

INCOMING 00150005

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From: Mark Reynolds <mreynolds@etv.net>
To: <kboyer@fs.fed.us>
Date: 10/5/2006 5:19:39 PM
Subject: Bear Canyon Lease Addition

Karl,

Attached is a draft response to the Forest Service comments on the DOGM permit amendment. If you have any question please call me.

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CC: <dharber@fs.fed.us>, Joe Helfrich <joe Helfrich@utah.gov>, Wayne Hedberg <waynehedberg@utah.gov>

1. Much of the plan has not been updated to cover the proposed longwall mining. The discussion of the past room-and pillar mining should remain, as that is how the area was mined in the past. This mine plan should cover the entire mine, so all mining was discussed.

Longwall mining is discussed in section R645-301-523 as well as in Appendix 5C. Appendix 5C Attachment 2 has an in depth discussion of longwall mining. In regards to the room and pillar mining discussion, room and pillar mining is currently being used and will continue to be used at various times through out the life of the mine. The current submitted mine plan shows this. Thus the discussion of room and pillar mining is talking about past mining, but future mining.

2. Page 5-10, Section R645-301-523, Mining Method.
Only room-and-pillar mining is discussed. Describe longwall mining that is proposed for this mine plan modification.

Longwall mining described in general on page 5-10 and in detail in Appendix 5C Attachment 3.

3. Page 5-19, Protection of Natural Surface Structures & Streams.
Use the angle of draw to determine the distance needed to protect streams and escarpments, not fixed distances.

This section is found on page 5-18, not 5-19. All discussion relative to fixed barriers was removed and a reference to Appendix 5C was made were a detailed description of how these areas will be protected based on the angle of draw was added on pages 5C-3, 5C-8, 5C-9, and 4C-10.

4. Page 5C-4
The discussion is only for subsidence due to room-and-pillar mining. Add a discussion of the predicted subsidence due to longwall mining.

Longwall mining is discussed on page 5C-3, and in depth in Attachment 3 of Appendix 5C.

5. Page 5C-14, last paragraph.
Use the angle-of-draw to define the outcrop protection, not a fixed distance.

This is now found on page 5C-16. This statement is referring to escarpment protection in Lease U-024316. In preceding paragraphs it mentions that an angle of draw of 22.5° was used to determine the 200' barrier. This distance only refers to the protection zone in Lease U-024316 as described in the text. Page 5C-16 was changed so that it only refers to this section and not the overall plan.

6. Section 5, Engineering, pg. 5-18, 1st paragraph.
The sentence contradicts the next to the last sentence in the paragraph. A minimum 200 foot protection zone barrier may not be adequate in all circumstances. Appendix 5-C, page 5C-16, 3rd paragraph uses and angle of draw of 22.5° to determine an adequate protection zone barrier; however, in the next paragraph protection zone barriers of 300 feet and 370 feet are given for the Tank and Blind Canyon Seams, respectively. Any reference in the text to a static barrier limit (instead of using the angel of draw to determine it) should be removed. If a certain protection zone barrier is given for a particular location for a

specific coal seam, then explain how that was determined by using depth and the angle of draw. The criteria to use are depth and angle of draw when determining an adequate protection zone barrier at each location.

The text on page 5-18 was changed to reference the angle of draw instead of using the distance calculated from it. For the comments about page 5C-16, this information is now found on page 5C-18. This text refers to specific leases, however since some escarpment failure is now planned in these lease the text was changed to reflect this. Escarpment failure for the leases is discussed on pages 5C-18, 5C-19, 5C-20, and 5C-21.

7. Subsidence Control and Monitoring Plan, Appendix 5-C, pg. 5C-3.
Attachments 2 and 3 are missing.

A copy of the plan modification including these attachments were hand delivered to Karl Boyer of the Forest Service by Mark Reynolds of C. W. Mining. Furthermore they were included, in pdf format, on all cd's of the amendment that were distributed. All other reviewers were able to find these amendments. They will also be included with this response. However, if you are still unable to find them, or need any parts of the plan modification you can email me at mreynolds@etv.net, and I will provide you with whatever copies you need.

8. Subsidence Control and Monitoring Plan, Appendix 5C, pg 5C-4.

The paragraph infers that no subsidence will occur as a result of longwall mining. The paragraph should make it explicit that only room and pillar has been done up to now. The first sentence implies that past experience with room and pillar mining can be extrapolated to the results anticipated with longwall mining. The paragraph also needs to point out that two seams overlap each other over a large area.

This paragraph does not infer that no subsidence will occur; the paragraph explicitly states "The main affect will be a uniform lowering in elevation".

There are countless studies stating that the effects of room and pillar mining and longwall mining are similar except that with longwall mining the effects are not as notable or as drastic, because there is a more uniform removal of the coal, and no pillars are left behind creating areas extremely susceptible to surface cracking. The statement about past mining experience was used to justify the claim that no surface cracks are expected. This is a valid justification. Additionally the fact that two seams will be mined does not change the statement or the conclusions from it, because in the areas of past mining being referred to, three seams overlapped each other in an area almost equally as large, and secondary retreat mining took place in all three seams.

The effects anticipated with longwall mining are discussed in great detail in Appendix 5C Attachment 3.

9. Subsidence Control and Monitoring Plan, Appendix 5C.
Figure 5C-2 is missing

This is addressed in the response to comment #7.

10. Subsidence Control and Monitoring Plan, Appendix 5C, pg 5C-14, last paragraph. The paragraph should be rewritten to reflect that depth of overburden and angle of draw will be used to determine the barrier protection zone at each location. The previous page, 5C-13, 3rd paragraph, discusses this. These inconsistencies should be corrected throughout the document.

This is addressed in the response to comments 3, 5, and 6.

11. Hydrology, R645-301-728, Probable Hydrologic Consequences Determination, pg 7-44, 3rd paragraph, 4th sentence

The sentence needs clarification.

- a. Which coal seam is being referred to?
- b. At some point the minimum overburden thickness(es) will be zero because the coal seam(s) outcrop along the creek.
- c. A comparison of Plates 5-1C, 6-2, and 7-4 indicates that the subsidence resulting from the present Tank Seam mine plan configuration will extend to an area under the Left Fork of Fish Creek drainage with little more than 400 feet of overburden.
- d. The "Area of Concern to be Monitored While Undermining" is in this area. Apparently, this "Area of Concern" is the primary source of water contributing to the perennial section of the Left Fork of Fish Creek. This area will need to be analyzed more thoroughly before the present mine plan configuration can be approved.

This sentence no longer exists; it has been replaced by references to specific parts of Appendix 7J that address probable hydrologic consequences.

- b. In most areas along Fish Creek the coal is burnt before it reaches the surface. In areas where it does outcrop it is typically at a vertical ledge so there is still some overburden. Plate 6-2 does assume coal outcrops everywhere and does go down to a zero overburden contour.
- c. A cross-section of this area was hand delivered to Karl Boyer of the Forest Service showing that there is an overburden of 900 ft. Additionally plates 5-1A, 5-1B, 5-1C, and 5-3 have been updated to reflect a 22.5° angle of draw as stated in the text, instead of the 32° angle of draw.
- d. The area of concern was visited by Dale Harber of the Forest Service. It was determined that water monitoring site SBC-21 is the source of this water. A monitoring program for this area, and the one above the right fork of Fish Creek was developed in a meeting that was attended Dale Harber of the Forest Service, and representatives from BLM, DOGM, and C. W. Mining.

12. Hydrology, R645-301-728, Probable Hydrologic Consequences Determination, pg. 7-44, 3rd paragraph, 6th sentence.

A mitigation plan needs to be in place before an impact occurs.

Mitigation plans are discussed in the water replacement section found on pages 7-61A to 7-61D.

13. Hydrology, R645-301-100, Hydrologic Balance Protection, page 7-46, 2nd paragraph, last sentence. Correct the sentence to reflect the most up-to-date subsidence predictions. Also discuss the use of depth and angle of draw to determine the limits of the protection zone barrier.

This sentence was updated to reflect current mining. Subsidence impacts are discussed in Appendix 5C.

14. Hydrology, R645-301-100, Hydrologic Balance Protection, page 7-46, 3rd paragraph, last sentence. Correct the paragraph to reflect what is currently being proposed, i.e. U-024316 mining will take place in the Hiawatha Seam, no the Tank Seam and subsidence will be approximately 5 feet in that area. Update the discussion of the barrier protection zone for Bear Creek to reflect the use of depth and angle of draw in its boundary determination.

This sentence was changed to reflect the changes in mining. However in regards to the comments, Mining will not take place in the Hiawatha Seam in Lease U-024316, and no future mining is planned near the protection zone or Bear Creek. Both the protection zone and Bear Creek are separated from future mining by a fault as shown on Plate 5-3.

15. Hydrology, R645-301-731.100.210, Groundwater monitoring Plan, Pg. 7-49, last paragraph, 2nd sentence.

If Baseline data were collected for SBC-17, then so state.

The statements on this page were corrected.

16. Hydrology, R645-301-731.100.210, Groundwater monitoring Plan, Pg. 7-49, last paragraph, last sentence.

The sentence now state all additional sites added will have 3 years of baseline data.

17. Hydrology, Table 714, Water Monitoring Matrix, pg. 7-53.

The table needs to be updated to reflect recent discussion and field trip findings regarding additional sampling locations:

- a) 2 additional surface water monitoring points in the McCadden Hollow drainage.
- b) 1 new spring or seep location to be determined in T.16S., R.7E, Section 10.
- c) 2 springs in T. 16S., R.8E., Section 19 (SBC 16-A and SBC-16B).
- d) The "Area Of Concern" in T. 16S. R.8E., Section 19.

Table 7-14 (pg 7-53) and Plate 7-4 have been updated to reflect all recent discussions.

- a) Only one site was added because the last spring visited in McCadden Hollow was north of the permit area
- b) There was no spring found in this section, however, we did visit springs in Section 12 and 13, these were added as SMH-5 and SBC-22 respectively.
- c) These were added
- d) This area is primarily in Section 18 and extends down into 19. The source is being monitored as SBC-21. SBC-20 was also added to help monitor this area.

18. Hydrology, Section 731.220, Surface Water Monitoring, pg. 7-57.

Update this section to reflect the current permit revision and all new monitoring points.

All current surface sites are now listed on the page.

19. Subsidence Map, Plate 5-3A.

The castlegate sandstone needs to be mapped throughout the permit revision area.

The castlegate sandstone is shown on Plate 5-3, and 5-3A in all areas of concern.

20. Archaeology Map.

An archaeology map needs to be submitted for review as part of the permit revision package.

This will be submitted once the study is complete.

21. Geologic Map, Plate 6-1

Use colored shading for the geologic formations.

A different color is used for each formation.

22. Plate 7-4 and Plate 7-12.

Both of these plates are titled Water Monitoring and dated the same. Both are not needed. Put all correct information on one and delete the other. Update the plate to reflect the recently approved monitoring locations.

Plate 7-4 is Water Monitoring and Plate 7-12 is Water Rights. The titles have been corrected and both plates have been updated.

23. Plate 3-1

This plate has symbols in the legend for riparian habitats, but none are shown on the map. Joe Helfrich said there would be additional field work done to delineate these habitats, and they would then be mapped. Add the new data to the map before the next review.

The legend refers to "Tree Dominated Riparian Area" which is shown on the map along Huntington Creek. The only other riparian areas are around seeps, springs, and a narrow corridor along the right fork of Fish Creek. These areas are small enough that they would not be visible on the map. These areas are addressed on page 3-32.

24. Page 3-23, 2nd paragraph.

This paragraph states that "Bear Creek and Fish Creek are low-quality aquatic environments of little value to the aquatic resources of the area".

Is this based on a systematic survey that rated the drainages as low, or is it just someone's opinion? Does Bear Creek have water quality issues? I would argue that Fish Creek is pretty important to the aquatic resources that use the area (insects, amphibians etc). On page 3-27 under the amphibian section it says that the area provides substantial value habitat for the tree species that might be present. Present references and documentation that support the statement that "Bear Creek and Fish Creek are low quality aquatic environments of little importance..."

The statement goes on to say that a biological community mostly occurs on both creeks on an intermittent basis. I understand that we are treating these as perennial drainages (not intermittent) and this is stated in the first paragraph on this page. I would recommend dropping the 2nd paragraph or really cleaning it up.

A review of Bear Creek water monitoring data does show that it flows intermittently. I have removed any text added that links Fish Creek into this statement. The statement was added before either Charles or I worked for C. W. Mining, so we don't know what evidence they had supporting the study. We would be fine with removing the entire paragraph if it wouldn't create any additional problems with DOGM.

25. Pg 3-5, Birds.

The comment was made last time that peregrine falcons were not a federally listed species anymore, and that they would be addressed as FS sensitive species. The references to them as endangered, were changed to sensitive, but the statements are not true now, as written. There is also a statement about impacts from a haul road and utility corridor. As far as I know, we are not looking at haul roads or utility corridors. Rewrite this whole paragraph.

“There are no federally listed birds species potentially present in the project area. However, there are several Forest Service and Utah sensitive species that may be present: northern goshawk, flammulated owl, three-toed woodpecker and peregrine falcon, as well as the golden eagle, which is a USFS Management Indicator Species. Bird species potentially effected including species nesting on the escarpment and species associated with riparian habitats or dependent of prey or forage associated with riparian habitats. Surveys for cliff nesting raptors were started in 1987 and were most recently conducted in 2006. Golden Eagles, prairie falcons, redtail hawks, unidentified falcon species and ravens have been found nesting on cliffs in the area. Factors that favor the stability of the Castlegate escarpment are outlined in Maleki 2001, pg 13. Owl surveys were done in the spring of 2004. Surveys in 2004 found great horned owls in the Wild Horse Ridge area.”

I am unclear as to what you want done with this page. What is not true about the statements? What is the purpose of your second paragraph, is this a suggestion to put in the MRP?

The statements about haul roads and utility corridors still apply. Our MRP refers to the entire mining operation not just the area we are trying to add with this submittal. Our current mine site has haul roads and utility corridors so they must be addressed.

26. Pg 3-27 Amphibians.

App. 31 says that it is probable that 6 species of amphibians inhabit the project area. App. I also says that only one species has been determined to be of high interest to the state of Utah (Tiger salamander). Pg 3-27 amphibian section says that “the area provides substantial value habitat for the three species listed”. Describe the three species and their habitat.

The 3 species were listed in the paragraph.

27. Pg 3-28

This page includes a new list of threatened and endangered species. Change the heading to Utah Sensitive Species. Add a sentence to the beginning “The Utah Sensitive Species list includes federally-listed threatened and endangered species, as well as species with existing conversation agreements, and species identified as species of concern, Add to the next sentence “The list of federally listed threatened and...”

The paragraph under the list, state that a map with blocks that lists threatened and endangered species was also downloaded. This is a little confusing, because if you actually look at the species status for some of the species listed in Figure 3-1, they are not federally-listed species. Call these species (Utah Sensitive Species”. Utah Sensitive Species include federally listed species, but also includes quite a few other species. So, in this paragraph replace threatened and endangered species, with Utah Sensitive Species.

The Last 2 paragraphs on this page are confusing. It starts with a meeting in 2006. The first paragraph mentions townsend's big-eared bats and ends by saying that the flammulated owl may be added to the threatened and endangered list (replace with Utah sensitive species list). The next paragraph says that to address these concerns bat owl surveys were done. It implies that surveys were done in 2006 to address concerns identified at a meeting with DWR in 2006. But, Appendix 3M discusses surveys done in 2004. If there were additional bat and owl surveys done in 2006, they need to be added to App 3M. I'm assuming

that there were no additional surveys done in 2006, and that it's just the wording of these 2 paragraphs that is confusing. Please Clarify.

Page 3-28 now states “The list of Utah Sensitive Species for Emery county created May 12, 2006 by the Utah Division of Wildlife Resources (DWR) is shown below. This includes federally listed threatened and endangered species.”

In the second paragraph the words threatened and endangered were changed to Utah sensitive.

The meeting date of 2006 was changed to the correct date of 2004.

28. Page 3-29, Figure 3-1
Changes the heading to Utah Sensitive Species in Relation to the Permit Area.

The heading was changed.

29. Page 3-30, 3rd paragraph
Changing endangered to sensitive did not fix the problem. There are several species of raptors that might be found in the project area (see 3-25 above).

The text was changed to reflect several species in the area.

30. old page 3-31, 2nd paragraph
Add that “Canyon sweet-vetch was also noted in the fish creek drainage during field surveys in June 2006”

A note was made of the existence of Canyon sweet-vetch in Fish Creek.

31. Pg 3-32
Regarding the paragraph on Link Trail Columbine, add that this was found in Left Fork of Fish Creek during field surveys in June 2006.

A note was made of the existence of Link Trail Columbine in Fish Creek.

32. Pg 3-32
It says that “Due to the depth of overburden no impact to these areas is expected” (referring to riparian areas). Cite reference to support this statement for the new permit revision areas. Discuss the effects to Fish Creek.

A reference was made to Appendix 5C where this information can be found on pages 5C-9 and 5C-10.

33. Old Page 3-39, 3rd Paragraph
This Paragraph makes a reference to App 3-C and predicted effects from subsidence. However, I could find no discussion about effects from subsidence, it is merely a report on existing vegetation. Please Clarify

The paragraph was changed to reference Appendix 5C.

34. Pg 3-43, Birds

Replace first sentence with "There are no federally listed birds species potentially present in the project area. However, there are several Forest Service and Utah Sensitive Species that may be present: northern goshawk, flammulated owl, three-toed woodpecker and peregrine falcon, as well as the golden eagle, which is a USFS management Indicator Species."

Next two paragraphs- first says that "potential impact on birds species would be limited to the proposed new construction area". This is not applicable. Potential effects are from escarpment failure and loss of riparian habitats due to subsidence from mining.

Bottom of this page, aquatic wildlife, again talks about high quality streams, with no mention of Fish Creek.

A statement was added about sensitive species. No specific species were listed since they may change. A statement was added that the Golden Eagle is present and is an indicator species.

A statement about escarpment failure and loss of riparian habitat was added, as well as a reference to Appendix 5C.

This statement at the bottom of the page is correct, Fish Creek is not in the surface operations area, there are no plans for surface operations in the Fish Creek area, and no water passing through the disturbed surface area could ever reach Fish Creek.

35. Page 3-68

At the end of the first paragraph, it says that raptor nests will be safeguarded from subsidence by maintaining a minimum of a 100 ft barrier to the outcrop. Page 5-17 says mining will be stopped within 200 f of the outcrop. Page 5-18 says 200 ft, 5C-14 says 200 ft. These inconsistencies need to be corrected throughout the documents, wherever they occur. Use depth and angle of draw to determine an adequate protection zone barrier in each area.

The text concerning raptor nest protection was changed.

36. old page 3-69, monitoring, 1st paragraph

This paragraph refers to water in Bear Creek, But there is no mention of Fish Creek or other water monitoring sites. Update this and reference Plate 7-4.

Fish Creek was mentioned and a reference to Plate 7-4 was included.

37. Appendix 3-I, Fish and Wildlife Resources Information

The whole appendix needs to be updated to address the new permit revision areas and changes in listed species. Make sure it incorporates all comments made by Forest Service resource specialist on topic covered under documents as part of this submittal.

What specifically is outdated? All documents and publications used in writing this appendix are studies about the Wasatch Plateau or Southeastern Utah. These areas included the new permit area as well as the old ones. In reviewing the document all information appeared to be pertinent to the new permit areas also.

38. There is no discussion regarding existing surface uses, specifically livestock grazing or recreation; however, natural resources (vegetation and wildlife) that affect these activities were discussed.

This is found in the Land Use Section of the MRP (R645-301-410)

39. Mitigation of impacts to vegetation and water resources are presented in general terms but should be more specific as to how the company will replace or repair subsidence damage to roads, fences, trails, springs, water troughs and ponds.

A detailed description of mitigation is included in the water replacement section. Additionally C. W. Mining has committed to replace any that DOGM has found to be materially damaged by mining activities.

40. No discussion was found regarding forest service sensitive plants. As a vegetation survey was completed, all species or concern should have been included. It is possible that canyon sweetvetch (Hedysarum occidentale Var. canone) is in the lease area at lower elevations as it is found near the bottom of Trail Canyon.

Canyon sweetvetch is already discussed in the permit. Additionally all areas being added to the permit are at higher elevations.

Literature pertaining to the amphibians and reptiles is extensive, but much of it refers to species occurring in the desert areas and has only limited reference to forms inhabiting high elev in Utah. Most of the publication dealing with species lists for the state are old.

The most up-to-date listing for the area under consideration may well be a checklist of Utah amphibians and reptiles (Tanner, 1975), and Utah Division Publication No. 78-16 (Dalton, 1978) (Appendix 3-K) which references a contiguous and similar geographic area.

Amphibians. Based on the literature review, it was determined that probably six species of amphibians inhabit the proposed area of concern which provides substantial value habitat for the three species listed, the Great Plains Toad, Great Basin Spadefoot, Woodhouse's Toad,. All amphibians are legally protected in Utah, but since the species listed are all widespread throughout similar habitats in Utah, none are treated as high interest species, and therefore, are not individually discussed.

Reptiles. Based on a review of the literature, it was determined that probably 18 species of reptiles occupy the expansion area; this area is considered to be a substantial value habitat for all species. All reptiles have some protection under the Utah code, but since the species listed are all widespread throughout similar habitats in Utah, none are treated as high interest species and, therefore, are not individually discussed.

Appendix 3-I contains a more detailed discussion of amphibian and reptile species.

¹V. Tanner, Amphibians, 1931; Woobury, Reptiles, 1931, and Pack, Snakes, 1930

²Other recent literature pertinent to this report are: Schmidt (1953); Stebbins (1954 and 1966); W. Tanner (1953, 1957 a and b, 1966 with Banta, 1969 with Morris and 1972 with Fisher and Willis); and Woodbury (1952).

Listed or Proposed Endangered or Protected Species of Plants and Animals

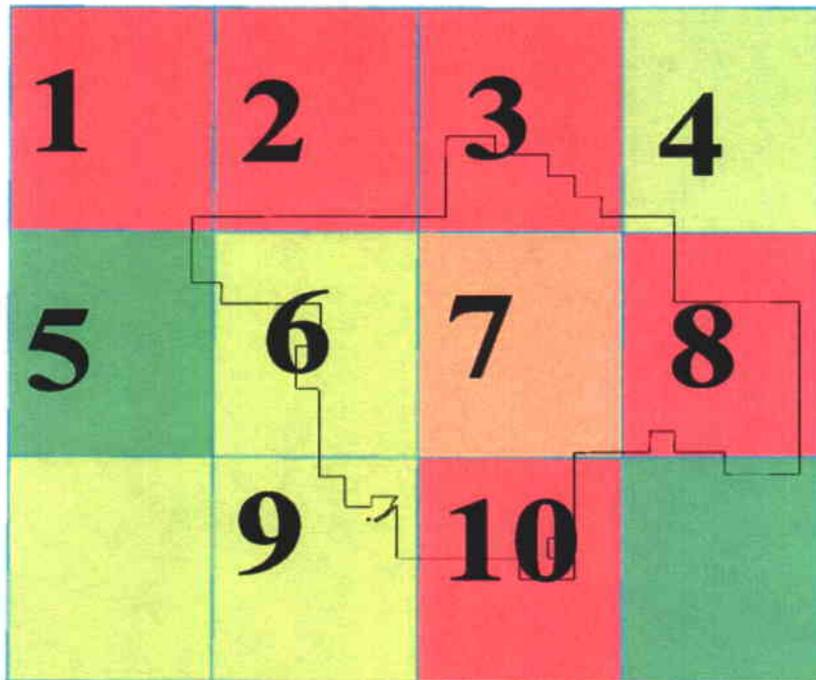
The list of Utah Sensitive Species for Emery county created May 12, 2006 by the Utah Division of Wildlife Resources (DWR) is shown below. This includes federally listed threatened and endangered species.

<u>Common Name</u>	<u>Scientific name</u>	<u>Status</u>
<u>Jones Cycladenia</u>	<u>Cycladenia humilis var jonesii</u>	<u>T</u>
<u>Maguire Daisy</u>	<u>Erigeron maguire</u>	<u>T</u>
<u>Last Chance Townsendia</u>	<u>Townsendia aprica</u>	<u>T</u>
<u>Barneby Reed-mustard</u>	<u>Schoenocrambe barnebyi</u>	<u>E</u>
<u>San Rafael Cactus</u>	<u>Pediocactus despainii</u>	<u>E</u>
<u>Winkler Pincushion Cactus</u>	<u>Pediocactus winkleri</u>	<u>T</u>
<u>Wright Fishhook Cactus</u>	<u>Sclerocactus srightiae</u>	<u>E</u>
<u>Humpback Chub</u>	<u>Gila cypha</u>	<u>E</u>
<u>Bonytail</u>	<u>Gila elegans</u>	<u>E</u>
<u>Colorado Pikeminnow</u>	<u>Ptychocheilus lucius</u>	<u>E</u>
<u>Razorback Sucker</u>	<u>Xyrauchen texanus</u>	<u>E</u>
<u>Bald Eagle – Breeding</u>	<u>Haliaeetus leucocephalus</u>	<u>T</u>
<u>Mexican Spotted Owl</u>	<u>Strix occidentalis lucida</u>	<u>T</u>
<u>Southwestern Willow Flycatcher</u>	<u>Empidonax traillii extimus</u>	<u>E</u>

A map showing blocks with lists of Utah sensitive species was also downloaded from DWR's web page. (See figure 3-1)

In 2004 C. W. Mining meet with DWR and based on this map it was determined that due to elevation the only possible species of concern for the permit area was the Townsend's Big-eared Bat. DWR also stated that they anticipated the addition of the Flamulated Owl to the threatened and endangered species list in the near future and that it may also be a species of concern.

In order to address these concerns C. W. Mining conducted a bat and owl survey and determined that neither of these species were located in the permit area. The results of this survey can be found in Appendix 3-M



See T&E Species List

Figure 3-1 Utah Sensitive Endangered Mammalian Species in Relation to Permit Area
(created by the Utah Division of Wildlife Resources May 3, 2006)

T & E Species List

Block 1

Bald Eagle (*Haliaeetus leucocephalus*)

Block 2

Northern Goshawk (*Accipiter gentilis*)
Greater Sage-grouse (*Centrocercus urophasianus*)
Canada Lynx (*Lynx canadensis*)

Block 3

American Three Toed Woodpecker (*Picoides dorsalis*)
Townsend's Big-eared Bat (*Corynorhinus townsendii*)
Greater Sage-grouse (*Centrocercus urophasianus*)
Canada Lynx (*Lynx canadensis*)

Block 4

Western Toad (*Bufo boreas*)
Ferruginous Hawk (*Buteo Regalis*)

Block 5

Bonneville Cutthroat Trout (*Oncorhynchus clarkii utah*)
Columbia Spotted Frog (*Rana luteiventris*)
Western Toad (*Bufo boreas*)

Block 6

Northern Goshawk (*Accipiter gentilis*)
Greater Sage-grouse (*Centrocercus urophasianus*)
Canada Lynx (*Lynx canadensis*)

Block 7

Northern Goshawk (*Accipiter gentilis*)
Greater Sage-grouse (*Centrocercus urophasianus*)

Block 8

Ferruginous Hawk (*Buteo Regalis*)

Block 9

Greater Sage-grouse (*Centrocercus urophasianus*)

Block 10

Wright Fishhook Cactus (*Sclerocactus wrightiae*)
Winkler's Pincushion Cactus (*Pediocactus winkleri*)
Bluehead Sucker (*Catostomus discobolus*)
Black-footed Ferret (*Mustela nigripes*)
Bald Eagle (*Haliaeetus leucocephalus*)
Greater Sage-grouse (*Centrocercus urophasianus*)

There are no endangered or threatened species of mammals in the mine plan area, nor are there any in proximity close enough to be considered (~~Figure 3-1~~). Co-Op is committed to notify the Division in the event any T & E species were observed on the permit area, as well as any critical habitat.

Official U.S. Fish and Wildlife Service Section 7 opinions relating to the aquatic resources of Huntington and Eccles Canyon drainages have indicated that no threatened or endangered species of fish or other aquatic organisms have been found in waters upstream of the lowest 2 or 3 mi of the Price or San Rafael rivers. The organisms of Trail Creek, as presently known, are all common and widely distributed throughout streams of Utah. The aquatic organisms of Bear Creek have representatives of several taxonomic classifications that are limited to low quality environs, but none, as far as is presently known, are rare in the intermountain region.

~~One~~ Several species of ~~endangered~~ sensitive raptors, ~~the peregrine falcon,~~ may be found in the mine plan area. Known raptor nest sites within the permit area are shown in [Appendix 3-L](#) and on [Plate 5-3A](#), ~~according to a survey conducted by the Raptor Biologist from the U.S. Fish and Wildlife Service.~~

According to the Utah Division of Wildlife Resources report, there are ~~forty-six~~ fifty-eight current or old raptor nest locations within or near the permit area. The location of the nests are shown on [Plate 5-3A](#) and a description of them and of the raptor surveys is in [Appendix 3-L](#).

No plant species listed as threatened or endangered (U.S. Fish and Wildlife Service, 1982) or proposed for threatened or endangered status (Welsh and Thorne, 1979) was observed on the study area. No plants listed as threatened or endangered are known to occur in the Co-Op permit area (Thompson, personal communication, 1983). The U.S.D.A. Forest Service identified no threatened or endangered plants in their correspondence dated 29 Jan 1991 ([Appendix 3-B](#)). A survey on November 4, 1993 by Robert M. Thompson, USFS Botanist, revealed no threatened or endangered species within the proposed road extension area for the Tank Seam (letter, [Appendix 3-B](#)).

A sensitive species, Canyon Sweetvetch (*Hedysarum Occidental Var Canone*), was identified within and adjacent to the Bear Canyon disturbed area. Populations were found to be high, especially in the areas on Federal Lease U-024316. Information on this species is presented in [Appendix 3-E](#). Locations of these plants are shown on [Plate 3-1](#) and [3E-1](#). And is discussed in [Appendix 3-F](#), populations were also observed within portions of the proposed Wild Horse Ridge disturbed area, and in the lower portion of Fish Creek outside the permit boundary. Where these plants are located, Co-Op will avoid disturbing them to the extent possible during and subsequent to construction.

In order to re-establish the species in this area upon final reclamation, the topsoil stockpile will be seeded with the species to establish a community on the stockpile. This seed will be obtained from the Canyon Sweetvetch communities located in upper Bear Creek, shown on [Plate 3E-1](#). During the season prior to final reclamation, seed will be harvested from the community established on the topsoil pile, as well as from the other communities within Bear

Canyon. These seeds will be incorporated into the seed mix during seeding following the topsoil redistribution.

Link Trail Columbine (*Aquilegia flavescens* Var. *rubicunda*) also classified as a sensitive species, has been found in three locations in Bear Canyon. The first location is in the vicinity of Big Bear Spring. The second location is in the riparian area of the right fork of Bear Canyon, located below spring SBC-14 near the Wild Horse Ridge Coal Storage Bin. The third site is at the confluence of Bear Creek and the right fork of Bear Creek. The third location is the only sight proposed to be disturbed, where two specimens ~~were~~are observed. The plant was also found in the lower portions of Fish Creek below the permit boundary. Where these plants are located, Co-Op will avoid disturbing them to the extent possible during and subsequent to construction.

322.220 Habitats and Areas of High Value

These areas are shown on ~~Plate 3-2~~. The main areas of high value for vegetation are the riparian areas around springs and streams. These areas extend approximately 0-100 ft. from spring sources. They also occur intermittently along a 30 ft. corridor in the right fork of Fish Creek starting at a point 1,637 ft. west and 1,151 south of the northeast corner of section 18 T16S R8E, and extending past the permit boundary.

Due to the depth of overburden no impact to these areas is expected. Since these area are dependent on the springs and streams within them any impacts to them will be the result of loss of water flow. The water monitoring plan outlined in Chapter 7 will catch any impacts to the water flow. If an impact is noticed the land owner and the Division will be consulted and a site specific mitigation plan will be developed. A detailed discussion of subsidence impacts and protection methods is included in Appendix 5C.

Areas of high value for wildlife include deer and elk calving, fawning, and grazing areas, as well as areas of habitat for Black Bears, Bobcats, and Mountain Lions. All information available on these areas are shown on Plates 3-2, 3-3, 3-4, and 3-5. A more detailed discussion of habitats and areas of high value can be found in Appendix 3-I. Appendix 3-K includes a mitigation plan addressing possible impacts to wildlife.

In order to eliminate the potential of coal fines migrating to surface waters, this area was added into the disturbed area boundary in 1992. Runoff will be directed to sediment ponds, see [R645-301-742.300](#). Areas in Bear Canyon surrounding the mine site will be routinely monitored and additional preventative and/or control actions will be taken if additional affected areas are identified.

Waste dumping or other disturbance on undisturbed areas is not permitted. Disturbed area perimeter markers delineate the boundaries of disturbance. Employees are trained not to dump or otherwise disturb areas outside those boundaries.

Renewable vegetative resources exist within the wild Horse Ridge subsidence zone in the form of timber and grasslands which are used for grazing. As discussed in [Appendix 35-C](#), minimal detectable subsidence is expected on the surface. Past experience has shown that tension fractures which result from subsidence are localized and minimal, so these resources should not be impacted. Further discussion is contained in [Appendix 35-C](#).

Mitigating Measures to be Employed to Reduce Impacts on Vegetative Resources

All recontoured areas will be planted and revegetated during the first appropriate season following grading and redistribution of topsoil. This program will include any necessary addition of remedial treatments to the soil. A suitable, permanent and diverse vegetative cover has been selected on the basis of appropriate land management agency requirements and will be established on all reclaimed areas. The schedule of the program is presented in [R645-301-](#)

could increase mortality and reduce reproductive success temporarily, but the effect would be temporary because of the continued survival of the breeding population in contiguous areas and to the high densities of these species.

Birds. Only one species found in the vicinity of the mine permit area is on the endangered species list: ~~The peregrine falcon is not known to nest within the permit area.~~ However, several sensitive species may be present. The Golden Eagle is found on escarpments in and around the permit boundary which is a USFS Management Indicator Species.

Potential impact on bird species would be escarpment failure and loss of riparian habitats. No loss of riparian habitat is expected. Escarpment failure and protection of escarpments and riparian areas inside the affected area are discussed in Appendix 5C. ~~limited to the proposed new construction areas. Impacts, however, should be minor since the areas involved are small and since equivalent habitat is readily available close by.~~ (See Raptor Survey UDWR -- Appendix 3-D).

~~Prior to construction of surface facilities, Co-Op will work with the UDWR in developing a mitigation plan for potential impacts to raptor nest utilization in the vicinity of Wild Horse Ridge.~~

Amphibians. The three amphibians occurring in the permit area occupy similar habitats throughout the region and are unlikely to be affected in any major way by planned activities.

Reptiles. Reptiles found in the permit area are located in many other similar habitats and their populations will not be seriously impacted by planned activities. UDWR personnel will be notified if any denning sites are discovered during mining or construction.

Aquatic Wildlife. Since there are no high quality streams in the surface operation areas, little impact to aquatic wildlife is expected. Huntington Creek, the closest high quality stream to the permit boundary, is located a considerable distance from the surface operation, 1.5 miles. This high quality fishery is protected through Co-Op's Sediment Control Structures (R645-301-742.300).

In addition, Co-Op has agreed that in the event that escarpment failure due to subsidence impacts any raptor nests within the permit area, that Co-Op will notify UDWR and the U.S. Fish and Wildlife Service and take whatever action is recommended in order to mitigate such loss. ~~At this time no raptor nest are at risk due to their absence from all areas of potential impact. Raptor nests will be safeguarded from subsidence by maintaining a min of a 100' barrier to the outcrop.~~ In areas where raptor nest may be impacted C. W. Mining will try to adjust their timing so that these areas will not be undermined during the nesting season. In the event we are unable to do this obstructions such as fencing will be placed over the nest to prevent them from being used. If a nest is lost due to escarpment failure C. W. Mining will get a take permit for the nest and the impact will be mitigated. This mitigated will most likely be replacing the nest with an artificial nest, or expanding on the raptor prey base study included in Appendix 3N.

UDWR authorities will be consulted, in the event a need for pesticides becomes necessary to control rodents or insects during reclamation. No control measures will be used without prior approval by all parties concerned.

In order to mitigate a possible impact to a red tail hawk nest during the WHR construction DWR required C.W. Mining Company performed a Raptor prey base study in 2005. The results of this study are included in Appendix 3N. ~~will require some mitigation for the loss of Big Game Habitat and for the potential loss of raptor nesting during the construction and operation of the facilities. C. W. Mining Company is working with the Division of Wildlife Resources to develop a raptor prey base study and will complete the study in the summer of 2003 for mitigation.~~

In the event that a crack forms that interferes with any migratory paths, C.W. Mining will seal the cracks in a method acceptable to the land owner.

Stream Buffer Zone

Current surface facilities are in the upper reaches of the Bear Creek drainage, which is a tributary of Huntington Creek drainage. Appropriate sedimentation ponds have been constructed. This coupled with coal pile drainage ditches, clear water diversion, water bars, and wind erosion control measures within the permit area disturbed areas, will assure protection from mining impact of aquatic resources far downstream from the mine. Thus, no aquatic biological community determinations have been made relative to surface activities. Stream buffer zones are established along Bear Creek as determined by DOGM to insure protection of the stream channel. Stream buffer zone signs are in place at approximately 200 foot intervals along Bear Creek.

FISH AND WILDLIFE MONITORING

Bear Creek does not warrant a biological or habitat monitoring effort since it is naturally of poor quality. Water quality will be monitored as outlined in R645-301-731.200. Data collected will be correlated with water quality and hydrology measurements discussed in R645-301-731.200. If subsidence should become evident in the drainage area that contributes to Bear Creek or Fish Creek, monitoring of aquatic macroinvertebrates and habitat changes will be instated using approved methodology to collect data as the base for impact evaluation. Plate 7-4 shows all water monitoring sites used to determine impacts to flows and watersheds.

Co-Op has monitored all existing power transmission lines in order to determine use by raptors. No use was observed, Co-Op will take all necessary measures to ensure the poles and/or

R645-301-523 Mining Method

Mining at the Bear Canyon complex is done by a longwall and continuous miners. ~~The miners discharge into shuttle cars, which carry the coal to the feeder breaker. The feeder breaker discharges the coal onto the belt conveyor where it is taken out of the mine.~~ The main entries consist of a five-entry system on 80 ft -200 ft centers to be driven to the property limits. For longwall recovery 2-5 gate entries are driven off the mains on either side of the panel to the head of the panel where they are connected by bleeders. The longwall then mines out the panel. For continuous miner recover sub-mains consisting of five entries on 80 ft - 200 ft centers are then driven off the mains and room-and-pillar panels are developed off the sub-mains. Rooms are developed within the panels on 70 ft - 150 ft centers. This is referred to as "Development". The pillars are then recovered according to the approved plan. This is referred to as "retreat". Timber or mobile roof supports are installed to support the roof and provide for breaker control of the caving roof. Retreat mining of this type will provide a recovery of 70pct - 80 pct within the panels. See Figures 5-1 and 5-2. Sub-mains under the escarpment area in Bear Canyon will be developed and left.

Anticipated average annual production is 2,100,000 Tons from the longwall face and 400,000 Tons from development mining. Before the longwall face comes on line and after it is finished some room and pillar retreat mining will be done. The average annual production from room and pillar retreat mining is 600,000 Tons.

As can be seen on Plates 5-1A and 5-1B, the lower seam workings are planned to be columnized with the upper seams as closely as practicable. Where this is not practiced due to geologic conditions, pillars will be adequately sized to afford stability for the rooms. Geologic conditions and the limited lateral extent of reserves in the Tank Seam precludes columnizing of pillars with the other seams in some areas. However, experience has shown that the overburden (250') between these seams will provide adequate roof stability even if the pillars are not all columnized. The mining plan sequence allows for recovery of the upper seam areas (Tank Seam first, then Blind Canyon Seam) prior to final recovery of the lower seam. This procedure is consistent with accepted engineering practice in multiple seam mining.

Protection of Natural Surface Structures & Streams

~~C. W. Mining's commitment to maintain a min of 200 ft barrier pillars to outcrops where required by lease stipulations, or protection of streams and wildlife to minimize the possibility of escarpment failure and resulting detrimental impacts to down stream water quality or nesting raptor. Submains under the escarpment area in Bear Canyon will be left unless otherwise approved, no retreat mining will take place under the escarpment areas, which are outside of the potential subsidence zones shown on Plate 5-3.~~ The primary natural structures that need protection are escarpments and streams. Escarpment locations are shown on Plate 5-3 and 5-3A, and a discussion of their protection is included in Appendix 5C. The only stream channels which lies over the minable portion of the permit area is Bear Creek, where it flows through Federal Lease U-024316, and Fish Creek where it flows through a portion of Federal Lease U-61049 and private property. See Appendix 5-C for an explanation of the protection zone delineation and method of protection. Adequate barrier zones will be left to protect adjacent stream channels, such as Bear Creek. Downstream channels are protected from disturbed area runoff contamination by utilization of sediment ponds. Temporary sediment controls i.e.; silt fences, straw bail dikes, etc. will be installed and vegetation will be reestablished as required in the event of impacts by escarpment failure.

In areas where coal burn exists the burning of the coal as caused natural subsidence causing failure of some natural structures. A barrier left adjacent to these areas would cause an interruption between the natural and man made subsidence creating greater impacts to the surface. Because of this no barrier will be left in these areas unless it is needed for roof stability or temperature considerations, in which cause the minimum possible size will be used.

SUBSIDENCE CONTROL AND MONITORING PLAN

SUBSIDENCE

Subsidence can normally be expected to occur over areas where second mining has taken place (~~pillaring~~). See R645-301-523 for mining operation. Based on the geologic interruptions within a mine, subsidence becomes very difficult to predict, due to the variable nature of the mining panels. However, Figure 5C-1 will give an estimate of the maximum subsidence from room and pillar mining that may be expected in mine studied in the Western U.S. Maximum subsidence for an average room and pillar panel in the Bear Canyon Mine has been estimated from Figure 5C-1, using the criteria shown in Table 5C-1. For longwall panels, due to their ability to uniformly remove the coal, subsidence predictions are more accurate and there is less surface impacts. An analysis of subsidence effects from longwall mining specific to the Bear Canyon Mine reserves in the Tank seam and Hiawatha seam is included as Attachment 3. Attachment 3 mentions additional reserves, these reserves are located in the Blind Canyon. The cumulative affects of subsidence, based on Attachment 3 for the Tank and Hiawatha seams, and Attachment 1 for the Blind Canyon seam, is shown on Plate 5-3. Subsidence has been estimated based on the number of seams mined in the area and assuming the worst case scenario for mine layout and barrier pillar sizing.

For all subsidence calculations, and in determining the affected area an angle of draw of 22.5° was used. Past experience in this area shows no indication that subsidence

would be this drastic, historically mines in the area have experienced an angle of draw of
B.C. 5C-3 01/28/2005

going across the width of the panel (points 25A-K) in order to determine if subsidence is following the predicted pattern. Potential points were also selected above the 2nd and 3rd longwall panels and will continue to be selected above each of the panels one year prior to mining at a spacing of 250 ft as recommended in Attachment 3. The actual spacing and location of these points may change based on the results from points 24A-K, and on the yearly analysis that will be performed. If subsidence occurs as anticipated the spacing of 250 ft will continue. If it does not additional points will be added to determine the behavior, and our subsidence model will be updated. At a minimum 1 point will be placed in each panel as near as possible to the latitudinal and longitudinal centers.

Stations shall be monitored, and evaluated yearly for changes in elevation. This evaluation will include the current year and the previous two years at a minimum. In addition, a field investigation shall be made yearly of the mining area (including escarpment areas), and any obvious subsidence or mine related surface effects will be noted and located on a map. A copy of the results of the subsidence analysis, survey and map will be available for inspection at the office, and a summary of the ~~survey~~ results will be sent to the Division with the Annual Report.

MITIGATION/PROTECTION OF POTENTIAL IMPACTS

~~_____ .11.20025 Potential impacts and mitigation efforts are discussed in R645-301-5~~
Mr. Larry Dalton, Resource Analyst Utah Division of Wildlife Resources and the State's foremost authority on potential impacts of subsidence on wildlife, inspected the site in June 1984. The results of that investigation, as well as others, in part are as follows:

Considering the absence of spring, water sources, the negative potential impacts of subsidence within the Bear Canyon Permit Area could easily be offset by potential positive aspects.

On the negative side: Loss of riparian area and/or water sources and state appropriated water rights is of greatest concern, followed by loss of vegetation from methane gas leaking to the surface from an underground works. Considering the lack of riparian area or water sources above the coal seam, this concern is not warranted for most areas. There are two area of concern above Fish Creek in section 19 as shown on Plate 7-4. These areas will be monitored for loss of water as it is being undermined. Secondly, In regards to methane gas Co-Op has never encountered methane gas underground so there is little concern relative to potential vegetation loss. ~~and last,~~ The last concern is the loss of nests due to escarpment failure.

On the positive side: The tension fractures resulting from subsidence along the steep side hills are frequently utilized by big game as movement corridors. The fractures and rubble provide escape cover for a variety of wildlife species as well as additional habitat for burrowing and denning animals. While there is concern over the potential loss of nests as a result of escarpment failure, there is also a potential for additional nesting sites to be created through this gravitational shearing of escarpment surfaces.

PROTECTION

In order to protect water resources and state appropriated water rights from impacts C. W. Mining has designed their mine layout so that areas where these resources

exist with less than 900 feet of overburden between the resource and the coal, the resource will be outside of the affected area. Based on the mining handbook¹ and past history, 900 feet of overburden is sufficient to prevent adverse affects to the resource. Additionally in the areas where perennial streams exist above the affected area (as shown on Plate 7-4) C. W. Mining will increase the monitoring of these areas to a weekly bases one month prior to mining in the area. This weekly monitoring will continue until one month after mining has left the area. Monitoring will then be reduced to once a month for an additional 6 months at which time it will resume its normal schedule. This increased monitoring will include the sites FC-2, FC-3, FC-4, FC-5, and SCC-2 for the right fork of Fish Creek, and FC-1, FC-6, SBC-18, SBC-20, and SBC-21 for the left fork of Fish Creek. (¹ Lowrie, Raymond L., ed. 2002 "SME Mining Reference Handbook" pp. 256)

In escarpment failure areas containing raptor nests C. W. Mining will try to time their mining so that it does not occur during the nesting season. If we are unable to do this a physical obstruction such as fencing will be placed over the nesting site to prevent it's use. This would ensure that if a nest was lost no raptors would be lost with it. As of 2005 there were currently 6 raptor nest located inside the affected area. These area discussed in greater detail in Appendix 3L. Anticipated escarpment failure is discussed in greater detail under the applicable lease.

Outcrop protection has been increased to a minimum of 200 feet in this area ~~the plan~~ (see ~~R645-301-525-300~~). This is consistent with other mines in the Wasatch Plateau, and with the exception of some longwall operations, has been shown to be effective at preventing escarpment failure near outcrops.

U-38727, U-61048, U-61049, and U-020668

As with Federal Lease U-024316, lease stipulation 13+2 requires mining to be conducted in a manner to prevent hazardous conditions such as potential escarpment failure.

The uppermost escarpment in the Wild Horse Ridge area is the Castlegate sandstone, located approximately 800 ft. above the Tank Seam, and 950 ft. Above the Blind Canyon Seam.

To prevent subsidence to these escarpments in areas where it has been determined escarpment failure would be a hazardous condition, a barrier zone will be left in which no retreat mining will take place. The width of this barrier was determined using an angle of draw of 22.5° (See Figure 5C-2 and attachment 2).

~~or the Tank Seam a minimum barrier of 300' will be maintained in which no retreat mining will take place. For the Blind Canyon Seam, a minimum barrier of 370 feet will be maintained.~~ Plate 5-3 shows the cumulative anticipated zone which will be affected by subsidence contours, and the Castlegate Sandstone, located ~~outside of this area.~~ within the permit area. ~~This zone is also~~ Individual seam subsidence contours are shown on Plates 5-1A, 5-1B, and 5-1C to show the relationship between the development and retreat panels. ~~Therefore, this pillar size will be adequate to prevent subsidence and escarpment failure. Mining on Federal Lease U-024316 has also confirmed that this size is adequate in the Bear Canyon Mine area. for room and pillar retreat mining here~~

~~panels are shown encroaching on the barrier zone, pillars will be developed and left in place to prevent subsidence. The pillars will be developed on 80' centers minimum. Using the ARMPS software (NIOSH), a minimum pillar stability factor of 1.58 was determined~~

There are two areas within these leases and a third area just outside of the leases where it has been determined that escarpment failure does not present a hazardous condition. The locations of the areas are in the left fork of Fish Creek where it runs through lease U-020668, and U-38782, as well as an area at the top of the left fork of Fish Creek just outside of two portions of lease U-61049, and in the left fork of Bear Creek where it runs through lease U-61049. These areas as well as additional areas of been studied and modeled for rock falls. This study is included as Attachment 2. A summary and discussion of these results are included below. The cross-sections modeled for rock falls are shown on Plate 5-3.

Summary of Rock Fall Analysis

<u>Section</u>	<u>Distance to Stream Bed</u>	<u>Maximum Rockfall Distance</u>
<u>A-A'</u>	<u>2,050 ft.</u>	<u>800 ft.</u>
<u>B-B'</u>	<u>1,674 ft.</u>	<u>1,200 ft.</u>
<u>C-C'</u>	<u>2,600 ft.</u>	<u>950 ft.</u>
<u>D-D'</u>	<u>1,980 ft.</u>	<u>650 ft.</u>
<u>E-E'</u>	<u>450 ft.</u>	<u>450 ft. (rock hits bottom of canyon)</u>

Section A-A'

This area is located above the old Bear Canyon #1 and #2 mines. It was used to calibrate the model

Section B-B'

This section is located on the point of Wild Horse Ridge. It was initially selected because it represented the steepest slope within the affected area. However as mining proceeded towards this area it was discovered that there was active burning so mining stopped and never reached this area. This area will however be impacted by natural subsidence resulting from the natural burning of the coal.

Section C-C'

This section is located on Wild Horse Ridge against the left fork of Fish Creek near the south-east end of U-38727. It was selected because secondary mining will take place under this area and also go out past the escarpments. The escarpments in this area range from 0-80 feet. The cross-section was placed where escarpments were the largest and the slope was the steepest. Escarpment failure will occur in this section, however based on models, the failure will not reach the stream channel so no water impacts will occur. There will however be loss of vegetation in the path of the rock fall. This will have minimal aesthetic impacts since there is little vegetation along the slope and also because escarpment failure happens naturally along Fish Creek so any areas would still match the appearance of surrounding areas.

Section D-D'

This section is located on Wild Horse Ridge against the left fork of Fish Creek near the north-east end of U-38727. This section represents the transition area where subsidence contours are beginning to move from under the escarpments to adjacent to the

escarpments, and then away from the escarpments. The escarpments in this area range from 80-160 feet. Any escarpment failure in this area will not reach the stream channel so impacts are the same as section C-C'.

Section E-E'

This area is at the upper portion of the right fork of Fish Creek between the two segments of Lease U-61049. Fish Creek is a box canyon and the escarpments in the area that will be impacted are the stream bed. The escarpments range from 160-240 feet. Since the escarpments are the stream bed any escarpment failure would have an impact on water resources. However the impacts would be quickly dissipated since flow are minimal in this area (10-30 gpm). Little vegetation impact is expected because of the short slope distance and the fact that water has eroded most of the soil in the area leaving exposed rock ledges.

References

Mark, C., and F.E. Chase
Analysis of Retreat Mining Pillar Stability (ARMPS). Paper in
Proceedings on New Technology for Ground Control In Retreat Mining, 1997,
NIOSH pub. 97-133, pp. 17-34.

and to ensure that no impacts occur. Springs above the mine will be monitored for field parameters, since the potential for impact to these springs is quantity rather than quality. SBC-9A and SBC-4 will be monitored for lead quality.

Groundwater monitoring will follow the ground water sampling guidelines as shown in Table 7-12 using the water quality parameter list in Table 7-13. These tables follow the recommendations presented in Appendix 7-J. New significant occurrences within the present permit area will be promptly included in the sampling program, as specified by state requirements. Operational ground water monitoring will continue through reclamation to Bond Release.

The sampling matrix for each of the existing monitoring stations during the operational phase of mining is included in Table 7-14. ~~No baseline data is available for SBC-17, but will be collected in 2000 and 2001, prior to mining occurring within the vicinity of this spring.~~ Baseline samples were collected for SBC-14, SBC-15, SBC-16, SBC-17, MW-114 and MW-117 in 2001. Three years of baseline will be collected on all additional sites added after 2001.

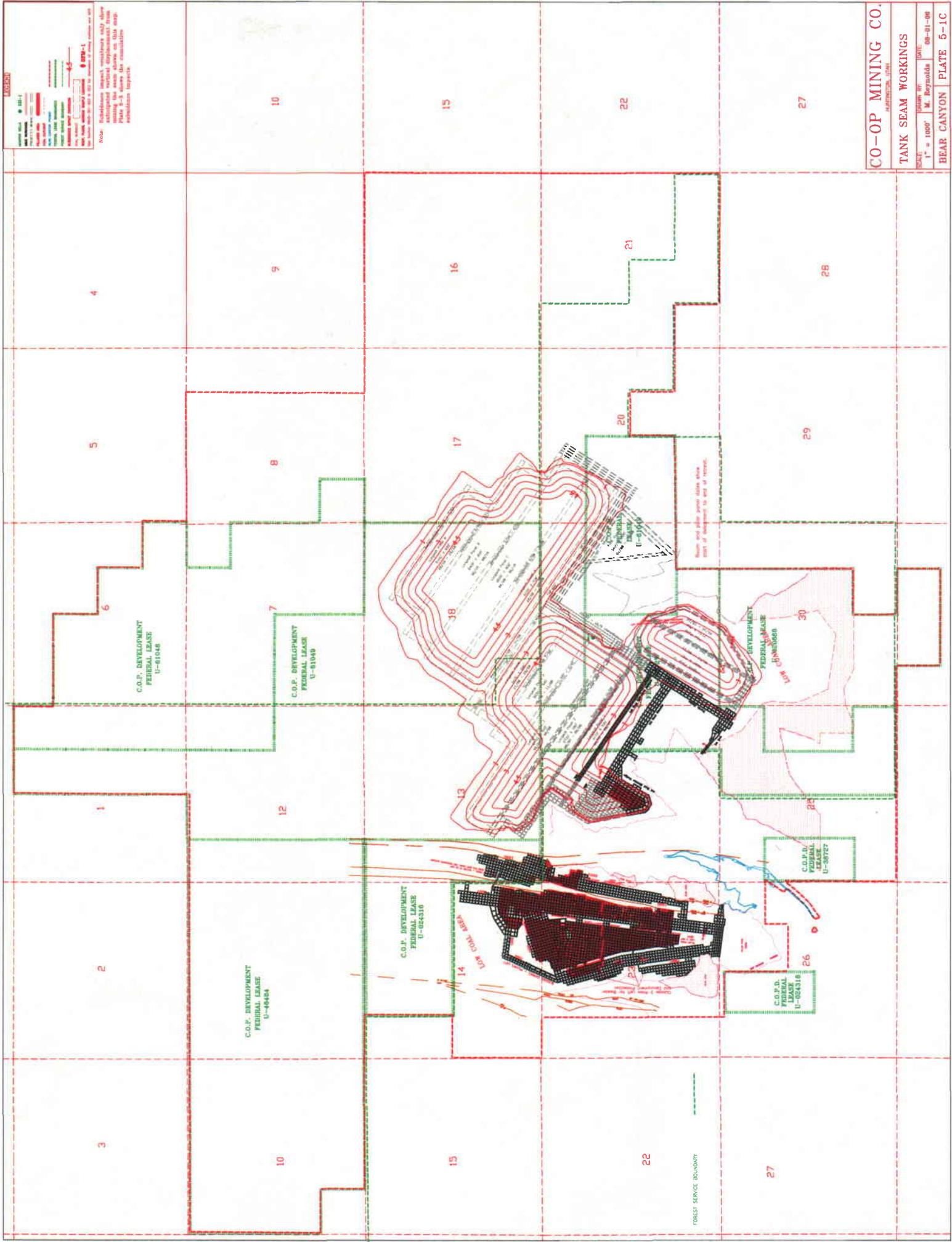
Temporary Drill Hole Seals. Within 30 days of completion, drill holes utilized for groundwater monitoring will be sealed in a nonpermanent fashion by installing PVC surface casing with a threaded cap for access.

Annual Report. An Annual Report evaluating all data collected for the year will be submitted to DOGM as required.

Table 7-14 Water Monitoring Matrix: Operational Phase of Mining

Location	Jan	Feb	Mar	Apr	May	June	July	Aug ³	Sept	Oct	Nov	Dec
Streams												
BC-1 (Upper Bear Creek)		oper			oper	field	field	oper.	field	oper		
BC-2 (Lower Bear Creek)		oper			oper	field	field	oper.	field	oper		
BC-3 (Lower Rt Fork Bear Creek)		oper			oper	field	field	oper.	field	oper		
BC-4 (Upper Rt Fk. Bear Creek)		oper			oper.	field	field	oper.	field	oper		
CK-1 (Upper Cedar Creek)		oper			oper.	field	field	oper.	field	oper		
CK-2 (Lower Cedar Creek)		oper			oper.	field	field	oper.	field	oper		
MH-1 (McCadden Hollow Creek)					field ⁵		field	field		field		
FC-1 (Lower Left Fork Fish Creek) ⁷					field ⁵		field	field		field		
FC-2 (Lower Right Fork Fish Creek) ⁷					field ⁵		field	field		field		
FC-3 (Right Fork Fish Creek Property Line) ⁷					field ⁵		field	field		field		
FC-4 (Upper Right Fork Fish Creek) ⁷					field ⁵		field	field		field		
FC-5 (Mud Spring) ⁷					field ⁵		field	field		field		
FC-6 (Upper Left Fork Fish Creek) ⁷					field ⁵		field	field		field		
FC-7 (Water Right Upper LF FC)					field ⁵		field	field		field		
FC-8 (Water Right Upper LF FC)					field ⁵		field	field		field		
Springs												
SBC-3 (Creek Well)		oper			oper			oper.		oper		
SBC-4 (Big Bear Springs) ⁴		oper			oper			oper.		oper		
SBC-5 (Birch Spring) ⁴		oper			oper.			oper.		oper		
SBC-9A (Hiawatha Seam)		oper			oper			oper		oper		
SBC-12 (16-7-13-1)					field. ⁵		field	field		field		
SBC-14 (WHR-6)		oper			oper.			oper.		oper		
SBC-15 (WHR-5)					field ⁵		field	field		field		
SBC-16 (WHR-4) ⁶					field ⁵		field	field		field		
SBC-16A					field ⁵		field	field		field		
SBC-16B					field ⁵		field	field		field		
SBC-17 (16-7-24-4)		oper			oper.			oper.		oper		
SBC-18 (WHR-2) ⁷					field ⁵		field	field		field		
SBC-20 (16-18-16-4) ⁷					field ⁵		field	field		field		
SBC-21 (16-18-29-1) ⁷					field ⁵		field	field		field		
SBC-22 (Stockwater Trough)					field ⁵		field	field		field		
SCC-1 (16-8-20-1)					field ⁵		field	field		field		
SCC-2 (16-8-15-5) ⁷					field ⁵		field	field		field		
SCC-3 (Mohrland Portal)					field ⁵		field	field		field		
SCC-5 (16-8-7-3)					field ⁵		field	field		field		
SMH-1 (FBC-6)					field. ⁵		field	field		field		
SMH-2 (FBC-5)					field ⁵		field	field		field		
SMH-3 (FBC-13)					field. ⁵		field	field		field		
SMH-4 (FBC-4)					field ⁵		field	field		field		
SMH-5 (Stockwater Trough)					field ⁵		field	field		field		
Wells												
SDH-2 (Well, Sec. 11, T16S, R7E)					level ⁵		level	level	level	level		
SDH-3 (Well, Sec. 10, T16S, R7E)					level ⁵		level	level	level	level		
MW-114 (Well, Sec 18, T16S, R8E)					level ⁵		level	level	level	level		
MW-117 (Well, Sec 12, T16S, R8E)					level ⁵		level	level	level	level		

- Notes:
1. See Tables 7-13 and 7-17 for listing of water quality monitoring parameters.
 2. oper. = operational base. = baseline
 3. Baseline parameters taken in August of year 5 prior to each permit renewal.
 4. SBC-4 and SBC-5 shall also be tested for oil and grease.
 5. First sample to be taken in May or June, when Gentry Mountain is accessible.
 6. A comment will be made regarding the level of the pond feeding the spring
 7. Monitoring to be done weekly while undermining and one month prior and one month after, then monthly for 6 months



CO-OP MINING CO.
 INCORPORATED, 1941

TANK SEAM WORKINGS

SCALE: 1" = 1000'
 DRAWN BY: M. Reynolds
 DATE: 08-31-06

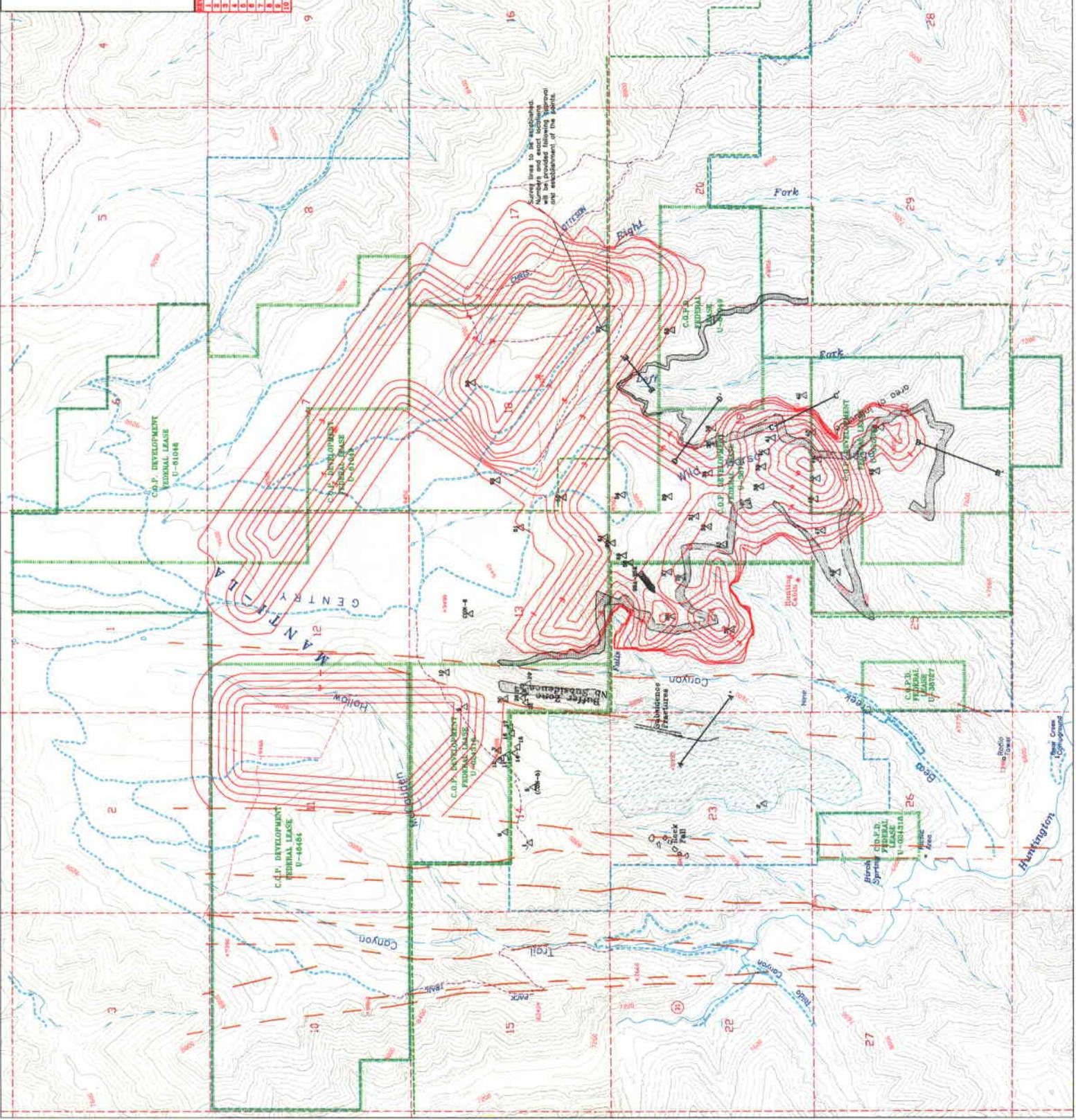
BEAR CANYON PLATE 5-1C

LEGEND

- BEAR CANYON TRAIL
- FEDERAL LEASE BOUNDARIES
- FOREST SERVICE BOUNDARY
- SUBSIDENCE STATION
- SECTION LINE
- SUBSIDENCE MINE CONTOURS
- EQUIPMENT LOCATION
- FAULT LINE

THIS PLATE SHOWS COMPUTED SUBSIDENCE FROM ALL DATA FOR PLATES 5-1 FOR DEVELOPMENT AREA SUBSIDENCE CONTOURS AND PLATE 5-2 FOR DEVELOPMENT AREA SUBSIDENCE CONTOURS. SEE APPENDIX E-C FOR SUBSIDENCE DATA.

DATE	DESCRIPTION	BY
1-1-58	Initial Area 1 Data, Map Area Expanded (4-1)	J.C.R.
1-1-58	Initial Area 2 Data, Map Area Expanded (4-2)	J.C.R.
1-1-58	Initial Area 3 Data, Map Area Expanded (4-3)	J.C.R.
1-1-58	Initial Area 4 Data, Map Area Expanded (4-4)	J.C.R.
1-1-58	Initial Area 5 Data, Map Area Expanded (4-5)	J.C.R.
1-1-58	Initial Area 6 Data, Map Area Expanded (4-6)	J.C.R.
1-1-58	Initial Area 7 Data, Map Area Expanded (4-7)	J.C.R.
1-1-58	Initial Area 8 Data, Map Area Expanded (4-8)	J.C.R.
1-1-58	Initial Area 9 Data, Map Area Expanded (4-9)	J.C.R.
1-1-58	Initial Area 10 Data, Map Area Expanded (4-10)	J.C.R.
1-1-58	Initial Area 11 Data, Map Area Expanded (4-11)	J.C.R.
1-1-58	Initial Area 12 Data, Map Area Expanded (4-12)	J.C.R.
1-1-58	Initial Area 13 Data, Map Area Expanded (4-13)	J.C.R.
1-1-58	Initial Area 14 Data, Map Area Expanded (4-14)	J.C.R.
1-1-58	Initial Area 15 Data, Map Area Expanded (4-15)	J.C.R.
1-1-58	Initial Area 16 Data, Map Area Expanded (4-16)	J.C.R.
1-1-58	Initial Area 17 Data, Map Area Expanded (4-17)	J.C.R.
1-1-58	Initial Area 18 Data, Map Area Expanded (4-18)	J.C.R.
1-1-58	Initial Area 19 Data, Map Area Expanded (4-19)	J.C.R.
1-1-58	Initial Area 20 Data, Map Area Expanded (4-20)	J.C.R.
1-1-58	Initial Area 21 Data, Map Area Expanded (4-21)	J.C.R.
1-1-58	Initial Area 22 Data, Map Area Expanded (4-22)	J.C.R.
1-1-58	Initial Area 23 Data, Map Area Expanded (4-23)	J.C.R.
1-1-58	Initial Area 24 Data, Map Area Expanded (4-24)	J.C.R.
1-1-58	Initial Area 25 Data, Map Area Expanded (4-25)	J.C.R.
1-1-58	Initial Area 26 Data, Map Area Expanded (4-26)	J.C.R.
1-1-58	Initial Area 27 Data, Map Area Expanded (4-27)	J.C.R.
1-1-58	Initial Area 28 Data, Map Area Expanded (4-28)	J.C.R.
1-1-58	Initial Area 29 Data, Map Area Expanded (4-29)	J.C.R.
1-1-58	Initial Area 30 Data, Map Area Expanded (4-30)	J.C.R.



CO-OP MINING CO.
HARRINGTON, IOWA

SUBSIDENCE MAP

SCALE: 1" = 1000'

DATE: 07-11-09

BY: C. Reynolds

BEAR CANYON PLATE 5-3

- LEGEND**
- FOREST SERVICE BOUNDARY
 - SEAN COOPER FEDERAL
 - FEDERAL LEASE BOUNDARIES
 - UNDEVELOPED AREA
 - WATER RIGHTS SECTION
 - SECTION LINE
 - CHUCK SECTION
 - PAINT LINE
 - MINERAL COAL SEAM OUTLINE
 - THICK COAL SEAM OUTLINE

REV	DATE	REVISIONS	APPROV
1	11/10/08	Initial Issue/Rev. Address	
2			
3			
4			
5			
6			
7			
8			
9			
10			

CO-OP MINING CO.
 INDEPENDENT, USA

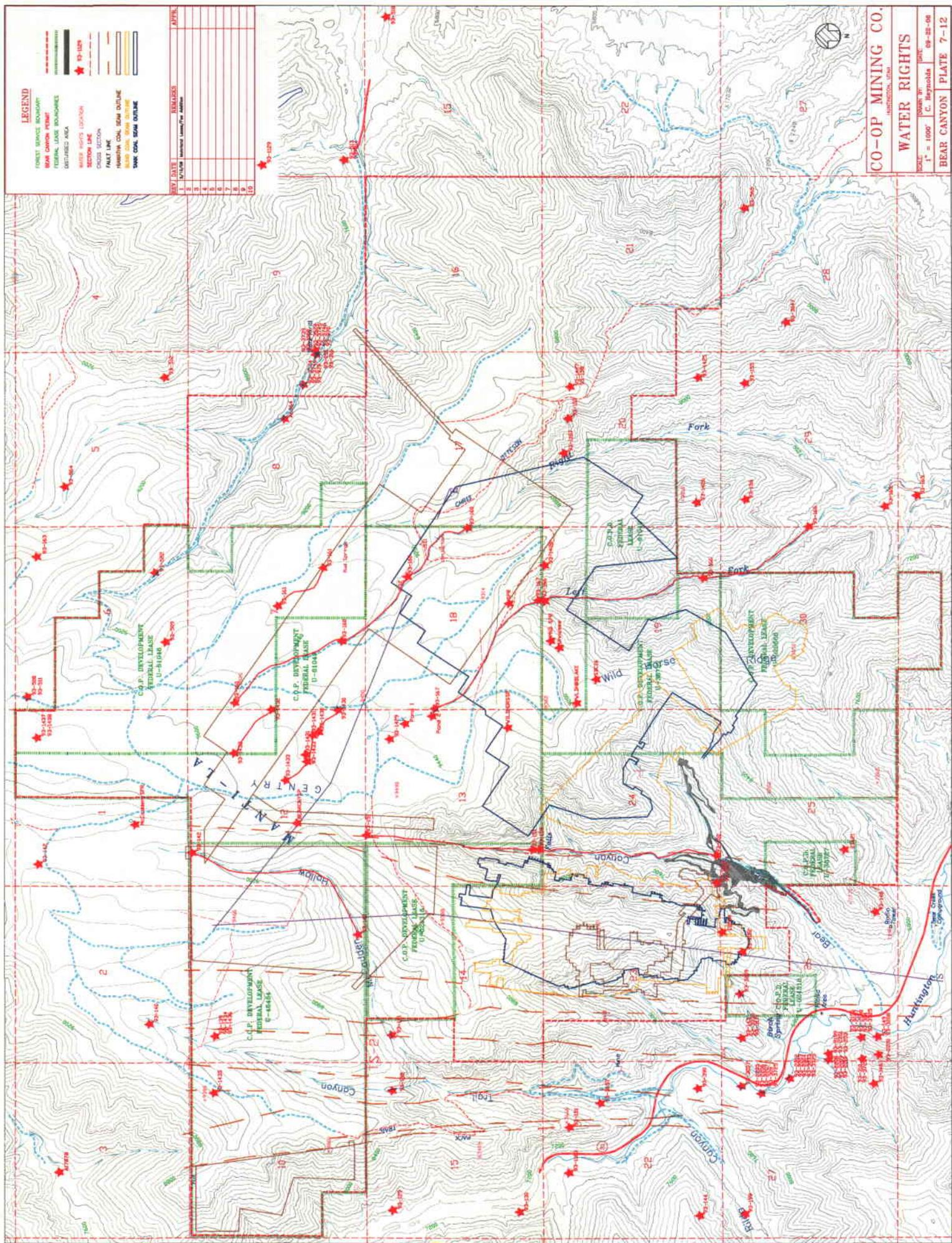
WATER RIGHTS

SCALE: 1" = 1000'

DATE: 08-28-06

BY: C. Reynolds

BEAR CANYON PLATE 7-12



TW 07 08