



December 7, 2006

Mr. Jason Thomas  
Wyoming Department of Environmental Quality - WQD  
122 West 25th Street, Herschler Bldg. 4-W  
Cheyenne, WY 82002

**RE: Sheridan State Phase I – WYPDES Permit Application  
Storm Cat Energy (USA) Operating Corporation**

Mr. Thomas:

Storm Cat Energy (USA) Operating Corporation (Storm Cat) hereby submits the enclosed WYPDES permit application for its Sheridan State Phase I coal bed natural gas (CBNG) facility. This application is being filed under an Option 1B. Enclosed for your consideration are the following:

- WYPDES Permit Application for CBNG Water Discharge
- Permit Table 1: Outfall Information
- Permit Table 2: Well Information
- Permit Table 3: Reservoir Information
- Permit Table 4: Bonding Information
- Water Balance and Explanation
- Storm Calculations
- Representative Water Quality
- Permit Application Map

Under this new WYPDES permit application, Storm Cat proposes to produce water from 19 CBNG production wells completed within the Monarch, Carney, Dietz1, Dietz2, and Dietz3 coal seams. The produced water will be discharged to one (1) headwater on-channel reservoir through one (1) outfall.

The associated reservoir is capable of containing all effluent plus precipitation from a 50-year, 24-hour storm event. The reservoir has a 2-foot built-in freeboard that provides a freeboard capacity of 12.8 acre-feet. A storm runoff volume for a 50-year, 24-hour storm event is estimated at 2.2 acre-feet, which leaves 10.6 acre-feet of excess capacity within the reservoir during the storm event. Please refer to the attached water balance and storm calculations for details.

Please note that the wells on this permit are also being permitted under the Sheridan State Phase II. The water balance for this permit application takes into account the reservoir capacity of both permits. The impoundments associated with Sheridan State Phase II have been included in this permit application to show excess storage capacity for increased flexibility in water management strategy. Storm Cat is committed to full containment of CBNG produced water plus precipitation from up to a 50-year, 24-hour storm event.

The maximum continuous flow rate intended with this permit application is 0.56 MGD. The requested flow rate is based on the estimated available capacity of the associated reservoir as well as application of CBNG produced water onto nearby irrigated lands. In addition to reservoir storage, Storm Cat's water management strategy includes irrigating with stored CBNG produced water onto approximately 180 acres of SR Cattle Company Land using five (5) center pivots as shown in the attached permit application map. Using standard land application rates, this system is capable of managing approximately 5,103 bwpd. Please refer to the attached water balance for details.

*CBM ASSOCIATES, INC. ADDITIONAL OFFICES:*

345 Sinclair Street  
Gillette, WY 82718  
307.686.6664

500 W. Lott St.  
Buffalo, WY 82834  
307.684.0252

3036 South Flower Court  
Lakewood, CO 80227  
303.973.2302

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For your convenience, an electronic version of this application is being submitted on the enclosed CD.  
Please contact me with any questions or comments at 307-742-4991 or [sjanssen@cbmainc.com](mailto:sjanssen@cbmainc.com).

Sincerely,  
CBM Associates, Inc.



Sara Janssen  
Environmental Specialist

/saj  
Enclosures

cc: Wyoming Department of Environmental Quality  
Storm Cat Energy (USA) Operating Corporation  
CBM Associates, Inc. – Gillette, Laramie

**For Agency Use Only**

Application Number

**WY00** \_\_\_\_\_

Date Received:

\_\_\_\_\_  
(mo/day/yr)

***SUBMIT ONE HARD COPY AND ONE ELECTRONIC COPY***

***WYOMING POLLUTANT DISCHARGE ELIMINATION SYSTEM***

**APPLICATION FOR PERMIT TO SURFACE DISCHARGE PRODUCED WATER  
FROM COAL BED METHANE NEW DISCHARGES, RENEWALS, OR MAJOR  
MODIFICATIONS**

**Revised: 06-22-06**

PLEASE PRINT OR TYPE (*Submission of illegible materials will result in return of the application to the applicant*)

1. Check the box corresponding to the type of application being applied for:

New CBM permit

CBM permit renewal                      Permit number                      Expiration Date:

CBM permit major modification      Permit number                      Expiration Date:

2. Identify the river basin in which the discharge will occur:

Belle Fourche                       Cheyenne                       Powder                       Little Powder                       Tongue

Other (identify) \_\_\_\_\_

3. Select permit option(s): *if more than one option is selected, the applicant must describe which option applies to which outfall.*

Option 1A – Discharge is contained within a class 4 water body: Containment within an off-channel pit (class 4C) **OR** containment within a headwater reservoir situated within a class 4 channel and capable of containing all effluent plus up to a 50-year / 24-hour storm event.

Option 1B – Discharge is contained within a class 3 water body: Containment within a natural closed basin or playa lake (class 3A) **OR** containment within a headwater reservoir situated within a class 3 channel and capable of containing all effluent plus up to a 50-year / 24-hour storm event.

Option 2 – This option includes any on-channel discharge (including discharge into an on-channel reservoir) that does not meet the impoundment requirements specified in options 1A or 1B above.

If applying for outfalls under Option 2, will discharges from the facility proposed in this application require the use of assimilative capacity credits for salt and sodium in the Powder River?

Yes                       No **Not applicable. This is an Option 1B permit in the Tongue River Basin.**

4. General Facility Location:    Township(s) **57N**                      Range(s) **81W**

Immediate Receiving Stream(s)

**Badger Creek; HUC 10-1009010103**

5. Name of the facility producing the discharge (this is the facility name that will appear on the WYPDES permit)

**Sheridan State Phase I**

6. Company, Contact Name, mailing address, e-mail address, and telephone number of the individual or company which owns the facility producing the discharge, and the person (consultant) responsible for permit submission.

<i>Company Contact Name</i> <b>Keith J. Knapstad</b>	<i>Consultant Contact Name</i> <b>Sara Janssen</b>
<i>Company Name</i> <b>Storm Cat Energy (USA) Operating Corporation</b>	<i>Company Name</i> <b>CBM Associates, Inc.</b>
<i>Mailing Address</i> <b>1125 17<sup>th</sup> Street, Suite 2310</b>	<i>Mailing Address</i> <b>920 E. Sheridan Street</b>
<i>City, State, and Zip Code</i> <b>Denver, CO 80202</b>	<i>City, State, and Zip Code</i> <b>Laramie, WY 82070</b>
<i>Telephone Number</i> <b>(303) 991-5070</b>	<i>Telephone Number</i> <b>(307) 742-4991</b>
<i>E-Mail Address</i> <b>keith@stormcatenergy.com</b>	<i>E-Mail Address</i> <b>sjanssen@cbmainc.com</b>

7. If submitting a major modification or permit renewal, please describe all requested permit modifications (i.e. add 2 outfalls, add 23 wells, move outfall 001 500 feet...):

**Not applicable. This is a new WYPDES permit.**

\*NOTE: Major modification applications requesting to increase the permitted flow for a facility will be processed as RENEWALS. Major modification applications for permits within six months of their expiration date will also be processed as RENEWALS.

8. Name(s) and mailing address(es) of owner(s) of the surface rights on whose land the discharge occurs (in cases where the land is owned by the state or federal government but surface rights are leased to a private individual, provide lessee's name and address)

<i>Landowner #1 Name</i> <b>SR Cattle Company ATTN: Charles Kane</b>
<i>Mailing Address</i> <b>1317 Stonegate Drive</b>
<i>City, State, and Zip Code</i> <b>Sheridan, WY 82801</b>

9. For all facilities relying on reservoirs of any type as part of their water management plan, attach a water balance that demonstrates, considering total maximum projected discharge inflows, natural precipitation, evaporation and infiltration, the amount of the discharge that will be contained within the reservoirs, and the circumstances and volume of effluent that could potentially be discharged. If applying for an Option 1A or 1B permit, the water balance must demonstrate that the containment unit will be adequately sized to contain all projected discharge and storm water runoff from a 50 year, 24 hour storm event. If actual flow rates are available, use the maximum flow rate from all active wells within the previous six months of operation in the water balance.

**Please see attached water balance and storm calculations. The associated reservoir is capable of containing all effluent plus precipitation from a 50-year, 24-hour storm event. The reservoir has a 2-foot built-in freeboard that provides a freeboard capacity of 12.8 acre-feet. A storm runoff volume for a 50-year, 24-hour storm event is estimated at 2.2 acre-feet, which leaves 10.6 acre-feet of excess capacity within the reservoir during the storm event. Please refer to the attached water balance and storm calculations for details.**

**Please note that the wells on this permit are also being permitted under the Sheridan State Phase II. The water balance for this permit application takes into account the reservoir capacity of both permits. The**

**impoundments associated with Sheridan State Phase II have been included in this permit application to show excess storage capacity for increased flexibility in water management strategy. Storm Cat is committed to full containment of CBNG produced water plus precipitation from a 50-year, 24-hour storm event.**

**The maximum continuous flow rate intended with this permit application is 0.56 MGD. The requested flow rate is based on the estimated available capacity of the associated reservoir as well as application of CBNG produced water onto nearby irrigated lands. In addition to reservoir storage, Storm Cat's water management strategy includes irrigating with stored CBNG produced water onto approximately 180 acres of SR Cattle Company Land using five (5) center pivots as shown in the attached permit application map. Using standard land application rates, this system is capable of managing approximately 5,103 bwpd. Please refer to the attached water balance for details.**

10. For all facilities relying on reservoirs of any type as part of their water management plan, include analyses of expected water quality within the reservoirs. Should the water balance required for Question #9 above indicate that the effluent has the potential to be discharged from the reservoirs under circumstances except a 50 year - 24 hour storm or larger, please provide additional analyses describing the expected quality and quantity of the discharge from the reservoirs and expected impacts on water quality in the receiving streams.

**Not applicable. This is an Option 1B permit.**

11. Attach a description and a clear, legible, detailed topographic map of the discharging facility. Include the following:
- a. A legend
  - b. Well locations
  - c. Ponds – **No ponds have been identified within this facility.**
  - d. Reservoirs
  - e. Stock tanks – **Stock tanks are not pertinent to the water management strategy.**
  - f. Discharge points (outfalls)
  - g. Immediate receiving streams
  - h. Water quality monitoring stations – **Not applicable. This is an Option 1B permit.**
  - i. Irrigation compliance points – **Not applicable. This is an Option 1B permit.**
  - j. Location of nearest downstream irrigator. – **Not applicable. This is an Option 1B permit.**
  - k. Section, Township, and Range information
  - l. If proposing to use class 4C off-channel pits, include footprint outline of the proposed pits. To denote setback distance, include a distance marker from closest side of pit to the nearest water feature, floodplain, or stream alluvium. Identify latitude and longitude in decimal degrees (using a minimum of 6 decimal places) for each end point of the setback distance marker. – **Not applicable. This facility uses an on-channel reservoir.**

**Please see attached Permit Application Maps for items a, b, d, f, g, and k.**

12. Describe the control measures that will be implemented to prevent significant damage to or erosion of the receiving water channel at the point of discharge.

**The outfall will be constructed on topography that gradually slopes towards the on-channel reservoir. Erosion control such as rip-rap and geotextiles will be used if necessary.**

13. Describe the control measures that will be implemented to achieve water quality standards and effluent limits. If proposing to utilize a treatment process, provide a detailed description of the treatment process, including, but not limited to: Water quality analyses demonstrating the effluent quality before and after treatment; waste stream volumes and planned method of disposal; aquatic life toxicity data for any chemicals being used in the treatment process; description of how the chemicals will be handled at the facility and the potential for any impacts to

waters of the state in the event of a spill; and diagrams of the facility indicating the water treatment path. Additional sheets and diagrams may be attached.

**No active water treatment is planned. Produced CBNG water will be discharged into and contained within an on-channel reservoir. The outfall will be constructed in a manner that aerates stored CBNG water to help induce precipitation of dissolved metals.**

14. Outfall locations must be established as part of a preliminary field reconnaissance survey using GPS or conventional survey equipment and documented in Table 1. Please document the type of equipment used, the expected accuracy of your measurements, and a brief rationale for locating the outfalls at the requested sites below.

**The outfall associated with this facility will be constructed in a site designated by the landowner. Site coordinates were obtained by field personnel using hand held GPS units with accuracies ranging from 15 to 60 feet.**

15. Complete the attached Table 1. Provide all the information requested in the table for each proposed discharge point or monitoring point. If proposing changes (a major modification) to an existing facility, clearly indicate the desired changes on the table. Additional tables may be attached. Use the format provided. Option 2 permits must include water quality monitoring station locations. "Non-Discharging" Option 2 permits (reservoirs capable of 50 year, 24 hour storm water containment) must include flow monitoring station locations. Option 1A and 1B permits must include containment unit monitoring station locations. Information related to reservoirs is only required if the facility's water management plan includes reservoir containment.

**Please see attached Table 1: Outfall Information.**

16. Complete the attached Table 2. Provide all the information requested in the table for each well associated with this proposed discharge authorization. If proposing changes (a major modification) to an existing facility, clearly indicate the desired changes on the table. Additional tables may be attached. Use the format provided.

**Please see attached Table 2: Well Information.**

17. Complete the attached Table 3. Provide all the information requested in the table for each reservoir proposed for containment of CBM produced water. Specified locations refer to the approximate center of the reservoir. If proposing changes (a major modification) to an existing facility, clearly indicate the desired changes on the table. Additional tables may be attached. Use the format provided. Information related to reservoirs is only required if the facility's water management plan includes reservoir containment.

**Please see attached Table 3: Reservoir Information.**

18. Complete the attached Table 4. Provide all information requested in the table related to reservoir bonding requirements for each reservoir proposed for the containment of CBM produced water. If proposing any changes (a major modification) to an existing facility, clearly indicate the desired changes on the table. Additional tables may be attached. Use the format provided. Information related to reservoirs is only required if the facility's water management plan includes reservoir containment.

**Please see attached Table 4: Bonding Information.**

19. Provide the results of water analyses for a sample collected from a location representative of the quality of the water being proposed for discharge for all of the chemical parameters listed in the table below. The sample must be collected from well(s) or outfall(s) within a twenty mile radius of the proposed facility's location, and from the same coal formation(s) and the same approximate depth(s) as proposed in this application. If filing an application for a permit renewal or modification, the representative sample must be collected from the facility

being proposed for renewal or modification. Explain why this sample is representative of the produced water to be discharged.

*Samples from co-mingled coal seams are acceptable as long as the sample(s) meet the following criteria:*

- A. all of the coal seams being proposed for development are represented in the co-mingled sample, with no contribution from coal seams not being proposed for development at the new facility.
- B. the ratio of each coal seam's contribution is approximately the same in the sample and the proposed development,
- C. documentation is provided to verify the criteria listed in A. and B.

**Please refer to the following sample identification table and corresponding lab analyses attached for representative water quality. As this facility is a new facility, water quality samples from nearby CBNG facilities are being submitted to represent water produced from the requested coal seams. The following samples were taken at the wellhead.**

<b>SAMPLE ID</b>	<b>SAMPLE DATE</b>	<b>QTR/QTR</b>	<b>SEC</b>	<b>TWP</b>	<b>RNG</b>	<b>DISTANCE FROM SHERIDAN STATE FACILITY</b>	<b>PRODUCED FORMATIONS</b>
PW_49_033_22687_13_22_57_83CR	12/04/2003	SWSW	22	57	83	10.2 miles	Carney
PW_11_22_57_83M	1/14/2004	NESW	22	57	83	10.1 miles	Monarch
PW_3_22_57_83D1	2/27/2004	NENW	22	57	83	9.8 miles	Dietz1
PW_11_22_57_83D2	1/14/2004	NESW	22	57	83	10.1 miles	Dietz2
PW_49_033_22681	2/27/2004	NENW	22	57	83	9.8 miles	Dietz3

The analyses must be conducted in accordance with approved EPA test procedures (40 CFR Part 136). Include a signed copy of your lab report that includes the following:

- a. detection limits
- b. results of each of the 25 chemical parameters at the chemical state given below
- c. quarter/quarter, section, township and range of the sample collection location
- d. Time and date of sample collection
- e. Time and date of analysis for each parameter
- f. Analyst's initials for each parameter
- g. Detection limit for each parameter as achieved by the laboratory
- h. WYPDES permit number and outfall number, where the sample was collected.
- i. Origin of produced water (coal seam and legal location of sample collection location)

If more than one coal seam is being proposed for development, the permittee must submit a lab analysis and complete information characterizing water quality from each coal seam being proposed for development. If the permittee is proposing to include discharges from a coal seam not previously developed at this facility, the permittee must submit a lab analysis and complete information characterizing water quality from the new coal seam being proposed for development. A mixing analysis may be required if the representative water quality analysis from the new coal seam indicates that the inclusion of the new effluent source may result in degradation of existing effluent quality. Analyses must be provided in the units listed below.

<b>Parameter*</b> (See notes following the table on chemical states)	<b>Required Detection Limits and Required Units</b>
Alkalinity, Total	1 mg/l as CaCO <sub>3</sub>
Aluminum, Total Recoverable	50 µg/l
Arsenic, Total Recoverable	1 µg/l

<b>Parameter*</b> (See notes following the table on chemical states)	<b>Required Detection Limits and Required Units</b>
Barium, Total Recoverable	100 µg/l
Bicarbonate	10 mg/l
Cadmium, Dissolved	5 µg/l
Calcium, Dissolved	50 µg/l, report as mg/l
Chlorides	5 mg/l
Copper, Dissolved	10 µg/l
Dissolved Solids, Total	5 mg/l
Fluoride, Dissolved	100 µg/l
Hardness, Total	10 mg/l as CaCO <sub>3</sub>
Iron, Dissolved	50 µg/l
Lead, Dissolved	2 µg/l
Magnesium, Dissolved	100 µg/l, report as mg/l
Manganese, Dissolved	50 µg/l
Mercury, Dissolved	1 µg/l
pH	to 0.1 pH unit
Radium 226, Total	0.2 pCi/l
Radium 228, Total**	0.2 pCi/l
Selenium, Total Recoverable	5 µg/l
Sodium Adsorption Ratio	Calculated as unadjusted ratio
Sodium, Dissolved	100 µg/l, report as mg/l
Specific Conductance	5 micromhos/cm
Sulfates	10 mg/l
Zinc, Dissolved	50 µg/l

\*Discharges into drainages other than the Powder River geologic basin may require analysis of additional parameters, please contact the WDEQ for a separate list.

\*\*This parameter is only required for those discharges located within one stream mile of a class 2 water.

20. For new facilities, provide the expected (estimated) flow volume from each well in gallons per day, and provide the rationale behind the flow volume estimate. For existing facilities, provide actual flow data from all wells within the last six months.

Flow: **36,000 gpd/well**

**Rationale: Projected water discharge rates are based on average initial water production trends from the Monarch, Carney, Dietz1, Dietz 2, and Dietz 3 coal seams. Water production is expected to decline as coal seams are dewatered. Please see attached water balance.**

21. For applications for new facilities, are any of the required chemical constituents in the laboratory analysis present in concentrations above Wyoming Water Quality Standards?

YES

NO

If the answer to question # 21 is yes, answer 21.a. – 21.b below. If no, proceed to question 23.

a. Which constituents?

b. Has this constituent been addressed in the response to question 13?



22. For applications for existing facilities, has the facility ever exceeded permit limits or water quality standards?

- YES  NO **Not applicable. This is a new facility.**

If the answer to question 22 is yes, answer 22.a. – 22.b. If no, proceed to question 23.

- a. Which constituents?
- b. Has the exceedance been addressed?
- c. Describe how the exceedance was addressed.

23. Is there active irrigation in the drainage downstream of the discharge? *(Please note that this response includes both artificially and naturally irrigated bottomlands as defined in the Draft Agricultural Use Protection Policy for the interpretation and implementation of Chapter 1, Section 20 of the Wyoming Water Quality Rules and Regulations).*

- YES  NO **Not applicable. This is an Option 1B permit.**

If yes, at a minimum, the WYPDES Program requires submission of the following information:

1. Location(s) of irrigation diversions and/or sub-irrigated acreage;
2. Type(s) of Crops grown under irrigation;
3. Description of Irrigation Practices
4. A topographic map showing irrigated acreage, any structures, ownership of irrigated acreage.

In addition to the minimum information described above, the WYPDES Program may require additional information should the permittee request site-specific effluent limits protective of irrigation uses. Contact the WYPDES Program for more information regarding requirements for site-specific SAR, TDS, and EC limits.

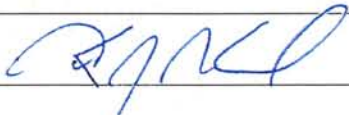
24. Provide name(s) and address(es) for all downstream irrigators between the outfalls and the mainstem.

**Not applicable. This is an Option 1B permit.**

25. Provide a listing of all active permits or construction approvals received or applied for by the applicant for the site described in this permit application in accordance with *Chapter 2, Section 5.T. of the Wyoming Water Quality Rules and Regulations*.

- **Please see attached Table 2 for API numbers.**
- **Sheridan State Water Management Plan (In Progress)**
- **Sheridan State Project Storm Water Pollution Prevention Plan (In Progress)**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I am requesting **1** outfall in this application.

<b>Keith J. Knapstad</b>	<b>Vice President of Operations - USA</b>
<i>Printed Name of Person Signing*</i>	<i>Title</i>
<i>Signature*</i> 	<i>Date</i> 12/7/06

\*All permit applications must be signed in accordance with *Section 14, Chapter 2 of the Wyoming Water Quality Rules and Regulations*, “for” or “by” signatures are not acceptable.

Section 35-11-901 of Wyoming Statutes provides that:

Any person who knowingly makes any false statement, representation, or certification in any application ... shall upon conviction be fined not more than \$10,000 or imprisoned for not more than one year, or both. Permittees are required to retain records of all data used to complete permit applications in accordance with *Chapter 2, Section 5, Part 5.V.vii of the Wyoming Water Quality Rules and Regulations*.

Mail this application to:

WYPDES Permits Section  
 Department of Environmental Quality/WQD  
 122 West 25<sup>th</sup> Street, Herschler Building, 4W  
 Cheyenne, WY 82002

**Table 1: Outfall Information - Sheridan State Phase I**

Discharge Point (Outfalls) #	Immediate Receiving Stream	Mainstem	Distance to Closest 2AB Channel & Mainstem (Miles)	Quarter / Quarter	Section	Twn (N)	Rng (W)	Nad 27 Latitude	Nad 27 Longitude	County	Reservoir Name and Type
001	Tributary to Badger Creek	Tongue River	Not applicable Option 1B	NENE	7	57	81	44.936848	-106.660385	Sheridan	Kane 01-7-5781 Headwater Option 1B
Station Name	Station Description			Quarter / Quarter	Section	Twn (N)	Rng (W)	Nad 27 Latitude	Nad 27 Longitude	Notes regarding water quality monitoring station types	
CU01	Containment Unit Water Quality Monitoring Station			NENE	7	57	81	44.937825	-106.662802	--	
FM01	Flow Monitoring Station			SWNE	7	57	81	44.932267	-106.667617	--	

*Please note that not all station types may be applicable for a particular facility. Additional spaces may be added if necessary. Use the format provided. Please denote reservoir type(s) - on channel, off-channel, playa, headwater Option 1B - in the appropriate column. Please note that reservoir information is not required if reservoir containment is not part of the facility's water management plan - for instance, information about existing "incidental" downstream reservoirs is not required.*

**Table 2: Well Information - Sheridan State Phase I**

Well Name	API Number	Coal Seam	Well Depth	Location (QQ, Section, Township, Range)	Discharges to Outfall #*
<b>*AWAO - All wells permitted to discharge to all outfalls</b>					
State 1-18 5781 MZ/CR	49-033-26416	Monarch-Carney-Dietz1-Dietz2-Dietz3	1731	NENE 18-57-81	AWAO
State 1-19 5781 MZ/CR	49-033-26426	Monarch-Carney-Dietz1-Dietz2-Dietz3	1519	NENE 19-57-81	AWAO
State 1-30 5781 MZ/CR	49-033-26404	Monarch-Carney-Dietz1-Dietz2-Dietz3	1828	NENE 30-57-81	AWAO
State 3-18 5781 MZ/CR	49-033-26417	Monarch-Carney-Dietz1-Dietz2-Dietz3	1459	NENW 18-57-81	AWAO
State 3-30 5781 MZ/CR	49-033-26400	Monarch-Carney-Dietz1-Dietz2-Dietz3	1915	NENW 30-57-81	AWAO
State 9-18 5781 MZ/CR	49-033-26408	Monarch-Carney-Dietz1-Dietz2-Dietz3	1762	NESE 18-57-81	AWAO
State 9-19 5781 MZ/CR	49-033-26420	Monarch-Carney-Dietz1-Dietz2-Dietz3	1663	NESE 19-57-81	AWAO
State 9-30 5781 MZ/CR	49-033-26402	Monarch-Carney-Dietz1-Dietz2-Dietz3	1917	NESE 30-57-81	AWAO
State 11-18 5781 MZ/CR	49-033-26414	Monarch-Carney-Dietz1-Dietz2-Dietz3	1495	NESW 18-57-81	AWAO
State 11-29 5781 MZ/CR	49-033-26430	Monarch-Carney-Dietz1-Dietz2-Dietz3	1758	NESW 29-57-81	AWAO
State 7-18 5781 MZ/CR	49-033-26407	Monarch-Carney-Dietz1-Dietz2-Dietz3	1550	SWNE 18-57-81	AWAO
State 7-19 5781 MZ/CR	49-033-26423	Monarch-Carney-Dietz1-Dietz2-Dietz3	1581	SWNE 19-57-81	AWAO
State 7-30 5781 MZ/CR	49-033-26403	Monarch-Carney-Dietz1-Dietz2-Dietz3	1935	SWNE 30-57-81	AWAO
State 5-18 5781 MZ/CR	49-033-26406	Monarch-Carney-Dietz1-Dietz2-Dietz3	1501	SWNW 18-57-81	AWAO
State 15-18 5781 MZ/CR	49-033-26409	Monarch-Carney-Dietz1-Dietz2-Dietz3	1505	SWSE 18-57-81	AWAO
State 15-19 5781 MZ/CR	49-033-26427	Monarch-Carney-Dietz1-Dietz2-Dietz3	1748	SWSE 19-57-81	AWAO
State 15-30 5781 MZ/CR	49-033-26421	Monarch-Carney-Dietz1-Dietz2-Dietz3	2027	SWSE 30-57-81	AWAO
State 13-18 5781 MZ/CR	49-033-26415	Monarch-Carney-Dietz1-Dietz2-Dietz3	1704	SWSW 18-57-81	AWAO
State 13-29 5781 MZ/CR	49-033-26428	Monarch-Carney-Dietz1-Dietz2-Dietz3	1924	SWSW 29-57-81	AWAO

**Total Number of Wells: 19**

**Table 3: Reservoir Information - Sheridan State Phase I**

Reservoir Name	Reservoir Storage Volume (acre/feet)	SEO Permit #	SEO Reservoir Requirements	Location				Geographic Location*	
				Qtr- Qtr	Sec	Township (N)	Range (W)	NAD 27 Latitude	NAD 27 Longitude
Kane 01-7-5781	110	Pending	None Available	NENE	7	57	81	44.937822	-106.662804

\*Geographic location for on-channel impoundments represents the approximate of Center of Dam - Center of Channel, location for off-channel impoundments represents the approximate center of the impoundment.

**Table 4: Bonding Information - Sheridan State Phase I**

		Please check only one "reservoir reclamation volume" box for each reservoir				
Reservoir Name	Reservoir Bonding Authority	Reservoir Reclamation Volume* less than 5000 cubic yards?	Reservoir Reclamation Volume* between 5000 and 10,000 cubic yards	Reservoir Reclamation Volume* greater than 10,000 cubic yards	Reservoir constructed/upgraded** prior to September 1, 2005	Bond Currently posted with bonding authority?
Kane 01-7-5781	Wyoming Department of Environmental Quality	--	--	X	No	No

\* "Reservoir Reclamation Volume" is the volume of backfill and/or topsoil needed to fill the reservoir upon reclamation, in cubic yards. This can also be measured in the amount of material that was excavated to create the reservoir. Please note that reservoir information is not required if reservoir containment is not part of the facility's water management plan - for instance, information about existing "incidental" downstream reservoirs is not required.

\*\* "Reservoir constructed/upgraded" information relates to the September 2005 memo regarding topsoil storage on-site. A 'NO' response in this column represents that either the reservoir is not constructed or that it requires upgrades which would require topsoil stockpiling on site. A 'Yes' response in this column represents that the reservoir has been constructed prior to September 2005 and any upgrades, if required, do not require the stockpiling of topsoil.



## **Explanation of Water Balance Calculation Table**

### **Introduction:**

The attached water balance table is a conservative model developed by CBM Associates, Inc. (CBMA) of Laramie, Wyoming. The model examines water management strategies in terms of available containment unit storage volumes. It also enables the modeler to include additional water losses resulting from the use of other management options. The model is dynamic; it utilizes coal seam water production decline projections, operator provided well completion schedules, and reservoir completion schedules. A short explanation by each table column or group of columns is provided below to help the reviewer understand the calculations provided on the attached table.

### **Dates and Production Schedule:**

**Dates:** The month and year during which production of CBNG water will occur.

**Wells Activated/Month:** Inside these columns, the coal seams associated with the wells for the project act as labels for each column. The figures inside a column represent the number of wells being activated for that particular coal seam and project month.

**Total Wells:** A running total of wells as they become active.

### **Inflow:**

**Daily Production:** The average projected rate of water production, in barrels of water per day (bwpd), for that month. This is calculated using two data sets (operator provided or CBMA calculated): coal seam water production decline projections and the well completion schedules.

**Monthly Production:** The daily production multiplied by the number of days in the month, converted from barrels of water into acre-ft.

### **Reservoir Information:**

**Existing/Added Reservoir Capacity:** The amount, in acre-ft, of existing or added project reservoir capacity. Additional capacity can be added into this column to increase the volumes of water that can be managed via containment as newly constructed reservoirs become available for use.

**Action (reservoir name):** A description of the added reservoir capacity for that month.

*CBM ASSOCIATES, INC. ADDITIONAL OFFICES:*

345 Sinclair Street  
Gillette, WY 82718  
307.686.6664

500 W. Lott St.  
Buffalo, WY 82834  
307.684.0252

3036 South Flower Court  
Lakewood, CO 80227  
303.973.2302

**Total Reservoir Capacity:** The total amount, in acre-ft, of reservoir capacity that has been constructed to date (month and year) for the project.

**Maximum Evaporation:** The amount of water, in acre-ft, expected to be lost to evaporation based upon the current stored volume of CBNG water (stored volume from the previous month + volume delivered to the reservoir during the current month) to a minimum of 5% of the total current impound capacity. The basis for these values comes from the Western Regional Climate Center. The values are derived from four-foot Class A evaporation pans at the Gillette 9 ESE Station over an 81 year period (1925-2005). Values were decreased 30% to more closely estimate evaporation rates for lakes or ponds. For every acre-ft of stored CBNG water, it is assumed that there are 0.1245 acres of surface area. This value comes from a CBMA regression analysis of 2814 deep channel reservoirs. Values used for evaporation are in the following table:

Month	Evaporation Mean (in.)	Evaporation Mean * 0.7 (in.)
January	0	0
February	0	0
March	0	0
April	4.52	3.164
May	6.4	4.480
June	7.5	5.250
July	9.88	6.916
August	9.44	6.608
September	6.18	4.326
October	4.36	3.052
November	2.39	1.673
December	0	0

**Maximum Infiltration:** The amount of water, in acre-ft, expected to be lost to infiltration based upon the current stored volume of CBNG water (stored volume from the previous month + volume delivered to the reservoir during the current month) to a minimum of 5% of the total current impound capacity. The initial maximum infiltration rate is ~67 bwpd per acre-ft of stored water. The maximum infiltration rate declines at a rate of ~1.68% per month during the life of the reservoir.

**Maximum Exfiltration:** The amount of water, in acre-ft, expected to be lost to the combination of evaporation and infiltration.

**Actual Exfiltration:** This is the minimum of the maximum exfiltration and the amount of water delivered to the reservoirs that month plus the amount of water remaining in the reservoirs from the previous month.

**Dewatering Reservoir for Irrigation:** The rate of loss for each month, in bwpd and acre-ft, for which produced water is managed by irrigation. The Kane 01-7-5781 reservoir will be dewatered in order to irrigate a predetermined area, 180.06 acres, using a prescribed application rate, 16 inches per year, and a prescribed irrigation period, April 1<sup>st</sup> through September 30<sup>th</sup>.



### **Months End Results:**

**Change in Storage:** The change in available storage capacity, in acre-ft, from the end of the previous month to the end of the current month. Negative numbers indicate a decrease in available storage while positive numbers indicate an increase in available storage.

**Available Storage:** Storage volumes, in acre-ft, available at the end of each month. This value depends upon the available storage of the previous month and all inflows and losses for the month.

**Amount of Water in the Reservoirs:** The difference between the total reservoir capacity and the available capacity.

**% of Existing Storage Available:** The available storage divided by the total reservoir capacity in percent form. Generally, a minimum monthly excess capacity of ~10% is maintained during the life of the permit.

### **“Amount of CBNG Water in Reservoirs” Graph:**

This is a graphical representation of the “Amount of Water in the Reservoirs” column. The units of the vertical axis are acre-ft and the units of the horizontal axis are months (typically 0-180 representing 15 years of time). The brown line represents the existing total reservoir storage capabilities of the project. This line is generally horizontal, but may increase in a stair-step fashion as more reservoirs become online. The blue line represents the expected volume of water inside the reservoirs at the end of the month. This line may become a flat line at the bottom of the graph through several months. This indicates that in the water balance table, water is able to exfiltrate from the reservoirs at a greater rate than the water is being delivered to the reservoirs. In actuality, a negligible amount of water will inevitably remain within a small wetted perimeter present in each reservoir since there will be a constant inflow of CBNG water, but this amount of water is small enough as to not affect the integrity of the water balance.

### **Conservatism of the Model:**

The attached water balance model developed by CBM Associates, Inc. (CBMA) of Laramie, Wyoming is considered to be conservative based upon the following assumptions:

- Coal seam water production decline curves and the corresponding production values are chosen to slightly over predict the amount of water that will actually be produced.
- Production values are based upon the initial production rate for that month and remain constant throughout the entire month when in actuality there would be a continuous decline in production throughout the month.
- All evaporation rates from pan evaporation studies have been decreased by 30%.
- All reservoirs are assumed to be deep channel reservoirs. The conversion from reservoir capacity to reservoir surface area comes from an analysis of deep channel reservoirs. If the reservoirs exist in shallow channels or playas the conversion factor is significantly increased.
- The initial reservoir infiltration rate is derived from a study in the Prairie Dog Creek area, where studies from other areas report significantly larger infiltration rates.
- Reservoir infiltration rates decline at a constant rate throughout the life of the reservoir.
- Reservoir infiltration and evaporation rates are based upon the stored volume of CBNG water rather than the entire capacity.

## WATER BALANCE CALCULATION TABLE

**Project:** Sheridan State Phase I

Prepared for: **Storm Cat Energy (USA) Operating Corporation**  
 Prepared by: CBM Associates, Inc.  
 Prepared on: 12/7/2006

PROJECT RESERVOIR CAPACITY		
Project Containment		
EXISTING	110.0	(ac-ft)@start
AVAILABLE	110.0	(ac-ft)@start
POTENTIAL	185.9	(ac-ft)
<b>TOTAL</b>	<b>295.9</b>	(ac-ft)

67.2	Initial reservoir infiltration rate (bwpd/acre-ft)
1.68%	Monthly reservoir infiltration decline rate
18.4%	Annual reservoir infiltration decline rate
0	Average Existing Reservoir Age (months)

Year	Month	#	Wells Activated/mo.		Daily Production (bwpd)	Monthly Production (acre-ft)	Action (reservoir name)	Exist/ Added Impound Capacity (acre-ft)	Total Impound Capacity (acre-ft)	Maximum Evaporation (acre-ft)	Maximum Infiltration (acre-ft)	Maximum Exfiltration (acre-ft)	Actual Exfiltration (acre-ft)	Dewatering Reservoir for Irrigation (acre-ft)	Dewatering Reservoir for Irrigation (bwpd)	Results for months end			
			Project Wells	Total Wells												Change in Storage (acre-ft)	Available Storage (acre-ft)	Amount of Water in Reservoirs (acre-ft)	% of Existing Storage Available %
15	=SUM=	180	19	19															
2007	Initial State	0															110.0	0.0	100.0%
2007	May	1	19	19	16,286	65.1	Reservoir from Phase I Online	110.0	110.0	3.0	17.5	20.5	20.5	20.4	5,103.1	-24.2	85.8	24.2	78.0%
2007	June	2	--	19	15,634	60.5	--	--	110.0	4.6	21.6	26.2	26.2	19.7	5,103.1	-14.5	71.3	38.7	64.8%
2007	July	3	--	19	15,009	60.0	--	--	110.0	7.1	25.6	32.7	32.7	20.4	5,103.1	-6.9	64.4	45.6	58.6%
2007	August	4	--	19	14,409	57.6	--	--	110.0	7.1	26.3	33.4	33.4	20.4	5,103.1	-3.8	60.6	49.4	55.1%
2007	September	5	--	19	13,832	53.5	--	--	110.0	4.6	25.0	29.6	29.6	19.7	5,103.1	-4.2	56.4	53.6	51.3%
2007	October	6	--	19	13,279	53.1	--	--	110.0	3.4	26.3	29.7	29.7	0.0	0.0	-23.4	33.0	77.0	30.0%
2007	November	7	--	19	12,748	49.3	Reservoirs from Phase II Online	185.9	295.9	2.2	31.6	33.8	33.8	0.0	0.0	170.4	203.4	92.5	68.7%
2007	December	8	--	19	12,238	48.9	--	--	295.9	0.0	35.9	35.9	35.9	0.0	0.0	-13.0	190.4	105.5	64.4%
2008	January	9	--	19	11,748	46.9	--	--	295.9	0.0	38.1	38.1	38.1	0.0	0.0	-8.9	181.6	114.3	61.4%
2008	February	10	--	19	11,278	40.7	--	--	295.9	0.0	34.4	34.4	34.4	0.0	0.0	-6.3	175.3	120.6	59.2%
2008	March	11	--	19	10,827	43.3	--	--	295.9	0.0	39.6	39.6	39.6	0.0	0.0	-3.7	171.6	124.3	58.0%
2008	April	12	--	19	10,394	40.2	--	--	295.9	5.4	37.8	43.2	43.2	19.7	5,103.1	22.7	194.3	101.6	65.7%
2008	May	13	--	19	9,978	39.9	--	--	295.9	6.6	33.0	39.6	39.6	20.4	5,103.1	20.1	214.4	81.5	72.5%
2008	June	14	--	19	9,579	37.0	--	--	295.9	6.5	26.3	32.8	32.8	19.7	5,103.1	15.5	229.9	66.0	77.7%
2008	July	15	--	19	9,196	36.7	--	--	295.9	7.4	23.2	30.6	30.6	20.4	5,103.1	14.2	244.1	51.8	82.5%
2008	August	16	--	19	8,828	35.3	--	--	295.9	6.0	19.3	25.3	25.3	20.4	5,103.1	10.4	254.5	41.4	86.0%
2008	September	17	--	19	8,475	32.8	--	--	295.9	3.3	15.7	19.0	19.0	19.7	5,103.1	5.9	260.4	35.5	88.0%
2008	October	18	--	19	8,136	32.5	--	--	295.9	2.2	14.6	16.7	16.7	0.0	0.0	-15.8	244.6	51.3	82.7%
2008	November	19	--	19	7,811	30.2	--	--	295.9	1.4	16.6	18.0	18.0	0.0	0.0	-12.2	232.5	63.4	78.6%
2008	December	20	--	19	7,498	30.0	--	--	295.9	0.0	19.4	19.4	19.4	0.0	0.0	-10.6	221.9	74.0	75.0%
2009	January	21	--	19	7,198	28.8	--	--	295.9	0.0	20.9	20.9	20.9	0.0	0.0	-7.8	214.0	81.9	72.3%
2009	February	22	--	19	6,910	24.9	--	--	295.9	0.0	19.3	19.3	19.3	0.0	0.0	-5.6	208.4	87.5	70.4%
2009	March	23	--	19	6,634	26.5	--	--	295.9	0.0	22.4	22.4	22.4	0.0	0.0	-4.1	204.4	91.5	69.1%
2009	April	24	--	19	6,369	24.6	--	--	295.9	3.8	21.8	25.6	25.6	19.7	5,103.1	20.7	225.0	70.9	76.1%
2009	May	25	--	19	6,305	25.2	--	--	295.9	4.5	18.3	22.7	22.7	20.4	5,103.1	17.9	243.0	52.9	82.1%
2009	June	26	--	19	6,242	24.1	--	--	295.9	4.2	14.0	18.1	18.1	19.7	5,103.1	13.7	256.7	39.2	86.8%
2009	July	27	--	19	6,179	24.7	--	--	295.9	4.6	11.7	16.3	16.3	20.4	5,103.1	12.0	268.8	27.1	90.8%
2009	August	28	--	19	6,118	24.4	--	--	295.9	3.5	9.3	12.9	12.9	20.4	5,103.1	8.8	277.6	18.3	93.8%
2009	September	29	--	19	6,056	23.4	--	--	295.9	1.9	7.2	9.1	9.1	19.7	5,103.1	5.4	282.9	13.0	95.6%
2009	October	30	--	19	5,996	24.0	--	--	295.9	1.2	6.5	7.6	7.6	0.0	0.0	-16.3	266.6	29.3	90.1%

## WATER BALANCE CALCULATION TABLE

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Prepared for: **Storm Cat Energy (USA) Operating Corporation**  
 Prepared by: CBM Associates, Inc.  
 Prepared on: 12/7/2006

PROJECT RESERVOIR CAPACITY		
Project Containment		
EXISTING	110.0	(ac-ft)@start
AVAILABLE	110.0	(ac-ft)@start
POTENTIAL	185.9	(ac-ft)
<b>TOTAL</b>	<b>295.9</b>	(ac-ft)

67.2	Initial reservoir infiltration rate (bwpd/acre-ft)
1.68%	Monthly reservoir infiltration decline rate
18.4%	Annual reservoir infiltration decline rate
0	Average Existing Reservoir Age (months)

Year	Month	#	Wells Activated/mo.		Daily Production (bwpd)	Monthly Production (acre-ft)	Action (reservoir name)	Exist/ Added Impound Capacity (acre-ft)	Total Impound Capacity (acre-ft)	Maximum Evaporation (acre-ft)	Maximum Infiltration (acre-ft)	Maximum Exfiltration (acre-ft)	Actual Exfiltration (acre-ft)	Dewatering Reservoir for Irrigation (acre-ft)	Dewatering Reservoir for Irrigation (bwpd)	Results for months end			
			Project Wells	Total Wells												Change in Storage (acre-ft)	Available Storage (acre-ft)	Amount of Water in Reservoirs (acre-ft)	% of Existing Storage Available %
15	=SUM=	180	19	19															
2009	November	31	--	19	5,936	23.0	--	--	295.9	0.9	8.7	9.6	9.6	0.0	0.0	-13.4	253.3	42.6	85.6%
2009	December	32	--	19	5,877	23.5	--	--	295.9	0.0	11.2	11.2	11.2	0.0	0.0	-12.3	240.9	55.0	81.4%
2010	January	33	--	19	5,818	23.2	--	--	295.9	0.0	13.0	13.0	13.0	0.0	0.0	-10.3	230.7	65.2	78.0%
2010	February	34	--	19	5,760	20.8	--	--	295.9	0.0	12.7	12.7	12.7	0.0	0.0	-8.1	222.6	73.3	75.2%
2010	March	35	--	19	5,702	22.8	--	--	295.9	0.0	15.4	15.4	15.4	0.0	0.0	-7.4	215.2	80.7	72.7%
2010	April	36	--	19	5,645	21.8	--	--	295.9	3.4	15.7	19.0	19.0	19.7	5,103.1	16.9	232.2	63.7	78.5%
2010	May	37	--	19	5,589	22.3	--	--	295.9	4.0	13.4	17.4	17.4	20.4	5,103.1	15.4	247.6	48.3	83.7%
2010	June	38	--	19	5,533	21.4	--	--	295.9	3.8	10.3	14.1	14.1	19.7	5,103.1	12.4	260.0	35.9	87.9%
2010	July	39	--	19	5,477	21.9	--	--	295.9	4.1	8.7	12.8	12.8	20.4	5,103.1	11.3	271.3	24.6	91.7%
2010	August	40	--	19	5,423	21.7	--	--	295.9	3.2	6.8	10.0	10.0	20.4	5,103.1	8.7	280.0	15.9	94.6%
2010	September	41	--	19	5,368	20.8	--	--	295.9	1.6	5.1	6.8	6.8	19.7	5,103.1	5.8	285.8	10.1	96.6%
2010	October	42	--	19	5,315	21.2	--	--	295.9	1.0	4.5	5.5	5.5	0.0	0.0	-15.8	270.0	25.9	91.3%
2010	November	43	--	19	5,262	20.3	--	--	295.9	0.8	6.3	7.1	7.1	0.0	0.0	-13.3	256.8	39.1	86.8%
2010	December	44	--	19	5,209	20.8	--	--	295.9	0.0	8.3	8.3	8.3	0.0	0.0	-12.5	244.2	51.7	82.5%
2011	January	45	--	19	5,157	20.6	--	--	295.9	0.0	9.8	9.8	9.8	0.0	0.0	-10.8	233.4	62.5	78.9%
2011	February	46	--	19	5,105	18.4	--	--	295.9	0.0	9.7	9.7	9.7	0.0	0.0	-8.7	224.7	71.2	75.9%
2011	March	47	--	19	5,054	20.2	--	--	295.9	0.0	12.0	12.0	12.0	0.0	0.0	-8.2	216.5	79.4	73.2%
2011	April	48	--	19	5,004	19.3	--	--	295.9	3.2	12.3	15.5	15.5	19.7	5,103.1	15.9	232.4	63.5	78.5%
2011	May	49	--	19	4,954	19.8	--	--	295.9	3.9	10.5	14.4	14.4	20.4	5,103.1	15.0	247.4	48.5	83.6%
2011	June	50	--	19	4,904	19.0	--	--	295.9	3.7	8.1	11.8	11.8	19.7	5,103.1	12.6	260.0	35.9	87.9%
2011	July	51	--	19	4,855	19.4	--	--	295.9	4.0	6.8	10.7	10.7	20.4	5,103.1	11.7	271.7	24.2	91.8%
2011	August	52	--	19	4,807	19.2	--	--	295.9	3.0	5.2	8.2	8.2	20.4	5,103.1	9.4	281.1	14.8	95.0%
2011	September	53	--	19	4,758	18.4	--	--	295.9	1.5	3.8	5.3	5.3	19.7	5,103.1	6.6	287.7	8.2	97.2%
2011	October	54	--	19	4,711	18.8	--	--	295.9	0.9	3.1	4.0	4.0	0.0	0.0	-14.8	272.9	23.0	92.2%
2011	November	55	--	19	4,664	18.0	--	--	295.9	0.7	4.5	5.3	5.3	0.0	0.0	-12.8	260.1	35.8	87.9%
2011	December	56	--	19	4,617	18.4	--	--	295.9	0.0	6.1	6.1	6.1	0.0	0.0	-12.4	247.8	48.1	83.7%
2012	January	57	--	19	4,571	18.3	--	--	295.9	0.0	7.3	7.3	7.3	0.0	0.0	-10.9	236.8	59.1	80.0%
2012	February	58	--	19	4,525	16.3	--	--	295.9	0.0	7.4	7.4	7.4	0.0	0.0	-8.9	227.9	68.0	77.0%
2012	March	59	--	19	4,480	17.9	--	--	295.9	0.0	9.2	9.2	9.2	0.0	0.0	-8.7	219.2	76.7	74.1%
2012	April	60	--	19	4,435	17.1	--	--	295.9	3.1	9.5	12.6	12.6	19.7	5,103.1	15.2	234.4	61.5	79.2%
2012	May	61	--	19	4,391	17.5	--	--	295.9	3.7	8.2	11.8	11.8	20.4	5,103.1	14.7	249.1	46.8	84.2%
2012	June	62	--	19	4,347	16.8	--	--	295.9	3.5	6.3	9.7	9.7	19.7	5,103.1	12.6	261.7	34.2	88.4%

## WATER BALANCE CALCULATION TABLE

**Project:** Sheridan State Phase I

Prepared for: **Storm Cat Energy (USA) Operating Corporation**  
 Prepared by: CBM Associates, Inc.  
 Prepared on: 12/7/2006

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Project Containment		
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AVAILABLE	110.0	(ac-ft)@start
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			Project Wells	Total Wells												Change in Storage (acre-ft)	Available Storage (acre-ft)	Amount of Water in Reservoirs (acre-ft)	% of Existing Storage Available %
15	=SUM=	180	19	19															
2012	July	63	--	19	4,303	17.2	--	295.9	3.7	5.1	8.8	8.8	20.4	5,103.1	12.0	273.7	22.2	92.5%	
2012	August	64	--	19	4,260	17.0	--	295.9	2.7	3.8	6.5	6.5	20.4	5,103.1	9.9	283.6	12.3	95.8%	
2012	September	65	--	19	4,218	16.3	--	295.9	1.3	2.7	4.0	4.0	19.7	5,103.1	7.4	291.0	4.9	98.3%	
2012	October	66	--	19	4,176	16.7	--	295.9	0.7	2.0	2.7	2.7	0.0	0.0	-14.0	277.0	18.9	93.6%	
2012	November	67	--	19	4,134	16.0	--	295.9	0.6	3.1	3.7	3.7	0.0	0.0	-12.2	264.8	31.1	89.5%	
2012	December	68	--	19	4,093	16.4	--	295.9	0.0	4.3	4.3	4.3	0.0	0.0	-12.0	252.8	43.1	85.4%	
2013	January	69	--	19	4,052	16.2	--	295.9	0.0	5.3	5.3	5.3	0.0	0.0	-10.8	242.0	53.9	81.8%	
2013	February	70	--	19	4,011	14.5	--	295.9	0.0	5.5	5.5	5.5	0.0	0.0	-9.0	233.0	62.9	78.7%	
2013	March	71	--	19	3,971	15.9	--	295.9	0.0	6.9	6.9	6.9	0.0	0.0	-9.0	224.0	71.9	75.7%	
2013	April	72	--	19	3,931	15.2	--	295.9	2.9	7.2	10.1	10.1	19.7	5,103.1	14.6	238.6	57.3	80.6%	
2013	May	73	--	19	3,892	15.6	--	295.9	3.4	6.1	9.5	9.5	20.4	5,103.1	14.4	252.9	43.0	85.5%	
2013	June	74	--	19	3,853	14.9	--	295.9	3.2	4.6	7.8	7.8	19.7	5,103.1	12.6	265.6	30.3	89.7%	
2013	July	75	--	19	3,815	15.2	--	295.9	3.3	3.7	7.0	7.0	20.4	5,103.1	12.1	277.7	18.2	93.8%	
2013	August	76	--	19	3,776	15.1	--	295.9	2.3	2.7	4.9	4.9	20.4	5,103.1	10.2	287.9	8.0	97.3%	
2013	September	77	--	19	3,739	14.5	--	295.9	1.0	1.7	2.7	2.7	19.7	5,103.1	8.0	295.9	0.0	100.0%	
2013	October	78	--	19	3,701	14.8	--	295.9	0.5	1.1	1.6	1.6	0.0	0.0	-13.2	282.7	13.2	95.5%	
2013	November	79	--	19	3,664	14.2	--	295.9	0.5	2.0	2.5	2.5	0.0	0.0	-11.7	271.0	24.9	91.6%	
2013	December	80	--	19	3,628	14.5	--	295.9	0.0	2.9	2.9	2.9	0.0	0.0	-11.6	259.5	36.4	87.7%	
2014	January	81	--	19	3,591	14.3	--	295.9	0.0	3.7	3.7	3.7	0.0	0.0	-10.6	248.9	47.0	84.1%	
2014	February	82	--	19	3,555	12.8	--	295.9	0.0	3.9	3.9	3.9	0.0	0.0	-8.9	239.9	56.0	81.1%	
2014	March	83	--	19	3,520	14.1	--	295.9	0.0	5.0	5.0	5.0	0.0	0.0	-9.1	230.9	65.0	78.0%	
2014	April	84	--	19	3,485	13.5	--	295.9	2.6	5.3	7.9	7.9	19.7	5,103.1	14.1	245.0	50.9	82.8%	
2014	May	85	--	19	3,450	13.8	--	295.9	3.0	4.4	7.4	7.4	20.4	5,103.1	14.1	259.1	36.8	87.5%	
2014	June	86	--	19	3,415	13.2	--	295.9	2.7	3.3	6.0	6.0	19.7	5,103.1	12.5	271.6	24.3	91.8%	
2014	July	87	--	19	3,381	13.5	--	295.9	2.7	2.5	5.2	5.2	20.4	5,103.1	12.1	283.7	12.2	95.9%	
2014	August	88	--	19	3,347	13.4	--	295.9	1.8	1.7	3.4	3.4	20.4	5,103.1	10.4	294.1	1.8	99.4%	
2014	September	89	--	19	3,314	12.8	--	295.9	0.7	0.9	1.6	1.6	19.7	5,103.1	1.8	295.9	0.0	100.0%	
2014	October	90	--	19	3,281	13.1	--	295.9	0.5	0.9	1.4	1.4	0.0	0.0	-11.7	284.2	11.7	96.0%	
2014	November	91	--	19	3,248	12.6	--	295.9	0.4	1.5	1.9	1.9	0.0	0.0	-10.7	273.5	22.4	92.4%	
2014	December	92	--	19	3,215	12.8	--	295.9	0.0	2.1	2.1	2.1	0.0	0.0	-10.7	262.8	33.1	88.8%	
2015	January	93	--	19	3,183	12.7	--	295.9	0.0	2.7	2.7	2.7	0.0	0.0	-10.0	252.8	43.1	85.4%	
2015	February	94	--	19	3,151	11.4	--	295.9	0.0	2.9	2.9	2.9	0.0	0.0	-8.5	244.4	51.5	82.6%	

## WATER BALANCE CALCULATION TABLE

**Project:** Sheridan State Phase I

Prepared for: **Storm Cat Energy (USA) Operating Corporation**  
 Prepared by: CBM Associates, Inc.  
 Prepared on: 12/7/2006

PROJECT RESERVOIR CAPACITY		
Project Containment		
EXISTING	110.0	(ac-ft)@start
AVAILABLE	110.0	(ac-ft)@start
POTENTIAL	185.9	(ac-ft)
<b>TOTAL</b>	<b>295.9</b>	(ac-ft)

67.2	Initial reservoir infiltration rate (bwpd/acre-ft)
1.68%	Monthly reservoir infiltration decline rate
18.4%	Annual reservoir infiltration decline rate
0	Average Existing Reservoir Age (months)

Year	Month	#	Wells Activated/mo.		Daily Production (bwpd)	Monthly Production (acre-ft)	Action (reservoir name)	Exist/ Added Impound Capacity (acre-ft)	Total Impound Capacity (acre-ft)	Maximum Evaporation (acre-ft)	Maximum Infiltration (acre-ft)	Maximum Exfiltration (acre-ft)	Actual Exfiltration (acre-ft)	Dewatering Reservoir for Irrigation (acre-ft)	Dewatering Reservoir for Irrigation (bwpd)	Results for months end			
			Project Wells	Total Wells												Change in Storage (acre-ft)	Available Storage (acre-ft)	Amount of Water in Reservoirs (acre-ft)	% of Existing Storage Available %
15	=SUM=	180	19	19															
2015	March	95	--	19	3,120	12.5	--	--	295.9	0.0	3.7	3.7	3.7	0.0	0.0	-8.8	235.6	60.3	79.6%
2015	April	96	--	19	3,089	11.9	--	--	295.9	2.4	4.0	6.4	6.4	19.7	5,103.1	14.1	249.7	46.2	84.4%
2015	May	97	--	19	3,058	12.2	--	--	295.9	2.7	3.3	6.0	6.0	20.4	5,103.1	14.2	263.9	32.0	89.2%
2015	June	98	--	19	3,027	11.7	--	--	295.9	2.4	2.3	4.7	4.7	19.7	5,103.1	12.7	276.6	19.3	93.5%
2015	July	99	--	19	2,997	12.0	--	--	295.9	2.2	1.7	3.9	3.9	20.4	5,103.1	12.3	289.0	6.9	97.7%
2015	August	100	--	19	2,967	11.9	--	--	295.9	1.3	1.0	2.3	2.3	20.4	5,103.1	6.9	295.9	0.0	100.0%
2015	September	101	--	19	2,937	11.4	--	--	295.9	0.7	0.7	1.4	1.4	19.7	5,103.1	0.0	295.9	0.0	100.0%
2015	October	102	--	19	2,908	11.6	--	--	295.9	0.5	0.8	1.2	1.2	0.0	0.0	-10.4	285.5	10.4	96.5%
2015	November	103	--	19	2,879	11.1	--	--	295.9	0.4	1.1	1.4	1.4	0.0	0.0	-9.7	275.8	20.1	93.2%
2015	December	104	--	19	2,850	11.4	--	--	295.9	0.0	1.6	1.6	1.6	0.0	0.0	-9.8	266.0	29.9	89.9%
2016	January	105	--	19	2,822	11.3	--	--	295.9	0.0	2.0	2.0	2.0	0.0	0.0	-9.3	256.7	39.2	86.8%
2016	February	106	--	19	2,793	10.1	--	--	295.9	0.0	2.1	2.1	2.1	0.0	0.0	-7.9	248.8	47.1	84.1%
2016	March	107	--	19	2,765	11.0	--	--	295.9	0.0	2.7	2.7	2.7	0.0	0.0	-8.3	240.5	55.4	81.3%
2016	April	108	--	19	2,738	10.6	--	--	295.9	2.2	3.0	5.1	5.1	19.7	5,103.1	14.3	254.8	41.1	86.1%
2016	May	109	--	19	2,710	10.8	--	--	295.9	2.4	2.4	4.8	4.8	20.4	5,103.1	14.3	269.1	26.8	90.9%
2016	June	110	--	19	2,683	10.4	--	--	295.9	2.0	1.6	3.6	3.6	19.7	5,103.1	13.0	282.1	13.8	95.3%
2016	July	111	--	19	2,656	10.6	--	--	295.9	1.8	1.1	2.8	2.8	20.4	5,103.1	12.6	294.7	1.2	99.6%
2016	August	112	--	19	2,630	10.5	--	--	295.9	1.0	0.6	1.7	1.7	20.4	5,103.1	1.2	295.9	0.0	100.0%
2016	September	113	--	19	2,604	10.1	--	--	295.9	0.7	0.6	1.3	1.3	19.7	5,103.1	0.0	295.9	0.0	100.0%
2016	October	114	--	19	2,578	10.3	--	--	295.9	0.5	0.6	1.1	1.1	0.0	0.0	-9.2	286.7	9.2	96.9%
2016	November	115	--	19	2,552	9.9	--	--	295.9	0.3	0.8	1.1	1.1	0.0	0.0	-8.8	277.9	18.0	93.9%
2016	December	116	--	19	2,526	10.1	--	--	295.9	0.0	1.1	1.1	1.1	0.0	0.0	-9.0	269.0	26.9	90.9%
2017	January	117	--	19	2,501	10.0	--	--	295.9	0.0	1.5	1.5	1.5	0.0	0.0	-8.5	260.4	35.5	88.0%
2017	February	118	--	19	2,476	8.9	--	--	295.9	0.0	1.6	1.6	1.6	0.0	0.0	-7.4	253.1	42.8	85.5%
2017	March	119	--	19	2,451	9.8	--	--	295.9	0.0	2.0	2.0	2.0	0.0	0.0	-7.8	245.3	50.6	82.9%
2017	April	120	--	19	2,427	9.4	--	--	295.9	2.0	2.2	4.2	4.2	19.7	5,103.1	14.5	259.8	36.1	87.8%
2017	May	121	--	19	2,402	9.6	--	--	295.9	2.1	1.7	3.8	3.8	20.4	5,103.1	14.6	274.4	21.5	92.7%
2017	June	122	--	19	2,378	9.2	--	--	295.9	1.7	1.1	2.8	2.8	19.7	5,103.1	13.3	287.7	8.2	97.2%
2017	July	123	--	19	2,355	9.4	--	--	295.9	1.3	0.6	1.9	1.9	20.4	5,103.1	8.2	295.9	0.0	100.0%
2017	August	124	--	19	2,331	9.3	--	--	295.9	1.0	0.5	1.5	1.5	20.4	5,103.1	0.0	295.9	0.0	100.0%
2017	September	125	--	19	2,308	8.9	--	--	295.9	0.7	0.5	1.2	1.2	19.7	5,103.1	0.0	295.9	0.0	100.0%
2017	October	126	--	19	2,285	9.1	--	--	295.9	0.5	0.5	1.0	1.0	0.0	0.0	-8.2	287.7	8.2	97.2%

## WATER BALANCE CALCULATION TABLE

**Project:** Sheridan State Phase I

Prepared for: **Storm Cat Energy (USA) Operating Corporation**  
 Prepared by: CBM Associates, Inc.  
 Prepared on: 12/7/2006

PROJECT RESERVOIR CAPACITY		
Project Containment		
EXISTING	110.0	(ac-ft)@start
AVAILABLE	110.0	(ac-ft)@start
POTENTIAL	185.9	(ac-ft)
<b>TOTAL</b>	<b>295.9</b>	(ac-ft)

67.2	Initial reservoir infiltration rate (bwpd/acre-ft)
1.68%	Monthly reservoir infiltration decline rate
18.4%	Annual reservoir infiltration decline rate
0	Average Existing Reservoir Age (months)

Year	Month	#	Wells Activated/mo.		Daily Production (bwpd)	Monthly Production (acre-ft)	Action (reservoir name)	Exist/ Added Impound Capacity (acre-ft)	Total Impound Capacity (acre-ft)	Maximum Evaporation (acre-ft)	Maximum Infiltration (acre-ft)	Maximum Exfiltration (acre-ft)	Actual Exfiltration (acre-ft)	Dewatering Reservoir for Irrigation (acre-ft)	Dewatering Reservoir for Irrigation (bwpd)	Results for months end			
			Project Wells	Total Wells												Change in Storage (acre-ft)	Available Storage (acre-ft)	Amount of Water in Reservoirs (acre-ft)	% of Existing Storage Available %
15	=SUM=	180	19	19															
2017	November	127	--	19	2,262	8.7	--	--	295.9	0.3	0.6	0.8	0.8	0.0	0.0	-7.9	279.8	16.1	94.6%
2017	December	128	--	19	2,239	8.9	--	--	295.9	0.0	0.8	0.8	0.8	0.0	0.0	-8.1	271.7	24.2	91.8%
2018	January	129	--	19	2,217	8.9	--	--	295.9	0.0	1.1	1.1	1.1	0.0	0.0	-7.8	263.9	32.0	89.2%
2018	February	130	--	19	2,195	7.9	--	--	295.9	0.0	1.2	1.2	1.2	0.0	0.0	-6.8	257.2	38.7	86.9%
2018	March	131	--	19	2,173	8.7	--	--	295.9	0.0	1.5	1.5	1.5	0.0	0.0	-7.2	250.0	45.9	84.5%
2018	April	132	--	19	2,151	8.3	--	--	295.9	1.8	1.6	3.4	3.4	19.7	5,103.1	14.8	264.8	31.1	89.5%
2018	May	133	--	19	2,130	8.5	--	--	295.9	1.8	1.2	3.0	3.0	20.4	5,103.1	14.9	279.7	16.2	94.5%
2018	June	134	--	19	2,108	8.2	--	--	295.9	1.3	0.7	2.0	2.0	19.7	5,103.1	13.6	293.3	2.6	99.1%
2018	July	135	--	19	2,087	8.3	--	--	295.9	1.1	0.4	1.5	1.5	20.4	5,103.1	2.6	295.9	0.0	100.0%
2018	August	136	--	19	2,066	8.3	--	--	295.9	1.0	0.4	1.4	1.4	20.4	5,103.1	0.0	295.9	0.0	100.0%
2018	September	137	--	19	2,046	7.9	--	--	295.9	0.7	0.4	1.1	1.1	19.7	5,103.1	0.0	295.9	0.0	100.0%
2018	October	138	--	19	2,025	8.1	--	--	295.9	0.5	0.4	0.9	0.9	0.0	0.0	-7.2	288.7	7.2	97.6%
2018	November	139	--	19	2,005	7.8	--	--	295.9	0.3	0.4	0.7	0.7	0.0	0.0	-7.1	281.6	14.3	95.2%
2018	December	140	--	19	1,985	7.9	--	--	295.9	0.0	0.6	0.6	0.6	0.0	0.0	-7.3	274.3	21.6	92.7%
2019	January	141	--	19	1,965	7.9	--	--	295.9	0.0	0.8	0.8	0.8	0.0	0.0	-7.1	267.2	28.7	90.3%
2019	February	142	--	19	1,945	7.0	--	--	295.9	0.0	0.8	0.8	0.8	0.0	0.0	-6.2	261.0	34.9	88.2%
2019	March	143	--	19	1,926	7.7	--	--	295.9	0.0	1.1	1.1	1.1	0.0	0.0	-6.6	254.4	41.5	86.0%
2019	April	144	--	19	1,907	7.4	--	--	295.9	1.6	1.2	2.8	2.8	19.7	5,103.1	15.2	269.6	26.3	91.1%
2019	May	145	--	19	1,888	7.5	--	--	295.9	1.6	0.8	2.4	2.4	20.4	5,103.1	15.3	284.8	11.1	96.3%
2019	June	146	--	19	1,869	7.2	--	--	295.9	1.0	0.4	1.4	1.4	19.7	5,103.1	11.1	295.9	0.0	100.0%
2019	July	147	--	19	1,850	7.4	--	--	295.9	1.1	0.4	1.4	1.4	20.4	5,103.1	0.0	295.9	0.0	100.0%
2019	August	148	--	19	1,832	7.3	--	--	295.9	1.0	0.3	1.4	1.4	20.4	5,103.1	0.0	295.9	0.0	100.0%
2019	September	149	--	19	1,813	7.0	--	--	295.9	0.7	0.3	1.0	1.0	19.7	5,103.1	0.0	295.9	0.0	100.0%
2019	October	150	--	19	1,795	7.2	--	--	295.9	0.5	0.3	0.8	0.8	0.0	0.0	-6.4	289.5	6.4	97.8%
2019	November	151	--	19	1,777	6.9	--	--	295.9	0.3	0.3	0.6	0.6	0.0	0.0	-6.3	283.2	12.7	95.7%
2019	December	152	--	19	1,759	7.0	--	--	295.9	0.0	0.4	0.4	0.4	0.0	0.0	-6.6	276.6	19.3	93.5%
2020	January	153	--	19	1,742	7.0	--	--	295.9	0.0	0.6	0.6	0.6	0.0	0.0	-6.4	270.2	25.7	91.3%
2020	February	154	--	19	1,724	6.2	--	--	295.9	0.0	0.6	0.6	0.6	0.0	0.0	-5.6	264.6	31.3	89.4%
2020	March	155	--	19	1,707	6.8	--	--	295.9	0.0	0.8	0.8	0.8	0.0	0.0	-6.0	258.6	37.3	87.4%
2020	April	156	--	19	1,690	6.5	--	--	295.9	1.4	0.9	2.3	2.3	19.7	5,103.1	15.5	274.1	21.8	92.6%
2020	May	157	--	19	1,673	6.7	--	--	295.9	1.3	0.6	1.9	1.9	20.4	5,103.1	15.6	289.7	6.2	97.9%
2020	June	158	--	19	1,656	6.4	--	--	295.9	0.8	0.3	1.1	1.1	19.7	5,103.1	6.2	295.9	0.0	100.0%

## WATER BALANCE CALCULATION TABLE

**Project:** Sheridan State Phase I

Prepared for: Storm Cat Energy (USA) Operating Corporation  
 Prepared by: CBM Associates, Inc.  
 Prepared on: 12/7/2006

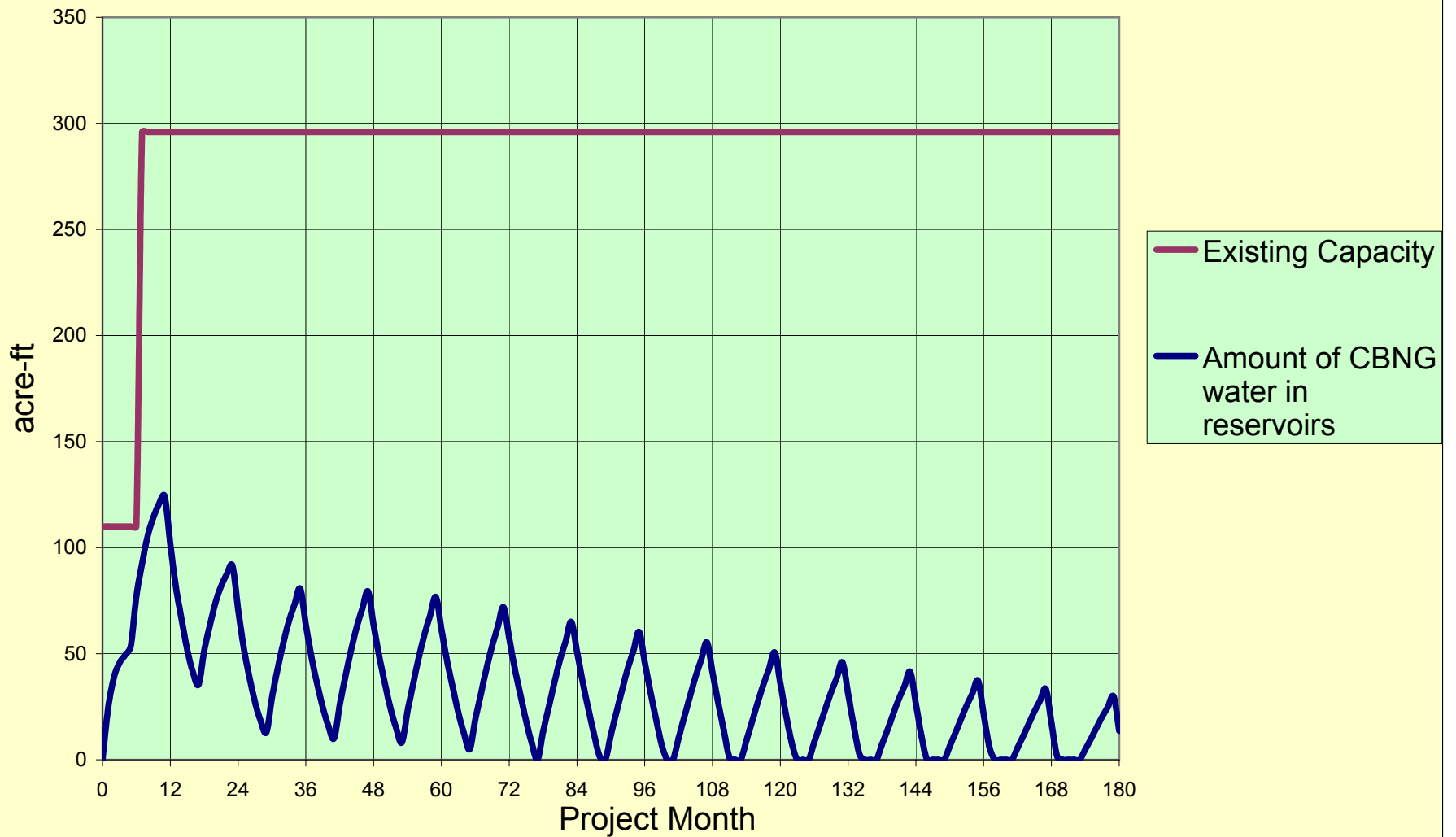
PROJECT RESERVOIR CAPACITY		
Project Containment		
EXISTING	110.0	(ac-ft)@start
AVAILABLE	110.0	(ac-ft)@start
POTENTIAL	185.9	(ac-ft)
<b>TOTAL</b>	<b>295.9</b>	(ac-ft)

67.2	Initial reservoir infiltration rate (bwpd/acre-ft)
1.68%	Monthly reservoir infiltration decline rate
18.4%	Annual reservoir infiltration decline rate
0	Average Existing Reservoir Age (months)

Year	Month	#	Wells Activated/mo. Project Wells	Total Wells	Provided Daily Production (bwpd)	Calculated Monthly Production (acre-ft)	Action (reservoir name)	Exist/ Added Impound Capacity (acre-ft)	Total Impound Capacity (acre-ft)	Maximum Evaporation (acre-ft)	Maximum Infiltration (acre-ft)	Maximum Exfiltration (acre-ft)	Actual Exfiltration (acre-ft)	Dewatering Reservoir for Irrigation (acre-ft)	Dewatering Reservoir for Irrigation (bwpd)	Results for months end			
																Change in Storage (acre-ft)	Available Storage (acre-ft)	Amount of Water in Reservoirs (acre-ft)	% of Existing Storage Available %
15	=SUM=	180	19	19															
2020	July	159	--	19	1,640	6.6	--	--	295.9	1.1	0.3	1.4	1.4	20.4	5,103.1	0.0	295.9	0.0	100.0%
2020	August	160	--	19	1,623	6.5	--	--	295.9	1.0	0.3	1.3	1.3	20.4	5,103.1	0.0	295.9	0.0	100.0%
2020	September	161	--	19	1,607	6.2	--	--	295.9	0.7	0.3	0.9	0.9	19.7	5,103.1	0.0	295.9	0.0	100.0%
2020	October	162	--	19	1,591	6.4	--	--	295.9	0.5	0.3	0.7	0.7	0.0	0.0	-5.6	290.3	5.6	98.1%
2020	November	163	--	19	1,575	6.1	--	--	295.9	0.3	0.3	0.5	0.5	0.0	0.0	-5.6	284.7	11.2	96.2%
2020	December	164	--	19	1,559	6.2	--	--	295.9	0.0	0.3	0.3	0.3	0.0	0.0	-5.9	278.8	17.1	94.2%
2021	January	165	--	19	1,544	6.2	--	--	295.9	0.0	0.4	0.4	0.4	0.0	0.0	-5.8	273.0	22.9	92.3%
2021	February	166	--	19	1,528	5.5	--	--	295.9	0.0	0.4	0.4	0.4	0.0	0.0	-5.1	268.0	27.9	90.6%
2021	March	167	--	19	1,513	6.0	--	--	295.9	0.0	0.6	0.6	0.6	0.0	0.0	-5.5	262.5	33.4	88.7%
2021	April	168	--	19	1,498	5.8	--	--	295.9	1.3	0.6	1.9	1.9	19.7	5,103.1	15.9	278.4	17.5	94.1%
2021	May	169	--	19	1,483	5.9	--	--	295.9	1.1	0.4	1.5	1.5	20.4	5,103.1	15.9	294.3	1.6	99.5%
2021	June	170	--	19	1,468	5.7	--	--	295.9	0.8	0.2	1.0	1.0	19.7	5,103.1	1.6	295.9	0.0	100.0%
2021	July	171	--	19	1,454	5.8	--	--	295.9	1.1	0.2	1.3	1.3	20.4	5,103.1	0.0	295.9	0.0	100.0%
2021	August	172	--	19	1,439	5.7	--	--	295.9	1.0	0.2	1.2	1.2	20.4	5,103.1	0.0	295.9	0.0	100.0%
2021	September	173	--	19	1,425	5.5	--	--	295.9	0.7	0.2	0.9	0.9	19.7	5,103.1	0.0	295.9	0.0	100.0%
2021	October	174	--	19	1,410	5.6	--	--	295.9	0.5	0.2	0.7	0.7	0.0	0.0	-4.9	291.0	4.9	98.3%
2021	November	175	--	19	1,396	5.4	--	--	295.9	0.3	0.2	0.5	0.5	0.0	0.0	-4.9	286.0	9.9	96.7%
2021	December	176	--	19	1,382	5.5	--	--	295.9	0.0	0.2	0.2	0.2	0.0	0.0	-5.3	280.7	15.2	94.9%
2022	January	177	--	19	1,368	5.5	--	--	295.9	0.0	0.3	0.3	0.3	0.0	0.0	-5.2	275.6	20.3	93.1%
2022	February	178	--	19	1,355	4.9	--	--	295.9	0.0	0.3	0.3	0.3	0.0	0.0	-4.6	271.0	24.9	91.6%
2022	March	179	--	19	1,341	5.4	--	--	295.9	0.0	0.4	0.4	0.4	0.0	0.0	-4.9	266.1	29.8	89.9%
2022	April	180	--	19	1,328	5.1	--	--	295.9	1.1	0.5	1.6	1.6	19.7	5,103.1	16.2	282.3	13.6	95.4%



## Amount of CBNG Water in Reservoirs



**Sheridan State Phase I Area Watersheds**

**Storm Cat Energy (USA) Operating Corporation**

**Storm Runoff Calculations using SCS and HEC-HMS**

Soils C  
 CN = 75  
 la = 0.66666667 in.

Reservoir Name	Watershed Area (sq mi)	Hydraulic Length of Watershed (feet)	Basin Slope (%)	Time of Concentration (min)	SCS Lag Time (min)	Reservoir Capacity (acre-ft)	Estimated Precipitation Level for 50-yr Event (in.)	HEC-HMS Calculated Runoff from 50-yr Event (acre-ft)
<b>Kane 01-7-5781</b>	0.0429	589.5	12.1	1.16	0.70	110.0	3.0	2.20

**SCE - Sheridan State #1 Freeboard Volume Calculations**

Reservoir Name	50-yr, 24-hr Storm Volume (acre-ft)	Reservoir Surface Area at High Water Line (HWL) (acres)	Height of Freeboard (ft)	Freeboard Capacity* (height x HWL area) (acre-ft)	Excess Freeboard Capacity after a 50-yr, 24-hr Storm Event (acre-ft)
<b>Kane 01-7-5781</b>	2.2	6.4	2.0	12.8	<b>10.6</b>

\* This is a conservative estimate of freeboard capacity since it ignores the increase in reservoir surface area as the water line raises from the high water line to 2 ft above the high water line.



LABORATORY ANALYTICAL REPORT

**Client:** MOC-CMS-Pennaco Energy  
**Site Name:** Prairie\_Dog  
**Project:** Production\_Well\_Sample  
**Samp FRQ/Type:** OT  
**Client Sample ID:** PW\_49\_033\_22687\_13\_22\_57\_83CR  
**Location:**

**Lab ID:** G03120080-001  
**Report Date:** 12/16/03  
**Collection Date:** 12/04/03 10:45  
**Date Received:** 12/05/03  
**Sampled By:** Dan Freeland  
**Matrix:** AQUEOUS  
**Tracking Number:** 24161

Analyses	Result	Units	Qualifiers	RL	QCL	Method	Analysis Date / By
<b>FIELD PARAMETERS</b>							
pH, field	7.60	s.u.				FIELD	12/04/03 10:45 / ***
*** Performed by Sampler							
<b>MAJOR IONS</b>							
Bicarbonate as HCO3	1980	mg/L		5		A2320 B	12/08/03 09:47 / mli
Chloride	10	mg/L		1		E300.0	12/08/03 10:17 / mli
Fluoride	2.3	mg/L		0.1		E300.0	12/08/03 10:17 / mli
Sulfate	ND	mg/L		1		E300.0	12/08/03 10:17 / mli
Calcium	9	mg/L	D	2		E200.7	12/15/03 17:12 / rh
Magnesium	3	mg/L		1		E200.7	12/15/03 17:12 / rh
Potassium	12	mg/L		1		E200.7	12/08/03 21:18 / rh
Sodium	719	mg/L	D	2		E200.7	12/15/03 17:12 / rh
<b>MAJOR IONS - MILLIEQUIVALENTS</b>							
Calcium, meq	0.44	meq/L		0.05		E200.7	12/15/03 17:12 / rh
Magnesium, meq	0.25	meq/L		0.08		E200.7	12/15/03 17:12 / rh
Sodium, meq	31.3	meq/L		0.04		E200.7	12/15/03 17:12 / rh
<b>METALS, DISSOLVED</b>							
Boron	194	ug/L		100		E200.7	12/08/03 21:18 / rh
Cadmium	ND	ug/L		0.1		E200.8	12/08/03 20:59 / car
Chromium	2	ug/L		1		E200.8	12/08/03 20:59 / car
Copper	ND	ug/L		1		E200.8	12/08/03 20:59 / car
Iron	267	ug/L		30		E200.7	12/08/03 21:18 / rh
Lead	ND	ug/L		2		E200.8	12/09/03 22:37 / jw
Manganese	22	ug/L		10		E200.7	12/08/03 21:18 / rh
Mercury	ND	ug/L		0.06		E200.8	12/09/03 22:37 / jw
Nickel	ND	ug/L		10		E200.8	12/08/03 20:59 / car
Silver	ND	ug/L		3		E200.8	12/08/03 20:59 / car
Zinc	18	ug/L		10		E200.7	12/08/03 21:18 / rh
<b>METALS, TOTAL</b>							
Barium	960	ug/L		100		E200.7	12/11/03 10:55 / rh
Iron	2400	ug/L		30		E200.7	12/11/03 10:55 / rh
Manganese	24	ug/L		10		E200.7	12/11/03 10:55 / rh
<b>METALS, TOTAL RECOVERABLE</b>							
Aluminum	82	ug/L		50		E200.8	12/09/03 17:50 / jw
Antimony	ND	ug/L		5		E200.8	12/09/03 17:50 / jw
Arsenic	ND	ug/L		0.1		E200.8	12/11/03 15:03 / jw

**Report** RL - Analyte reporting limit. MCL - Maximum contaminant level.  
**Definitions:** QCL - Quality control limit. ND - Not detected at the reporting limit.  
 D - RL increased due to sample matrix interference.



LABORATORY ANALYTICAL REPORT

**Client:** MOC-CMS-Pennaco Energy  
**Site Name:** Prairie\_Dog  
**Project:** Production\_Well\_Sample  
**Samp FRQ/Type:** OT  
**Client Sample ID:** PW\_49\_033\_22687\_13\_22\_57\_83CR  
**Location:**

**Lab ID:** G03120080-001  
**Report Date:** 12/16/03  
**Collection Date:** 12/04/03 10:45  
**Date Received:** 12/05/03  
**Sampled By:** Dan Freeland  
**Matrix:** AQUEOUS  
**Tracking Number:** 24161

Analyses	Result	Units	Qualifiers	RL	QCL	Method	Analysis Date / By
<b>METALS, TOTAL RECOVERABLE</b>							
Beryllium	ND	ug/L		0.03		E200.8	12/11/03 15:03 / jw
Selenium	ND	ug/L		5		E200.8	12/09/03 17:50 / jw
Thallium	ND	ug/L		1		E200.8	12/10/03 18:13 / jw
<b>NON-METALS</b>							
Alkalinity, Total as CaCO3	1620	mg/L		5		A2320 B	12/08/03 09:47 / mli
Conductivity @ 25 C	2740	umhos/cm		1		A2510 B	12/05/03 13:27 / daa
Cyanide, Total Automated	ND	ug/L		5		E335.3	12/08/03 13:59 / kp
Hardness as CaCO3	35	mg/L		10		A2340 B	12/16/03 12:17 / cw
Phenolics, Total Recoverable	ND	ug/L		10		E420.2	12/09/03 10:32 / kp
Sodium Adsorption Ratio (SAR)	53.2	unitless		0.1		Calculation	12/16/03 12:17 / cw
Solids, Total Dissolved TDS @ 180 C	1770	mg/L		10		A2540 C	12/05/03 10:35 / mli
Total Petroleum Hydrocarbons	ND	mg/L		1.0		SW1664A	12/10/03 12:12 / aps
<b>DATA QUALITY</b>							
A/C Balance	-0.87	%				A1030 E	12/16/03 12:14 / cw
Anions	32.8	meq/L		0.01		A1030 E	12/16/03 12:14 / cw
Cations	32.3	meq/L		0.01		A1030 E	12/16/03 12:14 / cw
<b>RADIOCHEMICAL</b>							
Radium 226	ND	pCi/L		0.2		E903.0M	12/15/03 11:53 / df

**Report Definitions:** RL - Analyte reporting limit. MCL - Maximum contaminant level.  
 QCL - Quality control limit. ND - Not detected at the reporting limit.



LABORATORY ANALYTICAL REPORT

Client: MOC-CMS-Pennaco Energy  
 Site Name: Prairie\_Dog  
 Project: Produced\_Water\_Sampling  
 Samp FRQ/Type: SP  
 Client Sample ID: PW\_11\_22\_57\_83M  
 Location: NESW\_22\_57N\_83W

Lab ID: G04010184-001  
 Report Date: 02/26/04  
 Collection Date: 01/14/04 15:25  
 Date Received: 01/15/04  
 Sampled By: Dave Olson  
 Matrix: AQUEOUS  
 Tracking Number: 25797

Analyses	Result	Units	Qualifiers	RL	QCL	Method	Analysis Date / By
<b>FIELD PARAMETERS</b>							
pH, field	7.80	s.u.				FIELD	01/14/04 15:25 / ***
*** Performed by Sampler							
<b>MAJOR IONS</b>							
Bicarbonate as HCO3	1470	mg/L		5		A2320 B	01/22/04 10:27 / mli
Chloride	12	mg/L		1		E300.0	01/16/04 13:07 / mli
Fluoride	2.3	mg/L		0.1		E300.0	01/16/04 13:07 / mli
Sulfate	5	mg/L		1		E300.0	01/16/04 13:07 / mli
Calcium	5	mg/L		1		E200.7	01/21/04 13:17 / rlh
Magnesium	2	mg/L		1		E200.7	01/21/04 13:17 / rlh
Potassium	9	mg/L		1		E200.7	01/26/04 16:26 / rlh
Sodium	504	mg/L		1		E200.7	01/26/04 16:26 / rlh
<b>MAJOR IONS - MILLIEQUIVALENTS</b>							
Calcium, meq	0.27	meq/L		0.05		E200.7	01/21/04 13:17 / rlh
Magnesium, meq	0.18	meq/L		0.08		E200.7	01/21/04 13:17 / rlh
Sodium, meq	21.9	meq/L		0.04		E200.7	01/26/04 16:26 / rlh
<b>METALS, DISSOLVED</b>							
Boron	ND	ug/L		100		E200.7	01/16/04 15:51 / rlh
Cadmium	ND	ug/L		0.1		E200.8	01/16/04 13:59 / jw
Chromium	3	ug/L		1		E200.8	01/16/04 13:59 / jw
Copper	ND	ug/L		1		E200.8	01/16/04 13:59 / jw
Iron	49	ug/L		30		E200.7	01/16/04 15:51 / rlh
Lead	ND	ug/L		2		E200.8	01/16/04 13:59 / jw
Manganese	25	ug/L		10		E200.7	01/16/04 15:51 / rlh
Mercury	ND	ug/L		0.06		E200.8	01/16/04 13:59 / jw
Nickel	ND	ug/L		10		E200.8	01/16/04 13:59 / jw
Silver	ND	ug/L		3		E200.8	01/16/04 13:59 / jw
Zinc	26	ug/L		10		E200.7	01/16/04 15:51 / rlh
<b>METALS, TOTAL</b>							
Barium	378	ug/L		100		E200.7	01/20/04 16:04 / rlh
<b>METALS, TOTAL RECOVERABLE</b>							
Aluminum	ND	ug/L		50		E200.8	01/19/04 20:01 / jw
Antimony	ND	ug/L		5		E200.8	01/19/04 20:01 / jw
Arsenic	0.4	ug/L		0.1		E200.8	01/19/04 20:01 / jw
Beryllium	ND	ug/L		0.03		E200.8	01/19/04 20:01 / jw
Selenium	ND	ug/L		5		E200.8	01/19/04 20:01 / jw

Report RL - Analyte reporting limit.  
 Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.



LABORATORY ANALYTICAL REPORT

Client: MOC-CMS-Pennaco Energy  
 Site Name: Prairie\_Dog  
 Project: Produced\_Water\_Sampling  
 Samp FRQ/Type: SP  
 Client Sample ID: PW\_11\_22\_57\_83M  
 Location: NESW\_22\_57N\_83W

Lab ID: G04010184-001  
 Report Date: 02/26/04  
 Collection Date: 01/14/04 15:25  
 Date Received: 01/15/04  
 Sampled By: Dave Olson  
 Matrix: AQUEOUS  
 Tracking Number: 25797

Analyses	Result	Units	Qualifiers	RL	QCL	Method	Analysis Date / By
<b>METALS, TOTAL RECOVERABLE</b>							
Thallium	ND	ug/L		1		E200.8	01/19/04 20:01 / jw
<b>NON-METALS</b>							
Alkalinity, Total as CaCO3	1230	mg/L		5		A2320 B	01/22/04 10:27 / mli
Conductivity @ 25 C	2140	umhos/cm		1		A2510 B	01/15/04 12:19 / daa
Cyanide, Total Manual Distillation	ND	ug/L		5		E335.4	01/20/04 14:43 / kp
Hardness as CaCO3	23	mg/L		10		A2340 B	01/27/04 10:43 / cw
Phenolics, Total Recoverable	ND	ug/L		10		E420.2	01/16/04 10:59 / kp
Sodium Adsorption Ratio (SAR)	46	unitless		0.10		Calculation	01/27/04 10:43 / cw
Solids, Total Dissolved TDS @ 180 C	1360	mg/L		10		A2540 C	01/16/04 08:31 / mli
Total Petroleum Hydrocarbons	ND	mg/L		1.0		SW1664A	01/21/04 13:16 / aps
<b>DATA QUALITY</b>							
A/C Balance	-5.24	%				A1030 E	01/27/04 10:41 / cw
Anions	25.1	%		0.01		A1030 E	01/27/04 10:41 / cw
Cations	22.6	%		0.01		A1030 E	01/27/04 10:41 / cw
<b>RADIOCHEMICAL</b>							
Radium 226	ND	pCi/L		0.2		E903.0M	01/19/04 10:55 / df

Report Definitions: RL - Analyte reporting limit.  
 QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.



LABORATORY ANALYTICAL REPORT

Client: MOC-CMS-Pennaco Energy  
 Site Name: Brinkerhoff  
 Project: Produced\_Water  
 Samp FRQ/Type: SP  
 Client Sample ID: PW\_3\_22\_57\_83D1  
 Location:

Lab ID: G04030001-002  
 Report Date: 03/23/04  
 Collection Date: 02/27/04 09:20  
 Date Received: 02/28/04  
 Sampled By: Dave Olson  
 Matrix: AQUEOUS  
 Tracking Number: 27317

Analyses	Result	Units	Qualifiers	RL	QCL	Method	Analysis Date / By
<b>FIELD PARAMETERS</b>							
pH, field	7.90	s.u.				FIELD	02/27/04 09:20 / ***
*** Performed by Sampler							
<b>MAJOR IONS</b>							
Bicarbonate as HCO3	1230	mg/L		5		A2320 B	03/02/04 09:55 / mli
Chloride	5	mg/L		1		E300.0	03/02/04 13:23 / mli
Fluoride	2.2	mg/L		0.1		E300.0	03/02/04 13:23 / mli
Sulfate	3	mg/L		1		E300.0	03/02/04 13:23 / mli
Calcium	5	mg/L		1		E200.7	03/03/04 21:33 / jw
Magnesium	3	mg/L		1		E200.7	03/03/04 21:33 / jw
Potassium	8	mg/L		1		E200.7	03/03/04 21:33 / jw
Sodium	483	mg/L		1		E200.7	03/03/04 21:33 / jw
<b>MAJOR IONS - MILLIEQUIVALENTS</b>							
Calcium, meq	0.26	meq/L		0.05		E200.7	03/03/04 21:33 / jw
Magnesium, meq	0.21	meq/L		0.08		E200.7	03/03/04 21:33 / jw
Sodium, meq	21.0	meq/L		0.04		E200.7	03/03/04 21:33 / jw
<b>METALS, DISSOLVED</b>							
Boron	213	ug/L		100		E200.8	03/04/04 00:02 / jw
Cadmium	ND	ug/L		0.1		E200.8	03/04/04 00:02 / jw
Chromium	2	ug/L		1		E200.8	03/04/04 00:02 / jw
Copper	ND	ug/L		1		E200.8	03/04/04 00:02 / jw
Iron	141	ug/L		30		E200.7	03/03/04 21:33 / jw
Lead	ND	ug/L		2		E200.8	03/04/04 00:02 / jw
Manganese	20	ug/L		10		E200.8	03/04/04 00:02 / jw
Mercury	ND	ug/L		0.06		E200.8	03/04/04 00:02 / jw
Nickel	ND	ug/L		10		E200.8	03/04/04 00:02 / jw
Silver	ND	ug/L		3		E200.8	03/04/04 00:02 / jw
Zinc	ND	ug/L		10		E200.8	03/04/04 00:02 / jw
<b>METALS, TOTAL</b>							
Barium	340	ug/L		100		E200.7	03/04/04 23:52 / jw
<b>METALS, TOTAL RECOVERABLE</b>							
Aluminum	160	ug/L		50		E200.8	03/04/04 23:32 / car
Antimony	ND	ug/L		5		E200.8	03/04/04 23:32 / car
Arsenic	0.6	ug/L		0.1		E200.8	03/05/04 20:23 / car
Beryllium	ND	ug/L		0.03		E200.8	03/04/04 23:32 / car
Selenium	ND	ug/L		5		E200.8	03/04/04 23:32 / car

Report RL - Analyte reporting limit.  
 Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.



LABORATORY ANALYTICAL REPORT

Client: MOC-CMS-Pennaco Energy  
 Site Name: Brinkerhoff  
 Project: Produced\_Water  
 Samp FRQ/Type: SP  
 Client Sample ID: PW\_3\_22\_57\_83D1  
 Location:

Lab ID: G04030001-002  
 Report Date: 03/23/04  
 Collection Date: 02/27/04 09:20  
 Date Received: 02/28/04  
 Sampled By: Dave Olson  
 Matrix: AQUEOUS  
 Tracking Number: 27317

Analyses	Result	Units	Qualifiers	RL	QCL	Method	Analysis Date / By
<b>METALS, TOTAL RECOVERABLE</b>							
Thallium	ND	ug/L		1		E200.8	03/04/04 23:32 / car
<b>NON-METALS</b>							
Alkalinity, Total as CaCO3	1010	mg/L		5		A2320 B	03/02/04 09:55 / mli
Conductivity @ 25 C	1780	umhos/cm		1		A2510 B	03/01/04 13:11 / daa
Cyanide, Total Automated	ND	ug/L		5		E335.3	03/04/04 12:54 / kp
Hardness as CaCO3	23.6	mg/L		10		A2340 B	03/08/04 18:36 / cw
Phenolics, Total Recoverable	ND	ug/L		10		E420.2	03/03/04 11:30 / kp
Sodium Adsorption Ratio (SAR)	43.3	unitless		0.1		Calculation	03/08/04 19:36 / cw
Solids, Total Dissolved TDS @ 180 C	1110	mg/L		10		A2540 C	03/02/04 15:39 / mli
Total Petroleum Hydrocarbons	ND	mg/L		1.0		SW1664A	03/03/04 13:41 / aps
<b>DATA QUALITY</b>							
A/C Balance	2.70	%				A1030 E	03/08/04 18:35 / cw
Anions	20.6	meq/L		0.01		A1030 E	03/08/04 18:35 / cw
Cations	21.7	meq/L		0.01		A1030 E	03/08/04 18:35 / cw
<b>RADIOCHEMICAL</b>							
Radium 226	ND	pCi/L		0.2		E903.0M	03/04/04 12:20 / df

Report RL - Analyte reporting limit.  
 Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.





LABORATORY ANALYTICAL REPORT

Client: MOC-CMS-Pennaco Energy  
 Site Name: Prairie\_Dog  
 Project: Produced\_Water\_Sampling  
 Samp FRQ/Type: SP  
 Client Sample ID: PW\_11\_22\_57\_83D2  
 Location: NESW\_22\_57N\_83W

Lab ID: G04010184-002  
 Report Date: 02/26/04  
 Collection Date: 01/14/04 15:40  
 Date Received: 01/15/04  
 Sampled By: Dave Olson  
 Matrix: AQUEOUS  
 Tracking Number: 25798

Analyses	Result	Units	Qualifiers	RL	QCL	Method	Analysis Date / By
<b>FIELD PARAMETERS</b>							
pH, field	8.80	s.u.				FIELD	01/14/04 15:40 / ***
*** Performed by Sampler							
<b>MAJOR IONS</b>							
Bicarbonate as HCO3	1340	mg/L		5		A2320 B	01/22/04 10:35 / mli
Chloride	7	mg/L		1		E300.0	01/16/04 13:23 / mli
Fluoride	3.1	mg/L		0.1		E300.0	01/16/04 13:23 / mli
Sulfate	ND	mg/L		1		E300.0	01/16/04 13:23 / mli
Calcium	3	mg/L		1		E200.7	01/21/04 13:21 / rlh
Magnesium	3	mg/L		1		E200.7	01/21/04 13:21 / rlh
Potassium	7	mg/L		1		E200.7	01/16/04 15:55 / rlh
Sodium	506	mg/L		1		E200.7	01/26/04 16:38 / rlh
<b>MAJOR IONS - MILLIEQUIVALENTS</b>							
Calcium, meq	0.13	meq/L		0.05		E200.7	01/21/04 13:21 / rlh
Magnesium, meq	0.25	meq/L		0.08		E200.7	01/21/04 13:21 / rlh
Sodium, meq	22.0	meq/L		0.04		E200.7	01/26/04 16:38 / rlh
<b>METALS, DISSOLVED</b>							
Boron	ND	ug/L		100		E200.7	01/16/04 15:55 / rlh
Cadmium	ND	ug/L		0.1		E200.8	01/16/04 14:05 / jw
Chromium	3	ug/L		1		E200.8	01/16/04 14:05 / jw
Copper	ND	ug/L		1		E200.8	01/16/04 14:05 / jw
Iron	37	ug/L		30		E200.7	01/16/04 15:55 / rlh
Lead	ND	ug/L		2		E200.8	01/16/04 14:05 / jw
Manganese	26	ug/L		10		E200.7	01/16/04 15:55 / rlh
Mercury	ND	ug/L		0.06		E200.8	01/16/04 14:05 / jw
Nickel	ND	ug/L		10		E200.8	01/16/04 14:05 / jw
Silver	ND	ug/L		3		E200.8	01/16/04 14:05 / jw
Zinc	14	ug/L		10		E200.7	01/16/04 15:55 / rlh
<b>METALS, TOTAL</b>							
Barium	130	ug/L		100		E200.8	01/20/04 19:20 / jw
<b>METALS, TOTAL RECOVERABLE</b>							
Aluminum	ND	ug/L		50		E200.8	01/19/04 20:12 / jw
Antimony	ND	ug/L		5		E200.8	01/19/04 20:12 / jw
Arsenic	0.4	ug/L		0.1		E200.8	01/19/04 20:12 / jw
Beryllium	ND	ug/L		0.03		E200.8	01/19/04 20:12 / jw
Selenium	ND	ug/L		5		E200.8	01/19/04 20:12 / jw

Report RL - Analyte reporting limit.  
 Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.



LABORATORY ANALYTICAL REPORT

Client: MOC-CMS-Pennaco Energy  
 Site Name: Prairie\_Dog  
 Project: Produced\_Water\_Sampling  
 Samp FRQ/Type: SP  
 Client Sample ID: PW\_11\_22\_57\_83D2  
 Location: NESW\_22\_57N\_83W

Lab ID: G04010184-002  
 Report Date: 02/26/04  
 Collection Date: 01/14/04 15:40  
 Date Received: 01/15/04  
 Sampled By: Dave Olson  
 Matrix: AQUEOUS  
 Tracking Number: 25798

Analyses	Result	Units	Qualifiers	RL	QCL	Method	Analysis Date / By
<b>METALS, TOTAL RECOVERABLE</b>							
Thallium	ND	ug/L		1		E200.8	01/19/04 20:12 / jw
<b>NON-METALS</b>							
Alkalinity, Total as CaCO3	1250	mg/L		5		A2320 B	01/22/04 10:35 / mli
Conductivity @ 25 C	2180	umhos/cm		1		A2510 B	01/15/04 12:20 / daa
Cyanide, Total Automated	ND	ug/L		5		E335.3	01/19/04 14:09 / kp
Hardness as CaCO3	19	mg/L		10		A2340 B	01/27/04 10:43 / cw
Phenolics, Total Recoverable	ND	ug/L		10		E420.2	01/16/04 11:01 / kp
Sodium Adsorption Ratio (SAR)	51	unitless		0.10		Calculation	01/27/04 10:43 / cw
Solids, Total Dissolved TDS @ 180 C	1370	mg/L		10		A2540 C	01/16/04 08:42 / mli
Total Petroleum Hydrocarbons	ND	mg/L		1.0		SW1664A	01/21/04 13:16 / aps
<b>DATA QUALITY</b>							
A/C Balance	-5.80	%				A1030 E	01/27/04 10:41 / cw
Anions	25.4	%		0.01		A1030 E	01/27/04 10:41 / cw
Cations	22.6	%		0.01		A1030 E	01/27/04 10:41 / cw
<b>RADIOCHEMICAL</b>							
Radium 226	ND	pCi/L		0.2		E903.0M	01/19/04 10:55 / df

Report RL - Analyte reporting limit.  
 Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.



LABORATORY ANALYTICAL REPORT

Client: MOC-CMS-Pennaco Energy  
 Site Name: Brinkerhoff  
 Project: Produced\_Water  
 Samp FRQ/Type: SP  
 Client Sample ID: PW\_49\_033\_22681  
 Location:

Lab ID: G04030001-001  
 Report Date: 03/23/04  
 Collection Date: 02/27/04 09:10  
 Date Received: 02/28/04  
 Sampled By: Dave Olson  
 Matrix: AQUEOUS  
 Tracking Number: 27316

Analyses	Result	Units	Qualifiers	RL	QCL	Method	Analysis Date / By
<b>FIELD PARAMETERS</b>							
pH, field	8.10	s.u.				FIELD	02/27/04 09:10 / ***
*** Performed by Sampler							
<b>MAJOR IONS</b>							
Bicarbonate as HCO3	1380	mg/L		5		A2320 B	03/09/04 09:49 / mli
Chloride	21	mg/L		1		E300.0	03/09/04 13:15 / mli
Fluoride	3.2	mg/L		0.1		E300.0	03/09/04 13:15 / mli
Sulfate	8	mg/L		1		E300.0	03/09/04 13:15 / mli
Calcium	6	mg/L		1		E200.7	03/09/04 12:34 / rh
Magnesium	3	mg/L		1		E200.7	03/09/04 12:34 / rh
Potassium	9	mg/L		1		E200.7	03/12/04 12:46 / rh
Sodium	497	mg/L		1		E200.7	03/12/04 12:46 / rh
<b>MAJOR IONS - MILLIEQUIVALENTS</b>							
Calcium, meq	0.29	meq/L		0.05		E200.7	03/09/04 12:34 / rh
Magnesium, meq	0.23	meq/L		0.08		E200.7	03/09/04 12:34 / rh
Sodium, meq	21.6	meq/L		0.04		E200.7	03/12/04 12:46 / rh
<b>METALS, DISSOLVED</b>							
Boron	189	ug/L		100		E200.8	03/03/04 23:56 / jw
Cadmium	ND	ug/L		0.1		E200.8	03/03/04 23:56 / jw
Chromium	1	ug/L		1		E200.8	03/03/04 23:56 / jw
Copper	ND	ug/L		1		E200.8	03/03/04 23:56 / jw
Iron	134	ug/L		30		E200.7	03/03/04 21:29 / jw
Lead	ND	ug/L		2		E200.8	03/03/04 23:56 / jw
Manganese	15	ug/L		10		E200.8	03/03/04 23:56 / jw
Mercury	ND	ug/L		0.06		E200.8	03/03/04 23:56 / jw
Nickel	ND	ug/L		10		E200.8	03/03/04 23:56 / jw
Silver	ND	ug/L		3		E200.8	03/03/04 23:56 / jw
Zinc	10	ug/L		10		E200.8	03/03/04 23:56 / jw
<b>METALS, TOTAL</b>							
Barium	360	ug/L		100		E200.7	03/05/04 04:34 / jw
<b>METALS, TOTAL RECOVERABLE</b>							
Aluminum	ND	ug/L		50		E200.8	03/04/04 19:38 / car
Antimony	ND	ug/L		5		E200.8	03/04/04 19:38 / car
Arsenic	5.7	ug/L		0.1		E200.8	03/04/04 19:38 / car
Beryllium	ND	ug/L		0.03		E200.8	03/04/04 19:38 / car
Selenium	ND	ug/L		5		E200.8	03/04/04 19:38 / car

Report RL - Analyte reporting limit.  
 Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.



LABORATORY ANALYTICAL REPORT

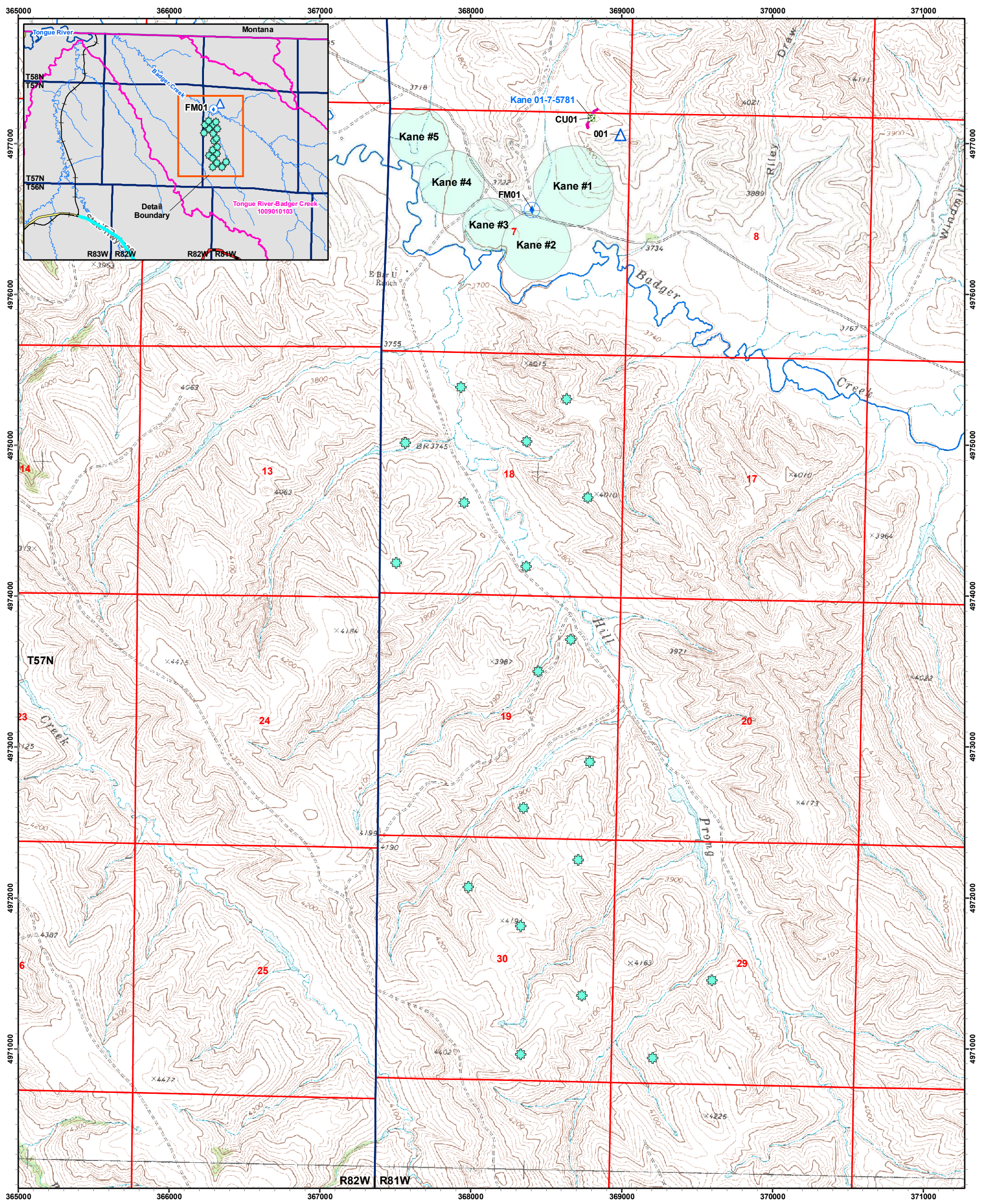
Client: MOC-CMS-Pennaco Energy  
 Site Name: Brinkerhoff  
 Project: Produced\_Water  
 Samp FRQ/Type: SP  
 Client Sample ID: PW\_49\_033\_22681  
 Location:

Lab ID: G04030001-001  
 Report Date: 03/23/04  
 Collection Date: 02/27/04 09:10  
 Date Received: 02/28/04  
 Sampled By: Dave Olson  
 Matrix: AQUEOUS  
 Tracking Number: 27316

Analyses	Result	Units	Qualifiers	RL	QCL	Method	Analysis Date / By
<b>METALS, TOTAL RECOVERABLE</b>							
Thallium	ND	ug/L		1		E200.8	03/04/04 19:38 / car
<b>NON-METALS</b>							
Alkalinity, Total as CaCO3	1140	mg/L		5		A2320 B	03/09/04 09:49 / mli
Conductivity @ 25 C	2030	umhos/cm		1		A2510 B	03/01/04 13:11 / daa
Cyanide, Total Automated	ND	ug/L		5		E335.3	03/04/04 12:53 / kp
Hardness as CaCO3	26.2	mg/L		10		A2340 B	03/15/04 12:33 / cw
Phenolics, Total Recoverable	ND	ug/L		10		E420.2	03/03/04 11:51 / kp
Sodium Adsorption Ratio (SAR)	42.2	unitless		0.1		Calculation	03/15/04 12:33 / cw
Solids, Total Dissolved TDS @ 180 C	1280	mg/L		10		A2540 C	03/02/04 15:35 / mli
Total Petroleum Hydrocarbons	ND	mg/L		1.0		SW1664A	03/03/04 13:15 / aps
<b>DATA QUALITY</b>							
A/C Balance	-2.88	%				A1030 E	03/15/04 12:22 / cw
Anions	23.7	meq/L		0.01		A1030 E	03/15/04 12:22 / cw
Cations	22.4	meq/L		0.01		A1030 E	03/15/04 12:22 / cw
<b>RADIOCHEMICAL</b>							
Radium 226	ND	pCi/L		0.2		E903.0M	03/04/04 12:20 / df

Report RL - Analyte reporting limit.  
 Definitions: QCL - Quality control limit.

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





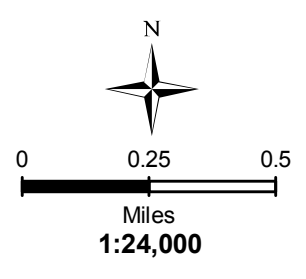
**Sheridan State  
Phase I  
WYPDES  
Permit Application**

**HUC 10 - 1009010103**

**December 5, 2006**

**Explanation:**

-  Outfall, Not Constructed
-  Containment Unit
-  Flow Monitor Station
-  On-Channel Impoundment, Proposed
-  CBM Well - State
-  County Road
-  Railroad
-  Highway
-  Pivots



**Table 1: Outfall Information - Sheridan State Phase I**

Discharge Point (Outfalls) #	Immediate Receiving Stream	Mainstem	Distance to Closest 2AB Channel & Mainstem (Miles)	Quarter / Quarter	Section	TwN (N)	Rng (W)	Nad 27 Latitude	Nad 27 Longitude	County	Reservoir Name and Type
001	Tributary to Badger Creek	Tongue River	Not applicable Option 1B	NENE	7	57	81	44.936848	-106.660385	Sheridan	Kane 01-7-5781 Headwater Option 1B
Station Name	Station Description			Quarter / Quarter	Section	TwN (N)	Rng (W)	Nad 27 Latitude	Nad 27 Longitude	Notes regarding water quality monitoring station types	
CU01	Containment Unit Water Quality Monitoring Station			NENE	7	57	81	44.937825	-106.662802	--	
FM01	Flow Monitoring Station			SWNE	7	57	81	44.932267	-106.667617	--	

*Please note that not all station types may be applicable for a particular facility. Additional spaces may be added if necessary. Use the format provided. Please denote reservoir type(s) - on channel, off-channel, playa, headwater Option 1B - in the appropriate column. Please note that reservoir information is not required if reservoir containment is not part of the facility's water management plan - for instance, information about existing "incidental" downstream reservoirs is not required.*