85-2-311. Criteria for issuance of permit.

(1) DNRC shall issue permit if the following criteria are met:

(a) (i) water is physically available at the POD; and
(ii) water is legally available:
(A) water is physically available;
(B) legal demands on water in affected area; and
(C) compare (A) and (B).

(b) no adverse affect. Use can be controlled (satisfy call);

(c) means of diversion, construction, and operation are adequate;

(d) use of water is a beneficial use;

(e) possessory interest in property where use will occur;

85-2-311. Criteria for issuance of permit (cont.)

(2) If valid 'at quality objection filed:

(f) water qu lity of prior appropriators;

(g) use in accordance with the classification of supply water; and

(h) effluent limitations of dischargers not adversely affected.

(5) Subject to 85-2-360, applicant shall submit hydrologic evidence:

- water supply data,
- field reports,
- information from applicant, DNRC, USGS., NRCS and other studies (MBMG).

85-2-311. Criteria for issuance of permit (cont.)

(8) Ground water in closed basin, shall comply with 85-2-360 also.

Closed Basins, statutory:

85-2-330: Teton River Basin
85-2-336: Upper Clark Fork River Basin
(Clark Fork and Blackfoot above confluence)
85-2-341: Jefferson and Madison River Basins
85-2-343: Upper Missouri River Basin (above Morony Dam)
85-2-344: Bitterroot River Basin

Closed Basins, administrative pursuant to 85-2-319:

Grant Creek Basin (Clark Fork River)
Rock Creek Basin (Yellowstone River)
Walker Creek Basin (Whitefish River)
Towhead Gulch Basin (Upper Missouri)
Musselshell River Basin
Sharrot Creek Basin (Bitterroot River)
Willow Creek Basin (Bitterroot River)
Truman Creek Basin (Ashley Creek)
Sixmile Creek Basin (Clark Fork River)
Houle Creek Basin (Clark Fork River)
Mainstem of Milk River
Southern Tributaries of Milk River

Effectively closed by DNRC Decision:

Lower Clark Fork River below Flathead River confluence

85-2-311. Criteria for issuance of permit (cont.)

85-2-360. Ground water appropriation right in closed basins.

(1) Hydrogeologic assessment: net depletion of surface water?

(3) If net depletion of surface water, adverse effect?

(4) If net depletion, shall comply with 85-2-362.

85-2-311. Criteria for issuance of permit (cont.)

85-2-361. Hydrogeologic assessment -- definition -- minimum requirements.

(1) "hydrogeologic assessment"

- geology,
- hydrogeologic environment,
- water quality, predicted net depletion
- timing of any net depletion

(2) (a) Hydrogeologic data or a model:

(i) the area of ground water that will be affected

(ii) the geology of the area

(iii) the aquifer parameters:

(A) lateral and vertical extent of the aquifer;
(B) confined or unconfined;
(C) hydraulic conductivity;
(D) transmissivity and storage coefficient; and
(E) flow direction and rate of movement of ground water;

(iv) locations of surface water within affected

(v) water availability; and

(vi) locations of all wells or other ground water source within affected area

85-2-311. Criteria for issuance of permit (cont.)

85-2-362. Aquifer recharge or mitigation plan

(1) If net depletion of surface water:

- mitigation plan, or
- aquifer recharge plan.

85-2-363. Combined Application

(1) combined application:

Permit Application and mitigation plan (Change Application) submitted jointly.

85-2-311. Criteria for issuance of permit (cont.)

85-2-361. Hydrogeologic assessment -- definition -- minimum requirements.

(1) "hydrogeologic assessment"

- geology,
- hydrogeologic environment,
- water quality, predicted net depletion
- timing of any net depletion

(2) (a) Hydrogeologic data or a model:

(i) the area of ground water that will be affected

(ii) the geology of the area

(iii) the aquifer parameters:

(A) lateral and vertical extent of the aquifer;
(B) confined or unconfined;
(C) hydraulic conductivity;
(D) transmissivity and storage coefficient; and
(E) flow direction and rate of movement of ground water;

(iv) locations of surface water within affected

(v) water availability; and

(vi) locations of all wells or other ground water source within affected area

85-2-311. Criteria for issuance of permit (cont.)

85-2-362. Aquifer recharge or mitigation plan

(1) If net depletion of surface water:

- mitigation plan, or
- aquifer recharge plan.

85-2-363. Combined Application

(1) combined application:

Permit Application and mitigation plan (Change Application) submitted jointly.

PUBLIC WATER SUPPLY WELLS APPLICATION FOR BENEFICIAL WATER USE PERMIT-SUPPLEMENTAL SHOW CAUSE ANALYSES

Buffalo Mountain Public Water System Phase I, II and III

Prepared for:

BUFFALO MOUNTAIN LLC
P.O. Box 4848
Whitefish, MT 59937

Prepared by:

PBSJ
206 Lupfer Avenue
Whitefish, MT 59937

March 2009

Project No. 0B3151200

CONTENTS

Page

1.0 INTRODUCTION 3

2.0 PHYSICAL SETTING SUMMARY 5
- 2.1 Pumping Test Summary 5
- 2.2 Geology 8

3.0 CRITERIA ADDENDUM 11
- 3.1 Physical Availability 11
- 3.2 Legal Availability 14
- 3.3 Adverse Effect to Senior Users 17
  - 3.3.1 Potential Adverse Effect to Groundwater 17
  - 3.3.2 Potential Adverse Effect to Surface Water: Stream Depletion Estimates 17
- 3.4 Beneficial Use 19
- 3.5 Conclusions 20

4.0 REFERENCES 22

APPENDICES

APPENDIX A – Well Logs
APPENDIX B – Zone of Influence Modeling
APPENDIX C – Groundwater Impacts and Water Rights Within Zone of Influence
APPENDIX D – Stream Depletion Modeling
APPENDIX E – Surface Water Rights

TABLES

Table 1-1. Well Construction Summary 3
Table 2-1. Buffalo Mountain Pumping Test Chronology 5
Table 2-2. Summary of Aquifer Parameters 6
Table 3-1. Summary of Predicted Impacts to Existing Groundwater Users 17
Table 3-2. Ashley Creek Flow Data 19

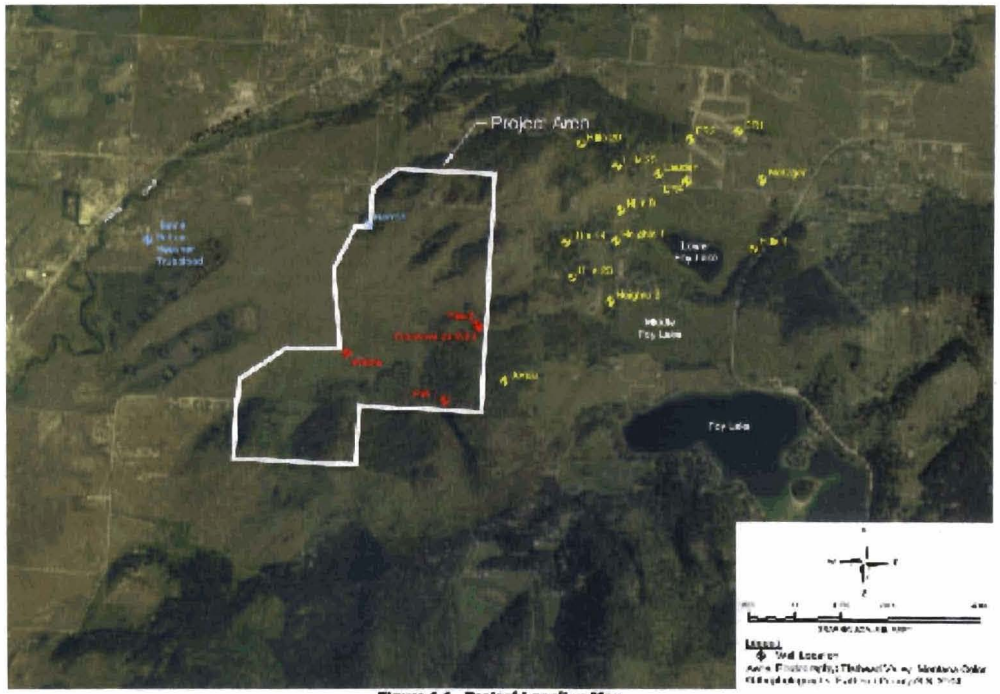

Figure 1-1. Project Location Map

2.2 Geology

A map of the surficial geology from the *Beneficial Use Application* is shown on **Figure 2-2**. The map shows that the two Buffalo Mountain wells are in close proximity to a northwest-southeast trending fault. It was suggested in the application that fracturing associated with this fault is the reason why the two Buffalo Mountain wells have relatively high yields.

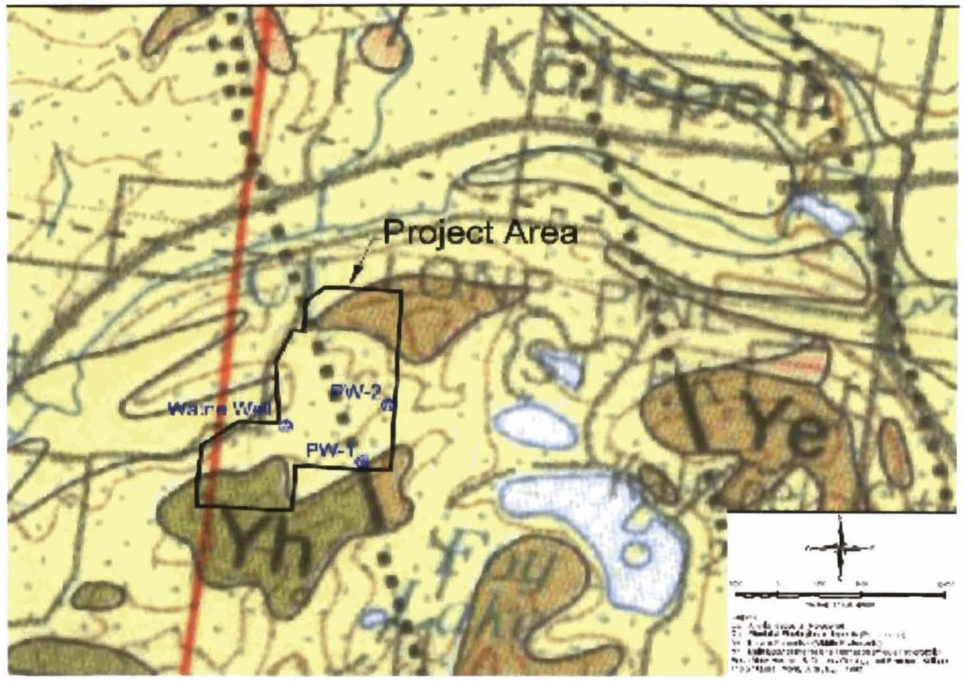

Figure 2-2. Geologic Map

Cross-sections have been developed to illustrate the vertical geology (**Figure 2-3 and Figure 2-4**). At the time the *Beneficial Use Application* was submitted a log was not available for the Watne well and it was believed to be completed in the shallow unconfined aquifer. As it turns out, a log is now available (include in **Appendix A**) which indicates the well is completed in the deep confined fractured bedrock unit.

The cross-sections show that to the west of the Watne well in the valley occupied by Ashley Creek the unconsolidated material thickens. The unconsolidated zone is characterized by a thick layer of till extending from the surface to 90-140 ft deep (see logs in **Appendix A**). Below the till are water bearing sands under confined conditions that may be hydraulically connected to the deep fractured bedrock aquifer. The till serves to isolate deeper units from surface water which is evident by the static water levels of the wells completed in the buried sand and gravel deposits. The water levels range from 77 to 112 feet below the ground surface which is significantly below the level of Ashley Creek. A thin shallow system of groundwater and surface water lies perched on top of the till, which is evidenced by wetlands in the area such as the Batavia wetlands. Water from this shallow system feeds into Ashley Creek, while the deeper units are believed to have a very weak connection, if any, with surface water.

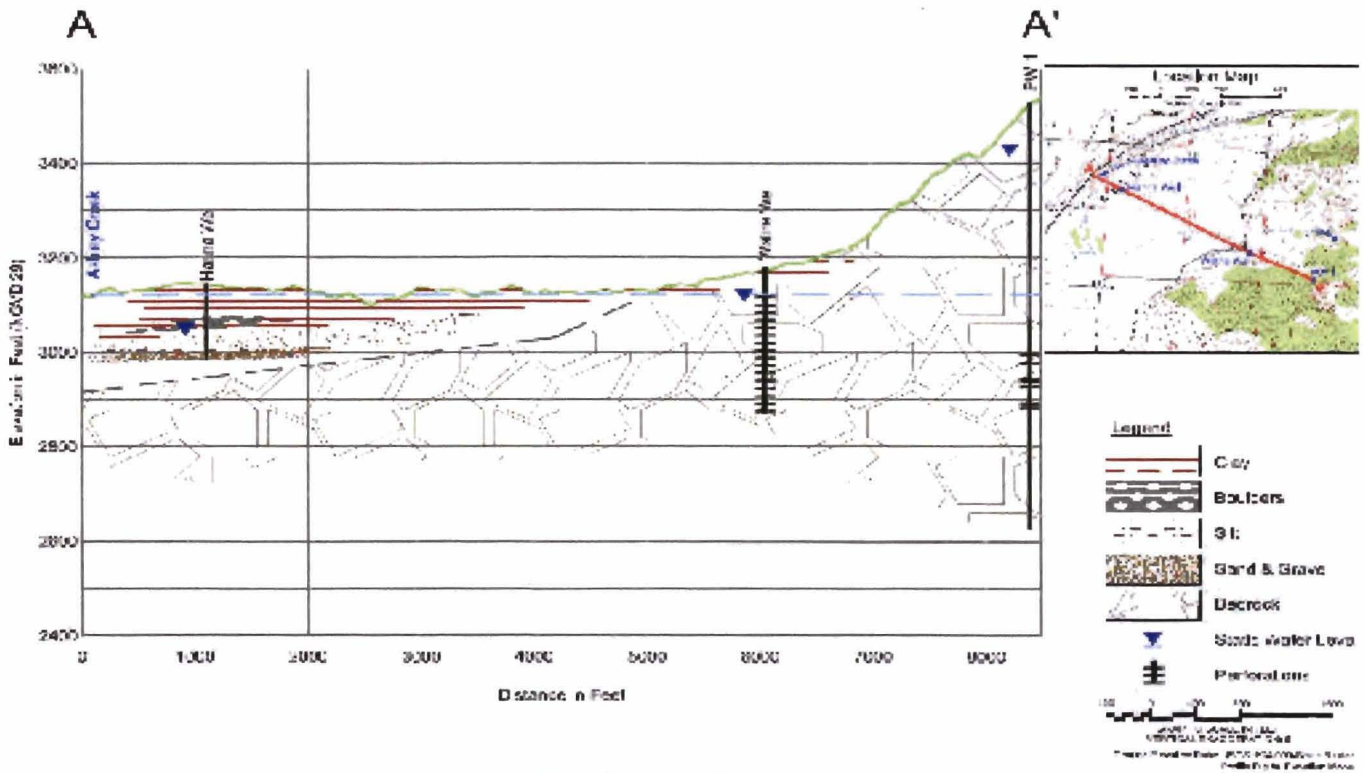

Figure 2-3. Cross-Section A-A'

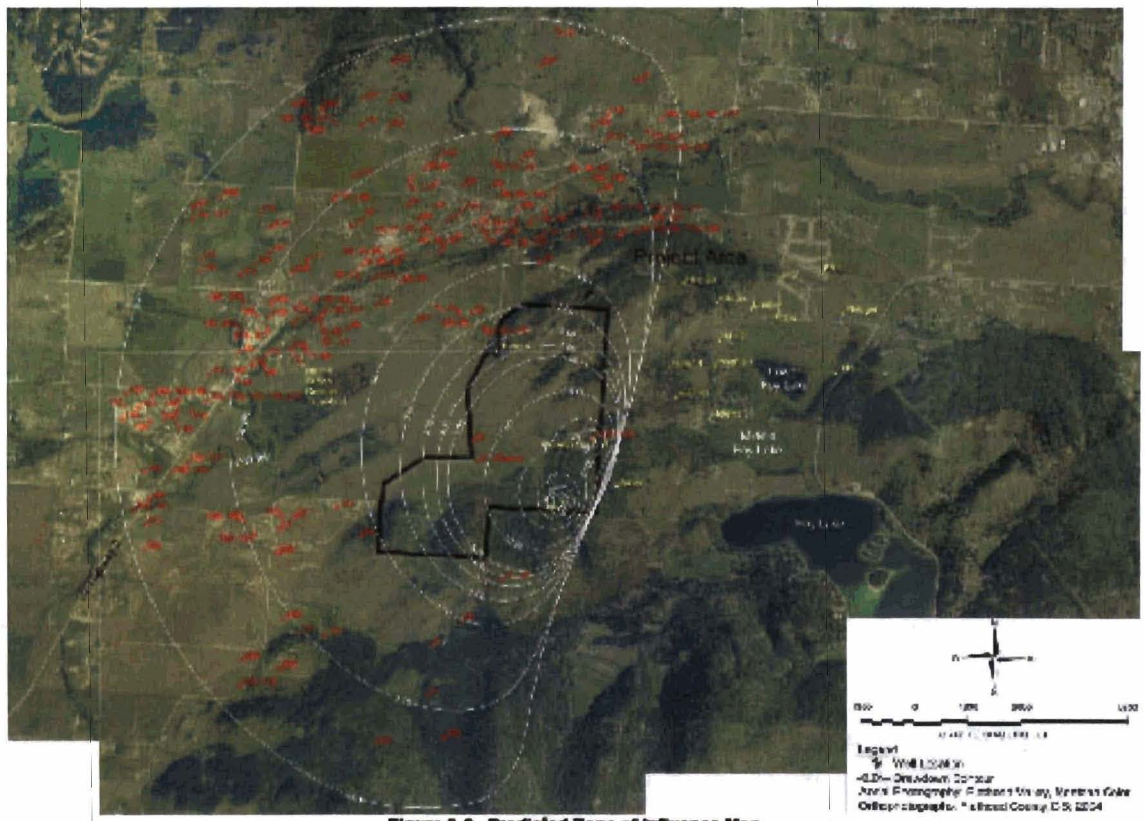

Figure 3-6. Predicted Zone of Influence Map

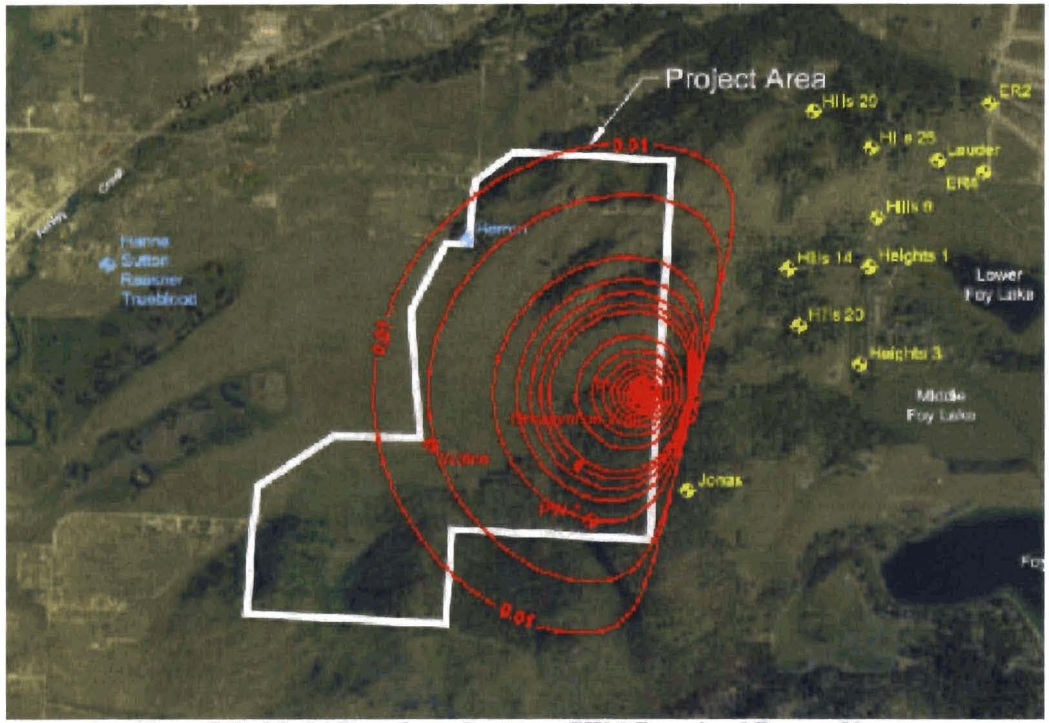

Figure B-1. Model Drawdown Contours: PW-2 Pumping 3 Days at 80 gpm

ZOI Simulations

The ZOI simulations were completed by combining two separate model runs. The first run simulated PW-2 pumping at 50.7 gpm for 365 days (the time required to use the requested volume at the requested rate). A second simulation was completed with PW-1 pumping at 25.3 gpm for the same period of time, using the lower transmissivity value calculated for that well. The two predicted drawdown grids were then added together to obtain a combined pumping zone of influence.

Storage was raised to 0.005 for these simulations to represent the conservative assumption that pumping from these wells will eventually lead to an interaction with the shallow groundwater system near Ashley Creek which would have a higher storage value. This approach has been accepted by the DNRC for other Beneficial Use Applications.

The combined drawdown contours are shown on **Figure B-2**. The 0.01 ft drawdown contour represents the predicted zone of influence for the Buffalo Mountain wells and is what is used in the ZOI discussion in the main body of this document.

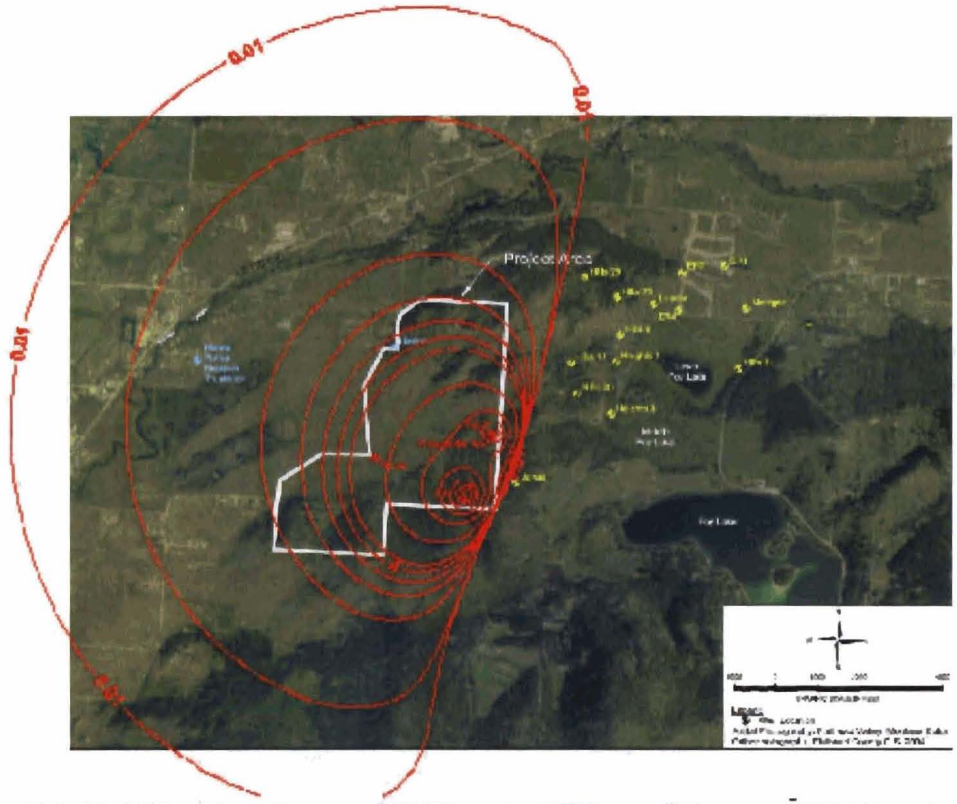

Figure B-2. Model Drawdown Contours: PW-2 Pumping 365 Days at 50.7 gpm and PW-1 Pumping 365 Days at 25.3 gpm

COSTS FOR APPLICATIONS

PERMIT APPLICATION:

Beneficial Use Analysis (Water Facilities Plan)
$5,000 to $20,000

Hydrogeological Assessment:
Well Drilling and Data Collection:
$15,000 to $30,000+

Modeling and Report Prep:
$10,000 to $30,000

Application prep and submittal:
$5,000

Respond to DNRC Deficiency Request:
$5,000 to $20,000

SUBTOTAL: $40,000 to $105,000+

COSTS FOR APPLICATIONS

MITIGATION PLAN:

Purchase mitigation water:
Market Cost + transaction cost

Change Application Prep:
Prove Beneficial Use and Consumptive Use:
$10,000 to $20,000+++

Application prep and submittal:
$5,000

Respond to DNRC Deficiency Request:
$5,000 to $20,000

SUBTOTAL: Water Purchase plus $20,000 to $45,000+++

OBJECTIONS AND HEARINGS