 3 on page 4-47. (169)

RESPONSE:
The agencies do not believe this wording needs to be changed.

275. COMMENT:
Page 4-47, last partial paragraph, 2nd sentence - GSM suggests modifying this sentence for clarity, *e.g.*, "GSM is capturing the majority of the seepage from Tailings Impoundment No. 1, a process that requires a number of pumpback and monitoring wells." The current wording suggests that a large number of additional wells are needed, which would not be correct. (169)

RESPONSE:
The agencies agree that the sentence requires clarification. The sentence in the ninth paragraph of Section 4.2.3.1.2 has been changed and now reads: "GSM is capturing the majority of the seepage from Tailings Impoundment No. 1, a process that uses a large number of pumpback and monitoring wells (Hydrometrics, 1996) that continue to be necessary."

276. COMMENT:
Page 4-48, 3rd full paragraph - GSM suggests moving this paragraph to the Environmental Issues section. (169)

RESPONSE:
The agencies disagree that the paragraph needs to be moved.

277. COMMENT:
Page 4-50, Section 4.2.3.5.1, 1st paragraph, 1st sentence - The wells described are not all located in Rattlesnake Gulch. Please modify the text to reflect the accurate well locations. (169)

RESPONSE:
The agencies agree. The text has been modified as follows: "...26 downgradient capture wells and 10 monitoring wells would be needed to capture and monitor pit seepage and ambient groundwater."

278. COMMENT:
Page 4-50, Section 4.2.3.5.1, 1st paragraph, 3rd line - GSM suggests replacing the term "impacts" with "impacts that would constitute water quality violations." (169)

RESPONSE:
The agencies agree. Section 4.2.3.5.1, first paragraph, second sentence has been changed to read: "Groundwater quality standards would be met at the mixing zone boundary if 96 percent or greater overall capture efficiency is achieved from two capture systems (HSI, 2006)."

279. COMMENT:
Page 4-50, Section 4.2.3.5.1, 2nd paragraph, 1st line - Since the reference is to a later section, it may be useful to provide some of the relevant information in this paragraph. (169)

RESPONSE:
The agencies disagree. No changes are needed.

280. COMMENT:
Page 4-51, Section 4.2.3.7.1 - GSM believes that since there would be more backfill maintenance due to settlement there would also be more soil cover maintenance with this alternative. (169)

RESPONSE:
The agencies agree. The text has been modified as follows: "The soil cover maintenance requirements for this alternative would be greater than the Partial Pit Backfill With In-Pit Collection Alternative due to more settlement in the saturated backfill."

281. COMMENT:
Page 4-54, Section 4.2.4.1.1, 2nd sentence beginning on 1st line - For consistency, GSM suggests modifying this sentence as follows: "Acidic waste rock containing sulfides would remain stored and capped..." (169)

RESPONSE:
The agencies agree. The text has been modified as follows: "Waste rock would remain stored and capped above the water table in the East Waste Rock Dump Complex."

282. COMMENT:
Page 4-55, 2nd paragraph beneath table, last sentence - GSM suggests adding the following information to the end of the sentence: "...but these are readily observable and can be corrected immediately. In addition, preventive measures, such as covering pipelines with rock after installations, are routinely implemented to minimize potential impacts." (169)

RESPONSE:
The agencies agree. This wording has been added to the second paragraph below Table 4.3.

283. COMMENT:
Page 4-57, Section 4.2.4.5.1, 1st paragraph - GSM suggests adding a statement indicating that the risks and uncertainties for wells would be less than the No Pit Pond Alternative since no new wells are required and no wells would be installed in any backfill. (169)

RESPONSE:
The agencies agree. The text has been modified as follows: "Risks and uncertainties for wells would be less than the No Pit Pond Alternative since no new wells are required and no wells would be installed in any backfill."

284. COMMENT:
Page 4-57, Section 4.2.4.6.1, last paragraph/sentence - GSM suggests adding "which are minimal" to the end of this sentence. (169)

RESPONSE:
The agencies do not believe this is necessary.

285. COMMENT:
Page 4-59, Section 4.2.4.9.1, 2nd paragraph - GSM suggests moving this paragraph to an appropriate section since it is not associated with the potential for utilization of new technologies.

RESPONSE:
The agencies do not believe this is necessary.

286. COMMENT:
Page 4-59, Section 4.2.4.9.1, 4th paragraph - GSM suggests indicating that this alternative offers the "best and only" opportunity to test and potentially treat water either in an open pond or in an open water body in the underground workings. (169)

RESPONSE:
The agencies disagree. This paragraph will remain unchanged.

287. COMMENT:
Page 4-59, Section 4.2.4.9.2, 1st paragraph - GSM suggests adding the following sentence to the end of this paragraph: "However, any such failure would be readily observable and corrective action would be taken before the pit substantially flooded." Please note that it would take approximately 180 days for water in the underground to reach the ultimate pit bottom (4,525 feet) if the inflow rate was 32 gpm (8.3 million gallons of water). (169)

RESPONSE:
The agencies agree. Text has been inserted at the end of the first paragraph: "Pit water would be readily observable, and corrective action would be taken before the pit substantially flooded. The revised pit water balance model predicts an inflow range from 25 to 27 gpm (Telesto, 2006). It would take approximately 230 to 262 days for 8.3 million gallons of water in the underground workings to reach the pit bottom elevation of 4,525 feet."

288. COMMENT:
Page 4-59, Section 4.2.4.9.2, 2nd paragraph (carries over to page 4-60) - GSM believes this paragraph is not relevant to this section and should be moved to the appropriate section. (169)

RESPONSE:
The agencies disagree. The second paragraph summarizes the No Pit Pond Alternative so it can be contrasted with the Underground Sump Alternative in the third paragraph.

289. COMMENT:
Page 4-60, last paragraph - GSM suggests moving the 3rd and 4th sentences to the Environmental Issues section. (169)

RESPONSE:
The agencies do not believe this is necessary.

290. COMMENT:
Page 4-61, Section 4.3.1.1, 1st paragraph, 5th line - The reference should be changed to (Gallagher, 2003c). (169)

RESPONSE:
The agencies agree. This reference has been changed.

291. COMMENT:
Page 4-61, Section 4.3.1.1, 3rd paragraph - There is no mention of the North Borrow Spring in this section. (169)

RESPONSE:
The agencies agree. The following paragraph has been added to Section 4.3.1.1:

"North Borrow Springs, located approximately 120 yards north of Tailings Impoundment No. 1, consists of a broad seepage area with flow rates ranging from 8 to 32 gpm. These springs were created when the North Borrow Area was excavated below the shallow water table. Spring water is now being intercepted by an underdrain system constructed beneath the Buttress Dump. The system conveys water by pipeline to Tailings Impoundment No. 2. The North Borrow Area excavation has been filled with material from the East Waste Rock Dump Complex to form the Buttress Dump. Flows from the underdrain system have been minimal since the Rattlesnake Gulch pumpback system was installed (Shannon Dunlap, GSM, personal communication to HSI, November 1, 2005)."

292. COMMENT:
Page 4-61, Section 4.3.1.1, 4th paragraph - The following information should be added to this paragraph: In order to lower the local potentiometric surface and

prevent contact between water and acidic waste rock, interception/infiltration facilities were constructed at both the Arkose Valley and Sunlight Springs in mid-1994. (169)

RESPONSE:
The agencies agree and the text in the fifth paragraph of the section has been modified as follows: "In order to lower the local potentiometric surface and prevent contact between water and waste rock, interception and infiltration facilities were constructed at both Arkose Valley Spring and Sunlight Spring in mid-1994."

293. COMMENT:
Page 4-61, Section 4.3.1.1, 4th paragraph - Sunlight Spring: A thin layer of fine-grain material was excavated in the Sunlight Spring area. Coarse gravel and perforated PVC pipe were then placed within the drainage for approximately 400 feet. The coarse gravel was to promote re-infiltration of surface discharge, and the pipe was placed to intercept and convey water from beneath the West Dump, if ever needed. The pipe is presently capped and all water remains as groundwater. The coarse gravel and pipe were covered by filter fabric, then by two feet of sand material, followed by a HDPE liner. The HDPE liner was then covered with two additional feet of sand and 5 to 8 feet of adjacent soil material. (169)

RESPONSE:
The agencies do not believe this information needs to be added.

294. COMMENT:
Page 4-61, Section 4.3.1.1, 4th paragraph – Arkose Spring: Construction in the Arkose Spring area was identical to the Sunlight Spring, but did not include initial excavation. The gravel, PVC, filter fabric, sand, HDPE, and soil mitigation measures were implemented in the same sequence and generally with the same thickness as in the Sunlight Spring. (169)

RESPONSE:
The agencies do not believe this information needs to be added.

295. COMMENT:
Page 4-61, Section 4.3.1.1, 4th paragraph - All work was completed prior to expansion of the West Dump over the area occupied by the springs. (169)

RESPONSE:
The agencies agree and the text in the fifth paragraph of the section has been added as follows: "All work was completed prior to expansion of the West Waste Rock Dump Complex over the springs."

296. COMMENT:
Page 4-62, 2nd full paragraph, 4th line - GSM (2002a) does not state that PW-48 and PW-49 have relatively good water quality for a sulfide mineralized zone. This document notes that "data show that pit water is generally of poor quality." PW-48 and PW-49 are included in the "pit water" category. (169)

RESPONSE:
The agencies partially agree. The third paragraph in Section 4.3.1.2.1 has been modified as follows: "Monitoring results from these wells indicate that, although the water is of better quality than the pit water, it would require treatment to meet water quality standards."

297. COMMENT:
Page 4-63, 1st full paragraph, 3rd and 4th lines - GSM suggests including additional information regarding dewatering activities from 1992 to 2002. The paragraph currently gives the reader the impression there were no dewatering activities for that 10-year period. (169)

RESPONSE:
The agencies disagree. This additional information is not necessary.

298. COMMENT:
Page 4-63, 1st full paragraph, 6th line – The well constructed in the bottom of the pit was 185 feet deep (see previous comment). (Note that 118 feet is cited on page 2-6 also.) (169)

RESPONSE:
The agencies disagree. See response to Comment 227.

299. COMMENT:
Page 4-63, 1st full paragraph, last line - GSM suggests referring the reader to the appropriate section for information on difficulties in operating the pit sump well. (169)

RESPONSE:
The reference to Section 4.2.1.5.2.1.3 was included in the seventh paragraph of this section.

300. COMMENT:
Page 4-68, top partial paragraph - GSM cannot find the statement attributed to Telesto (2003c) in that document. While it may be true that acid generation may be reduced by reclamation, but cannot be eliminated, GSM suggests the agencies provide an accurate reference to this conclusion. (169)

RESPONSE:
The agencies agree. This reference has been changed to "(Bennett, 1997)" in the second paragraph after the bullets in Section 4.3.2.1.1.1.1.

301. COMMENT:
Page 4-72, last partial paragraph, 4th line - GSM suggests adding "net" in front of "infiltration" for consistency with the rest of the text. (169)

RESPONSE:
The agencies agree. This change has been made in the second paragraph after Table 4-4.

302. COMMENT:
Page 4-74, Section 4.3.2.1.1.1.4 - The numbers provided in this section are incorrect and should be clarified. For the SEIS, HSI (2003) updated all of the ARD fate and transport modeling information for the East Waste Rock dump. All of the information should be discussed for clarity. For instance, the reference that the updated evaluation indicates ARD impacts in 33 to 72 years from the EWRD. HSI (2003) states this is the predicted time to wet the EWRD. The numbers provided for the 1997 EIS evaluation appear to indicate the total predicted travel time from the EWRD through the Bozeman aquifer. If this is the case, the two numbers are not comparable. In addition, the numbers generated for the SEIS are middle to worse case ranges. Comparison of these values to the 1997 EIS values should be clarified to ensure the reader is not confused by the comparison. (169)

RESPONSE:
The agencies agree that the comparison in the DSEIS is incorrect. Section 4.3.2.1.1.1.4 has been modified to read as follows: "The 1997 Draft EIS predicted that groundwater under the East Waste Rock Dump Complex would first experience ARD impacts in 54 to 433 years. An updated evaluation in this SEIS of the 1997 Draft EIS modeling was conducted using combinations of middle to worst-case parameters. The updated modeling predicts that groundwater under the East Waste Rock Dump Complex would first experience ARD impacts in 33 to 72 years (HSI, 2003)."

303. COMMENT:
Page 4-75, 2nd paragraph, 1st sentence - Based on the analysis completed for the SEIS (Telesto, 2003e), GSM believes the agencies should replace "could" with "would." (169)

RESPONSE:
The agencies do not believe this is necessary.

304. COMMENT:
Page 4-76, Section 4.3.2.1.1.2.2, 2nd paragraph, last sentence - GSM believes this amount is the same as the 75 percent of water that would be removed by evaporation described on page 4-57. (169)

RESPONSE:
The agencies disagree. The amount of water lost as a result of sulfide oxidation would be in addition to that lost through evaporation. Evaporation estimates were based on pan evaporation measurements at the mine (Telesto 2003a). Any evaporation from the heat of sulfide oxidation is over and above the predicted evaporation in the model.

305. COMMENT:
Page 4-76, 3rd paragraph, 1st sentence and Page 4-83, Section 4.3.2.2.2.2, 2nd paragraph, 1st sentence - GSM believes the agencies have presented compelling evidence throughout the document to change the word "assumed" to "concluded" in this section. (169)

RESPONSE:
The agencies partially agree. The text has been modified in the last paragraph of Section 4.3.2.1.1.2.2 as follows: "...the agencies have concluded that maintaining the pit as a hydrologic sink under the No Pit Pond Alternative would provide almost complete control of the ARD..."

The text has been modified in the last paragraph of Section 4.3.2.2.2.2 as follows: "The agencies have concluded that the No Pit Pond Alternative would provide almost complete control of pit discharges..."

306. COMMENT:
Page 4-78, 1st full paragraph - GSM believes that a number of conservative assumptions were used for the predictions and suggests the agencies include the assumptions or a reference to the discussion of the model. (169)

RESPONSE:
As stated in the first bullet after the cited paragraph, the analysis of seepage from the East Waste Rock Dump Complex was based on middle to worst case assumptions. The assumptions used in the SEIS, in comparison to those of the 1997 EIS, were provided in Table 4-4. A reference to Table 4-4 has been added to the third paragraph in Section 4.3.2.1.2.1.

307. COMMENT:
Page 4-78, 1st bulleted item - GSM believes the rationale for differences between the SEIS and 1997 DEIS travel time values should be incorporated so the reader is not confused. (169)

RESPONSE:
The first bullet in Section 4.3.2.1.2.1 has been modified to describe the differences between the 1997 DEIS and the SEIS in the values of parameters that affect the travel times as follows: "The differences reflect updated information available since the 1997 DEIS: a) a lower effective porosity of the East Waste Rock Dump Complex; b) the thinner layer of unsaturated Bozeman Group aquifer beneath the dump; c) a smaller depth of mixing; and d) a slightly shorter length and width of the flow path within the Bozeman Group aquifer (Table 4-4)."

308. COMMENT:
Page 4-78, 3rd bulleted item, last sentence - While it is unlikely that GSM would forego capture activities until contamination reached the permit boundary, it may be useful to clarify that groundwater contamination would not reach the permit boundary for 280 to 700 years. (169)

RESPONSE:
The agencies do not believe this wording needs to be clarified.

309. COMMENT:
Page 4-82, most of discussion - It is unclear how the discussion relates to "Risk of Violation of Surface Water Standards and Impacts to Beneficial Uses of the Jefferson River and Slough." The information contained in the discussion mostly relates to wildlife. Should this be discussed in a separate "impacts to wildlife" section? Also, the impact to wildlife should be more clearly stated, both adverse and beneficial. (169)

RESPONSE:
The agencies disagree. Wildlife is a beneficial use under the Water Quality Act and discussion of impacts to that beneficial use is appropriate to this section.

310. COMMENT:
Page 4-84, 4th bulleted item - GSM suggests replacing the term "hazards" to "impacts." (169)

RESPONSE:
The agencies do not believe this language needs to be changed.

311. COMMENT:
Page 4-85, Table 4-6 - It is unclear why this soils comparison table for all alternatives is contained in the No Pit Pond Alternative discussion. (169)

RESPONSE:
The agencies do not believe a change is warranted.

312. COMMENT:
Page 4-85, 2nd paragraph, 1st sentence - GSM suggests changing the term "would" to "may have to" since all current data show no amendment of the coversoil will be necessary. (169)

RESPONSE:
The agencies do not believe a change is warranted.

313. COMMENT:
Page 4-85, 2nd paragraph, after last sentence - GSM suggests showing potential borrow areas on one of the maps. (169)

RESPONSE:
The agencies agree. The potential borrow areas are shown on Figure 1-2.

314. COMMENT:
Page 4-86, first full sentence in top partial paragraph - GSM suggests changing the word "relevant" to "qualified." (169)

RESPONSE:
The agencies agree. The word "relevant" has been changed to "qualified."

315. COMMENT:
Page 4-86, Section 4.3.2.3.1, 1st paragraph, 2nd sentence - For clarity, GSM suggests adding to the beginning of the sentence: "Through minor revisions, GSM's currently approved…" (169)

RESPONSE:
The agencies agree. The second sentence has been modified to read "GSM's currently approved area for disturbance is 3,002.25 acres, which was acquired through minor revisions to the permit (GSM 2006 annual report)."

316. COMMENT:
Page 4-87, Section 4.3.2.3.2 - While GSM understands the MAA Group designated various surface disturbances as a potential hazard to wildlife and rated them accordingly, GSM believes the SEIS should evaluate the impacts to wildlife, both positive and negative. Therefore, GSM suggests changing the section name here and in every alternative section to "Impacts to Wildlife," and providing a discussion of both positive and negative impacts. For instance, a benefit to the No Pit Pond Alternative will be the creation of raptor nesting areas and bat roosts. This section does not allow for any discussion of benefits to wildlife by alternative. Please also see SRK Consulting (3/14/05) for additional information concerning raptors and bat habitat. (169)

RESPONSE:
The agencies disagree that the title of this section needs to be changed. The impacts to wildlife were addressed in the 1997 Draft EIS in Chapter IV.E and IV.F on pages 325-334. See response to Comment 85.

317. COMMENT:
Page 4-88, 2nd to last paragraph, 5th line - Page 4-88 should be corrected to state the thickness of waste rock would be reduced from 300 feet to 100 feet, as is discussed on the first paragraph of page 4-89 and shown in Figure 2-6. (169)

RESPONSE:
The agencies agree. This change has been made.

318. COMMENT:
Page 4-89, Section 4.3.3.1.1.2.1, 2nd paragraph, last sentence and Page 4-90, 2nd paragraph, 3rd sentence - GSM suggests adding "which the agencies have determined is unlikely" to the end of these sentences. (169)

RESPONSE:
The agencies do not believe this change is necessary.

319. COMMENT:
Page 4-92, 2nd full paragraph, 3rd line - The passivation test pads should not be included in the list of existing ARD sources. These pads were constructed in the pit and have been removed by mining. (169)

RESPONSE:
The agencies have rewritten this sentence in the ninth paragraph of Section 4.3.3.1.1.2.1 to read "...within the range of concentrations found in ARD sources..."

320. COMMENT:
Page 4-93, 2nd paragraph - GSM suggests the agencies modify this paragraph to be consistent with the analysis conducted: "Water quality in the saturated portion of the backfill in the GSM pit would be acidic and elevated in metals concentrations. Based on the limited data reviewed in the Butte underground mines, which are not backfilled, and were flooded rapidly, it is possible that concentrations of some metals in the saturated portion of the backfilled GSM pit water would decrease "naturally" over time. Other metals and sulfate can be expected to remain elevated for an extended period of time. ARD would be generated in the saturated backfill until the sulfides have reacted completely."

GSM has enclosed an evaluation by Dr. Donald Runnells (3/25/05), a renowned mining geochemist, as part of our comments. Dr. Runnells has experience at several partially backfilled open-pits including the San Luis gold mine in Colorado, the Midnite uranium mine in Washington, and the Blackbird cobalt/copper mine in

Idaho. He notes that "at each of these three sites, the specific conditions are different, including the geologic environment, the type of wallrock, the mineralogy, the type of mineralization and alteration, and the hydrology. However, none has been successful in restoring the quality of water to acceptable levels, and all three of these partially backfilled mines require on-going active treatment of groundwater." (169)

RESPONSE:
Thank you for your comment. The agencies do not believe that addition of the suggested text would add to the section.

321. COMMENT:
Page 4-94, 2nd full paragraph, last sentence - The water balance analyses were conducted on the entire area, including the additional 56 acres. Although the cover minimizes infiltration, the agencies have assumed some infiltration. Therefore, there is additional water from the 56 acres that affects the water balance. The last sentence does not make sense in this context. (169)

RESPONSE:
The agencies disagree and no change has been made.

322. COMMENT:
Page 4-95, partial first paragraph, after last line - GSM suggests the agencies provide information on the consequence of formation of the impermeable layer (*e.g.*, "Therefore, water would by-pass the capture system and report to groundwater."). (169)

RESPONSE:
The agencies agree. The following sentence has been added to the end of the fourth paragraph in Section 4.3.3.1.1.2.3: "Water could bypass the capture system and report to groundwater."

323. COMMENT:
Page 4-95, Section 4.3.3.1.1.2.4 - GSM believes the analysis clearly indicates it is highly unlikely the Partial Pit Backfill with In-Pit Collection Alternative will perform as intended. Additionally, the analysis describes the development of perched water systems and decreases in permeability. Therefore, we believe the impacts would be more severe for this alternative than for the No Pit Pond Alternative. (169)

RESPONSE:
The agencies disagree and no change is required.

324. COMMENT:
Page 4-96, 1st full paragraph (paragraph above Section 4.3.3.2) - GSM believes the impacts should be more clearly stated. For instance, if flow is captured there is no

impact to groundwater at the permit boundary. However, if flow is not captured, violations to water quality standards in the Jefferson River alluvial aquifer will occur. (169)

RESPONSE:
The agencies do not believe the wording needs to be changed.

325. COMMENT:
Page 4-96, Section 4.3.3.2.1.2, 1st paragraph, 8th and 9th lines and 2nd paragraph, 7th line - GSM suggests changing "could" to "would."

RESPONSE:
The agencies do not believe the wording needs to be changed.

326. COMMENT:
Page 4-96, Section 4.3.3.2.1.2, 2nd paragraph, 7th line - GSM suggests adding "as is likely" after the "5,050-foot elevation." (169)

RESPONSE:
The agencies do not agree. No change is necessary.

327. COMMENT:
Page 4-97, Section 4.3.3.2.2.1 - GSM suggests more clearly defining the impact to water quality. (169)

RESPONSE:
The last sentence of Section 4.3.3.2.2.1 has been changed to read as follows: "Impacts from the 1 to 3 gpm of seepage from the East Waste Rock Dump Complex in Rattlesnake Gulch would be similar impacts to those for the No Pit Pond Alternative described in Section 4.3.2.2.2.1."

328. COMMENT:
Page 4-97, Section 4.3.3.2.2.2, 4th line - GSM suggests adding "secondary" before "bedrock pathways." (169)

RESPONSE:
The agencies agree. This has been modified.

329. COMMENT:
Page 4-97, Section 4.3.3.2.2.2, end of paragraph - GSM suggests adding a statement to the end of this paragraph indicating this alternative leads to a non-mitigable risk of violation of surface water standards. (169)

RESPONSE:
The agencies do not agree. No updates are required.

330. COMMENT:
Page 4-100, Section 4.3.4.1.1.2, 3rd sentence beginning on 3rd line - Since the analysis has indicated difficulties in adequately collecting downgradient water, GSM suggests modifying the wording of this sentence to "Groundwater leaving the pit would be attempted to be collected from wells…" or "Groundwater leaving the pit would be collected from wells located downgradient of the pit to the extent capture can be accomplished." (169)

RESPONSE:
The agencies do not believe this change is required.

331. COMMENT:
Page 4-100, Section 4.3.4.1.1.2, 4th sentence beginning on 4th line - GSM suggests modifying this sentence as follows: "At least 10 new monitoring wells… may be required to attempt to intercept contaminated water…" (169)

RESPONSE:
The agencies do not believe this change is required.

332. COMMENT:
Page 4-101, first line - GSM suggests modifying the first full sentence as follows: "The fractured and faulted bedrock geology around the GSM pit…" (169)

RESPONSE:
The agencies agree. The second sentence of the fourth paragraph in Section 4.3.4.1.1.2 has been modified as follows: "The fractured and faulted bedrock geology around the GSM pit…"

333. COMMENT:
Page 4-103, first sentence - GSM suggests modifying this sentence as follows: "The water balance analysis indicated that the expected future pit discharge of 16 gpm would exhibit the following water quality parameters: a pH of 2.2, sulfate of 22,400 mg/l…" (169)

RESPONSE:
The agencies do not believe this change is warranted.

334. COMMENT:
Page 4-105, last paragraph, 6th line - GSM believes the agencies should provide a rationale for assuming the 10 percent and state that there is significant uncertainty with the assumption. (169)

RESPONSE:
The agencies disagree. See response to Comment 148.

335. COMMENT:
Page 4-106, 1st full paragraph, 2nd line - GSM suggests changing "at least 26 capture wells" to "an additional 26 capture wells." (169)

RESPONSE:
The agencies have modified this sentence in Section 4.3.4.1.1.2 to read: "...by a series of existing wells and at least 26 additional capture wells..."

336. COMMENT:
Page 4-106, 1st full paragraph, 9th line - GSM's experience does not indicate a maximum 80 percent pumpback efficiency. Since this was the agencies assumption, it may be useful to explain this assumption in the text. Also, the 10 well requirement was based on HSI (2003) analysis, not necessarily GSM's experience. (169)

RESPONSE:
The agencies modified the text in the ninth paragraph after Table 4-7 in Section 4.3.4.1.1.2 as follows: "At least 10 new wells would be needed to intercept groundwater with an estimated average of 80 to 90 percent recovery efficiency..." The agencies evaluated the Partial Pit Backfill With Downgradient Collection Alternative with various capture efficiencies ranging from 80 percent to 99.99 percent (HSI, 2003).

337. COMMENT:
Page 4-106, 1st full paragraph, after 2nd to last sentence on 2nd to last line - GSM suggests adding: "Therefore, groundwater standards may be exceeded." Also, it does not appear that GSM's groundwater capture experience is described in Section 4.2.2.1.2. (169)

RESPONSE:
The agencies do not believe this wording is necessary. Groundwater capture experience is described in Section 4.2.1.5.2.1.5. The reference has been changed.

338. COMMENT:
Page 4-107, 1st full and 2nd paragraphs - GSM believes the referenced paragraphs would be modified to more accurately represent information presented by both Telesto and HSI (2003).

Section 3.3.6 does not discuss a localized groundwater divide nor is this divide designated on Figure 3.7. The average reader would not be able to identify this feature. The elevation is not referenced in any supporting document and should be deleted from this discussion. Please note also that Figure 3-5 in the SEIS shows PW-64 (if you know where it is), but there are no elevations on the map. Figure 3-5 of HSI (2003) neither shows groundwater elevations nor includes PW-64. Note also that Telesto (2003a) uses 5,050 as the first discharge elevation as this is the contact between the pit and the Sunlight Fault. Telesto (2003a) states: "In an effort to be conservative and account for the high degree of uncertainty in the flow path and interconnectivity of fractures that are not intimately tied to the Corridor Fault, Telesto has assumed that groundwater may start to flow from the pit once the pit water elevation reaches 5,050 feet. The reasoning behind the 5,050 feet elevation is that the Sunlight Fault intersects and outcrops within the eastern portion of the pit at this elevation. At an elevation of 5,250 feet, the Corridor Fault outcrops at its lowest point on the east side of the pit (the lowest expected point on the Corridor Fault is at 5,150 feet, but this occurs on the upgradient side of the pit and therefore will not convey water out of the pit)..." (169)

RESPONSE:
The agencies agree that these paragraphs require additional clarification. A discussion of the groundwater divide has been added to Section 3.3.6 that provides support for the text in the above-referenced paragraphs. The reference to a specific elevation of the groundwater divide has been corrected in the thirteenth paragraph after Table 4-7 and now reads: "As discussed in Section 3.3.6, a local groundwater divide exists near the eastern rim of the pit between wells PW-62 and PW-64 (Figure 3-7). ... In a backfilled pit without water level control, groundwater levels are predicted to reach a steady state at the 5,260-foot elevation (Telesto, 2003a), which is between 68 and 115 feet above the current groundwater divide elevation..."

The second full paragraph now reads:
"Under the Partial Pit Backfill With Downgradient Collection Alternative, groundwater would saturate over 67 percent of the backfilled pit, and the water level would encounter the Corridor Fault at an elevation between 5,150 feet on the north side of the pit and 5,250 feet on the east side of the pit (Telesto, 2003a). Because the hydraulic head on the north side of the pit is higher than the water levels in the pit, the majority of flow from the pit to the Corridor Fault is expected to occur near the east side of the pit."

A new paragraph has been added in Section 3.3.6 as follows:
"A groundwater divide is located between wells PW-64 and PW-62 (URS, 2001) and is shown near the eastern edge of the pit in Figure 3-7. Recent groundwater elevations in PW-62 and PW-64 have ranged between 5,145 and 5,192 feet, and the groundwater divide is expected to be between those elevations. Groundwater west of the divide flows into the pit; groundwater east of the divide flows eastward into the Tdf/colluvial aquifer."

Figure 3-5 has been modified to make the labels larger and more legible. Figure 3.7 has been modified to include the groundwater divide.

339. COMMENT:
Page 4-108, Section 4.3.4.1.1.2.1 - It might be useful to include a paragraph with the expected change in water quality parameters. (169)

RESPONSE:
The changes in water quality from the Partial Pit Backfill With Downgradient Collection Alternative were provided (HSI, 2003). For the FSEIS, the agencies added a summary of these changes to Section 4.3.4.1.1.2.1, indicating which parameters either exceeded or came close to Montana water quality standards based on the results of the updated Dynamic Systems Modeling. These results are as shown in Table 4-8.

Table 4-8: Ability to Meet DEQ-7 Groundwater Standards with the Partial Pit Backfill With Downgradient Collection Alternative for Selected Parameters.

Parameter	DEQ-7 GW Stds mg/l	No Capture of Pit Seepage	One Downgradient Capture System at 80% Efficiency	Two Downgradient Capture Systems, each at 80% Efficiency (Measure 15a)
Predicted Pit Seepage		27 – 42 gpm	27 – 42 gpm	27 – 42 gpm
Arsenic	0.01	DEQ-7 groundwater standard met	DEQ-7 groundwater standard met	DEQ-7 groundwater standard met
Cadmium	0.005	DEQ-7 groundwater standard exceeded over entire predicted pit seepage range	DEQ-7 groundwater standard exceeded over entire predicted pit seepage range	DEQ-7 groundwater standard met
Copper	1.3	DEQ-7 groundwater standard exceeded over entire predicted pit seepage range	DEQ-7 groundwater standard exceeded over entire predicted pit seepage range	DEQ-7 groundwater standard met
Nickel	0.1	DEQ-7 groundwater standard exceeded over entire predicted pit seepage range	DEQ-7 groundwater standard exceeded over entire predicted pit seepage range	DEQ-7 groundwater standard exceeded over entire predicted pit seepage range
Selenium	0.05	DEQ-7 groundwater standard met	DEQ-7 groundwater standard met	DEQ-7 groundwater standard met
Zinc	2	DEQ-7 groundwater standard exceeded over entire predicted pit seepage range	DEQ-7 groundwater standard met	DEQ-7 groundwater standard met

340. COMMENT:
Page 4-108, Section 4.3.4.1.1.2.1, 2nd paragraph, last sentence - GSM suggests modifying the last part of this sentence as follows: "...and DEQ review of the permit would, if permitted by substantial law, be triggered." (169)

RESPONSE:
The agencies do not believe this wording needs to be added.

341. COMMENT:
Page 4-109, Section 4.3.4.1.1.2.2: - GSM believes the Partial Pit Backfill with Downgradient Collection Alternative poses a greater risk than all the other alternatives for creating new ARD-impacted springs or seeps, not just the Partial Pit Backfill with In-Pit Collection Alternative. (169)

RESPONSE:
The agencies do not believe this wording needs to be added because the No Pit Pond Alternative and the Underground Sump Alternative would not create new springs or seeps.

342. COMMENT:
Page 4-109, Section 4.3.4.1.1.2.3 - GSM believes the agencies should add that this alternative would result in intentional contamination of groundwater upgradient from the capture systems. (169)

RESPONSE:
The agencies do not agree and no change has been made.

343. COMMENT:
Page 4-109, Section 4.3.4.1.1.2.3, last sentence - GSM suggests adding "to avoid violations of water quality standards," after "required" in this sentence. (169)

RESPONSE:
The agencies agree. The last sentence in Section 4.3.4.1.1.2.3 has been modified to add the words "...to avoid a violation of a water quality standard (HSI, 2006)."

344. COMMENT:
Page 4-110, 1st full paragraph, 3rd line - GSM suggests adding "Darcy Law Groundwater Flux" to the glossary. (169)

RESPONSE:
The agencies agree. This has been added to the glossary.

345. COMMENT:
Page 4-110, last paragraph - The importance of the second sentence is unclear. The text suggests degradation could change the classification. GSM does not believe this is correct. (169)

RESPONSE:
The agencies agree that this statement is not relevant to the discussion in this section and it was stricken. Changes in water quality would not change the groundwater classification, although it could trigger corrective actions.

346. COMMENT:
Page 4-111, 1st full paragraph - GSM suggests incorporating information into this paragraph indicating that no conclusive data resulted from the in-situ work. Therefore, it is not known how long the downgradient collection wells would be needed. (169)

RESPONSE:
The agencies agree that no conclusive information resulted from GSM's in-situ testing. The text of Section 4.3.4.1.2.2.1 has been modified as follows: "GSM has been conducting studies of reclamation and in-situ treatment methods to prevent contaminants from Tailings Impoundment No. 1 from migrating to groundwater (GSM 2004 annual report). The agencies have not found conclusive results from these studies suggesting that downgradient control of contaminants using the existing pumpback systems may not be needed in the foreseeable future."

347. COMMENT:
Page 4-111, 2nd full paragraph, 3rd sentence beginning on the 6th line - Since impacts to groundwater from the East Waste Rock Dump Complex have not yet been identified and are not predicted to occur for many years, GSM suggests wording this sentence as follows: "If the pit…where groundwater is already impacted by ARD from natural mineralization and by future predicted seepage from the 13 percent…" (169)

RESPONSE:
The agencies agree. This sentence in the third paragraph after 4-2 in Section 4.3.4.1.2.2.1 has been changed to read: "If the pit…where groundwater is already impacted by ARD from natural mineralization and would be impacted by seepage from the portion..."

348. COMMENT:
Page 4-111, 2nd full paragraph, last sentence - GSM suggests deleting this sentence since it is not related to impacts, but describes other regulatory processes that may be invoked. (169)

RESPONSE:
The agencies do not agree and this sentence will remain.

349. COMMENT:
Page 4-114, Section 4.3.4.1.2.2.2, 1st paragraph, 9th line - GSM believes the agencies should provide a rationale for assuming 10 percent of flow from the pit through secondary pathways and state that there is significant uncertainty with the assumption. Also, in this instance, please cite the source of the "professional judgment." (169)

RESPONSE:
The agencies believe this is adequate. This is a conservative approach. See response to Comment 149.

350. COMMENT:
Page 4-114, Section 4.3.4.1.2.2.2, last complete paragraph, last sentence - GSM suggests deleting this sentence since it is not related to impacts, but describes other regulatory processes that may be invoked. (169)

RESPONSE:
The agencies disagree and this will remain in the text.

351. COMMENT:
Page 4-115, Section 4.3.4.2.1.2, 2nd paragraph (partial), last full sentence - GSM suggests referring the reader to Section 4.2.1.5.2.1.6 which describes the interception system for the Midas Spring. The discussion on page 4-115 implies the spring was just covered with the waste rock dump. (169)

RESPONSE:
The agencies agree. The reference to Section 4.2.1.5.2.1.6 has been added to the sentence in Section 4.3.4.2.1.2.

352. COMMENT:
Page 4-116, 1st full sentence - GSM suggests deleting "beneath the dump" at the end of this sentence.

RESPONSE:
The agencies agree and have deleted "beneath the dump" and added "...in the dump..." at the end of the sentence in the second paragraph of Section 4.3.4.2.1.2.

353. COMMENT:
Page 4-116, 2nd full paragraph - Due to the engineered drains constructed in mid-1994 (see previous comment), neither the Arkose Valley nor Sunlight Springs

currently have a surface expression. As reported in Table 3-1, none of the site springs have "good water quality." (169)

RESPONSE:
The agencies have modified the 4th paragraph in Section 4.3.4.2.1.2 to read "In addition, potential impacts could occur to springs having better water quality than found in the pit." The agencies have added Arkose Valley and Sunlight springs to Table 3-1 as follows:

Spring/Seep Name	Location	Elevation (feet)	Origination	Flow Rate** (gpm)	WQ**		Other
Sunlight	Near top of southwest section of West Waste Rock Dump Complex	5,312	possibly related to Latite Valley fault	0 to 6			covered by gravel trench system
Arkose Valley	Near top of southwest section of West Waste Rock Dump Complex, north of Sunlight	5,298	possibly related to Latite Valley fault	approx <1			covered by gravel trench system

354. COMMENT:
Page 4-117, Section 4.3.4.2.2.2, 12th line - GSM suggests changing "guaranteed" to "reasonably assured." (169)

RESPONSE:
The agencies agree. This wording change has been made.

355. COMMENT:
Page 4-117, Section 4.3.4.3.2 and Page 4-122, Section 4.3.5.3.2 - GSM suggests changing "Hazards" in the title and first line to "Impacts" to provide a more neutral assessment of both the positive and negative impacts.

RESPONSE:
The agencies disagree. This change has not been made.

356. COMMENT:
Also, GSM believes the impacts to wildlife under this alternative are greater than the Partial Pit Backfill with In-Pit Collection due to the potential impacts to springs and seeps. (169)

RESPONSE:
The agencies agree. The text in Section 4.3.4.3.2 has been changed to read: "Hazards to wildlife under this alternative would be similar to the Partial Pit Backfill

With In-Pit Collection Alternative, except that there is a greater potential for impacts to springs down gradient of the pit."

357. COMMENT:
Page 4-118, Section 4.3.5, 1st paragraph, 1st line - GSM suggests deleting "adapted to" from this sentence to merely state the "underground workings beneath the pit would be used as a sump for removing water from the pit." (169)

RESPONSE:
The agencies do not believe this change is necessary.

358. COMMENT:
Page 4-120, Section 4.3.5.1.1.2.3, 2nd sentence and last sentence - GSM believes these statements are contradictory. The last sentence states the water quality will be better, while the second sentence notes it will be similar to water quality predicted for the backfilled pit. (169)

RESPONSE:
The last sentence of Section 4.3.5.1.1.2.3 has been modified as follows: "It is anticipated that pit water quality would be slightly better..."

359. COMMENT:
Page 4-120, Section 4.3.5.1.1.2.3, 2nd to last sentence - GSM believes this statement should be modified to indicate the fact that pretreatment of water in an open sump is possible and has been done at GSM and other mine sites. This statement should reflect the agencies evaluation of the validity of this type of treatment and not GSM's "contention." (169)

RESPONSE:
The agencies agree. The second to the last sentence in Section 4.3.5.1.1.2.3 has been modified to read: "Pretreatment of the water in the sump may be possible and has been done at GSM (Shannon Dunlap, personal communication, 2006."

360. COMMENT:
Page 4-121, top partial paragraph, 2nd line - It is unclear why the pit water elevation would rise above the 4,635 foot level even with the assumed value of pit sloughing. (169)

RESPONSE:
The agencies have added text to the fourth sentence of the second paragraph in Section 4.3.5.1.2.2 to explain that the pit water elevation would rise as a result of displacement of water by the sloughed material as follows: "...200,000 cubic yards (300,000 tons) of highwall rock would ravel and slough over time. The additional 200,000 cubic yards of material would raise the pit lake a maximum of 32 feet to

approximately the 4,667-foot elevation. This is below the 5,050-foot-elevation at which water would begin to seep out of the pit."

361. COMMENT:
Page 4-122, Section 4.3.5.3.1, 2nd sentence - GSM believes this sentence should be reworded since it sounds like the referenced 52 acres is additional disturbance for this alternative. However, this acreage is common to the Underground Sump and No Pit Pond alternatives. (169)

RESPONSE:
The agencies agree. The word "additional" has been dropped and the sentence will read "...would be used to revegetate the 52 acres to be reclaimed..."

362. COMMENT:
Page 4-124, 1st full paragraph, last sentence - GSM believes the agencies should state the road will be widened where possible at this elevation, depending on the final pit configuration. (169)

RESPONSE:
The agencies agree. The last sentence of the second paragraph in Section 4.4.2.1.1 has been modified as follows: "The agencies would require the road leading down to the working area from the 4,875-foot elevation to be widened where possible, depending on the final pit configuration, by extending the road to the south over a portion of the 4,800-foot-elevation area and away from the highwall toe."

363. COMMENT:
Page 4-124, 4th full paragraph, last line and Page 4-125, Section 4.4.2.1.2, 2nd line - The highwall is defined as 1,875 feet and 1,775 ft in the respective sections. (169)

RESPONSE:
The agencies disagree. The highwall is 1,875 feet high before the 100 feet of fill is placed in the bottom and is 1,775 feet high after it is placed.

364. COMMENT:
Page 4-125, last line on page - GSM is unclear about the origin of this time frame and the starting point of the 10 year period.

RESPONSE:
The agencies have assumed 10 years to complete reclamation of the site.

365. COMMENT:
Page 4-127, 1st partial paragraph - GSM suggests adding "monitoring" to the post-reclamation activities. (169)

RESPONSE:
The agencies agree. The second to the last sentence of Section 4.4.2.3.1 has been reworded to say "…at a reduced level to maintain the site, provide monitoring, and operate the dewatering…"

366. COMMENT:
Page 4-127, Section 4.4.2.5.1 - GSM believes the last sentence on page 4-127 should be modified to read "Placer Dome reported 235,000 measured and indicated mineral resources (in ounces) at Golden Sunlight in their 2003 annual report." (169)

RESPONSE:
The agencies agree. The third sentence in the first paragraph of Section 4.4.2.5.1 has been changed to read "Placer Dome reported 448,000 measured and indicated mineral resources in ounces at GSM in their 2004 Annual Report." No resource numbers were reported in the 2005 Annual Report.

367. COMMENT:
Page 4-128, 1st partial paragraph, 6th line - GSM suggests changing "contends" to "believes." (169)

RESPONSE:
The agencies agree and this wording has been changed in the first paragraph of Section 4.4.2.5.1.

368. COMMENT:
Page 4-129, Section 4.4.2.6.1, 2nd paragraph - GSM requests the agencies review the information presented in SRK (3/14/05) enclosed with this submittal. In this memo, Dr. Gary Back reviews species utilizing mine pit highwalls at other western U.S. mines. He also evaluates species in the GSM area likely to utilize the highwall and recommends enhancements for wildlife use. (169)

RESPONSE:
Thank you for the comment. The following text has been added to the second paragraph of Section 4.4.2.6.1: "Observations at other mines suggest that the following species could use the GSM highwall at the conclusion of mining: golden eagle, red-tailed hawk, great horned owl, common raven, rock wren, fringed myotis, long-legged myotis, Yuma myotis, long-eared myotis, western small-footed myotis, and all BLM sensitive species (SRK Consulting, 2005). Mines at which these observations were made include several non-ARD pits (REN, Dee Gold, Sunshine, Marigold, Bald Mountain, and Robertson) and several having ARD potential (Gold Quarry, Reona, Gold Hole, and Coeur Rochester) (G. Back, SRK Consulting, personal communication, 2005). No conclusions were made on whether any nests were in sulfide material."

369. COMMENT:
Page 4-130, 1st full paragraph, last sentence - GSM suggests modifying this sentence to indicate that while 158 acres of habitat may be lost to some species, such as mule deer, that this loss will be partially offset by the addition of bat and raptor habitat provided by the highwall. (169)

RESPONSE:
The agencies partially agree. The last sentence in Section 4.4.2.6.1 has been reworded to say "...would be the permanent loss of 158 acres of mule deer habitat."

370. COMMENT:
Page 4-130, Section 4.4.2.7.1 - Additional visual analyses have been conducted by Telesto (4/11/05) and ENSR (2/7/05). These assessments are included with this submittal as part of GSM's comments. (169)

RESPONSE:
Thank you for your comment and the additional study information. The additional information does not change the conclusions in the SEIS.

371. COMMENT:
Page 4-132, 2nd to last line - GSM believes this sentence should be modified to note that "The analysis shows groundwater quality standards could be met under the No Pit Pond Alternative." This is not just a "contention" by the company. The analysis by Telesto (2003a) showed that water levels would only rise to 4,635 feet, well below the elevation of 5,050 feet assumed for significant outflow. In addition, the water would be pumped out, essentially eliminating the risk for water quality degradation outside the pit. (169)

RESPONSE:
The agencies do not believe the wording in the last paragraph of Section 4.4.2.8.2 requires changing.

372. COMMENT:
Page 4-133, Section 4.4.3.1.1, bulleted list - The number of months to implement this alternative appears too high. GSM previously estimated this alternative would take approximately 3 years to complete, operating 24 hours per day, 7 days per week. The numbers should be confirmed. (169)

RESPONSE:
The agencies used the GSM supplied number of 405,000 cubic yards per month to calculate the number of months. A 24-hours-per-day, 7-days-per-week schedule would shorten the overall time to implement this alternative from the 50 to 80 months down to 36 to 48 months. This does not affect the overall evaluation and no changes have been made.

373. COMMENT:
Page 4-135, Section 4.4.3.5.1, 2nd paragraph, 7th line - GSM believes it would be harder to dewater a backfilled pit than solid rock due to the challenges described in the analysis. Therefore, GSM suggests the agencies change the term "as difficult" to "more difficult." (169)

RESPONSE:
The agencies believe the wording is correct as stated.

374. COMMENT:
Page 4-137, last line and Page 4-138, first line - It is unclear to GSM how the untreated water escaping the pit would be the same for both the Partial Pit Backfill with In-Pit Collection Alternative and the No Pit Pond Alternative since no water would escape the pit under the No Pit Pond Alternative even if the dewatering system failed. (169)

RESPONSE:
The agencies believe the wording in the first paragraph of Section 4.4.3.8.2 is correct as stated.

375. COMMENT:
Page 4-138, last paragraph, 5th line - GSM believes the analysis has clearly shown the impacts to a dewatering system under this alternative. GSM suggests modifying the sentence to read "It has been demonstrated that this alternative would create a larger liability..." (169)

RESPONSE:
The agencies agree. The last sentence in Section 4.4.3.8.2 has been modified to read "This alternative may create a larger liability..."

376. COMMENT:
Page 4-140, Section 4.4.4.5.1, 1st and 2nd sentences - These sentences contradict one another. The first states the impact to access to future mineral resources would be the same for the both the Partial Pit Backfill Alternatives. The second sentence then states the backfill alternative with downgradient collection has an "additional impact." The analysis indicates there would be greater impacts to access to future mineral resources with the Partial Pit Backfill with Downgradient Collection Alternative and this should be stated. Please clarify. (169)

RESPONSE:
The agencies agree. The first sentence in Section 4.4.4.5.1 has been deleted.

377. COMMENT:
Page 4-140, Section 4.4.4.5.1, 10th line - GSM suggests clarifying the statement regarding "reversing" the alternative. (169)

RESPONSE:
The agencies agree. The sentence in the first paragraph of Section 4.4.4.5.1 has been reworded to read: "The agencies assume that a similar dewatering system as used in the Partial Pit Backfill With In-Pit Collection Alternative would have to be installed to dewater, which would facilitate removal of the backfill."

378. COMMENT:
Page 4-142, Section 4.4.4.8.2, 2nd paragraph, last sentence - GSM suggests also noting the company does not believe that it is in the best interest of the State of Montana to intentionally degrade groundwater. (169)

RESPONSE:
The agencies do not believe this sentence needs to be changed.

379. COMMENT:
Page 4-143, Section 4.4.5.1.1, 2nd paragraph, last sentence - GSM suggests modifying this sentence to read: "The agencies would require GSM to develop a long-term plan to stabilize and maintain the ceiling and walls of the underground workings, especially the stopes, where necessary to ensure employee safety." For example, only areas that require entry by maintenance personnel may need to be maintained. (169)

RESPONSE:
The agencies agree and this has been changed.

380. COMMENT:
Page 4-145, Section 4.4.5.8.1, 1st sentence - GSM believes the design for the Underground Sump Alternative was proposed, not assumed. (169)

RESPONSE:
The agencies agree. The first sentence in Section 4.4.5.8.1 has been changed to read: "For the Underground Sump Alternative, the dewatering system would consist of an underground..."

381. COMMENT:
Page 4-146, 1st full paragraph above Section 4.5, 4th line - GSM believes the analysis shows this alternative has the least liability and the agencies should indicate this is an agency position not a company contention. (169)

RESPONSE:
The agencies believe the wording is correct as stated.

382. COMMENT:
Page 4-147, Table 4-10 - Based on the tables in Chapter 2 that list the cover soil volumes required for each alternative, the costs for hauling and placing soil cover on revegetated acres for the No Pit Pond would be similar to, but slightly more than, the Underground Sump Alternative. (169)

RESPONSE:
The agencies agree. Table 4-10 has been changed to Table 4-11. The 3-foot-thick cover soil volume of 290,400 cubic yards listed under the No Pit Pond Alternative in Section 2.4.2.6 for 60 acres is correct. The cover soil volume of 290,400 cubic yards listed under the Underground Sump Alternative in Section 2.4.5.6 for 59 acres is incorrect. This volume has been changed to 285,600 cubic yards. In Table 4-11 the "Haul and Place Soil Cover on Revegetated Acres" row has been changed to $378,000 for the No Pit Pond Alternative and $371,000 for the Underground Sump Alternative.

The "TOTAL COSTS" row has been changed accordingly. A footnote has been added to indicate that these costs are based on 2003 dollars prior to the increase in diesel fuel prices.

383. COMMENT:
Page 4-150, Section 4.7.1.6 - It should be noted that although GSM does not have an ongoing exploration program, we are in the process of reviewing past exploration data. Once this review is complete, exploration targets could be generated. Based on the current knowledge, this does not change the cumulative impacts analysis.

RESPONSE:
The agencies agree. The first sentence in Section 4.7.1.6 has been deleted and replaced with the following: "GSM conducted limited exploration drilling in 2005 and is in the process of reviewing past exploration data. Once the review of existing and new data is complete, exploration targets could be generated (GSM, personal communication, 2005)."

384. COMMENT:
Page 4-151, Section 4.7.2, 2nd line - GSM suggests noting this will be a "light industrial park." (169)

RESPONSE:
The agencies agree and this wording change has been made.

385. COMMENT:
Page 4-151, Section 4.7.2, 3rd line - GSM believes the term "donated" should be replaced with "made available." (169)

RESPONSE:
The agencies agree and this wording has been changed.

386. COMMENT:
Page 4-151, Section 4.7.2 - GSM also suggests adding a sentence such as "GSM has also had discussions involving use of the property for a wind farm." (169)

RESPONSE:
The agencies agree and this sentence has been added to Section 4.7.2.

387. COMMENT:
Page 4-154, Section 4.8.1.2, 3rd paragraph - Backfilling of the underground is currently only required as specifically discussed in the EA, since evaluations show the underground would be stable without complete backfilling. An evaluation would be required to determine if this work could be completed, if necessary. (169)

RESPONSE:
The agencies believe the wording is correct as stated.

388. COMMENT:
Page 4-164, 1st bulleted item - GSM suggests modifying this sentence to indicate "...these areas would be seeded and possibly planted with tree seedlings." (169)

RESPONSE:
The agencies believe the wording is correct as stated in Measure 21 in Section 4.8.3.2.

389. COMMENT:
Page 4-164: Measure 22 - Please see the attached 2005 visual evaluations from Telesto (4/11/05) and ENSR (2/7/05), submitted as part of GSM's comments. (169)

RESPONSE:
See response to Comment 370.

390. COMMENT:
Page 4-167, Section 4.9.3, 3rd paragraph, last line - GSM believes the term "small" should be removed as no scale of reference is provided. The entire highwall area will provide habitat for raptors and bats. (169)

RESPONSE:
The entire highwall would be available for wildlife habitat. The agencies believe bats and raptors would use the oxidized portions of the upper highwall.

391. COMMENT:
Page 4-168, Section 4.11, last paragraph - GSM suggests striking the word "contends" and noting that the National Resource Council Report by Committee on Hard Rock Mining on Federal Lands, 1999, National Academy Press, Washington D.C., concluded that backfilling pits does limit the potential for future mining and recovery of remaining mineral resources and reserves. (169)

RESPONSE:
The agencies disagree. The third paragraph in Section 4.11 has been edited as follows: "GSM contends that the partial pit backfill alternatives would limit the potential for future mining and recovery of remaining mineral resources and reserves. This agrees with conclusions of the National Resource Council Report by Committee on Hard Rock Mining on Federal Lands, 1999, National Academy Press, Washington, D.C., that backfilling pits does limit the potential for future mining and recovery of remaining mineral resources and reserves."